Backup of DHMZ essential services using ECMWF HPCF and EWC

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Regional Conference of the Regional Association VI
on the Future role of National Meteorological and Hydrological Services:
Leadership and Management

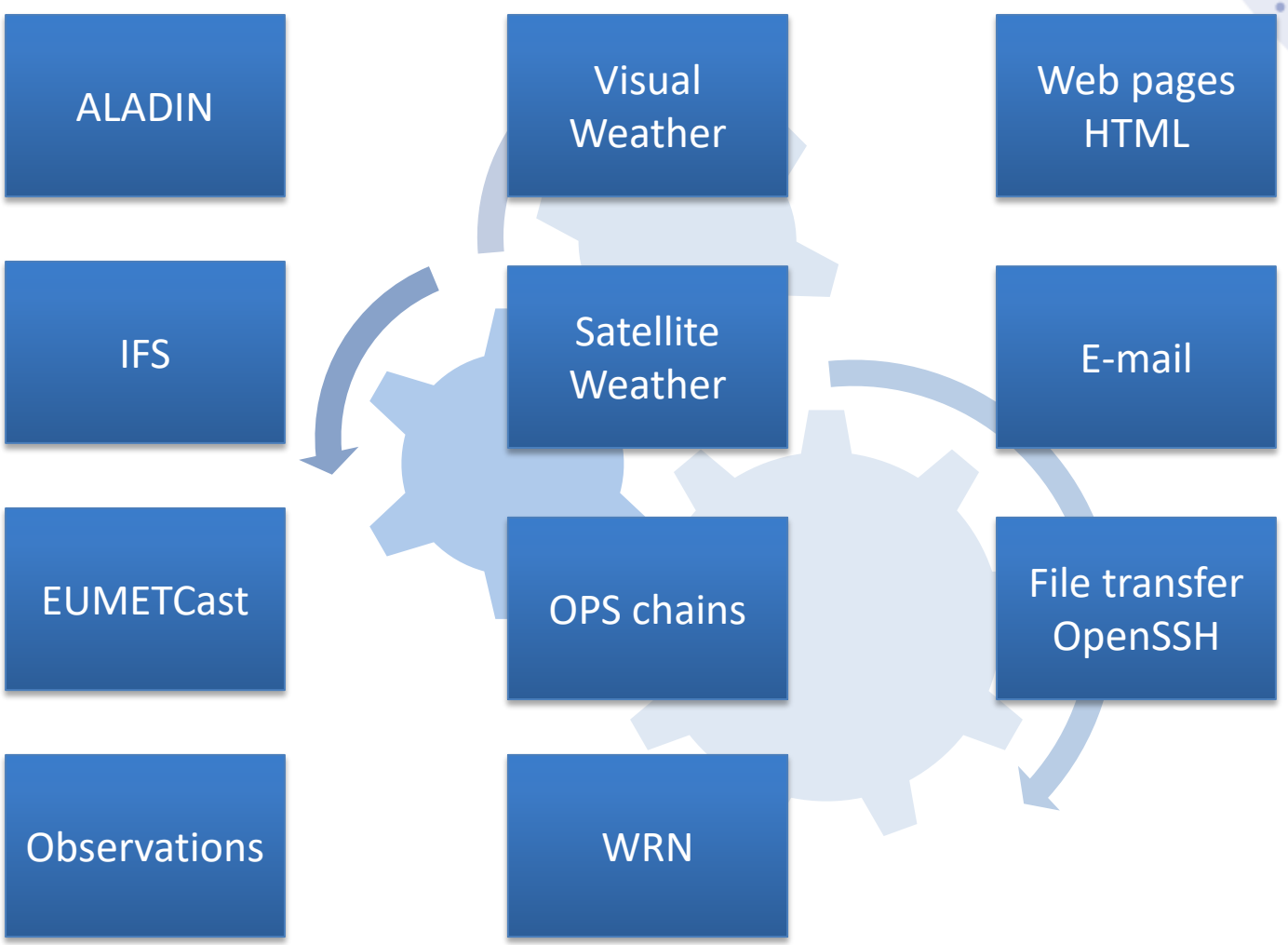
The event

- The 5.5 magnitude earthquake hit Zagreb on 22 Mar 2020 (YouTube video)
- DHMZ headquarters was considerably damaged and categorized unsafe for further usage
- Very high risk of malfunction of computing infrastructure as precipitation was able to leak through the damaged roof and walls

Response

- Quick decision to backup up most of the essential services
- Exploring options for external backup → usage of ECMWF and European Weather Cloud infrastructure
- Teaming of DHMZ with ECMWF, EUMETSAT as well as IBL experts
- Components of operational forecasting to backup:
  - ✓ Current weather, analysis
  - ✓ Short-range NWP – in house ALADIN-HR modelling system
  - ✓ Medium-range NWP from ECMWF, ICON, GFS
  - ✓ Postprocessing, visualisation and manipulation
  - ✓ Production of forecasts, warnings, reports
  - ✓ Dissemination to end users (general public, civil services, water, energy, gas, road, air, health,…)

Layout


ALADIN
IFS
EUMETCast
Observations
Visual Weather
Satellite Weather
OPS chains
WRN
Web pages HTML
E-mail
File transfer OpenSSH

Layout - ALADIN-HR short-range NWP

- DHMZ's NWP group set-up 2 OPS configurations (4km & 2km horizontal grid spacing) using new model cycle (cy43) of ALADIN model at ECMWF's HPC (cca) as a backup
- Initial and boundaries conditions for model integration were provided by ECMWF and RC-LACE (A-LAEF)
- Parallelised post-processing using conda environments and a python/bash framework was set up
- Production of postprocessed products and visualisation used both ECMWF HPCF and EWC
- ECMWF kindly increased priority for DHMZ NWP backup jobs

Layout - IFS medium-range NWP

- IFS output is an essential tool for our forecasters, EcCharts is a good last resort option but forecasters are not used to it in the operational environment and they worked from home with limited internet connection.

- ECMWF made its operational data for DHMZ available to us from EWC through S3 bucket
- Access to data via Amazon S3 Tools from command line (s3cmd) made integration of model data with visualization and data manipulation software possibile.

Layout - satellite & observations

- Subset (MSG SEVIRI HRITs & DWDSAT) of EUMETCast datastream was brought to EWC tenant as a push FTP service over the London EUMETCast Terrestrial node.

EUMETCAST TERRESTRIAL

EUMETCast Terrestrial is a demonstration dissemination service. It functions like the satellite service, but using a terrestrial network instead of a satellite network. The network used is the National Research and Education Network (NREN) and the GÉANT infrastructure. Only organisations eligible for access to a NREN can access the service, if the NREN supports multicasting.

EUMETCast Terrestrial is being evaluated for its potential to work as a back-up to the EUMETCast Satellite service.

- DWDSAT contains GTS data, SYNOPs, as well and surface pressure analysis and FC.

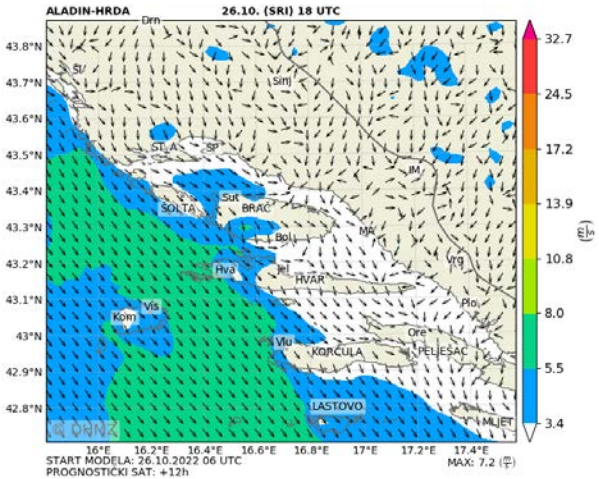
Layout - Visual Weather

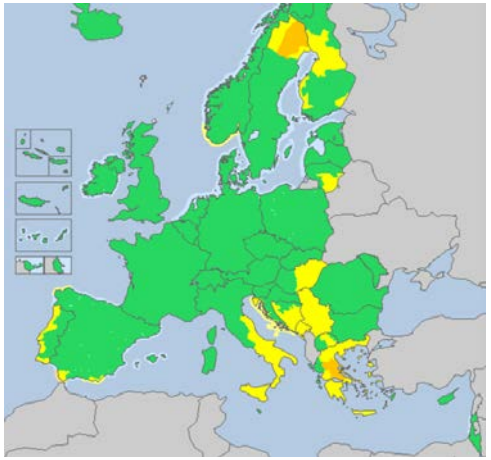
- At the centre of OPS env is Visual Weather system provided by IBL software engineering.

- New Visual Weather has been installed in EWC and the configuration was transferred from DHMZ's system in Zagreb, making the EWC-VW almost a full copy of the native system.

Layout - Product exposition and disseminaton

- All ALADIN-HR backup products were made available to forecasters and critical users at EWC using VM and PHP/HTML webpage
- Model fields (GRIB) were provided for Visual Weather system for data visualization and manipulation at another VM (CentOS) in EWC
- Visual Weather was configured on EWC, including temporary mail server to facilitate the product dissemination, NFS server…





DHMZ supercomputer move

- Months after the earthquake, DHMZ moved its supercomputer from damaged headquarters to a new data centre
- This caused a few weeks of supercomputer downtime and a full inability to run ALADIN-HR model in-house
- This time, however, the schedule for the move was well known, so everything could be appropriately organized, prepared, and tested weeks in advance
- Backup of operational services developed at ECMWF HPC & EWC in days after the earthquake was enhanced to include all operational NWP services of DHMZ
- All ALADIN-HR users were kept informed and test files were provided well in advance
- This assured a seamless delivery of the NWP forecasts and services to both forecasters and end users

Conclusion & Acknowledgement

- The earthquake in Croatia was a reminder of how natural hazards can endanger the critical role of NMHSs to serve society and protect lives and property

- Staff managed to carry on with their duties remotely and to deliver the service to the public, relevant authorities and critical end users

- Through effective collaboration with ECMWF and EUMETSAT, DHMZ was able to ensure the resilience of its critical weather services in the time after the earthquake and during a consequent supercomputer move to a new data centre

Thank you !

More details described in two ECMWF Newsletters:

Kristian Horvath, Endi Keresturi, Antonio Stanešić (all DHMZ), Xavier Abellan, Umberto Modigliani (both ECMWF): ECMWF supports Croatian met service during data centre move, ECMWF Newsletter 169, 2021

Xavier Abellan (ECMWF), Kristian Horvath, Izidor Pelajić, Antonio Stanešić (all DHMZ): Croatian met service backs up its production at ECMWF after earthquake, ECMWF Newsletter 164, 2020.