2010年
11月17－24日
温得和克

基本系统委员会

特别届会

世界气象组织

天气 · 气候 · 水

WMO-No.1070

天气 · 气候 · 水

基本系统委员会

特别届会

温得和克
2010年11月17–24日

含决议和建议案的最终节略报告

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Chairperson, Publications Board

World Meteorological Organization (WMO)
7 bis, avenue de la Paix
P.O. Box 2300
CH-1211 Geneva 2, Switzerland

Tel.: +41 (0) 22 730 84 03
Fax: +41 (0) 22 730 80 40
E-mail: publications@wmo.int

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届会工作总摘要

1 会议开幕 *(议题 1)*

1.1 应纳米比亚共和国政府的盛情邀请，基本系统委员会特别届会于 2010 年 11 月 17-24 日在温得和克召开。开幕式于 2010 年 11 月 17 日周三上午 10 点在温得和克乡村俱乐部酒店举行。

1.2 开幕式由纳米比亚工程和运输部常务秘书 George Simataa 先生主持。Simataa 先生对所有参会者来到纳米比亚表示欢迎。他指出，世界气象组织 (WMO) 基本系统委员会与 WMO 其它技术委员会协商，在界定和协调基本气象业务系统及基础设施方面发挥了主导作用。他回顾说，纳米比亚国家气象部门隶属于工程和运输部，与 WMO 合作，以确保提供纳米比亚公民安全和福祉所需的关键的天气和气候预测。他强调指出，天气和气候信息对于许多决策过程至关重要，特别是在社会经济部门，如各种方式的运输 (空中、海上和陆地)、农业、环境、水资源以及许多其它部门。Simataa 先生强调，纳米比亚及其相对年轻的气象部门期待着与 CBS 以及 WMO 其它组织机构密切合作，以确保获取所有气象和水文业务领域的能力。

1.3 委员会主席 Fred Branski 先生对所有与会者表示欢迎。他赞赏纳米比亚共和国总统及其政府在其美丽的国家承办这次会议。注意到 CBS-11 于 1996 年在埃及开罗举行，他对 CBS 届会在一区协举行表示高兴。他进一步强调说，作为世界上将环境保护纳入宪法的第一个国家，纳米比亚是一个理想的国家，可以反映 CBS 如何改善服务，作出将使 CBS 成为一个更好委员会的决策，以及计划 CBS 如何能够有助于所有会员改进其国家气象水文部门 (NMHS)。Branski 先生指出，本次 CBS 届会正好在 2011 年 5 月第十六次 WMO 大会之前召开，因而反映了所有其它技术委员会和区域协会会议的成果和建议，并建立在这些成果和建议的基础之上。

1.4 CBS 主席提到，将在会议上讨论一些挑战。这些挑战包括：进一步实施 WMO 信息系统 (WIS)，包括建议由大会指定第一批 WIS 中心；审查 WMO 全球综合观测系统 (WIGOS)，包括向大会建议实施 WIGOS。他指出，WMO 观测系统和信息系统是 WMO 所依赖的基本模块。其它挑战包括：全球资料处理和预报系统，包括灾害性天气预报示范项目；进一步加强公共气象服务计划，通过这一计划，WMO 会员向其政府、公众、商业部门以及各会员气象部门的所有其他用户提供服务。

1.5 Branski 先生进一步阐述了服务在 WMO 中的意义，他强调指出，资料和产品归根结底旨在帮助用户做出决定。无论这一决定是穿什么衣服，什么时候播种，还是由于一场风

暴即将到来，一个城市必须采取什么样的预防措施。提供信息是一种服务。帮助别人做出决定是一种服务。促进对生命、财产和资源的保护也是一种服务。了解用户需要或想要什么服务，以及为了提供这些服务需要什么，应该是 CBS 活动的驱动因素。进行观测，共享和处理信息，以便能够提供服务。NMHS 是提供这些服务的工具。他进一步指出，本次届会将考虑全球气候服务框架 (GFCS) 对于 CBS 可能意味着什么。WMO 需要提供 WIS 来支持 GFCS。WMO 需要实施 WIGOS 来支持 GFCS。资料处理和预报系统必须满足 GFCS 的需求，公共气象服务必须了解并提供 GFCS 所带来的服务需求。Branski 先生进一步重申，虽然 GFCS 仍在发展之中，并有必要等待大会的决定，但 CBS 应尽早做好准备，因为直到 2012 年才会再次召开委员会全会。

1.6 Branski 先生强调指出，在届会期间举行了技术大会“端到端服务提供：从观测到服务，用户需要它们的途径”。这将为委员会提供一个机会来研究如何改进委员会的工作。主席最后再次强调了他对东道国的感谢，并指出，这些奇妙的设施和支持，这样一个鼓舞人心的位置，使得这次 CBS 特别届会将变得不同寻常。

1.7 WMO 秘书长米歇尔·雅罗先生欢迎参加 CBS 特别届会的所有与会者。他代表 WMO，通过副总理 Marco Hausiku 阁下，感谢纳米比亚共和国政府在温得和克承办本次届会和 WMO“端到端服务示范”技术大会。他还感谢纳米比亚气象局长兼 WMO 常任代表 Franz Uirab 先生及其工作人员的盛情款待，以及为确保会议成功所作的出色安排。他还就纳米比亚自 1991 年 2 月 6 日加入本组织以来积极支持 WMO 的计划和活动对 Franz Uirab 先生表示感谢。

1.8 秘书长感谢 CBS 主席 Fred Branski 先生对委员会的领导，及其自 2009 年 3 至 4 月在 (克罗地亚) 杜布罗夫尼克举行的 CBS 第十四次届会以来休会期间所完成的工作。他还感谢 CBS 副主席 Susan Barrell 女士，以及各开放计划领域组的组长和成员、专家、协调小组和报告员。

1.9 注意到 WMO 在 2010 年 3 月 23 日庆祝其成立 60 周年，雅罗先生向会议简要介绍了 CBS 的历史及其来自国际气象组织 (IMO) 的起源，后者的职责于 1951 年被 WMO 取代。在 IMO 中，最初是天气信息委员会，在 WMO 中变成天气学委员会，在 1971 年成为 CBS。在 WMO 早期，委员会采取举措，扩大观测和电信，而这恰逢电信和计算能力的激增，以及空间时代的到来。在这种背景下，发展了世界天气监视网 (WWW) 的愿景，1963 年大会批准了 WWW 概念，1967 年大会通过了 WWW 计划，1968 年正式启动了 WWW。基于 WMO 会员所运行的设施，并认识到天气系统的所有部分都是互动的，没有一个国家能够自给自足，委员会成功地指导了 WWW 发展成为一个协调和综合系统。得到连接从科学到应用之路的 WMO 及其合作伙伴研究活动的支持，包括全球大气研究计划 (GARP) 及其随后的全球协调试验，WWW 成为 WMO 全球气象服务框架的基石。

1.10 秘书长强调指出，CBS 面临着新的挑战，并且必须满足其它 WMO 计划和 WMO 合作伙伴前所未有的需求。这包括新的倡议，如 GFCS，其发展将取决于 WIGOS 和 WIS。他鼓励委员会通过考虑采取以下举措，进一步支持 WIGOS 的发展和实施，尤其是：指导开发气候监测的空基架构；开发 WMO 观测用户需求和观测能力数据库以及未来担当数据库主机的战略；在 WIGOS 实施中进一步指导 CBS 的作用和责任。他还注意到大会休会期间在 WIS 管理材料和 WIS 中心分析方面所取得的重大进展。他建议委员会可以向大会推荐第一批 WIS 中心，在批准之后，WIS 将进入其运行阶段。因此，预计 WIS 的重点将从开发转到能力建设。不过，他指出，所有会员完成 WIS 的实施可能需要一些时间，他鼓励该委员会在以下几个方面提供进一步的指导，其中包括：继续改进 GTS，以确保联系尽可能多的会员；开发和推广区域试点项目，以促进会员在实施 WIS 能力方面的努力；促进 WIS 的应用，以满足其它 WMO 计划的需求。

1.11 雅罗先生强调指出，信息通信技术 (ICT) 的发展也需要更多地保护气象活动的无线电频率。他指出，尽管 2003 年召开的世界无线电通信大会 (WRC-03) 对无线电频率的分配进行了统一，但一些区域对这些活动的扩大几乎没有进行调控，所以继续构成重大威胁。因此，2012 年举行的下届 WRC 会议至关重要。

1.12 最后，雅罗先生指出，WMO 正面临抉择，这对未来的重要性或许等同于当初发展 WWW 的意义，因为 GFCS 将给对气候敏感的所有活动带来益处。他强调指出，CBS 面临的挑战将是继续保证基本系统的基础设施来支持 WMO 的所有计划，这样 WMO 才能满足国家可持续发展的需求，并为实现全球战略目标作出贡献。同时，他强调要与其他技术委员会和区域协会开展更加密切的合作，并进一步鼓励发展中国家的专家积极参与 CBS 的工作。他重申，WMO 感谢纳米比亚共和国承办本次 CBS 特别届会，并祝愿全体代表在温得和克生活愉快，祝愿召开一次最成功和最富有成效的会议。

1.13 纳米比亚信息与通信技术部长 Joel Kaapanda 阁下代表工程和运输部长 Erkki Nghimtina 阁下，欢迎各位代表莅临纳米比亚。他祝愿大家在纳米比亚生活愉快，并希望多数代表在返回各自国家之前能有机会访问该国其它地方以及温得和克。他谈到了全球变暖造成的影响，比如洪水、干旱和灾害天气现象 (比如热浪、飓风、热带风暴、飓风甚至海啸) 造成大规模的人口背井离乡。他指出，如果对这些事件无动于衷则将造成深远的影响，所以有必要明确气象和相关科学面临的挑战。他强调指出，包括陆运、海运和空运在内的交通部门在从规划到运行的所有层面的活动都是气象和相关服务的主要用户。

1.14 纳米比亚共和国副总理 Marco Hausiku 阁下代表该国总统 Hifikepunye Pohamba 阁下发表了主旨演讲。他说，承办这次重要的 WMO CBS 特别届会是纳米比亚的荣誉。他指出，天气和气候系统实际上是不断变化且没有国界的，并强调说，重要的是所有国家要开展合作，以确保气象部门有能力准确地预报天气事件。他指出，CBS 的活动涉及天气观测、资料处理、

资料通信和资料管理等综合系统的开发、实施和运行，也与公共气象服务的提供有关。他指出，如果利用新的科学知识并进行技术开发，则可以更加有效地开展 CBS 的活动；CBS 面临的挑战是确保发展旨在支持 WMO 所有计划的基本系统的基础设施。他希望通过本次会议的讨论来解决这些挑战，从而找到合适的解决办法。

1.15 Hausiku 阁下报告说，纳米比亚政府已经制订了加强该国气象部门的计划，这也是该国国家发展计划的部分内容。纳米比亚认识到，需要获得气象信息来支持对天气、气候和水敏感的许多社会经济部门的活动。他指出，纳米比亚的长期发展战略 (2030 年愿景) 认识到气候在发展议程中的重要性。由于纳米比亚的气候在半干旱与干旱之间变动，所以该国非常容易受到干旱和洪水的影响。他强调说，很明显，近年来干旱和洪水的发生更加频繁，所以需要采取减缓行动和设计有效的应对机制。他希望委员会能促进气象基础设施和系统的发展，从而提高系统观测和天气预报的准确性。

1.16 南部非洲发展共同体 (SADC) 国家元首和政府首脑认识到，重要的是区域内外的 NMHS 要彼此合作以确保提供更好的服务并提高效率，并在最近批准建立南部非洲气象协会 (MASA)。纳米比亚总统希望通过 MASA 的努力，给 CBS 和 WMO 其它组织机构的工作注入活力。Hausiku 阁下进一步报告说，作为 WMO 的一名会员，纳米比亚将继续参与 WMO 组织机构的活动，包括执行理事会及其工作组。他进一步指出，令总统感到骄傲的是，纳米比亚已与其它国家合作应对与天气有关的问题。全球变暖带来的持续挑战要求国际社会采取联合行动来找到持久的解决方案。总统相信，拥有丰富经验和专业知识的 WMO 将对这些活动作出积极的贡献。

1.17 Hausiku 阁下代表纳米比亚共和国总统，对那些参与组织和促进会议实现预定目标的全体人士表示称赞。他祝愿大家在温得和克足智多谋，祝愿讨论取得丰硕的成果。

1.18 工程和运输部副常任秘书 Balbina Pienaar 女士感谢 Hausiku 阁下抽时间出席这次历史性会议的开幕式并正式宣布开幕。她指出，这反映了纳米比亚对天气和气候问题持严肃认真的态度。她指出，本次会议是由 WMO 和纳米比亚政府联合主办，并感谢纳米比亚许多组织提供的帮助，包括当地组委会付出的时间和努力。

1.19 本报告附件为与会人员名单。

2 会议组织 *(议题 2)*

2.1 审议证书报告 *(议题 2.1)*

根据总则第 20 至 23 条，委员会注意到并批准了秘书长的代表提交的第一份证书报告。

2.2 通过议程 *(议题 2.2)*

届会一致通过了附件 B 中的议程。

2.3 建立委员会 *(议题 2.3)*

根据 WMO 总则第 24 至 28 条，委员会同意建立：

(a) 一个协调委员会，由委员会主席和副主席、CBS管理组其他成员、秘书长的代表以及承办国的一名代表组成。

(b) 一个WIS特设委员会，其任务是评审GISC和DCPC示范过程专家组(ET-GDDP)的建议，并评审届会期间希望展示其WIS能力以获认可的那些中心。WIS特设委员会由赵立成(中国)、M. Dell'Acqua(法国)(联合主席)、H. Ichijo(日本)、J. Kongoti(肯尼亚)、L. Bezrouk(俄罗斯联邦)、C. Hegemann(美国)以及S. Foreman(联合主席)(以OPAG-ISS组长的身份)组成。

委员会同意届会采用全会形式开展工作，并同意总全会将由委员会主席主持，负责审议议题 1、2、3、5、6、7、8、9 和 10。全会 A 将由委员会副主席主持，负责审议议题 4(除议题 4.4 和 4.5 外)。全会 B 由 F. Uirab 先生 (纳米比亚) 主持，负责审议议题 4.4 和 4.5。

2.4 其他组织事宜 *(议题 2.4)*

届会同意会议的工作时间。鉴于讨论的技术特点，届会同意不需要对全会做文字记录。根据总则第 3 条，委员会同意在整个届会期间暂停执行总则第 109 条的规定。

3. 委员会主席的报告 *(议题 3)*

3.1 委员会赞赏地注意到基本系统委员会 (CBS) 主席 F. Branski 先生做的报告。注意到 CBS 活动对所有 WMO 计划的重要性，包括对许多活动的引导作用，委员会认可自 CBS 第十四次届会 (2009) 以来做的大量工作，尤其是：

(a) CBS对进一步测试和开发WIGOS理念做了大量工作，包括顺利制定了明确各项具体任务的WDIP；它与CIMO、其他技术委员会、区域协会和EC WIGOS/WIS工作组一起更新了WIGOS操作理念(CONOPS)，使之更好地包括了WIGOS实施的业务方面，从而更全面地满足用户的希望；它为提交EC-62供审议和背书的WIGOS发展和实施战略(WDIS)做出了贡献，并且为框架性WIGOS实施计划(WIP)做出了贡献(http://www.wmo.int/pages/prog/www/wigos/principal_documents.html)；

(b) 审查了有关11项观测应用的指南声明(SoG：http://www.wmo.int/pages/prog/sat/RRR-and-SOG.html)；

(c) 审查了GOS发展实施计划(EGOS-IP：http://www.wmo.int/pages/prog/www/OSY/Reports/ET-EGOS-5-Final-Report.doc)；为响应新的GOS 2025年愿景和WIGOS的需要，业已采取措施制定新的全球观测系统发展实施计划；

(d) 对主要的NWP中心和THORPEX参与单位开展的影响研究的结果进行审查，审查结果将提交2012年召开的各观测系统对NWP的影响研讨会(http://www.wmo.int/pages/prog/www/OSY/Reports/ICT-IOS6-Geneva2010.doc)；

(e) 在开发适用的机载水汽传感器方面的工作取得进展，并在继续开展工作，努力开发一种能适用各主要机种和机型并含总体软硬件方案的湿度传感器(http://www.wmo.int/amdar/documents/AMDARPanel_13andET-AIR_2FinalReport.doc)；

(f) CBS与CIMO一起制定了天气雷达/风涡轮选址指南声明(http://www.wmo.int/pages/prog/www/IMOP/reports/2009/Final%20Report%20ET-SBRSO%20and%20ET-RSUTT.pdf)，人工观测站向自动观测站转化指南(http://www.wmo.int/pages/prog/www/OSY/Reports/ET-AWS-6_Geneva_2010_REV.doc)，以及地面观测站选址分类指南；

(g) 已经制定了一份WMO天气雷达/无线电频率共享频谱使用指南声明，通过与无线电频率指导小组协调，将提交该声明供审查(http://www.wmo.int/pages/prog/www/IMOP/reports/2009/Final%20Report%20ET-SBRSO%20and%20ET-RSUTT.pdf)；

(h) 已制定空基观测能力清单和评估报告，并已印制和分发WMO第153号技术文件–空基全球观测系统 2010 (GOS-2010)；

(i) 已制定空间气候监测框架概念；

(j) 已完成对WMO会员关于卫星资料和产品的可用性和使用情况的两年度调查，并进行了分析；

(k) 在第一、第三和第四区协建立了区域专家组，以审议对获取卫星资料的需求；

(l) 全球75%的卫星探测资料已标准化，并通过GTS近实时传输；

(m) 已开始对静止和极轨卫星的红外图像资料进行定期交叉检定；

(n) 通过跨计划空间天气协调组与国际空间环境服务组织(ISES)的合作已启动空间天气活动；

(o) WIS已取得长足进步，WIS中心的指定程序业已足够成熟，可以提请执行理事会背书及提交大会；

(p) 已开始指定WIS中心的评价工作；它们将与其他的提议一起提交大会批准；

(q) 更新WMO技术规则(WMO-No.49)，包括已制定WIS手册草案和 WIS指南草案，供审议后推荐大会批准；

(r) 南部非洲和南太平洋岛屿灾害性天气预报展示项目(SWFDP)继续拓展其成果，东南亚和东非的项目亦取得新进展；

(s) 通过多计划合作，旨在满足区域建立多灾种早期预警系统需要的SWFDP已通过改进预报和警报服务在许多发展中国家产生效益；

(t) SWFDP已成为在发展中国家NMHS推广基于EPS的概率预报产品的重要手段，用

于延伸灾害性天气警报时间和计算预报不确定性；

(u) 已全面开展对GDPFS手册的审查，并已制定一份新手册框架草案；

(v) 公共天气服务指南(http://www.wmo.int/pages/prog/amp/pwsp/publicationsguidelines_en.htm)已得到更新和加强，世界天气信息服务(WWIS)网站(http://worldweather.wmo.int/)也已更新，并开发了WMO会员权威警报发布的在线注册(http://www-db.wmo.int/alerting/edit.asp)；

(w) 制定了一些简短的“引导材料”(1-2页：http://www.wmo.int/pages/prog/amp/pwsp/publicationsguidelines_en.htm)用于总结和介绍ET/COPE在过去几年出版的各种指南和报告；

(x) 在WMO/中国气象局(CMA)展馆方面，开展活动以支持世界博览会临近预报服务(WENS)示范项目；

(y) 更新和加强ET/DPM制作的部分现有的指南；

(z) 建立了气象支持人道主义机构跨委员会专题组，并举行了首次会议。负责协调人道主义应急规划和响应的国际和联合国机构的29名专家出席了会议，与会方还包括IFRC、UNICEF、UNITAR、WFP、WHO、NMHS业务气象水文和气候预报中心的专家、专业中心和国际中心、WMO秘书处的职员。

3.2 委员会注意到 CBS 下次届会召开前 CBS 工作的优先重点如下：

(a) 根据GOS愿景2025和WIGOS的需求制定新的全球观测系统实施计划，继续开展滚动需求审查过程和进一步发展/更新相关的支持WIGOS的规则材料；

(b) 筹备和启动WIGOS实施阶段；

(c) 实施第一批WIS中心，支持NMHS，包括元数据制作所需的培训活动；

(d) WMO资料和产品表示从传统的字母数字电码向表驱动码转换，包括支持NMHS；

(e) 在东南亚、东非和其他可能的地区推广灾害性天气预报展示项目(SWFDP)；将建好的项目转交区域协会负责；

(f) 审查和更新GDPFS手册；

(g) 与CCl合作进一步发展全球长期预报产品中心，以支持RCC和国家中心提供季节和长期预测服务，从而支持全球气候服务框架的发展；

(h) 与CAS一起制定区域沙尘暴警报评估和咨询系统中心的指定标准，预计有两个要求指定为中心的申请；

(i) 支持实施WWW系统和公共天气服务方面的能力建设；

(j) 参与PWS有关沟通、宣传和出版方面的工作，以支持重要的WMO活动；

(k) 能力建设和培训以满足发展中国家的需求；

(l) 帮助NMHS发展与媒体积极的伙伴关系；

(m) 在通信服务中应用最新的技术；

(n) 提高对高质量、沟通良好和提供手段先进的PWS对NMHS形象和知名度的影响的认识；

(o) 继续对WWIS和灾害性天气信息中心(SWIC)的发展提供指导；

(p) 就PWS在开发跨界警报交换方面的作用提供指导；

(q) 确定PWS用户对产品和服务新的和更高的要求并就此提出建议，着重于PWS重点用户群；

(r) 帮助NMHS制定质量管理程序和规范，尤其是借助航空气象培训活动；

(s) 帮助NMHS开发对天气、气候和水服务的经济效益的评价和展示；

(t) 除空间计划对WIGOS的贡献外，进一步开发SCOPE-CM –用于气候监测的环境卫星资料可持续相互协调处理，以此作为GFCS的关键组成部分；

(u) 支持全球气候服务框架；

(v) 支持减轻灾害风险计划；

(w) 支持质量管理框架的开发。

4. 有关基本系统委员会工作计划的决定 *(议题 4)*

4.1 审议执行理事会有关委员会的决定和区域协会的需求，包括相关的 WMO 战略计划和 WMO 运行计划以及全球气候服务框架 *(议题 4.1)*

审议执行理事会有关委员会的决定

4.1.1 向委员会介绍了执行理事会第六十一次届会和第六十二次届会做出的与委员会工作有关的决定。委员会讨论了它们对委员会未来工作的相关影响，并将讨论结果纳入总摘要的相关议题。

4.1.2 委员会忆及，WMO 通过了基于结果的管理 (RBM) 方式，因此战略计划、WMO 运行计划及监测和评估是整合的一体。委员会注意到在制定 WMO 战略计划和运行计划方面取得的进展，以及区域协会和技术委员会对这一过程的参与。执行理事会第六十二次届会要求根据技术委员会提出的意见，进一步细化 WMO 运行计划 2012-2015 草案 。委员会提请其管理组继续与秘书处协同工作，为 RBM 过程的各个方面做出贡献，包括细化 WMO 运行计划 2012-2015 草案。

区域协会和委员会间的协调

4.1.3 委员会注意到执行理事会第六十二次届会 (EC-62) (2010 年 6 月，日内瓦)：

(a) 强调需要进一步改进区域协会(RA)、技术委员会(TC)和秘书处有关司之间的协调，尤其是通过确定区域需求和区域的实施重点，通过确定TC和RA的联合活动领域，以及通过在各区域管理结构中确定相关的区域计划联系人；

(b) 注意到执行理事会WMO战略和运行计划工作组在审议技术委员会和区域协会的工作安排和作用及责任时建议每个技术委员会根据区域协会的建议为每个区域协会指定一名积极的报告员。

4.1.4 委员会要求主席在管理组的支持下与区域协会主席一起协调行动，以便建立一个双向的沟通机制来改进 CBS 和区域协会之间的战略协调和反馈信息。

全球气候服务框架

4.1.5 委员会高兴地注意到全球气候服务框架高级别专题组的工作进展，特别是提交了报告草案，供国家政府和专家审议。

4.1.6 委员会希望强调指出，目前提供各种气候服务的能力尚未达到开发利用我们认识气候的全部知识的水平，远远不能满足当前和未来的各种需求，没有产生全部的潜在效益，尤其是在发展中国家。全球普遍利用强化的气候服务可有助于改进各种决策，反之改进的决策将为社会经济发展，并为降低灾害风险和减少灾害损失做出贡献。委员会还注意到，气候服务是适应气候变化的根本基础。

4.1.7 委员会高兴地看到，正如第三次世界气候大会所概括的那样，上述专题组基本上已通过了关于制定全球气候服务框架的关键组成部分，即：用户界面平台、气候服务信息系统、观测和监测部分、气候模拟和预测部分，以及作为主要补充的能力建设部分。

4.1.8 委员会注意到，如果得到 2011 年世界气象大会的普遍赞成，那么全球气候服务框架将会为国家气象水文部门提供一系列的机遇，并敦促将加强 NMHS 能力建设作为该框架实施战略的重点任务，从而提供旨在支持 GFCS 的气候服务。对此，委员会指出，NMHS 拥有独特的优势，可以提供许多用户需要的无缝隙的天气和气候服务。

4.1.9 委员会注意到，该专题组的报告草案已在 WMO 下一个财务期 (2012-2015 年) 确定了每年 5000 万美元用于各项能力开发项目的意向目标，并敦促将该笔发展基金用于更新 NMHS 的业务能力。委员会进一步认识到， WMO 只有赞同并实现这一目标 才会得到发展中国家强有力的支持，委员会鼓励这种支持。

4.1.10 委员会注意到，通过协助各国适应气候变化的各项举措，也许有可能为支持全球气候服务框架各组成部分提供所需的资金。因此，委员会建议将资金用于支持 NMHS 开展研究、监测、服务提供和能力建设，从而促进 GFCS 并更好地支持适应气候变化的各项决定。

4.1.11 委员会注意到，全球气候服务框架可能呼吁加大区域或次区域合作的力度、信息和资料的交换，并鼓励各会员加强其区域气候领域的组网并寻求交换资料和信息的各种机遇，这会为改进的国家气候服务提供支撑。尽可能加强区域气候展望论坛 (RCOF) 的过程并巩固行之有效的区域气候中心，这将会大大促进这一进程。此外，会员应寻找各种机会，直接和通过国家协调机制，与诸如农业、卫生和减轻灾害风险等遭受影响领域的部门合作，以确保提供协同增效作用和实现利益共享。

4.1.12 委员会表示，随着 GFCS 的进一步发展，在制定委员会自身的工作计划，尤其是在 WIGOS 和 WIS 的实施以及减轻灾害风险计划方面，要体现 GFCS 的实施计划和工作方法。委员会尤其注意到，要与 GCOS 合作，确保需求的滚动评审过程能充分支持观测资料需求认识方面的各种变化，从而支持 GFCS。同时，WIS 的实施应体现 WMO 和 NMHS 框架内外对资料获取和交换的需求。而且，服务的提供应在多灾种、多尺度早期预警系统范围内，从 WMO 所有的服务提供计划的调整和优化中获得益处。

4.1.13 委员会同意协助 EC-PORS 为全球冰冻圈监测制定实施战略，并提请秘书长与 IOC 和 ICSU 开展对话，以探讨建立伙伴关系的可能性。委员会还同意协助 EC-PORS 确定北极和南极区域气候中心的范围，并注意到他们在增加气候产品和服务的数量和改进质量方面作出的贡献。

4.1.14 委员会要求管理组在制定未来工作计划的过程中，密切关注各种能为 GFCS 作出有效贡献的机会。

教育培训需求和资质

4.1.15 委员会注意到执行理事会第六十二次届会决定用一个新的出版物系列替代 WMO No.258 出版物“气象和业务水文人员教育培训指南，卷 I：气象学”。新系列中 (1)WMO 气象学家或 WMO 气象技术人员资质教育培训；和 (2) 教员资质和教育培训需求由 EC 教育培训专家组负责审定。系列的其他各卷则由相关的技术委员会审定，它们负责制定各自职责领域中从业人员的资质和教育培训需求。

4.1.16 委员会注意到用资质确定人员的分类和确定具体承担的工作所需的资质是不同的。注意到确定专项领域专家的资质以及针对公共气象预报和警报服务工作的教育培训材料十分重要，委员会同意在确定这些资质以及确定相应所需的教育培训需求时发挥牵头作用。委员会强调应将这些资质保持在适当的有用和可用水平，不要太详细或者约定俗成。同样，委员会还同意在 PWS 的服务提供方面另外需要一个小组专门审查资质问题和相应的教育培训需求。委员会要求 OPAG-DPFS 和 OPAG-PWS 与理事会教育培训专家组密切联系，制定这些资质，确保它们与 WMO 气象学家和 WMO 气象技术人员的基础资质紧密挂钩。委员会注意到，EC 专家组将确保委员会对资质的定义采用一致的方法，并将与委员会一道解决重叠问题。

WMO 改革专题组建议的后续行动

4.1.17 委员会回顾到，EC-62 决定继续审议由 EC 战略计划和运行计划工作组 (WG/SOP) 成立的 WMO 改革专题组提出的建议。委员会还回顾到，其主席已经提议在 CBS-Ext.(10) 期间测试 WG/SOP WMO 改革专题组的一些建议，并通过 WG/SOP 向会员汇报。因此，委员会提出在区域协会和 CBS 之间建立一种双向沟通机制，对缩短会期进行测试，文件着重于各项决定。

4.1.18 关于文件需更加突出决定的问题，委员会认为，这方面已取得进展，加快了文件的进程。但在减少总摘要中与决定无关的文字方面仍有改进余地，它要求秘书处和管理组考虑进一步改进文件，使文件中需要做出决定的方面更为突出。

4.1.19 委员会认为将 TECO-E2E 融入届会的范畴十分成功。向它提供同传服务和如此多的与会人员说明会议得到了高度重视并且这是一次互动良好的会议。

4.1.20 委员会注意到，CBS 届会每两年举行一次，每次届会的议程类似，除了与官员选举有关的议题外，该议题只纳入每四年一次正常届会的议程。也就是说，它实际上一直是每两年召开一次届会。关于 CBS 届会的周期，委员会强烈认为，由于基本系统技术和用户需求的快速发展，CBS 需要每两年召开一次届会，并要求其管理组考虑在政府间会议上所花的时间，就如何最好地安排中期会议提出意见。根据第十六次大会的成果，委员会要求其主席与 CIMO 主席会谈，并与管理组密切磋商，讨论召开管理组和委员会联合会议的各种选择方案。

4.1.21 委员会要求主席向 WG/SOP 提供一份 CBS 经验的报告，供 Cg-16 进一步审议。

4.2 关于综合观测系统开放计划领域组的决定，包括 WMO 全球综合观测系统和 WMO 空间计划，能力建设和质量管理框架 (议题 4.2)

关于综合观测系统开放计划领域组的决定

4.2.1 委员会对 OPAG-IOS 主席 Lars Peter Riishojgaard 博士和他的联合主席 Jochen Dibbern 博士关于 GOS 地基和空基子系统的运行和进一步发展的综合报告表示赞赏。它注意到通过会员的协调努力，GOS 源源不断地提供大量有关地球及其大气状况的观测资料和信息，以满足各类用户不断增加的需求。它强调随着卫星资料和服务的不断拓宽，尤其通过研发卫星，进一步改进了 GOS 其它组成部分提供的资料的可用性，尤其是海洋和 AMDAR 资料。

4.2.2 根据在 OPAG-IOS 责任范围内开展的活动和取得的成果，委员会对以下有关 OPAG-IOS 的指导作出决定。

4.2.3 委员会对本报告附录 1 中有关 WMO 用户观测需求和观测系统能力数据库 (滚动需求审查 [RRR] 数据库) 的发展策略和未来承办问题表示赞同并要求 OPAG-IOS 邀请愿意承办 RRR 数据库的潜在候选单位以及根据 ICT-IOS 制定的程序对这些候选单位进行评估。委员会还要求 OPAG-IOS 确保通过正在开展的 RRR 进程来表达对极地气象的任何特定要求。

4.2.4 委员会注意到第一区协基本天气和气候网 (RBSN/RBCN) 台站的运行及报告的提供水平仍然很低，它同意需要国际社会集中努力帮助第一区协的会员实施和运行 RBSN/RBCN 台站。委员会进一步注意到资料的减少，尤其是第一区协高空资料的减少不仅对第一区协，而且对所有区域的中期预报质量都会产生负面影响。

4.2.5 委员会认为区域代表参加 OPAG-IOS 的工作对更好地认识观测系统区域方面的问题十分重要，并赞赏秘书处 (发展和区域活动司) 与相关区协主席协调，提名区域代表参加 OPAG-IOS。本报告附录 2 为委员会提出的这些代表的职责，职责拟提交各区域协会届会审议。委员会同意，ICT-IOS 中的区域代表应与区域的工作结构有良好的联系。

4.2.6 委员会注意到，目前还不能完全满足 NWP 和气候监测对降水资料全球交换的需求，并敦促会员开展适当的资料交换。

4.2.7 委员会注意到部分会员改变了观测规范，将部分观测站每天两次汽球探空改为一次。委员会鼓励会员在不具备其它探空系统的地区，如 AMDAR 系统，保持每天两次汽球探空。

4.2.8 委员会对制定 GCOS 高空基准网 (GRUAN) 台站观测规范的机制表示同意。为使 GRUAN 全面业务化，必须将其业务规范纳入 WMO 的规则材料，尤其是 GOS 手册和指南。委员会同意，应组织一次专家会最终敲定这些规范，以便提交 CBS 第十五次届会审议。它要求全球观测系统发展专家组 (ET-EGOS)、地基遥感观测专家组 (ET-SBRSO) 和卫星系统专家组 (ET-SAT) 组长提名成员与 OPAG-IOS 规则材料报告员一起参加这项工作。委员会同意 GCOS 秘书处负责协调这些活动。

4.2.9 委员会同意 AMDAR 计划在大部分区域具有拓展的潜力，并同意应由区协主席采取措施鼓励更多地参与 AMDAR 计划。因此，委员会要求 OPAG-IOS 通过飞机观测专家组 (ET-AIR) 提供有助于加强该区域 AMDAR 计划的指导步骤。

4.2.10 委员会要求 OPAG-IOS 帮助 ET-EGOS 就共同的兴趣 (包括 IPY 遗留的观测方面的举措)、增加极地地区的观测次数 (包括浮标计划) 和收集极地地区实时资料的行动，与理事会极地观测、研究和服务专家组 (EC-PORS) 进行协调。委员会要求秘书处就此通知 EC-PORS 的联合主席。

4.2.11 委员会要求其主席就极地地区的观测、研究和服务问题指定相应的 CBS 联系人，并相应地通知 EC-PORS 联合主席。

4.2.12 委员会要求感兴趣的会员根据《CBS 第十四次届会含决议和建议案的最终节略报告》总摘要第 6.1.32 段的附录 (2009；第四次各类观测系统对 NWP 的影响研讨会的结论和建议) 开展影响研究，此外，针对以下问题开展试验：

(a) 在具有高密度卫星洋面风观测的情况下对实地表面气压观测密度的需求如何？

(b) 对最佳海洋自动船载高空计划 (ASAP) 探测需提供的指导；

(c) 为支持高分辨率 NWP 需要哪些行星边界层观测 - 哪些变量，及它们的时 / 空分辨率？

(d) 需开展研究，用于确定地基站的重点方位。

4.2.13 委员会注意到第五次各类观测系统对 NWP 的影响研讨会的筹备工作已经启动并已成立了组织委员会。委员会要求 OPAG-IOS 尽快确定会议的范围，包括在 2012 年召开研讨会的具体日期。委员会欢迎美国代表关于承办本次研讨会的提议。

4.2.14 委员会注意到 ICT-IOS 针对 “WMO 秘书处在协调和支持 AMDAR 计划活动 ” 方面提出的指导意见，要求 WMO 秘书处继续协调 AMDAR 计划活动，并要求相关的秘书处人员最好能得到 WMO 正常预算的支持。在协助区协和会员扩大 AMDAR 计划方面，委员会注意到有必要继续发挥已确定的 AMDAR 技术协调员的作用，并感谢在目前的 WMO 秘书处和 AMDAR 专家组协议框架下，开放 “ 飞机和遥感观测科学官 ” 这个新岗位，并从 AMDAR 信托基金和 WMO 正常预算中予以同等的资金支持。委员会还注意到，AMDAR 专家组正与 ET-AIR 合作，以便更新 “ 描述国际 AMDAR 计划对 WMO 会员益处 ” 的小册子，并正在编写一本有关对航空公司益处的新的出版物。

4.2.15 委员会要求 OPAG-IOS 尽快安排出版《观测站自动化指南和程序》这个 CBS 和 CIMO 联合技术报告，并协助会员实施自动观测系统。

4.2.16 委员会注意到 ICT-IOS-6 的建议，即致力于建立一个涵盖诸多用户的卫星资料通讯系统国际用户论坛 (海洋观测站和偏远地区的 AWS 和其他自动环境观测站)，以及以现有的 WMO-IOC Argos 联合收费协议 (JTA) 为基础解决所有相关的卫星资料通讯系统问题。委员会认为拥有一个强有力的涵盖多方面应用的用户基础来解决系统的缺陷，与所有相关的卫星资料通讯系统的运行单位谈判收费和潜在的改进服务问题是十分有益的。它要求秘书处与合作伙伴联系，如 IOC 和 FAO，以及与 JTA 协调，旨在建立这样的论坛，以解决由 WMO 和伙伴组织共同协调的自动环境观测系统偏远地区资料的通讯需求，包括所需的收费谈判。委员会强调，该论坛不仅要考虑价格谈判事宜，而且要广泛考虑现有的技术、方案、价格及合作开展资料收集的平台。

4.2.17 委员会建议在 CIMO-15 通过的《地面观测站选址分类》中将其升级为 WMO 和 ISO 的共同标准。委员会还建议 ET-AWS 为落实分类制定指南，并在区域培训课程中利用这些指南。

4.2.18 为响应 WMO 全球综合观测系统战略的实施，委员会同意将“全球观测系统发展实施计划”改名为“全球综合观测系统发展实施计划”。委员会还同意将“GOS 发展专家组”改名为“全球综合观测系统发展专家组”。

4.2.19 委员会注意到为响应 GOS 2025 展望和 WIGOS 的需求，在制定新的全球综合观测系统发展实施计划 (EGOS-IP) 方面的进展。委员会要求 OPAG-IOS 确保实施计划的制定能取得平稳的进展，并要求在 2012 年的 CBS 第十五次届会前完成最终稿供审议。

4.2.20 委员会认识到利用 BUFR 格式传输高分辨率资料需要投入经费升级高空观测系统。但是考虑到这类资料的影响，委员会鼓励会员为利用适当的 BUFR 模块提供高分辨率高空资料作出适当的安排。

4.2.21 委员会注意到卫星观测被认为是 GAW 计划中实施 IGACO 战略不可或缺的一部分。同时，为支持大气成分观测和监测，业务卫星运行单位开展了许多活动。这些活动将为实现 WIGOS/GAW 计划的目标作出重大贡献。考虑到卫星计划的交叉性和它们承担的不同任务以及需要协调大气成分监测对卫星观测资料的需求，委员会建议为此建立一个 CBS 和 CAS 的专题专家组。它要求其主席与 CAS 主席就此问题开展协调。

4.2.22 注意到理事会第六十二次届会要求为持续的空基气候监测搭建一个框架，委员会同意对该框架的定义和实施应考虑到各类实体 (包括研发和业务空间机构及它们的协调机构) 不同的作用和责任，同时能满足连续和持续作业的需要。为此委员会对筹备一次重点为持续性气候观测具体需求以及这些需求对框架的影响研讨会表示支持。该研讨会将对业已纳入 GOS 2025 展望，并由气象卫星协调小组 (CGMS) 提出的召开一次气候观测“意外情况规划研讨会”作出响应。

4.2.23 委员会重申静止、极轨或其它轨道的卫星系统的重要性，因为这些卫星系统是观测资料的唯一来源。关于静止卫星星群，委员会获悉 2014-2017 年的发展规划，其中包括对中国 (以 2014 年的 FY-4 开始)、欧洲 (以 2017 年的 MTG-I1 开始)、日本 (以 2014 年的 Himawari-8 开始)、韩国 (以 2017 年的 COMS 第二代开始) 和美国 (以 2015 年的 GOES-R 开始) 的新航天器协调一致的实施。这将继续和扩大当前地球静止轨道的业务卫星群。此外，委员会获悉俄罗斯联邦计划发射 Elektro-L1 卫星。为了充分利用这些卫星以及避免业务用户遭遇崩溃局面，委员会同意提前提请相关区域协会注意这些变化，并应制定战略帮助 WMO 各区域的用户做好准备适应这些新的系统。委员会还进一步建议计划实施新一代地球静止卫星的会员为当前和未来的卫星留出一个适当的重叠期，以便比对和验证产品，并且帮助用户平稳过渡。

4.2.24 委员会注意到近地轨道 (LEO) 和高椭圆轨道 (HEO) 卫星系统计划和面临的相关挑战。委员会忆及中国 (FY-3A)、EUMETSAT(METOP-A) 和俄罗斯联邦 (Meteor-M1，与先进的有效载荷同时使用，这是三颗极轨卫星中的第一颗) 在上午轨道上运行极轨卫星；而下午轨道则由中国 (使用中的 FY-3B) 和美国 (NOAA-18 和 -19) 运行，其它的卫星则以辅助或备份模式运行。由于近地轨道系统卫星探测是对 NWP 的一种关键支持，所以委员会表示关注的是，根据目前卫星运营方在未来十年的计划，仍然没有根据 “GOS 2025 年愿景 ” 的要求在上午轨道开展探测任务的路径。此外，委员会强调，HEO 飞行任务 (如目前加拿大和俄罗斯联邦在闪电轨道上开展的飞行任务) 拥有扩大静止影像和空间天气的潜力，从而提供整个北极地区的准永久观测数据。委员会获悉中国计划于 2015 年发射一颗降水雷达卫星。

4.2.25 委员会注意到需要更加关注卫星资料和产品提供问题，尤其是在发展中国家。同时，委员会认为在综合全球资料分发服务 (IGDDS) 和 GEONETCas 背景下，有关改进资料获取的战略应认可不同的用户需求，在其重点优先中考虑：(a) 组织对资料需求的系统表述和组织资料用户与资料提供方的对话；(b) 实施持续的区域 DVB-S 分发系统，为每个区域提供高成本效率的卫星资料获取；(c) 在这样的广播服务中整合所有相关的资料类型，包括跨区域交换的资料；(d) 以及支持未来协调一致的直接广播系统和利用因特网的补充资料获取和分发服务。考虑到第三和第四区协卫星资料需求研讨会的积极成果，委员会鼓励其他卫星资料获取受制约的区域采取类似的方法。委员会获悉首届亚洲 - 大洋洲气象卫星用户大会于 2010 年 11 月 1-2 日在中国北京举行，并欢迎中国、日本和韩国在未来合作举办类似的活动。

4.2.26 委员会要求 OPAG-IOS 与其它技术委员会、ICAO 和其它有关组织密切合作，以便提出建议，设计和实施一种可持续的火山灰观测能力。委员会还与英国一道，代表 VAAC 衷心感谢那些在埃亚菲亚德拉冰盖火山爆发期间共享专业观测数据的会员。ICAO 代表表示，ICAO 愿意促进 OPAG-IOS 在火山灰方面的工作，因为这对国际航空极其重要和紧迫。

能力建设和技术合作

4.2.27 委员会同意需作出更多的努力支持发展中国家、LDC 国家和 SIDS 国家，尤其是在相关区域向它们提供指导和为它们组织培训和能力建设活动。

4.2.28 委员会同意根据以下指南确定综合观测系统方面技术合作活动的优先重点：

(a) 旨在改进和恢复现有，及建设新的RBSN/RBCN高空观测能力方面的项目作为最高优先，重点是恢复高空观测哑站，以及提高资料稀缺地区的覆盖率(尤其是购买设备和消耗器材、通讯和人员培训)；

(b) 向发展中国家、LDC国家和SIDS国家延伸AMDAR覆盖作为最高优先，以便补充稀缺的高空观测或为无力承担昂贵的高空探测系统的国家提供一条高成本效率的替代方法；

(c) 提高RBSN/RBCN地面观测资料质量、定期性和覆盖的项目作为高优先，重点是恢复哑站和提高资料稀缺地区的覆盖率；

(d) 引进和/或使用新的观测设备和系统的项目作为高优先，包括具有成本效益的地基AWS、AMDAR、ASAP和漂移浮标；

(e) 未列入RBSN/RBCN台站表的台站的改进/升级项目作为中等优先。

4.2.29 委员会同意本报告附录 3 列出的修订后的 ET-SUP 的职责。

4.2.30 委员会同意本报告附录 4-9 列出的 OPAG-IOS 各专家组新的工作计划。

WMO 全球综合观测系统 (WIGOS)

4.2.31 委员会结合 CBS 目前和未来的职责审议了 WIGOS 发展和实施现状。

4.2.32 委员会赞赏地注意到执行理事会第六十二次届会业已同意提交第十六次大会供批准的最新版 WIGOS 运行概念 (CONOPS) 和最新版 WIGOS 发展和实施战略 (WDIS)，根据 WIGOS 概念测试阶段的经验，可能会对这些文件作进一步细化。根据 WDIS 的介绍，WIGOS 实施阶段 (2012-2015 年) 将以 WIGOS 概念测试阶段 (2007-2011 年) 积累的经验为基础，为业务阶段 (自 2016 年起) 奠定基础。WIGOS 实施计划 (WIP) 将按照 WDIS 制定。

4.2.33 对此委员会强调，为响应全球观测系统 2005 年愿景，制定一份新的作为 WIGOS 综合核心组成部分的全球观测系统发展实施计划 (EGOS-IP) 十分重要。实施计划将对如何设计、发展和实施国家综合观测系统提供指导，以便满足所有的 WMO 会员和计划对高质量天气、水和气候的资料产品和服务的需要。

4.2.34 委员会强调必须坚持整合，以确保互操作性，促进 WIGOS 各分系统的优化和克服各观测分系统存在的问题和差距。

4.2.35 委员会指出，要确定在国家层面实施 WIGOS 所需的具体行动的进一步细节。在确定这些细节时应借鉴从 WIGOS 试点项目和 WIGOS 示范项目中吸取的教训。委员会要求 OPAG-IOS 和秘书处与 CIMO 并在必要时与其它技术委员会协调，来解决这一问题。

4.2.36 在审议 WIGOS 的发展和实施现状时，委员会同意执行理事会 WIGOS 和 WIS 工作组 (EC-WG/WIGOS-WIS) 的意见，即 WIGOS 的实施需要负有必要的项目管理职能的 WIGOS 项目办公室提供积极的协调和支持。这将使项目试点和展示团队、未来的 WIGOS 跨委员会协调组 (ICG-WIGOS) 和相关的技术委员会工作组之间开展更好的互动。

4.2.37 委员会同意执行理事会第六十二次届会的意见，认为满足用户的质量要求和期望对 WIGOS 的成功与否至关重要。这需要深入审查各 WMO 观测计划目前使用的规范、已有的各项任务的具体需求以及现有的技术条件。WIGOS 质量管理框架 (QMF) 实施战略将具体确定所有观测网络 / 系统实施质量管理系统 (QMS) 的步骤。还应注意指导如何管理观测网络和观测分系统，以便充分满足 QMF 的要求。

4.2.38 对此委员会同意，CBS 在 WIGOS 中应抓住的关键的标准化工作之一是，与 CIMO 合作，实施 WMO QMF 以及制定、利用和维护相关的 WMO 规则材料 (技术规则、手册和指南)，以确保：

(a) 有关天气、水和气候及其他环境资源的观测、记录和报告、业务预报、警报、相关信息和服务达到一定的质量，并且符合与其他国际组织达成的相关的联合标准；

(b) 向终端用户提供最好的观测资料和产品。此举应以已经达成共识的质量保证和质量控制标准为基础，其目的是制定和实施一套整合的QMS，以便提供拥有足够的质量控制和相关元数据的可靠和及时的观测资料和产品。

4.2.39 对此，届会注意到在日本东京举行的 JMA/WMO 二区协 (亚洲) 地面、气候和高空观测质量管理研讨会 (2010 年 7 月 27-30 日)。届会对研讨会关于定期审查用户需求以及收集用户反馈重要性的结论表示欢迎。

4.2.40 委员会认识到对观测资料、产品和服务制定标准质量管理程序的需求。它进一步认为，标准的实施将有力促进 NMHS 提高其气象服务质量，因为其服务很大程度上取决于观测质量。

4.2.41 委员会同意 CBS 将在技术上引领 WIGOS 的发展和实施，并强调各技术委员会需密切合作和加强协调，其中 CBS 应发挥引领作用。

4.2.42 对此，委员会对执行理事会第六十二次届会关于在第十六次大会后立即为此建立 ICG-WIGOS 的决定表示欢迎。委员会本着在 WIGOS 整合过程中的技术引领作用，建议 CBS 主席作为法定人员担任 ICG-WIGOS 的核心成员。

4.2.43 根据 WIGOS 的需求和执行理事会第六十二次届会的要求，委员会对开放计划领域组 (OPAG)、专家组 (ET) 和报告员的职责 (TOR) 作了相应的调整，以便最佳地满足 WIGOS 在整合、互操作性、标准化和质量管理方面的需求。为此，委员会要求其管理组与 OPAG 和 ET 的组长及相关报告员协调，在它们的工作计划中融入相关的任务和活动，以促进 WIGOS 作为一项优先得到落实。

4.2.44 考虑到 WDIS 确定的各项关键任务，委员会同意下述领域为下一休会期的优先：

(a) 制定 EGOS-IP，包括更新 RRR 过程的应用领域；

(b) 与其他技术委员会和合作组织密切合作，制定 WIGOS 标准，包括 QM 程序和元数据标准；

(c) 向会员和区域协会提供有关 WIGOS 的技术指南和指导；

(d) 审议、更新和协调有关 WIGOS 业务结构和需求的规则材料。

关于 WMO 空间计划的决定

4.2.45 委员会对运行卫星系统的会员表示感谢，感谢他们参与开发空基气候监测架构的设想。委员会注意到需要为气候监测开发一个非常类似于过去 50 年来为天气监测和预报已开发的端对端系统。

4.2.46 委员会赞同本报告附录 10 中关于建立一个空基气候监测架构的提案，该架构将以全球气候观测系统 (GCOS) 制定的各项要求并以空间观测反演的关键气候变量 (ECV) 为契机。建议的架构将增强并仿照为气象观测、研究、模拟、预报和服务而开发的端对端系统；它将成为 WMO 全球综合观测系统 (WIGOS) 空基组成部分的一部分。这一端对端系统的其它组成部分可包括全球空间相互标定系统 (GSICS) 的相互标定活动、与仪器和观测方法委员会 (CIMO) 协调开展的额外的标定和验证活动、持续协调的用于气候监测的环境卫星资料处理 (SCOPE-CM) 框架内开展的产品制作努力以及 WMO/CGMS(气象卫星协调组) 虚拟实验室 (VLab) 的培训和能力建设活动。

4.2.47 鉴于建立一个空基气候监测架构的艰巨程度和全球气候服务框架 (GFCS) 工作的重要性，委员会建议提请各会员考虑进一步支持 WMO 空间计划的两种选择，要么通过援派人员到该计划办公室工作，要么为该空间信托基金捐款。

4.2.48 委员会表示支持那些提名其技术专家为机构间空间天气协调组 (ICTSW) 服务的所有会员，并支持中国和美国自愿担任该协调组的联合组长。鼓励 ICTSW 继续开展其工作计划，包括作为重点问题，与 ET-EGOS 协调，评审空间天气观测需求，以及与 OPAG ISS 协调，开展资料管理标准化方面的工作。

4.2.49 委员会对通过在韩国气象厅 (KMA) 设在仁川的国家卫星气象中心 (NSMC) 建立一个从事遥感应用和卫星气象培训的英才中心的方式扩大卫星气象教育培训虚拟实验室 (VLab) 表示欢迎。委员会感谢 KMA 为上述培训活动作出的承诺。委员会祝贺韩国在 2010 年 6 月成功发射了 COMS 卫星，并对韩国宣布将提供 COMS 资料和产品支持气象活动 (包

括台风监测) 表示欢迎。

4.3 关于信息系统和服务开放计划领域组的决定，包括 WMO 信息系统、能力建设和质量管理框架 *(议题 4.3)*

4.3.1 委员会注意到 OPAG-ISS 组长 S. Foreman 博士的报告，并对他在百忙之中完成的工作表示感谢。委员会注意到，在 ICG-WIS 配合下使用了各种在线工具 (如 WIS 的维基 (http://www.wmo.int / wiswiki)、案例和项目跟踪系统)，并鼓励 OPAG-ISS 继续试用这类工具。

4.3.2 委员会对改进的主干通信网络 (IMTN) 方面所取得的进展表示高兴，该网络正朝着两个 IMTN 网云方向过渡。委员会注意到，由于大多数 MTN 中心目前已进入 IMTN 网云，而且其他中心已有计划加入该网云，因此 IMTN 项目目前正进入完成阶段。委员会感谢 ET-CTS 和 ECMWF 为该项目的成功所做出的贡献。委员会注意到在各区域网络中所取得的进展，并注意到向 IP 的过渡几乎完成。此外，委员会还注意到大多数基于 X-25 通信协议的线路已被替代，并建议可认为 X-25 通信技术已经过时，委员会要求秘书处在《GTS 手册》和各种指南中删除有关 X-25 的提法。

4.3.3 委员会注意到，目前 MTN 网云可包括连接所有 GISC 并正在成为 AMDCN 主要组成部分的 WIS 核心网络。委员会从各专家组的结果中注意到，为确保在 WIS 中达到 2 分钟的端对端 " 全灾种网络 " 的性能要求，所有 GISC 中心必须采用 WIS 核心网络的从任何一端到其它任何一端的连接方式，以来自 AMDCN 的各类警报发至所有其它 GISC 中心。委员会要求有关专家组评审《GTS 手册》中有关电报交换的程序和指南，以与 ET-CTS 专家组为支持 WIS" 全灾种网络 " 所确定的各项性能标准相一致。委员会还注意到 ET-CTS 有关各 GISC 所需网络带宽与 GISC 数量之间存在线性关系的发现，原因是各 GISC 中心均需要实现与所有各节点的相互连接。委员会建议，凡正在考虑成为 GISC 的中心考虑上述通信过量问题，并建议当考虑在 WIS 系统增加新的 GISC 中心时应考虑现有各 GISC 超负荷与 WIS 系统增添新 GISC 中心所带来效益之间存在这种线性关系。委员会注意到，如果证实多广播技术能够有效地压缩带宽需求，则未来可消除这一局限性，并鼓励 ET-CTS 从网络和应用观点出发测试这种多广播技术。委员会建议区域协会注意与 GISC 数量有关的所有 GISC 的潜在成本，并对各区域的要求进行相应的审议。

4.3.4 委员会注意到卫星分发服务是 WIS 的一个重要组成部分。此外，委员会注意到一些卫星系统还提供数据采集服务。委员会感谢新 EUMETSAT 实施新的 HRDCP 系统，并敦促会员在设计新的观测和预警系统过程中考虑利用这种新服务。

4.3.5 委员会注意到并坚决赞同 EC-62 的意见，即需要为无线电频率的协调工作提供更多的支持和资金，包括正在进行的工作以及 WMO 在无线电频率管理过程中的表现 (ITU/WMO 气象无线电频谱使用手册：天气、水和气候监测及预测；http://www.itu.int/publications/publications.aspx?lang=en&media=electronic&parent=R-HDB-45-2008)。委员会要求大会采取必要的措施来继续保障气象频率，并要求秘书处像过去那样继续支持无线电频率活动。

委员会还建议设立一个自愿信托基金以获得更多的支持。然而，委员会注意到，许多会员已向 EUMETNET 的无线电频率管理活动捐款，从而使 WMO 直接受益，并认为这些国家可能无法就同一事项再向 WMO 信托基金捐款。委员会建议秘书处不要依靠该信托基金来开展正在进行的重要工作，以及 WMO 在无线电频率管理过程中的代表权，特别是考虑到 ITU-R WRC-12。委员会还提请秘书处致函会员，要求他们向该基金捐款，并要求会员支持当地的频率管理进程。所有的 CBS 会员应强调参与本地频率管理的重要性，并要求专家与相关的国家和区域机构合作加入到提高人们意识和能力建设活动中去。

修订《电码手册》

4.3.6 委员会注意到在 CBS-14 届会之后，通过在 CBS 休会期间批准《电码手册》修改的新程序和快速工作程序，CBS 主席批准了跨计划资料表示和电码专家组 (IPET-DRC) 提交的关于修改《电码手册》的意见。

4.3.7 委员会满意地注意到，在 CBS 休会期间批准修订《电码手册》的新程序使之能够减少批准修订的延误时间，在某些情况下以把批准过程从两年减至一年。为确保用户更好地从减少延误中受益，委员会强调了让用户了解这一新程序的重要性，并尽快向 IPET-DRC 提交修改要求，包括 关于可能实施的日期。EC-62 提请 CBS 确保按此程序实施的修订内容仅限于那些既不会给会员造成额外财务负担也不会给他们带来业务问题的内容。

4.3.8 根据在在 CBS 休会期间启用批准修改内容的新程序方面所积累的经验，并注意到越来越多地用 TDCF 电码表示天气、气候和水文数据，根据 OPAG-ISS 的建议，委员会同意评审关于批准修改《电码手册》的程序。委员会通过了建议 1(CBS-Ext.(10))– 修订《电码手册》(WMO-No. 306)，第 I.1 和第 I.2 卷的引言。

4.3.9 为响应国际民航组织 (ICAO) 的要求，委员会支持 IPET-DRC 建议的对《电码手册》中的航空电码、METAR(FM 15)、SPECI(FM 16) 和 TAF(FM 51) 的有关修订条款，委员会通过了建议 2(CBS-Ext.(10))– 修订《电码手册》(WMO-No. 306) 第 I.1 卷。

4.3.10 委员会满意地注意到，秘书处提供了 NMHS 在运行自动处理系统如编码器和解码器时可以使用的电子格式的电码表。委员会还注意到，电子格式的电码表可以促进对《电码手册》(I.2 卷) 修订的管理，秘书处正相应地改写《电码手册》的格式，包括链接到电码表。

向表驱动电码格式 (TDCF) 的过渡

4.3.11 注意到 WMO 会员在 2010 年最终完成第一类资料 (SYNOP、PILOT、TEMP 和 CLIMAT) 过渡方面所遇到的困难，EC-62 提请 CBS 考虑各种措施，以确保 WMO 所有会员能继续获取在 GTS 上以适当格式提供的观测资料，以及促进和推动从 TAC 向 TDCF 的过渡。

4.3.12 委员会注意到许多会员为成功地满足最后期限所作的重大努力，以及 CBS 专家所提供的有力支持。委员会一致认为，2010 年 11 月以后，TAC 和 TDCF 格式的第一类资料的

并行分发可能会继续下去，但将逐步停止，并在可能的情况下会各自提前通知。委员会同意 2014 年 11 月作为停止并行分发 TAC 和 TDCF 第一类资料以及第二类 (卫星观测资料) 和第四类 (海洋资料) 资料的最后期限。2014 年 11 月以后，TAC 只可用于在双边协议下两个国家气象水文部门之间的资料交换。委员会同意，虽然 TAC 将被逐步淘汰，但 IPET-DRC 将继续考虑对航空 TAC 电码的修订建议 (即 METAR, SPECI 和 TAF)。为响应 ICAO 附录 3/WMO《技术规则》[C.3.1] 的修订条款，将继续更新航空 TAC 电码，直到 ICAO 赞同向 TDCF 电码过渡。关于对新的编码能力的任何要求，应通过 TDCF 提出。

4.3.13 注意到已停止提供和国际交换每月高空 CLIMAT TEMP 报告，委员会同意将 CLIMAT TEMP 和 CLIMAT TEMP SHIP 资料纳入第六类资料 (过时的资料)。

4.3.14 会议同意修订本报告附录 11 中的过渡时间表。

4.3.15 委员会重申如下：

(a) 所有会员应制定和实施其国家计划，特别是要利用由CBS专家组、区域协调员/报告员和会员编写或开发的现有指南、自我培训和编码解码器软件；

(b) 已经制定和/或实施其国家计划的会员应协助其它会员这样做，特别是那些运行GTS区域电信枢纽(RTH)的会员应协助在其RTH责任区内的会员国；

(c) 会员应强调在WMO区域培训中心提供TDCF培训的重要性；

(d) 会员应优先开发和实施支持转换的技术合作活动项目。

4.3.16 委员会请运行 RTH 的 WMO 会员考虑为促进转换做出贡献，特别是，它们的 RTH 要：

(a) 通过协助确定RTH责任区之间的临时安排，并通过监督在GTS上TDCF公告和报告的交换，促进逐步过渡；

(b) 当相关的NMC仍不能发送TDCF资料，但TAC和TDCF资料的并行分发已经停止时，将TAC资料转换成TDCF资料；

(c) 如果相关的NMC仍需要接收TAC资料，但TAC和TDCF资料的并行分发已经停止时，将TDCF资料转换成TAC资料。

4.3.17 委员会赞同 ET-OI 的建议，即向一个 NMHS 提供在 TAC 和 TDCF 之间转换另一个 NMHS 电报和文件的正式做法。NMHS 应确保由转换后的资料所构成的公报纳入 C1 卷，由 NMHS 转换的资料信息纳入 C1 卷每份公报的 “ 备注 ” 栏。同样，从 TAC 转换成 TDCF 的信息应包括由 TAC 来源核准的及创建 TDCF 所需的相关元数据，包括用于转换的模板的信息。关于通过月报分发元数据问题，提出了一个标准化的内容建议。为此，委员会指出，

对提供给 WIS 的解决方案而言，重要的是要不断更新 C 卷内容。委员会要求有关专家组评审 GTS 指南，并进行相应更新。

4.3.18 委员会获悉，英国气象局开发了一个从 TAC 向 TDCF 双向转换的软件包，并从 2010 年 7 月以来一直在业务上使用。委员会欢迎英国气象局通过 CBS 软件注册表分发 TDCF 转换器软件包。委员会进一步注意到，英国气象局鼓励会员探讨在未来开发软件方面开展合作的机会。

与 ISS 有关的业务信息服务

4.3.19 委员会注意到所提出的从气象公报 (C1 卷) 目录向 WIS DAR 元数据目录过渡的转换计划。过渡计划指出，RTH 将利用现行程序继续维持 C1 卷，同时提供对 WIS DAR 元数据目录的更新。到 2015 年之前，C1 卷将作为这一信息的主要来源。随着 WIS DAR 元数据目录 (以及相关 GISC 的实施) 可靠性的提高，RTH 将考虑通过一些自动流程从 WIS DAR 目录中提取对 C1 卷的修订。预计，在 2011-2015 年期间，对 C1 卷修订的人工整理将逐渐停止。委员会注意到法国气象局的提议，即在 WIS 前期运作阶段开始时，代表那些不能通过 GISC 提供其 DAR 元数据更新的会员，整理对对 C1 卷的修订，并更新 WIS DAR 元数据目录。

4.3.20 委员会请 OPAG-ISS：

(a) 跟踪从 C1 卷向 WIS DAR 元数据目录过渡的计划的实施；

(b) 开发由 GISC 实施的机制，以便向 WMO 会员通报有关取代 METNO 公报的目录的变化；

(c) 评审用于维持“额外”资料和产品表的做法，并提出相关的建议，包括 GISC 的作用。

4.3.21 注意到几个 MTN 中心尚未实施对其 C1 卷部分的维护，和 / 或尚未提供对其路由目录的更新，委员会敦促这些中心全面实施维护 C1 卷的标准程序以及更新路由目录的推荐做法。

4.3.22 注意到在更新和表现 C2 卷 (WMO-No. 9)– 传输计划方面的不足，委员会建议 WMO 会员评审 C2 卷的内容，并把需要的修订发送给 WMO 秘书处。

资料和产品的收集、路由和分发程序

4.3.23 委员会一致建议修订 GTS 手册附件 II-5，以便确定：

(a) 表 A 中，对于通用警报协议 (CAP) 电报，$T_1 = X$；

(b) 表 C6 中，对于发自深海海啸仪的资料，$T_1T_2A_1 = IOZ$；

(c) 表 C6 和 C7 中新的臭氧资料条目。

4.3.24 委员会注意到需要更新 GTS 手册，以反映 OPAG-ISS 的其它修改建议。内容包括对交换系统做法和修改程序的更新，使用电子邮件和网页作为提交和接收 GTS 信息的路径。

4.3.25 委员会通过了建议 3(CBS-Ext.(10))– 修订《全球电信系统手册》(WMO-No. 386) 第 1 卷第二部分，包括更新附件 II-15 – 在 GTS 上实施、使用和利用 TCP/IP 的推荐做法和程序。

CLIMAT 报在 GTS 上的路由

4.3.26 委员会注意到通过 GTS 接收 CLIMAT 月报的问题由 GCOS/WCRP 气候大气观测专家组提了出来。这些既是通信问题，也是电码问题。委员会敦促作为 RTH 的 WMO 会员要:

(a) 确保所指定的 RTH 联络员能协助解决这类问题，特别是与 CBS GCOS 牵头中心合作；

(b) 审议气象公报的目录内容 (WMO-No. 9 卷 C1) 以及路由目录，并对其做必要、及时的更新。

对 WWW 的运行作定量监测

4.3.27 委员会强调 WWW 综合监测 (IWM) 的规划和实施依赖于 RTH 的行动。委员会注意到有 10 个 MTN 中心于 2009/2010 年参加了 IWM，主要是提供 RTH/MTN 监测报告，说明 MTN 上的来报率。委员会敦促所有 RTH：

(a) 与有关 NMC 协调实施 IWM；

(b) 提供 IWM RTH 报告，包括对有关 NMC 的监测报告；

(c) 检查分析监测活动，由秘书处提供在 WMO 服务器上发布；对发现的问题采取进一步行动予以解决，特别是在其责任区内。

4.3.28 委员会高兴地注意到 RTH 北京、东京、以及 WMC 墨尔本同意协助将 MTN 特别监测 (SMM) 扩大到对 BUFR 气候和海洋资料的监测：三个中心同意提供原始数据，WMC 墨尔本提供有关预分析文件。委员会还要求秘书处审议年度全球监测 (AGM) 的程序以及 IWM 的程序，以便将观测资料的监测扩大到 BUFR 气候和海洋资料。

4.3.29 气候学委员会决定停止提供、分发和在国际上交换 CLIMAT TEMP 月报 (决议 3(CCl-15)，WMO-No. 1054)，决定自 2010 年 6 月起生效。委员会要求秘书处修改《全球电信系统手册》，反映 CLIMAT TEMP 报告的交换已经停止，特别要修改监测程序之处。

4.3.30 中国气象局 (CMA) 提出协助秘书处开发综合定量 WWW 监测应用程序。秘书处负责协调监测活动，有了这套应用程序，秘书处的分析任务可以效率更高。关于 RTH 和 NMC 使用应用程序对监测报告进行自己的分析，委员会注意到正在考虑这方面可能性。委员会对 CMA 为定量监测活动所作的重要贡献表示感谢。

元数据开发和实施

4.3.31 元数据和资料互可操作性计划间专家组 (IPET-MDI；http://www.wmo.int/pages/prog/www/WDM/IPET-MDI-I/documents/Doc2-1-1_Core1.1.doc) 第一次会议对 UML 的表示提出了文字更正建议，委员会表示同意；具体就是 WMO 对 ISO 元数据标准的核心标准文件版本 1.1，可参见 IPET-MDI-I/ 文件 2.1 (1)；目的是将其与 ISO 19115 Cor 1 附录 A 保持一致。

4.3.32 委员会注意到 IPET-MDI 拟定了一套 62 条建议，以便澄清 WIS 中心为实施 WMO 核心标准文件而要求了解的事情，或提供位支持编写 WMO 核心标准而要求的有关工具。委员会高兴地看到“包清单”已经列了出来，WMO 核心标准文件每次发布时将由其附带，特别注意到自动检验工具和指导材料均包括在内。鉴于 EC-58 赋予技术委员会主席主管 WMO 元数据管理的职责，委员会建议请技术委员会主席批准，并要求秘书处公布元数据包，包括 IPET-MDI 第一次会议上提出的对版本 1.1 的文字更正、电码清单扩充，并建议成为 WMO 核心标准文件的第 1.2 号版本，详细内容可登录以下网页： http://wis.wmo.int/2010/metadata/version_1-2。

4.3.33 委员会注意到对 ISO19115 地理信息 – 元数据的修订时间表：国际标准草案 (DIS) 预计于 2011 年完成，于 2012 年最终发布 ISO19115:2012。WMO 核心标准文件 v2.0(下一个主要版本) 预计将包含向 ISO19115:2012 的过渡，并与 JCOMM/ 海洋和水文元数据标准文件进行协调统一。

4.3.34 委员会确定需要发布 WMO 核心标准文件的临时版本，以便满足其它技术委员会和交叉性计划不断变化的需求。临时版本的发布编号为版本 1.2.1(2011 年第二季度) 和版本 1.2.2(2012 年第一季度)。委员会建议这些临时版本由技术委员会主席授权发布，并且应保持与以往版本的兼容性。

4.3.35 鉴于有些中心在实施 WMO 核心标准文件方面积累了经验，委员会要求 IPET-MDI 考虑办法，将与其它中心共享经验。委员会还强调需要对从目前的规范进行过渡给予明确的指导。

开发 WMO 资料模式

4.3.36 CAeM-CBS OPMET 资料表示专家组 (ET-ODR) 被责成具体研究解决航空气象包括 ICAO 对资料表示系统的需求。委员会注意到在开展用 XML 展示 OPMET 资料的试点项目框架内，于 2009 年 7 月开展了传输试验，是在 ICAO 航空固定通信网 (AFTN) 上，是用 METAR 实例对 WMO 资料产品做的三层模拟，是以 BUFR/CREX 表为基础，用 XML 来展

示的。ET-ODR 的结论认为 XML 可用于在航空界对 OPMET 资料进行编码交换。为了满足 ICAO 的要求：使用 WXXM 模式以 XML 表示 OPMET 资料，委员会请 IPET-MDI 进一步考虑是否可能绘制 WMO 资料航空领域模式图，以及 WXXM 模式图，并继续围绕 TDCF 表格码开展 WMO 的资料模式工作。

4.3.37 委员会高兴地注意到 WMO 与开放地理空间联盟 (OGC) 于 2009 年 11 月签署了一项谅解备忘录 (MoU)。WMO/OGC MoU 有助于提供机制，协调 OGC 和 WMO 之间的活动，以便促进对 ISO/OGC 标准的利用，包括对 WMO 资料模式的开发。还注意到 IPET-MDI/ 气象 - 海洋 - 和水文 - 领域工作组 (DWG) 之间承诺开展联合互可操作性试验，试验定于 2011 年开始，目的是涵盖与整个水圈有关的资料管理。

4.3.38 委员会强调技术委员会参与确定 WMO 计划的需求以及参与开发 WMO 资料模式十分重要。注意到 WMO 概念资料模式的初步建议对 OGC 气象 - 海洋 DWG 概念模拟分组的工作相辅相成的，因为这些建议是以 'ISO/DIS 19156 地理信息 – 观测和测量 '(O&M) 为基础的，是与 FAA/EUROCONTROL 和 OGC 水文 DWG 的决定相一致的，即 WXCM/ WXXM2 和 WaterML2 分别由 O&M 推导而来。委员会注意到 IPET-MDI 计划着手创建 ISO19156 标准文件，将 O&M 模式与 WMO 表格电码表示联系起来。委员会要求必需对这个方法进行验证，确保资料模式与现有 WMO TDCF 相兼容。委员会强调确保 BUFR 表与 WMO 资料模式之间的密切联系十分重要，这样，IPET-DRC 仍可继续为 WMO 模式的治理做出主要贡献，同时 BUFR 表及相关规定也可以继续保持。

GISC 和 DCPC 示范过程

4.3.39 委员会注意到，GISC 和 DCPC 示范过程专家组 (ET-GDDP) 编写了一份问卷，以便从 WIS 候选中心获得其运行 GISC 和 DCPC 能力的证据，并草拟了一份提供 WIS 示范过程的程序和指南文件。

4.3.40 委员会注意到示范测试的重要性，这有助于确保 WIS 候选中心符合 WIS 的功能和技术规范。委员会强调，重要的是每个 WIS 候选中心应建立一个综合系统，以便向 ET-GDDP 展示能力，尤其是在元数据收集、元数据发布、数据发现、支持特殊需求、用户识别和访问授权等方面的能力。

4.3.41 委员会满意地注意到，GISC 候选中心的评估过程包括一次实地考察，以便 ET-GDDP 对技术设施、业务过程和已确定的组织工作进行评估；审议 WIS 的文件和程序并进行示范测试。委员会对评估过程表示欢迎，因为它强调了优势、劣势、改进机遇和潜在的关注领域。

4.3.42 委员会满意地注意到，有 18 个会员 / 组织参与了第一轮示范过程，总计 13 个 GISC 和 56 个 DCPC。ET-GDDP 分析了第一轮获得的证据，并将反馈意见提供给候选中心。委员会高兴地支持中国、德国和日本的 GISC 候选中心资格、它们的有关 DCPC、EUMETSAT 的 DCPC 和 ECMWF，并向大会提出建议。委员会注意到，有些建议的中心自

2010 年 5 月以来已进入预操作模式。委员会注意到，澳大利亚、巴西、法国、印度、伊朗伊斯兰共和国、韩国、沙特阿拉伯、瑞典、意大利、挪威、摩洛哥、香港、中国和英国的候选中心资格正在审查之中。委员会还同意，如果那些中心在大会前获得 ET-GDDP 和 CBS 管理组的批准，则也将被推荐给大会。委员会还决定要求大会指定正在接受对其符合 CBS 预备业务要求的示范进行评审的中心，包括那些宣布有兴趣完成示范过程的中心，比如俄罗斯联邦和美国的中心。委员会通过了建议 4(CBS-Ext.(10))– 指定 WMO 信息系统的中心。

4.3.43 委员会强调了启动 WIS 预备业务阶段示范过程的重要性，并要求 ET-GDDP 建立和启动第二轮示范过程。委员会还注意到，EC 将通过对《WIS 手册》的评审来予以进一步指定。

4.3.44 委员会注意到 CGMS 会议 (2010 年 11 月，新德里) 提出的建议，并鼓励所有相关的气象卫星中心争取成为 DCPC，从而为世界气象界提供服务。

4.3.45 为确保 DAR 元数据目录和高速缓存完整可靠，委员会注意到一些 WIS 中心正在积累 GISC 之间数据和元数据同步方面的经验，并强调在全球开展 WIS 的示范工作，同时邀请 ET-GDDP 协调此项工作。

4.3.46 注意到 GISC 在协调 WIS 电信基础设施方面承担的职责，目的是满足其责任区 WIS 中心信息交换的要求，委员会建议提请 GISC 开始为区域气象资料通信网络 (AMDCN) 提出建议，并要求 ET-GDDP 检查所有的 WIS 中心是否都包含在 AMDCN 中，并检查各项建议的重叠部分。每个 GISC 都必须阐明其是否将担任该中心的主要 GISC 或者有关的 GISC。

WMO 信息系统的法规文件

4.3.47 委员会回顾了第十五次大会强调需要适当的规章性文件，以促进会员国在全球、区域和国家层面的实施。关于技术规则 (WMO-No.49)，委员会要求 ICG-WIS 和 CBS 与区域协会和技术委员会协商，以准备对有关章节进行修订，并提交第十六次大会审议。委员会审议并赞同对《技术规则》第 1 卷 –《常用气象标准和推荐规范 A.3 部分》的修订草案，并通过了建议 5(CBS-Ext.(2010)) – 修订《技术规则》(WMO-No. 49)，第 I 卷 ，第 A.3 部分。

4.3.48 委员会还回顾了第十五次大会要求 CBS 与 ICG-WIS 合作编写法规文件，包括组织的和推荐的规范和程序 (如《WMO 信息系统手册》)，在各个阶段都是以初步的组织、功能和业务设计检验为基础。对此，EC-62 强调要高度优先编写《WMO 信息系统手册》，并注意到和支持编写这些重要的基本组成部分，以便形成未来的《WIS 手册》。第十六次大会强调，WIS 的实施应基于现有的 WMO 信息系统，包括服务于时间紧迫的关键运行资料，继续对 GTS 进行合并和改进。为此，委员会认为目前的《WMO 信息系统手册》是对《GTS 手册》(WMO-No. 386) 的补充。最终，委员会要求 ISS OPAG 应当更新和整合《WIS 手册》的内容。对此，委员会对 ISS 开放计划领域组进一步编写《WMO 信息系统手册》表示感谢。委员会审议并通过了建议建议 6 (CBS-Ext.(10)) –《WMO 信息系统手册》(WMO-No. 1060)，

并要求秘书长做出必要的安排，以便将其提交给第十六次大会。

4.3.49 委员会注意到《WMO 信息系统指南》取得的进展，并要求继续开展此项工作。它强调需要额外的组成部分，包括“元数据管理的最佳规范”和适当的培训材料。它注意到，由于所有会员都要求从 WIS 获益，所以也应提供所有正式语言版本的《WMO 信息系统指南》。

4.3.50 委员会注意到，对单个中心和诸如在土耳其和日本举行的培训讲习班而言，WIS 快速启动项目取得了成功。委员会鼓励会员继续支持 WIS 信托基金，并继续捐赠实物和借调人员来支持 WIS 的实施。

未来WIS实施的重点、能力建设

4.3.51 委员会注意到，目前 WIS 的实施处于正确的轨道，以便使新的中心根据第十六次大会的要求进入业务化。委员会强调，虽然少数核心中心 WIS 的新功能将投入业务运行，但是许多会员仍必须开始实施。因此，如果所有会员要全面实施 WIS，则需要进行长期的努力。委员会注意到，WIS 的工作重点已从发展转移到能力建设上来，尤其是面向发展中国家和最不发达国家的能力建设活动。委员会欢迎韩国为向 TDCF 过渡的能力建设活动和 WIS 的实施作出贡献。它鼓励那些实施 WIS 的会员协助那些尚未实施的会员。它注意到 WIS 是一个不断发展变化的系统，它随着新技术的发展而得到改进。因此，CBS 专家组应继续改进 WIS 的组成部分，以便提高 WIS 的效率和效益，尤其要注意全面解决与这些新技术有关的安全问题。委员会鼓励会员与负责标准的有关部门开展合作，以保证作为 WIS 互可操作性基础的各项标准，从而更好地满足 WMO 的需求。

4.3.52 委员会强调，WIS 是 WMO 许多优先计划的基本组成部分，包括减轻灾害风险、WIGOS 和 GFCS。委员会鼓励会员确保新项目要利用 WIS 及其互可操作性标准，从而提高能力以满足用户的要求，并降低制定和实施新举措的成本。

4.4 关于资料处理和预报系统开放计划领域组的决定，包括能力建设、质量管理框架和紧急响应活动 *(议题 4.4)*

4.4.1 委员会注意到，在 Bernard Strauss 先生 (法国) 的领导下，DPFS OPAG 的工作取得了显著进展，并注意到 OPAG 负责全球资料处理和预报系统 (GDPFS) 以及应急响应活动 (ERA) 计划。这些计划是会员业务基础设施的核心组成部分，可以对 WMO 会员提供的各类相关预报和环境服务给予支持。它们直接有助于 WMO 预期结果 1(制作预报和预警) 和其它预期结果，包括气候信息和预测、降低灾害风险、服务和应用以及能力建设。DPFS 活动涉及 WMO 的诸多优先重点领域，包括 GFCS 开发、降低灾害风险、能力建设和航空气象学，并合作开发 WIS 和 WIGOS，以及与 WWRP 合作开展天气预报和气候预测。

4.4.2 委员会审议了 GDPFS 手册并通过了建议 7 – 修订全球资料处理和预报系统手册 (WMO-No.485)。

灾害天气预报示范项目 (SWFDP)

4.4.3 委员会注意到，以降低灾害风险为重点的 GDPFS 继续开展各时间尺度的灾害及高影响天气现象每日预报。许多发展中国家的 NMHS 一直通过参与灾害天气预报示范项目 (SWFDP) 而从中获益，特别是在提供灾害天气事件的咨询和预警方面，具有更大的时间提前量和可靠性。SWFDP 是实施“分级预报过程”，该方法有助于促进发展中国家预报员调用、判读及使用由先进的 GDPFS 中心提供的 NWP/EPS 产品。

4.4.4 委员会注意到，SWFDP 目前在两个地区进展良好：即 16 个南部非洲国家；以及多达 9 个南太平洋岛屿国家。

4.4.5 委员会注意到，JMA(日本) 已建立了一个专门网站，以支持南太平洋群岛的 SWFDP，并为东南亚区域项目的持续发展提供支持。

4.4.6 委员会赞赏地注意到，作为一个全球产品中心，ECMWF 为 SWFDP 提供支持，并就其中心提供 WMO 会员使用的 NWP/EPS 产品开展年度培训。虽然优先考虑从 WMO 支持的 SWFDP 参与国中选择合格的受训者，但预计随着 SWFDP 区域项目的不断增多，目前分配的资金水平将不可能充分满足对这一宝贵培训日益增长的需求。

4.4.7 有些国家一直面临着诸多困难，无法全面参与 SWFDP，委员会鼓励这些国家确定可弥补差距和不足的具体培训需求，以使它们全面参与该项目。

4.4.8 委员会回顾到，曾要求其 SWFDP 指导组 (SG-SWFDP) 继续对现有和新项目的进一步开发给予指导并加以监督，并进一步注意到，开发两个新子项目的计划已经启动：针对 4 个东南亚国家；以及 6 个东部非洲国家，包括毗邻维多利亚湖的各参与国及邻近国家。

4.4.9 委员会注意到，为配合东非 SWFDP 的发展，在肯尼亚内罗毕举办了一次研讨会 (2010 年 10 月 4-8 日)，与会者来自东非六国 (肯尼亚、乌干达、埃塞俄比亚、坦桑尼亚联合共和国、布隆迪和卢旺达)。研讨会的主要目的旨在开始制定一项在大非洲之角 (GHA) 实施 SWFDP 的计划，重点是通过实施叠加预报过程，提高 NMHS 利用现有 NWP/EPS 产品预报灾害性天气并提供预警服务的能力。会议还讨论了 GHA 项目的推出战略。同时，委员会注意到，在坦桑尼亚达累斯萨拉姆举办了一次培训研讨会 (2010 年 10 月 19-29 日)，以加强东非地区筹备 SWFDP 的能力建设。

4.4.10 委员会重申了对于推动 SWFDP 非常重要的是应采用阶段性方法，以最切实可行的要素为起始，并考虑到当地的需求以及成功实施 SWFDP 的科技可行性。委员会认为，在启动新的区域子项目过程中，参与国数量限定为 3 或 4 个最为理想，且重点应放在强风和强降水的灾害预报方面，并在后续阶段尽可能地扩展到更多的国家并涉及其它天气相关灾害的预报。

4.4.11 委员会注意到东南亚正在推出一个由四个国家 (柬埔寨、老挝人民民主共和国、

泰国和越南) 人员参与的新的子项目。近年来，这些国家遭受了诸如热带气旋和暴雨等自然灾害，造成生命财产的巨大损失。该子项目旨在加强该地区业务预报的技术能力和改进天气服务的提供。(2010 年 9 月 17-18 日) 在东京举行了一次会议，以便为该子项目制定一份实施计划。

4.4.12 委员会注意到，在缺少足够的实时观测网，尤其是缺少天气雷达覆盖的情况下，SWFDP 面临的主要挑战之一是需要甚短期预报 (包括最初 12 小时预报) 工具，来应对会导致强降水和强风的突发性局部强雷暴。委员会鼓励 SWFDP 指导组和 CBS 卫星应用和产品专家组 (ET-SUP) 之间继续进行协调，以探索在有关培训、卫星信息 (资料和产品) 和分发机制等方面的合作来支持 SWFDP。此外，委员会认为，WMO 应在 SWFDP 的开发方面为气象卫星协调组的年会提供支持，建议在促进预报中心获取卫星产品以及卫星分发 SWFDP 所需产品等方面尽可能地开展合作。

4.4.13 委员会一致认为，能力建设，尤其是在人的技能和素质以及适当的工具包括创新科技 (如高性能计算机) 方面的能力建设，对于发展中国家和最不发达国家至关重要，也是它们所需要的。

灾害性天气预报示范项目 (SWFDP) 战略

4.4.14 委员会注意到 EC-62 认识到需要确保利用 SWFDP 取得效益的长期可持续性，并要求 CBS 制定一项 SWFDP 战略。委员会同意本报告附录 12 提出的战略并提出如下意见：

- SWFDP显然是一个成功的故事，它应被视为促进全球GDPFS和服务提供的典范。
- 向业务转化主要依赖于对可持续资助的获取，特别是来自预算外资金。
- 应事先审慎评估新的产品，如那些来自富有前景的研究的产品，要提供产品描述和精度信息以及应用指导。

4.4.15 委员会同意作为 SWFDP 战略的一部分，成熟项目的成功内容 (如在南部非洲) 需要转化为日常业务。对此，SG-SWFDP 建立了一个新增的项目阶段，题为：" 持续发展阶段 "，(称为 " 第四阶段 ")，此时项目通过初级阶段足以形成框架，使之在各区域协会的职责内继续得到充分发展，包括筹集维持项目所需的必要资源。委员会要求秘书处和有关计划维持其对区域子项目的强有力支持，以便这些子项目过渡到 “ 第四阶段 ”。

4.4.16 委员会一致认为，应明确规定 SWFDP 向业务状态转化的标准，并要求 SG-SWFDP 与参与中心和有关的区域机构协商，制定这些标准。

4.4.17 委员会建议，在 SWFDP 的框架内的培训活动最好定期举行 (例如每年)，并相机与其它培训活动结合起来，以覆盖新发展动态和预报中心的新业务天气预报员。委员会还建议，以定期 “ 培训教师 ” 研讨会的形式，为区域协会内正在进行的培训提供支持，包括来自

全球中心和 RSMC 的贡献，并要求秘书长在这方面提供帮助。

4.4.18 委员会注意到为 SWFDP 开展可持续教育和培训的重要性，因为它从试点阶段转向业务阶段。委员会还注意到 CGMS-WMO 卫星气象虚拟实验室的例子，它作为卫星运营商和许多培训机构之间的一种伙伴关系，促进和提供了卫星气象的教育和培训。委员会建议 SG-SWFDP 主席成立一个小型的特别专题组，调研按照卫星气象虚拟实验室构建 SWFDP 虚拟实验室的可行性，并向 CBS MG 报告可行性研究的成果。

4.4.19 委员会认识到大幅度增加了用于支持多个同时运行项目所需的经费和人力资源，包括全球和区域中心作出的承诺和秘书处提供的协调和支持。委员会赞赏秘书处成功地从世界银行调动资源，协同支持东非的 SWFDP 项目。委员会强调指出，EC-62(2010 年) 关于拓展 SWFDP 的要求只能依靠为这些项目提供支持的成功的融资战略才能实现。

4.4.20 委员会敦促秘书长调查可能的预算外资金来源，以支持实施可持续的 SWFDP 项目，这些项目与该战略一致，包括培训和能力建设活动，SWFDP 的全面协调和管理，以及成熟项目向日常业务的转化。

甚短期预报

4.4.21 委员会回顾到，利用实时观测资料集和临近预报方法并适当融合高分辨率 NWP 结果，有可能满足该时间尺度预报 (最初 12 小时)。委员会认为，这种可能的融合方法表 (WMO-No.1040) 应得到进一步的完善或应用，例如，用于已明确了需求的 SWFDP 项目，又如用于山洪预报的指导。

延伸和长期预报

4.4.22 委员会回顾了曾要求对长期预报全球制作中心 (GPC) 是否遵循指定标准进行审议，并且注意到，全部 12 个 GPC 已在提供预报产品和检验信息。尽管委员会担心有些 GPC 并未完全遵守指定标准，但它要求 ET-ELRF 审议强制性标准，以确保这些 GPC 严格切实地履行 GPC 最重要的职能。

4.4.23 委员会回顾到，EC-62 已敦促所有 GPC 为用户提供后报。

4.4.24 委员会注意到，ET-ELRF 一直在为一系列支持全球气候服务框架 (GFCS) 基础的活动做出贡献，包括：各 GPC 和有关牵头中心 (LC) 在 GFCS 的气候服务信息系统 (CSIS) 部分中的作用；指定区域气候中心 (RCC) 作为 GDPFS 的一部分；组建 CCl-CBS RCC 联合专家组；在 RCOF 上，将 GPC 和 LC 的产品用于编制区域集成预报。委员会注意到，ET-ELRF 审议了 WMO 立场声明草案中关于 GPC 的阐述及其作用，并要求将它们的意见和建议转达给 GFCS 起草小组。

4.4.25 委员会注意到，拟议的 WMO 全球季节气候最新报告 (GSCU) 应概述全球主要的

大气环流特点和大尺度海洋距平 (例如，ENSO、北大西洋涛动、印度洋偶极子等) 的现状 (监测) 和预计的未来规律 (预测)，并讨论对大陆尺度温度和降水模式可能产生的影响。委员会欢迎这一倡议，并注意到，进一步开发 GPC 和 LC 产品会有助于编写 GSCU，包括：LC-LRFMME 新的概率产品、LC-LRFMME 多模式产品的检验以及可能对各 GPC 的产品检验评分进行集中计算。因此，委员会敦促各 GPC 和 LC 审议这些开发工作的可行性，并取得进展。

4.4.26 委员会注意到，已在鼓励 RCC 使用长期预报标准化检验评分 (SVSLRF) 的检验评分，并认为，需要对《GDPFS 手册》第二部分附件 II.8 做出某些修改，因为目前它仅满足了 GPC 的需求。此外，委员会认为，不必再对 GPC 进行强制性 3 级检验评分，因为在区域一级进行此类评分更有意义。为此，委员会建议修订《GDPFS 手册》附件 II.8 中有关此类及 LRF 相关事宜，详见建议 7(CBS-Ext.(10)) 的附录 1。

4.4.27 委员会注意到，在 GFCS 背景下，有些 GPC 预计将会在提供全球季节到更长时间尺度气候预测方面发挥重要作用。委员会注意到并赞赏埃克塞特 GPC 目前已准备与 CCl 协调，在年代际预测研究方面协调国际合作并加以审议，促进向 CBS 汇报 (通过 DPFS) 进行多年际预测的可能性。为响应 EC-62 的要求，委员会同意在 ET-ELRF 的职责中增加一项这方面的职责，内容如下：

> “ 对季节以上时间尺度的初始预测研究进行评审，并就业务预测的可能性向 CBS 和 CCl 提交报告。”

4.4.28 委员会注意到，气候学委员会已经为属于一个以上区域协会职责的气候敏感区 (如极地地区) 开发了一种新的程序，来指定这些地区的 RCC 及 RCC 网络。为此，委员会建议修订《GDPFS 手册》，见建议 7(CBS-Ext.(10)) 的附录 4。

概率预报和集合预报系统及应用

4.4.29 鉴于业务 EPS 系统取得重大进展，委员会鼓励开发概率预报作为最高优先重点之一，以支持灾害和高影响天气的早期预警，包括将气象参数预报纳入影响模式，来促进减低灾害风险。

4.4.30 委员会注意到，在预报灾害天气事件方面，关键是要考虑到它们的低发生概率，以便有效利用 NWP/EPS 预报，并确保发布可靠的警报和预警。要实现全面有效的利用，就需要思想上的根本转变，考虑究竟如何将警报、监测，甚至预警更好地转换为概率形式来表示高影响天气和相关天气现象的风险。向用户有效地通报低概率的高影响事件预警对于确保其有效利用至关重要。为此，委员会建议，DPFS 和 PWS 合作解决这一问题。

4.4.31 委员会一致认为，在使用 EPS 产品时，需要对天气预报员进行定期培训，尤其是危险天气现象的预报，以改进预警计划和服务。

4.4.32 委员会要求 DPFS 继续起草一系列技术说明，因为这是教员和预报员进一步制定

关于如何在日常预报过程中使用 EPS 的指南的基础。

4.4.33 委员会回顾到，日本气象厅主持的 EPS 检验牵头中心为全球 EPS 提供了一个检验信息单一窗口。委员会要求所有 EPS 制作中心向该牵头中心提供检验资料。委员会还注意到，尚无任何中心能够根据观测资料提供降水检验，但有可能有其它方法对降水评分进行某些对比，比如利用短期降水预报或卫星估算的降水资料来检验中期预报。为了进一步促进 EPS 检验，委员会建议修订《GDPFS 手册》，见建议 7(CBS-Ext.(10)) 附录 2。

确定性NWP的预报检验

4.4.34 委员会回顾到，曾要求审议确定性 NWP 检验的现行标准，参见《GDPFS 手册》第一卷第二部分附录 II.7 表 F，并认为，不加检验地开展 NWP 不符合质量管理原则，且无法为预报员提供有必要质量保证的信息。委员会认为，检验行动建议中的有些主要部分应当是强制性的，并认为，有效和系统的检验系统应当以实时方式运行，来收集和制作信息，供快速调用，特别是供各业务中心和模式开发人员使用。

4.4.35 委员会注意到，检验系统的各个方面都需要加以更新，包括需要有关于所有全球 NWP 中心如何确保统一实施的更为明确的说明和指南。委员会认可已开发的最新标准检验系统，为此，建议修订《GDPFS 手册》，见建议 7(CBS-Ext.(10)) 的附录 2。

4.4.36 鉴于最新标准检验系统包含了强制检验内容，并且应将该系统作为一个新附件纳入《GDPFS 手册》。然而，委员会认为，与 NWP 检验 (确定性、EPS 和 LRF) 有关的所有各章节应仍然编排在一起，并安排在手册附录中的当前位置。待通过后，这些章节将在修订后的手册新结构中重新安排在相应位置，同时遵循强制性和非强制性作用。

4.4.37 委员会注意到要确保不同中心之间的结果的一致性，应将普通气候学用于那些需要气候学的评分，并注意到，ECMWF ERA-interim 再分析气候学是推荐的选择方案。委员会建议，公认的气候学应提供给 WMO 各会员，用于实施其各自的标准检验系统。

4.4.38 委员会强调了对 NWP 中心 (包括 GPC 和 RCC) 提供培训的重要性，以便实施《GDPFS 手册》中列出的核查要求和最佳做法，以促进和确保在这些中心开展协调一致的核查活动。

4.4.39 委员会回顾到，曾要求建立确定性 NWP 检验牵头中心 (LC-DNV)，并同意该牵头中心的一系列职能，并为此建议修订《GDPFS 手册》，见建议 7(CBS-Ext.(10)) 的附录 2。

4.4.40 委员会高兴地收到了来自 ECMWF 的一份简报，提出要成为确定性 NWP 检验的牵头中心，并一致认为，它符合对牵头中心一系列职能的需求，并建议指定它为确定性 NWP 检验牵头中心。

应急响应活动 – 大气传输模拟 (ATM)

4.4.41 委员会回顾了其通过 CBS-14 提出的建议)，并注意到，已制定一项计划，旨在将 RSMC 产品的分发由传真转换为利用电子邮件 / 互联网进行分发。该计划将于今年开始实施，并将在 2011 年完成。然而，委员会指出，传真分发应会持续一段时期，特别是对于那些互联网能力有限的地区。

4.4.42 委员会注意到，随着时间的推移和经验的增加，包括国际原子能机构 (IAEA) 经验的增加，对现有的 RSMC 产品进行了诸多改进，因此建议 (1) 设定一个较低的临界值，以显示综合大气浓度时间结果图表和总沉降图表；(2) 增加 t+24 和 t+48 小时时效的两个总累积沉降图，并建议修订《GDPFS 手册》，见建议 7(CBS-Ext.(10)) 的附录 3。

4.4.43 委员会注意到 WMO 已收到奥地利的来函，表示其有意承担 RSMC 业务职责，开展大气传输回溯模拟专业活动，此前它在与 CTBTO 合作开展大量试验期间成功展示了其能力。为此，根据一份关于维也纳 NMC 功能和提案的简报，委员会同意指定其作为维也纳 RSMC，并建议修订《GDPFS 手册》，将维也纳 RSMC 列入开展这一专业活动的 RSMC 名单，见建议 7 (CBS-Ext.(10)) 附录 3。

4.4.44 委员会回顾了执行理事会要求审议 WMO 第 170 号技术说明，题为 " 有关核电站选址和运行的气象和水文问题 "，并认为，该出版物中仅有少数涉及 CBS 的章节已不适用。委员会建议要对这些章节进行彻底的审议，以便有助于更新此文件，使之更贴合用户。同时，委员会注意到 WMO 在当前《安全指南：" 核设施选址评估中有关气象和水文灾害问题 "》修订版方面，继续与国际原子能机构进行合作，并注意到，WMO 气候学委员会的一位专家参与了此项工作。

修订后的全球资料处理和预报系统手册 (WMO-No. 485)

4.4.45 委员会回顾到在 CBS-14 上要求对 GDPFS 手册进行全面的审议，并注意到专家会议的主要成果是制定了新的、修订后的手册的大纲。委员会一致认为新的 GDPFS 手册应以本报告附录 8 中的大纲为基础。委员会还一致认为：

(a) 手册的第二卷(区域方面)没有会员的管理状况，应终止；然而产品以及指定一个或几个极地地区RSMC可能性的名单应予以保留并纳入新手册的第二部分。；

(b) 维基专题网站包括适当的专家参与，可用于制定新的手册内容；

(c) 与WMO其它计划协调是必需的，主要是WIGOS和WIS以确保有关GDPFS的观测与资料管理方面被纳入WIGOS和WIS监管文件中；

(d) 在制定新的手册期间，手册的现有版本应继续有效直至新手册完成。

4.4.46 委员会注意到 ICAO 观察员所表示的赞赏，即 ICAO 国际航路火山监视业务小组 (IAVWOPSG) 和国际火山灰工作队 (IVATF) 对火山灰咨询中心 (VAAC) 的具体要求已纳入修

订后的《GDPFS 手册》的大纲。在这方面，委员会注意到，WMO 在这一领域的支持对于 ICAO 国际航路火山监视系统 (IAVW) 的发展仍至关重要。

WMO 沙尘暴预警、咨询评估系统 (SDS-WAS)

4.4.47 委员会注意到将继续与大气科学委员会 (CAS) 合作为规划的两个业务 SDS-WAS 区域中心的设立制定业务程序和职能，作为 SDS-WAS 实施计划，两个中心一个针对亚洲，另一个是针对欧洲 / 北中部非洲 / 中东。委员会要求其代表就此事参与 CAS-CBS 特设任务组以确保按照 GDPFS 的宗旨和原则来制定规划系统的业务方面。

未来的工作计划，包括 DPFS 的战略方向

4.4.48 委员会注意到 CBS-14 批准的 DPFS OPAG 的结构保持不变，同时 ET ELRF 的职责范围添加了一项 (参见上文第 4.4.27 段)。

4.4.49 委员会建议灾害性天气预报示范项目 (SWFDP) 作为对减少灾害风险和能力建设非常有效的项目都非常有效的项目应当予以保留，并由 CBS 的 SWFDP 指导小组进行监督和指导。

4.4.50 委员会注意到 DPFS OPAG 在未来的工作计划中制定了开展活动的战略方向的草案，同时考虑了 WMO 的优先事项。委员会注意到该草案文件包括在背景材料中。

4.4.51 委员会注意到，已经审议了现有《GDPFS 手册》中有关各中心之间交换产品的相关部分，以符合 WIS 的建立与发展，因此，建议对《GDPFS 手册》进行修订，见建议 7(CBS-Ext.(10)) 的附录 5。

能力建设

4.4.52 委员会同意以下有关的能力建设的原则，用于确定 DPFS 技术合作活动的优先事项：

(a) 使国家气象水文部门能获取先进中心的NWP/EPS产品定为最高优先以便检查和利用这些产品作为预报应用的指导尤其是强天气预报；

(b) 业务资料处理功能定为最高优先，包括观测资料的处理和NWP产品的后处理，旨在改进对所有天气预报的应用，特别是极短期预报包括临近预报；

(c) 数值预报产品的应用培训定为高优先，尤其是EPS产品的应用和概率预报方法，以支持SWFDP；

(d) 当NMHS能力不足时，将业务资料处理的培训定为高优先，包括NWP产品的后处理、有限区域模式的运行以及NWP检验；

(e) GPC发布的LRF产品的应用培训定为高优先。

4.4.53 委员会回顾到，它曾鼓励各中心运行全球模式，以便考虑为 NMC 运行有限区域模式 (LAM) 提供边界条件，并协助评估和提供必要的技术基础设施，以开展 LAM 的实施。

质量管理框架 (QMF)

4.4.54 委员会一致认为 NWP 检验活动作为 GDPFS 的质量保证和管理措施应当在 DPFS 中予以保留。

4.4.55 委员会注意到制定新的手册时应当遵循质量管理原则，这将确保它作为 WMO 质量管理框架一部分的连续性。

4.5 关于公共天气服务开放计划领域组的决定，包括能力建设和质量管理框架 *(议题 4.5)*

4.5.1 有关公共天气服务的决定 *(议题 4.5.1)*

4.5.1.1 这一部分介绍 CBS 特别届会 (10) 有关为实现 WMO 预期结果 (ER) – 7 作贡献的决定，重点是关于公共天气服务 (PWS) 开放计划领域组 (OPAG) 协助各国家气象水文局 (NMHS) 提高技能和能力，向公众和其他用户提供天气及相关服务。

4.5.1.2 委员会对 PWS OPAG 主席 Gerald Fleming 先生、PWS 专家组成员以及实施协调组 (ICT) 成员在休会期间所做的工作表示感谢。

WMO 服务提供战略

4.5.1.3 委员会欢迎所制订的 “WMO 关于提供服务的指导原则 ”(见本报告附录 14)，该原则已得到 WMO 执行理事会第六十二次届会 (EC-62，日内瓦，2010 年 6 月) 批准。委员会一致支持秘书长制订 “WMO 服务提供战略 ”，并由 WMO 第十六次大会 (Cg-16，日内瓦，2011 年 5 月) 根据上述指导原则予以通过。委员会对在届会期间介绍的战略内容表示赞同。委员会指出，这是 WMO 全系统的战略，该战略适用于在向用户提供服务过程中发挥作用的所有活动和计划。委员会认为迫切需要制订这样一个战略，以协助会员具备服务提供功能，履行提供服务的职责并坚决支持提交大会批准。

公共天气服务的实施和协调方面

4.5.1.4 委员会听取了 PWS 实施协调组 (ICT) 会议的成果，会议是于 2010 年 9 月 20-24 日在中国上海举行的；委员会会还批准了协调组提出的建议内容。注意到气象服务改进人道主义规划和响应跨委员会专题组 (ICTT) 组长首次参加了此次 ICT 会议。根据 CBS-14 的决定，ICTT 被放在了 PWS OPAG 之中。专题组组长介绍了 ICTT 第一次会议的成果和行动建议，

委员会对此表示支持。

4.5.1.5 委员会获悉 ICT 主要工作重点是 WMO 的形势变化，因为战略规划已在整个组织结构上产生影响。对于 PWS OPAG 尤其重要的是已将服务提供定位为本组织高度优先的关键战略主旨之一。“WMO 服务提供战略 ”(见第 4.5.1.3 段) 目前是处于草案形式，ICT 讨论了如何才可以将其最佳地在 OPAG 以及委员会的工作中予以反映。ICT 认为到一定时候，WMO 内可形成一种结构，使服务提供工作得到改进完善，实现无缝隙，跨越所有时间尺度和所有学科 (天气、气候和水)。作为第一步，决定向 CBS 建议重新调整 PWS OPAG 内的各专家组的机构，与拟议的 “WMO 服务提供战略 ” 保持一致。

4.5.1.6 委员会支持 ICT 的意见：“WMO 服务提供战略 ” 可通过四个相关的组成部分加以阐明，这四个部分构成了 “ 服务链 ”，即：用户参与、服务设计与开发、服务提供、评估和改进。这些部分包括识别用户并了解其需求；确保用户需求得到满足；制作、分发并交流符合此目的的信息 (即服务)；以及收集用户反馈意见，并利用绩效指标评估并改进服务。委员会注意到这四个部分在 “WMO 服务提供战略 ” 草案中得到了体现，并强调需仔细审议上述 “ 服务链 ” 每个阶段对人才类型、技能和培训的需求。

4.5.1.7 委员会认为，为了将这一模式反映在 PWS OPAG 的结构中，应对三个现有专家组的工作重点作出调整，从而反映 OPAG 工作中主流化服务提供的迫切需求。因此，对 ICT 提出的结构予以批准，具体如下：

(a) PWS 用户需求专家组；

(b) PWS 服务和产品专家组；

(c) PWS 提供专家组；

(d) PWS 监督与评估专家组。

委员会强调需进行适当的协调，以确保在 OPAG 内部、各个 OPAG 和区域协会之间，新的结构要高效运转且避免工作重复。委员会进一步要求拥有服务提供经验的会员积极参与新的结构，以确保共享作为该战略重要组成部分的知识和经验。

4.5.1.8 鉴于 CBS 2012-2015 年运行计划草案中已经提出额外组建一个专家组，专门研究服务提供工作，委员会认为所提出的结构可将现有专家组的工作与 “WMO 服务提供战略 ” 直接对应起来。委员会要求 PWS OPAG 和秘书处确定拟议的新结构和现有结构的职责之间的关系。

4.5.1.9 委员会注意到 ICT 下述问题的讨论已有了结果：如何衡量 PWS OPAG 和 PWS 计划的工作效果，以及 NMHS 为用户提供服务的效果。注意到专家组制订了一些关于提高衡量和检验流程的策略。考虑到大多数 NMHS 已委任了 PWS 联络员，以便与 PWS 计划并与

用户界保持联系，委员会要求扩大这些联络员网络，并让这一网络更多地参与 PWS 活动，尤其是在收集和共享会员在 PWS 活动方面取得的进展信息。委员会进一步建议为 PWS 联络员召开真实的或虚拟的 (通过视频会议) 区域研讨会，以便让他们了解与 PWS 有关的发展和专题讨论情况。

改进公共天气服务的服务和产品

4.5.1.10 委员会坚定支持服务和产品改进专家组会议 (ET/SPI，中国香港，2010 年 5 月) 的工作成果，会议对重点是如何改进对 PWS 关键用户提供产品和服务，特别是发展中国家的。

4.5.1.11 委员会要求继续高度重视对概率预报的宣传，并批准了专家组的工作设想：为此主题拟订一系列要实现的成果。这些包括关于不确定性和概率产品宣传的预报员培训教材清单；基于 WMO/TD-No. 1422 " 预报不确定性宣传导则 " 的培训材料；以及在开发 PWS 网站上的专门网页。除了宣传不确定性之外，委员会要求关注内在预报的不确定性，并将其与更深入地理解用户的要求联系起来。

4.5.1.12 委员会针对 PWS 的边干边学 (LTD) 项目作了回顾 (见第 4.5.1.23 段)，并批准了 ET/SPI 的计划：拟订东非 PWS LTD 项目，将其纳入维多利亚湖区灾害性天气预报示范项目，以便改进为该地区已知关键用户提供的服务。要求在项目中应包括一个系统性监督和报告系统，对预警预报服务提供方面的改进以及吸取的经验教训建立文件立档，以便用于今后的其它项目。

4.5.1.13 委员会强调收集关于服务提供状况和用户感受的信息十分重要，这类信息可作为衡量并改进服务的依据，委员会批准了专家组和 PWS 计划为推进这项工作而采取的行动。这包括：从部分 NMHS 那里收集经过抽样测试过的用户调研，并将用户调研情况发给所有 NMHS；将抽样调研情况放到 PWS 网站上；编写关于 NMHS 如何开展调研的摘要指南。委员会要求告知这项工作的进展，以及会员对此的反应。 委员会鼓励 NMHS 开展气象服务的绩效评估，从而改进这些服务。

4.5.1.14 委员会批准了专家组的行动建议：促进 SWFDP 的 PWS 检验和评估方面。这些包括与 METEOALARM 检验组开展合作，并与世界天气研究计划 / 预报检验研究联合工作组 (WWRP/JWGFVR) 开展合作。

4.5.1.15 委员会要求专家组继续支持进一步深化 "WMO 服务提供战略 "，并与 PWS 计划设立的其它机制开展合作，制订战略，以提交 Cg-16 审议。

公共天气服务的宣传、推广和公共教育方面

4.5.1.16 委员会审议了 PWS 宣传、推广和公共教育方面专家组会议 (ET/COPE，古巴哈瓦那，2009 年 11 月) 的成果，并对 ET/COPE 的工作重点表示支持，即：特别重视发展中国家对与媒体单位建立伙伴关系的需求；开展用户教育和宣传；宣讲预报的不确定性和可信度；媒

体的归属；以及与利益攸关方进行沟通。

4.5.1.17 委员会强调需要让 NMHS 制定策略，发展并维护与媒体的有效关系，包括培养能力，做到向电视、广播、报纸和网络服务提供方提供 PWS 信息。要求秘书长继续支持该领域的 PWS 活动。委员会注意到阿曼提供的以下信息，即该国将其新安装的最先进的电视演播室与其国家电视台和多数媒体直接连接起来，且阿曼希望与其它拥有类似系统的会员共享经验。委员会要求秘书长继续支持会员在通讯技术和媒体展示领域的有效应用。

4.5.1.18 委员会强调‘社会媒体’交流手段对发布预报和预警很重要，如 Facebook、Twitter 个博客，因为它们广受人们的喜欢。委员会批准了专家组起草“问题文件”的工作，协助 NMHS 考虑实施上述技术，并要求不断提供有关此领域进展的情况。

4.5.1.19 委员会称赞 PWS OPAG 和秘书处专家组在总结许多 PWS 指南的基础上编写的一套‘操作指南’，其内容包括：

(a) 对预报不确定性的传达；

(b) 宣传、公共教育和宣讲；

(c) 与公众交流；

(d) 利用调研对服务进行评估；

(e) 与媒体合作。

委员会要求广泛散发这些“指南摘要”，并鼓励 NMHS 在网上查阅这些指南，并查阅有关这些主题的现有完整指南材料，可登录本组织的公共天气服务 (PWS) 网站： http://www.wmo.int/pages/prog/amp/pwsp/publications_en.htm。

4.5.1.20 委员会赞同专家组制作下列准则，并要求尽早出版：

(a) “宣传公共气象服务的社会经济效益及其影响”；

(b) “新兴技术与社交媒体”。

委员会认识到这些指南，尤其是《宣传公共气象服务的社会经济效益及其影响指南》的重要性，并要求在分发上述指南时附上一封秘书长的信函，要求常任代表将其分发给有关的所有国家机构。

4.5.1.21 注意到，在发展中国家人口大都居住在缺乏获取天气信息和预警渠道的农村地区，因此委员会再次要求 ET/COPE 与电台和互联网 (RANET) 通信系统在国家和国际层面的运

行机构密切配合。

支持防灾减灾的公共天气服务

4.5.1.22 委员会审议了专家组自 2009 年 5 月在吉隆坡召开最后一次会议以来 PWS 在支持防灾减灾 (ET/DPM) 方面的工作。它欢迎对世界天气信息服务 (WWIS) 网站 (http://world-weather.wmo.int) 的改造，使其能够启用 " 谷歌地球 "，用户从而可在一个三维虚拟地球状况下查看城市天气预报，并赞扬所有 Web 主机地区 (中国、法国、德国、意大利、阿曼、葡萄牙和西班牙)，特别是中国香港，在本项目发挥的主导作用。这个新版本在 2010 年上海世博会世界气象馆中进行了演示，在历时 184 天的世博会期间，80 多万人观看了该新版本。鉴于用不同语言的主机进行改造所需的成本和资金，委员会认为中国香港和其它主机地区之间应进行适当的协调，以确保在该版本正式推出之前，改造后的所有语言的版本就准备就绪。委员会还建议考虑进行软件开发，以便将未来所有语言版本的工作量减到最少。委员会要求定期举办 WWIS 主机国的协调会议，并指出这些会议由参与的主机国予以支持。注意到，参与 WWIS 的会员不断增加，目前有 124 个会员提供 1319 个城市的官方天气预报，同时网站的点击率有了提高，委员会敦促会员增加提供预报的城市数量，并希望那些尚未加入的会员开始参与该项目。印度打算给 WWIS 大量增加天气预报的城市数量，委员会对此表示欢迎。

4.5.1.23 随着 2010 年 6 月一项被称为 SWIdget 的新服务的推出，灾害性天气信息中心 (SWIC) 网站 (http:// severe.worldweather.wmo.int) 得到了增强。通过该项新的服务，用户可以在个人计算机上选择并自动显示不同区域的天气警报。目前，SWIdget 测试版提供中国香港、中国澳门和美国关岛等三个参与方 NMHS 的警报。已拟定计划，准备邀请更多的 NMHS 参与并向该网站提供其当地的官方灾害天气警报。委员会赞同在 WMO、谷歌和中国香港之间建立伙伴关系，促进公众和媒体获得热带气旋官方警告的可获取性。通过该伙伴关系，SWIC 发布的预警将始终位居谷歌搜索引擎的前列。委员会一致认为，这是 WMO 的一个重大突破，它成为谷歌用户搜索热带气旋官方警报的来源。

4.5.1.24 委员会赞同 PWS 发起的 "WMO 会员预警主管部门注册 " 的倡议，并指出，推出注册是实现 " 天气预警发布的单一官方声音 " 的一个重要步骤，这是会员已确定的一项重点领域。委员会要求会员确保它们的注册信息不断更新。委员会指出，由于公众或媒体不可能查阅该登记册，所以强调会员在提供灾害天气警报方面要坚持单一官方声音的立场，在宣称其发布警报的权威角色时要提及其在登记册中的会员资格。

4.5.1.25 委员会欢迎专家组根据现有的 PWS" 灾害性天气预警纳入灾害风险管理 " 指南 (WMO/TD-No.1292, PWS-13) 的基础上编写 PWS" 早期预警系统和临近预报在预警业务中的应用 " 指南。这些 " 指南 " 的编写是应 CBS-14 的要求，即 PWSP 应继续指导资料采集新技术和科研成果的应用，特别是在临近预报和多灾种预警方面的应用，从而协助会员改进本国的 PWS 计划。编写这些指南的重点是制定 NMHS 风险管理行动计划，为 NMHS 提供关于发展早期预警系统和临近预报在预警中应用方面的建议。同样，委员会同意采在现有的跨界交换警报的 PWS 指南 (WMO/TD-No. 1179, PWS-9)。委员会要求通过印制和 PWS 的网站方

式广泛分发这些出版物。

4.5.1.26 委员会注意到，EC 已获悉在海地地震灾害 (2010 年 1 月 12 日) 发生后秘书处成立的海地任务组的工作。委员会赞扬了 PWS 在这项工作中发挥的作用；这有助于加强海地国家气象局 (CNM) 向政府部门、公众和在海地工作的国际机构分发预报和预警的能力。这是通过 PWSP 启动和 / 或经其协调的工作促成的，其中包括将 CNM 的官方公共网站与 WWIS 网站链接，向联合国组织和受灾社区通信通报如何获取官方预报和警报的信息，以通过广播、电子邮件和手机短信系统分发。

公共天气服务在社会和经济上的应用

4.5.1.27 委员会回顾到，PWS 计划的一个重要组成部分关系到与公共气象服务相关的一些社会经济问题。这些问题的影响越来越大，也日益融合为 PWS OPAG 工作中的一部分。委员会对各机构之间正在进行的合作和互动表示满意。这些项目包括 PWS OPAG、世界天气研究计划 (WWRP)- 社会经济研究和应用 (SERA) 工作组，以及 WMO 论坛：天气、气候和水资源服务的社会经济应用及效益，这使得 PWS 在社会经济方面的合作得以实现并且减少了重复性工作。委员会要求这类合作继续开展下去并得到加强。

4.5.1.28 委员会欢迎 PWS 天气，气候和水服务社会经济效益网站 (www.wmo.int/socioec)，它为决策支持工具和案例研究以及天气、气候和水服务的效益的评估，量化以及展示提供了来源。委员会要求网站进行改进，以便其可得资源能够以更加精简的结构呈现。

公共天气服务示范项目

4.5.1.29 委员会审议了PWS计划在一区协、三区协和四区协中实施的不同的边干边学(LTD)项目取得的巨大进步。这些项目是为了增强智利、埃塞俄比亚、马达加斯加、巴拿马和秘鲁的 NMHS 的服务提供能力而设立的。这些项目的重点主要在于卫生部门，项目设立了若干天气、气候和卫生工作组，旨在发起并增进卫生部门与 NMHS 的合作。在智利和秘鲁，农业和渔业部门都已经在与 NMHS 的类似合作中受益。

4.5.1.30 委员会了解到 PWS 计划在 LTD 项目的设计和施行中的参与情况，这些项目由西班牙气象局 (AEMET) 提供资金，在布基纳法索、马里、毛里塔尼亚、尼日尔和尼日利亚开展，主要致力于调查天气和气候在虫媒疾病的影响。委员会要求秘书长继续支持正在进行中的 LTD 项目以及由 PWS OPAG 发起的新项目，这些新项目致力于解决 PWS 为不同部门的用户和公众提供这些关键领域服务的问题。委员会要求在 WMO 的其它区域也发起 LTD 项目，尤其是在二区协的西南部地区。

4.5.1.31 委员会坚定支持 PWS 部分在 SWFDP 计划中的进一步融合，这样通过改进服务可确保参与计划的 NMHS 分发和传递警报和预报的能力，以及因评估和评价服务得到改善而获得效益的能力得以加强。PWS 是在东部非洲、南部非洲、东南亚和西南太平洋地区 SWFDP 的一个主要组成部分。在东部非洲的 SWFDP，PWS 部分将以提供警报和预报服务

为重点，提高在维多利亚湖周边的农民和渔民的生命安全和生计，此举将惠及肯尼亚、乌干达和坦桑尼亚联合共和国。在东南亚的 SWFDP 覆盖了柬埔寨、老挝人民民主共和国、泰国和越南。委员会赞扬了数据处理和预报系统 OPAG 与 PWS 在这些项目中相关的合作，并要求它们在协助其他会员时继续紧密合作。

4.5.1.32 委员会对南部非洲 SWFDP 的进展以及该项目对服务提供的积极影响表示满意。其中包括：制定沟通策略和方法；与主要用户和合作伙伴协作，比如媒体、受灾社区、公众；监督和评估用户对灾害性天气服务的反馈；公共教育和宣传工作。

4.5.1.33 委员会赞同 PWS OPAG 对 WMO 上海多灾种早期预警服务示范项目 (M-HEWS) 的大力参与，尤其是对世博会临近预报服务 (WENS) 示范项目 (2008-2011) 的参与。委员会回顾了 WENS 示范项目的目标，其中包括利用 2010 年上海世博会的机遇展示临近预报的各项应用如何能够完善多灾种早期预警服务。委员会称赞了此项目在暴雨和雷暴预报预警获得很高满意度。委员会要求准备一篇完整报告在 WENS 上发表，并要求将 WENS 的结果在 2011 年项目完工国际研讨会上与其他感兴趣的发展中国家共享。

能力建设活动和技术合作

4.5.1.34 委员会再次呼吁 PWS 计划在能力建设上继续努力，尤其是在发展中国家和最不发达国家 (LDC)。委员会指出 PWS OPAG 正致力于在 NMHS 内为用户提供 PWS 构建足够的能力，同时还在编辑一份专家名单，以便在需要时能够协助 PWS 的培训活动。委员会要求 OPAG 和 WMO 教育与培训 (ETR) 办公室在此项工作中紧密合作。委员会还审议了将 NMHS 职员临时借调到公认的英才中心开展在职培训的益处；以及英才中心有经验的职员访问那些国家的 NMHS 以协助进行能力开发的益处。

4.5.1.35 委员会强调了气象服务在社会经济效益领域开展培训的重要性，它满意地注意到，PWS 组织了气象和水文服务社会经济效益评估培训研习班 (中国南京，2009 年 9 月)，一区协、二区协以及五区协的参与者从中受益。此外，委员会还注意到，为东部和南部非洲的国家气象部门组织的 “ 从加强服务提供中受益 ” 的研讨会也计划于 2011 年初于坦桑尼亚共和国召开。委员会要求 PWSP 为 WMO 的其它区域举办类似的培训。

4.5.1.36 就公共天气服务优先重点的安排，委员会坚决支持下列指导方针：

(a) 在加强NMHS互联网访问，使其作为一种交流工具方面的最优先重点是确保：能访问制作中心的数据和产品，以制作特制产品满足当地用户的需求，以及分发到所有用户作为改进天气服务提供的手段，并推广使用来自NMHS官方的一致性信息；

(b) 固定和移动通信系统方面的最高优先重点包括：移动电话，寻呼机/短消息系统，按需收发传真，以及播发公共天气警报和预报的RANET；

(c) 计算机辅助工作站的最高优先重点为通过预报员的互动，以可向用户提供新的或增强型产品，旨在加强服务的提供；

(d) 电视/媒体展示系统的最高优先重点包括高性能计算和通信硬件、辅助设备和软件、电视制作视频设备，以及相关的员工培训；

(e) 提供以用户为中心的PWS的相关培训最高优先重点包括用户和客户咨询和宣传培训，传媒技巧(撰写和演示)培训，产品设计培训，以及提高公众意识；

委员会鼓励与 ISS OPAG 密切合作，以解决上面 (a) 点提出的通信和互联网问题。

质量管理构架

4.5.1.37 委员会支持 EC-62(2010 年 6 月，日内瓦) 的建议，在 WMO 秘书处设立一个关于 QMS 执行的试点项目，并认为，这会在提供成本效益和秘书处响应性服务和流程方面带来潜在的效益。委员会认为这与 WMO 特别重视服务是相一致的。注意到 PWS 计划在执行 WMO 服务提供战略中的主导作用，委员会要求将 QMS 正式纳入 PWS 的活动。

4.5.1.38 委员会注意到计划编写适用于所有 WMO 计划的通用指南，与此同时确定程序上和组织上的要求。这类指导还包括 NMHS 质量手册、有关的认证手册、安全管理手册、职业保健手册、安全管理手册和环境管理手册等最佳规范。委员会鼓励会员与秘书处紧密合作，以便提供，交流和应用这类范例。

4.5.2 与减轻灾害风险 (DRR) 有关的决定 *(议题 4.5.2)*

4.5.2.1 委员会回顾到，CBS-14(克罗地亚杜布罗夫尼克，2009 年) 在 PWS OPAG 下成立了 " 改进人道主义规划和响应气象服务 " 专题组 (以下简称 " 人道主义专题组 ")。委员会获悉，2009 年 4 月 17 日在 WMO 秘书处举行了 " 改进人道主义应急规划和响应气象服务 " 的集体讨论会，启动了人道主义机构对气象、水文和气候信息产品及服务的需求评估过程，PWS OPAG 组长在与 CBS 主席协调之后，与气候学委员会 (CCl) 和水文学委员会 (CHy) 的主席建立了联系，他们指定了来自这些委员会的专家参加人道主义专题组。在咨询了 CCl 和 CHy 主席之后，CBS 主席批准了经修订的人道主义专题组的职责。委员会注意到 2010 年 8 月 31 日至 9 月 2 日在 WMO 总部举行的人道主义专题组第一次会议的成果和建议，其中包括一些具体的行动，如确定参加 WMO 区域专业气象中心 (RSMC) 和区域气候中心 (RCC) 业务网络的试点项目，以开发支持人道主义机构应急规划、备灾和响应工作的原型产品和服务。

4.5.2.2 关于人道主义专题组的职责第 2 条，委员会获悉，2005 年举行了 WMO 和联合国人道主义事务协调办公室 (UN-OCHA) 高级管理人员和工作人员会议。除其它 DRR 问题外，会议还讨论了 20 世纪 90 年代的 PWS 倡议，即促进提供来自国家气象中心 (NMC) 和区域专业气象中心 (RSMC) 的气象援助和信息，以支持 UN-OCHA 的前身 — 联合国人道主义事务部 (DHA) 的救援行动。会议得出结论说，尽管这一倡议受到了高度赞赏，但它尚未得到后续

实施，因为没有确定业务产品和服务的细节以及向 UN-OCHA 提供信息的机制。此外，会议指出，需要建立一种系统化的方法，以确定人道主义机构的需求，并使 NMHS 和 RSMC 开发能够通过人道主义信息系统传播的产品和服务。委员会认识到，在危机发生时，强烈需要一个有效的机制，以确保基于明确的业务程序向人道主义机构提供官方的信息和警报。在这方面，委员会一致认为，人道主义专题组很好地制定了这样一种机制，确保在危机发生时向人道主义机构有效地传播信息和警报，以便他们制订应急规划。

4.5.2.3 委员会认识到，尽管水文和气象灾害的应力影响到 NMHS，但在许多情况下，由于从中吸取了教训，以及将其纳入实际业务，它们也促进了与 DRR 有关的核心能力的进一步发展。委员会获悉，DRR 计划正在建立与联合国紧急呼吁程序和 UNDP- 世界银行 - 欧盟灾后需求评估 (PDNA) 程序的联系，以便作为受灾国家重建的一部分，实现为加强 NMHS 及其现代化提供资金的机会。在这方面，委员会注意到，在如 2010 年 1 月海地地震和 2010 年巴基斯坦洪水等大灾之后，WMO 秘书处与其会员、联合国和国际合作伙伴之间进行了有效协调。委员会获悉，这些努力侧重于：(1) 满足恢复和加强提供气象信息和警报的业务能力的迫切需求；和 (2) 受灾国家气象水文部门的中长期发展和加强。委员会强调，为了提供快速而有效的响应，WMO 可能会受益于一种使秘书处和会员都参与的有效的协调和响应机制。在这方面，委员会注意到有必要：

(a) 确定来自会员NMHS的具有相关专业知识的专家名册，以便他们参加WMO秘书处协调的针对受灾国家的任务，以确定能力发展需求，制定加强受灾国家NMHS及其现代化的战略。在这方面，委员会指出，需要与其它有关委员会协商，以确定评估涵盖气象、水文和气候观测网络、通信、预报和有关培训的基本能力所需的专业知识。委员会进一步指出，这些评估对于编制提交给PDNA程序和各自政府申请资金的提案至关重要；

(b) 编制指南，(1)协助会员评估他们与DRR有关的核心基本系统能力，包括观测、通信和预报以及相关的人力资源开发；(2)协助在受灾地区迅速部署的人道主义组织充分利用通过WMO团体能够提供的产品和服务。委员会同意与有关委员会进行磋商，以确定编制这类指南的机制。

4.5.2.4 委员会注意到那些不仅影响人道主义机构、而且影响更广泛的 DRR 团体的问题的出现。特别是，根据 DRR 利益攸关方 (国际和区域人道主义机构及发展机构) 的需求，RSMC 和 RCC 在气象、水文和气候产品开发中发挥着关键作用。在这方面，委员会注意到，需要审查具有区域专业化的 RSMC 的标准和业务能力，以确保充分满足制作和提供与 DRR 有关的气象、水文和气候产品及服务的需求。RSMC 应该能够基于 DRR 的需求 (例如，通过正在东南欧、东南亚、中美洲和加勒比地区进行的国家 / 区域 DRR 项目以及人道主义工作队的有关机制来确定) 以及全球资料处理和预报系统 (GDPFS) 的准则开展工作。委员会要求 CBS 减轻灾害风险协调员与 WMO 秘书处合作，作为下一步发展，探索通过滚动需求评审 (RRR) 流程确定基本 DRR 产品和服务的机会。

4.5.2.5 委员会获悉，关于“气象灾害因子标准指南”专题组，尚未取得什么进展。在这方面，

认识到气候学委员会在其新结构下已经成立了一个资料拯救专题组，因此，该专题组的工作将必须与 CCl 密切协调。委员会要求 CBS 管理组考虑最佳机制，以便通过这些机制与 CCl 有关专家合作，推进该项工作。

4.5.2.6 委员会同意任命一名减轻灾害风险联络员，作为人道主义工作队的一部分，与秘书处合作，制定一项战略，以便持续一致地收集和分发与气象和水文灾害有关的资料及信息。

5. 审议委员会的职责 *(议题 5)*

5.1 委员会注意到执行理事会希望 CBS 结合 WMO 基于结果的管理方法及本组织的总体目标和战略主旨审议其职责。委员会还注意到技术委员会主席考虑了执行理事会对此问题的指导意见并建议对技术委员会的总职责进行修改，执行理事会对此修改表示赞同并建议大会予以批准。

5.2 委员会审议了具体的职责，同意建议 8(CBS-Ext.(10)) – 基本系统委员会的职责提出的修订意见，并建议提交大会批准。

6. 审议委员会以往的决议和建议以及相关的执行理事会决议 *(议题 6)*

按照惯例，委员会审查了本次届会前通过且仍然有效的决议和建议，并通过了决议 1(CBS-Ext.(10))– 审议基本系统委员会以往的决议和建议，和建议 9(CBS-Ext.(10))– 审议执行理事会基于基本系统委员会以往的建议作出的决议或有关委员会的决议。

7. 点到点服务展示技术大会的成果 *(议题 7)*

7.1 委员会欢迎本报告附录 15 中关于 " 端到端服务提供 " 技术大会 (TECO-E2E) 的报告，该技术大会于 2010 年 11 月 19 日 (下午) 至 20 日与 CBS-Ext.(10) 共同举行，并对所有参会者表示感谢，特别是那些为大会带来重要用户观点的参会者。委员会赞赏 GEO 秘书处展示了 GEOSS 在确保获取和利用地球观测资料及信息以满足更广泛用户群体需求方面的补充作用，并强调指出，WMO 与其它 GEO 会员以及参加组织合作，在许多领域积极参与 GEOSS。

7.2 委员会感到高兴的是，TECO-E2E 强调了用户及其需求在整个 CBS 工作计划所有方面的关键作用，报告和小组讨论极其有效地阐明了 CBS 的端到端方法。TECO-E2E 展示了各个 OPAG 的作用和工作计划，以及它们如何横跨从用户需求到用户满意的链，并指出，服务只有满足需求，才对用户具有价值，无论是真实的或是感觉到的。委员会尤其欢迎的是，非洲的灾害性天气预报示范项目 (SWFDP) 已成为 CBS 端到端方法的非常实用和成功的典范。

7.3 委员会注意到，TECO-E2E 已经捕捉到关于用户、关于如何收集用户需求、以及

关于如何沿着端到端之链的所有步骤满足这些需求的一些重要观点，并一致认为，作为一个开发和改进的持续循环，要适当地描述用户、CBS、其它技术委员会、区域协会和 NMHS 之间关系的特点，从而促进发展和增长。

7.4 虽然委员会赞赏所取得的成功，并赞赏 CBS 为其会员在国家、区域和全球尺度上端到端的监测、分析、预报和预警服务提供了强大的后盾支持，但委员会一致认为，有可能改善 CBS 的工作方式，并向会员提供支持，包括支持采用一站式方法提供用户所需的无缝隙服务。因此，委员会密切关注 TECO-E2E 在其报告中确定的以下改进机会，并要求其管理组和 OPAG 联合组长酌情考虑如何将它们纳入委员会的工作安排和工作计划：

- 重新平衡OPAG-IOS专家组之间在更新RRR数据库方面的工作量，并加强与区域协会之间的联系。
- 加强各个OPAG之间的合作，从而在RRR过程中改进旨在确定非NWP要求的方式方法。
- 建立与其它技术委员会中各个OPAG和专家组之间的正式联系，以便进一步制定能够在RRR数据库中代表“观测系统能力”的方式方法。
- 发布适合非技术用户的WIS使用指南。
- 确定不同WIS相关服务所需的服务水准，并将其纳入滚动需求评审和监督程序之中。
- 澄清所有委员会的各项计划需要WIS提供支持的资料政策。
- 保留迄今为止在SWFDP开发中采用的原则：即现实主义、实用主义、参与人员和各个部门的志向和承诺。
- 不要因为想做得太多太快而损害SWFDP。
- 在SWFDP模式的基础上不断发展，要特别注意确保可持续性，并将有针对性的应用范围逐步扩大，从而将SWFDP的效益转移给其它的用户部门。
- 将通过对PWS OPAG的改组来更好地表示服务链(用户需求、服务和产品、提供、监督和评估)中的四个要素。
- OPAG-PWS应研究预报员作用的变化、对所需技能和能力产生的影响，以及对培训和能力建设的影响。
- 认识到需要确定内部和外部的用户，所以PWS OPAG应与CBS其它OPAG组长一道，在委员会工作范围内简化服务的提供。
- 作为一个交叉“用户”，在适当的时候与其它技术委员会和组织合作以更好地支持DRR。启动一个进程以便分析现有体制性机制的优劣，从而确保资金的最佳使用

和开展适当的协调；并启动工作以量化天气、水和气候服务对减灾所作的贡献。

7.5 委员会感谢 TECO-E2E 的组织者，并同意报告的如下观点，即委员会需要提高技能以理解和满足用户不断变化的需求和达到所需的能力，如果我们在全部工作中始终坚持用户至上的原则，就能实现我们的目标。

8. 其他事项 *(议题 8)*

8.1 委员会注意到 Eva Červená 女士长期以来对纳入《WMO 电码手册》的 WMO 电码的开发和实施作出的重要贡献。目前担任六区协向 TDCF 过渡专题组组长的 Eva Červená 女士对许多 NMHS 资料表示系统的实施发挥了重要作用，尤其是在传统的字母数字电码 (TAC) 向表驱动电码格式 (TDCF) 过渡的框架下。委员会提请主席为 Eva Červená 女士所作的贡献颁发一份特殊的感谢证书。

8.2 委员会认识到在 WWW 框架下提供服务日益受到重视，CBS 的工作包含三个以服务为驱动的计划 (PWS、DPFS 和 DRR) 且 CBS 的核心是越来越多地根据用户需求提供服务，所以委员会建议第 16 次大会将委员会的名字改成 " 基本系统和服务委员会 "，从而反映工作重点的发展变化。委员会还建议保留 "CBS" 的缩写，以表示对委员会的品牌实力和所具有历史意义的认可。

8.3 委员会赞赏地注意到会议安排的科学讲座。委员会感谢 Lars Peter Riishojgaard 先生 (美国) 等人就以下主题所作的精彩报告：

- "天气预报的经济价值" Lars Peter Riishojgaard先生(美国)；
- "EUCOS，EUMETNET的综合观测系统" Jochen Dibbern先生(德国)

9. 第十五次届会的日期和地点 *(议题 9)*

委员会未收到任何代表团关于在 2012 年第四季度承办 CBS 第十五次届会的意向声明。委员会注意到，根据总则第 187 条，该届会的日期和地点将由委员会主席与秘书长协商后确定。

10. 会议闭幕 *(议题 10)*

基本系统委员会特别届会于 2010 年 11 月 24 日 上午 11 时 25 分闭幕。

届会通过的决议

决议1(CBS-Ext.(10))
审议基本系统委员会以往的决议和建议

基本系统委员会,

注意到委员会对其2010年特别届会前通过的决议和建议所采取的行动，

决定：

(1) 保留决议2(CBS-Ext.(98))、决议1(CBS-12)、决议1(CBS-Ext.(06))、决议1和2(CBS-14)有效；

(2) 保留建议1(CBS-14)、建议4(CBS-14)和建议10(CBS-14)有效；

(3) 2010年特别届会前通过的其他决议和建议不再保留有效 。

届会通过的建议

建议1 (CBS Ext.(10))
修订《电码手册》 (WMO-No. 306)， 第I.1 和 I.2卷的引言

基本系统委员会，

注意到：

(1) 决议(Cg-15) – 世界气象组织《技术规则》，

(2) 决议2(Cg-15)–《电码手册》 2008-2011世界天气监视网计划，

(3) 《电码手册》(WMO-No. 306)，

考虑到需要：：

(1) 快速程序通过对《电码手册》的修订，

(2) 委员会届会休会期间通过对《电码手册》修改的程序，

(3) 委员会届会期间通过对《电码手册》修改的程序，

建议自2011年7月1日起使用本建议附录中的《电码手册》修改程序；
要求秘书长安排将这些程序并入《电码手册》第I.1卷和第I.2卷的引言篇；；
授权秘书长对《电码手册》第I.1卷和第I.2卷引言篇的文字作相应修改。

建议1 (CBS Ext.(10)) 的附录
修订《电码手册》(WMO-NO. 306)， 修订程序, 第I.1和 I.2卷

编辑说明： 下列各种符号的含义为：

文字 --- 没有改动

文字 --- 增补或修改

~~文字~~ --- 删除或修改

文字 --- 来自其它条款

~~文字~~ --- 调整到其它条款

《电码手册》修订程序

1. 一般性验证和执行程序

1.1 修订提案

对《电码手册》的修改必须向 WMO 秘书处提出书面提案。该提案必须说明需求、目的和要求以及技术问题的联络员信息。

1.2 起草建议案

秘书处支持的资料表示和电码跨计划专家组（IPET-DRC）[1] 应验证所述要求（除非该要求是 WMO 技术规则修改案引起的），之后视情起草建议草案，以便响应该要求。

1.3 执行日期

~~ET-DRC 的建议草案必须予以验证。ET-DRC 的建议草案必须征得信息系统和服务开放计划领域组（OPAG-ISS）的信息系统和服务实施/协调组同意。.~~The IPET-DRC 应确定执行日期，以便保证 WMO 会员得到通知之后有充足时间执行修改内容； 若二者时间间隔不足 6 个月，IPET-DRC 应说明原因，但快速程序除外。

1.4 批准程序

依照第 6 节的程序规定验证 IPET-DRC 的建议草案， IPET-DRC 可根据修改的类型选择下列一种修改批准程序：

- 快速程序（见下面第 2 节）；
- CBS 休会期间通过修改内容的程序（见下面第 3 节）；
- CBS 届会休会期间通过修改内容的程序（见下面第 4 节）。

1.5 紧急采用

除了上述程序外，下列程序将作为一条特殊措施来满足用户的紧急需求，以便采用 BUFR/CREX 表 A、B 和 D 新目录，BUFR, CREX 和 GRIB 第 2 版的电码和标识表格以及通用电码表。

(a) 应根据下面 6.1、6.2 和 6.3 节验证 IPET-DRC 编写的建议草案。

(b) 可在业务资料和产品中使用的预运行的建议草案应由 IPET-DRC 和 OPAG-ISS 以及 CBS 主席批准。预运行目录清单始终保留在 WMO 网站服务器上；

(c) 预运行条目需要按照 1.4 节规定的其中一条程序予以批准。

1.6 版本号

主表的版本号依次升高。

1.7 发布更新版本

一旦批准《电码手册》的修改内容，手册相关部分的更新版本须用四种语言发布：即英文、法文、俄文和西班牙文发布。秘书处应在 1.3 节中提及的通知日期时告知 WMO 所有会员已提供相关部分的新版本。

2. 快速程序

2.1 范围

BUFR 或 CREX 表 A、B 和 D 及相关电码表或标识表的增补以及 GRIB 形式的电码或表示表和格式的增补，以及通用表 C 的增补均可使用快速程序。

2.2 认可

~~必须根据下面第 6 节的程序验证 ET-DRC 的决议草案。~~IPET-DRC 编写的建议草案，包括修改内容的执行日期必须征得 OPAG-ISS 组长认同。

~~填补现有电码和标识表保留和未使用的目录将视作小幅改动，将由秘书长与 CBS 主席协商进行。对于其它类型的修改，包括执行日期在内的建议草案的英文版本应分发给电码和资料表示联络员来征求意见，并要求两月之内答复。之后应提交给 CBS 主席，他将代表执行理事会（EC）予以通过。~~

2.3 批准

2.3.1 小幅调整

填补现有电码和标识表以及通用电码表保留和未使用的目录将视作小幅调整，将由秘书长与 CBS 主席协商进行。

2.3.2 其它类型的修改

对于其它类型的修改，包括执行日期在内的建议草案的英文版本应分发给电码和资料表示联络员来征求意见，并要求两月之内答复。之后应提交给 CBS 主席，他将代表执行理事会（EC）予以批准。

2.4 修订频次

经快速程序批准执行修改每年可进行两次，分别于五月和十一月~~（原文为通常是一年一次）。如果 ET-DRC 和 OPAG-ISS 组长/联合组长认为出现特殊情况，可启动第三次快速执行。~~

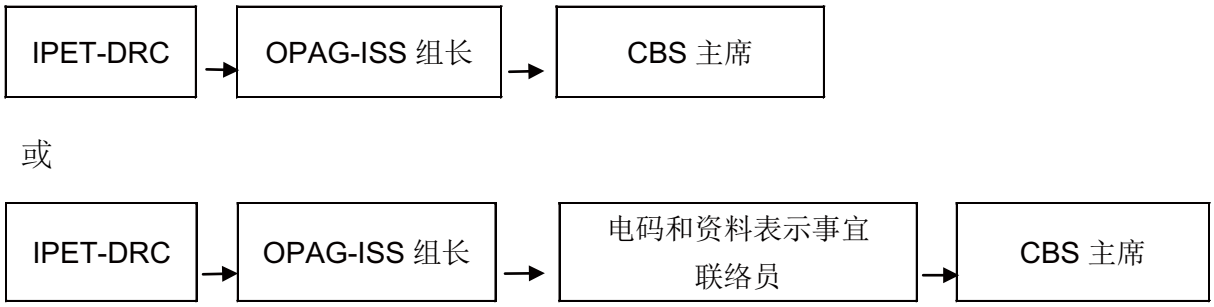

图 1 – 通过修改的快速程序示意图

3. CBS 休会期间接受修改的程序

3.1 建议草案的批准

若要在 CBS 休会期间直接接受修改内容，~~第一步，~~应将 IPET-DRC 编写的建议草案，

包括修改内容的执行日期提交给 OPAG-ISS 组长和 CBS 主席和副主席批准。~~第三步，一旦 CBS 主席批准，秘书处将用四种语言（英文、法文、俄文和西班牙文）向 WMO 所有会员分发建议，包括修改内容的执行日期，要求它们在两个月内对此提出意见；将提请 WMO 会员指定负责与 ET-DRC 讨论可能的意见 / 分歧的联络员。如果 ET-DRC 和联络员就 WMO 某个会员提出的某条意见无法达成一致意见，该修改意见将由 ET-DRC 来审议。在发出修改意见两个月内未予以答复的 WMO 会员将视同同意修改意见。第三步，~~ 一旦 WMO 会员通过了修订案，经与 OPAG-ISS 组长和 CBA 主席与副主席协商之后，秘书处在同一时间通知 WMO 会员以及执行理事会的成员关于批准的修订案和实施日期。

3.2 通报会员

~~第三步，~~ 一旦 CBS 主席批准，秘书处将用四种语言（英文、法文、俄文和西班牙文）向 WMO 所有会员分发建议，包括修改内容的执行日期，要求它们在两个月内对此提出意见；将提请 WMO 会员指定负责与 ET-DRC 讨论可能的意见 / 分歧的联络员。

3.3 达成一致

在发出修改意见两个月内未予以答复的 WMO 会员将视同同意修改意见。

3.4 协调

邀请 WMO 会员指定一位联络员负责与 IPET-DRC 讨论任何意见 / 分歧。如果 IPET-DRC 和联络员之间的讨论不能就 WMO 会员的具体修订案达成一致，IPET-DRC 将重新审议此项修订案。

3.5 通知

~~第三步，~~一旦 WMO 会员通过了修订案，经与 OPAG-ISS 组长和 CBA 主席与副主席协商之后，秘书处在同一时间通知 WMO 会员以及执行理事会的成员关于批准的修订案以及实施的日期。

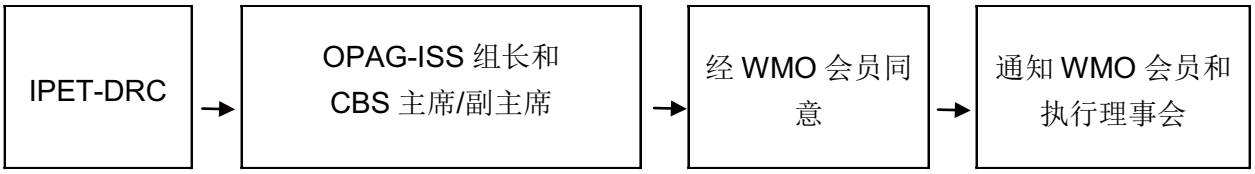

图2 - CBS两次届会期间批准修正案

4. CBS 届会期间批准修正案的程序

在 CBS 届会期间批准修正案，IPET-DRC 向信息系统和服务空开计划领域组 (OPAG-ISS) 的信息系统和服务实施 / 实施小组 (ICT-ISS) 提交修正建议包括实施修正案的日期。接着该建议将先提交 CBS 届会审议，然后再提交 EC 届会审议。

5. 更正 BUFR 和 CREX 表中现有的输入的程序

5.1 引入新的描述符

如果在业务 BUFR 或 CREX 要素描述符或序列描述符中发现输入了错误的条目规格，

最好是在适当的表中增加一个新描述符，通过快速通道程序或是 CBS 两次届会休会期间批准修正案的程序。新描述符应该取代旧的描述符进行编码（尤其是如果它涉及数据宽度）。适当的解释应加入到表的注解中，以说明更改日期的做法。根据上述~~2.2~~2.3.1 段，这种情况被认为是一个小的调整。

5.2 更正错误的规范

作为表 B 中错误条目的特殊措施，如果发现完全有必要通过修改规范的方式更改错误的规范或某个现有的条目，须采用以下规则：

5.2.1 除了小的说明外，要素描述符的名称和单位应当保持不变。

5.2.2 尺度、基准值和位宽可订正为所需的各值。

5.2.3 这种修改将通过快速通道程序提交。

~~**5.2.4** 将增加主版本的数量。~~

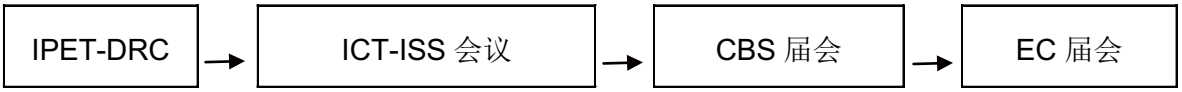

图 3 – CBS 届会期间批准修正案

6. 验证程序

6.1 建立有关需求和目的文件

应当建立有关更正的必要性、目的和建议的文件。

6.2 建立有关结果的文件

文件立档必须包括修改建议的验证测试结果，如下文所述。

6.3 用编码器 / 解码器测试

对于新的或修改的 WMO 电码和数据表示格式，应当用已纳入更改建议的至少两个独立开发的编码器和两个独立开发的解码器进行测试。凡是数据源自某个必要的唯一来源（如：数据流来自某颗试验卫星），使用至少两个独立开发的解码器对某一个编码器的成功测试就足够了。应当向 IPET-DRC 提供结果，以检查技术规范。

~~7. 迫切需要在 BUFR, CREX 和 GRIB 第 2 版表中引入新描述符或条目~~

经 CBS 同意（见基本系统委员会特别届会（2002 年）含决议和建议的最终节略报告（WMO-No. 955）总摘要的第 6.2.66 段），关于在 BUFR, CREX 和 GRIB 第 2 版表中引入新描述符或条目的三步机制能满足以下用户的迫切需求：

(a) 在表达需求后（由 ET-DRC 组长、OPAG-ISS 组长和 CBS 主席）批准的分配条目。有待验证的所分配的条目清单将在线保留在 WMO 网站的服务器上；

(b) 在验证之后（根据上述第 6.1, 6.2 和 6.3 段），将宣布供预备业务使用（经 ET-DRC 组长、OPAG-ISS 组长和 CBS 主席批准后）。供预备业务使用的条目清单将在线保留在 WMO 网站的服务器上；

(c) 最终，根据上述第 2、3 或 4 节中的详细规定的程序批准各项修订。

建议2 (CBS–Ext.(10))
修订《电码手册》(WMO- No.306)，第I.1卷

基本系统委员会，

注意到：

(1) 决议 1 (Cg-15) – 世界气象组织《技术规则》，

(2) 决议 2 (Cg-15) - 世界天气监视网计划 2008–2011，

(3) 《电码手册》(WMO-No. 306)，第 I.1 卷，

考虑到对航空电码进行修正因为国际民航组织已作了相应改动即附录 3 的第 75 号修正案国际航空导航气象服务 WMO 的《技术规则》[C.3.1]，

建议通过本建议附录对 FM 15-XIV METAR、 FM 16-XIV SPECI 和 FM 51-XIV TAF 的修订，并从 2001 年 11 月 2 日起投入使用：

要求秘书长安排将这些修正案纳入《电码手册》 第 I.1 卷；

授权秘书长对《电码手册》- 第 I.1 卷作相应的编辑修改。

建议2 (CBS–Ext.(10))的附录
AMENDMENTS TO FM 15-XIV METAR, FM 16-XIV SPECI and FM 51-XIV TAF

Amend the titles of METAR and SPECI:

FM 15–XIV Ext. METAR	Aerodrome routine meteorological report (with or without trend forecast)
FM 16–XIV Ext. SPECI	Aerodrome special meteorological report (with or without trend forecast)

Amend the code form of METAR and SPECI:

METAR / or / **SPECI** } **COR** CCCC YYGGgg**Z** **NIL** **AUTO** dddff**G**$f_m f_m$ { ~~**KMH** or~~ / **KT** or / **MPS** } $d_n d_n d_n$**V**$d_x d_x d_x$

{ VVVV $V_N V_N V_N V_N D_v$ / ~~or~~ / ~~VVVV**NDV**~~ / or / **CAVOK** } { **R**$D_R D_R$/$V_R V_R V_R V_R$i / or / **R**$D_R D_R$/$V_R V_R V_R V_R$**V**$V_R V_R V_R V_R$i } w´w´ { $N_s N_s N_s h_s h_s h_s$ / or / **VV**$h_s h_s h_s$ / or / **NSC** / or / **NCD** }

$T'T'/T'_dT'_d$ **Q**$P_HP_HP_HP_H$ **RE**w′w′ { **WS R**D_RD_R or **WS ALL RWY** } (**W**T_sT_s/SS′) (**R**$D_RD_R/E_RC_Re_Re_RB_RB_R$)

{ (TTTTT TTGGgg dddff**G**f_mf_m { ~~**KMH** or~~ **KT** or **MPS** { VVVV or **CAVOK** { w′w′ or **NSW** { $N_sN_sN_sh_sh_sh_s$ or **VV**$h_sh_sh_s$ or **NSC**
or **NOSIG**)

(**RMK** . . . . .)

Amend the Regulations 15.5 to 15.6.2:

15.5 **Groups** dddff**G**f_mf_m { ~~**KMH** or~~ **KT** or **MPS** } $d_nd_nd_n$**V**$d_xd_xd_x$

15.5.1 The mean true direction in degrees rounded off to the nearest 10 degrees from which the wind is blowing and the mean speed of the wind over the 10-minute period immediately preceding the observation shall be reported for dddff followed, without a space, by one of the abbreviations ~~KMH,~~ KT or MPS, to specify the unit used for reporting wind speed. Values of wind direction less than 100° shall be preceded by 0 and a wind from true north shall be reported as 360. Values of wind speed less than 10 units shall be preceded by 0. However, when the 10-minute period includes a marked discontinuity in the wind characteristics, only data after the discontinuity shall be used for obtaining mean wind speed and maximum gust values, and mean wind direction and variations of the wind direction, hence the time interval in these circumstances shall be correspondingly reduced.

Notes:

(1) ~~KMH,~~ KT and MPS are the standard ICAO abbreviations for ~~kilometres per hour,~~ knots and metres per second, respectively.

(2) The ~~unit of wind speed used is determined by national decision. However, the~~ primary unit prescribed in ICAO Annex 5 for wind speed is the metre per second (MPS)~~kilometre per hour (KMH),~~ with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided.

(3) A marked discontinuity occurs when there is an abrupt and sustained change in wind direction of 30° or more, with a wind speed of 5 m s^{-1}~~20 km h^{-1}~~ (10 kt) or more before or after the change, or a change in wind speed of 5 m s^{-1}~~20 km h^{-1}~~ (10 kt) or more, lasting at least two minutes.

15.5.2 In the case of variable wind direction, ddd shall be encoded as VRB when the mean wind speed is less than 1.5 m s^{-1} (3 knots) ~~(2 m s^{-1} or 6 km h^{-1})~~. A variable wind at higher speeds shall be reported only when the variation of wind direction is 180° or more or when it is impossible to determine a single wind direction, for example when a thunderstorm passes over the aerodrome.

15.5.3 If, during the 10-minute period preceding the observation, the total variation in wind direction is 60° or more but less than 180° and the mean wind speed is 1.5 m s^{-1} (3 knots) ~~(2 m s^{-1} or 6 km h^{-1})~~ or more, the observed two extreme directions between which the wind has varied shall be given for $d_nd_nd_n$**V**$d_xd_xd_x$ in clockwise order. Otherwise this group shall not be included.

15.5.4 "Calm" shall be coded as 00000 followed immediately, without a space, by one of the abbreviations ~~KMH,~~ KT or MPS to specify the unit, used normally for reporting wind.

15.5.5 If, during the 10-minute period preceding the observation, the maximum wind gust speed exceeds the mean speed by 5 m s^{-1} (10 knots) ~~(5 m s^{-1} or 20 km h^{-1})~~ or more, this maximum speed shall be reported as **G**f_mf_m immediately after dddff, followed

immediately, without a space, by one of the abbreviations ~~KMH,~~ KT or MPS to specify the units used for reporting wind speed. Otherwise the element **G**$f_m f_m$ shall not be included.

Note: It is recommended that the wind measuring systems should be such that peak gusts should represent a three-second average.

15.5.6 For wind speeds of 100 units or greater, the exact number of wind speed units shall be given in lieu of the two-figure code ff or $f_m f_m$. When the wind speed is 50 m s^{-1} (100 knots) or more ~~(50 m s^{-1} or 200 km h^{-1})~~, the groups ff and $f_m f_m$ shall be preceded by the letter indicator P and reported as P49MPS (P99KT)~~P99 KT (P49 MPS or P199 KMH)~~.

Note: There is no aeronautical requirement to report surface wind speeds of 50 m s^{-1} ~~200 km h^{-1}~~ (100 kt) or more; however, provision has been made for reporting wind speeds up to 99 m s^{-1} ~~399 km h^{-1}~~ (199 kt) for non-aeronautical purposes, as necessary.

15.6 **Groups** VVVV ~~VVVV**NDV**~~ $V_N V_N V_N V_N D_v$

Note: The coding of visibility is based on the use of the metre and kilometre, in accordance with the units specified in ICAO Annex 5.

15.6.1 The group VVVV shall be used to report prevailing visibility. When the horizontal visibility is not the same in different directions and when the visibility is fluctuating rapidly and the prevailing visibility cannot be determined, the group VVVV shall be used to report the lowest visibility. ~~When visibility sensors are used and they are sited in such a manner that no directional variations can be given, the abbreviation NDV shall be appended to visibility reported.~~

15.6.2 ***Directional variation in visibility*** $V_N V_N V_N V_N D_v$

When the horizontal visibility is not the same in different directions and when the minimum visibility is different from the prevailing visibility, and less than 1 500 metres or less than 50 per cent of the prevailing visibility, and less than 5000 metres, the group $V_N V_N V_N V_N D_v$ shall also be used to report the minimum visibility and, when possible, its general direction in relation to the aerodrome reference point indicated by reference to one of the eight points of the compass. If the minimum visibility is observed in more than one direction, the D_v shall represent the most operationally significant direction.

Amend the Regulation 15.7.4.2:

15.7.4.2 The mean value of the runway visual range over the 10-minute period immediately preceding the observation shall be reported for $V_R V_R V_R V_R$. However, when the 10-minute period includes a marked discontinuity in the RVR (for example, sudden advection of fog, rapid onset or cessation of an obscuring snow shower), only data after the discontinuity shall be used for obtaining mean RVR values and variations thereof, hence the time interval in these circumstances shall be correspondingly reduced.

Notes:
(1) See Regulation 15.7.5.
(2) Any observed value which does not fit the reporting scale in use should be rounded down to the nearest lower step in the scale.
(3) A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least two minutes, consistent with the issuance of aerodrome special meteorological reports (SPECI) ~~selected special reports~~ given in Technical Regulation [C.3.1.] 4.3.3.

Amend the Regulation 15.8.4:

15.8.4 Intensity shall be indicated only with precipitation, precipitation associated with showers and/or thunderstorms, funnel cloud, duststorm or sandstorm. If the intensity of the phenomena reported in the group is either light or heavy, this shall be indicated by the

appropriate sign (see Code table 4678 and specially Note (5)). No indicator shall be included in the group when the intensity of the reported phenomenon is moderate.

Amend the Regulation 15.8.15:

15.8.15 The letter abbreviation FG shall be used when the obstruction to vision consists of water droplets or ice crystals (fog or ice fog). For w´w´= FG to be reported without the qualifiers MI, BC, PR or VC, the visibility reported in the group VVVV shall be less than 1 000 metres.

Amend the Regulation 15.8.19:

15.8.19 The letter abbreviation SQ shall be used to report squalls when a sudden increase in wind speed is observed of at least 8 m s^{-1} (16 knots) ~~(32 km h^{-1}, 8 m s^{-1})~~, the speed rising to 11 m s^{-1} (22 knots) ~~(44 km h^{-1}, 11 m s^{-1})~~ or more and lasting for at least one minute.

Amend the Regulation 15.14.12:

15.14.12 Inclusion of significant forecast weather w'w', using the appropriate abbreviations in accordance with Regulation 15.8, shall be restricted to indicate:

(1) the onset, cessation or change in intensity of the following weather phenomena:
– Freezing precipitation;
– Moderate or heavy precipitation (including showers);
– Duststorm;
– Sandstorm;
– Thunderstorm (with precipitation)
– Other weather phenomena – given in Code table 4678 as agreed by the meteorological authority and air traffic services authority and operators concerned

(2) the onset or cessation of the following weather phenomena:
– Freezing fog;
– Ice crystals;
– Low drifting dust, sand or snow;
– Blowing dust, sand or snow;
– Thunderstorm (without precipitation);
– Squall;
– Funnel cloud (tornado or waterspout).

Amend the title of TAF:

FM 51–XIV Ext. TAF Aerodrome forecast

Amend the code form of TAF:

{ **TAF AMD** or / **TAF COR** or / **TAF** } CCCC YYGGgg**Z** { **NIL** or $Y_1Y_1G_1G_1/Y_2Y_2G_2G_2$ } { dddff**G**f_mf_m or **CNL** } { ~~**KMH**~~ ~~or~~ **KT** or **MPS** }

{ VVVV or **CAVOK** w'w' { $N_sN_sN_sh_sh_sh_s$ or **VV**$h_sh_sh_s$ or **NSC** } }

(**TX**$T_FT_F/Y_FY_FG_FG_F$**Z** **TN**$T_FT_F/Y_FY_FG_FG_F$**Z**)

{ { **PROB** C_2C_2 or / **PROB** C_2C_2 TTTTT / or TTTTT } YYGG/$Y_eY_eG_eG_e$ / or / TTYYGGgg } dddff**G**f_mf_m { ~~**KMH**~~ ~~or~~ **KT** or **MPS** } { VVVV or **CAVOK** { w'w' or **NSW** } { $N_sN_sN_sh_sh_sh_s$ or **VV**$h_sh_sh_s$ or **NSC** } }

Amend the Regulations 51.3 and 51.3.1:

51.3 **Group** dddff**G**$f_m f_m$ { ~~**KMH** or~~ **KT** or **MPS**

51.3.1 The mean direction and speed of the forecast wind shall be indicated by dddff immediately followed, without a space, by one of the letter code indicators ~~KMH,~~ KT or MPS, as the case may be.

Notes:

(1) ~~KMH,~~ KT and MPS are the standard ICAO abbreviations for ~~kilometres per hour,~~ knots and metres per second, respectively.

(2) The ~~unit of wind speed used is determined by national decision. However, the~~ primary unit prescribed in ICAO Annex 5 for wind speed is the metre per second (MPS)~~kilometre per hour (KMH),~~ with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided ~~– subject to a decision which is currently under review by ICAO~~.

Amend the Regulations 51.3.3 and 51.3.4:

51.3.3 ddd shall normally be encoded as VRB only when the mean wind speed is less than 1.5 m s^{-1} (3 knots) ~~(2 m s^{-1} or 6 km h^{-1})~~. A variable wind at higher speeds shall be indicated only when it is impossible to forecast a single wind direction.

51.3.4 When it is forecast that the maximum wind speed will exceed the mean speed by 5 m s^{-1} (10 knots) ~~(5 m s^{-1} or 20 km h^{-1})~~ or more, the maximum wind speed shall be indicated by adding **G**$f_m f_m$ immediately after dddff.

Note: If after a change group the wind is reported again, **G**$f_m f_m$ should be included, or not, in accordance with these same criteria.

Amend the Regulation 51.5.1:

51.5.1 Inclusion of significant forecast weather w'w', using the appropriate abbreviations in accordance with Regulation 15.8, shall be restricted to indicate:

(1) the occurrence, cessation or change in intensity of the following weather phenomena:
– Freezing precipitation;
– Moderate or heavy precipitation (including showers);
– Duststorm;
– Sandstorm;
– Thunderstorm (with precipitation);

(2) the occurrence or cessation of the following weather phenomena:
– Ice crystals;
– Freezing fog;
– Low drifting dust, sand or snow;
– Blowing dust, sand or snow;
– Thunderstorm (without precipitation);
– Squall;
– Funnel cloud (tornado or waterspout).
– Other weather phenomena – given in code table 4678 shall be included as agreed by the meteorological authority with the air traffic services authority and operators concerned.

Amend the Regulations 51.6.1.3 and 51.6.1.4:

51.6.1.3 The cloud group shall be repeated to indicate different layers or masses of cloud forecast. The number of groups shall not exceed three, except that cumulonimbus clouds and/or towering cumulus clouds, when forecast, shall always be included.

51.6.1.4 The selection of forecast layers or masses of cloud to be included shall be made in accordance with the following criteria:

1st group:	the lowest individual layer (mass) of any amount, to be indicated as FEW, SCT, BKN or OVC;
2nd group:	the next individual layer (mass) covering more than two oktas, to be indicated as SCT, BKN or OVC;
3rd group:	the next higher individual layer (mass) covering more than four oktas, to be indicated as BKN or OVC;
Additional groups:	Cumulonimbus clouds (CB) and/or towering cumulus clouds when forecast, if not already included in one of the three groups above.

The order of inclusion of the groups shall be from lower to higher levels.

Amend the Regulations 51.6.1.6:

51.6.1.6 Types of forecast clouds other than cumulonimbus clouds and towering cumulus clouds shall not be given. Cumulonimbus clouds and towering cumulus clouds when expected shall be indicated by appending the letter abbreviations CB and TCU, respectively to the cloud group without a space. In case CB and TCU are forecast with the same height of cloud base, the cloud amount shall be the sum of the CB and TCU amounts and the cloud type given as CB.

Amend the Regulation 51.6.3:

51.6.3 Cloud information shall be limited to cloud of operational significance, i.e. cloud below 1500 metres (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and Cumulonimbus and/or towering cumulus whenever forecast. In applying this limitation, when no Cumulonimbus and no towering cumulus and no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, are forecast, and CAVOK is not appropriate, the abbreviation NSC shall be used.

Amend the Regulation 51.7:

51.7 **Code word CAVOK**

When it is expected that the following conditions will apply simultaneously, the code word **CAVOK** shall be included in place of the groups VVVV, w´w´ and $N_sN_sN_sh_sh_sh_s$ or **VV**$h_sh_sh_s$:

(a) Visibility: 10 km or more;
(b) No cloud below 1 500 metres (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus and no towering cumulus;
(c) No significant weather phenomena (see Code table 4678).

Note: See note under Regulation 15.10.

Amend the Regulation 51.10.1:

51.10.1 To indicate forecast maximum and minimum temperatures expected to occur at the time indicated by $Y_FY_FG_FG_F$**Z**, the letter indicator TX for the maximum forecast temperature and TN for the minimum forecast temperature shall precede T_FT_F without a space. Up to a maximum of four temperatures shall be included, i.e. two maximum temperatures and two minimum temperatures.

Amend the SYMBOLIC LETTERS ff and f_mf_m:

ff Wind speed, in units indicated by i_w.
(FM 12, FM 13, FM 14, FM 18, FM 22)
(1) If wind speed is 99 units or more, see Regulation 12.2.2.3.3.

— Wind speed, in ~~kilometres per hour or~~ knots or metres per second.
(FM 15, FM 16, FM 51)

(2) For wind speeds of 100 units or more, see Regulations 15.5.6 or 51.3.5, as appropriate.

— Wind speed, in knots.
(FM 45)
(3) For wind speeds of 100 units or more, see Regulation 45.3.6.2.

— Wind speed, in units indicated by i_u.
(FM 63, FM 64)

$f_m f_m$ Maximum wind speed, in ~~kilometres per hour or~~ knots or metres per second.
(FM 15, FM 16, FM 51)
(4) See Note (1) under ff (second specification).

Amend the Note (5) to Code table 4678:

(5) Intensity shall be indicated only with precipitation, precipitation associated with showers and/or thunderstorms, duststorm or sandstorm, and funnel clouds.

建议 3 (CBS-Ext.(10))

修订《全球电信系统手册》（WMO-No. 386），第 I 卷 , 第 II 部分

基本系统委员会，

注意到 :

(1) 决议 1 (Cg-XV) – 世界气象组织《技术规则》，

(2) 决议 2 (Cg-XV) - 世界天气监视网计划 2008–2011，

(3) 《全球电信系统手册》 (WMO-No. 386)，第一卷 – 全球方面，第二部分，

建议按照本建议附录中提出的修改意见修改《全球电信系统手册》（WMO-No. 386）的第一卷 – 全球方面，第二部分，从 2011 年 11 月 2 日开始生效；

要求秘书长根据本建议的附录修订《全球电信系统手册》(WMO-No. 386) 的第一卷 – 全球方面，第二部分；

授权秘书长对《全球电信系统手册》作任何相应的文字编辑修改。

建议 3（CBS-Ext.(10)）的附录 1

修订《全球电信系统手册》（WMO-No. 386），第 I 卷

PART II – OPERATIONAL PROCEDURES FOR THE GLOBAL TELECOMMUNICATION SYSTEM

Attachment II-5

– To allocate T1=X to "Common Alert Protocol (CAP) messages" in replacement of "GRID regional use"; the current allocations of T_2A_1 A_2ii are deleted and new allocations of T_2A_1 A_2 will be further studied

– To add the following allocation in Table C6

$T_1T_2A_1$	ii	Data type	TAC correspondence	Data Category/ Sub-Category Common Code Table C13
IOZ		Deep ocean tsunameter		031/007

– To replace the following allocations for ozone data in Tables C6 and C7:

	$T_1T_2A_1$	Data type	Data category/subcategory
Table C6 - BUFR	ISE	Ozone measurement at surface	008/000
Table C7 - CREX	KSE	Ozone measurement at surface	008/000
Table C6 - BUFR	IUE	Ozone vertical sounding	008/001
Table C7 - CREX	KUL	Ozone vertical profile	008/001

By the new following allocations (the modifications/additions are marked written in blue):

	$T_1T_2A_1$	Data type	Data category/subcategory
Table C6 - BUFR	ISE	Measurement of surface ozone	008/000
Table C7 - CREX	KSE	Measurement of surface ozone	008/000
Table C6 - BUFR	IUE	Ozone vertical sounding	008/001
Table C7 - CREX	**KUE**	Ozone vertical sounding	008/001
Table C6 - BUFR	**IUL**	Total ozone	008/002
Table C7 - CREX	KUL	Total ozone	008/**002**

建议 3（CBS-Ext.(10)）的附录 2

修订《全球电信系统手册》（WMO-No. 386），第 I 卷

PART II – OPERATIONAL PROCEDURES FOR THE GLOBAL TELECOMMUNICATION SYSTEM

Section 2.12.1:

2.12.1 The transmission protocols for use on the GTS shall be elements of procedures as specified in ~~ITU-T Recommendation X.25 and~~ the Transmission Control Protocol/Internet Protocol (TCP/IP).

Section 2.12.2 (entire section 2.12.2 and subsections removed)

~~2.12.2 ITU-T Recommendation X.25 procedures~~
~~The methods and elements of ITU-T Recommendation X.25 procedures to be used in the GTS are as outlined below, and are given in Attachment II-13.~~

~~Note: References to OSI layers are taken from the Reference Model of Open Systems Interconnection (OSI) given in International Standard ISO 7498 and ITU-T Recommendation X.200.~~

~~2.12.2.1 Physical layer (ITU-T Recommendation X.25, physical layer, paragraph 1/OSI layer 1)~~
~~The provisions given in ITU-T Recommendation X.25, paragraph 1, shall be applied to point-to-point circuits and the interface between the data terminal equipment (DTE) and data circuit terminating equipment (DCE).~~

~~2.12.2.2 Link layer (ITU-T Recommendation X.25, data link layer, paragraph 2/OSI layer 2)~~
~~The following provisions shall be applicable only to point-to-point circuits between centres of the GTS:~~
~~Frame structure: The frame format shall be as described in Table 1/X.25, with the following parameters:~~
~~Address field: one octet; Control field: one octet.~~
~~Note: The extended control field of two octets or more needs further study.~~
~~Information field: 259 octets, 131 octets optional subject to bilateral agreement between centres concerned.~~
~~Elements of procedure: The elements of procedure shall be as described in section 2.3, "LAPB elements of procedures", of ITU-T Recommendation X.25.~~
~~Description of the procedures: The description of the procedures shall be as described in section 2.4, "Description of the LAPB procedures", of ITU-T Recommendation X.25.~~
~~It is recommended that WMCs and RTHs should take the role of DTE or DCE and NMCs should take the role of DTE, by bilateral agreement between centres concerned.~~
~~System parameters shall be as follows:~~
~~Timer T1 : T1 > Transmission time for three frames + two-way signal propagation time over the link + maximum time for processing one frame in a specific receiving centre.~~
~~Note: Examples of values of Timer T1 with processing time of ten milliseconds are as follows:~~
~~Cable links: 9600 bit/s: 0.4 s 4800 bit/s: 0.8 s 2400 bit/s: 1.6 s~~
~~Satellite links: 9600 bit/s: 1.2 s 4800 bit/s: 1.6 s 2400 bit/s: 2.4 s~~
~~Maximum number of transmissions N2:10~~
~~Number of outstanding frames k : 2 ≤ k ≤ 7~~
~~Note: International Standard ISO 7776 – Information processing systems – Data communication – High-level data link control procedures – Description of the X.25 LAPB-compatible DTE data link procedures, describes the X.25 layer 2 procedures as viewed by the DTE for DTE to DCE operation and for DTE to DTE operation without an intervening packet-switched network.~~

~~2.12.2.3 Network layer (ITU-T Recommendation X.25, packet layer, sections 3, 4, 5.1 to 5.5/OSI layer 3)~~
~~The packet layer of ITU-T Recommendation X.25 shall be used in accordance with the procedures for permanent virtual circuit (PVC) and virtual call (VC) services.~~
~~The maximum length of the user data field shall be 256 octets or optionally 128 octets.~~
~~Window size W : 2 ≤ W ≤ 7 depending on type of communication circuit and system equipment.~~
~~One or more logical channels (PVC and/or VC) should be established between two adjacent centres. Multiplexing provided by logical channels (PVCc and/or VCs) should be used in preference to multiplexing provided at the physical layer (e.g. by V.29 modems). The recommended procedures for the use of VCs – also called switched virtual circuits (SVCs) – are given in Attachment II-14.~~
~~Note: One or more PVC and/or VC could be used between non-adjacent centres by multilateral agreement.When the transport layer procedures have not been implemented, "more data mark" (binary element M) shall be used to identify the sequence of packets containing the complete message.~~
~~Note: International Standard ISO 8208 – Information processing systems – Data communication – X.25 Packet layer protocol for data terminal equipment, describes the X.25 packet layer procedures as viewed by theDTE for DTE to DCE operation and for DTE to DTE operation without an intervening packet-switched network.~~

~~2.12.2.4 Transport layer (OSI layer 4)~~
~~A transport protocol should be employed in accordance with ITU-T Recommendation X.224. When implemented, the class 2 procedures, including those for multiplexing, explicit flow control and expedited data transfer, shall be used. Class~~

ATTACHMENT II-6

Paragraph "TYPE 3" (II-6/2)

The structure of the text for this message type has two specific classes using two different formats in the request text. This addressed message type is for use between nodes of the GTS. To use the CLASS 1 formatted request form, the nodes of the GTS must be adjacent nodes. To use the CLASS 2 formatted request form, the nodes of the GTS do not have to be adjacent to each other. The request/reply type message is for the acquisition of data at the bulletin level and the bulletin is assumed to exist already. If it is sent on an ~~X.25 virtual channel~~ a connection established for the exchange of alphanumeric data, then the T1T2 option of BM is recommended; and if, the X.25 virtual channel was established for binary data exchange, then the T1T2option of BI is recommended. If there is only one virtual channel between nodes for both alphanumeric and binary data exchange, it is recommended to use the T1T2 option of BI as a default. The use of the T1T2 option of BM would be used on all GTS links using character protocols (i.e. BAUDOT or ERROR CONTROL PROCEDURES), as all addressed messages and request/reply responses are alphanumeric.

Paragraph "Choice 1" (II-6/2)

1. Format for an alphanumeric connection ~~virtual channel or for any non-binary GTS link~~.

2. Format for a binary connection ~~virtual channel on X.25 GTS links~~.

Paragraph "Choice 2" (II-6/2)

1. Format for an alphanumeric connection ~~virtual channel or for any non-binary link.~~

2. Format for a binary connection ~~virtual channel on X.25 GTS links~~.

Paragraph "CLASS 2" (II-6/3)

CLASS 2. Request for a bulletin – can be sent to any centre on the GTS. There is only one choice for the form of the text of the request. The form is always alphanumeric, however, the T1T2 option of BM is to be used for all requests for alphanumeric messages, and the T1T2 option of BI is to be used for all requests for binary messages, as all returned responses will use the same T1T2 for the heading type to facilitate proper routing ~~when X.25 or equivalent links are required~~.

Examples – CLASS 2 (II-6/3, II-6/4)

• Used for a non-binary connection ~~X.25 virtual channel~~

[…]

• Used for a binary connection ~~X.25 virtual channel only~~

Note at the bottom of ATTACHMENT II-6 (II-6/5)

Note: Connections ~~Limitation circuits or virtual channels~~ with priority queues must guard against confusion when selecting and responding to sequence number requests for transmission.

ATTACHMENT II-9

Subtitle of II-9 and following (II-9/1)

I. Coded or non coded digital facsimile transmission procedures between centres on a network connection ~~channel equipped for X.25 procedures~~
1. The structure of the message, containing a bit oriented product for transmission on GTS links ~~conforming to the provisions of ITU-T Recommendation X.25~~, should be as follows:

[…]

~~This message should be transmitted according to the procedures conforming to ITU-T Recommendation X.25, given in Part II, paragraph 2.12~~.

ATTACHMENT II-13 (the entire text is removed and replaced by the text below. See background document CBS Ext.(10) BM4.3(4) for old text)

NOT USED

ATTACHMENT II-14 (the entire text is removed and replaced by the text below. See background document CBS Ext.(10) BM4.3(4) for old text)

NOT USED

ATTACHMENT II-15 [See Annex 3 to Recommendation 3 (CBS-Ext.(10)) for recommended text]

ATTACHMENT II-16

Title

PROCEDURES FOR TRANSMITTING AND COLLECTING METEOROLOGICAL BULLETINS ~~ON THE INTERNET~~ USING E-MAIL AND WEB

Background

[…]

The following guidelines describe practices for sending both data collection bulletins and binary meteorological bulletins via e-mail while minimizing security ~~issues~~ risks.

[…]

~~Format of messages~~ Guidelines for sending meteorological bulletins via electronic mail on the Internet

1. The main body of e-mail should use charset (character encoding) which is understandable by receiving centres. If e-mail client software can be configured, “US-ASCII” or “UTF-8” is suggested where there is no bilateral arrangement.

~~1~~2. The sender should be reminded, however, that not all of transmittable characters are acceptable to the GTS. The main body of e-mail messages should use only characters defined in International Alphabet No. 5. Use of other characters especially NO-BREAK SPACE is discouraged for interoperability reasons. It is recommended that the meteorological bulletin should be contained in the main body of the e-mail message; as an option it may be contained in an attachment.

~~Note: ‘Attachments’ are a part of an e-mail message that are separate from the main body of the mail message, and that their display/storage is normally contingent upon some further action of the user.~~

3. The “From:” header field should be previously agreed with receiving centre.

4. The “Subject:” header field is recommended to be either:
   (a) the AHL if the email message contains a single meteorological bulletin; or
   (b) a <security string> previously agreed with receiving centre.

~~2~~5. It is recommended that only a single bulletin should be sent in each e-mail message. However, receiving centres may agree to accept multiple meteorological bulletins per e-mail message to a maximum of five.

~~3~~6. The meteorological bulletin(s) can be sent either as text in the main body of the e-mail message, or in the attachment(s) of the e-mail message, but not in both. Text data should be sent in the main body of the email message. Binary data can only be sent in the attachment(s). Attachments should be encoded in Base64 (MIME standard).

7. When (a set of) meteorological bulletin(s) is sent in t~~T~~he main body of an e-mail message should follow the following format: <Meteorological Bulletin>

[…]

8. When (a set of) meteorological bulletin(s) is sent in attachments, the attachments must be in a format agreed with receiving centre. One possible format is described in “Accumulating messages into files” of Attachment II-15. The main body should be blank.

~~5~~9. The total size of e-mail message including all attachments should not exceed 2 Meg~~ab~~Bytes or as specified in a bilateral agreement. Attachments should be coded in Base64 (MIME standard).

~~6. The e-mail header “Subject:” field either:~~
~~(a) May contain the AHL if the e-mail message contains a single meteorological bulletin;~~
~~(b) Or a pre-defined <security string>~~

Example

```
From: NMCAAAAA <NMCAAAAA@meteo.fr>
To: RTHcollector <RTHcollector@meteo.zz>
Subject: SMFW01 NWBB 270000

SMFW01 NWBB 270000
AAXX 27004
91753 32481 51008 10331 20259 40078 58017 83202
  333 20263 59018 83816 84078=
91754 01581 51812 10287 20245 40092 58017 60034 70182 85200
  333 20256 59016 60017 85820=
NNNN
```

Information which is part of the e-mail header

Text in the main body of the e-mail message or in the attachment

Guidelines for e-mail-to-GTS gateways
~~Security considerations~~

1. ~~E-mail is inherently insecure.~~ To minimize security risks ~~issues~~, ~~all e-mail input should be pre-authorized by means of a list of valid source e-mail addresses at the receiving site. The receiving centre should only process GTS-related e-mails from the pre-defined list of e-mail addresses. That is,~~ the receiving centre should validate the e-mail message header “From:” field against previously-agreed list of source addresses before sending bulletins to GTS. ~~To avoid problems with e-mail messages containing manipulated “From”-fields,~~

2. If receiving and sending centres ~~may optionally~~ agree to implement <security strings> > it should be placed in the message header “Subject:” field or the previously agreed field~~. If <security strings> are agreed on, and GTS message(s) are included in attachment(s), then the main body of the e-mail message can only contain the <security string>.~~

3. The receiving centre should ~~validate the "Subject" field for~~ the AHL ~~or the pre-agreed string~~ found in the "Subject:" header field (if it is not <security string>) or extracted from meteorological bulletin(s) such as main body.

4~~2~~. No automatic acknowledgements or replies should be sent from the receiving centres.

5~~3~~. It is recommended to use specific mail accounts for receiving GTS data transfer with bilaterally agreed names and not to receive GTS data in personal mailboxes.

6~~4~~. A problem with some e-mail exchanger applications is that by default they operate as an "open-relay", which is exploited for sending unsolicited bulk e-mail. An open-relay occurs, for example, if site A.COM accepts mail from B.NET destined for C.ORG. This means that spammers can use A.COM's mail system to distribute their e-mails. Centres should ensure that they do not operate as an open-relay.

7. To minimize the risk of operational trouble, the receiving centre should understand and decode all MIME standard multipart structure and Content-Transfer-Encodings (namely Base64 and Quoted-Printable). When sending text bulletins intended for global distribution, the gateway should ensure the content is in ITU International Reference Alphabet. For example, NO-BREAK SPACE (hexadecimal code A0 or C2 A0 in many charsets) can be replaced by ordinary SPACE (20).

Security considerations

E-mail is inherently insecure. In order to minimize the risk of unauthorized message submission, this guideline recommends that e-mail-to-GTS gateways:

(1) Validate "From:" address, and

(2) Validate <security-string> in "Subject:"

Hence it is advised that the agreed e-mail address and/or <security-string> are treated as secret by both sending and receiving centres.

~~*Example*~~

~~From: NMCAAAAA <NMCAAAAA@meteo.fr>~~
~~To: RTHcollector <RTHcollector@meteo.zz>~~
~~Subject: SMFW01 NWBB 270000~~

} ~~*Information which is part of the e-mail header*~~

~~SMFW01 NWBB 270000~~
~~AAXX 27004~~
~~91753 32481 51008 10331 20259 40078 58017 83202~~
~~333 20263 59018 83816 84078=~~
~~91754 01581 51812 10287 20245 40092 58017 60034 70182 85200~~
~~333 20256 59016 60017 85820=~~
~~NNNN~~

} ~~*Text in the main body of the e-mail message or in the attachment*~~

建议 3（CBS-Ext.(10)）的附录 3

修订《全球电信系统手册》（WMO-No. 386），第 I 卷

ATTACHMENT II-15

RECOMMENDED PRACTICES AND PROCEDURES FOR THE IMPLEMENTATION, USE AND APPLICATION OF TCP/IP ON THE GTS

Text – No changes
Text – Addition or modification
~~Text – Deleted~~
Text – Move from other article
~~Text – Move to other article~~

FOREWORD

~~The strategic direction for development of the GTS, as endorsed by CBS, has since the early eighties, been based on the OSI standards, especially the ITU-T recommendation X.25. However, CBS now considers that the TCP/IP protocols as used on the Internet, should replace X.25 for supporting GTS operations in the future.~~

~~The change in strategic direction has evolved within the CBS in recent years. It has occurred for various reasons, including the expanding functional needs of the various WMO programs and the evolution of the Internet and its supporting technical standards, as a dominant force in the information technology industry, supplanting the OSI standards in many areas.~~

~~The transition to TCP/IP is considered appropriate because:~~

~~(a) Vendor support for X.25 technology is declining and becoming more expensive due to industry concentration on TCP/IP;~~

~~(b) TCP/IP supports numerous application utilities available off the shelf, which offer solutions to information communications needs of Members, such as file transfer, Web browsers, electronic mail and future applications such as multimedia communications;~~

~~The transition to TCP/IP is considered appropriate because:~~

~~(a) Vendor support for X.25 technology is declining and becoming more expensive due to industry concentration on TCP/IP;~~

~~(b) TCP/IP supports numerous application utilities available off the shelf, which offer solutions to information communications needs of Members, such as file transfer, Web browsers, electronic mail and future applications such as multimedia communications;~~

~~(c) TCP/IP provides connectivity between Members in a more flexible and versatile manner than the X.25 based equivalent.~~

Over the years, the GTS has evolved tremendously. Various protocols were used including X.25 in the recent years. Most GTS links have now been converted to the industry standard TCP/IP, either using direct point-to-point links or more sophisticated networks.

~~These benefits equate to~~ The use of TCP/IP protocols and associated procedures continue to deliver direct savings in financial and human resource costs to Members by:

~~(a) Reduced~~ Reducing costs for communications equipment purchase and maintenance; and

~~(b) Reduced~~ Reducing software development work through use of industry standard software systems.

Considerable efforts have been applied in defining the framework for applying TCP/IP to the GTS and for the orderly transition from the OSI/X.25 based origin of the GTS. Furthermore, it is understood that TCP/IP will be the basis for all new telecommunication functions implemented in support of the WMO Information Systems (WIS).

Procedures are defined to ensure that the primary function of the GTS in carrying real time operational traffic with minimum delay is preserved. ~~Also,~~ The issue of securing the GTS from interference from the Internet and other networks is also addressed in general terms. Reliance must however be placed on all Members with a TCP/IP based connection to the GTS, who are also connected to the Internet and other networks, to implement and maintain thorough security practices.

This Attachment ~~was originally written as the culmination of work undertaken by CBS during 1997 and 1998. The TCP/IP procedures have since been implemented by most national Centres. The opportunity has been taken to capture the practical experiences gained in the use of TCP/IP and update material accordingly. In addition, a World Wide Web resource has been set-up which gives further details of the technical implementation of many of the concepts and procedures introduced within this Attachment.~~ and the information related to this topic which is available on the WMO

World Wide Web pages, provide details of the technical implementation of many of TCP/IP procedures for the GTS. ~~This~~ The information is available on the WMO web pages at:

http://www.wmo.int/pages/prog/www/manuals.html
http://www.wmo.int/pages/prog/www/documents.html

Members are strongly advised to take account of the adoption of the TCP/IP based strategy for the future development of GTS, in planning the future development of systems within their national Centres.

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INTRODUCTION

Historical perspective

The GTS at present is predominantly used to support the message switching application using message exchange in WMO format. This exchange is done using:

- ~~The~~ TCP/IP protocols~~, suite~~
- limited OSI transport service based on point to point X.25;

and is supplemented by broadcasts.

This implementation is adequate for the legacy application of message switching but it ~~is recognized that it~~ requires continuous improvements to fully support the various WMO programs and ~~the new requirements of~~ WIS. For example, the GTS should support:

- Distributed Data Bases (DDB);
- Data exchange between non adjacent centres;
- Exchange of information that cannot readily be handled by message switching systems (MSSs).

Purpose of this Attachment

This Attachment is intended to assist Centres to implement Transmission Control Protocol/Internet Protocol (TCP/IP) based services on the GTS. Throughout this document, it is understood that the implementation of TCP/IP protocols include all essential protocols that are normally part of the TCP/IP protocol suite, as described in the Internet Engineering Task Force (IETF) reference

documents RFC1122 and RFC1123. These documents are available from the IETF website at: http://www.ietf.org/.

The aim of this Attachment is to describe those aspects of the application of TCP/IP that apply specifically to the GTS to meet new requirements and also the long established routine data exchange undertaken by Message Switching Systems (MSSs). The Attachment takes account of the technical evolution of the GTS from an X.25 based network, and maintains the philosophy that Centres continue to be autonomous as far as possible. It is recognized that the timing for implementation of new systems is determined by individual Members in the light of their available resources and relative priorities, but it is also understood that new WIS functionality is expected to be achieved mostly via TCP/IP protocols.

This Attachment does not cover fundamentals of TCP/IP but focuses on those aspects that are essential for successful application on the GTS. Such aspects include appropriate use of the GTS compared with the Internet, co-existence of the GTS and the Internet, IP and X.25 and Autonomous System addressing, router management, TCP/IP application services (such as FTP) and fault management. ~~The Attachment also gives an overview of recommended security practices with TCP/IP, but does not address security issues and practices in detail, this being a highly complex subject in itself. Some references on TCP/IP and on computer security are given in Appendix 4.~~

Information Technology Security (ITS) is an important consideration in the design and operation of networks today. A ~~more~~ comprehensive discussion on security can be found in the “WMO Guide on Information Technology Security”, which is available on the WMO website at: http://www.wmo.int/pages/prog/www/manuals.html.

Relationship of the Internet and GTS

The Internet has grown rapidly in capacity, penetration and diversity of applications. ~~As well, day to day performance of the Internet, which used to be recognized as a weakness, is now reaching acceptable levels of reliability~~ Its bandwidth greatly exceeds that of the GTS and it could potentially take over some functions of the GTS. Although day to day performance of the Internet used to be a recognized weakness, recent experience shows that in many countries, its reliability has reached acceptable levels. It should be noted however that the very nature of the Internet will always mean that no one can build a system using the Internet for which specific service levels can be guaranteed. The Internet is the result of the amalgamation of numerous telecommunication systems, for which no operator has complete responsibility.

It is therefore recognized that the internet can be used as:
An underlying technology for some components of the GTS in special conditions,
As a backup to the GTS; and
As a complement to the GTS.

Table 1. Usage of GTS and Internet

Communication Component	*Underlying Technologies*	*Function*
GTS	Dedicated links, high availability network clouds, VPN via Internet for backup or when no other technology is available	Delivery of time critical communication for weather, water and climate operations
Internet	As provided by supplier	Communication for less critical requirements and possibly for large volumes of data

Coexistence with the Internet also brings some special security problems that must be addressed to ensure the GTS can fulfil its function. In particular, the networks must be engineered in such a way that the GTS is protected from general Internet traffic and is secured against inappropriate use and unauthorized access. For example, the use of IP and dynamic routing protocols such as BGP4 (Border Gateway Protocol) on the GTS will have to be managed in such a way as to allow communication between non-adjacent Centres only with the knowledge and concurrence of all intermediate Centres. Otherwise there is a danger that large amounts of GTS capacity could be consumed by non-routine traffic, to the detriment of real time operational data exchange.

Evolution of the GTS

The use of the ISO/ITU standard X.25 was adopted by WMO in the early 1980's to facilitate the exchange of data and products encoded in WMO binary code forms (GRIB, BUFR etc) and to act as a base for higher level OSI applications. Although OSI was regarded at the time as the strategic direction for the evolution of data communications, this has changed. Today, there is no doubt TCP/IP protocols are the most accepted and widespread protocols for exchange of data.

TCP/IP is appropriate because:

(a) it is the dominant protocol suite in everyday use being now packaged with virtually all implementations of Unix and many PC operating systems;

(b) it offers a wide range of standard applications (file transfer, electronic mail, remote logon, World Wide Web, etc.) that will greatly reduce the need for the WMO community to develop special procedures and protocols as it has had to do in the past.

(c) it provides useful features such as automatic alternate routing (in a meshed network) which could improve the reliability of the GTS.

~~This Attachment however takes account of the fact that centres have based plans and developed systems in line with the OSI standards, particularly X.25, as endorsed by WMO and specified in the Manual on GTS. The transition to TCP/IP based services must continue in an orderly fashion from the X.25 based links in such a way that operation of the GTS is not disrupted or put at risk.~~

~~The Attachment provides for this by defining procedures for:~~

~~(a) An interim hybrid based on:~~

~~(i) Carrying TCP/IP based services over an X.25 network service; or~~

~~(ii) Carrying X.25 data over IP based network service via directly connected routers;~~

~~(b) Subsequent transition to pure IP utilizing directly connected routers, together with TCP/IP based application services, such as TCP sockets or File Transfer Protocol (FTP).~~

~~The transition to the second step (pure IP) is desirable because:~~

~~(a) Operating TCP/IP over X.25 may not provide expected throughput because of router processing overheads involved in packet encapsulation of IP frames within X.25 packets. This appears to become worse as line speeds increases. Limited tests which have been done between Centres in Region VI indicate efficiency less than 70 per cent at 64Kbps;~~

~~(b) The management and maintenance activities required for the X.25 network and associated packet switches can be avoided;~~

~~(c) Carrying X.25 over IP requires use of proprietary features of specific router brands.~~

~~In order to move to pure IP, it is necessary to modify MSSs at each Centre to make use of TCP/IP services such as FTP and Sockets. This is covered in some detail in Chapter 4.~~

Other related issues

Many Centres now have experience of TCP/IP on the GTS. Experience has shown that the main technical issues, which need to be addressed to establish widespread use of TCP/IP on the GTS, are:

1.1 agreed methods for the message switching application to use TCP/IP either directly or via higher level applications e.g. FTP;

1.2 an agreed file naming convention and standard for metadata associated with files;
1.3 a community wide Naming and Addressing agreement.

It is the aim of this Attachment to make some progress with these issues, some of which lie in the domain of Data Management as much as Telecommunications. It must also be recognised that overall, the existing GTS is not a homogenous network in the true sense of the word, but a collection of regional networks and discrete point-to-point links. Also managed networks using Frame Relay and MPLS (Multi Protocol Label Switching) technology are now part of the GTS. These developments introduce new issues regarding multi lateral co-operation in operating the GTS. While these issues are raised, they are beyond the scope of this Attachment.

PRINCIPLES GOVERNING THE USE OF TCP/IP ON THE GTS

Basic Concepts

The exchange of information using the standards proposed by the WMO uses a layer model for telecommunication. These layers can be divided in 2 groups:

(a) The lowest layers are more or less the 7 layers of the OSI Model (http://en.wikipedia.org/wiki/OSI_model). These layers are the standard TCP/IP protocol stack;

(b) The top layers are the WMO Message Switching System (MSS) applications.

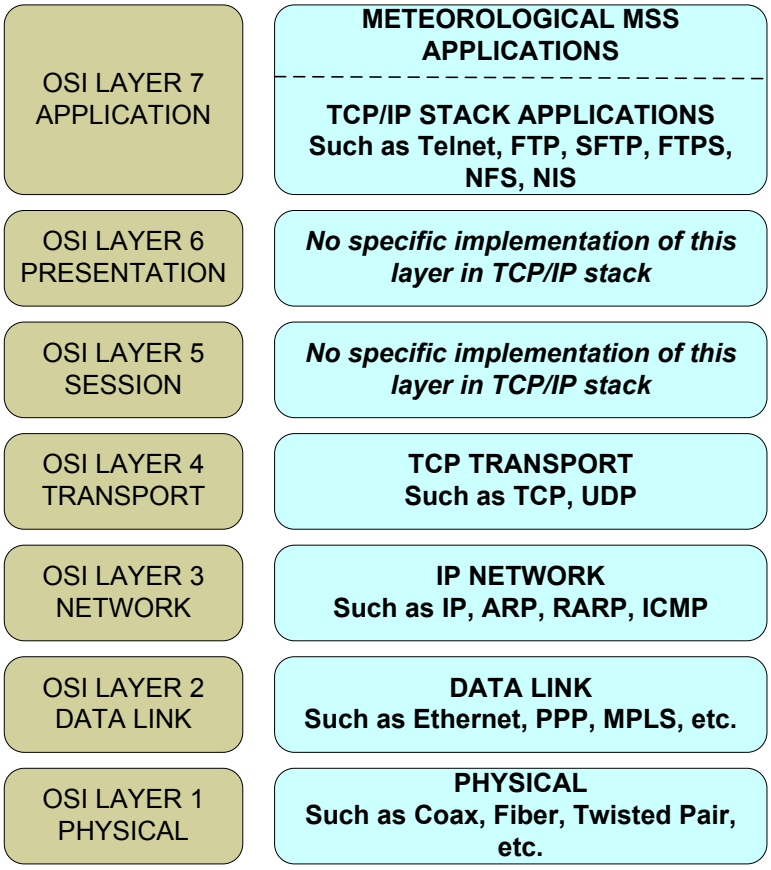

Figure 2.1.1 Layer Model for Telecommunications

The introduction of TCP/IP does not remove the need for some Meteorological MSS telecommunication components. They are still required to properly route the weather and environmental data based on standard $T_1T_2A_1A_2ii$ data designators (the WMO standard data designators are given in Attachment II-5) or based on standard file naming (described later in this attachment).

The protocols in rest of the TCP/IP protocol stack are used to actually deliver the messages to a given location in the world. When a message is transmitted, the MSS applications prepare the message and decide where the information should be sent. The information is then encapsulated in the TCP/IP protocol stack layers and it is the bottom layers that actually deliver the messages to their destination.

The TCP/IP protocol suite is an enabler to:

(1) Simplify interconnectivity between computer systems by allowing several telecommunication technologies to be integrated into a coherent network which may include automatic redundant backup routes,

(2) Lower costs by providing standard telecommunication solutions,

(3) Build modern applications not just limited to strict, fixed store and forward traffic rules.

~~However, some care must be taken to address the counter effects of these benefits and in particular, more flexibility in interconnection and in applications comes at the price of less control on where traffic can go. For example, a general purpose link to a GTS cloud network might get flooded with less critical traffic requested by a site that doesn't normally request data through a given link. It may also mean that traffic has trouble reaching its destination because there are several ill-defined routes (through both the GTS and the Internet) to get there.~~

It should be noted that both the top layers (MSS applications) and bottom layers (TCP/IP protocol stack) use addresses and routing. These addresses are different from layer to layer. Also the routing is different. The MSS layers use $T_1T_2A_1A_2ii$ data designators and country codes for addresses. The routing is a manual configuration based on the particular data needs of each Centre.

Overall topology of interconnection

A general view of the possible interconnectivity between Centres is given in Figure 2.2.1.

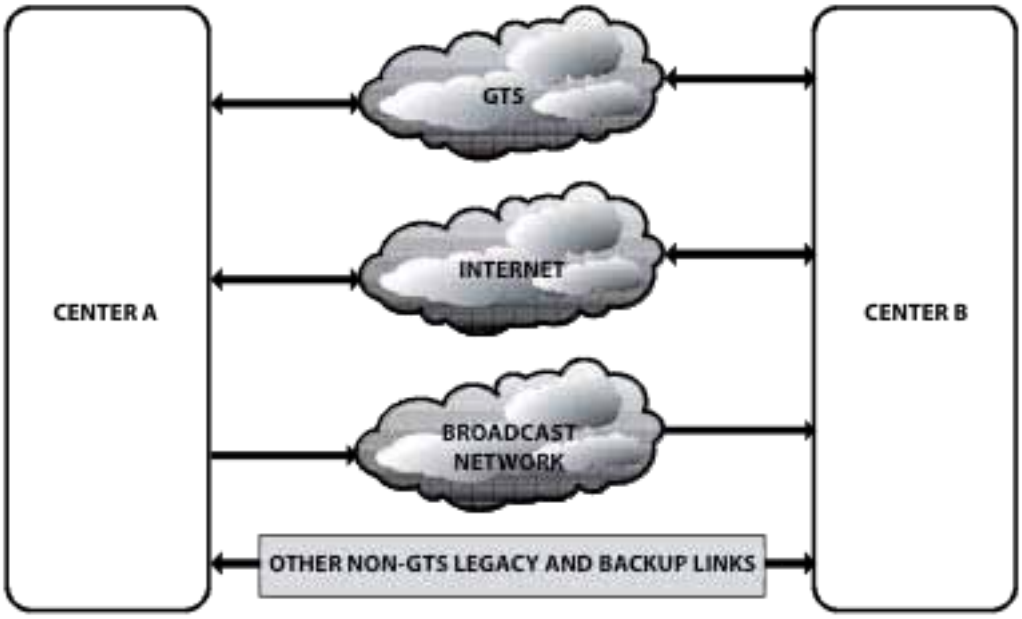

Figure 2.2.1. Possible interconnectivity between Centres

This picture shows that there are many ways to interconnect Centres. The functions carried out by a particular Centre will dictate which telecommunication systems and technologies that Centre will need to support.

The GTS, Internet and Broadcast Network are separate physical networks. Each provides different levels of security, service and redundancy. They should therefore be used for different purposes and different traffic types. They should also be kept as separate networks. This in particular is discussed further later on in this attachment.

It should be noted that the Internet as a network is also used in a second manner. Specifically, CBS has expressed the view that the use of Internet for GTS links can be considered in circumstances where they are cost effective, offer an acceptable level of service and where adequate security measures are implemented. In general, the same principles for routing and security apply where Internet links are used instead of dedicated links. This special configuration requires special devices and protocols and is a particular configuration of Virtual Private Networks (VPN). Further details applying to the use of Internet based links, especially related to small GTS Centres, are given in Appendix 4.

Since most Centres and most telecommunication systems already use TCP/IP, the interconnection using the various networks becomes a fairly simple task. However, some care must be taken to address the counter effects of these benefits and in particular, more flexibility in interconnection and in applications comes at the price of less control on where traffic can go. For example, a general purpose link to a GTS cloud network might get flooded with less critical traffic requested by a site that doesn't normally request data through a given link. It may also mean that traffic has trouble reaching its destination because there are several ill-defined routes (through both the GTS and the Internet) to get there.

This care can be achieved through traffic control and segregation, which would address three basic issues:

(a) traffic management (ensuring timely delivery of critical data, controlling limited bandwidth availability in some areas)
(b) security (protecting centres from unwanted threatening events)
(c) routing coherence (ensuring that the overall resulting network can deliver traffic without difficulty to any given location)

~~To achieve traffic control and segregation, there are several important aspects to consider:~~

~~(a) IP addressing: using universally recognizable and coherent network addresses so that all systems only have one unique reference number, which is valid not only within the GTS but across the Internet and any other network which may eventually be interconnected to the GTS;~~
~~(b) IP network routing rules: using a common set of routing protocols and rules to ensure that any traffic can be consistently sent to its destination without delay or confusion;~~
~~(c) Zoning of each Centre's network elements: creating different network zones with different security levels, to isolate a Centre's critical elements from publicly available areas and ensuring that data can still flow between zones of differing security levels.~~

In order to properly manage the interconnections of Centres and networks, the following elements are essential responsibilities of all Centres:

(a) Ensure that proper TCP/IP addressing is used and properly configured to maintain network integrity and to uniquely identify all components;
(b) Ensure that proper TCP/IP routing is used and properly configured to direct traffic on the correct network and to prevent traffic from going where it shouldn't.
(c) Ensure that networks are separated from each other. Networks can also be divided in various security zones. Different networks and zones must not allow unfiltered routing and traffic to traverse their boundaries. Security gateways (such as firewall devices or routers using access lists) must be used to control the borders if networks must be interconnected.
(d) Ensure that only proper traffic is allowed on any given network to control the volume of data and prevent link flooding.

The following sections discuss these elements in detail.

~~Overall topology of interconnection~~
~~A general view of the possible interconnectivity between Centres using the GTS and the Internet is given in Appendix 1, as well a typical data flows.~~

~~Actual device configuration details to implement these functions in the Cisco family of routers are given in Appendix 2.~~

TCP/IP addressing

Centres must use officially registered IP addresses issued by the Internet Assigned Numbers Authority (IANA) or the relevant Regional Internet Registry. Official IP addresses are required for all systems which communicate through any inter-organizational network, including the GTS (in particular the Main Telecommunication Network (MTN) and the Internet.

Since it is recognized that official IP addresses sometimes difficult to obtain in certain areas of the world, some compromise options have been developed to mitigate this problem.

Appendix 7 describes IP addresses in further detail and the recommended options for the use of IP addresses over the GTS.

If Centres use private IP addresses or non-official addresses on their internal networks, then Network Address Translation (NAT) must be adopted for any hosts requiring to communicate over the GTS or the Internet.

A sufficient number of official addresses must be obtained to correspond to the number of hosts required to communicate externally, and the type of NAT supported by the Centre's access router. If static NAT is adopted, then a one to one correspondence of internal and official addresses is required. If dynamic NAT is used, then there can be more internal addresses than official addresses, with the router allocating the pool of official addresses dynamically as necessary.

Private addresses must not be visible on the GTS or Internet. Figure 2.3.1 shows simplified examples of allowable and non allowable arrangements.

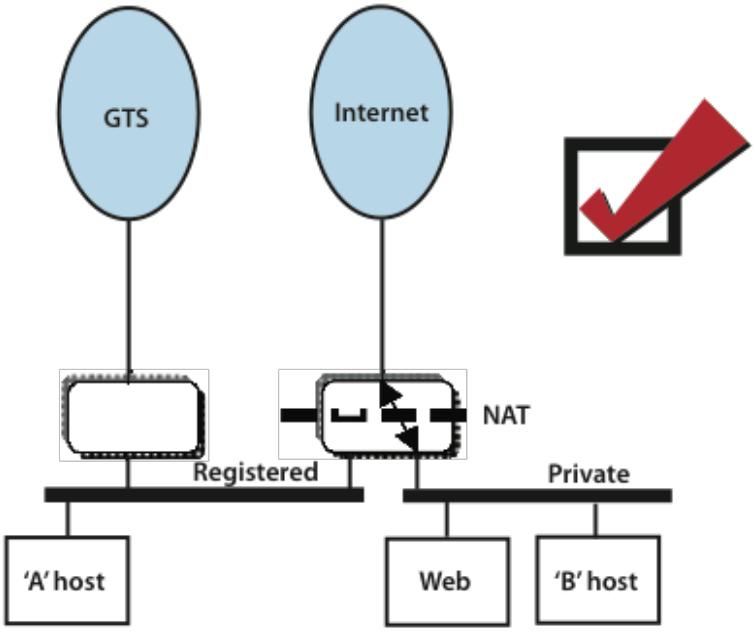

Figure 2.3.1 (a) (Allowed)

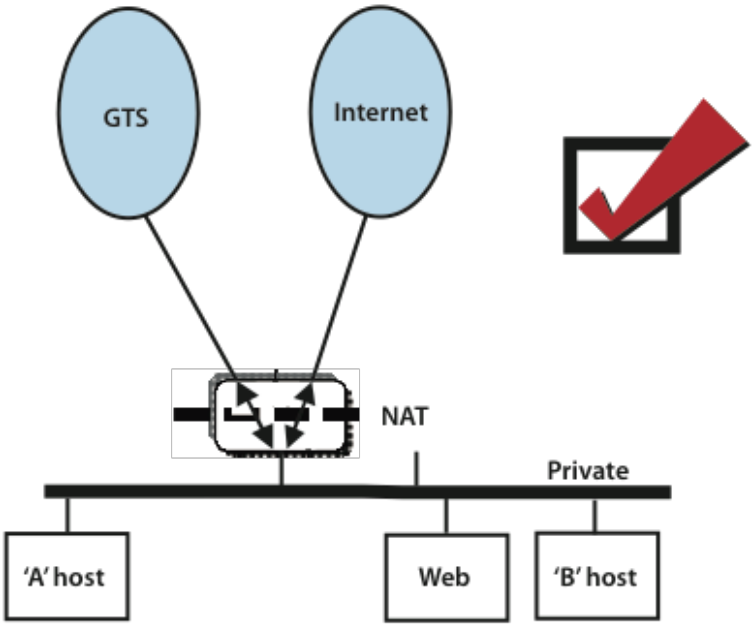

Figure 2.3.1 (b) (Allowed)

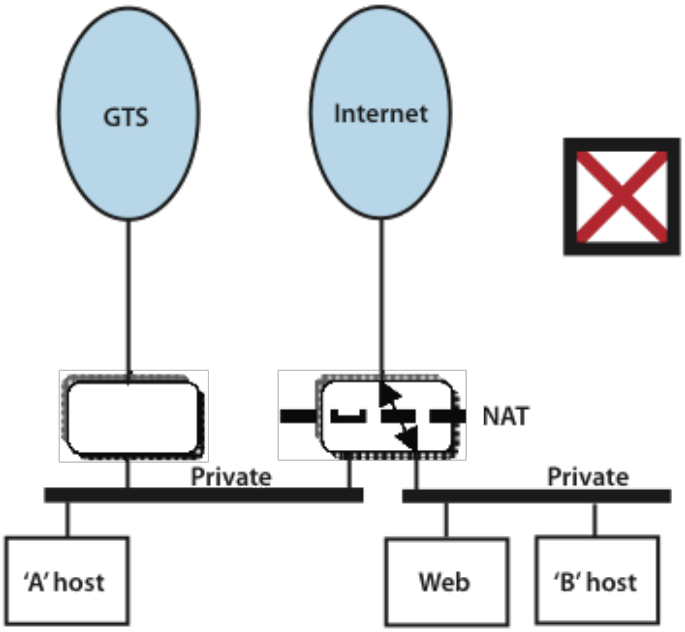

Figure 2.3.1 (c) (Not Allowed)

Summary of tasks to ensure proper use of IP on the GTS

Use only official IP addresses for external communication on the GTS.

(b) Establish an IP connection with one or more Centres. This connection will be pure IP using PPP as a level 2 protocol on the link, or a proprietary protocol such as Cisco HDLC by bilateral agreement. Configure dynamic routing with BGP (unless you are a Centre with only one GTS connection and have agreed with your neighbouring Centre to use static routing).

(c) Check the barrier (security gateway) between Internet and the GTS (prevent routing from the Internet to the GTS.)

(d) Filter incoming and outgoing traffic in accordance with the requirements described above.

~~Traffic management~~

~~Traffic management is an area which is unfortunately not limited to networks, but also involves data management and application configurations. Several groups are therefore involved in this matter.~~

~~In general, it can be said that some applications such as file transfer, World Wide Web have potential to place heavy loads on the limited bandwidth circuits that comprise the GTS. Limits need to be applied to ensure that the GTS carries only important traffic such as the real time data and products currently exchanged on the GTS plus data to be carried to fulfil new requirements such as Distributed Data Bases (DDBs), and routinely exchanged large data files such as satellite imagery.~~

~~Less important traffic such as ad hoc file exchange, e-mail, general World Wide Web and suchlike should be carried on the Internet. To protect the GTS, the full capabilities of TCP/IP connectivity and information exchange must be restricted. In practical terms, TCP/IP traffic carried on the GTS could be restricted on the basis of:~~

~~(a) Protocol type (e.g. FTP, HTTP, SMTP etc);~~

~~(b) Originating and destination IP address;~~

~~(c) A combination of the above.~~

~~If the measures adopted are to be successful, it is necessary that they be:~~

~~(a) Not confined to a single router brand since it cannot be assumed that all centres will have the same brand of router; and~~

~~(b) Be reasonably straightforward to configure, so that there is minimum risk that configuration errors or omissions will endanger the GTS.~~

~~Security issues and segregation of Internet and GTS traffic~~

~~Any Centre which has a TCP/IP based GTS connection and a connection to the Internet, is a potential weak point where the GTS could be exposed to deliberate or inadvertent interference through unwanted traffic or unauthorised connection to GTS hosts.~~

~~Centres are strongly encouraged to implement protective barriers such as firewall systems on the connection of their Centre with the Internet. It is important that every practical step is taken to prevent accidental or deliberate use of GTS links or unauthorised access to GTS Centres, by Internet users.~~

~~When setting up IP on the GTS, it is vital to ensure that the GTS does NOT become part of the Internet or an unintended transmission path for Internet traffic. Each Centre must consider the GTS and the Internet as two separate networks and ensure that inappropriate flow of traffic from one to the other cannot occur. This will ensure that the GTS is used only for transferring bona fide meteorological data between authorised hosts.~~

~~Some basic principles for implementing basic security measures for the GTS are shown in figure A1.2 in Appendix 1. It illustrates in a general way, how a Centre with TCP/IP connection to the GTS and an Internet connection might be set up. Functions to be implemented include:~~

~~(a) Allowing only GTS designated hosts to communicate through the GTS router;~~

~~(b) Blocking access to GTS designated hosts through the firewall and Internet router;~~

~~(c) Firewall allows only approved hosts on the Internet to access B hosts and then, only for approved applications such as FTP;~~

~~(d) Prevention of access to A hosts from Internet via B hosts.~~

~~The actual choice of routers and firewall and the setting up of these will require expertise in the design and configuration of networking and security systems. It is not intended here, to provide detailed coverage of security system implementation and management as it is a large and complex topic. It is simply emphasised that it is important that every Centre should implement the best practical security measures, appropriate to its system complexity and capabilities. Some additional material relevant to small Centres is given in Appendix 4.~~

~~In addition to network security measures, it is vital that good security practices are followed in the management of all hosts in a Centre. Computer security is a complex subject in itself and Centres are encouraged to study this in depth and apply appropriate practices. Some references in computer security are given in Appendix 5. As a bare minimum, good password practices should be followed in the management of all host machines in a Centre. Some recommended practices are given in Appendix 6.~~

Routing and traffic management

Routing algorithms

In order to be able to send a packet, every host, router or equipment connected on an IP network must have a routing table. The table tells the system where to send the packet. This may be achieved by:
(a) Static routing; or
(b) Dynamic routing.

Static routing

With static routing, every required destination and next hop must be entered in the routing tables by the system administrator. Alternatively, a default route can be declared, although this option is mainly applicable to sites with only one connection to the outside world. If a default route is set up, filters must be established to ensure that only authorised hosts can access the GTS.

Whenever a new Centre is connected to the GTS with IP protocol, the site managers of all other IP capable Centres must add the new address to their routing tables. This might become a major task as IP connectivity spreads over the GTS.

Dynamic routing

With dynamic routing, the routing information is automatically exchanged between routers. This enables the network to learn new addresses and to use alternative paths under fault conditions in a partially meshed network topology. The initial set-up of dynamic routing may be somewhat more complex, but the ongoing management task is greatly reduced.

Use of dynamic routing requires selection of an appropriate routing protocol to operate over the links of the GTS. The protocol must be an exterior gateway protocol (e.g. EGP, BGP) as opposed to an interior gateway protocol (such as IGRP, RIP, OSPF) because interior gateway protocols are intended for use within a single management domain. The GTS is an aggregation of many separate management domains. As such, it is necessary to select a gateway protocol that can be autonomously managed by each Centre to implement routing and hence traffic flow, consistent with its particular requirements.

Two exterior gateway protocols are defined by RFCs – EGP and BGP (now release 4 – RFC 1771). As the GTS is not a tree structure, setting up routing with EGP may be difficult.

BGP can distribute subnetted routes. This feature might be very useful for the GTS. Instead of propagating host-based routes or full network routes, routing can be based on subnetted networks. Instead of declaring hosts eligible to use the GTS, a Centre could declare a full subnet of eligible hosts. In that case, the routing information consists of just an IP address and a subnet mask. For

example, if a Centre has a class C addresses 193.168.1.0, by declaring that the subnet 193.168.1.16 with mask 255.255.255.248 is allowed to use the GTS, all hosts with IP address 193.168.1.17 to 193.168.1.22 will be routable on the GTS.

~~Registered and private addresses~~
~~It is recommended that Centres strive to use officially registered IP addresses issued by the Internet Assigned Numbers Authority (IANA) or the relevant Regional Internet Registry. Official IP addresses are required for all systems which communicate through the Internet. Their use is also strongly recommended for systems which communicate on any inter-organization network, including of course the GTS.~~

~~Since it is recognized that official IP addresses sometimes difficult to obtain in certain areas of the world, some compromise options have been developed to mitigate this problem. Appendix 7 describes IP addresses in further detail and the recommended options for the use of IP addresses over the GTS.~~
~~If Centres use private IP addresses on their internal networks, then Network Address Translation (NAT) must be adopted for any hosts requiring to communicate over the GTS or the Internet.~~

~~A sufficient number of official addresses must be obtained to correspond to the number of hosts required to communicate externally, and the type of NAT supported by the Centre's access router. If static NAT is adopted, then a one to one correspondence of internal and official addresses is required. If dynamic NAT is used, then there can be more internal addresses than official addresses, with the router allocating the pool of official addresses dynamically as necessary. The documentation for the Centre's access router should be consulted to ascertain the NAT support provided.~~
~~Private addresses must not be visible on the GTS or Internet. Figure 2.1 shows simplified examples of allowable and non allowable arrangements.~~

~~Figure 2.1 (a) (Allowed)~~
~~Figure 2.1 (b) (Allowed)~~
~~Figure 2.1 (c) (Not allowed)~~

~~Implementation of GTS links via Internet~~
~~CBS has expressed the view that the use of Internet for GTS links can be considered in circumstances where they are cost effective, offer an acceptable level of service and where adequate security measures are implemented. In general, the same principles for routing and security described above, apply where Internet links are used instead of dedicated links. Further details applying to the use of Internet based links, especially related to small GTS Centres, are given in Appendix 4.~~

~~Summary of tasks to ensure proper use of IP on the GTS~~
~~Use only official IP addresses for external communication on the GTS.~~
~~Establish an IP connection with one or more Centres. This connection will be pure IP using PPP as a level 2 protocol on the link, (or a proprietary protocol such as Cisco HDLC by bilateral agreement) or IP over X.25 (RFC 1356). In this case use X.121 addresses as defined in Chapter 3. Configure dynamic routing with BGP (unless you are a Centre with only one GTS connection and have agreed with your neighbouring Centre to use static routing).~~

~~Check the barrier between Internet and the GTS (prevent routing from the Internet to the GTS).~~
~~Filter incoming and outgoing traffic in accordance with the requirements described above.~~

Recommended routing method

Based on consideration of the above factors the BGP4 routing protocol should be used between Centres on the GTS, unless an alternative is bilaterally agreed on individual links. Examples of BGP4 set-up for the Cisco router family are given in Appendix 2.

Network Segregation and Zoning

Any Centre which has a TCP/IP based GTS connection and a connection to another TCP/IP network is a potential weak point where the GTS could be exposed to deliberate or inadvertent interference through unwanted traffic or unauthorised connection to GTS hosts.

Centres are strongly encouraged to implement protective barriers such as security gateways on the connection of their Centre with the Internet. It is important that every practical step is taken to prevent accidental or deliberate use of GTS links or unauthorised access to GTS Centres, by Internet users.

When setting up IP on the GTS, it is vital to ensure that the GTS does NOT become part of the Internet or an unintended transmission path for Internet traffic. Each Centre must consider the GTS and other TCP/IP networks (such as the Internet) as separate networks and ensure that inappropriate flow of traffic from one to the other cannot occur. This will ensure that the GTS is used only for transferring bona fide meteorological data between authorised hosts.

To achieve traffic control and segregation, there are several important aspects to consider:

(a) IP addressing: using universally recognizable and coherent network addresses so that all systems only have one unique reference number, which is valid not only within the GTS but across the Internet and any other network which may eventually be interconnected to the GTS

(b) IP network routing rules: using a common set of routing protocols and rules to ensure that any traffic can be consistently sent to its destination without delay or confusion

(c) Zoning of each Centre's network elements: creating different network zones with different security levels, to isolate a Centre's critical elements from publicly available areas and ensuring that data can still flow between zones of differing security levels

Figure 2.2.1 illustrates in a general way, how a Centre with TCP/IP connection to the GTS and an Internet connection might be set up. This setup also infers that certain security function must be implemented. Functions to be implemented include:

- allowing only GTS designated hosts to communicate through the GTS router;
- blocking access to GTS designated hosts through the security gateway and Internet router;
- security gateway allows only approved hosts on the Internet to access B hosts and then, only for approved applications such as FTP;
- prevention of access to A hosts from Internet via B hosts.

In addition to network security measures, it is vital that good security practices are followed in the management of all hosts in a Centre. Computer security is a complex subject in itself and Centres are encouraged to study this in depth and apply appropriate practices. The Information Technology (IT) Security Guide available at

http://www.wmo.int/pages/prog/www/documents.html

provides information on basic essential security practices.

Traffic management

Traffic management is an area which is unfortunately not limited to networks, but also involves data management and application configurations. Several groups are therefore involved in this matter.

In general, it can be said that some applications such as file transfer, World Wide Web have potential to place heavy loads on the limited bandwidth circuits that comprise the GTS. Limits need to be applied to ensure that the GTS carries only important time critical and operations critical traffic such as the real time data and products currently exchanged on the GTS.

Less important traffic such as ad hoc file exchange, e-mail, general World Wide Web and such should be carried on the Internet. To protect the GTS, the full capabilities of TCP/IP connectivity and information exchange must be restricted. In practical terms, TCP/IP traffic carried on the GTS could be restricted on the basis of

(a) protocol type (e.g. FTP, HTTP, SMTP etc);
(b) originating and destination IP address;
(c) a combination of the above.

If the measures adopted are to be successful, it is necessary that they be:

1. not confined to a single router brand since it cannot be assumed that all centres will have the same brand of router; and
(d) be reasonably straightforward to configure, so that there is minimum risk that configuration errors or omissions will endanger the GTS.

IMPLEMENTATION GUIDELINES

IP Addressing

~~Addressing for Direct IP~~
~~The preferred connection for the future is to use direct IP links. Centres already using IP over X.25 should consider updating the links to use direct IP. This transition should be considered in the near future.~~ Figure 3.2 illustrates how a pair of Centres has agreed to implement a direct IP connection using the first available pair of 'host' numbers using the 193.105.178.0 network as an example.

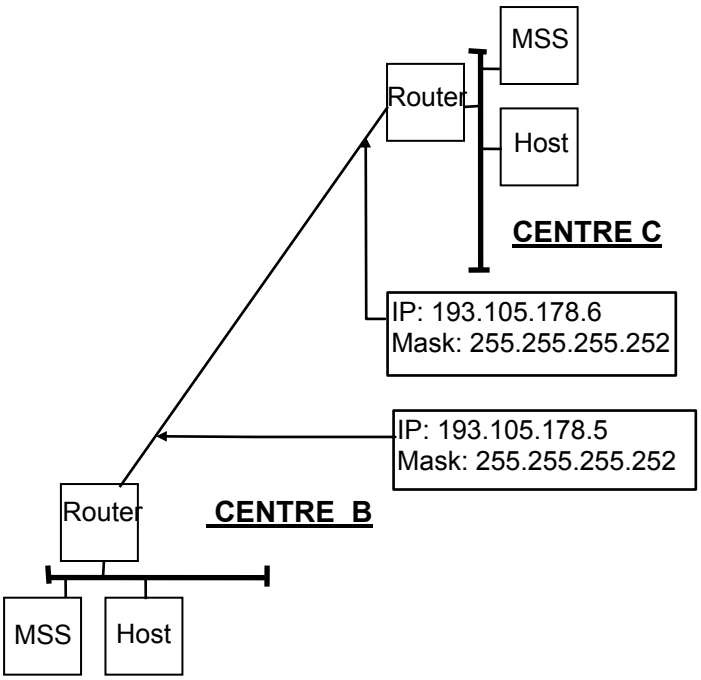

Figure 3.2. Direct IP link between centres B and C

Allocation of class C addresses for direct IP links

Routers have to be connected by links having unique subnet numbers. To achieve this, a Class C address is used (for example 193.105.178.0) with a mask of 255.255.255.252. This provides 62 subnets each with 2 hosts. These two host numbers are allocated to the ends of the link connecting the routers between the two Centres. The lowest useable network number is 193.105.178.4, with host addresses of 193.105.178.5 and 6. The next network number is 193.105.178.8, with host addresses of 193.105.178.9 and 10, followed by:
193.105.178.12, with host addresses of 193.105.178.13 and 14, followed by
193.105.178.16, with host addresses of 193.105.178.17 and 18, followed by
193.105.178.20, with host addresses of 193.105.178.21 and 22, and so on, up to
193.105.178.248, with host addresses of 193.105.178.249 and 250.

~~Addressing for X.25 over IP~~
~~Where two Centres have a common brand of Router (e.g. Cisco), and the traffic is mostly IP with some X.25, it may be appropriate to carry the X.25 over the directly connected routers as shown for the link between Centre B and Centre C in Figure 3.3. The X.25 packets are carried within IP packets over the serial link between the routers, which may be a proprietary HDLC protocol, or a standard protocol such as PPP. This functionality requires that routers in each Centre contain X.25 packet switching software and that the X.25 route details are included in the router configuration. Examples of typical configurations are given in Appendix 2.~~

~~Figure 3.3 — Combination of IP over X.25 and X.25 over IP~~

TCP/IP Routing

Autonomous System Numbers

The use of BGP4 as the recommended dynamic routing protocol for the GTS (Chapter 2) requires allocation of Autonomous System (AS) numbers to each GTS Centre.

The use of BGP requires introduction of the concept of the Autonomous System (AS)[1]. Each GTS Centre manages an AS number to enable the Centre to adopt BGP with neighbouring centres. In addition to addressing, this chapter shows allocation scheme of AS numbers.

The Internet Assigned Numbers Authority (IANA), through RFC1930, has reserved the block of AS numbers 64512 through 65535 for private use (not to be advertised on the global Internet). This provides 8 groups of 128 AS numbers to be assigned to GTS Centres, satisfying the current and foreseeable future needs of the GTS. The AS numbers will be assigned as follows:

MTN centres and reserve	64512 to 64639
Centres within RA I	64640 to 64767
Centres within RA II	64768 to 64895
Centres within RA III	64896 to 65023
Centres within RA IV	65024 to 65151
Centres within RA V	65152 to 65279
Centres within RA VI	65280 to 65407
Antarctic	65408 to 65471
*Private use by GTS Centres	65472 to 65535

* These AS numbers are for national use and are not to be advertised on the GTS.

Implementation details

In order to implement IP services, Centres need to know certain details regarding IP addressing at other Centres on the GTS. The following diagram and associated tables explain in detail, the information required at various Centres:

~~Figure 3.4 — IP over X.25 network~~
~~Table 3.4A. IP and X.121 addresses to be known at Centre A~~
~~Table 3.4B. IP and X.121 addresses to be known at Centre B~~
~~Table 3.4C. IP and X.121 addresses to be known at Centre C~~
~~Table 3.4D. IP and X.121 addresses to be known at Centre D~~

[1] An Autonomous System is defined in RFC1630 as “a set of routers under a single technical administration, using an interior gateway protocol and common metrics to route packets within the AS, and using an exterior gateway protocol to route packets to other ASs.”

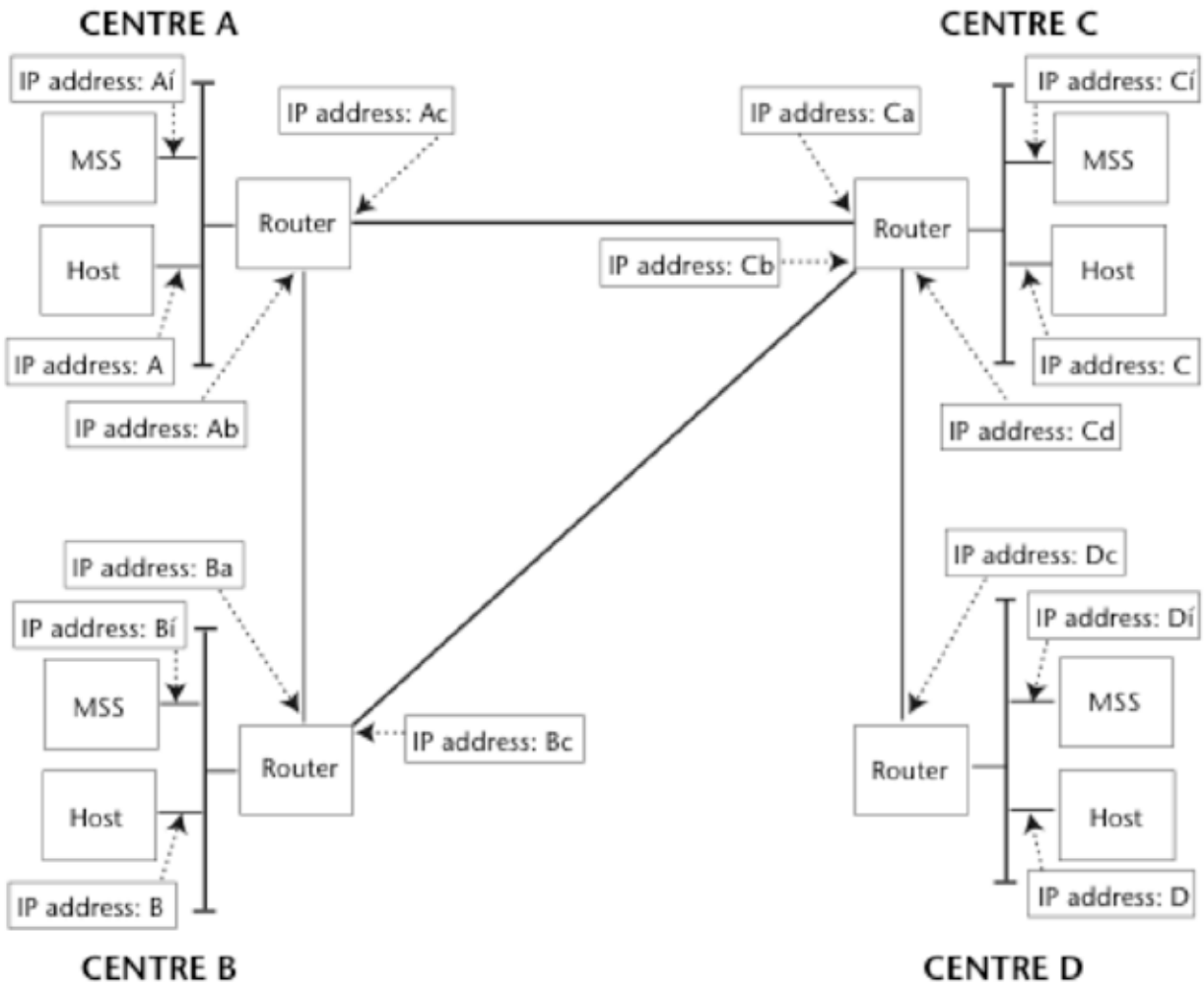

Figure 3.5. Direct IP Network

Table 3.5a. IP address to be known at CENTRE A

Destination	IP addresses to be known		Suitable route
	for communication between ends	for communication between Routers	
CENTRE B (Host to host)	IP address : B	IP address : Ba	CENTRE A – CENTRE B
CENTRE C (Host to host)	IP address : C	IP address : Ca	CENTRE A – CENTRE C
CENTRE D (Host to host)	IP address : D	IP address : Ca	CENTRE A – CENTRE C – CENTRE D (Host [A] – Router [A] – Router [C] – Router [D] – Host [D]) [x] : CENTRE x
CENTRE B (MSS to MSS)	IP address : B’	IP address : Ba	CENTRE A – CENTRE B
CENTRE C (MSS to MSS)	IP address : C’	IP address : Ca	CENTRE A – CENTRE C
CENTRE D (MSS to MSS)	IP address : D’	IP address : Ca	CENTRE A – CENTRE C – CENTRE D

Table 3.5b. IP address to be known at CENTRE B

Destination	IP addresses to be known		Suitable route
	for communication between ends	for communication between Routers	
CENTRE A (Host to host)	IP address : A	IP address : Ab	CENTRE B – CENTRE A
CENTRE C (Host to host)	IP address : C	IP address : Cb	CENTRE B – CENTRE C
CENTRE D (Host to host)	IP address : D	IP address : Cb	CENTRE B – CENTRE C – CENTRE D
CENTRE A (MSS to MSS)	IP address : A’	IP address : Ab	CENTRE B – CENTRE A
CENTRE C (MSS to MSS)	IP address : C’	IP address : Cb	CENTRE B – CENTRE C
CENTRE D (MSS to MSS)	IP address : D’	IP address : Cb	CENTRE B – CENTRE C – CENTRE D

Table 3.5c. IP address to be known at CENTRE C

Destination	IP addresses to be known		Suitable route
	for communication between ends	for communication between Routers	
CENTRE A (Host to host)	IP address : A	IP address : Ac	CENTRE C – CENTRE A
CENTRE B (Host to host)	IP address : B	IP address : Bc	CENTRE C – CENTRE B
CENTRE D (Host to host)	IP address : D	IP address : Dc	CENTRE C – CENTRE D
CENTRE A (MSS to MSS)	IP address : A’	IP address : Ac	CENTRE C – CENTRE A
CENTRE B (MSS to MSS)	IP address : B’	IP address : Bc	CENTRE C – CENTRE B
CENTRE D (MSS to MSS)	IP address : D’	IP address : Dc	CENTRE C – CENTRE D

Table 3.5d. IP address to be known at CENTRE D

Destination	IP addresses to be known		Suitable route
	for communication between ends	for communication between Routers	
CENTRE A (Host to host)	IP address : A	IP address : Cd	CENTRE D – CENTRE C – CENTRE A
CENTRE B (Host to host)	IP address : B	IP address : Cd	CENTRE D – CENTRE C – CENTRE B
CENTRE C (Host to host)	IP address : C	IP address : Cd	CENTRE D – CENTRE C
CENTRE A (MSS to MSS)	IP address : A’	IP address : Cd	CENTRE D – CENTRE C – CENTRE A
CENTRE B (MSS to MSS)	IP address : B’	IP address : Cd	CENTRE D – CENTRE C – CENTRE B
CENTRE C (MSS to MSS)	IP address : C’	IP address : Cd	CENTRE D – CENTRE C

~~Figure 3.6 — Coexistence of direct IP with IP over X.25~~
~~Table 3.6A. IP and X.121 addresses to be known at Centre A~~
~~Table 3.6B. IP and X.121 addresses to be known at Centre B~~
~~Table 3.6C. IP and X.121 addresses to be known at Centre C~~
~~Table 3.6D. IP and X.121 addresses to be known at Centre D~~
~~Figure 3.7 — Coexistence of direct IP, IP over X.25 and X.25 over IP~~
~~Table 3.7A. IP and X.121 addresses to be known at Centre A~~
~~Table 3.7B. IP and X.121 addresses to be known at Centre B~~
~~Table 3.7C. IP and X.121 addresses to be known at Centre C~~
~~Table 3.7D. IP and X.121 addresses to be known at Centre D~~

Management and allocation of addresses and AS numbers

~~X.25 addresses~~
~~The framework described above allows Centres full autonomy in allocating X.25 numbers. The WMO Secretariat will maintain a current list of X.25 addresses which Centres have allocated for use on the GTS. Centres are requested to notify the Chief of the Information and Telecommunication System Division of the Observing and Information Systems Department, WMO Secretariat by e-mail or fax of X.25 addresses allocated.~~

IP addresses

IP addresses should be acquired or agreed on as per the instructions in Appendix 7.

GTS nominated host/network addresses

Host and subnet IP addresses for use with GTS nominated Centres should be notified to WMO as described above.

AS numbers

AS numbers for use on the GTS will be co-ordinated and issued by the WMO Secretariat as required. Centres should direct their requests for AS numbers to WMO as described above.

Publication of addresses and AS numbers

The WMO will publish updated lists of addresses and AS numbers in the monthly WWW Newsletter and will also make these lists available in ASCII text form for access by FTP on the WMO web server and in World Wide Web format at http://www.wmo.int/pages/prog/www/ois/Operational_Information/RtngCat_en.html

GTS DATA EXCHANGE METHODS ~~ADAPTING MESSAGE SWITCHING SYSTEMS TO TCP/IP~~

Introduction

~~Although there are new requirements emerging, for the time being GTS usage is dominated by the traditional Message Switching application, which has been developed to use X.25 packet switching. We now need to consider how best to migrate the message switching task to use TCP/IP to satisfy the new requirements by providing "Internet like" facilities on the GTS, and to stay aligned with IT industry trends.~~

~~Additionally, migration of Message Switching Systems (MSS) to use TCP/IP means that X.25 infrastructure can be removed, greatly simplifying the technology of the GTS by moving to a pure IP network rather than a mixture of IP and X.25.~~

~~There are two possible technical approaches to this problem, one using TCP Sockets and the other FTP. In the long term the FTP approach is thought to be the most strategically attractive but may~~

~~require more work to implement in operational Message Switching Systems. It may suit some Centres to adopt an approach based on TCP Sockets as the first step towards a TCP/IP based GTS.~~

~~The transition of the MSSs to TCP/IP does not imply any change in the basic store and forward architecture of the GTS. It is envisaged that the store and forward architecture, with automatic on forwarding based on routing tables, will remain. However, the adoption of FTP means there is an additional option for data exchange to be achieved through bilateral arrangements, by the use of FTP retrieve initiated by the receiving centre.~~

There are three data exchange methods defined for use on the GTS. The first two are for the exchange of traditional GTS messages. The third is for the exchange of other data.

For traditional GTS messages (those with TTAAII CCCC) the two standards are based on:
(1) TCP/IP sockets
(2) FTP

Centres are able to choose between these standards by bilateral agreement.

Other data may also be exchanged on the GTS using a separate standard based on FTP.

TCP Sockets based data exchange

~~TCP Socket is an approach which is highly suitable for a programmatic implementation to provide regular exchange of messages. As such it should simply be regarded as an alternative protocol to X.25. A centre will be required to produce MSS application programs capable of transmitting and receiving via a TCP socket. Centres with current applications capable of driving an X.25 virtual circuit should be able to very quickly and simply produce a sockets version by changing a few system calls (see Appendix 3 for sample programs). The programming work involved is minimal and more importantly all other areas of the MSS such as queuing, routing, data management, operator interfaces etc. remain unchanged because the communication exchange is still based on the traditional message.~~

~~The protocol defined here, is based on the assumption that the physical circuit over which the data is to be transmitted has low error rate and is subject to interruptions rarely. On such circuits, the TCP protocol can be expected to deliver error free data. However, some GTS circuits may not be of sufficient quality for the standard TCP socket to function reliably. The development of special protocols for use on low quality circuits may be studied further.~~

~~Loss of data may occur if the TCP session is lost. This may be due to MSS hardware, application or communications failure. A special case of this is when a Centre with more than one MSS switches from the primary to the backup systems. Recommendations to avoid this problem are given below.~~

~~One useful feature of the X.25 based communication that is not available using TCP sockets, is the ability to detect start and end of message by reference to the M bit in the X.25 packet header. No such bit or any equivalent feature exists in TCP. Therefore, to enable receiving centres to detect end of message, each message is preceded with an 8 character string giving the message length, plus two characters indicating message type (binary, alphanumeric or fax). Thereafter the message is structured within an SOH/ETX envelope as for exchange via X.25.~~

The TCP socket standard involves establishing a connection from the sender to the receiver and for GTS messages to be sent preceded by two control fields. The first field contains the message length and the second is a 2 character field indicating message type (binary, alphanumeric or fax). The third field is the actual GTS message contained within a standard GTS SOH/ETX envelope. The receiving centre uses the message length to determine where each incoming message begins and ends.

The GTS TCP socket protocol does not guarantee end to end delivery and data may be lost if the link or one of the Message Switching Systems fails.

The complete data structure is illustrated in figure 4.1. Note that the message length does not include the length of the first two fields (message length and type). The message length must always be eight characters long and include leading zeroes as required. The message type field should be encoded using ASCII characters BI for binary, AN for alphanumeric, and FX for facsimile. ~~All new connections established must begin with a message length and type structure.~~

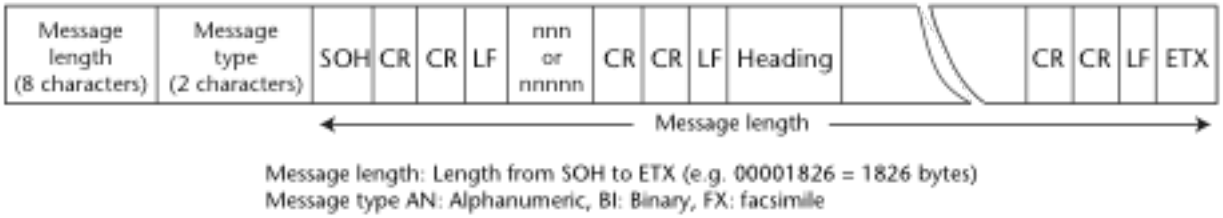

Figure 4.1 Message structure for Socket exchange applications

The rules for use of TCP/IP socket exchange can be summarised as:

1. All new connections must start from a new message.
2. Each message is preceded by a message length field of eight ASCII characters and a message type field of two ASCII characters.
3. Message length is counted from SOH to ETX inclusive and must contain leading zeroes as necessary.
4. Message type must be encoded as BI for binary, AN for alphanumeric or FX for facsimile.
5. Receiving centres will check synchronization as follows:
   - Check that the first 8 characters are ASCII numeric
   - Check that the 9th and 10th characters are BI, AN or FX
   - Check that the 11th character is SOH
   - Check that the last character is ETX.
6. If synchronization is lost the receiver shall break the connection using the following sequence of TCP user primitives:
   - ~~S~~*shutdown* (to make sure that all data in the TCP send buffer has been transferred)
   - ~~C~~*close*.
7. It is recommended to use separate sockets for ASCII and binary messages, and separate connections for sending and receiving. The sender should always be responsible for establishing the connection.
8. Once a connection is established, it should be maintained.
9. If there should be a need to close a socket, the procedure should be as follows:
   - ~~S~~*shutdown* (to make sure that all data in the TCP send buffer has been transferred)
   - ~~C~~*close*.
10. This procedure should also be used when a MSS is being shutdown.
11. If the receiving side receives a new unexpected connection request on a port for which it has an established socket, the old socket should be closed and the new socket accepted.
12. TCP/IP Service/Port numbers for these connections will be decided by bilateral agreement. The use of reserved ports (1 to 1023) should be avoided. The use of ports above 10000 is recommended.
13. To reduce the amount of data lost if an established connection fails, the TCP send and receive buffer sizes can be adjusted. The recommended value for the buffer size is 4KByte, however this value may be agreed on a bilateral basis.
14. To enable detection of message loss, the use of the channel sequence number, (CSN) is mandatory. When using the CSN to check for missing messages, the WMO request/repeat procedures should be used to recover these. It may be useful to automate this mechanism

to avoid delays caused by manual interaction. In order to minimize data loss it is strongly recommended that Centres implement a 5 character long CSN in the future.

15. The channel sequence number 000 (or 00000 respectively) should indicate an initialization, and should not cause retransmission requests.

FTP Procedures and File Naming Convention

Introduction

FTP (File Transfer Protocol) is a convenient and reliable method for exchanging files, especially large files. The protocol is defined in RFC 959.

The main issues to be considered are:

1. Procedures for accumulating messages into files so as to minimize FTP overheads with short messages (applies only to existing message types);
2. File naming conventions for existing message types (existing AHL);
3. File naming conventions for new messages types (no existing AHL);
4. File renaming;
5 Use of directories;
6. Account names and passwords;
7. FTP sessions;
8. Local FTP requirements;
9. File compression.

Accumulating messages into files

One of the problems with using FTP to send traditional GTS messages is the overhead if each message is sent in a separate file. To overcome this problem, multiple messages in the standard GTS message envelope should be placed in the same file according to the rules set out below. This method of accumulating multiple messages applies only to messages for which AHLs have been assigned.

Centres have the option of including or deleting the Starting Line and End of Message strings and indicating which option they are using via the format identifier (refer points 2 and 4 below).

1. Each message should be preceded by an 8 octet message length field (8 ASCII characters). The length includes the Starting Line (if present), AHL, text and End of Message (if present).

2. Each message should start with the currently defined Starting Line and AHL as shown in figure 4.2.

3. Messages should be accumulated in files thus:
   (a) Length indicator, message 1 (8 characters);
   (b) Format identifier (2 characters);
   (c) Message 1;
   (d) Length indicator, message 2 (8 characters);
   (e) Format identifier (2 characters);
   (f) Message 2;
   (g) And so on, until the last message;
   (h) If necessary, and subject to bilateral agreement, a 'dummy' message of zero length may be inserted after the last real message, to assist with end of file detection in certain MSS systems. This requirement does not exist in most cases and need only be implemented where necessary, and agreed between centres.

4. Format identifier (2 ASCII characters) has the following values:-
   (a) 00 if Starting Line and End of Message strings present;

(b) 01 if Starting Line and End of Message strings absent (not preferred, to be discontinued).

5. The sending centre should combine messages in the file for no more than 60 seconds to minimize transmission delays; this limit should be set to a value depending upon the characteristics of the link. However the file should be sent immediately when a GTS Priority 1 message (as defined in section 2.11.1 of the Manual on GTS) is added to the file.

6. The sending centre should limit the number of messages in a file to a maximum of 100; this limit should be set to a value depending upon the characteristics of the link.

7. The format applies regardless of the number of messages, i.e. it applies even if there is only one message in the file.

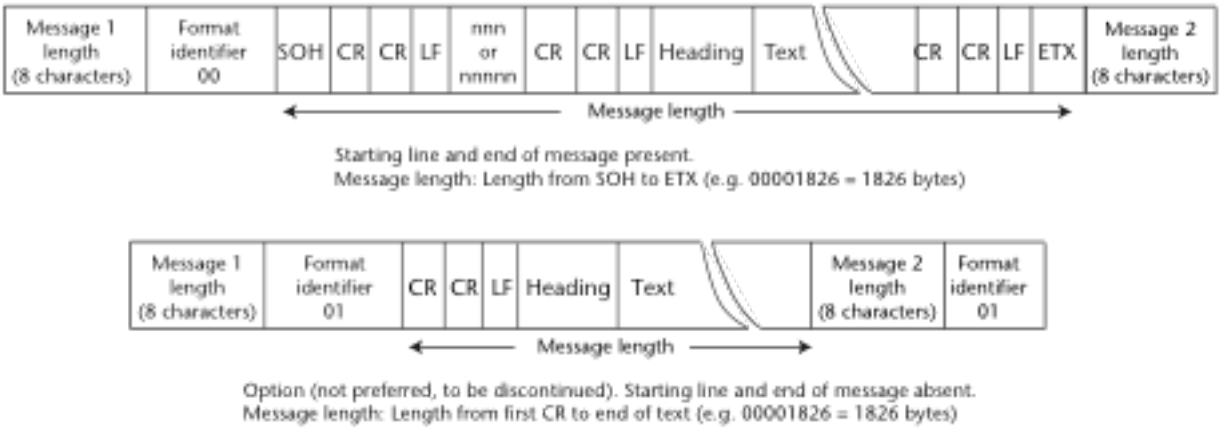

Figure 4.2 Structure of a typical message in a file

File naming conventions for existing message types (existing AHL)

The file naming convention is:

CCCCNNNNNNNN.ext

where:

CCCC is the international four letter location identifier of the sending Centre, as defined in WMO publication No. 9, Volume C;

NNNNNNNN is a sequential number from 1 to 99999999 generated by the sending Centre for each data type determined by **ext**; 0 is used for (re-) initialization; Through bilateral agreement, Centres may use NNNN instead of NNNNNNNN in case of limitation on filename length.

ext is

‘ua’ for urgent alpha numeric information
‘ub’ for urgent binary information
‘a’ for normal alpha numeric information
‘b’ for normal binary information
‘f’ for facsimile information

Note: Where, through bilateral agreement, Centres allow alphanumeric and binary data in the one file, the b or ub extent shall be used.

General file naming conventions

The following file naming convention should be implemented with a transition period not exceeding 2008. The implementation date is subject to review by CBS.

The procedure is based on transmission of file pairs, one file being the information file and the other being the associated metadata file. The concept of file pairs allows the communications function to be implemented independently of data management requirements for structure of metadata, yet provides for the carriage of whatever metadata is required. It is not compulsory to always have a .met file, such as when the information file itself is self-specifying or when a single .met file can describe several information files (for example as in the case of same data type for different times). There is always however a clear relation between the Information File Name and the Metadata File Name, which should only differ from their Extension field and possible wildcards. File names for new message types (no existing AHL) shall follow the following format. It should be noted that file names for existing message types (existing AHL) can also follow the following format.

The File Name format is a predetermined combination of fields, delimited by the _ (underscore) character except for the last 2 fields, which are delimited by the . (period) character.

Each field can be of variable length, except for the Date/time stamp field which is predetermined.

The order of the fields is mandatory.

The File Name fields are as follows:

pflag_productidentifier_oflag_originator_yyyyMMddhhmmss[_freeformat].type[.compression]

where the mandatory fields are:

pflag is a character or combination of characters indicating how to decode the **productidentifier** field. At this time, the **pflag** field has only the following acceptable value:

Table 4.1 Accepted pflag values

pflag	Meaning
T	The **productidentifier** field will be decoded as a standard $T_1T_2A_1A_2ii$ data designator (The WMO standard data designators are given in Attachment II-5)
A	The **productidentifier** field will be decoded as a standard Abbreviated Heading, including BBB as appropriate, space characters being discarded, e.g. $T_1T_2A_1A_2$iiCCCCYYGGgg[BBB]
W	WMO Product Identifier
Z	Originating centre's local product identifier
TM	The **productidentifier** field will be decoded as a standard $T_1T_2A_1A_2ii$ data designator (The WMO standard data designators are given in Attachment II-5). The file will contain the metadata corresponding to the related "T" file.
AM	The **productidentifier** field will be decoded as a standard Abbreviated Heading, including BBB as appropriate, space characters being discarded, e.g. $T_1T_2A_1A_2$iiCCCCYYGGgg[BBB]. The file will contain the metadata corresponding to the related "A" file.
WM	WMO Product Identifier. The file will contain the metadata corresponding to the related "W" file.
ZM	Originating centre's local product identifier. The file will contain the metadata corresponding to the related "Z" file.

productidentifier is a variable length field containing information that describes the nature of the data in the file. The productidentifier field should be decoded according to the pflag**.**

The WMO Product Identifier to be used with **pflag** = W shall be decoded as follows:

<location indicator>,<data designator>,<free description>,<International date-timegroup>,<BBB modification header>

The WMO Product Identifier is composed of two parts:

- the "static part" for description of the product and
- the "optional part" to define the time stamp and status of the product (correction, amendment).

The WMO Product Identifier is not case sensitive. These two parts are defined as follows:

Static part: <location indicator>,<data designator>,<free description>

- <location indicator> defines the producer: Country, organization and the production centre; The country shall be represented by the official ISO 3166 standard 2 letter code. Example: <gb-metoffice-exeter>. Each field shall be separated by "-" symbol. The ISO 3166 standard 2-letter code xx shall be used for international organizations and shall therefore be the two first characters of the location indicator of international organizations, e.g. "xx-eumetsat-darmstadt", "xx-ecmwf-reading".

- <data designator> specifies the type of data with reference to the categories and subcategories defined in the Common Table C-13 of the *Manual on Codes*, e.g. <SYNOP>, <TAF>, <MODEL>, <RADAR>, <SATELLITE>, etc. When the type of data is a composite type, use the sign "+" for concatenation.

- <free description> is determined by the production centre to characterize the product.

Optional part: [,<International date-time group>,<BBB modification header>]

- <International date-time group> is a YYYYMMDDHHMMSS time stamp of the product, full format without substitution characters (only decimal digits). This field is optional because it can be recovered from the file name field: yyyyMMddhhmmss

- <BBB modification header> is a complementary group with a similar purpose as the current BBB group of AHL

Note: In order to facilitate the identification of each field of the product identifier, the static part, as well as the optional part if used, shall comprise two symbols "," separating the fields. Each field shall not contain any symbol ",". If a field is empty, no character shall be inserted between the relevant field delimiters "_" or ",".

oflag is a character or combination of characters indicating how to decode the **originator** field. At this time, the **oflag** field has only the following acceptable value:

Table 4.2 Accepted oflag values

oflag	Meaning
C	The **originator** field will be decoded as a standard CCCC country code

originator is a variable length field containing information that states where the file originated from. The **originator** field should be decoded according to the **oflag**

yyyyMMddhhmmss is a fixed length date and time stamp field. The interpretation of this field should be in accordance with the standard rules set for specific data description and types. Therefore it may have various significance such as date of creation or the file, or date of collection of data. If a particular date and time stamp field is not specified, it should be

replaced by a `-` (minus) character. For example: ------311500-- represents a stamp that specifies only the day (31st), hours (15) and minutes (00). If there are no rules for a specific data type, this field should represent the date and time of creation of the file by the originator.

Type is a variable length field that describes the general format type of the file. Although this information could be considered somewhat redundant to the **productidentifier** field, it is kept as such for industry accepted standard compatibility. It should be noted that the delimiter before the type field is a . (period). This is to help parse the file name for fields, since the **freeformat** field could make use of further _ (underscore) to delimit subfields.

Table 4.3 Accepted type values

type	Meaning
met	The file is a metadata file pair which describes the content and format of the corresponding information file with the same name
tif	TIFF file
gif	GIF file
png	PNG file
ps	Postscript file
mpg	MPEG file
jpg	JPEG file
txt	text file
htm	HTML file
bin	a file containing data encoded in a WMO binary code form such as GRIB or BUFR
doc	a Microsoft Word file
wpd	a Corel WordPerfect file
hdf	HDF file
nc	NetCDF file
pdf	Portable Document Format file
xml	XML format files (data or metadata)

And the non mandatory fields are:

freeformat is a variable length field containing further descriptors as required by a given originator. This field can be further divided in sub-fields. Originating countries should strive to make their **freeformat** descriptions available to others.

compression is a field that specifies if the file uses industry standard compression techniques

Table 4.4 Accepted compression values

compression	Meaning
Z	The file has been compressed using the Unix COMPRESS technique
zip	The file has been compressed using the PKWare zip technique
gz	The file has been compressed using the Unix gzip technique
bz2	The file has been compressed using the Unix bzip2 technique

Maximum file name length: Although no maximum length is specified for the entire file name, the mandatory fields shall not exceed 63 characters (including all delimiters) to allow processing by all international systems.

Character set: The filenames shall be composed of any combination of the standard character set (ITU-T Rec. X.4) with the exceptions noted in Table 4.5. Case insensitivity shall be used as it is widely accepted and implemented in the industry (for example e-mail addresses and URLs). However, it is recommended to use the “canonical form” of file names when files are being processed in a system. In this manner it would be expected that:

- A possible synoptic surface observations file from France:
  W_fr-meteofrance
  Toulouse,SYNOP,MAIN+HOURS,,RRA_C_LFPW_20060913030000.txt
- A possible model output file from France:
  W_fr-meteofrance-toulouse,GRIB,ARPEGE-75N10N-
  60W65E_C_LFPW_200610000000.bin
- A possible image from Australia:
  Z_IDN60000_C_AMMC_20020617000000.gif
  Note that this shows that the date and time stamp is to be interpreted to be 00 hours, 00 minutes and 00 seconds.
- A possible compressed TOVS satellite data file from the United Kingdom:
  Z_LWDA_C_EGRR_20020617000000_LWDA16_0000.BIN.Z
- A possible image (radar) from Canada:
  T_SDCN50_C_CWAO_200204201530--_WKR_ECHOTOP,2-0,100M,AGL,78,N.gif
- A possible single-record GRIB file from Canada:
  Z__C_CWAO_2002032812----
  _CMC_reg_TMP_ISBL_500_ps60km_2002032812_P036.bin
- A possible multiple record batch file from China:
  Z_SM_C_BABJ_20020520101502.TXT

File renaming

The method used by receiving centres to detect the presence of a new file may depend on the type of machine used. However most centres will do this by scanning a directory for new files.

To avoid problems with the receiving centre processing a file before it has completely arrived, all sending centres must remotely rename the files they send.

The file shall be sent with the added extent '.tmp' and then renamed to the appropriate extent defined above when the transfer is completed. e.g.

(a) put xxxxx RJTD00220401.a.tmp (xxxxx = local file name)
rename RJTD00220401.a.tmp RJTD00220401.a

(b) put xxxxx AMMC09871234.ub.tmp
rename AMMC09871234.ub.tmp AMMC09871234.ub

Use of directories

Some receiving centres may wish the files to be placed in specific sub-directories. This should be limited to require only that all files of the same type be delivered to the same directory. It is recommended that a separate directory be used for each host system which is initiating FTP sessions to avoid the possibility of filename duplication.

Account names and passwords

Using FTP the sender "logs in" to a remote machine using a specific account name and password. The receiving centre defines the account name and the password. There are potential security implications for centres so care needs to be taken.

The following general rules should however apply.

1. The receiving centre defines the user account and password for the sending centre.
2. Anonymous FTP may be used or a specific account may be created. (If anonymous FTP is used, each sending Centre must have its own sub directory on the FTP server).

- A possible synoptic surface observations file from France:
  W_fr-meteofrance
  Toulouse,SYNOP,MAIN+HOURS,,RRA_C_LFPW_20060913030000.txt
- A possible model output file from France:
  W_fr-meteofrance-toulouse,GRIB,ARPEGE-75N10N-
  60W65E_C_LFPW_200610000000.bin
- A possible image from Australia:
  Z_IDN60000_C_AMMC_20020617000000.gif
  Note that this shows that the date and time stamp is to be interpreted to be 00 hours, 00 minutes and 00 seconds.
- A possible compressed TOVS satellite data file from the United Kingdom:
  Z_LWDA_C_EGRR_20020617000000_LWDA16_0000.BIN.Z
- A possible image (radar) from Canada:
  T_SDCN50_C_CWAO_200204201530--_WKR_ECHOTOP,2-0,100M,AGL,78,N.gif
- A possible single-record GRIB file from Canada:
  Z__C_CWAO_2002032812----
  _CMC_reg_TMP_ISBL_500_ps60km_2002032812_P036.bin
- A possible multiple record batch file from China:
  Z_SM_C_BABJ_20020520101502.TXT

File renaming

The method used by receiving centres to detect the presence of a new file may depend on the type of machine used. However most centres will do this by scanning a directory for new files.

To avoid problems with the receiving centre processing a file before it has completely arrived, all sending centres must remotely rename the files they send.

The file shall be sent with the added extent '.tmp' and then renamed to the appropriate extent defined above when the transfer is completed. e.g.

(a) put xxxxx RJTD00220401.a.tmp (xxxxx = local file name)
rename RJTD00220401.a.tmp RJTD00220401.a

(b) put xxxxx AMMC09871234.ub.tmp
rename AMMC09871234.ub.tmp AMMC09871234.ub

Use of directories

Some receiving centres may wish the files to be placed in specific sub-directories. This should be limited to require only that all files of the same type be delivered to the same directory. It is recommended that a separate directory be used for each host system which is initiating FTP sessions to avoid the possibility of filename duplication.

Account names and passwords

Using FTP the sender "logs in" to a remote machine using a specific account name and password. The receiving centre defines the account name and the password. There are potential security implications for centres so care needs to be taken.

The following general rules should however apply.

1. The receiving centre defines the user account and password for the sending centre.
2. Anonymous FTP may be used or a specific account may be created. (If anonymous FTP is used, each sending Centre must have its own sub directory on the FTP server).

FTP Sessions

To limit the load on both the sending and receiving systems, no more than one FTP session per file type should exist at the same time. If for example, Centre A wishes to send two files to Centre B of the same type (say .ua), the second file must not be sent until the first is finished. Centres should limit the number of concurrent sessions with a particular Centre to five maximum.

The idle timer for closing the FTP session should be set to a value between the cut-off time for accumulating messages (max. 60 seconds) and a maximum of 3 minutes.

To minimize overheads the sending centre should keep the FTP session connected for at least 10 minutes or until the idle timeout has been reached (subject to bilateral agreement).

Local FTP requirements

All sending centres will need to allow for additional "static" FTP commands to be included in the FTP commands that they issue. For example some MVS centres may require the inclusion of "SITE" commands to define record and block lengths. Centres should support FTP commands as specified in RFC 959 unless some are excluded by bilateral agreement. There may also need to be bilaterally agreed procedures and commands.

It is the responsibility of receiving Centres to delete files after they have been processed.

In order to meet the 2 minute maximum delivery requirement for warning messages, centres receiving files via FTP should aim to pickup and process incoming files no later than 15 seconds after they are received.

Use of file compression

If large files are to be sent then it is often desirable to compress them first.

Centres should only use compression by bilateral agreement.

Backup with an IP based GTS

A final consideration is that of MSS backup. The new GTS will use IP addresses, where an individual address is usually associated with only one system. Should a system fail and an alternative be used there are implementation issues to be considered by transmitting centres. Ideally a transmitting centre should be unaffected by a receiving Centre's backup arrangements. This is a good principle, which all Centres should seek to adhere to. However it may not always be possible to achieve complete IP transparency. If this cannot be done sending Centres must be prepared to try an alternate IP address. Once using such an alternate address it must periodically try the primary address. It is suggested that such periodicity be established by bilateral agreement between centres because it will be heavily influenced by each centres backup strategy.

TROUBLE SHOOTING AND PROBLEM RESOLUTION

IP Layer Tools

In a large IP network, every router involved in the path between two hosts must know the next hop to be used to reach the destination address. As every router and/or link might be a point of failure, it is very important to determine rapidly where the problem is, and then how to solve it.

Suggested steps in resolving problems (not necessarily in the order given) are:

(a) check the remote centre (if the security policy of the remote centre allows it).

(b) check if the link to the “outside” network is reachable

(c) check the local network by trying to reach the next/default gateway
(d) check the local IP stack and configuration

Some basic tools that can be used such as Ping, Traceroute and Netstat are described below. PING and TRACEROUTE provide information on paths between hosts. They both use ICMP (traceroute also need UDP), but it should be noted that many sites block ICMP packets as part of their security measures. To be able to locate problems in a network, it is necessary to have an exact documentation of the network.

PING

PING will check if the destination IP address can be reached. This tool is standard in almost every operating system with TCP/IP. On a Unix host the output looks like:

```
zinder# ping -s cadillac
PING cadillac : 56 data bytes
64 bytes from cadillac ( 193.168.1.17 ) : icmp_seq=0. time=3. ms
64 bytes from cadillac ( 193.168.1.17 ) : icmp_seq=1. time=2. ms
64 bytes from cadillac ( 193.168.1.17 ) : icmp_seq=2. time=3. ms
64 bytes from cadillac ( 193.168.1.17 ) : icmp_seq=3. time=3. ms
64 bytes from cadillac ( 193.168.1.17 ) : icmp_seq=4. time=5. ms
64 bytes from cadillac ( 193.168.1.17 ) : icmp_seq=5. time=3. ms
64 bytes from cadillac ( 193.168.1.17 ) : icmp_seq=6. time=3. ms
----cadillac PING statistics----
7 packets transmitted, 7 packets received, 0% packet loss
round-trip (ms) min/avg/max = 2/3/5
```

A useful test could be to ping the MSS of the neighbouring Centre. If this ping succeeds with an acceptable time delay, it would indicate that the network is operating correctly. If the ping fails, it could mean that the circuit is down or the ICMP ping packets are being blocked by the neighbouring Centre's router or security gateway. In this event, it could be useful to ping the serial interface of the neighbouring Centre's router. If this succeeds, then the communications link to the neighbouring Centre is working. Any malfunction would then be within the neighbouring Centre.

Ping can be used to check whether the network performance is reasonable. The time is the delay between sending and receiving back the packet. It is not really possible to give an average value of the delay, but it is more important to notice any variation.

Finally, it might happen that packets are lost. In this case, there are missing numbers in the icmp_seq number. Either packet loss or variation in delays will badly degrade the performance.

TRACEROUTE

This tool is used to show which routers are transited on the network between A and B. As said above, traceroute need UDP and ICMP packets to work. Firewalls or packet filter on router may block such traffic as part of local security policy. It is not available on all systems, but is rather easy to compile. It is a free tool available on the Internet.

Traceroute output looks like:

```
cadillac 22: traceroute ftp.inria.fr
traceroute to ftp.inria.fr (192.93.2.54), 30 hops max, 40 byte packets
 1 antonio.meteo.fr (137.129.1.5) 3 ms 2 ms 2 ms
 2 clara.meteo.fr (137.129.14.249) 1 ms 2 ms 2 ms
 3 andrea.meteo.fr (193.105.190.253) 4 ms 3 ms 2 ms
 4 octares1.octares.ft.net (193.48.63.5) 30 ms 35 ms 10 ms
 5 192.70.80.97 (192.70.80.97) 9 ms 15 ms 27 ms
```

```
 6 stamand1.renater.ft.net (195.220.180.21) 40 ms 96 ms 29 ms
 7 stamand3.renater.ft.net (195.220.180.41) 56 ms 100 ms 108 ms
 8 stlambert.rerif.ft.net (195.220.180.10) 63 ms 56 ms 34 ms
 9 193.55.250.34 (193.55.250.34) 46 ms 28 ms 26 ms
10 rocq-gwr.inria.fr (192.93.122.2) 21 ms 147 ms 85 ms
11 ftp.inria.fr (192.93.2.54) 86 ms 58 ms 128 ms
```

When a router does not know where to send the packet, the result may be like the following:

```
cadillac 22: traceroute 193.105.178.5
traceroute to 193.105.178.5 (193.105.178.5), 30 hops max, 40 byte packets
 1 antonio.meteo.fr (137.129.1.5) 2 ms 1 ms 1 ms
 2 clara.meteo.fr (137.129.14.249) 1 ms 4 ms 1 ms
 3 andrea.meteo.fr (193.105.190.253) 4 ms 11 ms 4 ms
 4 octares1.octares.ft.net (193.48.63.5) 42 ms 39 ms 42 ms
 5 192.70.80.97 (192.70.80.97) 8 ms 7 ms 7 ms
 6 stamand1.renater.ft.net (195.220.180.5) 48 ms 86 ms 113 ms
 7 rbs1.renater.ft.net (195.220.180.50) 63 ms 107 ms 154 ms
 8 Paris-EBS2.Ebone.net (192.121.156.105) 146 ms 167 ms 140 ms
 9 stockholm-ebs-s5-2.ebone.net (192.121.154.21) 100 ms 80 ms 92 ms
10 Amsterdam-ebs.Ebone.NET (192.121.155.13) 249 ms 227 ms 205 ms
11 amsterdam1.NL.EU.net (193.0.15.131) 257 ms 249 ms 316 ms
12 * Amsterdam5.NL.EU.net (134.222.228.81) 300 ms 297 ms
13 Amsterdam6.NL.EU.net (134.222.186.6) 359 ms 218 ms 304 ms
14 Paris1.FR.EU.net (134.222.228.50) 308 ms 311 ms 388 ms
15 * Etoile0.FR.EU.net (134.222.30.2) 177 ms *
16 Etoile0.FR.EU.net (134.222.30.2) * * *
```

In the second case, cadillac would not be able to reach 193.105.178.5 because the router Etoile0.fr.eu.net failed to send the packet. With traceroute, it is not possible to know if it is a router failure or a link failure.

NETSTAT

This is a command available on most computing platforms. It gives information about the set up of the host's IP stack.

Netstat can be used to find out if the local IP address and subnet mask are configured correctly as well as if the routing information is still correct. There are many other options but is it not the intention of this guide to describe them all.

A sample output looks like:

```
$ netstat -rn
Routing tables

Internet:
Destination      Gateway        Netmask        Flags  Refs   Use            Interface
default          141.38.48.2                   UG     12     4014211        ec0
127.0.0.1        127.0.0.1                     UH     9      2321           lo0
141.38.48        141.38.48.12   0xffffff00     U      3      68981          ec0
141.38.48.12     127.0.0.1                     UGH    10     253410         lo0
195.37.164.100   141.38.48.5                   UGH    2      345            lo0
224              141.38.48.12   0xf0000000     U      1      19848          ec0
$
```

The output shows that this particular host has the IP address 141.38.48.12 with a subnet mask of 24 bit (0Xffffff00 or 255.255.255.0). It also shows that the host 195.37.164.100 can be reached via the gateway 141.38.48.5, and the flags indicate that the route is up (U), that it is a route to a gateway (G) and that it is a host route (H). The first line indicates that all other destinations are reachable via the hosts default gateway 141.38.48.2.

In the next output:

```
$ netstat -rn
Routing tables

Internet:
Destination      Gateway       Netmask      Flags      Refs  Use       Interface
default        141.38.48.2                 UG       12    4014211     ec0
127.0.0.1        127.0.0.1           UH   9    2321      lo0
141.38.48        141.38.48.12  0xffffff00    U    3    68981     ec0
141.38.48.12     127.0.0.1                 UGH  10    253410     lo0
195.37.164.100           141.38.48.2                UGHM  2     345           lo0
224          141.38.48.12  0xf0000000  U    1    19848       ec0
$
```

The only difference to the first sample output is, that the host route to 195.37.164.100 is now flagged with a M, which means that this route was modified by an ICMP redirect message from the old gateway 141.38.48.5. This usually means that the router with the IP address 141.38.48.5 has lost it’s route to 195.37.164.100 and may indicate a problem with the link to the remote network.

Other monitoring tools

Verifying correct IP connectivity is a necessary first step. Other tools can be used to provide more information on what is happening. There are many options. It is possible to use protocol analysers and SNMP based software tools. For example, Sun Microsystems bundles with Solaris a tool called snoop who can replace in most cases a local area network analyser. Others tools such as TCPDUMP are available free on the Internet and can be installed on various systems. TCPDUMP is often bundled in various Linux distributions. These tools require a rather good knowledge of IP protocol. But, for example, TCPDUMP might be used to diagnose application level problems.

The following is a simple example on the host 'pontiac', of the capture of ICMP exchanges between zinder and cadillac.

```
pontiac# /usr/local/bin/tcpdump -i nf0 host cadillac and zinder and proto icmp
15:28:06.68 cadillac.meteo.fr > zinder.meteo.fr: icmp: echo request
15:28:06.68 zinder.meteo.fr > cadillac.meteo.fr: icmp: echo reply
15:28:19.45 cadillac.meteo.fr > zinder.meteo.fr: icmp: echo request
15:28:19.45 zinder.meteo.fr > cadillac.meteo.fr: icmp: echo reply
15:28:29.44 cadillac.meteo.fr > zinder.meteo.fr: icmp: echo request
15:28:29.45 zinder.meteo.fr > cadillac.meteo.fr: icmp: echo reply
```

SNMP

Simple Network Management Protocol was developed in the late 80’s in order to offer to network manager a standard tool for controlling networks. In most case SNMP could be used to replace more crude tools describe above. Unfortunately, good SNMP software is not cheap. SNMP is a client-server protocol. In order to be able to gather information with SNMP, the equipment connected on the network must have Management Information Base (MIB). These bases are catalogues of integer, counters, strings, etc…. The manager asks the agents to send it some values. These values might be for example, IP routing table. The example below is obtained by

requesting with HP Open View (a commercial package) the routeing table on the host monica.meteo.fr.

Title: : monica.meteo.fr
Name or IP Address: monica.meteo.fr

ipRouteDest	ipRouteMask	ipRouteNextHop	ipRouteProto	ipRouteMetric1
0.0.0.0	0.0.0.0	137.129.1.5	local	0
136.156.0.0	255.255.0.0	137.129.1.5	ciscolgrp	8786
137.129.1.0	255.255.255.0	137.129.1.6	local	0
137.129.2.0	255.255.255.0	137.129.1.5	ciscolgrp	1110
137.129.3.0	255.255.255.0	137.129.3.254	local	0
137.129.4.0	255.255.255.0	137.129.4.254	local	0
137.129.5.0	255.255.255.0	137.129.5.254	local	0
137.129.6.0	255.255.255.0	137.129.1.62	local	0
137.129.7.0	255.255.255.0	137.129.7.254	local	0
137.129.8.0	255.255.255.0	137.129.8.254	local	0
137.129.9.0	255.255.255.0	137.129.1.5	ciscolgrp	1110

Information given above with TCPDUMP might be obtained with SNMP but to do so, probes running the Remote Monitoring MIB must be connected on the network.

On a bilateral basis, it might be useful for Centres to allow SNMP access to their router from the other NMC. However, regular polling of other Centres' routers should be avoided to avoid overloading of circuits.

MRTG

Another public domain package, called MRTG, is a very helpful tool to gather information about the local network and about connected links. The Multi Router Traffic Grapher (MRTG) is a tool to monitor the traffic load on networks and links. It generates HTML pages containing images which provide a live visual representation of this traffic. It can also be implemented to indicate failures of network links. MRTG consists of a Perl script which uses SNMP to read the traffic counters of your router(s) and a fast C program which logs the traffic data and creates graphs representing the traffic on the monitored network connection(s). Below is a sample output. It shows traffic statistics for a dedicated link and gives information about the traffic pattern on the link. This is just one of many other graphs one can create with MRTG. More information about MRTG can be found at http://oss.oetiker.ch/mrtg/

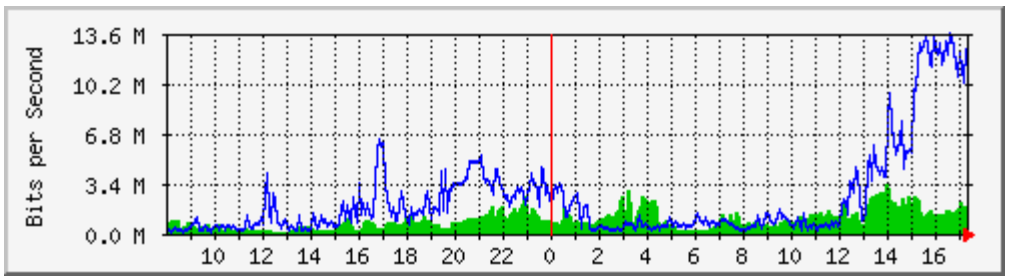

Figure 5.2.2.1 Sample MRTG Graph

SYSLOG

Many of the possible problems can be located if one not only looks at the SYSLOG files on the hosts, but uses a SYSLOG server as well and lets the router(s) send their messages to it. This file can then be checked regularly e.g. for messages that indicate high CPU load, processes that use

up much memory or CPU cycles, lines going up and down, and messages about events regarding the used routing protocol.

There are 8 different levels of messages the router will log to the syslog server. They are:

Emergencies	0	System unusable
Alerts	1	Immediate action needed
Critical	2	Critical conditions
Errors	3	Error conditions
Warnings	4	Warning conditions
Notifications	5	Normal but significant condition
Informational	6	Informational messages only
Debugging	7	Debugging messages

The default logging facility on a cisco router is set to local7, this is important to know when configuring a host to be a syslog server and will be explained there.

The configuration commands on a Cisco router to activate logging are:

```
cisco-gts-1(config)#logging trap level-of-messages-to-log
cisco-gts-1(config)#logging 141.38.48.12
```

and can be checked with the command “show logging”:

```
cisco-gts-1#sho logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
Console logging: level debugging, 117892 messages logged
Monitor logging: level debugging, 8317 messages logged
Trap logging: level debugging, 117150 message lines logged
Logging to 141.38.48.12, 117150 message lines logged
Buffer logging: disabled
cisco-gts-1#
```

In this example, logging is set to the level debugging (“logging trap debugging”), and all messages from level 7 up to level 0 will be sent to the syslog server with the IP address 141.38.48.12.

To activate the SYSLOG server on for instance a SGI UNIX machine, the following entries should be there:

In the file /etc/services: syslog 514/udp
In the file /etc/syslog.conf: local7.debug /usr/people/cisco/logs/cisco.log

The local7.debug relates to the default facility of logging that is defined on a cisco router as mentioned (local7). The file above will be the file to which the syslog daemon writes all incoming syslog messages for local7.

The last action on the host is to have the syslog daemon reread it’s config file (kill –1 pid-of-syslogd).

Bandwidth Management

On an IP network, all packets will be routed over the links without any prioritization mechanism. Therefore an FTP transfer can occupy all the bandwidth available starving all others applications. When traffic increases, it might therefore be needed to introduce some bandwidth management in the network configuration. Further information may be available on the online reference (http://www.wmo.~~ch~~int/).

APPENDIX 1 – HIGH LEVEL TCP/IP TOPOLOGY AND TCP/IP DATA FLOWS

The following diagrams show a high level view of the topology of a simple Centre and the main data flows regarding GTS and Internet telecommunication. More detailed X.25 over IP configurations can be found in the following appendices.

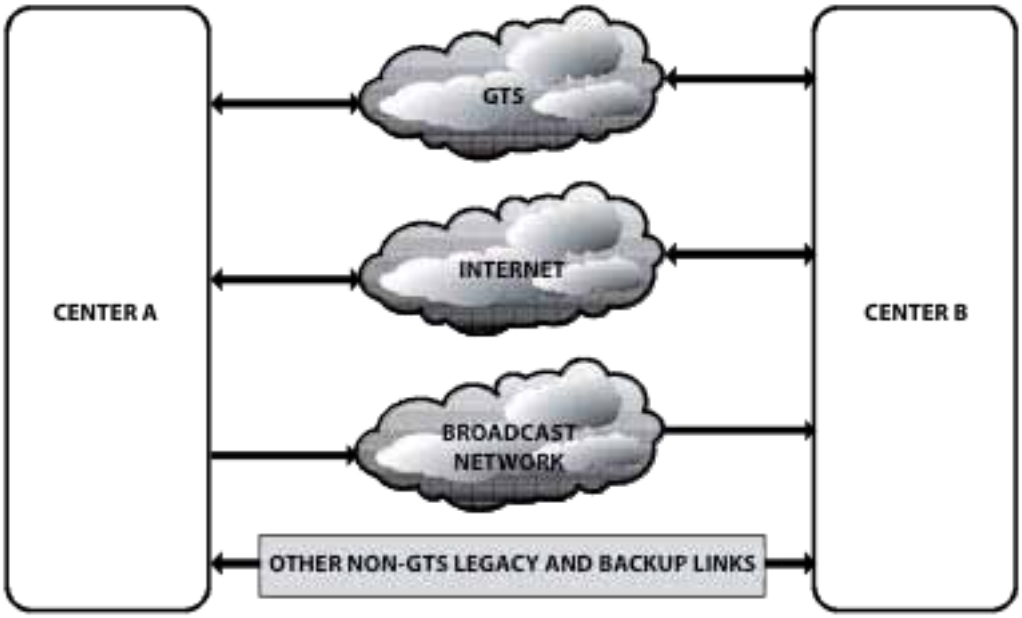

Figure A1.1 – General interconnectivity between Centres

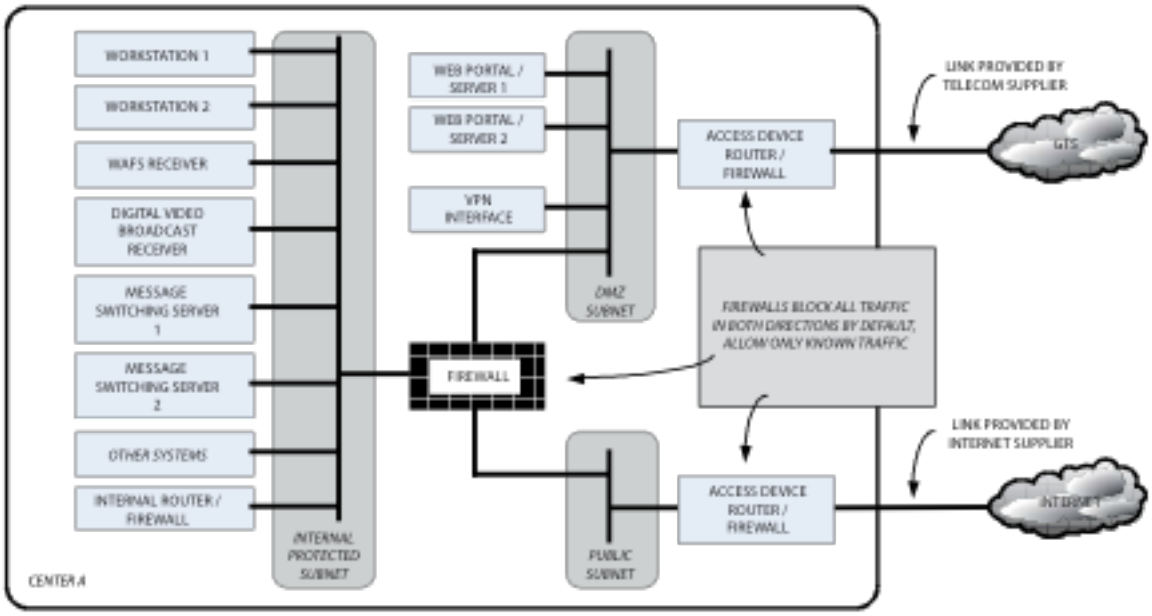

Figure A1.2 – Topology of TCP/IP network in a simple Centre

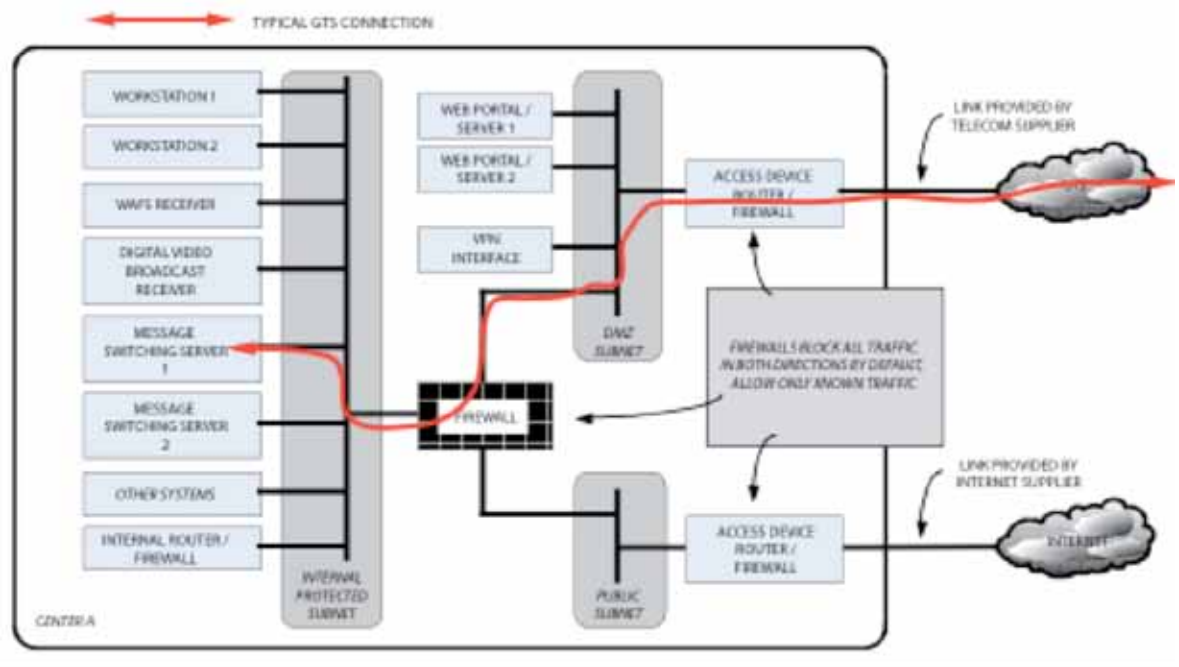

Figure A1.3 – Data flow of traffic over the GTS – IP only

~~Figure A1.4 – Data flow of traffic over the GTS – X.25 over IP~~

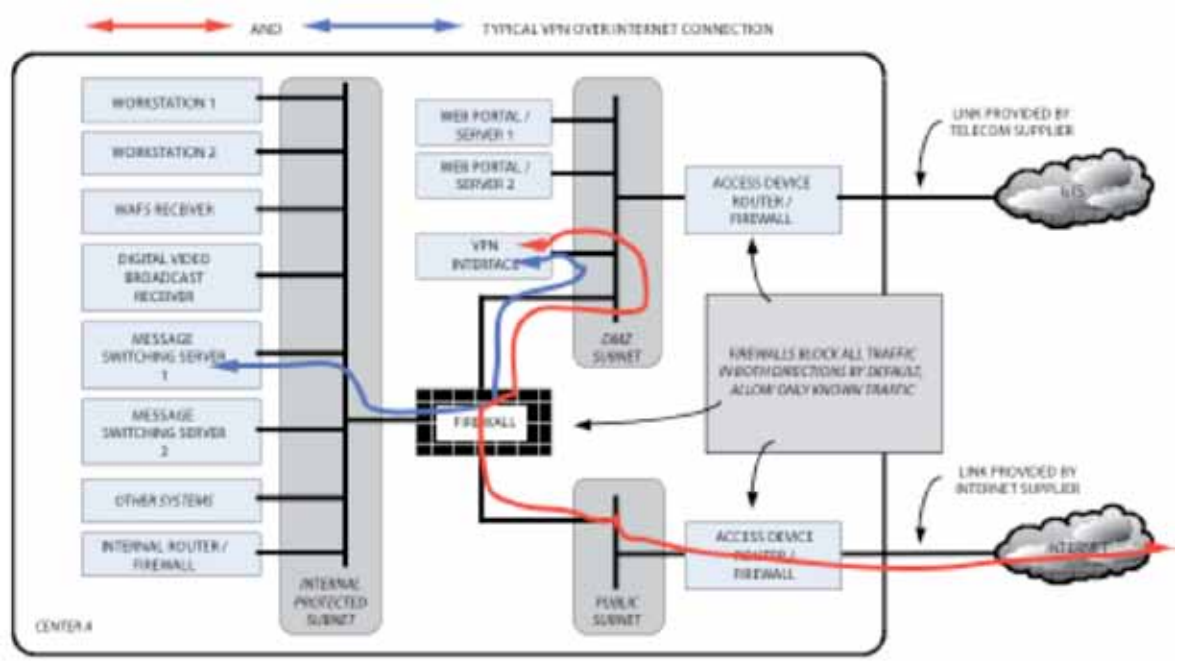

Figure A1.5 – Data flow of traffic using VPN over the Internet

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APPENDIX 2 – CISCO ROUTER CONFIGURATIONS

The router configurations provided in this appendix are examples and should not be interpreted as a suggestion that Cisco is the only supplier capable of this functionality.

This appendix is not intended to be a complete description of all available commands in a Cisco, nor a full course on this equipment, but it is useful to describe more precisely the configuration tasks in order to comply with the policy outlined in Chapter 2.

The configuration described below respects what is available in release 11.1 of Cisco IOS software. Some features are not available in previous releases, and some will be modified in the future.

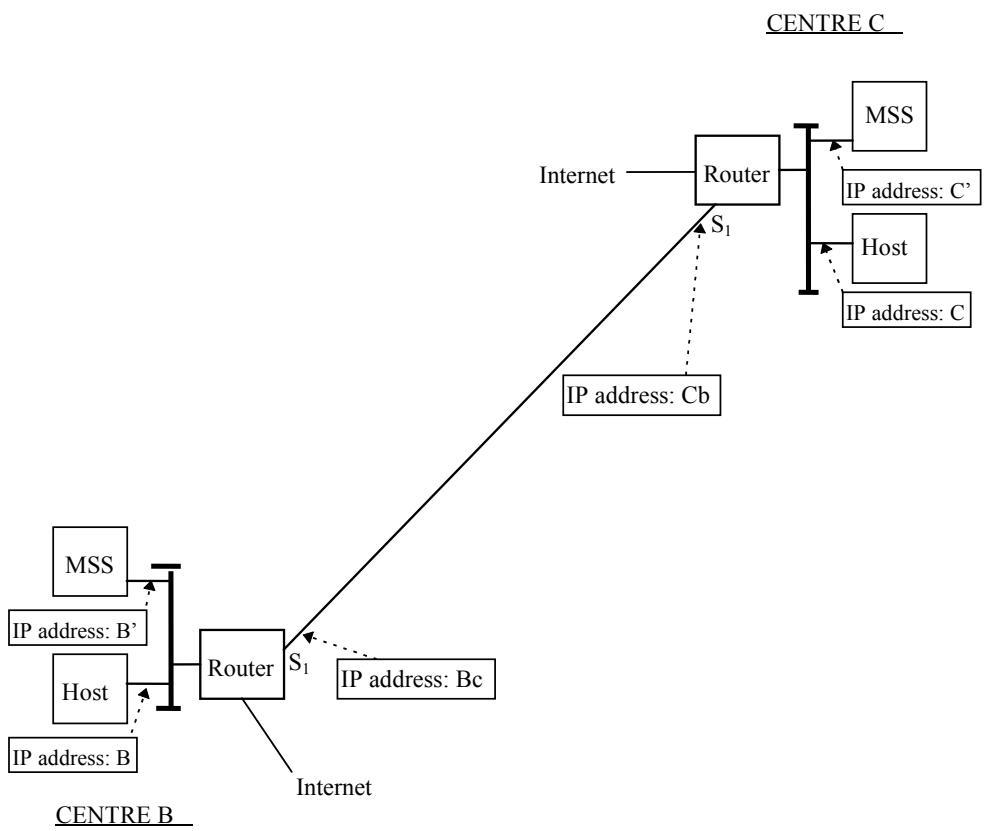
We are going to describe different steps:

1. Establishing IP connection
   - IP over PPP
   - ~~IP over X25~~
   - ~~X25 over IP (in fact it is X25 over TCP, the XOT protocol)~~

2. Routing configuration
   - leaf node with static routes (Centre A)
   - leaf node with dynamic routing (Centre C)
   - configuration in a non-leaf node (in our case two different GTS connections, Centre B)

3. Security configuration
   - filtering traffic based on declared IP addresses
   - controlling routing exchanges between GTS and the Internet

In our example, ~~A is connected to B with IP over X25 link,~~ Centre B is connected to C with IP over PPP[2]. ~~There is also the option for the MSSs at B and C to communicate using X.25 over TCP/IP. A is a leaf node, B and C are non-leaf nodes~~. B and C are also connected to the Internet. B and its Internet provider use static routes[3], C and its Internet provider use RIP[4].



[2] Note that using PPP encapsulation is not the preferred option, but since it is a non default option, it shows the usage of the "encapsulation" statement in this example

[3] B cannot use EGP and BGP on the same router; one router cannot belong to more than one AS

[4] RIP is NOT a good choice for this type of configuration. But as RIP is the most basic protocol, it is used in this case too.

The following will be used along this appendix:

	IP router address	IP hosts address for GTS	Autonomous-System
Centre B	193.105.177.2 193.105.178.5	137.129.9.0/255.255.255.0	65001
Centre C	193.105.178.6	195.1.1.0/255.255.255.0	65200

Centre B use serial interface 0 to connect to the packet switches. Centres B and C use serial interfaces 1 for the PPP link.

Step 1: Establishing connections

~~Centre A:~~
~~interface serial 0~~
~~encapsulation X25~~
~~! depending on local set-up (virtual channels,~~
~~! windows…) extra configuration might be necessary~~
~~x25 address 01016661166666~~
~~ip address 193.105.177.1 255.255.255.0~~
~~!~~
~~x25 map ip 193.105.177.2 01017771177777~~

Centre B:
~~interface serial 0~~
~~encapsulation X25~~
~~x25 address 01017771177777~~
~~! depending on local set-up (virtual channels,~~
~~! windows…) extra configuration might be necessary~~
~~ip address 193.105.177.2 255.255.255.0~~
~~!~~
~~x25 map ip 193.105.177.1 01016661166666~~
~~!~~

interface serial 1
 encapsulation PPP
 ip address 193.105.178.5 255.255.255.252
!
~~! X25 over TCP commands~~
~~x25 routing~~
~~x25 route 010177711* ip 193.105.178.5~~
~~x25 route 010188811* interface serial 0~~

Centre C:
~~interface serial 0~~
~~encapsulation X25~~
~~x25 address 01018881188888~~
~~! depending on local set-up (virtual channels,~~
~~! windows…) extra configuration might be necessary~~
interface serial 1
 encapsulation PPP
 ip address 193.105.178.6 255.255.255.252
!
~~! X25 over TCP commands~~
~~x25 routing~~
~~x25 route 010177711* ip 193.105.178.5~~
~~x25 route 010188811* interface serial 0~~

After this first step, IP configuration between the routers is complete. ~~The router in Centre A can then ping router in B. B can ping A and C, but A and C cannot communicate because there is no routing set up.~~

MSS at B and C can communicate with IP (once end-to-end routing is established) ~~or with X25 over TCP. Experience has shown that all the X25 parameters on router in centres B and C MUST be the same (packet size, window size) to avoid any strange behaviour.~~

Step 2: Routing

~~Centre A:~~
~~! Simply define a default route with a metric 10 (the price) via B~~
~~ip route 0.0.0.0 255.255.255.255 193.105.177.2 10~~

Centre B:
~~*! First define static route with A*~~
~~*ip route 194.168.1.16 255.255.255.248 193.105.177.1 10*~~
~~*ip route 0.0.0.0 ip_provider_address 10*~~
~~*! Define a default route to the internet*~~
~~ip route 0.0.0.0 0.0.0.0 *internet_provider_address* 10~~
! BGP routing
router bgp 65001
 network 137.129.9.0 mask 255.255.255.0
 neighbour 193.105.178.6 remote-as 65200
~~! Route to A is static, force sending to C~~
~~redistribute static~~

Centre C:
! BGP routing
router bgp 65200
 network 195.1.1.0
 neighbour 193.105.178.5 remote-as 65001
! 196.1.1.0 is network address for non-GTS hosts in C
router rip
version 2
network 195.1.1.0
no auto-summary

~~A defines a default route. So, when A wants to communicate with C, the router knows where to send packets. C is going to receive routing information from B, so A is also reachable from C. It is also important to note that if A tries to reach an Internet site, attempts will be made through B's Internet connection. It will fail because the Internet site A tries to reach cannot return packets to A (only B's address is reachable on the internet via B's Internet connection). The link A to B link will thus carry some inappropriate data. Also note that we use RIP version 2.~~

Step 3: Security

~~Centre A:~~
~~! Declare which hosts can use GTS~~
~~access-list 1 permit 194.168.1.16 0.0.0.7~~
~~! Declare which hosts can come from GTS~~
~~access-list 2 permit 195.1.1.0 0.0.0.255~~
~~access-list 2 permit 137.129.9.0 0.0.0.255~~
~~!~~
~~interface serial 0~~
~~ip access-group 1 out~~
~~ip access-group 2 in~~

Centre B:

```
! Declare which hosts can use GTS
access-list 1 permit 137.129.9.0 0.0.0.255
! Declare which hosts can come from GTS
access-list 2 permit 195.1.1.0 0.0.0.255

! Only accept BGP updates from AS neighbour
ip as-path access-list 3 permit ^$
ip as-path access-list 3 permit ^65200
!
interface serial 0
ip access-group 1 out
ip access-group 2 in
!
interface serial 1
 ip access-group 1 out
 ip access-group 2 in
! Restrict BGP updates
router bgp 65001
 network 137.129.9.0 mask 255.255.255.0
 neighbour 193.105.178.6 remote-as 65200
 neighbour 193.105.178.6 filter-list 3 in
 neighbour 193.105.178.6 filter-list 3 out
redistribute static
```

Centre C:

```
! Declare which hosts can use GTS
access-list 1 permit 195.1.1.0 0.0.0.255
! Declare which hosts can come from GTS
access-list 2 permit 137.129.9.0 0.0.0.255

! Only accept BGP updates from AS neighbour
ip as-path access-list 3 permit ^$
ip as-path access-list 3 permit ^65001
!
interface serial 1
 ip access-group 1 out
 ip access-group 2 in
! Restrict BGP updates
router bgp 65200
interface serial 0
ip access-group 1 out
ip access-group 2 in
! Restrict BGP updates
router bgp 65200
network 195.1.1.0 mask 255.255.255.0
 neighbour 193.105.178.5 remote-as 65001
 neighbour 193.105.178.5 filter-list 3 in
 neighbour 193.105.178.5 filter-list 3 out
```

In these configurations, there are two important features used:

(a) BGP filtering

The access-list 3 in both B and C checks the autonomous system number sent by its neighbour. By filtering in and out in the BGP process this guarantees that all known routes must be issued from one of these ASs.

(b) IP filtering

The access-list 1 list allows IP addresses issued from within each Centre. This list should be quite stable. The access-list 2 checks the incoming IP addresses. As new Centres are added to the IP network, the corresponding addresses must be added to these access-lists.

It must also be noted that despite Internet connections in B and C no extra attention is required to control routing exchange. A static default route is not sent even *if « redistribute static »* is enabled. RIP and BGP ignore routing information known via the other protocol.

APPENDIX 3 – SAMPLE SOCKET SEND AND RECEIVE ROUTINES

```
/*********************************************************************
* Sample TCP/IP Socket program that SENDS a single message
*********************************************************************/
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <signal.h>
#include <string.h>
#include <memory.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <netdb.h>

/* TCP/IP DESTINATION and SERVICE ARE DEFINED BY THE RECEIVING CENTRE */
#define DESTINATION         "localhost"
#define SERVICE      39000
#define GTS_LENFIELD 8
#define MAX_MSGSIZE       15000 /* value of the send buffer size, recommended: 4096 */

static void GetDestinationInfo();
static void SetupSocket();
static void SendData();
static void MakeConnection();

static struct sockaddr_in dest;
static int         pr_sock;

/*********************************************************************
*                              MAINLINE
* 1. Ignore SIGPIPE signals. These are generated if a connection
*  is lost. By default they cause a program to terminate.
* 2. Get information about the destination (GetDestinationInfo):
*              - IP number (and name)
*              - Service/Port number
* 3. Create a TCP/IP Socket (SetupSocket)
* 4. Connect to the destination centre (MakeConnection)
* 5. Send the message (SendData)
* 6. Close the socket (shutdown + close)
*********************************************************************/
main(int argc, char *argv[])
{

signal (SIGPIPE,SIG_IGN);
```

```
GetDestinationInfo();
SetupSocket();
MakeConnection();
SendData();
/* shutdown(pr_sock,1) */
close(pr_sock);

}

/*********************************************************************
*                              GET DESTINATION INFO
* Store the destination IP number and service number in a socket
* structure (dest).
* 1. Convert the destination name to an IP number (gethostbyname)
* 2. Store the IP number and service number in the "dest" structure.
*********************************************************************/
static void GetDestinationInfo()
{
struct hostent *hp;

hp = gethostbyname (DESTINATION);
if ( hp == NULL ) {
  printf("host error\n");
  exit(1);
  }

memset ((char *)&dest, 0, sizeof dest);
memcpy (&dest.sin_addr.s_addr, hp->h_addr, hp->h_length);
dest.sin_family = AF_INET;
dest.sin_port = SERVICE;
}

/*********************************************************************
*                              SETUP SOCKET
* Setup a TCP/IP Socket
* 1. Create the socket
* 2. Set the socket KEEPALIVE option.
*  This enables the automatic periodic transmission of "check"
*  messages to be sent on the connection. If the destination
*  does not respond then it is considered broken and this process
*  is notified (by SIGPIPE or end-of-file)
*3. Set the socket REUSEADDR option. Enable quicker restarting of
*  terminated processes.
*4. Reduce the size of the Socket send buffer to reduce the amount of data lost
*  if the connection fails.
*********************************************************************/
static void SetupSocket()
{
int          on = 1;
int          rc;
int          buffsize = MAX_MSGSIZE;

pr_sock = socket (AF_INET, SOCK_STREAM, 0);
if (pr_sock < 0) {
  printf("sock error\n");
  exit(1);
  }
```

```
 rc = setsockopt(pr_sock,SOL_SOCKET,SO_KEEPALIVE,(char *)&on,sizeof(on));
 if (rc != 0) {
  printf("keepalive error\n");
   }

 rc = setsockopt(pr_sock,SOL_SOCKET,SO_REUSEADDR,(char *)&on,sizeof(on));
 if (rc != 0) {
  printf("reuse error\n");
   }

rc = setsockopt(pr_sock,SOL_SOCKET,SO_SNDBUF,(char *)&buffsize,sizeof(buffsize));
 if (rc != 0) {
  printf("unable to set send buffer size\n");
   }

}

/*********************************************************************
*                              MAKE CONNECTION
* Attempt to make a TCP/IP Socket connection to the destination on
* the agreed service/port number.
*********************************************************************/
static void MakeConnection()
{
int             length;

length = sizeof (dest);
if ( connect (pr_sock,(struct sockaddr *)&dest,length) == -1 ) {
  printf("connection error\n");
  exit(1);
  }

printf("connected\n");
}

/*********************************************************************
*                                  SEND DATA
* Send a message on the socket (5 times actually).
*
* NOTE: A real program would check the return code from the write
* and if the write failed it would close the socket, raise an operator
* alarm, and then try to re-send from the start of the message
*********************************************************************/
static void SendData()
{
char            msg[MAX_MSGSIZE+1], buffer[MAX_MSGSIZE+GTS_LENFIELD+3];
int             buflen, i, rc = 0;

strcpy(msg,"\001\r\r\n001\r\r\nTTAA01 AMMC 000000\r\r\n");
for (i=0;i<60;i++)
  strcat(msg,"THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789\r\r\n");
strcat(msg,"\r\r\n\003");

sprintf(buffer,"%0*dAN%s",GTS_LENFIELD,strlen(msg),msg);
buflen = strlen(buffer);
```

```
for (i=0; i<5; i++) {
  rc = write(pr_sock,buffer,buflen);
  printf("write. rc = %d\n",rc);
  }

}

/*******************************************************************
* TEST TCP/IP SOCKET RECEIVING PROGRAM.
* Program is designed to give some ideas as to how to receive GTS
* style messages on a TCP/IP Socket connection.
*******************************************************************/
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <signal.h>
#include <string.h>
#include <memory.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <netdb.h>

#define SERVICE                 39000
#define MAX_MSGSIZE                     15000
#define MAX_BUFLEN                      MAX_MSGSIZE + 100
#define SOH                     '\001'
#define ETX             '\003'
#define GTS_LENFIELD                    8
#define GTS_SOCKET_HEADER       10

static void SetupService();
static void RecvData();
static void AcceptConnection();
static int ExtractMsg(char *buffer, int *buflen);
static int CheckMsgBoundaries (char *, int);
static int FindMessage (char *, int, int *);
static void ShiftBuffer (char *, int *, int);

static struct sockaddr_in dest;

static int      pr_sock, msgsock;
static char     buffer[MAX_BUFLEN+1];
static int      buflen = 0;

/*******************************************************************
*                                       MAIN
* Listen for incoming IP calls and read any incoming messages on
* the first call established.
*
* 1. Ignore SIGPIPE signals. These are generated if a connection
*  is lost. By default they cause a program to terminate.
* 2. Set-up a listening socket for incoming msgs (SetupService)
* 3. Accept the first call received (AcceptConnection)
* 4. Read any messages on this connection (RecvData)
* 5. Close the call and close the listening socket.
*******************************************************************/
main(int argc, char *argv[])
```

```
{

signal (SIGPIPE,SIG_IGN);

SetupService();
AcceptConnection();
RecvData();

close(msgsock);
/* shutdown(pr_sock,1) */
close(pr_sock);
}

/*********************************************************************
*                              SETUP SERVICE
* Listen for calls on a given Service/Port.
* 1. Create a socket
* 2. Set the socket KEEPALIVE option.
*  This enables the automatic periodic transmission of "check"
*  messages to be sent on the connection. If the destination
*  does not respond then it is considered broken and this process
*  is notified (by SIGPIPE or end-of-file)
* 3. Set the socket REUSEADDR option. Enable quicker restarting of
*  terminated processes.
* 4. Bind the socket to the required Service/Port
* 5. Start listening for calls.
*********************************************************************/
static void SetupService()
{
int             on = 1;
int             rc;
/* adjust the TCP receive buffer size
int             buffsize = MAX_MSGSIZE; */

memset ((char *)&dest, 0, sizeof dest);
dest.sin_addr.s_addr = INADDR_ANY;
dest.sin_family = AF_INET;
dest.sin_port = SERVICE;

pr_sock = socket (AF_INET, SOCK_STREAM, 0);
if (pr_sock < 0) {
  printf("sock error\n");
  exit(1);
  }

 rc = setsockopt(pr_sock,SOL_SOCKET,SO_KEEPALIVE,(char *)&on,sizeof(on));
 if (rc != 0) {
  printf("keepalive error\n");
  exit(1);
  }
 rc = setsockopt(pr_sock,SOL_SOCKET,SO_REUSEADDR,(char *)&on,sizeof(on));
 if (rc != 0) {
  printf("reuse error\n");
  exit(1);
  }
/* adjust the TCP receive buffer size
rc = setsockopt(pr_sock,SOL_SOCKET,SO_RCVBUF,(char *)&buffsize,sizeof(buffsize));
```

```
 if (rc != 0) {
  printf("unable to set send receive size\n");
  }
*/
rc = bind(pr_sock,(struct sockaddr *)&dest,sizeof dest);
if ( rc < 0) {
  printf("bind error\n");
  exit(1);
  }


rc = listen(pr_sock,1);
if ( rc < 0) {
  printf("listen error\n");
  exit(1);
  }

printf("listening\n");
}

/*********************************************************************
*                              ACCEPT CONNECTION
* Wait for an incoming call (accept).
* Return the socket of the call established.
*********************************************************************/
static void AcceptConnection()
{
int             addrlen;

printf("waiting connection\n");

addrlen = sizeof(sockaddr_in);
msgsock = accept (pr_sock,&dest,&addrlen);
if ( msgsock < 0) {
  printf("accept error\n");
  exit(1);
  }
printf("connected\n");
}

/*********************************************************************
*                              RECV DATA
* Read data from the message/call socket.
* Extract GTS messages from this data.
* Keep reading until the sender drops the call or there is an error.
*********************************************************************/
static void RecvData()
{
int             numr = 1;
int             rc = 0;

while (numr > 0 && rc >= 0) {
  numr = read(msgsock,buffer+buflen, MAX_BUFLEN-buflen);
  if (numr > 0) {
    buflen += numr;
    buffer[buflen] = '\0';
    printf("buffer = %s\n",buffer);
```

```
    rc = ExtractMsg(buffer,&buflen);
    }
  }
}


/*********************************************************************
*                          EXTRACT MSG
*  DESCRIPTION
*  This function accepts a buffer of data on input, along with the
*  amount of data in the buffer, and extracts GTS messages from this
*  buffer.
*
*  Messages that are in the buffer are identified as follows…
*
*  – The first 8 bytes of the message buffer HAVE to be a message
*   length in character format.
*   If the length exceeds the GTS defined maximum message size, or
*   does not consist of numeric characters, then an error is returned
*   (lost synchronization).
*
*  – Immediately following the message length is a 2 character
*              Message Type: "AN" = Alphanumeric, "BI" = binary, “FX” = Fax
*
*  – The GTS message begins with a SOH character, and is terminated
*   with a ETX character, if this does not occur, then an error is
*   returned (lost synchronization).
*
*  – If a GTS message is identified, then it is extracted and the
*   message is shifted out of the buffer.
*
*  – As there may be more than 1 message in the buffer, this function
*   will loop (extracting messages) until either and
*   error or incomplete message is detected.
*
*
*  RETURNS   = 0 - Not a complete message in the buffer.
*                < 0 - Fatal error in the format of the buffer.
*                > 0 - Success, the message(s) have been extracted
*********************************************************************/
static int ExtractMsg(char *buffer, int *buflen)
{
int          rc, msglen;
char         msg[MAX_MSGSIZE+1];

/* FIND THE FIRST MESSAGE IN THE BUFFER */
rc = FindMessage (buffer, *buflen, &msglen);

/* WHILE A VALID MESSAGE LENGTH IS FOUND IN THE MESSAGE BUFFER… */
while ( rc > 0 ) {

 /* ENSURE THAT THE FIRST CHARACTER AFTER THE MESSAGE LENGTH IS
   A 'SOH' CHARACTER, AND THE LAST CHARACTER AS INDICATED BY
   THE MESSAGE LENGTH IS AN 'ETX' CHARACTER. */
 if ( (rc = CheckMsgBoundaries (buffer, msglen)) < 0 )
   continue;
```

```
 /* PRINT THE EXTRACTED MESSAGE */
 memcpy(msg,buffer+GTS_SOCKET_HEADER,msglen);
 msg[msglen] = '\0';
 printf("GTS MSG = \n%s\n",msg);

 /* SHIFT THE JUST INJECTED MESSAGE OUT OF THE MESSAGE BUFFER,
   AND LOOP BACK TO LOOK FOR A NEW MESSAGE. */

 ShiftBuffer (buffer, buflen, msglen);

 /* FIND THE FIRST MESSAGE IN THE SHIFTED BUFFER */
 rc = FindMessage (buffer, *buflen, &msglen);

 }

return (rc);
}

/*********************************************************************
*                              FIND MESSAGE
* Check that the complete message is at the start of the buffer.
* 1. Check the first 8 characters which are the message length
* 2. Check the next 2 characters - Message Type
* 3. Check that the complete message, as defined by the "message length"
*  field, is in the buffer.
* Return codes:
*   0 = message incomplete
*   1 = message complete
*  -1 = error
*********************************************************************/
static int FindMessage (char *buffer, int buflen, int *mlen)
{
  char charlen[GTS_LENFIELD+1];
  int  intlen;

  *mlen = 0;

  /* IF THE LENGTH OF THE PASSED MESSAGE BUFFER IS NOT GREATER THAN
   10 CHARACTERS THEN RETURN 'INCOMPLETE'.  */
  if ( buflen < GTS_SOCKET_HEADER ) {
   return (0);
   }

  /* CHECK THAT THE MESSAGE TYPE IS VALID */
  if   (strncmp(buffer+GTS_LENFIELD,"AN",2)   &&   strncmp(buffer+GTS_LENFIELD,"BI",2)   &&
strncmp(buffer+GTS_LENFIELD,"FX",2)) {
   printf("ERROR: Message Type field invalid");
   return (-1);
   }

  /* EXTRACT THE MESSAGE LENGTH */
  strncpy (charlen, buffer, GTS_LENFIELD);
  charlen[GTS_LENFIELD] = '\0';

  /* CHECK THAT THE MESSAGE LENGTH CHARACTER STRING COMPRISES
   ENTIRELY OF DIGITS. RETURN AN ERROR IF THIS IS NOT THE CASE. */
  if ( strspn (charlen, "0123456789") != strlen (charlen) ) {
```

```
    printf("ERROR: length not numeric");
    return (-1);
    }

   /* CONVERT THE MESSAGE LENGTH CHARACTER STRING TO AN INTEGER. */
   intlen = atoi (charlen);

   /* CHECK THAT THE LENGTH EXTRACTED FROM THE BUFFER IS NOT GREATER
    THAN THE GTS DEFINED MAXIMUM MESSAGE SIZE - RETURN AN ERROR IF
    THIS IS THE CASE. */
   if ( intlen > MAX_MSGSIZE ) {
    printf("ERROR: message overlength");
    return (-1);
    }

   /* CHECK IF THE ENTIRE MESSAGE HAS BEEN RECEIVED. RETURN IF NOT */
   if ( buflen < intlen + GTS_SOCKET_HEADER ) {
    return (0);
    }

   *mlen = intlen;
   return (1);
}

/*********************************************************************
*                          CHECK MSG BOUNDARIES
* Confirm the first character after the Socket Header is
* a SOH, and the last character in the message (given by the message
* length) is an ETX.
*********************************************************************/
static int CheckMsgBoundaries (char *buffer, int msglen)
{

   /* CHECK THAT THE FIRST CHARACTER (AFTER THE MESSAGE LENGTH
     FIELD) IS AN SOH CHARACTER - RETURN AN ERROR IF IT ISN'T. */
   if ( buffer[GTS_SOCKET_HEADER] != SOH ) {
    printf("ERROR: SOH not found\n");
    return (-1);
    }

   /* CHECK THAT THE LAST CHARACTER (ACCORDING TO THE MESSAGE LENGTH
     FIELD) IS AN ETX CHARACTER - RETURN AN ERROR IF IT ISN'T. */
   if ( buffer[msglen+GTS_SOCKET_HEADER-1] != ETX ) {
    printf("ERROR: ETX not found\n");
    return (-1);
    }

   return (1);
}

/*********************************************************************
*                          SHIFT BUFFER
* Shift the leading message in the buffer out of the buffer. This may
* either empty the buffer, or move all or part of a new message to the
* start of the buffer.
*********************************************************************/
static void ShiftBuffer (char *buffer, int *buflen, int msglen)
```

```
{
  int shiftlen;

  /* CALCULATE THE AMOUNT OF DATA TO BE SHIFTED OUT OF THE BUFFER. */
  shiftlen = msglen + GTS_SOCKET_HEADER;

  /* SHIFT THE 'PROCESSED' DATA OUT OF THE BUFFER BY MOVING THE
   UNPROCESSED DATA OVER THE TOP OF IT.
   CALCULATE THE NEW AMOUNT OF DATA IN THE BUFFER. */
  *buflen = *buflen - shiftlen;
  memcpy (buffer, buffer + shiftlen, *buflen);
}
```

APPENDIX 4 – SOME SECURITY ARRANGEMENTS FOR SMALL GTS CENTRES (OBSOLETE)

Appendix 4 has been removed from this Attachment. All IT Security material can now be found in the "Guide on Information Technology Security" which is at

http://www.wmo.int/pages/prog/www/documents.html

~~This Appendix provides information on low-cost measures to secure GTS centres, when they are connected to the Internet. The traditional GTS with Message Switching Systems passing bulletins over point-to-point circuits is inherently secure, while the Internet is inherently insecure. So, it is important to prevent Internet users from being able to traverse GTS links, where they may be able to cause damage to neighbouring centres.~~

~~Security policy~~

~~In a mixed Internet/GTS environment, a security hole at a GTS centre may compromise other GTS segments. It is very likely that sooner or later, most of the GTS centres will be connected to the Internet, so a solution for the security aspects must be found, which are practical for all Centres and especially, small centres. Different levels of network security can be achieved with the tools available today at costs that vary from a few dollars (freeware) to expensive proprietary solutions.~~

~~There are, however, other important aspects besides costs. Technical expertise and strong management support are indispensable elements to implement and enforce an effective security policy. Without them, no protection will be achieved, even with the best and most expensive firewall systems.~~

~~Coexistence of Internet and dedicated GTS links~~

~~There are many options for the general configuration of systems in small Centres. Figure A4.1 shows an arrangement where separate routers are used to provide access to Internet and GTS.~~

~~Figure A4.1 — Coexistence of GTS and Internet – separate access routers~~

~~To achieve cost reduction, GTS centres, may wish to consolidate the GTS and Internet networks, whilst still providing a level of security for their GTS systems. Figure A4.2 depicts a low cost configuration that may meet this objective.~~

~~Figure A4.2 — Coexistence of GTS and Internet – common access router~~

~~Protecting the GTS links from the Internet~~

~~It is important that the exterior router(s), connected to both GTS and Internet links be securely passworded, and protected so that it may not be configured via the Internet. Additionally, no Internet traffic should be allowed to propagate down GTS links, nor GTS traffic be sent to the Internet unless specifically intended to do so. This can be achieved by carefully filtering routing updates.~~

~~There should be a definite separation between general Internet services (www/http, e-mail access) and the GTS system (e.g. Message Switch). They should be in separate machines. Additionally, use of firewalling technology should be undertaken to limit general Internet access to the GTS~~

~~Centre internal network, possibly restricting incoming connections to SMTP on the mail server, HTTP on the web server and DNS on the Domain Name servers.~~
~~In between the exterior router and critical systems, a firewall should be deployed. This firewall must have the capacity to limit, proxy or redirect access to internal hosts in order to protect them. Several brands of firewall are on the market, with ranges of capabilities. In most cases because of the simple nature of the network in small centres, a simple firewall may be deployed.~~
~~When connecting to the Internet, deploying some sort of firewall is virtually mandatory. The risks for internal data and systems would justify this. In order to allow the access control some low-cost options are available.~~

~~Linux computers~~
~~Linux Operating system is free, and runs on a variety of hardware platforms, notably on PCs. The newest versions of Linux (Kernel version 2.2) come with firewalling software called ipchains. Additionally, they support routing protocols through a routing program called gated. Centres with some experience with UNIX will be able to get a working firewall setting up linux from scratch.~~

~~Windows NT~~
~~A variety of commercial packages exist. The familiarity with the Windows and relatively low cost of PC hardware is seen as main advantage.~~

~~Free Toolkits~~
~~A company called TIS (Trusted Information Systems) has released a set of source code, mainly for UNIX/LINUX hosts, which is freely available. This requires access to UNIX/LINUX machines, compilers, and requires good knowledge of Internet security issues.~~

~~Routers~~
~~Many routers have packet filtering capabilities. It is possible to deploy one of these as firewall, although they aren't very flexible. Smaller centres may want to consider this.~~
~~Desirable solution~~
~~Some firewall vendors have been providing firewall solutions, based on their hardware. Cisco's IOS firewall is a notable example. This type of solution is depicted in Figure A4.3.~~

~~Figure A4.3 — Coexistence of GTS and Internet – separate access routers plus firewall GTS using the Internet~~

~~There will be situations where GTS centres will use Internet to transport data and products. Security concerns are also applicable here. The arrangement shown below in Figure A4.4 represents a simple and safe way to use the Internet to connect neighbouring GTS centres that may become popular in small centres in future. Firewalling is done using access lists.~~
~~Figure A4.4 — The use of Internet between neighbouring GTS Centres~~

~~Virtual private network – secure GTS connections over the Internet~~
~~A virtual private network (VPN) is a private network implementation among organizations to communicate over a publicly accessible network. VPN message traffic can be carried over the Internet on top of the standard TCP/IP protocols. Secure VPNs use cryptographic tunneling protocols to provide the sender authentication, message integrity and confidentiality to achieve privacy. This is considered suitable for use for the transmission and exchange of meteorological data among centres.~~

~~The most common Secure VPN protocol is IPSec. IPSec is designed to provide interoperable high quality, cryptographically-based security for IP. The set of security services offered includes access control, connectionless integrity, data origin authentication, protection against replays, as well as confidentiality. IPSec is an end-to-end security protocol: all the functionality and intelligence of the VPN connection reside at the end points, either in a gateway or in the end-host. Through IPSec, it is possible to establish a tunnel between two gateways. An IPSec gateway would typically consist of an access router, a firewall or a VPN gateway on which the IPSec protocol is implemented. The IPSec gateway locates between the user's private network and the carrier's shared network.~~

~~IPSec tunnels are established dynamically and released automatically when they are not in use. To establish an IPSec tunnel, two gateways must authenticate themselves and defi ne which security algorithms and keys they will use for the tunnel. The entire original IP packet is encrypted and wrapped inside IPSec authentication and encryption headers. Figure A4.5 shows an implementation of a VPN connection using IPSec between two GTS centres.~~

~~Figure A4.5 — The use of VPN over the Internet to connect two GTS Centres~~

~~The VPN gateway is connected to a firewall and a router. The VPN gateway can establish a VPN tunnel with other VPN gateways through the interface of the router. The flow of traffic into the internal network will be through the firewall and will be controlled by an access list defined by the user.~~

~~IPSec makes use of the Authentication Header (AH) and the Encapsulation Security Payload (ESP) to achieve data integrity and confidentiality.~~

~~The most common encryption algorithm used in ESP is Triple Data Encryption Standard (3DES) and Advanced Encryption Standard (AES). They have encryption key sizes from 128 bits to 256 bits, providing suffi cient protection for data traffi c along the trunk.~~

~~Further details on VPN implementation can be found in the Guide on Virtual Private Network (VPN) via the Internet between GTS centres. This Guide is available on the WMO web page at http://www.wmo.int/web/pages/prog/manuals.html.~~

APPENDIX 5 – REFERENCE MATERIAL

General references on TCP/IP

1. Internetworking TCP/IP Vol. 1 (2/E) – Douglas Comer – Prentice Hall
2. TCP/IP Illustrated Vol. 1. – Stevens – Addison-Wesley
3. TCP/IP Architecture, Protocols and Implementation – Feit – McGraw Hill
4. TCP/IP and Related Protocols – Black – McGraw Hill
5. TCP/IP Running a Successful Network – Washburn and Evans – Addison-Wesley
6. TCP/IP and ONC/NFS (2/E) – Santifaller – Addison-Wesley
7. Inside TCP/IP – Arnett et. al. – New Riders Publishing
8. Teach Yourself TCP/IP in 14 days – Parker – SAMS
9. Introduction to TCP/IP – Davidson – Springer

References on Security

1. Firewalls and Internet Security- Cheswick & Bellovin – Addison-Wesley
2. Building Internet Firewall – Chapman – O'Reilly
3. Practical Unix Security – Garfinkel & Spafford – O'Reilly
4. Internet RFC 2196 (Site security Handbook)
5. http://www.computersecuritynow.com: a website with a lot of reference documents on 6. implementing security

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APPENDIX 6 – SUGGESTED PASSWORD MANAGEMENT PRACTICES (OBSOLETE)

Password management is a topic included in the IT Security discussion. All IT Security material can now be found in the "Guide on Information Technology Security" which is at

http://www.wmo.int/pages/prog/www/documents.html

~~Passwords are the system's fi rst line of defence against unauthorized intrusion. While it is possible to violate system security without logging in, a poorly protected or chosen password can make a hacker's task a lot easier.~~

~~GOOD PASSWORDS:~~

1. ~~Have both upper-case and lower case letters, and/or~~
2. ~~Have digits and/or non-alphanumeric characters.~~
3. ~~Are 6 to 8 characters long.~~
4. ~~Should consist of at least 2 words or groups of characters.~~
5. ~~Should not be shared or used by more than one user.~~
6. ~~Should not be used on more than one computer.~~
7. ~~Should be changed regularly, e.g. monthly.~~
8. ~~Can be typed quickly and easily, so that an observer cannot follow the keystrokes.~~
9. ~~Are easy to remember so that they should not have to be written down. (e.g. use first letter of words in a well known phrase).~~

~~BAD PASSWORDS:~~

1. ~~The name of: yourself, your spouse, your children, your parents, your pet, your friends, your favourite film stars/characters, anyone associated with you, your workstation or its host.~~
2. ~~The number of: your telephone, your car's license plate, your user ID, any part of your credit cards' numbers, or any number associated with you.~~
3. ~~The birthday of yourself or anyone associated with you.~~
4. ~~Any word from any dictionary, any place name, any proper noun.~~
5. ~~The name of a well known public identity such as a sporting hero, entertainer or well known fictional character.~~
6. ~~Simple patterns: aaaaaaa, qwerty.~~
7. ~~Any of 1 - 6 spelled backwards.~~
8. ~~Any of 1 - 6 preceded or followed by a digit.~~
9. ~~Any password that has been written down and left in an unlocked drawer or unsecured computer file.~~
10. ~~Any password that has been on a machine that may have been successfully hacked (except as part of authorised exercises).~~
11. ~~Any password on a machine that has been left unattended when any user is logged on.~~

APPENDIX 7 – IP ADDRESSES FOR USE ON THE GTS

INTRODUCTION

The current "Recommended practices and procedures for the implementation, use and application of the Transmission Control Protocol/Internet Protocol (TCP/IP) on the GTS" as given in the Manual on GTS, Attachment II-15 (also known as "Guide on the Use of TCP/IP on the GTS") describe guidelines and a procedure for assigning IP addresses to GTS links which are no longer adequate. In particular, it states that a number of official class C IP addresses were available through the WMO Secretariat to be assigned for GTS links. These sets of IP addresses are no longer officially available, as a consequence of a strict application of Internet standards (RFCs) by Internet Authorities and Services Providers, and unfortunately cannot be used on the GTS, as they may now be assigned to other organizations on the Internet. The WMO Secretariat has therefore been instructed to discontinue the assignment of such IP addresses.

The Expert Team on Communication Techniques and Structure (ET-CTS) has been tasked to provide alternate solutions to solve this issue.

This document is a provisional description of the available options and related guidance to mitigate this problem and assist Members in their implementation. The included guidelines only concern the IP addressing. They do not change the existing recommendations on how IP relates to X.25 or other IP functionality.

The ET-CTS will proceed with developing the proposed amendments to this Attachment to reflect the new recommended practices for allocating IP addresses.

WHO CAN PROVIDE OFFICIAL IP ADDRESSES?

In order to build a network that interconnects many organizations from various countries in the world, it is essential to maintain a standard in the addressing scheme, and to maintain uniqueness in the allocation of addresses to the various organizations. The Internet community has identified this basic principle and created some official bodies to coordinate the distribution of official IP addresses. Today, this responsibility belongs to the Internet Assigned Numbers Authority (IANA), and its regional delegates, the relevant Regional Internet Registries:

AfriNIC (African Network Information Centre) – Africa region
APNIC (Asia Pacific Network Information Centre) – Asia Pacific region
ARIN (American Registry for Internet Numbers) – Americas and Southern Africa
LACNIC (Regional Latin-American and Caribbean IP Address Registry) – Latin America and some Caribbean islands
RIPE NCC (Réseaux IP Européens Network Coordination Centre) – Europe and surrounding areas

These organizations further delegate the allocation of addresses to their regional Internet and telecommunications suppliers through national Internet registries.

In this scheme, it is not the WMO's responsibility to allocate IP addresses. Since the GTS is not built as a unique network under the complete authority of a single organization, the allocation of addresses must therefore go through the respective national Internet registry or the appropriate Regional Internet Registry.

However, several countries now face the issue of the restriction of allocation of IP version 4 (IPv4) addresses and may have difficulty obtaining official addresses. This problem is not an easy one to solve in the short term and provisional measures may have to be taken to allow the further development of the GTS. The following guidelines explain how to interconnect networks with and without the use of official IP addresses.

CONNECTING NETWORKS WITH OFFICIAL IP ADDRESSES

Using official IP addresses assigned directly to an organization (e.g. the NMS)

This remains the preferred option if it is feasible. It is basically the main procedure described in the existing "Guide on Use of TCP/IP on the GTS". It follows all the Internet rules and allows an organization to build a coherent network with interconnections to the Internet, GTS and possibly other partner organizations. It is also the easiest configuration to maintain.

In interconnecting two countries to form a GTS link, the two National Meteorological Services should decide which one actually provides the address to the interconnecting link. The decision remains one of practicality for the countries. There are no general rules that would favour one set of addresses over another one.

Using official IP addresses provided by a telecommunications supplier

This option is very similar to the previous one. The addresses supplied would be official and all the rules would of course be followed.

It may require that a common telecommunications supplier be used between the two interconnecting organizations.

This option however has the drawback that a change in telecommunication suppliers may require a change in IP addressing as original incumbent reclaims "his" addresses. Each organization should

plan for this possibility ahead of time and evaluate its impact on future operations. If these addresses are only used for link purposes and not for an organization's internal purposes, then this drawback may be of minimal impact.

Using IP version 6 (IPv6) addresses

The new IP version 6 (IPv6) protocol standard was designed in great part to address the shortage of IPv4 addresses. Although the IPv6 protocol is available and supported in many telecommunication equipments available today, its implementation requires much planning. In particular, IPv4 and IPv6 are not compatible without the use of gateways and there are several operational tools still missing to make IPv6 usable for the GTS at this time. Converting to IPv6 would be a major task that can not be imposed on our members until the industry is ready to take this step as a whole.

This option is therefore not available today. It is only mentioned here for completeness and will be further studied over the next years.

CONNECTING NETWORKS WITHOUT OFFICIAL IP ADDRESSES

Using the "ip unnumbered" feature

Several network equipment suppliers (Cisco, 3Com, Juniper) have now introduced a feature in their configurations which allows the implementation of links without the need for allocation of IP addresses. This feature is usually called the "ip unnumbered" feature. For example, Cisco provides a document on "Understanding and Configuring the ip unnumbered Command" (see
http://www.cisco. com/warp/public/701/20.html
for details).

This feature is not a standard IP protocol feature, so it requires compatible equipment at both ends of the link to work (most frequent situation anyhow).

Routing between the two networks can be accomplished by binding the unnumbered interface to another existing interface in the router (either a real LAN or virtual loopback interface). The use of this feature may introduce limitations in routing flexibility.

Using RFC1918 – Addresses for private internets

The Internet Engineering Task Force (IETF) document "RFC1918 – Addresses for private internets" describes a set of addresses reserved for use by organizations *for sole intra-enterprise communications, without any intention to ever directly connect to other enterprises or the Internet itself*. Private internet addresses are sometimes referred to as "non-official IP addresses" or "non-registered IP addresses". Addresses for private internets are in fact official, but they are not unique.

Therefore the use of these addresses does not require official registration. The main purpose of this scheme is to allow a big organization to make use of a larger address space for its internal operations. As soon as the organization needs to exchange with others, a gateway must be traversed to enter an area of officially assigned addresses to maintain overall network coherence. This gateway must translate the internal RFC1918 addresses into official external IP addresses, which must be obtained via the official bodies. The function (usually performed by a router or firewall) that does this translation is called Network Address Translation (NAT). This address translation will also have the effect of concentrating several RFC1918 internal addresses into a very small number of official addresses, thus preserving official address space.

Although this scheme might seem attractive at first for our issue, the GTS is not the network of a single enterprise. At this time, any number of the WMO Member NMHSs and related organizations

may already make use of the RFC1918 in their own networks, which may result in conflicting address allocations if the networks interconnect. A recommendation from WMO for the use of RFC1918 is almost an impossible task, as the NMHSs may already be under guidelines of their own government, which might conflict with a directive of WMO. However, interconnecting countries may find adequate address space within RFC1918 in a bilateral agreement.

This option is therefore feasible as long as the following points are carefully considered, planned, maintained and monitored:

1. Great care should be taken in selecting a proper RFC1918 set of addresses for links between organizations. It is important that the selected addresses are not already in use by any of the involved organizations.

2. Great care should be taken to ensure that routing configurations do not allow the leaking of RFC1918 addresses into other organization's network or worse, into the Internet.

3. Although this solution will work quite satisfactorily between a few countries, it cannot be expanded to many directly interconnected countries, as the choice of RFC1918 addresses will get more and more complicated.

4. The IANA has reserved the following blocks in RFC1918.
   10.0.0.0 - 10.255.255.255 (10/8 prefix)
   172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
   192.168.0.0 - 192.168.255.255 (192.168/16 prefix)
   Since many organizations already use the 10.0.0.0/8 block internally and since the 192.168.0.0/16 block is often used as default addresses by several equipment manufacturers, it is recommended that GTS links be used out of the 172.16.0.0/12 block only if possible.

6. Furthermore, it is also recommended that the 172.16.0.0/12 be subnetted in a way to maximize the usage of the address space. To that effect, GTS links can be subnetted to /30 bits. This allows 4 hosts per link (leaving the hosts addresses 1 and 2 available to designate the 2 ends of a given link).

7. NMHS that consider using the RFC1918 addresses should consult with all potential NMHS with whom they might establish a link in order to coordinate and plan the use of these subnets ahead of time. In the case of address conflicts, other address schemes within RFC1918 might be used by bilateral agreement. The ET-CTS would like to be informed of such issues if they arise to further develop this recommendation.

The use of RFC1918 addresses should not introduce security problems as long as the above points are well managed.

RECOMMENDATION

All the options described above can be used in the GTS. The order of preference is as follows:

1. Using official IP addresses assigned directly to an organization, e.g. the NMHS (preferred).
2. Using official IP addresses provided by a telecommunications supplier.
3. Using the "ip unnumbered" feature.
4. Using RFC1918 – Addresses for private internets.

The use of IPv6 on the GTS is not recommended at this time.

It should be understood that all options that do not require official IP addresses are workarounds to mitigate the shortage of addresses and must be used with care.

It should be understood that all options that do not require official IP addresses are workarounds to mitigate the shortage of addresses and must be used with care.

CONFIGURATION EXAMPLES

Option 1 – Using existing organization (NMHS) official IP addresses or Option 2 – Using Telecommunication Supplier official IP addresses

This is the standard way to configure an interface between two networks.

```
Router A:
!
interface Ethernet0
ip address 131.238.17.11 255.255.255.0
!
interface Serial0
description 64Kbps leased line to router B
ip address 131.238.18.01 255.255.255.252
encapsulation ppp
bandwidth 64
!
ip route 142.47.43.0 255.255.255.0 131.238.18.2
!
Router B:
!
interface Ethernet0
ip address 142.47.43.201 255.255.255.0
!
interface Serial0
description 64Kbps leased line to router A
ip address 131.238.18.02 255.255.255.252
encapsulation ppp
bandwidth 64
!
ip route 131.238.17.0 255.255.255.0 131.238.18.1
```

建议4 (CBS-Ext.(10))

指定WMO信息系统(WIS)的中心

基本系统委员会，

注意到：

(1) 第十五次世界气象大会含决议案的最终节略报告(WMO-No.1026)赞同的全球信息系统中心(GISC)和资料收集或制作中心(DCPC)的指定程序(总摘要第3.1.2.13段)，

(2) 基本系统委员会特别届会(2006)含决议和建议案的最终节略报告(WMO-No.1017)附录三给出的GISC和DCPC的建议指定程序，

(3) 建议5 (CBS-Ext.(10)) – 修订《技术规则》(WMO-No. 49)卷1第A.3节建议的对《技术规则》(WMO-No. 49)卷1第A.3节的修订，

(4) 建议6 (CBS-Ext.(10)) –《WMO信息系统手册》(WMO-No.1060)关于《WMO信息系统手册》(WMO-No.1060)的建议，

建议大会，

(1) 指定本建议附录表1列出的中心为WIS全球信息系统中心(GISC)；

(2) 指定本建议附录表2列出的中心为WIS资料收集或制作中心(DCPC)；

(3) 指定本建议附录表3列出的中心发挥表3规定的作用；

(4) 有条件地指定本建议附录表4列出的证明其符合CBS管理组预备业务要求的中心为GISC或DCPC，其条件是向委员会管理组展示已符合预备业务中心要求，并且表4列出的任何中心，如果至EC-64尚未证明其符合预备业务要求，将从有条件指定的中心中删除；

(5) 确认任何希望接纳为DCPC或GISC的中心在执行理事会第六十四次届会前尚未得到指定，必须在执行理事会指定其为规定的中心前证明它已符合预备业务要求并得到委员会管理组的赞同；

要求秘书长采取适当的行动，在委员会主席与委员会管理组磋商并对建议进行更新后，将该建议提交给第 16 次世界气象大会。

建议 4(CBS-Ext.(10)) 的附录

指定 WMO 信息系统 (WIS) 的中心

本附录列出了那些委员会建议指定其发挥 WMO 信息系统中心作用的中心。

表 1：因满足预备业务要求而被 CBS-Ext(10) 批准的发挥 WIS 全球信息系统中心（GISC）作用的中心

中心	拟发挥的作用
中国北京	GISC
德国奥芬巴赫	GISC
日本东京	GISC

表2： 因满足预备业务要求而被CBS-Ext(10)批准的发挥WIS资料采集和制作中心(DCPC)作用的中心

中心	拟发挥的作用
中国北京	DCPC
德国奥芬巴赫	DCPC
日本东京	DCPC
ECMWF	DCPC
EUMETSAT	DCPC

表3： 在CBS-EXT(10)之后得到委员会管理组同意且符合预备业务要求的中心

中心	拟发挥的作用

注：待委员会主席在第十六次大会前更新。

表4： 已注册拟发挥WIS GISC和/或DCPC作用的中心，但在向第16次大会提交文件时这些中心尚未完成符合预备业务要求的展示活动。

中心	拟发挥的作用
美国阿什维尔	DCPC
美国博尔德	DCPC
巴西巴西利亚	GISC
印度德里	GISC, DCPC
英国埃克塞特	GISC, DCPC
中国香港(世界天气信息服务)	DCPC
沙特阿拉伯吉达	GISC
俄罗斯联邦哈巴罗夫斯克	DCPC
摩洛哥马拉喀什	GISC
澳大利亚墨尔本	GISC, DCPC
加拿大蒙特利尔	DCPC
俄罗斯联邦莫斯科	GISC, DCPC
俄罗斯联邦奥布宁斯克	DCPC
挪威奥斯陆	DCPC
南非比勒陀利亚	GISC
意大利罗马	DCPC

中心	拟发挥的作用
俄罗斯联邦圣彼得堡	DCPC
韩国首尔	GISC, DCPC
芬兰索丹屈莱	DCPC
瑞典斯德哥尔摩	DCPC
伊朗伊斯兰共和国德黑兰	GISC
法国图卢兹	GISC, DCPC
俄罗斯联邦新西伯利亚	DCPC
美国华盛顿	GISC, DCPC

建议5 (CBS-Ext.(10))
修订《技术规则》(WMO-No. 49)，第I 卷，第A.3节

基本系统委员会，

注意到：

(1) 决议1(Cg-15)– 《世界气象组织技术规则》，

(2) 决议2(Cg-15)– 2008-2011年世界天气监视网计划，

(3) 《技术规则》(WMO-No. 49)第一卷 – 通用气象标准和建议的规范，第A.3节，

(4) 第十四次大会在其第14次届会决定建立一个总体的WMO信息系统(WIS)，用于信息收集并与整个WMO及相关国际计划共享。

考虑到：

(1) 第十五次大会强调指出，WIS需要有相应的规章性文件，并要求基本系统委员会制定规章性文件，

(2) 执行理事会在其第六十二次届会上强调了有关WIS的相应规章性和指导性文件的重要性，并要求WMO信息系统跨委员会协调组(ICG-WIS) 和基本系统委员会就技术规则(WMO-No. 49)中的相关章节提出修正案，提交第十六次大会审议，

建议大会，修订《技术规则》第一卷 – 通用气象标准和建议规范第 A.3 节 (见本建议的附录)，并于 2012 年 1 月 1 日起生效。

建议5(CBS-Ext.(10))的附录
修订《技术规则》(WMO-No.49)第I卷，第A.3节

整个 A.3 节包括其标题由下文取代，并据此修订第 I 卷的内容：

目录

A. 世界天气监视网
A.3. WMO 信息系统 (WIS)
第 A.3.1 章 目的 { 插入页码 }
第 A.3.2 章 原则 { 插入页码 }
第 A.3.3 章 组织 { 插入页码 }
第 A.3.4 章 职责 { 插入页码 }
第 A.3.5 章 规范、程序和规格 { 插入页码 }

第 A.3.1 章 目的

WMO 认为，其在天气、气候、水和相关环境问题方面开展的工作是依靠信息的收集、分发、及公开共享，通常采用快速和非常可靠的方法。WMO 信息系统 (WIS) 使 WMO 充分发挥效率和效能的一项关键战略。

第 A.3.2 章 原则

A.3.2.1 WIS 须用于收集信息并与整个 WMO 及相关国际计划共享。

A.3.2.2 WIS 须提供一种灵活且可扩展的资料管理和资料通讯结构，使各参与中心能够随着其国家和国际责任的发展提高其能力。

A.3.2.3 WIS 须在相关规范、程序和规格中采用国际标准。

A.3.2.4 WIS 资料通讯网所采用的基本工程原则须对全球、区域和国家资料通讯系统的整合做出规定，以确保在规定的可接受的延时范围内传输所需的信息。

第 A.3.3 章 组织

A.3.3.1 WIS 主要通过资料管理功能加以组织，并吸收所需的信息交换功能。WMO 全球电信系统 (GTS) 将被纳入 WIS。

A.3.3.2 WIS 的各参与中心须被分为三类：

- 全球信息系统中心 (GISC)，
- 资料收集或制作中心 (DCPC)，

- 国家中心 (NC)。

A.3.3.3 大会和执行理事会须根据基本系统委员会 (CBS) 的建议，考虑指定 GISC 和 DCPC。大会和执行理事会须定期审议以前指定的各 GISC 和 DCPC，并可根据 CBS 的建议，重新考虑对它们的指定。CBS 的建议须包括与相关技术委员会及区域协会的磋商意见。各会员须指定 NC。

A.3.3.4 WIS 的功能和业务须以包含描述 WMO 现有资料和产品的元数据，以及描述分发和获取方案的元数据目录为基础。这些目录将由各 WIS 中心保存。

A.3.3.5 通过所有 GISC 间的合作，各 GISC 须提供对整个目录的全面搜索。各 GISC 须对用于全球交换的 WMO 资料及产品提供调用和分发。各 GISC 须在其职责范围内与 DCPC 及 NC 进行合作。

A.3.3.6 各 DCPC 须利用 WIS 来收集、分发、调用及存储相关区域或特定计划的资料和产品。各 DCPC 须保留其产品和服务的目录，并向 GISC 提供相应部分的目录，以确保完整的 WIS 产品目录。

A.3.3.7 各 NC 须根据其计划职责，利用 WIS 来提供资料和产品。各 NC 须向其它 WIS 中心提供相关的元数据，以便将其纳入完整的 WIS 产品目录。

A.3.3.8 各 GISC、DCPC 和 NC 须参与对 WIS 性能的相关监测。

A.3.3.9 WIS 须合并资料通讯网管理，包括专用资料网络服务 (特别是关于重要任务的信息交换) 以及公共资料网络服务 (例如，互联网)，以确保有效和高效地交换所需信息。

第 A.3.4 章 职责

A.3.4.1 运行 GISC、DCPC 和 NC 的会员须根据其需求及其所承担的职责，确保采取所相应的措施，保证各自中心及所需的资料通信系统和服务的设施到位及运转良好。

A.3.4.2 各会员须确保其国家的信息收集系统不仅能够满足国家需求，而且还要满足国际需求。

第 A.3.5 章 规范、程序和规格

A.3.5.1 WIS 的资料管理和信息交换功能须根据附录 7(WMO 信息系统手册 (WMO No. 1060)) 规定的规范、程序和规格建立和运行。

A.3.5.2 WIS 的 GTS 的运行须遵照附录 3(全球电信系统手册 (WMO No. 386) 第一卷) 规定的规范、程序和规格。

注： 《WIS 手册》是《GTS 手册》(WMO No. 386) 的一个补充。最终，《WIS 手册》将合并相关内容后，取代《GTS 手册》。

建议 6(CBS-Ext.(10))

《WMO 信息系统手册》 (WMO-No. 1060)

基本系统委员会，

注意到：

(1) 决议 1 (Cg-15) – 世界气象组织技术规则，

(2) 决议 2 (Cg-15) – 世界天气监测网计划 2008–2011，

(3) 技术规则 (WMO-No. 49)，

(4) 全球电信系统手册 (WMO-No. 386)， 第一卷 – 全球方面，

考虑到：

(1) 第十五次大会强调需要一份相关的WMO 信息系统(WIS)规章文件，并要求基本系统委员会根据对初步的组织、功能和业务设计的验证分阶段制定规章文件，

(2) 执行理事会第六十二次届会，

(a) 根据WIS在早期实施中的经验，强调制定WMO信息系统手册为高优先重点；

(b) 注意到并支持为今后制定“WMO信息系统手册”业已奠定的基础，包括需遵守的WIS规格和WIS的功能结构，

建议通过本建议的附录给出的 WMO 信息系统手册，并将此作为技术规则 (WMO-No. 49) 的附录七，自 2012 年 1 月 1 日起生效；

要求秘书长用所有 WMO 正式语言出版本建议附录中的 WMO 信息系统手册；

授权秘书长对 WMO 信息系统手册做编辑修改。

建议6(CBS-EXT.(10))的附录
《WMO信息系统手册》(WMO-NO. 1060)

世界气象组织

WMO信息系统 (WIS) 手册

(WMO 技术规则附录七)

2012 年版

基本文件 No. 2

WMO-NO.1060

世界气象组织秘书处 - 瑞士 - 日内瓦

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1 引言

1.1 手册的目的

1.1.1 WIS 手册的目的是确保 WMO 会员在运行 WIS 以支持 WMO 的各项任务时采用的资料、信息和通讯规范、规程和规格具有足够的统一性和标准。WIS 手册列出标准的规范、规程和规格 (用 " 须 " 加以区别)，它们在技术方案中具有必须的地位，WMO 会员均须遵循或执行。WIS 手册还列出推荐的规范、规程和规格等 (用 " 应当 " 加以区别)，会员受敦促与其保持一致。

1.1.2 WIS 手册是《技术规则》(WMO No. 49)，第一卷 (常用气象标准和推荐规范) 的附录七。该附录指出，WIS 根据 WIS 手册中的规范、规程和规格建立和运行。

1.1.3 由于 WIS 与 WMO 所有相关学科领域相互交叉，WMO 许多其他规范、规程和规格与 WIS 交叉重叠。这些规范、规程和规格主要规定在各自具体的出版物中。如其中有全球资料处理和预报系统手册 (WMO No. 485) 和全球观测系统手册 (WMO No. 488)。

2 组织和责任

2.1 WIS 的组织

2.1.1 为保持与 WMO No. 49，第一卷，A.3 的统一，WMO 会员和它们的合作组织运行的中心须根据 WIS 的三种中心进行分类，形成 WIS 的核心基础结构：

- 全球信息系统中心 (GISC),
- 资料收集或制作中心 (DCPC),
- 国家中心 (NC).

WIS 三种中心 (GISC, DCPC, NC) 的功能区别见第 4 章 WIS 的功能。

2.1.2 WOM 常任代表负责批准 WIS 的用户。管理过程的权限可委托。

2.2 遵守规定的 WIS 功能

WIS 中心须始终遵守规定的 WIS 功能。WIS 手册对 WIS 各项功能的规范、规程和规格作出说明。WIS 指南 (WMO No. 1061) 提供的有关 WIS 功能的规范、规程和规格的其他信息是对手册的补充。

2.3 WIS 中心的互动

GISC 之间须以主干通讯网 (MTN) 为基础，用 WIS 核心网络连接。GISC 须收集各自责任区内的 DCPC 和 NC 的资料、产品和元数据。区域气象资料通讯网 (AMDCN) 须负责所有 GISC 与各自责任区内的 DCPC 和 NC 的连接。AMDCN 可能覆盖多个区域气象通讯网 (RMTN) 和部分 RMTN。

2.4 WIS 的实施

WIS 分两部分并行实施。一部分将继续发展 WMO 全球通讯系统 (GTS)，其重点是进一步改进重在时效和重在任务的资料、产品和服务的提供，包括警报。另一部分则通过发现、访问和检索 (DAR) 设施拓展 WMO 的服务，以及灵活及时的提供。

2.5 发现、访问和检索功能

根据 WMO No. 49，第一卷，A.3 的要求，WIS 须以包含描述 WMO 拥有的所有资料和产品的元数据目录，以及描述分发和访问选项的元数据目录为基础。WIS 的发现、访问和检索 (DAR) 功能须成为所有 WIS 中心合作维护的 WIS 综合目录的主要成果。

2.6 组成部分的稳定性和可靠性

组成部分的稳定性和可靠性对 WIS 的运行十分重要。在指定 WIS 中心的程序中须对性能指标进行评价。评价须包括通过 WIS 网络技术传输的资料内容能保证充分满足用户在安全、真实和可靠性方面的需求。本 WIS 手册规定了某些服务层次问题。

2.7 收集和分发服务

2.7.1 WIS 须提供三种收集和分发服务：

- 重在时效和重在业务的资料和产品的日常收集和分发服务：此项服务基于实时“推”机制，包括多点广播和广播；此项服务的实施应当采用能保证服务质量的专用通讯手段。

- 发现、访问和检索 (DAR) 服务：此项服务基于请求 / 回答“拉”机制，含相关的资料管理功能；它通过因特网实施。

- 及时提供资料和产品的服务：此项服务基于延迟型“推”机制；它通过专用通讯手段和公共数据通讯网，尤其是因特网，两者结合加以实施。

2.7.2 WIS 须对 WMO 实质上的所有灾害因子网提供支持，确保警报信息的快速、安全和可靠交换，包括 ITU(国际电联) 的建议 X.1303(公共警报协议)。

注：实质上的所有灾害因子网包含所有对及时处理和提供涉及 WMO 的警报信息必要的技术和运行上的安排。

2.7.3 WMO 全球综合资料分发服务 (IGDDS) 的目标是确保一个高效的空基观测资料和产品传输方案的定义和业务实施，以便在 WIS 方面满足 WMO 计划的需要。IGDDS 须继续作为 WIS 的重要组成部分，主要用于交换和分发空基观测系统的资料和产品。

3 WIS 中心的指定程序

3.1 综述

3.1.1 WIS 的建立和运行取决于 WMO 会员和相关组织承担 GISC、DCPC 和 NC 的功能作用。指定 WIS 中心的程序取决于已达成一致的 WIS 功能结构和需遵守的 WIS 的规格。

3.1.2 根据 WMO No. 49，第一卷，A.3 的要求，大会和执行理事会须根据基本系统委员会 (CBS) 的推荐，审议对 GISC 和 DCPC 的指定。CBS 的推荐过程包括与负责 WMO 计划和相关国际计划的技术委员会及有关的区域协会进行磋商和协调。注：执行理事会建立的相关小组根据它们的职责在指定 GISC 和 DCPC 过程中拥有发言权。

3.2 指定全球信息系统中心 (GISC) 的程序

GISC 的指定程序须包括四个步骤：

(1) 陈述对 WIS 的要求

(2) GISC 潜在会员的服务许诺

(3) 展示 GISC 的能力

(4) 指定 GISC。

3.2.1 陈述对 WIS 的要求

WMO 技术委员会和其他参与计划的代表机构，包括区域机构须陈述它们对 WIS 服务的要求并对它们的要求定期进行审议。基本系统委员会 (CBS) 将相关要求汇总成表，

定期进行审议，并向执行理事会报告。

3.2.2 GISC 潜在会员的服务许诺

3.2.2.1GISC 中心构成 WIS 的核心基础结构，WMO 会员可申请成为 GISC 中心。许诺的服务须包括：

- 遵守规定的 WIS 功能的声明，
- 提供 WIS 服务的责任区建议，和
- 会员的常任代表正式承诺提供日常和可持续的服务。

3.2.2.2 服务许诺须提交 WMO。经商相关区域协会，CBS 须就 WIS 的要求和遵循 GISC 功能和规格问题对提议的服务许诺作出分析，并提出推荐意见。

3.2.3 展示 GISC 的能力

3.2.3.1 许诺承担 GISC 的会员须向 CBS 展示拟议的中心向认可的用户提供可靠性和质量符合要求的 WIS 服务的能力。须展示的遵守事项有: 资料产品实时收集和分发功能; 对需求的非实时服务；对规定的资料产品和相关的最新元数据目录的储存功能；与其它 GISC 协调功能以及规划互相备份服务；坚持 WIS 标准和相关资料交换政策及访问权。

3.2.3.2 候选 GISC 运行会员的常任代表须根据做出的许诺就 GISC 的实施和提供 GISC 服务作出正式承诺和给出时间进度。

3.2.3.3 根据候选 GISC 的能力展示，CBS 须向大会或执行理事会提交关于指定 GISC 的建议。

3.2.4 指定 GISC

WIS 手册附件 C 给出经大会或执行理事会批准的 GISC 一览表。

3.3 指定资料收集或制作中心 (DCPC) 的程序

3.3.1 WMO 已确定 WIS 须向所有的 WMO 计划和相关的国际计划提供服务，因此建立的每个中心须执行规定的 WIS 功能。CBS 须针对这些中心作为 DCPC 如何在 WIS 中分类提出建议。

3.3.2 DCPC 的指定程序包括三个步骤：

(1) 潜在 DCPC 的服务许诺

(2) 展示 DCPC 的能力

(3) 指定 DCPC。

3.3.3 潜在 DCPC 的服务许诺

3.3.3.1 由 WMO 或相关国际计划，和 / 或区域协会建立的中心应承担规定的 DCPC 功能。相关的技术委员会和区域协会须相应地考虑 PCDC 潜在会员拟提供的服务，并须对潜在的 DCPC 作出背书。

3.3.3.2 然后，须将候选 DCPC 的服务许诺提交 CBS。CBS 须分析它们是否符合规定的 DCPC 功能和规格，并提出推荐意见。

3.3.4 展示 DCPC 的能力

3.3.4.1 许诺承担 DCPC 的会员将应邀向 CBS 展示其遵守 DCPC 的功能和责任，提供 WIS 服务的能力，包括它与相关 GISC 应有的同步和通讯能力。须展示的遵守事项有：资料和产品实时分发功能；对需求的非实时服务：提供相关的最新元数据目录；与相关 GISC 的协调和同步功能；坚持 WIS

标准和相关资料交换政策及访问权。

3.3.4.2 候选 DCPC 的能力展示得到认可后，CBS 须就 DCPC 的指定向大会或执行理事会提出推荐意见。

3.3.5 指定 DCPC

本 WIS 手册附件 C 给出经大会或执行理事会批准的 DCPC 一览表。每个 DCPC 条目均含与之挂钩的 GISC 的名称。

3.4 指定国家中心 (NC) 的程序

3.4.1 根据 WMO No. 49，第一卷，A.3 的要求，每个 NC 均须根据其在计划方面的责任利用 WIS 提供资料和产品。根据 WIS 规范、规程和规格，它们与相关的元数据一并提供。所有 NC 视情况均须参加相关的 WIS 性能监测。

3.4.2 每个 WMO 会员均须通报 WMO 其指定的 NC 目前的名称和位置。在相关区域协会的参与和 WMO 秘书处的协助下，CBS 须审议会员作出的指定，以确保 GISC、DCPC 或其他 NC 对每个 NC 的支持。会员指定的 NC 须列入本 WIS 手册附件 C 的 WIS 中心一览表。每个 NC 条目均含与之挂钩的 GISC 的名称。

4 WIS 的功能

4.1 WIS 功能的作用和对功能的复审

须通过一个持续的用于了解包括服务质量在内的用户需求过程，来确定 WIS 的功能范围和物理定型，由此确保 WIS 能适应计划对象在当前和未来的需要。所有的计划对象和技术委员会均须参加这一过程，这一过程须作为 WMO 总体需求审议的一部分。

4.2 WIS 功能一览表

4.2.1 下述 WIS 功能由各 WIS 中心一起提供保障：

1 收集观测资料、形成产品、制作元数据和信息存档

2 分配用户角色

3 维护和公布服务及信息目录

4 授权用户访问信息

5 向用户 (内部和外部) 提供信息

6 管理系统的性能

注：WIS 涉及资料管理和通讯方面，但资料和产品的实质内容不属WIS自身的范畴。此类内容属具体支持对象 (计划) 的问题。

4.2.2 WIS 的技术规格 (本 WIS 手册第 5 节) 详细叙述规定的与这些功能的标准接口。

4.3 WIS 的功能结构

注：WIS 指南 4.3 参考了 WIS 的功能结构，作为一份技术文件它是对 WIS 中心的补充指南。

4.4 WIS 功能中的数据流

注：WIS 指南 4.4 是 WIS 中心补充指南，它给出了WIS规定功能结构的数据流模式，展示了对 WIS 主要功能可能的实施。

4.5 GISC 的功能要求

4.5.1 综述

注："全球交换信息"一词指重在时效和重在业务的信息(资料和产品)。它包括WMO决议25(Cg-13)和决议40(Cg-12)规定的"基本资料"和部分"额外资料"。

4.5.2 接收GISC地区的信息

4.5.2.1 每个GISC须收集自己责任区内NC和DCPC供全球交换的信息。这一要求也与以下提及的WIS发现、访问和检索(DAR)要求相关联。

4.5.2.2 也见5.2节，WIS-技术规格-1(上传资料和产品的元数据)和5.3节，WIS-技术规格-2(上传资料和产品)

4.5.3 与其它GISC交换信息

4.5.3.1 每个GISC须与其它GISC交换供全球交换的信息。每个GISC须在自己区内收集这类信息，并与其它GSIC交换，使每个GISC拥有所有GSIC的信息。

4.5.3.2 GISC应当采用MTN和相关的合作机制进行有效的交换，并不给其他GISC的性能带来损害。

4.5.3.3 也见5.4节，WIS-技术规格-3(全球分布资料的集中)。

4.5.4 向GISC地区分发信息

4.5.4.1 每个GISC须向自己责任区内的NC和DCPC分发信息，包括不限于全球交换的信息。

4.5.4.2 也见5.11节，WIS-技术规格-10(用专用网络下载文档)；5.12节，WIS-技术规格-11(用非专用网络下载文档)；5.13节，WIS-技术规格-12(用其他方法下载文档)。

4.5.5 维持24小时高速缓存

4.5.5.1 每个GISC须至少保留24小时全球交换的信息，并通过WMO请求/回答("拉")方式提供。这一要求与以下提及的WIS发现、访问和检索(DAR)要求相关联。

4.5.5.2 也见5.4节，WIS-技术规格-3(全球分布资料的集中)；5.5节，WIS-技术规格-4(用户身份和角色信息的维护)；5.6节，WIS-技术规格-5(分布式用户身份和角色信息的统一视图)。

4.5.6 发现、访问和检索

4.5.6.1 每个GISC须维护WIS涵盖的所有WMO计划的综合信息目录并提供访问，以支持发现、访问和检索功能(DAR)。它包括，而且不限于全球交换的资料。为满足DAR功能需求，要求GISC以交互和成批方式支持：上传、修改和删除元数据；用户发现元数据；用户访问元数据；及WIS综合元数据目录与其他GISC的同步。

4.5.6.2 也见5.9节， WIS-技术规格-8(DAR目录搜索和检索)，和5.10节， WIS-技术规格-9(对分布式DAR元数据目录的统一视图)。

4.5.7 GISC资料网的连接

每个GISC须提供与公共和专用网络24小时不间断的连接，其容量足以满足其履行全球和区域责任。每个GISC应当保证WIS的每个通讯设施具有应有的可用性和包括必要的路由和备份的能力。每个GISC应当维持它与通讯线路及相应硬件供应商达成的服务水准协议。

4.5.8 协调GISC地区的通讯

每个 GISC 须与责任区内的中心协调 WIS 的通讯基础设施，使其能满足 WIS 对地区内信息交换的需求。如果拥有全球和 / 或区域性专门协议，GISC 还可以支持与其他地区交换经协商一致的重点为时效和重点为业务的 WIS 信息。通讯基础设施根据容量和可靠性需求采用不同的技术和服务 (如：因特网、基于卫星的资料分发和专用数据网)。

4.5.9 GISC 的恢复安排

每个 GISC 在发生停机时须执行和操作相关的程序和安排，以便迅速恢复其基本的服务或做好备份。每个 GISC 均须做好安排，以备其基本服务因系统故障由另一 GISC 接管。每个 GISC 均须做好系统备份安排，以备全站故障 (如站外灾害恢复中心)，以及部分备份，以备 GISC 内部 WIS 功能受影响。

4.5.10 GISC 的性能监测

4.5.10.1 每个 GISC 须参加 WIS 性能监测，包括监测全球交换资料和产品的收集和分发。每个 GISC 均须定期向其他 GISC 和 WMO 秘书处报告与其责任区的 WIS 中心的连接情况及性能，包括容量和采用的技术 (如因特网、基于卫星的资料分发和专用数据网等)。CBS 须在 WMO 秘书处的协助下审议各 GISC 的现状和运行情况，并提出报告。

4.5.10.2 WIS 信息 (资料和产品) 收集和分发的监测应当视情包括综合世界天气监视网监测和其他相关计划的监测。

4.5.10.3 也见 5.16 节 , WIS- 技术规格 -15(服务质量的报告)。

4.6 DCPC 的功能要求

4.6.1 综述

注：信息一词作为统称，它包括资料和产品。

一特定 DCPC 的具体性能和功能需求须取决于它所支持的计划。对以任务为重点责任的计划，尤其是以生命安全为任务的计划提供服务的 DCPC 须在业务上保持高度可靠，包括所需的通讯。每个 DCPC 须提供元数据，用于描述它通过 WIS 综合目录提供的信息，须提供对此信息的访问，以及须参加对 WIS 总体性能的监测。

4.6.2 收集 DCPC 地区的信息

4.6.2.1 针对在计划方面的角色，DCPC 须收集拟分发给其责任区的 NC 的信息 (即区域收集)。

4.6.2.2 也见 5.2 节， WIS- 技术规格 -1(上传资料和产品的元数据)，和 5.3 节，WIS- 技术规格 -2(上传资料和产品)。

4.6.3 收集有关计划的信息

4.6.3.1 针对在计划方面的角色，DCPC 须收集具体有关计划的资料和产品。

4.6.3.2 也见 5.2 节，WIS- 技术规格 -1，(上传资料和产品的元数据)，和 5.3 节，WIS- 技术规格 -2(上传资料和产品)。

4.6.4 对制作计划相关信息的支持

4.6.4.1 针对在计划方面的角色，DCPC 须提供足以支撑区域或专业资料和产品制作的资料管理和资料通讯。

4.6.4.2 也见 5.2 节，WIS- 技术规格 -1，(上传资料和产品的元数据)，和 5.3 节，WIS- 技术规格 -2(上传资料和产品)。

4.6.5 提供拟全球交换的信息

4.6.5.1 针对在计划方面的角色，每个 DCPC 须向由其负责的 GISC 提供拟全球交换的信息。

4.6.5.2 也见 5.2 节，WIS- 技术规格 -1，(上传资料和产品的元数据)，和 5.3 节，WIS- 技术规格 -2(上传资料和产品)。

4.6.6 分发信息

4.6.6.1 针对在计划方面的角色，除全球交换的信息，每个 DCPC 须分发其他的信息。

4.6.6.2 也见 5.11 节，WIS- 技术规格 -10(用专用网络下载文档)；5.12 节，WIS- 技术规格 -11(用非专用网络下载文档)；5.13 节，WIS- 技术规格 -12(用其他方法下载文档)。

4.6.7 提供对信息的访问

4.6.7.1 每个 DCPC 须通过适当方式用 WMO 请求 / 回答 (“ 拉 ”) 机制为其产品提供访问支持。

4.6.7.2 也见 5.5 节，WIS- 技术规格 -4(用户身份和角色信息的维护)；5.7 节，WIS- 技术规格 -6(用户鉴别)；5.8 节，WIS- 技术规格 -7(用户角色授权)。

4.6.8 用元数据描述信息

4.6.8.1 每个 DCPC 须根据协商一致的 WMO 元数据标准描述其资料和产品，提供资料和产品目录的访问，并视情提供，尤其向 GISC 提供该元数据。

4.6.8.2 也见 5.9 节，WIS- 技术规格 -8(DAR 目录搜索和检索)；5.10 节，WIS- 技术规格 -9(对分布式 DAR 元数据目录的统一视图)。

4.6.9 DCPC 的恢复安排

针对在计划方面的角色，每个 DCPC 须执行和操作相关的程序和安排，以便在停机后迅速恢复它们的基本服务或做好备份。

4.6.10 DCPC 的性能监测

4.6.10.1 每个 DCPC 须参建加 WIS 的性能监测。

4.6.10.2 也见 5.16 节，WIS- 技术规格 -15(服务质量的报告)。

4.7 NC 的功能要求

4.7.1 提供资料、产品和元数据

4.7.1.1 根据 WMO No. 49，第一卷，A.3 的要求，所有 NC 均须根据自己在计划方面的责任利用 WIS 提供资料和产品。相应的元数据须根据 WIS 规范、规程和规格一并提供。

4.7.1.2 也见 5.2 节，WIS- 技术规格 -1(上传资料和产品的元数据)；和 5.3 节，WIS- 技术规格 -2(上传资料和产品)。

4.7.2 收集有关计划的信息

4.7.2. 针对在计划方面的角色，每个 NC 须收集有关计划方面的资料和产品。

4.7.2.2 也见 5.2 节，WIS- 技术规格 -1(上传资料和产品的元数据)；和 5.3 节，WIS- 技术规格 -2(上传资料和产品)。

4.7.3 支持有关计划信息的制作

4.7.3.1 针对在计划方面的角色，每个 NC 须提供足以支持资料和产品制作的资料管理和

资料通讯。

4.7.3.2 也见 5.2 节，WIS- 技术规格 -1(上传资料和产品的元数据)；和 5.3 节，WIS- 技术规格 -2(上传资料和产品)。

4.7.4 用元数据描述信息

4.7.4.1 每个 NC 须根据协商一致的 WMO 标准描述其资料和产品，并视情向其他中心提供这一信息。

4.7.4.2 也见 5.9 节，WIS- 技术规格 -8(DAR 目录搜索和检索)。

4.7.5 NC 的性能监测

4.7.5.1 根据 WMO No. 49，第一卷，A.3 的要求，所有 NC 均须参加 WIS 性能监测。

4.7.5.2 也见 5.16 节，WIS- 技术规格 -15(服务质量的报告)。

5 WIS 的技术规格

5.1 综述

5.1.1 用 15 个技术规格 (WIS 技术规格) 规定与 WIS 各项主要功能的接口。这些接口技术规格的名称和编号如下：

1. 上传资料和产品的元数据
2. 上传资料和产品
3. 全球分布资料的集中
4. 用户身份和角色信息的维护
5. 分布式身份和角色信息的统一视图
6. 用户鉴别
7. 用户角色授权
8. DAR 目录搜索和检索
9. 对分布式 DAR 元数据目录的统一视图
10. 用专用网络下载文档
11. 用非专用网络下载文档
12. 用其他方法下载文档
13. 分发元数据的维护
14. 对分发分布式元数据目录的统一视图
15. 服务质量的报告

5.1.2 NC 须对 15 项技术规格中的 7 项提供支持，具体为 : WIS- 技术规格 -1、-2、-4、-10、-11、-12 和 -15。通过双边协议，NC 可安排另一 NC、DCPC 或 GISC 代表它执行功能。

5.1.3 根据对 DCPC 在计划作用方面的特别需要，DCPC 须支持 15 个技术规格中的 13 个。不要求 DCPC 支持 WIS- 技术规格 -3 和 WIS- 技术规格 -9。

5.1.4 WIS GISC 须支持所有 15 个技术规格。

5.1.5 对 DCPC 或 NC 实施最低需求以外的接口均表示欢迎。因此在任何情况下，凡需要采用接口，技术规格则需强制执行。

5.1.6 凡必要时，对文档及其相关的元数据记录均须采用 GTS 文档命名约定。GTS

(WMO No. 386)，第一卷，第二部分附件 II-15 记录了 GTS 文档命名约定。

注： WIS 指南 5.1 参考了 “GISC、DCPC 和 NC 遵守的 WIS 规格 ”，这一规格作为 WIS 中心的补充指南。

5.2 WIS- 技术规则 -1: 上传资料和产品的元数据

5.2.1 这一规格要求每个上传的元数据记录须符合 ISO 19115 1.2 版 WMO 核心元数据简图，并含特有的指示符。注：WIS 指南 5.2 参考了 “ 元数据的表示 ”，它对 WMO 核心元数据简图做了定义。

5.2.2 上传须使用接收方规定的方法，接收方往往是 WIS DAR 元数据目录的主办方。

5.2.3 DAR 元数据的提供应在提供相关元数据的文档或报文之前。

5.2.4 为更新 DAR 元数据目录，GISC 应当对两种维护设施提供支持：用于批量更新的文档上传设施 (补充、替换或删除作为分离文档处理的元数据记录)；在 DAR 元数据目录中用于更改元数据条目的在线表单 (在一条记录以及整个记录中补充、修改或删除要素)。

5.2.5 GISC 须维护更新后的 DAR 元数据目录作为可搜索的资源 (见 WIS- 技术规格 -8)。

5.2.6 也见 4.5.2 节 (收集 GISC 地区的信息)；4.6.2 节 (收集 DCPC 地区的信息)；4.6.3 节 (收集有关计划的信息)； 4.6.4 节 (制作有关计划的信息)。

5.3 WIS- 技术规格 -2: 上传资料和产品

5.3.1 该项技术规格要求上传的资料或产品须符合相关计划的格式规定，包括有关的 GTS 手册 (WMO No. 386) 第一卷，第二部分，附件 II-2，电码手册和其他 WMO 手册及 5.1.6 节提及的 GTS 文档命名约定。

5.3.2 资料和产品的处理应当符合 GTS 手册，第一卷，第一部分，1.3 节有关 GTS 设计原则及其他相关计划的 WMO 手册的具体规定。

5.3.3 也见下述各节：4.5.2 节 (接收 GISC 地区的信息)；4.6.2 节 (收集 DCPC 地区的信息)；4.6.3 节 (收集相关计划的信息)；4.6.4 节 (制作相关计划的信息)。

5.4 WIS- 技术规格 -3：全球分布资料的集中

5.4.1 这一技术规格要求对集中的全球交换信息 (见 4.5.1 节) 视情执行 GTS 手册 (WMO No.386) 第一卷，第一部分，附件 I-3。

5.4.2 警报须在 2 分钟内通过 WIS 作点到点传输。

5.4.3 也见 4.5.3 节 (与其它 GISC 交换信息) 和 4.5.5 节 (维持 24 小时高速缓存)。

5.5 WIS- 技术规格 -4: 用户身份和角色信息的维护

5.5.1 用户身份和角色信息须采用接收方事前规定的方法进行描述和传输，接收方通常为身份和角色信息资料库的主办方。

注：在本文中 “ 用户身份 ” 一词并非指对用户个人身份的识别。WIS 中心负责鉴别和授权的管理员需要分享 WIS 各中心拥有的最新的身份和角色信息。但有必要防止个人身份信息的不当泄露。

5.5.2 用户身份和角色信息的维护应当满足应用和主办中心的时效要求。

5.5.3 也见 4.5.5 节 (维护 24 小时高速缓存) 和 4.6.7 节 (提供对信息的访问)。

5.6 WIS- 技术规格 -5: 分布式用户身份和角色信息的统一视图

5.6.1 目前尚不需要这一用于分布式身份和角色信息统一视图的接口。(也见 5.5.1 节的注)。

5.6.2 开展身份和角色信息交换的中心应使用数据加密技术开展此项工作。

5.6.3 也见 4.5.5 节 (维护 24 小时高速缓存) 和 4.6.7 节 (提供对信息的访问)。

5.7 WIS- 技术规格 -6: 用户鉴别

5.7.1 WIS 中心应当采用含公钥基础结构技术的鉴别标准。

注：以工业和 / 或国际标准为基础的商业化现成鉴别软件优先。

5.7.2 用户鉴别应当满足特定的应用和符合主办中心的处理制约，并须提供能满足用户要求的服务质量。

5.7.3 也见 4.5.5 节 (维护 24 小时高速缓存) 和 4.6.7 节 (提供对信息的访问)。

5.8 WIS- 技术规格 -7: 用户角色授权

5.8.1 WIS 中心在用户授权软件、技术和规程方面应当采用政府支持的标准。

5.8.2 用户授权应当满足特定的应用和符合主办中心的处理制约，并须提供能满足用户要求的服务质量。

5.8.3 也见 4.5.5 节 (维护 24 小时高速缓存) 和 4.6.7 节 (提供对信息的访问)。

5.9 WIS- 技术规格 -8: DAR 目录搜索和检索

5.9.1 这一技术规格要求每个元数据目录主办方须支持 ISO 23950 信息搜索和检索协议的 SRU(用 URL 搜索和检索) 规格。一个符合 WIS 的 SRU 服务器须支持 SRU1.1 版、SRU 搜索检索业务、SRU 解释业务、返回错误诊断方法和 SRU 上下文查询语言 (CQL) 二级。

5.9.2 除全文搜索外，一个符合 WIS 的 SRU 服务器须搜索：至少 8 个字符串索引 (摘要、标题、作者、关键词、格式、身份、类型和 crs(坐标参照系))；至少 5 个日期顺序索引 (创建日期、修改日期、出版日期、起始日期和结束日期)；和地理坐标“边界”索引 (十进制经纬度、以北、西、南、东为序用空隔符分隔)。

注：WIS 指南 5.9 节参考了 “WIS SRU 执行人员备注 ”。

5.9.3 搜索服务须提供能满足用户要求的服务质量。

5.9.4 也见 4.5.6 节 (发现、访问和检索) 和 4.6.8 节 (用元数据描述信息)。

5.10 WIS- 技术规格 -9: 对分布式 DAR 元数据目录的统一视图

5.10.1 GISC 须使用开放文档库计划 - 元数据收割协议 (OAI-PMH) 第二版交换最新的元数据目录。

5.10.2 最新元数据目录的交换应做到 DAR 元数据分布个例偏差不超过一天以上。还应提供基于紧急情况的快速更新机制。

5.10.3 也见 4.5.6 节 (发现、访问和检索)。

5.11 WIS- 技术规格 -10: 用专用网络下载文档

5.11.1 这一规格要求下载的文档采用相关计划事前规定的表示方式，包括相关的 GTS 手册 (WMO No. 386) 第一卷，第二部分，附件 II-2 和其他 WMO 手册及 5.1.6 节提及的 GTS 文档命名约定。

5.11.2 资料和产品的处理应符合 GTS 手册，第一卷，第一部分，1.3 节有关 GTS 设计原则及其他相关计划的 WMO 手册的具体规定。

5.11.3 也见 4.5.4 节 (向 GISC 地区分发信息) 和 4.6.6 节 (提供全球交换的信息)。

5.12 WIS- 技术规格 -11: 用非专用网络下载文档

5.12.1 这一规格要求下载的资料或产品须采用适合相关计划的表示和通讯方式。

5.12.2 资料和产品的处理应符合 GTS 手册，第一卷，第一部分，1.3 节有关 GTS 设计原则及其他相关计划的 WMO 手册的具体规定。

5.12.3 也见 4.5.4 节 (向 GISC 地区分发信息) 和 4.6.6 节 (提供全球交换的信息)。

5.13 WIS- 技术规格 -12: 用其他方法下载文档

5.13.1 这一规格要求下载的资料或产品须采用适合相关计划的表示方式和通讯方式。

5.13.2 资料和产品的处理应符合 GTS 手册，第一卷，第一部分，1.3 节有关 GTS 设计原则及其他相关计划的 WMO 手册的具体规定。

5.13.3 也见 4.5.4 节 (向 GISC 地区分发信息) 和 4.6.6 节 (提供全球交换的信息)。

5.14 WIS- 技术规格 -13: 分发元数据的维护

5.14.1 这一规格要求分发元数据 (包括预订信息，如账号和提供细节) 须符合有关分发元数据的数据库主办方事前规定的表示方式和通讯方式。

5.14.2 要求改变非全球定期交换信息的分发可能取决于 GTS 规定的变化告示期。不然，分发的改变应在一天内予以实施。

5.14.3 也见 4.5.6 节 (发现、访问和检索) 和 4.6.6 节 (提供全球交换的信息)。

5.15 WIS- 技术规格 -14: 对分发分布式元数据目录的统一视图

5.15.1 对这一接口尚未提出要求。作为中心之间备份协议的一部分可能需要这一接口。

5.15.2 也见 4.5.6 节 (发现、访问和检索)。

5.16 WIS- 技术规格 -15: 服务质量的报告

5.16.1 这一规格要求服务质量报告须符合集中报告数据库主办方事前规定的表示方式和通讯方式。

5.16.2 应按照集中报告管理员根据 WIS 中心的需要确定的时间表发送报告。

5.16.3 也见 4.5.7 节 (GISC 的网络连接)；4.5.8 节 (协调 GISC 地区的通讯)；4.5.9 节 (GISC 的恢复安排)；4.5.10 节 (GISC 性能监测)；4.6.9 节 (DCPC 的恢复安排)；4.6.10 节 (DCPC 性能监测)。

附件 A – 缩略语表

Cg	世界气象大会
CBS	基本系统委员会
DAR	发现、访问和检索
DCPC	资料收集或制作中心
GDPFS	全球资料处理和预报系统
GISC	全球信息系统中心
GOS	全球观测系统
GTS	全球通讯系统
IGDDS	全球综合资料分发服务
MTN	主干通讯网络
NC	国家中心
NMC	国家气象中心
WIS	WMO 信息系统
WMO	世界气象组织

附件 B – 部分与WIS有关的WMO文件

政策文件

WMO No -15	基本文件
WMO – 49	技术规则：
	第一卷 - 常用气象标准和推荐规范
	第二卷 - 空中导航气象服务
	第三卷 - 水文气象服务
	第四卷 – 质量管理
WMO No - 60	协议和工作安排
WMO No - 508	大会决议和执行理事会报告

资料和产品国际交换

在事关社会安全、经济福利和环境保护方面，WMO促进实时或近实时资料、信息、产品和服务的免费和无限制交换。

WMO No - 837	气象资料交换— 商业化气象活动关系指南，WMO的政策和规范
	Cg-12 决议 40—WMO 气象和相关资料和产品交换的政策和规范，包括商业化气象活动关系指南
	Cg 13 决议 25—水文资料和产品的交换
	附录四 – 第十三次世界气象大会日内瓦宣言

手册

WMO No - 9	天气报告：
	卷 A – 观测站
	卷 C1 – 气象报告目录
	卷 C2 – 传输计划
	卷 D – 有关海运的信息
WMO No - 306	电码手册
WMO No - 386	全球通讯系统(GTS)手册，卷 I 和 II
WMO No - 485	全球资料处理和预报系统 (GDPFS)手册，第 1、 2 和 3部分
WMO No - 544	全球观测系统(GOS)手册

指南

WMO No - 8	仪器和观测方法指南
WMO No - 100	气候规范指南
WMO No - 134	农业气象规范指南
WMO No - 168	水文规范指南
WMO No - 305	全球资料处理系统指南
WMO No - 471	海洋气象服务指南
WMO No - 488	全球观测系统指南
WMO No - 611	WMO 二进制电码格式GRIB 1 指南 – 技术报告 No -17 - 1994年5月
***	WMO表驱动码格式：FM 94 BUFR and FM 95 CREX指南
***	FM 92 GRIB 第2版指南
WMO No - 636	资料处理中心自动化指南
WMO No - 702	波浪分析和预报指南
WMO No - 731	机场气象观测和信息分发系统指南
WMO No - 732	航空服务气象人员规范指南
WMO No - 750	系泊浮标和其他资料收集系统指南
WMO No - 788	世界天气监视资料管理指南
WMO No - 834	公共天气服务规范指南
GTS	因特网规范指南
GTS	中心间通过因特网VPN指南
GTS	TCP/IP 在GTS上的使用指南
GTS	IP 地址在GTS上的使用初步安排指南
GTS	IT 安全指南

附件C – 批准的WIS中心

附件 C.1 全球信息系统中心(GISC)

（迄今没有列入的）

附件 C.2 资料收集或制作中心(DCPC)

（迄今没有列入的）

附件 C.3 国家中心(NC)

（迄今没有列入的）

建议7(CBS-Ext.(10))
修订《全球资料处理和预报系统手册》 (WMO-NO. 485)

基本系统委员会，

注意到

(1) 《第十五次世界气象大会含决议案的最终节略报告》 (WMO-No. 1026),

(2) 《执行理事会第六十二次届会含决议案的最终节略报告》 (WMO-No. 1059),

(3) CBS资料处理和预报系统开放计划领域组(OPAG)实施协调组(ICT-DPFS)会议的报 告(2010年9月13-17日，日本东京)，

(4) 《全球资料处理和预报系统(GDPFS) 手册》(WMO-No. 485),

考虑到需要：

(1) 结合区域气候中心(RCC)和RCC网的建设，审议全球资料处理和预报系统手册(WMO-No.485)GDPFS手册中有关长期预报的标准化检验系统(SVSLRF)，

(2) 需要建立与确定性数值天气预报和集和预报系统检验相关的新的标准化程序，并纳入手册，包括指定验证确定性NWP的牵头中心，

(3) 新指定追溯中心和制定紧急响应活动的新程序并纳入手册，

(4) 把为多个区域协会负责的气候敏感区指定RCC和RCC网络的新程序纳入手册，如极地地区，

(5) 结合WMO信息系统的建立与发展，审议《GDPFS手册》中有关各中心之间交换产品的部分，

建议根据本建议附录中关于《全球资料处理和预报系统手册》(WMO-No. 485) 第一卷，全球方面进行修订，并于 2011 年 6 月 1 日起生效；

要求秘书长按照本建议附录对《全球资料处理和预报系统手册》进行适当的修订；

授权委员会主席与秘书长协商对《全球资料处理和预报系统手册》(WMO-No. 485) 作相应的纯文字编辑上的修订。

建议7 (CBS-Ext.(10))的附录1
修订《全球资料处理和预报系统手册》 (WMO-NO. 485)

The proposed amendment to the Manual on the GDPFS, Volume I, relates to the review of the standardized verification system for Long-range Forecasts (LRF), in line with the establishment of RCCs and RCC-Networks: amendments to Part II, Attachment II.8.

PROPOSED AMENDMENTS TO THE MANUAL ON THE GDPFS RELATED TO LONG-RANGE FORECASTS, VOLUME I, (WMO-No. 485)

Part II: Attachment II.8, Executive Summary shall be amended to read:
[…]

1.1 Diagnostics. The SVS includes ~~Information required incorporates~~ derived diagnostic measures and contingency tables. Estimates of the statistical significance of the scores achieved are also ~~required~~ included. Additional diagnostic measures are suggested but are not incorporated into the Core SVS as yet. ~~Use of the additional diagnostics is optional.~~

1.2 Parameters. Key variables and regions are proposed. However producers are not limited to these key parameters, thus all producers can contribute regardless of the structure of individual forecast systems. The parameters to be verified are defined on three levels. Levels 1 and 2 define the core SVS and are mandatory for GPCs.~~:~~

Level 1: Diagnostic measures aggregated over regions and for indices
Level 2: Diagnostic measures evaluated at individual grid-points
Level 3: Contingency tables provided for individual grid-points.

[…]

1.4 System details. Details of the individual forecast systems employed.

1.5 Exchange of verification information and the Lead Centres for SVSLRF

~~The~~ SVSLRF verification results generated by GPCs are made available through a web site maintained by the Lead Centre. The functions of the Lead Centre for SVSLRF include creating and maintaining ~~coordinated Web sites~~ a website for the LRF verification information so that potential users would benefit from a consistent presentation of the results. The address of the web site is

http://www.bom.gov.au/wmo/lrfvs/.

2. Diagnostics

Three diagnostic measures are incorporated in the Core SVS - Relative Operating Characteristics, reliability diagrams and accompanying measure of sharpness, and Mean Square Skill Scores with associated decomposition. Estimates of the statistical significance in the diagnostic scores are also included in the Core SVS. The three diagnostics permit direct intercomparison of results across different predicted variables, geographical regions, forecast ranges, etc. They may be applied in verification of most forecasts and it is proposed that, except where inappropriate, all three diagnostics are used on all occasions by GPCs. Tabulated information at grid-point resolution is also ~~part of the core SVS~~ included but is not part of the core SVS. The tabulated information ~~will~~ may allow reconstruction of scores for user defined areas and calculation of other diagnostic measures such as economic value.
[…]

2.3 Mean Square Skill Score and decomposition. To be used in verification of deterministic forecasts. For Level 1, an overall bulk Mean Square Skill Score (MSSS) value is required and will provide a comparison of forecast performance relative to "forecasts" of climatology. The three terms of the MSSS decomposition provide valuable information on phase errors (through forecast/ observation correlation), amplitude errors (through the ratio of the forecast to observed variances) and overall bias. For Level 2, quantities pertaining to the three decomposition terms should be provided. Additional terms relating to MSSS ~~are required as~~ form part of the Level 3 information.

2.4 Contingency tables. In addition to the derived diagnostic measures contingency table information provided at grid-points for both probability and categorical deterministic forecasts ~~form part of the core SVS. This information~~ constitutes Level 3 of the ~~exchange~~ SVSLRF and will allow RCCs and NMHSs (and in some cases end-users) to derive ROC, reliability, other probability based diagnostics and scores for categorical deterministic forecasts for user defined geographical areas.
[…]

3. Parameters

The key list of parameters in the ~~Core~~ SVS is provided below. Any verification for these key parameters should be assessed using the ~~Core~~ SVS techniques wherever possible. Many long-range forecasts are produced which do not include parameters in the key list (for example, there are numerous empirical systems that predict seasonal rainfall over part of/or over an entire, country). The ~~Core~~ SVS diagnostics should be used to assess these forecasts also, but full details of the predictions will need to be provided.

Forecast can be made using different levels of post-processing typically no-post-processing (raw or uncalibrated), simple correction of systematic errors (calibrated, i.e. calibration of mean and of variance) and more complex correction using hindcast skill (recalibrated, e.g. Model Output Statistics or perfect ~~prog~~ model approaches). ~~Most centres are currently issuing forecasts resulting from a simple calibration and so for sake of comparison on the Lead Centre web site scores for forecasts that were raw or calibrated (as specified in respective skill score section) are to be submitted. At the moment the team prefer to exclude forecast that were recalibrated, but GPCs are encouraged to apply the SVSLRF methodology and to display the results on their recalibrated forecasts on their web site.~~ Forecast producers should conduct verification on the forecast output provided to users (e.g. on the final product after application of post-processing). GPCs should provide verification on the final GPC products (which may include post-processing) to the LC-SVSLRF. In this way forecast verification match the products which are made available by GPCs to RCC and NMHS.

3.1 Level 1: Diagrams and scores to be produced for regions

GPCs should supply ~~D~~diagrams (e.g. ROC and reliability curves) ~~are to be supplied~~ in digital format as specified on the Lead Centre for SVSLRF website.

3.1.1 Atmospheric parameters. Predictions for:

T2m (Screen Temperature) anomalies with standard regions (for GPCs):
[…]

Precipitation anomalies with standard regions (for GPCs):
[…]

3.1.3 Scores to be used for deterministic forecasts
~~Mean Square Skill Score (~~MSSS~~)~~ with climatology as standard reference forecast.
[…]

3.2 Level 2: Grid point data for mapping

3.2.1 Grid point verification data to be produced for each of the following variables. Verification should be provided on a 2.5°x2.5° grid.
T2m (Screen Temperature)~~T2m~~
Precipitation
SST (Sea Surface Temperature)

3.2.2 Verification parameters to be produced for deterministic verification
The necessary parameters for reconstructing the MSSS decomposition, the number of forecast/observation pairs, the MSE of the forecasts and of climatology and the MSSS are all part of the ~~core~~ SVS. Significance estimates for the correlation, variance, bias, MSE and MSSS terms should also be supplied.
[…]

3.4.1 Indices to be verified
Verification of Niño3.4 region SST anomalies is mandatory for GPCs. Other indices may ~~be added in due course~~ also be provided.

~~4. Staged implementation~~

~~In order to ease implementation, producers may stage the provision of the elements of the Core SVS according to the following recommendation.~~

~~a) Verification at levels 1 and 2 in the first year of implementation~~
~~b) Verification at level 3 by the middle of the year following implementation of levels 1 and 2~~
~~c) Level of significance by the end of the year following implementation of levels 1 and 2.~~

Part II: Attachment II.8, section 1 (Introduction) shall be amended to read:

The following sections present the detailed specifications for the development of a Standardised Verification System (SVS) for Long-Range Forecasts (LRF) within the framework of a WMO exchange of verification scores. The SVS for LRF described herein constitutes the basis for long-range forecast evaluation and validation, and for exchange of verification scores. It will evolve and grow as more requirements are adopted.

Part II: Attachment II.8, section 2 (Definitions), item 2.1 (Long-Range Forecasts) shall be amended to read:
[…]

Seasons have been ~~loosely~~ defined in the Northern Hemisphere as December-January-February (DJF) for winter (summer in the Southern Hemisphere), March-April-May (MAM) for spring (Fall in the Southern Hemisphere), June-July-August (JJA) for summer (winter in the Southern Hemisphere) and September-October-November (SON) for Fall (spring in the Southern Hemisphere). Twelve rolling seasons are also defined e.g. MAM, AMJ, MJJ. In the Tropical areas, seasons may have different definitions. Outlooks over longer periods such as multi-seasonal outlooks or tropical rainy season outlooks may be provided.
~~It is recognised that in some countries long-range forecasts are considered to be climate products.~~
This attachment is ~~mostly~~ largely concerned with the three-month or 90-day outlooks and the seasonal outlooks.

Part II: Attachment II.8, section 3 (SVS for Long-Range Forecasts) shall be amended to read:
Forecast can be made using different levels of post-processing typically no-post-processing (raw or uncalibrated), simple correction of systematic errors (calibrated, i.e. calibration of mean and of variance) and more complex correction using hindcast skill (recalibrated, e.g. Model Output Statistics or perfect ~~programme~~ prognosis approaches). Forecast producers should conduct verification on the forecast output provided to users (e.g. on the final product after application of post-processing). GPCs should provide verification on the final GPC products (which may include post-processing) to the LC-SVSLRF. ~~Most centres are currently issuing forecasts resulting from a simple calibration and so for sake of comparison on the Lead Centre web site scores for forecasts that were raw or calibrated (as specified in respective skill score section) are to be submitted. At the moment the team prefer to exclude forecast that were recalibrated, but GPCs are encouraged to apply the SVSLRF methodology and to display the results on their recalibrated forecasts on their web site.~~

3.1 Parameters to be verified
Verification of the ~~The~~ following parameters is mandatory for GPCs~~are to be verified~~:
[…]

(c) ~~Sea Surface Temperature (~~SST~~)~~ anomaly
[…]

It is recommended that three levels of verification be done (with level 1 and 2 being mandatory for GPCs):
[…]

3.1.1 Aggregated verification (level 1)
Large scale verification statistics are required in order to evaluate the overall skill of the ~~models~~ LRFs and ultimately for assessing their improvements over time. These are bulk numbers calculated by aggregating verification scores over all grid points within large regions; they will not necessarily reflect skill for any sub-region. For GPCs, ~~This~~ aggregated verification for the following ~~is performed over three~~ regions is mandatory:
[…]

3.1.2 Grid point verification (level 2)
The grid point verification is recommended for a regionalised assessment of the skill of the model. The verification latitude/longitude grid is recommended as being 2.5° by 2.5°, with origin at 0°N, 0°E. GPCs~~Verification~~ should ~~be~~ suppl~~ied~~y grid point verification to the Lead Centre for visual rendering. The formats for supplying derived verification are specified on the Lead Centre website.
[…]

3.1.3 Contingency tables (level 3)

Level 1 (mandatory for GPCs)			
Parameters (minimum for GPCs)	**Verification regions (minimum for GPCs)**	**Deterministic forecasts**	**Probabilistic forecasts**
[…]			
Level 2 (mandatory for GPCs)			
Parameters	**Verification regions**	**Deterministic forecasts**	**Probabilistic forecasts**
[…]			
Level 3			
Parameters	**Verification regions**	**Deterministic forecasts**	**Probabilistic forecasts**
[…]			

3.1.4 Summary of the ~~Core~~ SVS

The following gives a summary of parameters, validation regions and diagnostics that form the ~~core~~ SVS. The required periods, lead-times and stratification against the state of ENSO are given in section 3.2.

The number of realisations of LRF is far smaller than in the case of short term numerical weather prediction forecasts. Consequently it is essential as part of the core SVS, to calculate and report error bars and level of significance (see section 3.3.5).

~~In order to ease implementation, participating LRF producers may stage the introduction of the core SVS by prioritizing implementation of verification at levels 1 and 2.~~

~~Other parameters and indices to be verified as well as other verification scores can be added to the core SVS in future versions.~~

In order to handle spatial forecasts, predictions for each point within the verification grid should be treated as having an individual forecasts but with all results combined into the final outcome. The same approach is applied when verification is done at stations. Categorical forecast verification can be performed for each category separately.

Similarly, all forecasts are treated as independent and combined together into the final outcome, when verification is done over a long period of time (~~several~~ 10 or more years, for example).

Stratification of the verification data is based on forecast period, lead time and verification area. Stratification by forecast period should, for T2m and precipitation, be by 4 conventional seasons for Level 1. For Levels 2 and ~~&~~3 stratification should be on 12 rolling seasons (section 2.1) if available, otherwise 4 conventional seasons should be used. Verification results for different seasons should not be mixed. ~~Stratification by lead-time should include a minimum of two leadtimes, with lead-time not greater than 4 months~~Verification should be provided for all periods and lead times for which forecasts are supplied. ~~Forecasts with different lead times are similarly to be verified separately.~~ Stratification according to the state of ENSO (where there are sufficient cases) should be as follows:

[…]

3.3 Verification scores

~~The following verification scores are to be~~The MSSS and ROC verification skill scores are to be used.~~:~~

~~1) Mean Square Skill Score (MSSS)~~

~~2) Relative Operating Characteristics (ROC).~~

[…]

Þ MSSS, provided as a single bulk number, is mandatory for level 1 verification in the core SVS. MSSS together with its three term decomposition are also mandatory for level 2 verification in the core SVS. ~~For the exchange of scores via the Lead Centre web site the MSSS and its decomposition term should be calculated using the raw forecasts and preferably not the calibrated ones.~~

3.3.2 Contingency tables and scores for categorical deterministic forecasts

For two- or three-category deterministic forecasts the ~~core~~ SVSLRF includes full contingency tables, because it is recognized that they constitute the most informative way to evaluate the performance of the forecasts. These contingency tables then form the basis for several skill scores that are useful for comparisons between different deterministic categorical forecast sets (Gerrity, 1992) and between deterministic and probabilistic categorical forecast sets (Hanssen and Kuipers, 1965) respectively.

The contingency tables may cover all ~~should be provided for every~~ combinations of parameters, lead times, target months or seasons, and ENSO stratification (when appropriate) at every verification point for both the forecasts and (when appropriate) damped persistence. […]

~~Contingency tables such as the one in Table 3 are mandatory for level 3 verification in the core SVS.~~

[…]

Þ Contingency tables for deterministic categorical forecasts (such as in Table 3) form part of ~~are mandatory for~~ level 3 verification in the ~~core~~ SVS. These contingency tables can provide the basis for the calculation of several scores and indices such as the Gerrity Skill Score, the LEPSCAT or the scaled Hanssen and Kuipers score and others.

3.3.3 ROC for probabilistic forecasts

[…]

~~Hit rate (~~HR~~)~~ and false alarm rate ~~(~~FAR~~)~~ are calculated for each probability threshold Pn, giving N points on a graph of HR (vertical axis) against FAR (horizontal axis) to form the Relative Operating Characteristics (ROC) curve. This curve, by definition, must pass through the points (0,0) and (1,1) (for events being predicted only with >100% probabilities (never occurs) and for all probabilities exceeding 0% respectively). No-skill forecasts are indicated by a diagonal line (where HR=FAR); the further the curve lies towards the upper left-hand corner (where HR=1 and FAR=0) the better

[…]

Þ Contingency tables for probabilistic forecasts (such as in Tables 5 and 6) form part of ~~are mandatory for~~ level 3 verification in the ~~core~~ SVS. For GPCs ROC curves and ROC areas are mandatory for level 1 verification in the core SVS while ROC areas only are mandatory for level 2 verification in the core SVS.

3.4 Hindcasts

In contrast to short- and medium-range dynamical Numerical Weather Prediction (NWP) forecasts, LRF are produced relatively few times a year (for example, one forecast for each season or one forecast for the following 90-day period, issued every month). Therefore the verification sampling for LRF may be limited, possibly to the point where the validity and significance of the verification results may be questionable. Providing verification for a few seasons or even over a few years only may be misleading and may not give a fair assessment of the skill of any LRF system. LRF systems should be verified over as long a period as possible in hindcast mode. Although there are limitations on the availability of verification data sets and in spite of the fact that validating numerical forecast systems in hindcast mode requires large computer resources, the hindcast period should be as long as possible. The recommended period for the exchange of scores is ~~advertised~~ provided on the Lead Centre web site (http://www.bom.gov.au/wmo/lrfvs/).

[…]

Þ Verification results over the hindcast period are mandatory for the exchange of LRF verification scores. Producing centres have to send new hindcast verification results ~~as soon as~~ when their forecast system is changed.

3.5 Real-time monitoring of forecasts

It is recommended that there be regular monitoring of the real time ~~long range forecasts~~ LRFs. It is acknowledged that this real-time monitoring is neither as rigorous nor as sophisticated as the hindcast verification; nevertheless it is necessary for forecast production and dissemination. It is also acknowledged that the sample size for this real-time monitoring may be too small to assess the overall skill of the models. However, it is recommended that the forecast and the observed verification for the previous forecast period be presented in visual format to the extent possible given the restrictions on availability of verification data.

Real-time monitoring of forecast performance is an activity for the GPCs rather than the ~~Lead Centre~~LC-SVSLRF. GPCs are free to choose the format and content of real-time monitoring information.

Part II: Attachment II.8, section 4 (Verification data sets) shall be amended to read:

The same data should be used to generate both climatology and verification data sets, although the forecast issuing Centres/Institutes own analyses or reanalyses and subsequent operational analyses may be used when ~~other data are not available~~ these are locally preferred.

Many LRFs are produced that are applicable to limited or local areas. It may not be possible to use the data in either the recommended climatology or verification data sets for validation or verification purposes in these cases. Appropriate data sets should then be used with full details provided.

[…]

Part II: Attachment II.8, section 5 (System Details) shall be amended to read:

Information must be provided on the system being verified. This information should include (but is not restricted to):

1. Whether the forecast system is numerical, empirical or hybrid.
2. Whether the system forecasts ~~is~~ are deterministic or probabilistic
3. Model type and resolution.
4. Ensemble size (if applicable).

[…]

Part II: Attachment II.8, section 6 (Lead Centres for SVSLRF) shall be amended to read:

6. EXCHANGE OF VERIFICATION INFORMATION AND THE LEAD CENTRES FOR SVSLRF

The WMO Fourteenth Congress endorsed the designation by CBS (Ext. 02) of WMC Melbourne and the Canadian Meteorological Centre Montreal as Co-Lead Centres for verification of long-range and ~~SI forecast activities Congress~~ forecasts. The co-lead centre functions include creating and maintaining coordinated Web sites for the display of GPC LRF verification information, so that potential users would benefit from a consistent presentation of the results. The goal is to help the RCCs and NMHSs to have a tool for improving the long-range forecasts delivered to the public. Congress urged all Members to actively participate in that activity as either users or producers of LRF verification information to assure the use of the best available products.

6.1 Role of lead centre

6.1.1 Create, develop and maintain web-site (the "SVSLRF web site") to provide access to the GPC LRF verification information. The address of the web site is http://www.bom.gov.au/wmo/lrfvs/. The web-site will:

(i) Provide access to standardized software for calculating scoring information (ROC curves, areas, contingency table scores, hit rates, …).

(ii) provide consistent graphical displays of the verification results from ~~participating centres~~ GPCs through processing of digital versions of the results;

(iii) contain relevant documentation and links to the web sites of global-scale producing centres (GPCs);
[…]

建议 7 (CBS-Ext.(10)) 的附录 2
修订《全球资料处理和预报系统手册》 (WMO-NO. 485)

The proposed amendments to the Manual on the GDPFS, Volume I, relate to the establishment of new standardized procedures related to verification of both deterministic NWP and EPS. These proposed amendments include:

- Standardized verification of deterministic NWP products: amendments to Part II, Attachment II.7, Table F;
- EPS verification requirements: amendments to Part II, Attachment II.7, Table F;
- Lead Centre for Deterministic NWP Verification (LC-DNV): Part II, new Attachment II.14.

PROPOSED AMENDMENTS TO THE MANUAL ON THE GDPFS RELATED TO STANDARDIZED PROCEDURES RELATED TO VERIFICATION OF BOTH DETERMINISTIC NWP AND EPS, VOLUME I, (WMO-No. 485)

Part II: Attachment II.7, Table F, sections I (Verification Against Analysis) and II (Verification Against Observations) shall be replaced by a single new section I (Standardized Verification of Deterministic NWP Products), with the existing formula; and rename section III (Standard Verification Measures of EPS) as section II. The new section I shall read as follows:

I – STANDARDIZED VERIFICATION OF DETERMINISTIC NWP PRODUCTS

1. Introduction

This section presents detailed procedures for the production and exchange of a standard set of verification scores for deterministic NWP forecasts produced by GDPFS centres. The goal is to provide consistent verification information on the NWP products of GDPFS participating centres for forecasters in the NMHSs and to help the GDPFS Centres compare and improve their forecasts. Scores will be exchanged between the participating producing centres via the Lead Centre for DNV. The Lead Centre functions, as described in Attachment II.14, include creating and maintaining a website for Deterministic NWP verification information, so that potential users will benefit from a consistent presentation of the results.

The term "deterministic NWP" refers to single integrations of NWP models providing products defining single future states of the atmosphere (as distinct from ensemble prediction systems where multiple integrations provide a range of future states).

The standardized verification should provide key relevant information appropriate to the state-of-the-art in NWP, while being as simple and as easy to implement as possible, and ensuring a consistent implementation across participating centres, in particular in the interpolation to verification grid, and use of a common climatology and set of observations.

2. Verification statistics

The following subsections define two sets of verification statistics. A minimum mandatory set shall be provided by all participating centres. A set of additional recommended statistics is also defined which all centres should provide if possible. The current specifications are for the verification of upper-air fields. The specifications will be expanded as recommended procedures for surface parameters are developed and in response to changing user requirements. The detailed procedures are required to ensure it is possible to compare results from the different participating centres in a scientifically valid manner.

3. Parameters

Extra-tropics

Mandatory
- Mean sea-level pressure
- Geopotential height at 850, 500 and 250 hPa
- Temperature at 850, 500 and 250 hPa
- Wind at 850, 500 and 250 hPa

Additional recommended
- Geopotential height, temperature, wind at 100 hPa
- Relative humidity at 700 hPa

Tropics

Mandatory
- Geopotential height at 850 and 250 hPa
- Temperature at 850 and 250 hPa
- Wind at 850 and 250 hPa

Additional recommended
- Relative humidity at 700 hPa

4. Forecast times

Scores shall be computed daily for forecasts initialised at 00 UTC and 12 UTC separately. For those centres not running forecasts from either 00 UTC or 12 UTC, scores may be provided for forecasts initiated at other times and must be labelled as such.

5. Forecast steps

Mandatory: forecast steps 24h, 48h, 72h, … 240h or end of forecast
Additional recommended: 12-hourly throughout forecast (12h, 24h, 36h, …)

6. Verification against analyses

6.1 Grid and interpolation

All parameters shall be verified against the centre's own analysis on a regular 1.5° x 1.5° grid.

In selecting the verification grid, consideration has been given to the variety of resolutions of current global NWP models, the resolved scales of models (several grid-lengths), the resolution of the available climatologies, the potential to monitor long-term trends in performance (including earlier, lower resolution forecasts) and computational efficiency.

Interpolation of higher resolution model fields to the verification grid shall be performed to retain features at the scale of the verification grid but not to introduce any additional smoothing. The following procedures shall be used:

– Spectral fields: truncate to equivalent spectral resolution (T120) for verification grid
– Grid point fields: use area-weighting to interpolate to verification grid

For scores requiring a climatology the climatology is made available via the LC-DNV website on the verification grid and needs no further interpolation.

6.2 Areas

Northern hemisphere extra-tropics	90°N - 20°N, inclusive, all longitudes
Southern hemisphere extra-tropics	90°S - 20°S, inclusive, all longitudes
Tropics	20°N - 20°S, inclusive, all longitudes
North America	25°N–60°N 50°W–145°W
Europe/North Africa	25°N–70°N 10°W–28°E
Asia	25°N–65°N 60°E–145°E
Australia/New Zealand	10°S–55°S 90°E–180°E

7. Verification against observations

7.1 Observations

All parameters shall be verified against a common set of radiosondes. The list of radiosonde observations for each area is updated annually by the CBS Lead Centre for radiosonde monitoring. The chosen stations' data must be available to all the centres and be of sufficient quality on a regular basis. Consultation with all centres (usually by electronic mail) is desirable before establishing the final list. The current list is available via the website of the LC-DNV. The LC-DNV will contact all participating centres when the new list is available and inform them of the date from which the new list shall be used.

The observations used for verification shall be screened to exclude those with large errors. In order to do this, it is recommended that centres exclude values rejected by their objective analysis. Moreover, centres which apply a correction to the observations received on the GTS to remove biases (e.g. radiation correction), should use the corrected observations to compute verification statistics.

7.2 Interpolation

Verification shall be made using the nearest native model grid point to the observation location.

7.3 Areas

The seven networks used in verification against radiosondes consist of radiosonde stations located

in the following geographical areas:

Northern hemisphere extra-tropics	90°N - 20°N, inclusive, all longitudes
Southern hemisphere extra-tropics	90°S - 20°S, inclusive, all longitudes
Tropics	20°N - 20°S, inclusive, all longitudes
North America	25°N–60°N 50°W–145°W
Europe/North Africa	25°N–70°N 10°W–28°E
Asia	25°N–65°N 60°E–145°E
Australia/New Zealand	10°S–55°S 90°E–180°E

The list of radiosonde stations to be used for each area is updated annually by the CBS Lead Centre for radiosonde monitoring (see subsection 7.1)

8. Scores

The following scores are to be calculated for all parameters against both analysis and observation.

Wind

Mandatory:
– rms vector wind error

Other parameters:

Mandatory
– Mean error
– Root mean square (rms) error
– Correlation coefficient between forecast and analysis anomalies (not required for obs)
– S1 score (for MSLP only)

Additional recommended
– mean absolute error
– rms forecast and analysis anomalies
– standard deviation of forecast and analysis fields

8.1 Score definitions

The following definitions should be used

Mean error $$M = \sum_{i=1}^{n} w_i (x_f - x_v)_i$$

Root mean square (rms) error $$rms = \sum_{i=1}^{n} w_i (x_f - x_v)_i^2$$

Correlation coefficient between ~~observed and~~ forecast and analysis anomalies ~~trends~~

$$r = \frac{\sum_{i=1}^{n} w_i (x_f - x_c - M_{f,c})_i (x_v - x_c - M_{v,c})_i}{\left(\sum_{i=1}^{n} w_i (x_f - x_c - M_{f,c})_i^2\right)^{1/2} \left(\sum_{i=1}^{n} w_i (x_v - x_c - M_{v,c})_i^2\right)^{1/2}}$$

rms vector wind error

$$rms = \sum_{i=1}^{n} w_i (\vec{V}_f - \vec{V}_v)_i^2$$

mean absolute error

$$MAE = \sum_{i=1}^{n} w_i \left| x_f - x_v \right|_i$$

rms anomaly

$$rmsa = \sum_{i=1}^{n} w_i (x - x_c)_i^2$$

standard deviation of field

$$sd = \sum_{i=1}^{n} w_i (x - M_x)_i^2 \quad \text{where} \quad M_x = \sum_{i=1}^{n} w_i x_i$$

S1 score

$$S_1 = 100 \frac{\sum_{i=1}^{n} w_i (e_g)_i}{\sum_{i=1}^{n} w_i (G_L)_i}$$

where:

x_f = the forecast value of the parameter in question

x_v = the corresponding verifying value ~~(observed)~~

x_c = the climatological value of the parameter

n = the number of grid points or observations in the verification area

$M_{f,c}$ = the mean value over the verification area of the forecast ~~climate~~ anomalies from climate

$M_{v,c}$ = the mean value over the verification area of the analysed ~~climate~~ anomalies from climate

$\vec{V}_f$ = the forecast wind vector

$\vec{V}_v$ = the corresponding verifying value

$$e_g = \left\{ \left| \frac{\partial}{\partial x}(x_f - x_v) \right| + \left| \frac{\partial}{\partial y}(x_f - x_v) \right| \right\}$$

$$G_L = \max\left(\left| \frac{\partial x_f}{\partial x} \right|, \left| \frac{\partial x_v}{\partial x} \right| \right) + \max\left(\left| \frac{\partial x_f}{\partial y} \right|, \left| \frac{\partial x_v}{\partial y} \right| \right)$$

where the differentiation is approximated by differences ~~on a 2.5° x 2.5° latitude/longitude~~ computed on the verification grid.

The weights w_i applied at each grid point or observation location are defined as
Verification against analyses: $w_i = \cos\phi_i$, cosine of latitude at grid point i
Verification against observations: $w_i = 1/n$, all observations have equal weight

9. Exchange of scores

Each centre shall provide scores monthly to the LC-DNV. Details of the procedure and the required format for the data are provided on the website of the LC-DNV. All scores (daily or 12-hourly) for all forecasts verifying within a month shall be provided as soon as possible after the end of that month.

10. Climatology

To ensure consistency between results from different centres a common climatology shall be used for those scores requiring a climatology. All centres shall use the climatology provided via the LC-DNV website.

A daily climatology of upper-air parameters are available for both 00 UTC and 12 UTC. This provides an up-to-date estimate of climate characteristics for each day of the year, including climate mean, standard deviation and selected quantiles of the climate distribution. These latter statistics are required for the CBS standardized verification of EPS forecasts.

The data is made available in Grib format. Information on access to the data and further documentation are provided on the LC-DNV website.

11. Monthly and annual averaged scores

Where average scores are required over a defined period, the averaging shall be made using the following procedures:

Linear scores (mean error, mean absolute error) - mean
Non-linear score should be transformed to appropriate linear measure for averaging
mean of MSE;
Z-transform for correlation

For a defined period, the average shall be computed over all forecasts verifying during the period. Averages shall be computed separately for forecasts initiated at 00 UTC and 12 UTC and both sets of average values provided.

Annual averages of the daily scores are included in the yearly Technical Progress Report on the Global Data-processing System. These statistics are for the 24, 72 and 120 h forecast and include the rms vector wind error at 850 hPa (tropics area only) and 250 hPa (all areas) as well as the rms error of geopotential heights at 500 hPa (all the areas except for tropics). A table of the number of observations per month should also be part of the yearly report.

12. Confidence Intervals

Bootstrapping*. Will be done by LC-DNV if daily scores are provided.

Note*: Introduction:

Any verification score must be regarded as a sample estimate of the "true" value for an infinitely large verification dataset. There is therefore some uncertainty associated with the score's value, especially when the sample size is small or the data are not independent. Some estimate of uncertainty (i.e. confidence intervals) must be used to set bounds on the expected value of the verification score. This also helps to assess whether differences between competing forecast systems are statistically significant. Typically confidence intervals of 5% and 95% are used.

Suggested method to calculate the Confidence Intervals (CI):

Mathematical formulae are available for computing CIs for distributions which are binomial or normal. In general, most verification scores cannot be expected to satisfy these assumptions. Moreover, the verification samples are often spatially and temporally correlated, especially at longer forecast ranges. A non parametric method such as the block bootstrap method handles spatially or temporally correlated data.

As described in Candille et al.(2007), a bootstrap technique for computing CIs involves recomputing scores numerous times after randomly extracting samples from the data set and then replacing them, again randomly, from the original data set. The correlation

between forecasts on subsequent days is accounted for by extracting and replacing blocks of samples from the data set, rather than individual samples. Based on a calculation of the autocorrelation between forecasts on subsequent days, it is concluded that blocks of 3 days may be used to calculate the 5% and 95% confidence intervals.

References:

– WMO/TD No. 1485 Recommendations for verification of QPF.

– G. Candille, C. Côté, P. L. Houtekamer, and G. Pellerin, 2007: Verification of an Ensemble Prediction System against Observations, Monthly Weather Review, Vol. 135, pp2688 2699

13. Documentation

Participating centres shall provide to the LC-DNV information on their implementation of the standardized verification system annually, shall confirm to the LC-DNV any changes to its implementation (including the annual change of station list, changes in additional statistics) and changes in their NWP model.

Part II: Attachment II.7, Table F, section III (Standard Verification Measures of EPS), renamed as section II, shall be amended to read:

[…]

Probabilities

Probabilistic scores (excluding the CRPS) are exchanged in the form of reliability tables. Details of the format of the exchange of verification data ~~reliability tables~~ are provided on the website of the Lead Centre for verification of EPS.

List of parameters

[…]

Observations for EPS verification should be based on the GCOS list of surface network (GSN). Verification of precipitation may alternatively be against a proxy analysis i.e. short range forecast from the control or high-resolution deterministic forecast, e.g. 12-36h f orecast to avoid spin-up problems.

[…]

Scores

Brier Skill Score (with respect to climatology) (see definition below*)

Relative Operating Characteristic (ROC)

Relative economic value (C/L) diagrams

Reliability diagrams with frequency distribution

Continuous Rank Probability Score (CRPS)

NOTES: Annual and seasonal averages of the Brier Skill Score at 24, 72, 120, 168 and 240 hours for Z500 and T850 should be included in the yearly Technical Progress Report on the Global Data-processing and Forecasting System.

In the case of CRPS, centres are encouraged to submit this for both EPS and the deterministic (control and high-resolution) forecast as well - CRPS for deterministic forecast is equal to the mean absolute error.

In Part II, add new Attachment II.14 as follows:

ATTACHMENT II.14

FUNCTIONS OF LEAD CENTRE FOR DETERMINISTIC NWP VERIFICATION (LC-DNV)

The Lead Centre functions include creating and maintaining a website for Deterministic NWP verification information, so that potential users will benefit from a consistent presentation of the results. The goal is to provide verification information on the NWP products of GDPFS participating centres for forecasters in the NMHSs and help the GDPFS Centres improve their forecasts. Congress urged all Members to actively participate in that activity as either users or producers of Deterministic NWP verification information to assure the best use of the available products.

Note: * The "deterministic NWP" refers to single integrations of NWP models providing products defining single future states of the atmosphere (as distinct from ensemble prediction systems where multiple integrations provide a range of future states).

The purpose of the LC-DNV shall be to create, develop and maintain the website to provide access to the Deterministic NWP verification information. The choice of verification statistics, the content of the documentation, the information on interpretation and use of the verification data will be determined and revised by the CBS.

1. The LC-DNV shall:
   - (a) Provide the facility for the GDPFS participating Centres to automatically deposit their verification statistics in the agreed format, and give all participating Centres access to these verification statistics
   - (b) Maintain an archive of the verification statistics to allow the generation and display of trends in performance
   - (c) provide specifications defining the format of the data to be sent by the GDPFS participating Centres to the LC-DNV (specification to be defined in consultation with the CG-FV)
   - (d) Monitor the received verification statistics and consult with the relevant participating centre if data is missing or suspect
   - (e) Provide on its website access to the standard procedures required to perform the verification
   - (f) Provide access to standard data sets needed to perform the standard verification, including climatology and lists of observations and keep this up to date according to CBS recommendation
   - (g) Provide on its website
     - o consistent up-to-date graphical displays of the verification results from participating Centres through processing of the received statistics
     - o relevant documentation and links to the websites of GDPFS participating Centres;
     - o contact details to encourage feedback from NMHSs and other GDPFS Centres on the usefulness of the verification information
2. The LC-DNV may also:
   - (a) Provide access to standardized software for calculating scoring information.

建议 7 (CBS-Ext.(10)) 的附录 3
修订《全球资料处理和预报系统手册》 (WMO-NO. 485)

The proposed amendments to the Manual on the GDPFS, Volume I, relate to the establishment of a new designation and new procedures related to the ERA. These proposed amendments include:

- Designation of RSMCs with activity specialization in the provision of atmospheric modelling (for environmental emergency response and/or backtracking): amendments to Part I, Appendix I-1;

- Data provision by RSMCs with activity specialization in the provision of atmospheric modelling (for environmental emergency response and/or backtracking): amendments to Part II, Appendix II-7.

PROPOSED AMENDMENTS TO THE MANUAL ON THE GDPFS RELATED TO EMERGENCY RESPONSE ACTIVITIES, VOLUME I, (WMO-No. 485)

Part I: Appendix I-1, section 3 (The RSMCs with activity specialization are the following:), add "RSMC Vienna (backtracking only)" to the list of RSMCs with activity specialization in the provision of atmospheric modelling (for environmental emergency response and/or backtracking), as follows:

3. The RSMCs with activity specialization are the following:
[…]

Provision of atmospheric transport modelling (for environmental emergency response and/or backtracking)

RSMC Beijing
RSMC Exeter
RSMC Melbourne
RSMC Montreal
RSMC Obninsk
RSMC Offenbach (backtracking only)
RSMC Tokyo
RSMC Toulouse
RSMC Vienna (backtracking only)
RSMC Washington

Part II: Appendix II-7, section 2 (Basic set of products) shall be amended to read:
2. Basic set of products

~~Five~~ Seven maps consisting of:

(a) Three-dimensional trajectories starting at 500, 1 500 and 3 000 m above the ground, with particle locations at six-hour intervals (main synoptic hours up to the end of the dispersion model forecast);

(b) Time-integrated airborne concentrations within the layer 500 m above the ground, in Bq s m–3 for each of the three forecast periods;

(c) Total deposition (wet + dry) in Bq m–2 from the release time to the end of each of the three forecast periods~~the dispersion model forecast~~.

Part II: Appendix II-7, section 5 (General rules for displaying results), paragraph 4 (Specific guidelines for concentration and deposition maps:), item (a) shall be amended to read:

5. General rules for displaying results
[…]
Specific guidelines for concentration and deposition maps:
(a) Adopt a maximum of four concentration/deposition contours corresponding to powers of 10 with minimum values not less than 10 20 Bq s m-3 for time-integrated airborne concentrations and not less than 10 20 Bq m-2 for total deposition;

建议 7 (CBS-Ext.(10)) 的附录 4
修订《全球资料处理和预报系统手册》 (WMO-NO. 485)

The proposed amendment to the Manual on the GDPFS, Volume I, relates to the designation of Regional Climate Centres (RCCs) and RCC-Networks for climate sensitive areas that fall within the responsibilities of more than one Regional Association (e.g. Polar Regions): amendments to Part II, Appendix II-10.

PROPOSED AMENDMENTS TO THE MANUAL ON THE GDPFS RELATED TO THE DESIGNATION OF RCCs AND RCC-NETWORKS, VOLUME I, (WMO-No. 485)

Part II: Appendix II-10 (Designation and mandatory functions of Regional Climate Centres (RCCs) and RCC-Networks), insert a new paragraph after paragraph 1, and rename paragraphs 2 and 3 as paragraphs 3 and 4. The new paragraph shall read as follows:

2. WMO RCCs or WMO RCC-Networks might be established, by request of the Members of the Regional Associations concerned, for climate-sensitive areas whose boundaries extend beyond or are outside those of a singlethat fall within the responsibilities of more than one Regional Association (e.g. Polar Regions).

建议 7 (CBS-Ext.(10)) 的附录 5
修订《全球资料处理和预报系统手册》 (WMO-NO. 485)

The proposed amendment to the Manual on the GDPFS, Volume I, relates to sections related to exchange of products between centres, in line with the establishment and development of the WMO Information System (WIS): amendments to Part II, section 5.

PROPOSED AMENDMENTS TO THE MANUAL ON THE GDPFS RELATED TO THE EXCHANGE OF PRODUCTS BETWEEN CENTRES, VOLUME I, (WMO-No. 485)

Part II: section 5 (Exchange of products between centres), in paragraph 5.1 (Times of availability of products), items 5.1.1 and 5.1.2 shall be merged and amended to read: (delete NOTE)

5.1.1 Processed data (products) required for real-time and non-real time purposes shall reach the national Meteorological Service sufficiently quickly to be of effective use in its associated timescale. Both observational and processed data shall therefore be handled rapidly by both the GDPFS and the WIS/GTS (see also paragraph 2.3.2). On the WIS/GTS, transmission of observational data shall have priority over the transmission of processed data.

Part II: section 5 (Exchange of products between centres), in paragraph 5.2 (Programmes of output products), shall be amended to read:

5.2.2 Members shall establish programmes of output products for general distribution by their WMCs and/or RSMCs, taking into account requirements of other Members and the WIS/GTS operational arrangements required ~~capability of the GTS~~ to handle and distribute these products.

[…]

5.2.3 In order to avoid overloading the WIS/GTS, Members should limit requests by their NMCs for products, taking into account the following considerations:

[…]

~~5.2.4 Globally specialized RSMCs should tailor their products to regions to meet regional requirements and, if possible, to limit their size to avoid overloading the GTS.~~

Part II: section 5 (Exchange of products between centres), in paragraph 5.3 (Transmission priorities for GDPFS products), insert new sub-paragraph 5.3.1 instead of a NOTE, and rename sub-paragraphs 5.3.1 to 5.3.11 accordingly. Paragraph 5.3 shall be amended to read:

5.3.1 Transmission priorities for GDPFS products~~NOTE: The priorities listed~~ described in this section are intended as guidance to GDPFS centres on providing observational data and output products to the WIS/GTS in the proper sequence. As regards the relay and distribution of information by WIS centres~~automated telecommunication centres~~, the provisions of the Manual on the Global Telecommunication System and the Manual on WIS apply.

5.3.21 Transmission priorities for global and regional model products ~~from WMCs and RSMCs~~ **(merge existing sub-paragraphs 5.3.1 and 5.3.2; delete NOTE)**

5.3.2 1.1 Priorities for the transmission of global model output products should be used when several such WMC and RSMC products are available at the same time. ~~NOTE: Transmission Priorities for global model output products are given in Attachment II.3. 5.3.2~~ Priorities for transmission of regional model products should be based on the requirements for interregional exchange of RSMC products ~~on the MTN and its branches~~.

5.3.3 Transmission priorities after transmission outages on the MTN and its branches **(merge items (a) and (b), and rename them as sub-paragraph 5.3.3.1; delete NOTES (1 and (2))**

~~(a)~~ In case of WIS centre or communication link failure, WIS/GTS provisions for backup apply. After transmission outages that have disrupted the normal information exchange, normal transmission schedules of observational data should be resumed no later than the first main standard time of observation following the cessation of the outage. ~~(b)~~ Procedures for the transmission of accumulated meteorological data should not interfere with the resumption of normal transmission schedules. If these data are redundant, they should not be transmitted.

5.3.4 Transmission priorities for global and regional model products ~~from WMCs and RSMCs~~ after outages **(merge existing sub-paragraphs 5.3.4 and 5.3.5; delete NOTE)**

5.3.4.1 Global and regional model products from RSMCs accumulated due to ~~circuit~~ communication link disruption should be transmitted with the least possible delay.

~~5.3.5 Transmission priorities for regional model products from RSMCs after outages~~

~~5.3.5.1 Regional model products from RSMCs accumulated due to circuit disruptions on the MTN and its branches should be transmitted with the least possible delay. 5.3.5.2~~ The regional model products should have a higher priority than global model products for transmission after outages~~ on the MTN and its branches~~.

5.3.5~~6~~ Priority of observational data over processed data **(merge existing sub-paragraphs 5.3.6 and 5.3.7; delete existing sub-paragraphs 5.3.7.2 and 5.3.8, and NOTE)**

5.3.5~~6~~.1 ~~On the MTN and its branches, transmission of observational data shall have priority over the transmission of processed data (in both analogue and digital form). 5.3.7 Transmission of products in binary, alphanumeric and pictorial form 5.3.7.1~~ Until such time as all centres are in a position to convert output products in GRIB, GRID and/or BUFR ~~GRID~~ code form into pictorial form, Members should transmit certain of their WMC and RSMC products also in pictorial form in addition to alphanumeric and/or binary form.

NOTES:

(1) Members are encouraged to transmit processed information in the GRID, GRIB and/or BUFR ~~GRIB~~ code forms.

~~(2) A minimum list for transmission of products in binary, alphanumeric and pictorial form is given in Attachment II.6.~~

(2~~3~~) As Members develop the capability at their ~~RSMCs~~ centres for transforming these products from GRID, GRIB and/or BUFR ~~GRIB~~ to pictorial form, the pictorial transmission will be discontinued, where appropriate.

5.3.7~~9~~ Procedures and formats for the exchange of monitoring results

[…]

5.3.8 ~~10~~ Standards in the provision of international services by Regional Specialized Meteorological Centres (RSMCs) for atmospheric modelling in radiological environmental emergency response

5.3.8~~10~~.1 The designated RSMCs with activity specialization in the provision of international services for atmospheric transport modelling in radiological environmental emergency response shall implement agreed standard procedures and products~~. NOTE: Standards in the provision of international services by RSMCs for atmospheric transport modelling, for radiological environmental emergency response are~~, given in Appendix II-7.

5.3.9~~11~~Standards in the provision of international services by Regional Specialized Meteorological Centres (RSMCs) for atmospheric transport modelling in backtracking

5.3.9 ~~11~~.1 The designated RSMCs with activity specialization in the provision of international services for atmospheric transport modelling in backtracking shall implement agreed standard procedures and products. ~~NOTE:~~ Standards in the provision of international services by RSMCs for CTBT Verification support are given in Manual on GDPFS, Appendix II-9.

Part II: section 5 (Exchange of products between centres), delete paragraph 5.4 (Responsibilities of Members for providing information on their real-time data-processing activities)

建议8 (CBS-Ext.(10))

基本系统委员会的职责

基本系统委员会，

注意到：

(1) 第十五次世界气象大会含决议案的最终节略报告 (WMO-No. 1026)，

(2) 技术委员会主席2009年会议最终报告(2009年2月2-4日，日内瓦)和技术委员会主席2010年会议最终报告(2010年1月28-30日，日内瓦)，

(3) 执行理事会第六十二次届会含决议案的最终节略报告(WMO-No.1059)，

(4) WMO战略计划 (WMO-No. 1028)，

考虑到执行理事会提议纳入 WMO 总则的有关技术委员会总职责的新前言，

认识到技术委员会的职责应与本组织的长期优先，WMO 基于结果的管理方式以及本组织的总体目标和战略主旨保持一致，

建议根据本建议的附录修改基本系统委员会的职责；

要求秘书长提请第十六次世界气象大会注意这一建议并对此进行审议和纳入 WMO 总则。

建议 8 (CBS-Ext.(10)) 的附录

基本系统委员会的职责

委员会负责以下相关事宜：

(a) 在观测、资料处理、预报、通信和资料管理等综合系统的发展及业务上，与各会员、其他技术委员会和有关机构合作。这些活动应满足各种要求；支持WMO的所有计划，尤其是为减轻灾害风险做贡献，并利用技术开发所提供的机会；

(b) 结合气象、水文、海洋和相关环境科学方面新的应用，评估并提供公共基础设施，以满足各技术委员会和区域协会，以及与世界气象组织有关的组织的要求；

(c) (i) 制定和实施公共气象服务计划，特别要注意提供端到端的服务；

(ii) 制定和实施WMO空间计划；

(iii) 为制定和实施全球气候服务框架作贡献；

(d) 为气象和相关的目的，特别是为了组建世界天气监视网的全球资料处理和预报系统，处理、存储和检索基本资料；

(e) 系统及技术的开发和应用，以满足用户的要求，其中包括业务天气分析和预报以及为环境应急部门服务方面的要求；

(f) 由各会员确定的观测系统、设施和站网(陆地、海洋、高空和空间)，特别是WMO全球综合观测系统和全球观测系统的全部技术问题；

(g) 电信网络、无线电频率分配和用于业务、研究以及应用的设施，特别是组建WMO信息系统，包括世界天气监视网全球电信系统；

(h) 根据WMO各项计划的要求，尤其是通过WMO信息系统，开发和实施业务程序、详细计划和安排，以便交换并获取有关天气、气候和水的信息(资料和产品)，包括警报信息；

(i) 资料管理原则和程序的制定和应用，包括公共基础设施，特别是世界天气监视网的监测和评估。

建议 9(CBS-Ext.(10))

审议执行理事会基于基本系统委员会以往的建议做出的决议或有关委员会的决议

基本系统委员会，

满意地**注意到**执行理事会对基本系统委员会以往建议或有关委员会所采取的行动，

考虑到执行理事会一些以往的决议仍然有效，

建议执行理事会的以下决议保留有效：决议 2(EC-56)、决议 3(EC-59)、决议 4(EC-61)、决议 6(EC-61)(仅建议 1、4 和 10(CBS-14) 保留有效)、决议 12 和 14(EC-62)。

附录

附录1

总摘要第4.2.3段的附录

WMO用户观测需求和观测系统能力数据库(RRR 数据库)的发展战略和未来承办问题

1. 引言

1.1 作为滚动需求审查 (RRR) 的一部分，WMO 维持了一个用户需求和观测系统能力数据库 (在本文中称 RRR 数据库)。它的主要目的是掌握能满足用户需求的实地和空基观测系统的能力。最初通过与对地观测卫星委员会 (CEOS) 的合作对 RRR 进行设计，并由 WMO 网站负责维护。

1.2 RRR 数据库包括两大组成部分，它们包含的内容有：(i) 以应用领域分类的用户需求； (ii) 地基和空基观测系统的能力。最初数据库包含各国际组织或计划的需求，其中包括 ICSU、IGBP、 IOCCG、 UNEP 和 UNOOSA，但更新版 RRR 数据库仅突出 WMO 和 WMO 参与发起的计划的需求。

用户需求

1.3 针对 WMO 计划和联合发起的计划，分应用领域收集用户的需求。就每个应用领域[1]和每个所需变量[2]而言，RRR 数据库中的用户需求包含以下内容: (i) 水平分辨率; 垂直分辨率; (iii) 观测周期：(iv) 时效；和 (v) 精度。专家针对上述各项指标，给出以下 3 个不同的值：

(a) “ 临界值 ” 是为确保资料有用性需达到的最低要求；

(b) “ 目标值 ” 是理想的要求，对此无需进一步提高；和

(c) “ 突破值 ” 介于 “ 临界值 ” 和 “ 目标值 ” 之间，如果达到该值，将给针对的应用带来重大改进。

观测系统能力

1.4 就观测系统的每个组成部分 (地基和空基) 以及具体区域测量的变量而言，观测系统的能力部分给出了以下实际的仪器性能: (i) 水平分辨率; (ii) 垂直分辨率; (iii) 观测周期; (iv) 时效；和 (v) 精度。

5: http://www.wmo.int/pages/prog/sat/Databases.html

6: 滚动需求审查目前涉及以下应用领域：(1) 全球数值天气预报 (NWP)，(2) 高分辨率 NWP，(3) 天气学，(4) 临近预报和甚短期预报，(5) 季节到年际预报，(6) 航空气象学，(7) 大气化学，(8) 海洋应用，(9) 农业气象学，(10) 水文学，(11) 在大气、海洋和陆地范畴的气候监测 (GCOS，(12) 气候应用 (CCl 从事的其他方面)，(13) 气候研究 (WCRP)。此外 WMO 正在考虑增加以下应用领域：(1)GCOS 尚未涉及的全球陆地方面的需求 (不属 GCOS 的 GTOS 的需求)，和 (2) 空间天气。

7 : 数据库目前涉及 112 个变量。目前正通过 ET-SAT 与 CEOS 磋商有关卫星部分，以便使名称和定义标准化。

RRR 数据库的用途

1.5 如果数据库是最新的，它反映了最新的用户需求和地基及空基观测系统的最新技术水平，RRR 数据库可用于以下目的：

(a) 作为用户需求的参考材料用于设计WMO各应用领域的观测系统；

(b) 作为当前各观测系统组成部分以及它们的实际性能的参考材料；

(c) 通过将仪器性能与用户需求的对比可进行严格审查，结合使用其他手段，如观测系统试验(OSE)和观测系统模拟试验(OSSE)可确定差距。严格审查将给出差距分析，提出具体建议和解决这些差距的优先重点，因此严格审查对制定每个应用领域的声明和指南(SoGs)特别有用。SoGs将有助于发展和更新全球综合观测系统发展实施计划(EGOS-IP)。

***CBS* 管理组的意见**

1.6 CBS 管理组在 2010 年 3 月 17-19 日，在日内瓦召开的第十一次会议上认可 RRR 数据库在 WIGOS 方面的作用。 它强调需要一个有适当资助的 WMO 用户需求和观测系统能力数据库，以便定期更新和维护。它具体提出了一个基于网络和可以互动更新的数据库。管理组同意，必须明确一个可持续的，用于开发和维护需求及能力的战略。RRR 数据库的这两个组成部分是 ET-EGOS 开发和发展 GOS 以及 WIGOS 工作的基础。因此管理组要求 ICT-IOS 制定一份实施和维护 RRR 数据库的建议提交 CBS-Ext.(10)。

2. 现状

2.1 秘书处通过 CBS 全球综合观测系统专家组 (ET-EGOS) 有关联系人提供的材料，以及由卫星系统专家组提供的有关卫星能力的材料负责维护 RRR 数据库。

用户需求

2.2 RRR 数据库的“需求”部分相对简单且易管理。RRR 各应用领域的联系人定期审查数据库中的用户需求并向 ET-EGOS 提出意见以便更新。最近已作了更新并可上网访问，目前使用 Excel workbook[3]，可吸收进一步的更新以及新的应用领域。其中特别注重各应用领域中变量名称、定义和单位的统一，以便确保对相似的地球物理变量的需求能用可比的方法表示。

观测系统能力

2.3 “能力”部分是较为复杂的问题，目前能力的可持续性是一个开放的问题。近些年，所谓的 CEOS-WMO 观测能力数据库未能得到维护，目前已经过时。

2.4 WMO 全球观测系统空基部分档案集 (GOS-2010)[4] 拥有空基能力的最新参考材料，材

7 : http://www.wmo.int/pages/prog/sat/Refdocuments.html#spacebasedgos
8 : http://www.eoportal.org/about.html

料可通过上网获取。该档案集每年更新两次，它包括以下内容：

(a) 引言;

(b) 卷1: 介绍卫星计划(2010年1月出版的卷1 还作为WMO/TD-No.1513 / SP-7) ;

(c) 卷2: 对地观测卫星及其仪器;

(d) 卷 3: GOS空基部分的差距分析;

(e) 卷 4: 对代表性仪器提供的产品的性能估计；和

(f) 卷 5: 潜在的产品性能与用户需求相符分析。

相关的空基能力信息虽然未经 WMO 秘书处质量控制，但仍然可在下述方面找到：

(a) 欧洲空间局为对地观测委员会(CEOS)维护的含互动存取功能的CEOS 对地观测手册
；和

(b) ESA 对地观测门户网站

WMO 秘书处拥有的其他相关数据库

2.5 WMO 秘书处目前正在开发一个“国别数据库”，用于提高跟踪会员现状和制定需求的能力。数据库将改进对各项计划和区域的协调和知识的管理。

2.6 还正在对另两个数据库的开发进行规划，它们将作为 WIGOS 实施过程的一部分。它们是：(i) 标准数据库，用于向所有 WMO 观测标准、指南、最佳规范、程序等提供统一的存取点；(ii) 用于描述所有致力于 WIGOS 观测系统部分和相关网络的数据库以及向终端用户提供相关元资料的数据库，这些元资料对 WIGOS 的运行以及 WIS 资料发现、存取和检索 (DAR) 服务均十分重要。

2.7 将独立开发 RRR 数据库，但 WMO 秘书处维护的所有数据库，包括用户需求数据库，有可能整合成一个统一的由秘书处管理的数据库。这需要提供适当的资源，包括工作人员，来开发和运行数据库。

3. 挑战

3.1 由于种种原因，维护和运行 RRR 数据库是一项挑战：

(a) 收集最新的用户需求信息：各计划领域指定的联系人必须在各自范围内积极主动收集材料并通过ET-EGOS将最新的信息传递给数据库。有些应用领域与其他领域相比能更好地反映当前的用户需求。尽管ET-EGOS定期通过联系人收集信息，但

9 : http://www.wmo.int/pages/prog/sat/Refdocuments.html#spacebasedgos
10 : http://www.eohandbook.com/
11 : http://www.eoportal.org/about.html

有些情况下仍存在问题；

(b) 推导/收集观测系统信息：与空基观测系统相比，获取适合数据库使用的地基观测系统能力方面的信息更为困难。需要一种以足够数量观测平台(它们用于提供国内不同区域或海洋专属经济区的观测)为基础的统计方法，以便降低地基观测网络在水平分辨率方面的性能。同样需利用单个观测和剖面方面的信息以便获得垂直分辨率、观测周期和时效方面的统计信息。虽然拥有GTS监测信息，但目前的信息结构并不能始终方便地和自动地获取所需的信息。对产生仪器精度的方法(如果不是标准的)必须妥善做好记录。不同国家采用的观测方法不同，这为获得良好的观测精度估计带来诸多困难。对观测系统能力数据库的地理体制可能需要进行优化，以便有助于计算输入数据库的所需信息。

(c) 向RRR数据库输入拥有的信息：必须拥有一个用户友好的界面，以便用最少的精力输入经验证的最新信息。有些必须进行质量检查或置入数值以确保对变量命名的一致性和防止RRR数据库“需求”部分和“能力”部分的重复；

(d) RRR数据库的查询： 必须具有能在网上自动查询和展示RRR数据库内容的可靠的数据库管理系统。目前在网上只有RRR数据库内容的输出，尚未建立网上实时查询。WMO秘书处也应具有查询RRR数据库的能力，以便进行严格的审查和向ET-EGOS专家提供相关的信息供审议。目前对用于制作严格审查表的工具很难管理并且十分耗时；

(e) RRR数据库的更新和使用：必须拥有固定的人员定期向RRR数据库输入新的信息，确保数据库能反映最新的用户需求和观测系统的能力。还必须有人进行严格的审查，如上所述，这项工作十分耗时。目前WMO秘书处尚欠所需的人员；

(f) 实际情况： RRR数据库必须每天24小时运行，必须有人监视数据库，以确保正常运行和与外部用户的连接。

3.2 ICT-IOS 认识到有一系列问题需审议，以便向 CBS 提出相关的建议，其中包括：

(a) 与WMO质量管理框架相一致的质量管理，使RRR数据库具有良好的可靠性和档案记载；

(b) 吸纳专家收集各自应用领域的用户需求；

(c) 吸纳各区域协会和各技术委员会的相关专家组以及会员收集仪器性能方面的信息，尤其是地基观测系统的信息；

(d) 各不同角色在RRR数据库总体协调、运行和维护、更新、查询和监督方面的作用。尤其是未来数据库的结构必须能为指定人员根据访问权限和特许向数据库提交信息提供方便；

(e) 资金需求和确定筹资渠道。

4. RRR 数据库发展的选项

4.1 尽管目前 RRR 数据库在运行和维护方面面临挑战，WMO 秘书处保证使数据库真正投入运行并实现其目标。要实现这一目标可以由 WMO 秘书处运行数据库，也可由一个 WMO 会员代表 WMO 来承办和运行这一系统。以下第 6 部分给出了对承办 RRR 数据库的要求。

4.2 对两种不同的承办和运行 RRR 数据库的方法开展了调研，即：(i) 集中方式，将数据库位于一个中心，由该中心负责运行、维护和更新；(ii) 分布式方式，由负责数据库具体组成部分的不同的中心 (如卫星、地基、区域或专用网络等) 参与数据库运行、维护和更新。一些国际组织表示已经做好准备支持 WMO 的 RRR 过程并且可以考虑至少承办部分 RRR 数据库。

4.3 作为分布式 RRR 数据库的一部分，建议 WMO 秘书处继续承办 RRR 数据库的观测需求部分。

4.4 ICT-IOS 决定建立一个由 Lars Peter Riishojgaard (美国，OPAG-IOS 组长) 为组长、John Eyre (英国，ET-EGOS 组长)、 Michael Kalb (美国，ET-SAT 组长)、 Klaus Jürgen Schreiber (德国)、 Jerome Lafeuille (WMO 秘书处) 和 Etienne Charpentier (WMO 秘书处) 为成员的专题组，由他们制定 RRR 数据库的开发、维护、运行和承办的战略，起草给潜在候选单位 (如 NOAA、EUMETSAT、EUMETNET 和 JCOMM 实地观测平台支持中心 (JCOMMOPS)) 的信函，并提出一个正式的评估过程于 2010 年提交 CBS(见议题 8)。本战略的附录为专题组的职责。

5. RRR 数据库的开发、维护、运行和承办战略

5.1 高层结构

关于 RRR 数据库的详细说明及其管理由秘书处商 ICT-IOS RRR 数据库专题组制定。建议 RRR 数据库根据下图详细描述的内容进行开发：

(a) WMO 秘书处承办 RRR 数据库的观测需求部分；

(b) RRR 数据库的空基观测系统能力部分由一个空间机构代表 WMO 承办；

(c) RRR 数据库的地基观测系统能力部分由另一具有管理和监测地基观测系统的机构承办；

(d) WMO 承办一个门户网站与数据库不同组成部分连接，并监督更新工作。

以下第 6 和第 7 部分详细介绍基本规格和各角色承担的作用和责任。

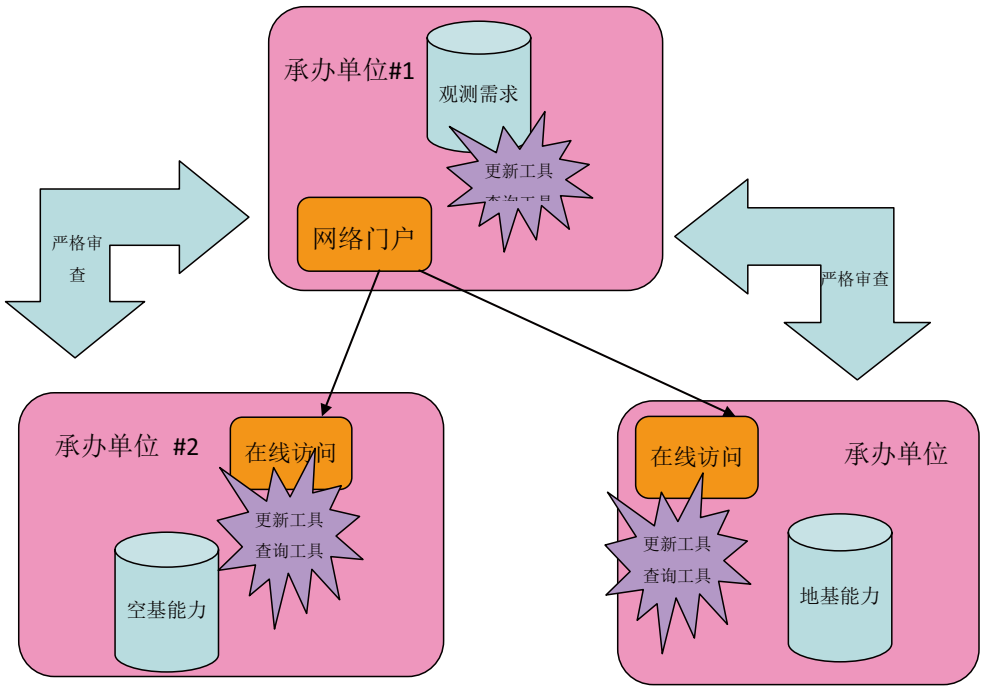


图 1: 分布式数据库概览

5.2 时间进度

以下为建议的 RRR 数据库开发时间进度：

(a) 2010年7月1-15日： RRR数据库专题组制定战略和详细说明；
(b) 2010年7月1日-8月31日：秘书处与RRR数据库专题组协商制定技术规格；
(c) 2010年9月1日-10月：根据秘书处制定的技术规格寻找承办RRR数据库空基和地基观测系统能力部分的候选单位；
(d) 2010年11月：向CBS-Ext提交战略;
(e) 2010年11-12月： 根据以下第8部分列出的标准，由RRR数据库专题组评估提出的各项建议；
(f) 2011年1月：RRR数据库专题组就秘书长提出的候选承办单位提出建议，供正式批准；正式要求经筛选的承办单位开始工作，签署备忘录；
(g) 2011年：承办单位制定不同的组成部分；
(h) 2012年：测试和调整各组成部分；
(i) 2012年CBS届会：全面投入应用，向CBS届会作展示介绍。

5.3 资金

用户需求和整体协调

WMO 秘书处将全力支持 RRR 数据库用户需求部分，及其内容的研发、管理和定期管理。

空基能力

预计 RRR 数据库空基观测系统能力部分内容的运行、维护和管理所需的大部分资金由承办单位承担。

地基能力

WMO 秘书处可能向承办 RRR 数据库地基观测系统能力部分的单位提供有限的资金，以帮助：(i) 开发应用；(ii) 运行和维护各项应用和数据库内容。这些资金将不超过 5 万瑞郎用于最初的开发，以及每年不超过 2.5 万瑞郎的运行资金。

6. 承办空基 / 地基观测系统能力的基本详细说明

凡拟代表 WMO 承办 RRR 数据库空基观测系统能力部分的 NMHS/ 单位 / 机构必须承诺：

(a) 以承办单位已有的软件和工具为基础开发数据库，数据库将以WMO提议的关系模式为基础；

(b) 用因特网在线提供数据库，允许用标准查询表查询信息，并对空基/地基观测系统如何满足用户需求开展严格审查。相应的网页应作为WMO网页展示，并含有WMO徽标(可能的话利用“WMO.int”网页地址)旨在明确表明这是WMO的应用程序。关于具体提供怎样的查询表，以及如何开展严格审查由WMO秘书处与RRR数据库专题组磋商后准备文件；

(c) 为方便管理数据库的内容提供工具，如：(i)通过因特网提供在线-密码保护-屏幕，使指定的专家能对数据库进行编辑并视需要做小的修改；(ii)为实质性修改引进工具；

(d) 确保数据库24小时运行。必须有人监管数据库，确保正常运行和外界用户的接入。还应设有联系人，以便报告可能出现的问题和提供必要的帮助；

(e) 开展数据库应用的日常维护，包括修正程序错误和必要的软件/硬件升级；

(f) 在线提供数据库文件，包括数据库原理、技术规格和描述，用户手册以及关于质量控制程序和过程的介绍。

(g) 实施RRR数据库的版本控制，包括修改/更新有关变量和要求的文档，以确保用户在使用方面的可追溯性和一致性。

秘书处商 RRR 数据库专题组后提供详细的技术规格。

7. 作用和责任

下表给出了不同角色对RRR数据库的总体协调、运行和维护、更新和监督的不同作用和责任。

联系人	作用和责任
WMO 秘书处	· 协调RRR数据库的总体管理； · 承办一个提供访问的门户并监管RRR数据库的所有组成部分和工具； · 承办RRR数据库的需求部分，包括： o 通过 WMO 网站在线提供数据库； o 按照授权专家提供的信息更新数据库； o 对内容进行质量控制，视需要与有关专家磋商进行调整； o 运行和监管，确保通过WMO网站予以提供； o 定期导出适当格式的文本表单，以便根据需要导入其他数据库； · 通过地基和空基能力数据库承办单位提供的支持负责总体维护RRR数据库能力部分的最新内容。
承办RRR数据库空基观测系统能力部分的空间机构	· 承办RRR数据库空基观测系统能力部分，包括： o 负责运行和监督空基观测系统能力部分，通过含WMO标志的网络服务器业务性提供这些能力，查询工具和标准报告； o 根据秘书处和指定专家提供的信息更新数据库； o 内容的质量控制以及商有关专家和WMO秘书处作必要的调整； o 定期评估数据库内容，确定丢失的信息，与秘书处磋商并代表秘书处在向有关专家征询相关信息方面发挥积极主动作用； o 定期导出适当格式的文本表单，以便根据需要导入其他数据库； o 每年向秘书处提交一份有关数据库内容及其流传程度的摘要统计报告。
承办RRR数据库地基观测系统能力部分的机构	· 承办RRR数据库地基观测系统能力部分，包括： o 负责运行和监督地基观测系统能力部分，通过含WMO标志的网络服务器业务性提供这些能力，查询工具和标准报告； o 根据秘书处和授权的指定专家提供的信息更新数据库； o 内容的质量控制以及商有关专家和WMO秘书处作必要的调整； o 定期评估数据库内容，确定丢失的信息，与秘书处磋商并代表秘书处在向有关专家征询相关信息方面发挥积极主动的作用； o 定期导出适当格式的文本表单，以便根据需要导入其他数据库； o 每年向秘书处提交一份有关数据库内容及其流传程度的摘要统计报告。

表 1: 数据库承办单位的作用和责任

提供信息和 / 或监督 RRR 数据库内容的单位的作用和责任见以下表 2。

ET-EGOS在各应用领域联系人	· 定期就相关领域与有关专家、小组和专家组联系和协调，收集用户需求信息和征询统一意见； · 每年向秘书处提交一次相关应用领域用户对观测的需求； · 定期在线检查RRR数据库内容，确保最新的用户观测需求； · 视情通过秘书处提出关于RRR数据库内容的专项修改建议； · 分析RRR数据库内容，以便开展严格审查和差距分析。
ET-EGOS国家联系人	· 针对各自的地理区域检查RRR数据库地基观测系统能力部分的内容，确保在线的信息是准确和最新的；通过秘书处视情提出修改建议。
监督中心	· 指定一个或多个中心向秘书处提供观测系统能力的统计信息。然后对信息进行质量控制并导入RRR数据库的观测系统能力部分；每个监督中心将根据收到和使用的观测资料提供要求的信息。
ET-EGOS	· 与相关应用领域的联系人联系分析RRR数据库内容，以便开展严格审查和差距分析； · 就RRR数据库结构和工具的发展提出建议。
ET-AWS	· 检查RRR数据库地基观测系统能力部分有关RBCN、RBSC和其他AWS网的内容，确保在线信息是准确和最新的。
ET-AIR	· 检查RRR数据库地基观测系统能力部分有关AMDAR的内容，确保在线信息是准确和最新的；通过秘书处视情提出修改建议。
ET-SBRSO	· 检查RRR数据库地基观测系统能力部分有关地基雷达系统的内容，确保在线信息是准确和最新的；通过秘书处视情提出修改建议。
ET-SAT	· 检查RRR数据库地基观测系统能力部分的内容，确保在线信息是准确和最新的，尤其是有关卫星的任务和仪器性能；通过秘书处视情提出修改建议。
ET-SUP	· RRR数据库空基观测系统能力部分的内容，确保在线信息是准确和最新的，尤其是有关卫星推导产品；通过秘书处视情提出修改建议。
JCOMM	· 检查RRR数据库地基观测系统能力部分有关海事和海洋观测系统的内容，确保在线信息是准确和最新的；通过秘书处视情提出修改建议。
GCOS	· 检查RRR数据库地基观测系统能力部分的内容，包括GSN、GUAN和GRUAN网，确保在线信息是准确和最新的；通过秘书处视情提出修改建议。

会员	· 检查RRR数据库地基和空基观测系统能力部分有关它们运行的系统的内容，确保在线信息是准确和最新的；通过秘书处视情提出修改建议。

表 2: 信息提供单位的作用和责任

8. 对候选单位的评估

ICT-IOS RRR 数据库专题组将根据以下标准以及必要的其他标准客观评估申请单位作出的响应，以确保技术方案、资金和承诺的可持续性，并由 OPAG-IOS 组长予以批准：

标准	权重
所需的规格	10
对开发数据库的承诺	10
长期承诺	10
WMO承担的费用	10
以WMO 的名义	5
对接受新需求的响应时效	5
数据库内容的更新和用于管理数据库内容的人力资源	10
用户访问	10
合计	70

评估后，专题组将向 WMO 秘书长提交一份建议供批准。

附录

WMO 用户观测需求和观测系统能力数据库的发展战略和未来承办问题

ICT-IOS RRR 数据库专题组的职责

滚动需求审议 (RRR) 数据库专题组的职责是：

1. 为发展、维护、运行和承办 RRR 数据库制定战略，包括原理、时间进度、资金需求和可能的资金来源；
2. 确定基本的详细说明：(i)RRR 数据库的空基观测系统能力；和 (ii) RRR 数据库的

地基观测系统能力；

3. 确定不同角色在 RRR 数据库的总体协调、运行和维护、更新、查询和监督方面的作用和责任；

4. 为秘书处起草致潜在候选单位 (如 NASA、EUMETSAT、 EUMETNET 和 JCOM-MOPS) 的函提供材料；

5. 确定标准和客观评估申请单位的响应，向 WMO 秘书长提出建议供批准；

6. 2010 年向 CBS 提交一份有关过程的文件；

7. 主要工作方式为电子邮件和远程会议，就战略和今后的发展道路寻求专题组的统一意见。

专题组由以下人员组成：

- Lars Peter Riishojgaard (美国，OPAG-IOS 组长) – 专题组组长
- John Eyre (英国，ET-EGOS 组长)
- Michael Kalb (美国，ET-SAT 组长)
- Klaus Jürgen Schreiber (德国)
- Jerome Lafeuille (WMO 秘书处)
- Etienne Charpentier (WMO 秘书处)

附录 2
总摘要第 4.2.5 段的附录

基本系统委员会综合观测系统开放计划领域组中区域代表的职责

1. 在 CBS 综合观测系统实施 / 协调组 (OPAG-IOS) 中代表区域，视情向 OPAG-IOS 及其专家组提供有关区域实施计划的信息；

2. 就区域会员对区域观测系统和 WIGOS 观测资料的需求向 OPAG-IOS 提出建议；

3. 就制定和实施全球综合观测系统发展计划及监督综合观测系统区域部分的发展担任 ET-EGOS 的联系人 (PoC)；

4. 就全球综合观测系统区域部分的各项问题向 OPAG-IOS 提出报告，如：
   a. 区域观测系统的性能；
   b. 区域观测系统存在的问题；
   c. 就改进区域观测系统的性能提出建议；
   d. 修订有关 GOS 的规则材料 (包括 9 号出版物 A 卷和 GOS 手册和指南)；

5. 就 OPAG-IOS 及其专家组确定的问题向区域协会提供反馈。

附录 3
总摘要第 4.2.29 段的附录

卫星应用和产品专家组 (ET-SUP) 的职责

为支持卫星资料应用改进战略， ET-SUP 须：

(a) 监督WMO会员在获取和应用卫星资料方面取得的进展，相关的问题和期望，目的是以WMO技术文件的形式出版监督结果和提出建议；

(b) 为开发和实施WIGOS提供建议和支持，目的是从用户的视角出发促进卫星测量、产品制作和验证程序标准化；

(c) 就全球综合观测系统空基部分的发展与ET-SAT和ET-EGOS进行协调；

(d) 发起活动，提高用户根据需求对业务和研发卫星资料的获取，与相关的CGMS工作组和WIS活动协调，监督这些活动；

(e) 审查目前和未来研发卫星资料和产品，包括它们的可用性和潜在的应用，为增加WMO会员的利用提出建议；

(f) 进一步评估环境卫星资料可持续协调过程(SCOPE)的理念；

(g) 审议WMO会员对获取和利用卫星资料及相关培训机会信息的需求；

(h) 不断审议WMO会员对卫星气象培训的需求，与卫星气象教育和培训虚拟实验室(VLab)管理组一起面对这些需求，根据虚拟实验室培训战略2009-2014致力于业务和研发卫星资料的全面应用；

(i) 起草文件，帮助会员总结上述活动的成果。

附录 4
总摘要第 4.2.30 段的附录

飞机观测专家组 (ET-AIR) 的
工作计划 2009-2012

	任务	行动
1.	为WIGOS理念的发展和实施作贡献以及为OPAG-IOS组长提供建议和支持。	针对EC-WG/WIGOS-WIS-2 同意的WIGOS实施活动的有关项目采取行动。
2.	与AMDAR专家组开展协调。	监督AMDAR专家组科学技术分组和培训宣传分组开展的工作。
3.	制定AMDAR计划的未来管理。	审查需求并向CBS和AMDAR专家组提出建议；就进一步将AMDAR整合进入WWW提出建议。
4.	制定AMDAR资料政策。	分析当前现状和需求，就资料政策向CBS提出建议； 为第三方资料提供单位如TAMDAR制定指南。
5.	指导WIGOS AMDAR PP的实施并为AMDAR制定标准规范。	就进一步整合AMDAR纳入WIGOS提供建议； 为WIGOS AMDAR PP活动和已有的AMDAR计划提供协调： (a) 为AMDAR制定标准的BUFR模块； (b) 有关AMDAR的WMO元资料的应用； (c) 为AMDAR资料制定标准质量管理框架； (d) 与CIMO协调，验证和筹备现有水汽传感器性能比对； (e) 更新AMDAR基准手册WMO-No.958； (f) 为AMDAR制定通用软件规格框架。
6.	指导WIGOS AMDAR PP的实施。	协调WIGOS AMDAR PP 的活动； 就进一步整合AMDAR纳入WIGOS提供建议。

附录 5
总摘要第 4.2.30 段的附录

AWS 平台要求和实施专家组 (ET-AWS) 的工作计划 2009-2012

	任务	行动
1.	为WIGOS理念的发展和实施作贡献，向OPAG-IOS组长提供相关的咨询和支持。	针对EC-WG/WIGOS-WIS-2 同意的WIGOS实施活动的有关项目采取行动。
2.	与ET-EGOS合作，开发和维护对自动观测网络的需求及其规格和应用领域。	为所有WMO相关计划监管和更新AWS功能规格(FS)。 根据要求更新标准AWS向多种用户提供的基本变量表。
3.	利用技术进展，制定适合欠发达、偏远和极端气候条件使用的可靠的基本AWS的标准，并开发对它们的需求。	为应对AWS业务面临的挑战准备建议。 对AWS技术的进展提出报告。 与HMEI联系，审议挑战、解决方案和进展。 与JCOMM合作致力于建立一个卫星资料通讯系统国际用户论坛。
4.	为AWS和空基观测的整合开发需求。	确定适合验证或与卫星观测整合的AWS地球物理参数表。 为试点比对提出建议。
5.	随着人工观测向AWS过渡，制定对自动观测的需求，以解决AWS的不足。	与CIMO ET-ST&MT合作，出版指南和程序，以帮助人工向自动地面观测站转换。 随着人工观测向AWS过渡，为开展自动观测差距分析做好准备。与专题领域的专家一起开展审查，包括JCOMM、CAgM、CHy、 CCl 和GCOS的专家。
6.	开发AWS元资料目录供通过WIS开展实时交换。	根据BUFR描述符制定AWS元资料对WIS的需求。 与IPET-DRC联系，在BUFR表中实施元资料。
7.	制定地面观测站选址分类指南。	与CIMO和其他技术委员会协调为会员制定最终的指导材料。

8.	根据要求审议与AWS测量有关的BUFR描述符。	审议BUFR描述符并根据需要提出新的描述符。就使用BUFR模块报告SYNOP/AWS问题与IPET-DRC协调实施。 验证n分钟AWS资料的BUFR模块及名义值的表示。 为实施国家站标识符制定指南，调查通过WMO 第9号出版物A卷包括国家站标识符的必要性。
9.	监测AWS技术的进展并为整合纳入AWS网制定指南。	审议AWS技术的进展。 为整合第三方AWS网络制定指南。

附录 6
总摘要第 4.2.30 段的附录

全球观测系统发展专家组 (ET-EGOS) 的
工作计划 2009-2012

	任务	行动
1.	为WIGOS理念的发展和实施作贡献，向OPAG-IOS组长提供相关的咨询和支持。	针对EC-WG/WIGOS-WIS-2 同意的WIGOS实施活动的有关项目采取行动。
2.	调查和整理WMO和WMO联合发起的计划对观测的需求。	通过各应用领域的联系人审查和更新CEOS/WMO用户观测需求数据库。
3.	调查和整理作为WIGOS候选组成部分的地基和空基观测系统的能力。	与其它OPAG IOS专家组合作，审查和更新CEOS/WMO观测系统能力数据库。
4.	利用专题领域的专家，包括CAS、JCOMM、 CAeM、CAgM、CHy、CCl 和 GCOS的专家，在一些应用领域维护滚动的观测需求审查(RRR)。	通过各应用领域的联系人继续12个应用领域的RRR过程，并视需要扩大到其他领域：视需要审议和更新当前/计划的观测系统能力满足用户需求的程度指南声明。

5.	准备和维护对OSE和OSSE的审查及其它NWP中心开展的研究的审议，并提供信息供ET-EGOS 和 OPAG-IOS考虑。	影响研究报告员和NWP专家审查有关GOS发展影响研究的结果。 组织和在2012年召开下一次NWP影响研究研讨会。
6.	推动CBS支持GCOS目标的活动。	审议GCOS实施计划2010年更新对CBS活动的影响。 提请ET-EGOS注意有关的问题。 支持GRUAN 规划。
7.	全面相应GOS 2025展望，制定新版全球综合观测系统发展实施计划(EGOS-IP)。在当前过渡阶段更新目前的实施计划。	根据对GOS进展的监测和GOS 2025 展望，在得到CBS-14的赞同后，ET-EGOS准备一份新版EGOS-IP，新版将吸纳展望中的有关信息。

附录 7
总摘要第 4.2.30 段的附录

地基遥感观测专家组 (ET-SBRSO) 的
工作计划 2009-2012

	任务	行动
1.	为WIGOS理念的发展和实施作贡献，向OPAG-IOS组长提供相关的咨询和支持。	审查WIGOS IP 制定ET SBRSO 的行动。 确定WIGOS实施任务，帮助改进非NMHS拥有的资料和产品(受许可证协议限制)的交换。
2.	结合业务影响评估SBRS观测系统新的潜在能力。	与CIMO ET-RSUATT紧密合作，确保SBRSO系统目前发展的最新信息，及充分认识SBRSO在测量整合阶段和观测程度方面的不足。
3.	评估WMO会员对SBRS观测系统的实施和规划现状。	要求会员提供业务风廓线仪、GNSS IWV和微波辐射网的实施现状。 制定发给会员的SBRSO调查表并对反馈进行分析。鼓励对天气雷达调查表继续作出响应。

	任务	行动
4.	通过更新WMO/CEOS观测系统能力数据库为这些能力及实施现状和规划制定书面文件。	分析天气雷达/闪电系统的结果以及有关系统精度的SBRSO调查表，由CIMO/CBS ET成员对分析结果进行审查，然后将结果上传WMO-CEOS观测系统能力数据库。 为定期收集SBRSO系统现状信息制定程序。
5.	与ET-EGOS合作，针对WMO和WMO发起的计划的所有应用领域评估SBRS观测系统为满足用户需求所作的贡献。	针对5个业务SBRSO系统对10个SoG进行审查，并就每个SBRSO系统对各应用领域的适合性提出报告。
6.	针对今后在GOS中如何整合这些系统提出建议。	为制定新的EGOS-IP作贡献，为制定草案提供反馈。
7.	对SBRS各观测系统收集和分发资料进行评估，并提出相关的建议。	为收集、处理和交换天气雷达资料的区域资料中心的发展(与WIS的发展严格一致)提出建议。
8.	监督SBRS各观测系统业务网络的现状，并向WMO会员及区域提供关于此类系统的技术咨询，包括业务和研发系统。	向OPAG-IOS报告业务网络以及SBRS各观测系统的重要发展，关注CBS需采取的行动，以便促进这类系统在WIGOS中的发展。 根据需要对其他CBS机构关于SBRS各观测系统方面的咨询需求作出响应。

附录 8
总摘要第 4.2.30 段的附录

卫星系统专家组 (ET-SAT) 的
工作计划 2009-2012

	任务	行动
1.	为WIGOS理念的发展和实施作贡献，向OPAG-IOS组长提供相关的咨询和支持。	针对WIGOS范畴内业务和研发环境卫星的整合提供咨询： -相互标定，包括GSICS WPP， -关于卫星仪器标准化问题与CIMO卫星观测各主题负责人合作。

	任务	行动
2.	审查业务和研发卫星的能力。	更新当前/规划的各颗卫星的任务。 更新GOS空基组成部分的差距分析。 针对卫星计划确定各类机遇和/或存在问题的方面。
3.	帮助CBS协调各卫星的全球规划，以便实施GOS 2015展望。	审查GOS(空间部分)发展实施计划。 在实施GOS展望方面，针对空基部分和观测战略提供咨询。
4.	就相关研发卫星转换为业务环境卫星提出建议。	就相关研发卫星转换为业务的机会提出建议。 就增加研发卫星资料的应用提出建议。
5.	就接收和利用环境卫星资料问题，尤其是发展中国家，评估系统的能力(与ET-SUP一起)。	提供能力评估结果和建议以便改进。
6.	向空间天气跨计划协调组提供空间天气方面的情况。	准备向空间天气跨计划协调组提供的材料。
7.	就其他相关问题向CBS提供咨询。	就无线电频率问题提供咨询。

附录 9
总摘要第 4.2.30 段的附录

卫星应用和产品专家组 (ET-SUP) 的工作计划 2009-2012

	任务	行动
1.	监督所有WMO会员的卫星资料和产品的应用，重点为两年一次的欠发达会员需求调查。	准备两年一次的调查表，分析调查结果，与VL COE提供的情况做比较。 整理调查结果和提出建议，就后续行动向区域协会提供咨询，准备一份技术文件供发表。

	任务	行动
2.	为WIGOS理念的发展和实施作贡献，向OPAG-IOS组长提供相关的咨询和支持	评价WIGOS SAT 试点项目(GSICS)。 就空基/地基观测产品整合提供咨询。
3.	审查GOS空基部分发展对用户的影响。	审查GOS空基部分发展对用户的影响。
4.	通过监督和指导RARS和IGDDS项目提高业务和研发卫星资料的可用性。	准备RARS和IGDDS进展的反馈。 为RARS 和 IGDDS实施组未来的活动提供指导。
5.	响应用户在区域层面上的需求，提高业务和研发卫星资料的可用性。	与区域报告员协调，提供区域资料获取需求报告。 为加强用户-提供单位关于资料分发手段的互动提供建议。
6.	促进已有和标准的卫星资料格式、处理技术和工具的广泛应用。	为卫星资料规则专题组制定指南。 为分析卫星资料准备一套软件工具，并确保工具的妥善维护。
7.	促进WMO会员使用研发卫星的资料和产品。	审议研发卫星资料与业务使用的相关性及可用性，为提高可用性及改进信息和培训确定优先和提出建议。
8.	通过将SCOPE-CM理念向其他应用领域拓展，扩大卫星资料和产品的使用。	根据SCOPE-CM的经验，就卫星资料和产品向其他主题领域拓展提出建议。
9.	支持在线提供有关卫星计划、系统、产品和获取手段的全面和最新的信息。	制定在WMO网页上发布的材料和培训行动。 针对与有关在线资源的连接提出建议。
10.	依靠虚拟实验室管理组支持虚拟实验室培训战略的实施，以满足WMO会员的培训需求。	定期审议虚拟实验室的现状、活动和计划，包括培训资源、课程、会议、简报等。 为满足用户的需求制定指南，尤其是欠发达会员的需求。 为开发培训资源作贡献。

附录 10
总摘要第 4.2.46 段的附录

关于空基气候监测架构的提议

WMO 空间计划提出建立一个空基气候监测架构的建议。拟议的架构将加强过去 50 年来已建立的端对端系统，而且该架构此后将作为一个样板，该系统是为天气观测、科研、模拟、预报和服务而建立的。鉴于气候系统的复杂性、WMO 全球综合观测系统 (WIGOS) 的新需求以及在全球气候服务框架 (GFCS) 方面做出的努力，将寻求与多个合作伙伴进行讨论并得到反馈意见。除了各业务空间机构、全球气候观测系统 (GCOS) 和气象卫星协调组 (CGMS) 之外，还将付出特别的努力，以便与空间研发机构以及气候研究界进行沟通。

下面的大纲列出了关于描述各主要组成部分的概念文件的拟议内容，迄今已确定了这些组成部分，旨在将端对端系统纳入其中。如上所述，目前正在征求 CBS 对大纲及其组成部分的反馈意见，以及将着手履行批准程序。

概念文件大纲草案

1. 引言

- WMO EC-62 要求建立一个从空间监测气候的架构
- 本文件的目的：为了在一个全球协调有序和有效的框架下从空间监测气候，为有关实施或维持各类活动的过程和能力的磋商奠定一个基础，并最终达成一致。
- 本文件的结构

2. 动机

2.1 背景：气候变化、第三次气候大会和全球气候服务框架

2.2 卫星系统的发展和从空间监测气候

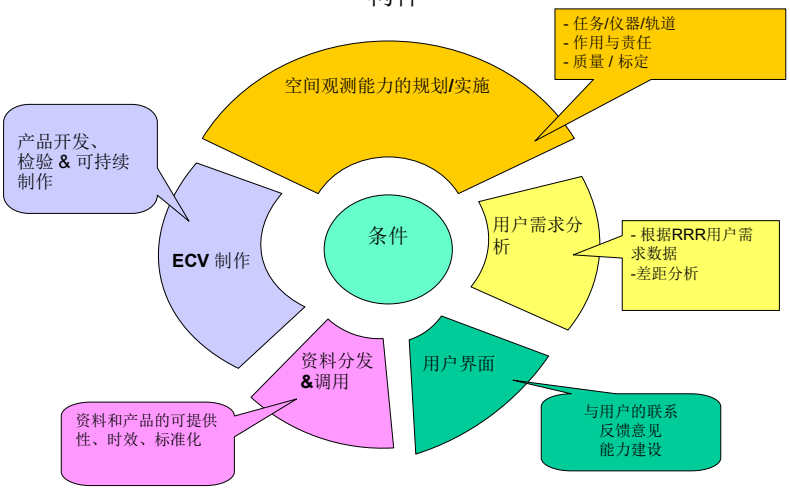
2.3 各业务和研发机构从空间开展气候监测的现状

2.4 关于建立空间气候监测架构的号召

3. 结构式方法

3.1 功能部分 (含定义)
- 用户需求分析
- 观测能力 (业务、科研 / 示范、过渡、能力)
- ECV 产品的生成 (持续提供成熟的产品并可用于试验)
- 资料分发和获取 (可提供性、标准格式)
- 用户界面 (用户采用、反馈监督)
- 协调 (全面管理、沟通宣传)

从空间监测气候的架构:
构件



3.2 交叉性方面的考虑

- 在此阶段仅限高层概念设计，细节设计应当循序渐进
- 长期性：始于当前，实施有计划，发展着眼长期愿景
- 基于现有的资产，强调逐步推进 (现在有什么？ 还需要什么)
- 承认科学进步并确保与科学界的关联性
- 承认技术进步并避免拘泥于目前的技术方法
- 承认并整合 R2O 过程
- 避免官僚主义：承认 CEOS 和 CGMS 的领导作用并以此为契机
- 在最佳努力与承诺之间实现平衡 (就某个过程达成一致，配有计划)
- 对用户的需求须有呼必应
- 可持续获取 / 制作成熟观测和产品需须稳定可靠
- 质量保障成为该子系统的一个不可分割的部分

4. 用户需求分析部分

4.1 内容

- 代表用户的各界表达的观测需求，并遵循建立完善的过程 (RRR, 得到 GEO WE SBA 认同)，定期对用户需求进行评审
- 对各类地球物理变量的需求 (如 ECV) 而不是增值产品。并非针对具体仪器的需求；原则上是非技术需求，因此不仅限于空基观测
- 各项需求应当明确：各变量、单位、分辨率 (时空)、精度、连续性。 这些内容在 WMO 维持的数据库中合并
- 对于气候监测，首要需求来源是 GCOS
- 在某个阶段，可能由 GFCS 服务驱动的其它观测需求 (如：降尺度)
- WCRP 科研需求也许是一个相关的内容

4.2 需求分析

- 选择一套可从空间满足的需求
- 将各项需求与现有的 / 计划的观测能力清单进行比较，开展差距分析
- 需要协调和指导这一过程

5. 观测能力部分

一个全面的架构应当包括各种业务能力和科研或示范能力 . 除了这些研究和业务能力之外 , 还应确定一个过程，以适当时促使从科研向业务转化。质量保障应当与这些内容有内在的联系。

5.1 业务能力

(a) 原则

- 应当对业务现状有清醒的认识，这可提供一个清晰的长期连续性视角，原则上这涉及对维持这一能力或相同能力作出的承诺，以持续的方式服务于业务界
- 应当充分满足所有 ECV 变量，具备成熟的观测能力，包括大气、海洋、陆地和冰冻圈
- 遵循 GCOS 卫星气候监测的各项原则
- 经久牢靠用 (包括再发 射、应急能力、冗余等)
- CGMS 是各空间机构协调其业务计划的主要机制

(b) 资产和发展计划

- 当前的 CGMS 基准在 GEO 和 LEO 中为 GOS 确定了所承诺的内容
- 服务于气候监测的 CGMS 基准自身的拟定发展 , 以 WMO2025 年愿景为指导 (细化卫星使命、轨道和任务)
- CGMS 的基准最终应当描述 WIGOS 的空基组成部分
- 能够从实际卫星星座 (如具有若干协调坐标轨道的一组卫星) 方面或从虚拟星座 (分配给不同卫星的但支持相同遥感任务的一组仪器) 方面加以描述，用三个气候变量绘制。

5.2 研究

(a) 原则

- 两方面：气候研究任务 (大气 / 气候过程研究) 和技术示范任务
- 无可靠的连续性看法
- 研究任务响应气候界审视的科学计划
- CEOS 是建立全球领导的主要空间科学机制

(b) 资产与发展

- 各空间机构的国家计划
- CEOS 虚拟卫星星座，用极端气候变量绘制

5.3 过渡进程

- 需要注意避免误解“面向业务”的范例
- 需要科研和业务，对于成功地提供与气候有关的测量，两者同等重要
- 应当考虑业务的延续，以具备经成功示范的各种能力，示范的视角包括性能、可靠性、可承受的经济能力、成熟度、用户接收和社会效益
- 切勿事先判断各实体之间的任何任务或预算的转移，这是某个机构或国家的内部事务，虽然大力鼓励科研和业务实体之间的合资事业，起码是作为一个过渡方式
- 目标是最终有一方能够作出长期承诺
- 作出长期承诺的相关层面也许是国家(如通过其常任代表的WMO会员)，倘若某个机构无法作出超出某个计划周期或预算周期的承诺。

5.4 质量保障：标定 / 相互标定

适用于所有观测部分 (见 QA4EO)，旨在生成基本气候资料记录 (FCDR)

- GSICS (CMA, CNES, EUMETSAT, ISRO, JAXA, JMA, KMA, NASA, NOAA)

- CEOS WGCV (Cal/Val 站址)
- GRUAN、SADE、ARM等可支持这项活动
- WMO-BIPM合作计划

6. ECV 产品生成部分

6.1 目标：确保持续地提供经过验证和质量控制的ECV变量产品 (按主题建立资料记录)

6.2 现有的计划活动

- SCOPE-CM
- ESA CCI
- 世界资料中心 (如 GAW DLR 气溶胶资料中心)
- 目前仅限于处理几个 ECV 变量

6.3 需要什么：

- 维持对现有的 / 计划的 ECV 产品制作情况的通盘掌握，若需要，可增加 " 额外气候变量 "(ACV)
- 激励新产品的开发工作，以填补针对重点需求的空白
- 根据成熟度对过渡过程进行模拟 (见成熟度指数)
- 确保做到检验 (同行评审)
- 结合质量控制，持续制作产品
- 加工处理

6.4 SCOPE-CM 和 (未来的)CEOS 气候工作组并行或联合可能发挥的协调作用，重点将分别放在业务或研发方面

7. 资料分发和获取部分

7.1 范围：确保以适当的各式获取各种观测和产品

7.2 关键的标准化方面：

元数据、互可操作性目录、格式

7.3 承认双重适用 (气候服务和实时服务) 并考虑主动分发和按标准通信协议分发 (直接读取或重播)

8. 用户界面部分

8.1 应当征求反馈意见，监督可提供的各项内容，并与用户的需求作比较

- 与科学界的关联性
- 与业务气候监测和季节预报的关联性
- 与 GEO/GEOSS 用户群的关联性

8.2 支持用户利用：包括培训在内的能力建设，

9. 协调职能

9.1 对于每个部分

每个部分都需要某些协调职能。临时归纳如下：

用户需求分析	WMO/CBS和GCOS
观测能力	CGMS (业务)和CEOS(其它方面)、GSICS和CEOS 气候工作组(质量保障方面)
ECV 产品生成	SCOPE-CM和(未来的)CEOS气候工作组
资料分发和获取	WMO/WIS计划(通过CBS)
用户界面	GCOS-WCRP

9.2 全面管理

- 管理计划的发展并支持商定的过程
- 管理并监督每个贡献者所作出的各项承诺
- 确保各部分之间的平稳互动
- 为对外沟通 / 宣传和扩大认知度提供支持
- 维持一个长期愿景
- 与 GEO/GEOSS 建立联系

建立过程与时间进度

将通过编写一个概念文件的方式启动上述架构的定义工作，该概念文件涉及与各有关方面进行广泛的磋商，旨在收集反馈意见，细化此概念，扩大支持面，充分利用以下国际会议：

- 2010 年 9 月 GCOS 指导委员会
- 2010 年 10 月 CEOS 全会
- 2010 年 11 月 亚太气象卫星用户大会、GEO 全会、CGMS 会议、 CBS 第十次特别届会
- 2011 年 1 月 美国气象学会的连续性和架构需求研讨会
- 2011 年 3 月 CBS/IOS ET-SAT 和 ET-SUP 会议

在协商阶段之后，根据 CBS- 特别届会 (10) 提出积极建议，将把上述概念文件提交给高层卫星事务政策协商会议和将于 2011 年 5 月召开的 WMO 大会批准。

随后将进入详细定义阶段，在该阶段中将细化各个过程，对每个构件的各项目标能力作出定义并完成作用分配。在此阶段，预计各活动部分将分别由以下实体里概牵头：

- 用户需求分析： WMO/CBS 和 GCOS
- 业务空基观测能力： CGMS
- 空间观测能力研究： CEOS
- 质量保障：标定 / 验证： GSICS 和 WGCV
- ECV 产品生成： SCOPE-CM, CEOS-CWG
- 资料分发与获取： WMO/WIS
- 用户界面： GCOS 和 WCRP

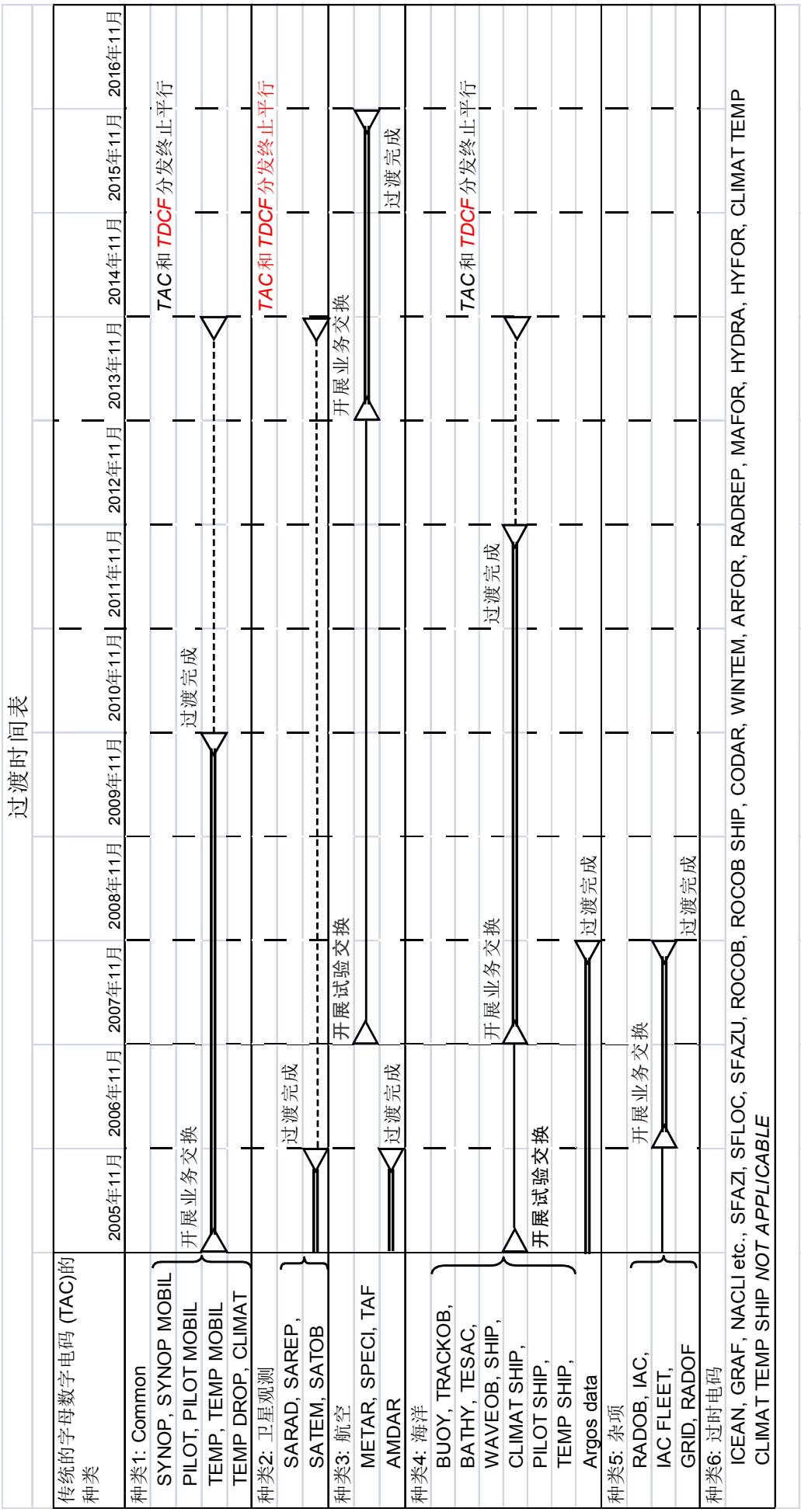
CGMS、CEOS、GCOS 和 WCRP 将在 2011 年第四季度审议上述详细定义阶段的成果。审议周期结束后，将向 2012 年 6 月召开的 WMO 执行委员会第六十四次届会提交一份关于从空间监测气候之架构的文件，供批准。

附录 11

总摘要第 4.3.14 段的附录

资料格式和电码跨计划专家组 (IPET-DRC) 审议的过渡时间表

注：由 IPET-DRC 建议的对过渡时间表的修改 (用红色标注)


过渡时间表
传统的字母数字电码 (TAC)的种类
2005年11月
2006年11月
2007年11月
2008年11月
2009年11月
2010年11月
2011年11月
2012年11月
2013年11月
2014年11月
2015年11月
2016年11月
种类1: Common
SYNOP, SYNOP MOBIL
PILOT, PILOT MOBIL
TEMP, TEMP MOBIL
TEMP DROP, CLIMAT
开展业务交换
过渡完成
TAC和 TDCF 分发终止平行
种类2: 卫星观测
SARAD, SAREP,
SATEM, SATOB
过渡完成
TAC和 TDCF 分发终止平行
种类3: 航空
METAR, SPECI, TAF
AMDAR
开展试验交换
过渡完成
开展业务交换
过渡完成
种类4: 海洋
BUOY, TRACKOB,
BATHY, TESAC,
WAVEOB, SHIP,
CLIMAT SHIP,
PILOT SHIP,
TEMP SHIP,
Argos data
开展试验交换
开展业务交换
过渡完成
过渡完成
TAC和 TDCF 分发终止平行
种类5: 杂项
RADOB, IAC,
IAC FLEET,
GRID, RADOF
开展业务交换
过渡完成
种类6: 过时电码
ICEAN, GRAF, NACLI etc., SFAZI, SFLOC, SFAZU, ROCOB, ROCOB SHIP, CODAR, WINTEM, ARFOR, RADREP, MAFOR, HYDRA, HYFOR, CLIMAT TEMP
CLIMAT TEMP SHIP NOT APPLICABLE

(1) 航空电码需要国际民航组织的协调和批准，但 AMDAR 的除外。
(2) SAREP 和 RADOB 需要 ESCAP/WMO 台风委员会的协调。
(3) 对于第五类电码，需要进行审议各个电码，以便决定是否需要过渡到 BUFR/CREX。
(4) 第六类电码不需要过渡。
(5) 以上所有日期均为 " 不迟于 " 的时间。 然而，如果所有条件 (见下文) 都得到满足，则鼓励会员和组织尽快开始实验交换和业务交换。

- 开始实验交换是指：还将按 BUFR(CREX) 格式提供资料，但不是业务性的，即除了目前的仍然是业务的字母数字电码之外。
- 开始业务交换是指：将按 BUFR(CREX) 格式提供资料，一些会员 (并非所有会员) 在业务上依赖这些资料。 目前的字母数字电码仍可进行分发 (平行分发)。
- 过渡完成是指：在此日期 BUFR(CREX) 交换成为标准的 WMO 做法。TAC 和 TDCF 平行分发可继续，并且将根据在相关 NMHS 之间做出的逐步实施的安排在某个区内终止。
- TAC 和 TDCF 并行分发终止是指：在此日期 TAC 和 TDCF 并行分发终止。出于归档用途和在一些地方 BUFR(CREX) 交换仍然有问题，字母数字电码可仅供当地使用。

在实验交换开始之前应满足的相关条件：
- 提供相关的 BUFR/CREX- 表和模板；
- 相关的测试方的培训已经完成；
- 测试方 (编码、解码、显示) 所需的软件已安装；

在业务交换开始之前应满足的相关条件 ：
- 相关的 BUFR/CREX- 表和模板已得到充分检验；
- 相关各当的培训已经完成 ；

在 TAC 终止停止之前应满足的相关条件：
- 所有需要的软件 (编码、解码、显示) 已投入业务运行。

附录 12

总摘要第 4.4.14 段的附录

灾害性天气预报示范项目战略

背景

SWFDP 最初是在 2004 年设计的。推动该项目的两个主要思路今天仍然有效：

- 确保世界天气监视网随时提供的有关灾害性天气发生的宝贵的预报信息在发展中国家得到 有效的业务使用；

- 开发 GDPFS 三层结构的潜力，及 " 梯级预报过程 "；

为 SWFDP 设立的目标 (CBS-13) 包括：

- 改进灾害性天气预报 ；

- 延长警报的提前量；

- 改进国家气象水文部门与媒体及灾害管理和民防部门的互动；

并还包括：

- 通过反馈提高 GDPFS 中心产品的预报技巧水平。

这些目标纳入了 2007 年第十五次大会提出的 WMO 关于 “ 提高发展中国家灾害性天气预报水平的愿景 ”：

“ 发展中国家的国家气象水文部门能够通过加强利用数值预报产品并提供及时和权威的预报和早期预警的方式实施并维持可靠和有效的日常预报和灾害天气预警计划，从而为降低自然灾害风险做出贡献 ”。(Cg -15，2007 年)

SWFDP 直接为 WMO 的关于提供服务和能力建设这两项战略主旨做出贡献，并为 EC-62(2010 年) 建议的两项 WMO 最高优先重点领域 (即能力建设和减少灾害风险) 做出直接贡献。

进展

委员会普遍认识到 SWFDP 的发展至今一直很成功。两个区域子项目已经实施，一个于 2006 年在一区协实施，另一个于 2009 年在五区协实施，可以预计其中第一个项目正在进入向业务全面转化阶段。这两个项目已朝着项目既定目标迈出重要步骤，此外，这些项目已经证明在 SWFDP 框架内可为气象技术的业务转化做出巨大贡献。

SWFDP 迄今为止成功的原因值得分析。其中原因之一是一个高效的管理框架已经到位：对每个子项目进行高层管理，即在这种区域案例中，项目指导组给与妥善指导，WMO 秘书处提供了高效支持。良好的项目管理做法受到鼓励，包括设立一个持续改进周期，定期报告并作出评价，以及客观地发现技术上存在的不足之处。

成功的第二个原因在于技术，其中最初选择在一个 3 层的阶梯程序基础上开发和建设已被证明是一个好做法，完全符合当今的气象业务。

在这一点上，应特别强调指出，成功的最关键的条件在于区域层面有高质量和高效率牵头中心的参与。这些中心作为区域联络点并作为全球、区域和国家合作伙伴之间各种信息交流的枢纽发挥的作用和职能是必不可少的，其中包括制作有关协调预测的指南。在 SWFDP 项目中取得的经验将实际用于重新定义区域中心的作用。

SWFDP 取得积极成果的一个重要方面是，它极具成本效益。该项目预算相当拮据，甚至考虑到由各全球和区域中心参与为其做出实物捐助，整体总成本远远低于对产生如此效果的项目的普遍预期。

SWFDP 项目最初把这点放在改进信息流动上，即流入和流经参与本项目的会员国的预报台。随着项目的进展，越来越明显发挥这些改进的最优效益在于技术，用户团体参与设计和产品的提供是不可或缺的。因此，为该项目开发了提供服务的内容，这项工作收集用户的反馈意见，并努力让 用户不间断参与在产品设计和服务交付进程。

我们可回顾一下，几乎从一开始人们对 SWFDP 有很高的期望值，在实现各项目标方面不许打折扣，更容不得失败。这是因为当今所面临的主要挑战，即：提高为减少灾害风险服务的能力，以及为实际的气象界开展能力建设。SWFDP 的概念是有效地应对上述挑战，而且令人满意的是能够在较短的期限内证明这一概念的可行性。

未来

EC-62(2010) 指明了 SWFDP 不同的进一步发展方向。该项目的目标应更新如下：

- 为提供服务和能力建设做出贡献；
- 改进的灾害性天气预报，包括准确率和预报提前量，应当依然是优先重点方面；
- 改进的灾害性天气警报服务，包括根据用户需求确定的准确率和预报提前量。这意味进一步发展概率信息的使用，以及继续努力加强终端用户的 反馈过程；
- 改进的公共天气服务；
- 面向其它应用并逐步拓展范围，以包括其它领域，如航空、海洋、农业和水文；
- 最后，应按照示范阶段的适当结论，特别重视确保项目的可持续性。

实现这些新目标，需要拓展现有项目机制。

战略

1. 技术方面 :

- 应当扩大使用高分辨率 NWP(已有) 和集合预报产品 . 已发现灾害性天气预报示范项目 (SWFDP) 框架特别适合于评价 GIFS-TIGGE 开发的产品，这应当是继续开展的活动；
- 临近预报和甚短期预报工具应引进到上述示范项目，其中包括卫星产品；
- 应当继续付出特别努力开展有关预报技术方面的培训，并应当更进一步开发这些预

报技术，重点放在满足各子项目的需求上。应当利用相关的局地个例研究。

2. 关于公共天气服务 (PWS) 的发展

- 探索新的和增强后的各类警报的编发形式，包括利用有关预报不确定性的估值；

- 延伸警报服务的时间期限，特别是建立与灾害管理组织的不间断连续互动；

- 需要进一步努力开展有关提供服务方面的培训。应当指出，除其它各种效益外，这可有助于在国家层面加强与各用户的之间的反馈过程，这正是目前所发现的薄弱环节之一。

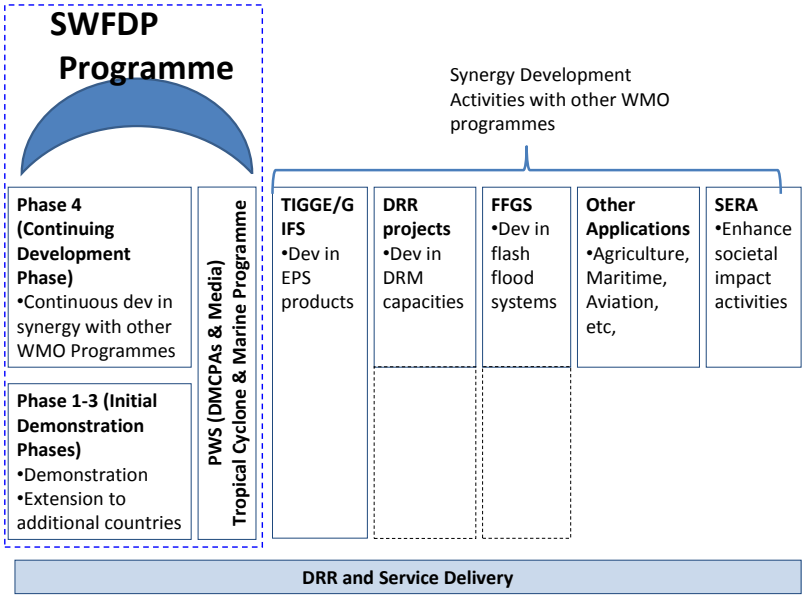
3. 面向其它应用的发展

在资源允许情况下，应当不断拓展定向应用的范围，以把 SWFDP 的效益转到社会的其他各界用户，与 WMO 的其它各项科技计划一道产生协同作用，并根据当地的各种需求和优先重点实现上述拓展，同时又不分散对灾害性天气的重点注意力。

4. 可持续性：

CBS 灾害性天气预报示范项目指导组建议在项目总体计划中引入一种“阶段四”的概念，即把成熟的区域项目转化成完全业务活动的阶段。将需要继续开展培训活动，应当每年开展培训，并应当在各区域内持续开展下去。

在阶段四期间，这类活动管理工作应当在区协内转化为正常的业务管理结构。下图为 SWFDP 延伸概念的总体结构。



5. 资金支持：

预计参与此项计划的全球和区域中心将继续提供大量的实物捐助，与此同时也将通过从相关科技计划的常规预算拨款和自愿合作计划 (VCP) 的形式为项目的管理、启动培训和研讨会做出贡献。但是，正如在以前阶段已面临诸多困难而充分表明的那样，对 SWFDP 项目的未来各阶段的支持还远远不足，并预计将开发一些新项目。增加资金支持对于持续加强培训工作是至关重要的。还将需要为改观某些参与该项目的国家气象水文部门 (NMH) 技术能力方面的缺陷而提供支持。

应当寻求那些出于减少灾害风险目的已表示对发展中国家处于发展阶段的 NMH 投资感兴趣的各方提供预算外资金支持。为了实现这一目标，WMO 需要通过国际和区域的协调融资机制为促进 SWFDP 并取得成功而投资。

最后，为该项目的延续提出两个重要的里程碑。第一个里程碑的标志是在每个区域协会至少引进一个项目，而这可能在 2013 年底之前实现。第二个里程碑将针对业务转化 (阶段四)，同样至少每个区协有一个业务转化项目，而这类项目可在 2015 年召开第十七次大会时或在大会之后不久实现。

附录 13
总摘要第 4.4.45 段的附录

修订后的全球资料处理和预报系统手册提纲

这些修订根据对基本系统委员会第十四次届会含决议和建议案的最终节略报告 (WMO No. 1040)，总摘要，第 6.3.49 到 6.3.56 段的讨论。

第一部分 - WMO 全球资料处理和预报系统 (GDPFS) 的目标和组织

1. GDPFS 的目标

全球资料处理和预报系统是由 WMO 会员运行的全球业务中心网络，提供有关天气、气候、水和环境的范围广泛的产品。设计 GDPFS 的职能、组织结构和运行是根据会员的需求及其能力推动该系统并从中受益。一个关键目标是促进合作和信息交流，从而也有助于发展中国家会员的能力建设。

这须通过以下途径完成：

- 提供数值天气预报产品 (分析和预报，包括概率信息) 和气候模拟以及预测信息
- 提供为特定应用定制的专业产品
- 确保必要的额外信息可用于上述提到的用途 :
  - 系统和产品介绍及特点
  - 检验和监测结果。

GDPFS 是一个以结果为导向的结构，旨在确保气象学和相关领域的科学技术成果能够有效地转移至业务运行以便让 WMO 会员受益。它提供了一个框架，以确保再其的范围内产品和服务提供满足规定的要求，在业务质量和可靠性方面达到适当的水平。

GDPFS 充分利用了数值天气预报的最新的研究及其发展。自 1992 年手册的上一完整版，NWP 的进展是巨大的：更高的精度、更高的分辨率、较长提前量、相关的应用范围更广泛。因此，业务气象的重点已经转向为不断增加的各种用户实施越来越复杂和多样化的数值模式和应用。

WIS 是交换和提供 GDPFS 产品的主要支持。与 GTS 相比，WIS 的主要特点之一是扩展了可连接到该系统的中心的范围；这项特点将有助于支持 GDPFS 应用范围的不断扩展。

2. GDPFS 组织

GDPFS 是由一些业务中心组成的，致力于开展科学业务活动以及让 WMO 会员从中受益。这些活动可以是一般目的或者是专门针对各类应用；业务协调活动 (通常称为牵头中心的活动) 也是 GDPFS 的一部分。有关每类活动的职能和承诺具体见手册的第二部分。

- 一般目的的活动：
  - 2.1.1. 全球 NWP
  - 运行确定性全球数值天气预报业务并使其在 WIS 上可用
  - 2.1.2. 有限区域 NWP
  - 2.1.3. 全球集合预报
  - 2.1.4. 有限区域集合预报
  - 2.1.5. 临近预报
  - 观测和数值模式产品的后处理
  - 2.1.6. 季节和气候数值预报
  - GPC 业务
  - 2.1.7. 海浪和风暴潮数值预报
- 专业活动：
  - 2.2.1. 协调高影响天气预报 (如东南非洲 SWFDP 比勒陀利亚)
  - 2.2.2. 气候预测和信息
  - RCC 业务
  - 2.2.3. 生产 LRF MME 产品
  - 2.2.4. 热带气旋预报
  - 2.2.5. 为航空提供火山灰预警和预测
  - 2.2.6. 海洋环境应急响应
  - 2.2.7. 核环境应急响应
  - 2.2.8. 非核环境应急响应
  - 2.2.9. 沙尘暴预警和预测
  - 2.2.10. ...
- 协调活动：
  - 2.3.0. 协调确定性数值预报检验
  - 从提供全球 NWP 的 GDPFS 中心收集标准检验统计，并提供在专用的网站上
  - 2.3.1. 协调 EPS 检验结果

2.3.2. 协调 LRF 检验结果
2.3.3. 协调海浪预报检验
2.3.4. 协调 GOS 观测监测结果 (地面、高空等)
2.3.5. 协调 GCOS 观测监测结果 (GSN 和 GUAN)
2.3.6. ...

一个给定的 GDPFS 中心可以开展几种 GDPFS 活动。

在适当情况下，可以为一个给定类型的活动做出贡献的中心可以组成一个协调的网络或者是子系统。一个给定的 GDPFS 中心可以协助几个子系统。

3. 与其它系统或计划协调

在许多情况下，GDPFS 中心开展的活动是由根据另一个机构或计划制定的系统业务组成部分组成的，或者是 WMO 自身或与其他国际组织联合开展的。在这种情况下，有关这些活动的规章应当包括：

- 由相关结构 (CCL 的区域气候中心 (RCC)、ICAO 国际航路火山监视业务小组

- 以及有关业务质量和可靠性、检验、记录和遵守情况的一般 GDPFS 标准 (见 cf. 2.1)。

该协调机制的作用并非在所有的活动类别都相同，在手册的第二部分对每种活动都做了具体的规定。

第二部分 – GDPFS 活动的规范

1. 总体要求

一直要求的总职责的说明 (详情见第二段)：

1.1. 观测资料的采集

i. 实时质量控制

ii. 非实时监测和报告

1.2. 通过 WIS 分发产品

1.3. 产品检验 (根据可用的具体程序，如 SVS-LRF)

面向用户

1.4. 提供和保持更新系统和产品的文件 (最好是在网站上)

1.5. 报告遵守的情况 (最好是通过保可用的实施信息的适当状况提供在网站上)

2. 具体职能

每项活动列在第一部分 (2.1.1 至 2.3.6):

- 在适当的时候：指定参与的系统或网络 (如 GMDSS, VAAC, SDS-WAS)
- 要求的职能和隐含的承诺的说明，或者是相应文件的参考文献：
  - 强制性职能

- 适当的职责的地理地区
- 强制性产品分发
- 强制性检验结构
- 实施信息的强制性状况

其它推荐的职能和产品见附件

活动 2.1.1 的范例：全球 NWP

- 参与活动 2.1.1 的中心 , 全球 NWP，须：
  - 提供全球大气三维结构的分析
  - 提供基本和派生大气参数领域的全球预报
  - 为 WIS 提供这些产品。提供的最低清单在附件 XXX 中给出，其中包括参数、预报范围、时步、生产时间窗和频率
  - 根据 XXX 附件 ’ 中确定的标准提供检验统计，并提供给参与协调确定性 NWP 检验的中心
  - 在网站上提供有关全球 NWP 系统特征的最新信息。应提供的最低信息在附件 XXX” 中给出

活动 2.3.1 的范例，协调确定性 NWP 检验

- 参与活动 2.3.1— 协调确定性 NWP 检验的中心须被指定为确定性 NWP 检验的牵头中心
- 这些中心须：
  - 为生产全球 NWP 的 GDPFS 中心提供设备，以自动储存附件 XXX 中确定的标准化检验统计，并让所有的参与中心获取这些检验统计
  - 保存一份检验统计的档案，以便制作很展示性能的趋势
  - 监测收到的检验统计，如果数据丢失或有疑问与相关参与中心协商
  - 提供执行标准检验所需的标准数据集，包括气候学和观察名单，并根据 CBS 的建议及时更新
  - 在网站上提供：
    - 通过处理收到的统计，来自各参与中心持续最新的检验结果的图形显示
    - 相关文件包括获取执行检验所需的标准程序，以及与 GDPFS 参与中心网站的链接
    - 联系方式以鼓励来自 NMHS 和 GDPFS 中心关于检验信息有用性的反馈
- 这些中心还可以提供用于计算得分信息的标准化软件。

修改程序

每项活动列在第一部分 (2.1.1 至 2.3.5):

- 指出负责确定要求的机构，这些要求列于第二段

共同责任的情况：协调机制的指示 (例如对于 RCC：CCl - CBS/DPFS 联合任务组；对于 VAAC：??? 等)

活动 2.1.1 的范例：全球 NWP

- 运行全球 NWP 的 GDPFS 中心要求的职责须由 CBS 资料处理和预报系统 OPAG 的 ICT 提议，并由 CBS 批准和 EC 决定

活动 2.3.1 的范例，协调确定性 NWP 检验

- 协调确定性 NWP 检验所要求的职责须由 CBS 预报检验协调小组提出，并由 CBS 批准和 EC 决定
- 确定负责监督遵守的机构

活动 2.1.1 的范例：全球 NWP

- 运行全球 NWP 的 GDPFS 中心的遵守情况须由 CBS 资料处理和预报系统 OPAG 的 ICT 进行监督，然后向 CBS 报告

活动 2.3.1 的范例，协调确定性 NWP 检验

- 参与协调确定性 NWP 检验的中心的遵守情况须由 CBS 预报检验协调小组监督，然后向 CBS 报告

第三部分 – GDPFS 实施

1. 每项活动列在第一部分 (2.1.1 至 2.3.6):

- 各中心和相关网页地址的名单附带实施信息的状态

2. 每个为做出贡献的中心：

- 开展活动的名单

附录14

总摘要第4.5.1.3段的附录

WMO服务提供指导原则

1. Purpose

The purpose of this document is to propose Guiding Principles for Service Delivery that will assist National Meteorological and Hydrological Services (NMHSs) in the provision of weather-, climate- and water-related services that incorporate user needs and performance metrics. While there is no prescriptive way to provide services, the Guiding Principles aim to improve service delivery by sharing best practises between NMHSs and to increase focus of WMO Programmes on service delivery in accordance with the WMO Strategic Plan.

2. Introduction

Effective service delivery is a fundamental requirement for NMHSs if they are to meet national needs. However, there are many different interpretations of the concept of service delivery as it relates to the provision of weather-, climate- and water-related services. Several of these are defined and discussed in this paper with the intent of forging an international WMO Guiding Principles for Service Delivery.

3. Principles guiding effective Service Delivery

(a) User engagement and feedback is essential in designing and delivering effective services;

(b) Sharing best practises leads to effective and efficient service design and implementation;

(c) Service concept applied to all WMO activities and culture change is essential to ensure the success of service delivery;

(d) Partnership with other international and regional organizations that are also engaged in delivering services is essential in maximizing the use of weather, climate and water information for decision making.

4. Attributes of effective services

Effective services should be:

(a) Available: at time and space scales that the user needs;
(b) Dependable: delivered regularly and on time;
(c) Usable: presented in user specific formats so that the client can fully understand;
(d) Useful: to respond appropriately to user needs;
(e) Credible: for the user to confidently apply to decision-making;
(f) Authentic: entitled to be accepted by stakeholders in the given decision contexts;
(g) Responsive and flexible: to the evolving user needs;
(h) Sustainable: affordable and consistent over time; and
(i) Expandable: to be applicable to different kinds of services.

5. The role of WMO in the Guiding Principles for Service Delivery

15.1 WMO provides international coordination and sets standards for weather-, climate- and water-related products and supporting services. This includes observations, data quality, and telecommunications. The data underpinning meteorological and related products require international coordination and validation to guarantee that they meet the needs of the product generating centres. The communication systems that move data and products globally are coordinated through WMO. The assessment, and objective verification of products that are generated by one country and used by others may also be coordinated by WMO and the results shared and used in the process of improving the quality of products for all.

15.2 WMO also provides guidance for service delivery which is used to good effect by all Members. However, Guiding Principles for Service Delivery are required to provide a more uniform and structured approach for WMO and its NMHSs on service development and delivery applicable to all weather, climate and water information.

15.3 NMHSs deliver a wide range of weather-, climate- and water-related services to meet a broad range of needs. In the majority of these cases needs are defined nationally, the major exceptions being services for international aviation and shipping, which conform to international standards and defined user requirements. Providing an international strategy through WMO will enable NMHSs to improve national service delivery by sharing better practises and supporting mutually agreed guidelines, and by increasing the user targeting of the services.

15.4 The Guiding Principles on Service Delivery will also help enable capacity building within NMHSs in order to make best possible use of resources. This is achieved by focusing the assignment of resources to countries with the greatest need for assistance in service improvements, or to relevant Secretariat activities required to underpin and coordinate this capacity building.

6. What drives the priority of Service Delivery in NMHSs?

16.1 The public and political assessments of the effectiveness of NMHSs occur continuously. These depend largely on how effectively the NMHSs meet the service delivery standards of the

nations they serve. Confidence in NMHSs derives from demonstrated capability to deliver services in a way that meets national and public needs. It is not enough that staff within the NMS or NHS consider the services they provide to be world-class, highly accurate or even perfectly usable and relevant to their community's needs, what is required is that the community receives services that meet their needs. This requires concerted effort for direct communication and engagement with the users.

16.2 The ability of an NMS or NHS to meet national service delivery needs is put to its most critical test when an extreme hydrometeorological event occurs and then even the best forecast, issued on time, is no defence in the event of a national disaster if no one used that forecast. Providing effective warning, forecast and assessment products and services depends on a system that engages users, the problems, the risks and the values throughout the process. Most of the utility of weather, climate and water information, added or lost in the value-chain of decisions and actions between the physical phenomena and their subsequent impact, occurs in communicating the information to users and in the behaviour of users in response to that information, and ultimately in the effect of their decisions in societal and economic outcomes. If the user cannot make changes or there is no effect on the outcome, the information is of little direct value. Value can be increased by improving the forecast, by improving communication, and by improving the decision-making process. If the currently available information is underutilized, value will likely accrue if the communication or decision-making process is improved. Service delivery is about providing the service that the users actually use because it meets their needs.

16.3 Countries make choices about which services their NMHSs will deliver. Generally, NMHSs must meet the key public needs in such a way as to have the greatest beneficial impact on their community. In one sense, this makes prioritization straightforward for NMHSs because it is clear that the activities that contribute most to the safety of life and property have the highest priority. However, the risks are not always obvious to national governments and are rarely objectively or continuously assessed.

7. Elements of service delivery for WMO

7.1 The WMO Strategic Plan emphasizes enhancing the capabilities of Members to provide and use weather, climate, water and environmental applications.

7.2 WMO Programmes, as part of the Guiding Principles on Service Delivery, should adopt improving service delivery as part of their responsibility to assist NMHSs, including by encouraging them to:

(a) Evaluate user needs and decisions, including drivers to:

- Increase understanding and acting upon societal and economic requirements for impact-related weather, climate, water and air quality services;
- Increase training and provision of guidance material to enhance NMHSs and partner organizations' ability to deliver useful services;
- Expand the use of weather, climate and hydrological services;
- Improve the decision making capability of Members by providing appropriate inputs to Members, including through integrated early warning of sector specific impacts, and information related to climate risk management and adaptation to climate change.

(b) Develop and improve Service Delivery mechanisms to:

- Improve relevant, timely, cost-effective and useful products and services that can be used beneficially by WMO Members;

- o Increase collaboration and cooperation between NMHSs, sectors and government agencies whose day-to-day activities are affected by weather and climate and which can benefit from improved weather, climate and water services.

(c) Define service outcome effectiveness to:

- o Effectively use performance management approaches, tools and methods;
- o Ensure more people take effective action in response to information received;
- o Increase participation of NMHSs in Members' meteorological and hydrological risk management activities.

(d) Establish governance practices by:

- o Ensuring that information is received and acted upon;
- o Learning from successful outcomes;
- o Sharing responsibility with all the partners engaged in Service Delivery.

8. Evolving User Needs

8.1 Service delivery must focus on collaborative problem solving which requires full engagement between providers and users. Service delivery is a complex issue and there are gaps in how services are delivered. These gaps need to be addressed and reduced. A service for a particular sector involves a broad partnership of producer and user organizations, meteorologists and related scientists, and practitioners from user sector and supporting organizations. It provides an opportunity to interlink global, regional and national information systems; to provide comprehensive modelling and analytical capability to address problems at regional and local scales, and to provide for a distributed decision-relevant research and development capability. It is the latter, which sets this service apart from the traditional, exclusively science-based forecasting service. Each service must be adapted to the sector it serves.

8.2 With evolving needs of users, in order to stay relevant, NMHSs need to adapt themselves to user requirements. Implicitly, although service delivery is part of the role of NMHSs and collaborating organizations on technical matters, it should ideally be a partnership between environmental and social organizations. As such, one approach is to create a mechanism, which may be in the form of a real or virtual co-location of providers and users of weather, climate and water information who work together, iteratively, to deliver timely, effective and user specific services. It brings together the operational capacity of providers and users of weather, climate and water information and services. The mechanism, which may be called a "platform", an "approach" or a "framework", integrates environmental and user-specific data to determine impacts on the public and social and economic sectors such as energy grid management, construction sites, flood control and urban inundation agencies, emergency responders including the police and fire services, hospitals, transportation, accident management and control, airports, harbours, etc. The benefit to users would be an operational network that evolves to meet specific user needs, forecasts systems targeted to user decisions and an integrated system that aligns weather, climate and water information with social, economic and other user-specific information. A public service "platform", "approach" or "framework" would provide the opportunity to focus on strengthening ground-based observation systems, strengthening surveillance, creating integrated early warning and assessment systems for weather, climate and hydrological forecasting systems, and providing fast, efficient and unified service delivery. The "platform", "approach" or "framework" (representing all the operational providers and users) is instrumental in setting requirements for research and development.

8.3 The net effect should include strengthening partnerships with key user sectors and

government ministries. The aim would be to realize tangible and quantifiable benefits to communities by exploiting new operating partnerships between user and provider to share responsibility for effective delivery of services. This would include the development of new tools and methods to strengthen dialogue and collaboration between provider and user, especially the implementation of more interactive early warning and forecasting systems for weather, climate and water, which are integrated into every level of governance from the community level to the national infrastructure.

8.4 By distinguishing between service delivery and production, emphasis is placed on information sharing, joint information dissemination, joint research and training, and joint product development between the service provider and the user. In addition to the information generated by the NMS, the platform would also seek to integrate data from outside partners, both national and international, so that users have access to all relevant information through a single source with which they can work directly.

9. Responsibilities of WMO Members

WMO Members will:

9.1 Rely on technological advancement to optimize forward looking service delivery, and this will be particularly important in building capacity in service delivery in developing countries.

9.2 Agree on minimum guidelines and approaches for the development and provision of weather, climate or hydrological services. The approaches may be nationally determined, monitored and evaluated and results should be exchanged among WMO Members. The evaluation should include user assessment of the services intended for their use.

9.3 Transfer knowledge through advanced capacity-building approaches (e.g., by engaging in regional partnerships and documentation of best practices).

9.4 Engage in regional focus on user needs through information platforms (e.g., METEOALARM in Europe), regional workshops and forums for different user sectors.

9.5 Develop acceptable metrics to determine the effectiveness of NMHSs' service delivery and agreed programmes that monitor and assess service quality and effectiveness.

9.6 Exchange information between NMHSs on their effectiveness in engaging users and measuring outcomes as a means of capacity building.

9.7 Understand better the relevance of their services judged in the context of user needs. The information will be used to improve the efficiency and effectiveness of all WMO Programmes, and, as a consequence, of all Members. Quality management is an important element of these Guiding Principles.

9.8 Establish a time-frame for reviewing the Guiding Principles

10. Implementation of the Guiding Principles

Taking into consideration the strong coordination aspect of service delivery, the following activities, among others, need to be undertaken to apply these Guiding Principles:

(a) Establish an approach within the NMHS to respond to needs of selected user communities;

(b) Conduct a survey of NMHS service delivery priorities, and develop an inventory of existing

good practices;

(c) Apply the new approach to at least one priority service;

(d) Evaluate the results of service quality taking into account the guidelines and approaches (see 9.2) and user satisfaction.

11. Definitions related to provision of weather, climate and water

11.1 NMHSs (always used in the plural) – National Meteorological Services (NMSs) and National Hydrological Services (NHSs); NMS – A National Meteorological or Hydrometeorological Service; NHS – A National Hydrological Service.

11.2 Users – Users are individuals or organizations with responsibilities for decisions and policies in sectors that are sensitive to weather, climate and water and for whom products and services are provided by NMHSs or collaborating organizations. If the user has paid directly for the service, he/she is generally called a customer.

11.3 Providers – Individuals or entities that produce or acquire weather, climate or water information or products that are then supplied in support of users' needs in this regard. NB: Providers may include NMHSs, Collaborating Organizations, other meteorologically-relevant agencies and the private sector, but this present strategy focuses only on WMO NMHSs

11.4 Collaborating Organization – An organization or entity (e.g. a University, a specialized non-government centre, a relevant government agency) of a WMO Member that provides complementary/additional weather, climate or water information to NMHSs or directly to users, under terms and conditions that have been mutually agreed.

11.5 Product – A product is basic information such as observations, datasets, or information that is created by an analysis or forecast process. For example, products include a warning of a tropical cyclone, a forecast of heating degree days for the next five days, a seasonal forecast, a time series, a climatological normal, a hydrological risk map, a satellite image, etc.

11.6 Service - A service is a product delivered or activity that is carried out (advice, interpretation, etc.) that meets the needs of a user or that can be applied by a user. A true service is therefore based on an understanding of the user's requirements, provides information, products and advice that is tailored for the user, e.g. in terms of timing, format, or content, and maintains a dialogue with the user. Providing a user access to a tropical cyclone warning in a convenient and timely manner is a non-user-specific service. Providing a customer access, for a commercial fee, to the five-day forecast of degree heat days, for example, is also a non-user-specific service. Both government and non-government entities supply weather-, climate- and water-related services (see also 3.3 and 3.4 above).

11.7 Service Development - A service should be co-developed by the user and the provider of the weather, climate and water products, a process which reflects the increasing importance of user-defined products and services, which integrate weather, climate and water information into user decision support systems.

11.8 Service Contract - Services may be provided as a public good; on a contractual basis to certain users or on a commercial basis to a fee paying customer. In all cases there is an implicit or explicit contract between the provider and user of the services to strive to meet the needs of the

user.

11.9 Fit for Purpose – Within the implicit or explicit contract between the provider and user, and resulting from an extensive dialogue between the provider and user, 'Fit for Purpose' implies a clear understanding and agreement in terms of:

- o What is the information need?
- o How will the information be provided?
- o How will the information be used?
- o The risks inherent in the decisions to be made using the information;
- o The strengths and weaknesses of the information being provided (including verification and inherent uncertainties).

11.1 Service Delivery Process - The service delivery process describes the end-to-end activity of:

- o Preparing and delivering the service;
- o Ensuring that the service is fit for purpose;
- o Establishing a feedback system that monitors the user/customer needs and their feedback on the quality of the service provided; and,
- o Managing the service performance continuously for service improvement over time, with respect to current and evolving user requirements.

附录 15

总摘要第 7.1 段的附录

基本系统委员会技术大会

“ 端到端服务提供：用户需要的从观测到服务的方法 ”
(2010 年 11 月 19-20 日，纳米比亚，温得和克)
最终报告

1. 引言

“ 端到端服务提供 ” 技术大会 (TECO-E2E) 于 2010 年 11 月 19 日 (下午) 至 20 日在纳米比亚温得和克与 CBS-Ext.(10) 共同举行。TECO-E2E 旨在展示 CBS 的端到端作用，它反映并支持 NMHS 向不同行业用户提供他们为自己目的所需要的天气、水和气候信息及服务的端到端作用。TECO-E2E 还考虑到 GEO 在确保获取和利用地球观测资料及信息以满足更广泛用户群体需求的补充作用，并探讨了我们如何在 CBS 内与 GEO 更好地合作，以便最大限度地满足最终用户的需求。

2. TECO 的结构

TECO-E2E 由 CBS 副主席主持。它包括 CBS 代表和特邀嘉宾的报告以及小组讨论。该计划遵循从用户通过系统和服务并返回到用户的链，重点是减轻灾害风险。

3. 用户 (第一部分)

会议从考虑 " 谁是用户，他们需要什么样的信息和服务，以及他们希望如何提供这些信息和服务 " 开始。通过各种实例证明了用户的广度和多样性，从那些需要服务以支持安全、健康和粮食供应的用户，到各种社会经济部门如交通和能源，再到重大活动的管理、公共政策和执法。

从用户开始，并到用户结束，CBS 主席描述了 CBS 的职能，即作为一种端到端的服务支持机制，通过世界天气监测网 (自 1963 年以来) 和公共气象服务 (自 1994 年以来) 提供基本系统和服务，包括支持减轻灾害风险 (DRR) 的无缝隙、多尺度、多灾种方法。他把 " 端到端服务 " 定义为 " 从用户到用户 "，并展示了各 OPAG 的作用和工作计划如何横跨从用户需求到用户满意的链。重要的是，他强调，服务只有满足需求，才对用户具有价值，无论是真实的或是感觉到的。

GEO 秘书处介绍了 GEOSS 的综合方法体系，重点是共享和获取观测资料和信息，以满足九个社会利益领域 (SBA) 用户的需求。基于会员和参与组织如 WMO 的贡献系统，GEOSS 提倡所有 SBA 用户交换和使用观测资料和信息。WMO 及其会员的基本系统为 GEOSS 资料和专业知识作出了重要贡献，并促成其取得了许多早期成就。在国家层面上与 GEO 的合作，将会加强 NMHS 在通过与其往往遍及所有 GEO SBA 用户群体的密切关系来满足对天气、水和气候信息及服务的国家需求方面的关键作用。

通过小组讨论，突出强调了关于用户的一些重要观点：

- 可得性、可靠性、可用性和可信性是用户有效理解服务的关键成功因素。
- 为了真正了解用户的需求，需要了解我们的用户(人到人)以及他们的世界、难题和问题。
- 为了确保服务提供他们想要的信息，需要确保这些信息得到正确和充分的解读。
- 用户的反馈意见至关重要，我们必须准备倾听和接受批评。
- 提供服务的现代渠道，如互联网，使得用户可以获取大量的信息，但质量不太容易控制。技术可能成为真正用户参与的障碍。信息的质量需要匹配表述的质量。
- 在一些国家，存在本土的、文化的或以民间传说为基础的天气预测。我们不是简单地摒弃这类方法，而是应该与这些社区合作，向他们介绍更多的预报天气的科学方法。

4. 综合观测系统

作为端到端机制的一部分，综合观测系统 (IOS) 的作用是示范如何获取用户需求，如何评估不同类型观测资料的价值，以及这些反过来又如何促进观测系统解决方案的制定。滚动需求评审 (RRR) 及其对 GOS 的未来影响，以及观测系统试验 (OSE) 和影响研究对 GOS 发展的贡献，构成了确保 NMHS 获得和使用的观测系统随着不断变化的用户需求而发展、并且最好地满足未来可能需求的基础。未来观测解决方案的设计也受益于综合观测试验和对技术进步的密切监测。

通过小组讨论，突出强调了一些重要问题和挑战：

- 当测量与有关地球物理量之间的关系比较复杂时(如降水雷达)，很难准确说明观测系统的“测量能力”。在这个问题上，与CIMO密切合作尤为重要。
- 需要保留支撑RRR的用户需求数据库的非技术本质。
- NWP度量是定量的，比较容易传达，因而是非常强大的评估工具。它们应被用于酌情提供指导，但应注意“不要”滥用它们来评估针对其它应用的观测系统。
- 因此，需要加强在RRR中获取非NWP应用的用户需求的方式。
- 需要发展与其它技术委员会以及所有CBS OPAG之间的互动，以确保RRR准确地获取所有的用户需求和观测系统能力。随着我们拓宽应用领域(如GFCS)，并致力于WIS和WIGOS的实施，这将变得更为重要。
- 在GEOSS和国家层面上，网络之网的概念引进了许多挑战和机遇。定义并维持满足关键需求(尤其是对气候、DRR和其它指定的高优先级需求)的基本优质网络至关重要。

5. 信息系统和服务

信息系统和服务 (ISS) 包含了 CBS 端到端机制的广度。这次会议以一种非常实际和直接的方式，讨论了 NMHS 在 WIS 实施中的一些主要利益问题，包括开发和准备用于 WIS 的资料、访问 WIS 的技术，以及 WIS 将如何依靠用户。

在报告和讨论中，突出强调了以下问题：

- 由于WIS已接近技术成熟，所以迫切需要针对WIS非技术用户的指南；
- 对于大多数会员来说，WIS中心的不同作用尚不明确；
- WIS有以下几类用户：公众、注册用户(来自参与WMO计划和可能参与GEO计划的NMHS和其它机构)、建立和维护元数据的用户以及管理WIS中心的用户；
- 虽然GISC拥有限制存取数据组的技术手段，但目前已确定的唯一的数据政策是有关“基本数据”和“额外数据”的政策。确定数据存取政策是WMO各项计划(或大会)的一项任务；
- 需要澄清有关服务水准的期望值，包括：
    - 各项计划在时间性和可用性方面的需求；
    - 进行监测以确保达到这些标准；
    - 对在 WIS 上进行交换的数据质量的期望值；
    - 数据责任方用于监测数据质量和采取纠正措施的机制。

6. 灾害天气预报示范项目 (SWFDP)

SWFDP 是一个端到端机制的成功范例，目的是制作针对用户的产品并提供给用户。一个由四部分组成的报告强调了 SWFDP 的概念和发展；全球产品中心对 SWFDP 的贡献，包括 GIFS-TIGGE；区域中心的作用；NMHS 参与方和用户代表的观点。

报告和讨论中强调的问题包括：

- SWFDP概念旨在改进那些在使用现代预报技术方面存在巨大差距的NMHS的早期预警系统，且该系统产生了预期的效果(如在莫桑比克的灾害管理中提供了有效的警报服务)；
- 在SWFDP过程中，牵头的区域中心提供一个门户网站，将全球中心和国家中心链接起来，从而发挥了关键作用，并促进了培训；
- SWFDP的可持续性取决于该区域跟踪国际社会在预报和早期预警业务方面发展的能力；
- SWFDP可能是加强端到端资料交换制作服务系统实施的一种手段；
- “SWFDP”已成为一个很强大的品牌并有助于争取资金，所以不应该被终止。

7. 用户 (第二部分)

(马达加斯加) 卫生部门和 (莫桑比克) 灾害管理部门的用户代表介绍了他们的看法，强调需要什么样的信息来帮助决策以及如何提供这些信息。中国强调了向终端用户提供公共气象服务。会议审议了每种提供方式的优劣。讨论的具体主题包括：希望拥有提供 PWS 的标准运行程序；另外还强调了培训和能力建设，因为预报员在向用户解释天气信息过程中要承担复杂的角色。

有关的重要事宜和面临的挑战包括：

- 存在一个非常广泛的用户群体，无论是在时间尺度和努力的程度方面；
- 许多部门在灾害天气面前的脆弱性日益增加，并对社会经济可能产生重大的负面影响；
- NMHS需要与用户主动沟通，说明NMHS能做什么并了解用户的需求；
- 天气信息分发的渠道是双向的，每个渠道都有具体的优劣；
- 端到端的服务意味着持续的改进周期和进步，这就像双螺旋一样，它意味着NMHS的能力和用户服务的持续发展和进步。

WMO 减轻灾害风险计划是水平端到端方法的一个良好范例。它旨在提升 WMO 的研究和业务能力，以应对所有层面灾害风险管理领域的信息挑战。通过实施的各种范例和最近与人道主义机构之间的互动，结果发现：

- 需要适应国际层面所有伙伴之间的体制机制；

- 需要一种系统化的方法来确定人道主义机构的需求；
- NMHS和RSMC需要一种促进产品和服务开发的机制，并可以通过人道主义机构的信息系统来分发这些产品和服务；
- 在危机时期迫切需要一种有效的机制，以便根据清晰的业务程序来确保向人道主义机构提供官方的信息和警报。

8. 关键信息

TECO-E2E 会议强调了一些关键信息，以便 CBS 在支持 NMHS 方面能更好地发挥端到端 (或用户到用户) 的作用。

从 OPAG-IOS 的角度看：

1. 重新平衡 OPAG-IOS 专家组之间在更新 RRR 数据库方面的工作量。加强与区域协会之间的联系。

2. 加强各个 OPAG 之间的合作，从而在 RRR 过程中改进旨在确定非 NWP 要求的方式方法。

3. 建立与其它技术委员会中各个 OPAG 和专家组之间的正式联系，以便进一步制定能够在 RRR 数据库中代表 “ 观测系统能力 ” 的方式方法。

从 OPAG-ISS 的角度看：

4. 发布适合非技术用户的 WIS 使用指南。

5. 确定 CBS 提供的不同的内外服务水准，并将其纳入滚动需求评审和监督程序之中。

6. 澄清所有委员会的各项计划需要 WIS 提供支持的资料政策。

从 SWFDP 的角度看：

7. 保留迄今为止在项目开发中采用的原则：即现实主义、实用主义、参与人员的志向和各种服务的应用。不要因为想做得太多太快而损害该项目。

8. 在 SWFDP 模式的基础上不断增加，要特别注意确保可持续性，并将有针对性的应用范围逐步扩大，从而将 SWFDP 的效益转移给其它的用户部门。

从 OPAG-PWS 的角度看：

9. 对 PWS OPAG 的改组将更好地表示服务链中的四个要素。

10. OPAG 应研究预报员作用的变化、对所需技能和能力产生的影响，以及对培训和能力建设的影响。

11. 认识到需要确定内部和外部的用户，所以 PWS OPAG 应与 CBS 其它 OPAG 组长一道，在委员会工作范围内简化委员会服务的提供。

从 DRR 的角度看：

12. 建议委员会在适当的时候与其它技术委员会开展合作：

- 进一步开发概率预报、产品和服务，并制定方式方法来为专家和非专家用户传递概率信息和背景材料
- 启动一个进程以收集和分析水文气象灾害统计资料
- 启动一个进程以量化天气、水和气候对减轻灾害风险作出的贡献
- 继续发展新的伙伴关系；维护并改进现有的伙伴关系
- 启动一个进程以分析现有体制化机制的优劣。

最后，主席在深思后认为，正如我们的用户群体一样，我们生活和工作的世界正在发生变化。我们需要提高技能以满足用户不断变化的需求和达到所需的能力。作为最大的委员会，CBS 要处理向用户提供服务的方方面面，所以需要认识到这些变化并采取相应的行动。只要我们在全部工作中始终坚持用户至上的原则，就能实现我们的目标。

附件

与会人员名单

1. Officers of the session

President Fred R. Branski (United States)

Vice-President Susan Lesley Barrell (Ms) (Australia)

2. Representatives of WMO Members

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Malek HAMANE	Delegate
Kamel KARA	Delegate

Australia

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Jonathan Paul Gill	Alternate
Russell Keith Stringer	Delegate

Belgium

Daniel Gellens	Delegate

Botswana

Gasewasepe Nthobatsang (Mrs)	Principal Delegate
Tapologo Kepaletswe (Mrs)	Delegate

Brunei Darussalam

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Abdullah SUHAILI	Delegate

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Tony Colavecchia	Delegate

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Li Jian	Delegate
Cui Jiangxue	Delegate
Zheng Jiangping	Delegate
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Krešo PANDŽIĆ	Alternate

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Amr Mohamed Amr MAHMOUD	Alternate

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Kimmo AALTONEN	Delegate

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Bernard STRAUSS	Principal Delegate
Matteo DELL'ACQUA	Alternate
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Jochen DIBBERN	Principal Delegate
Dieter SCHRÖDER	Delegate
Heene MARKUS	Delegate
Heinrich KNOTTENBERG	Delegate

Hong Kong, China

LEE Lap-shun	Principal Delegate

Hungary

Maria BURANSZKI SALLAI	Delegate

Indonesia

Mulyono PRABOWO	Delegate
Juana RIMBA (Mrs)	Delegate

India

Ladu Ram MEENA	Principal Delegate
Rajiv Kumar NAGPAL	Delegate

Ireland

Paul HALTON	Principal Delegate
Gerald FLEMING	Delegate

Israel

Henia BERKOVICH (Mrs)	Principal Delegate

Italy

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Adriano RASPANTI	Delegate

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Hiroyuki Ichijo	Principal Delegate
Yuki Honda	Alternate
Eiji Toyoda	Delegate

Kenya

Joseph Romanus Mukabana	Principal Delegate
James G. Kongoti	Alternate
Nicholas W. Maingi	Delegate

Mozambique

Sergio Lucas M. BUQUE	Principal Delegate

Namibia

George SIMATAA	Principal Delegate
Franz Uirab	Delegate
Philip AMUNYELA	Delegate
Balbina DAES	Delegate
Julios Ngweda	Delegate
Eddie Kondjeni HAIDUWA	Delegate
Jennifer MOETIE	Delegate
Sarafina TSHILUNGA	Delegate
Zeenaro KAMBUEZA	Delegate
Erastus NDATOOLEWE	Delegate

Netherlands

Bert G. van den Oord	Principal Delegate
Wouter J. Nieuwenhuizen	Delegate

New Zealand

Norm Henry	Principal Delegate
Peter Kreft	Alternate

Norway

Jens Sunde	Principal Delegate
Roar Skålin	Delegate

Oman

Ahmed Hamood M. Al-Harthi	Principal Delegate
Hussein Ali M. Al Maqbali	Delegate

Poland

Ivan Čačić	Delegate

Republic of Korea

Park Kwang-Joon	Delegate
Yun Won-Tae	Delegate
Won Jae Gwang	Delegate
Huh Sung-Hoi	Delegate
Ryu Je-Young	Delegate

Russian Federation

Alexander GUSEV	Principal Delegate

Vladimir ANTSYPOVICH	Delegate
Leonid BEZRUK	Delegate
Roman VILFAND	Delegate

Senegal

Michel JEAN	Delegate

South Africa

Linda MAKULENI (Mrs)	Delegate
Mnikeli NDABAMBI	Delegate
Eugene POOLMAN	Delegate

Swaziland

Linda MAKULENI (Mrs)	Delegate

Sweden

Stefan NILSSON	Principal Delegate
Ilmar KARRO	Alternate
Daniel MICHELSON	Delegate

Switzerland

Estelle GRÜTER (Mrs)	Delegate

Turkey

Ömer Hüdai ALBAYRAK	Principal Delegate
Ahmet YAGBASAN	Alternate

United Kingdom of Great Britain and Northern Ireland

Steve FOREMAN	Principal Delegate
Simon GILBERT	Alternate

United Republic of Tanzania

Khamis A. SULEIMAN	Principal Delegate

United States of America

Vickie L. NADOLSKI (Ms)	Principal Delegate
Fred R. BRANSKI	Delegate
William C. BOLHOFER	Delegate
Craig HEGEMANN	Delegate

Uzbekistan

Roman VILFAND	Delegate

Bolivarian Republic of Venezuela

Raquel ESCOBAR-GOMEZ	Delegate

Zambia

Grace SIKOTA	Delegate

3. Observers

Malaysia
LOW Kong Chiew

4. Invited Experts

Bertrand CALPINI	President of CIMO
Lars Peter RIISHOJGAARD	Chair OPAG IOS
Geerd-Rudiger HOFFMANN	Chair ICG/WIS
Lipeng JIANG	WIS Demonstration

5. Representatives of International Organizations

Association of Hydro-Meteorological Equipment Industry (HMEI)
Andy McDonald
Chris Goode

European Centre for Medium-Range Weather Forecasts (ECMWF)
Erik Anderson

EUMETNET
Jochen Dibbern

EUMETSAT
Simon Elliott
Lothar WOLF

International Civil Aviation Organization (ICAO)
Olli Turpeinen

Niger Basin Authority
Collins R.U. IHEKIRE

6. WMO Secretariat

M. Jarraud
W. Zhang
G. Love
M. Carrieri (Ms)
P. Shi
J. Lafeuille
O. Baddour
D. Thomas
M. Ondras
I. Zahumensky
H. Kootval (Ms)
P. Chen
P. Kerherve
M. Peeters

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