ECMWF strategic projects: an overview

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Bologna Data Centre

Bologna Our New Datacentre (BOND) in short
Why a new data centre?

A new fully operational, fully equipped datacentre in Bologna, operational end of 2020

• The current data centre facility does not offer the required flexibility for future growth and changes in high-performance computing (HPC) technology.

•The goals set out in ECMWF's ten-year Strategy launched in September 2016 include the development of a **5 km ensemble system by 2025**. Intermediary goals to 2020 already require that the Centre's next supercomputers should provide a significant increase in our computational capacity.

•The additional processors and power needed would require a significant expansion of our current data centre infrastructure, which unfortunately cannot be achieved in our current location.
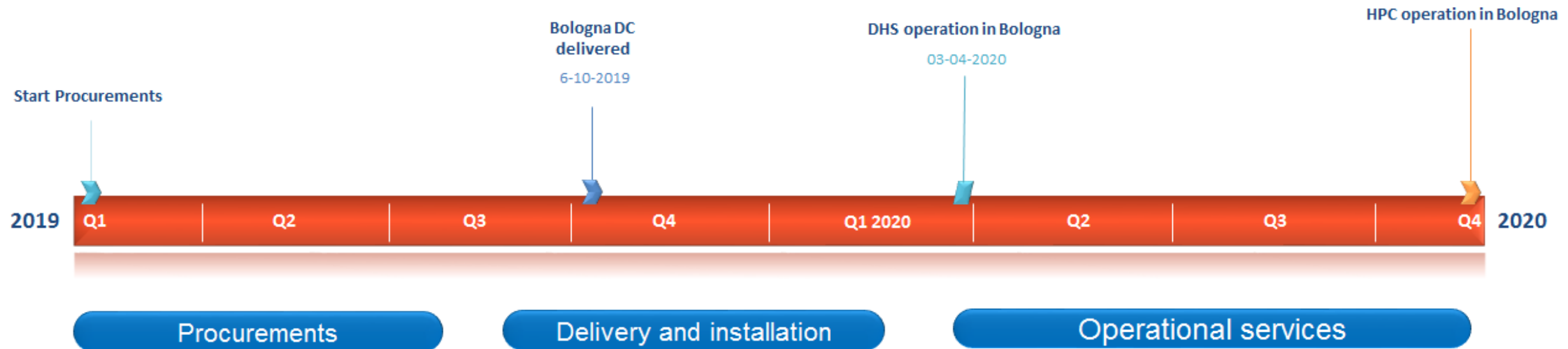

ECMWF   EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

Data design master plan
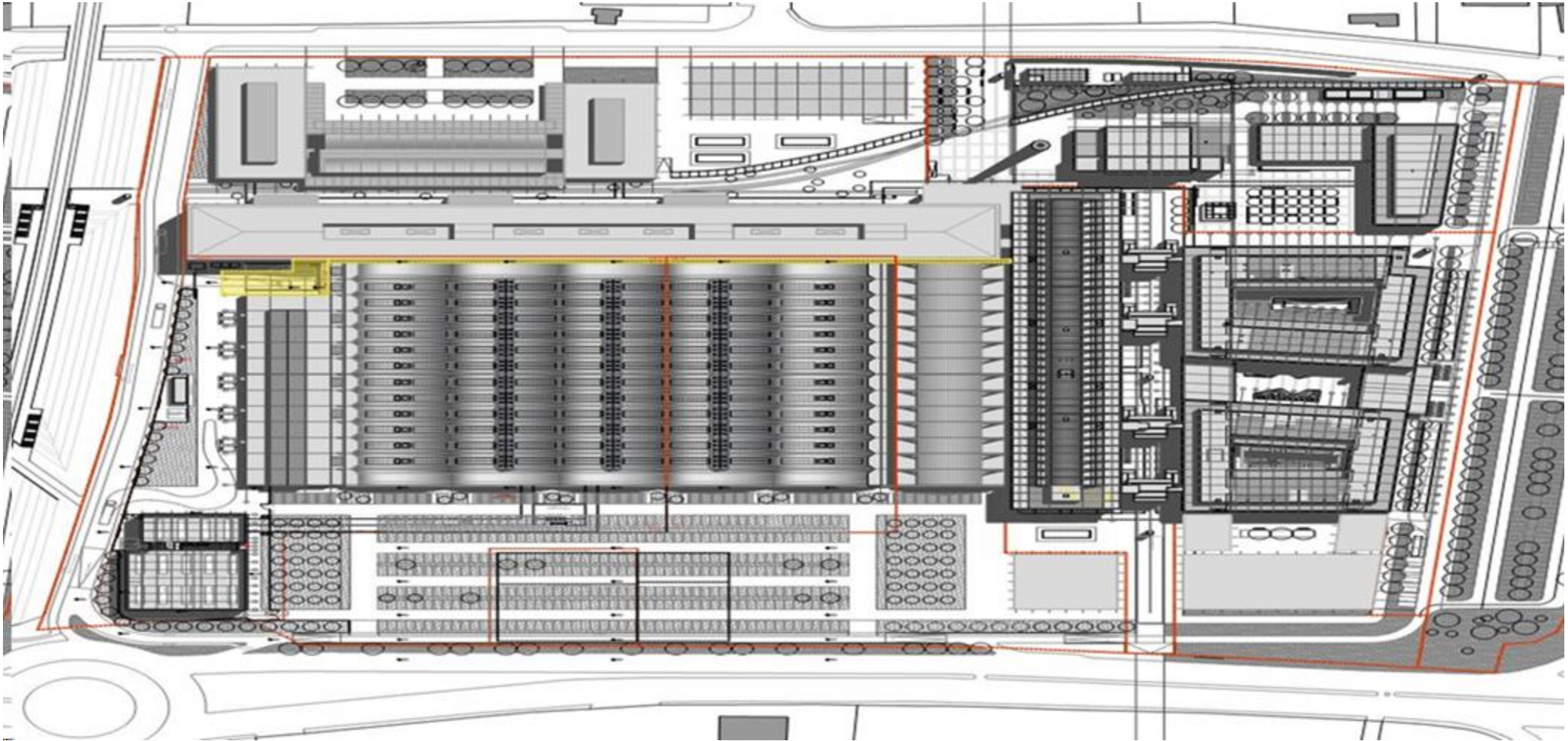
Current site May 2019

What it will look like

BOND Programme – Time line

European Weather Cloud

# 10-Year Challenge

30x more data sent to customers per day in critical path

Data acquisition

Forecast run

Product generation

Dissemination

RMDCN

Internet

Web services

Internet

Archive

Data Handling System

10x more observational data per day

2000x more model data per time step

25x more forecast product data per day in critical path

100x more data archived per day
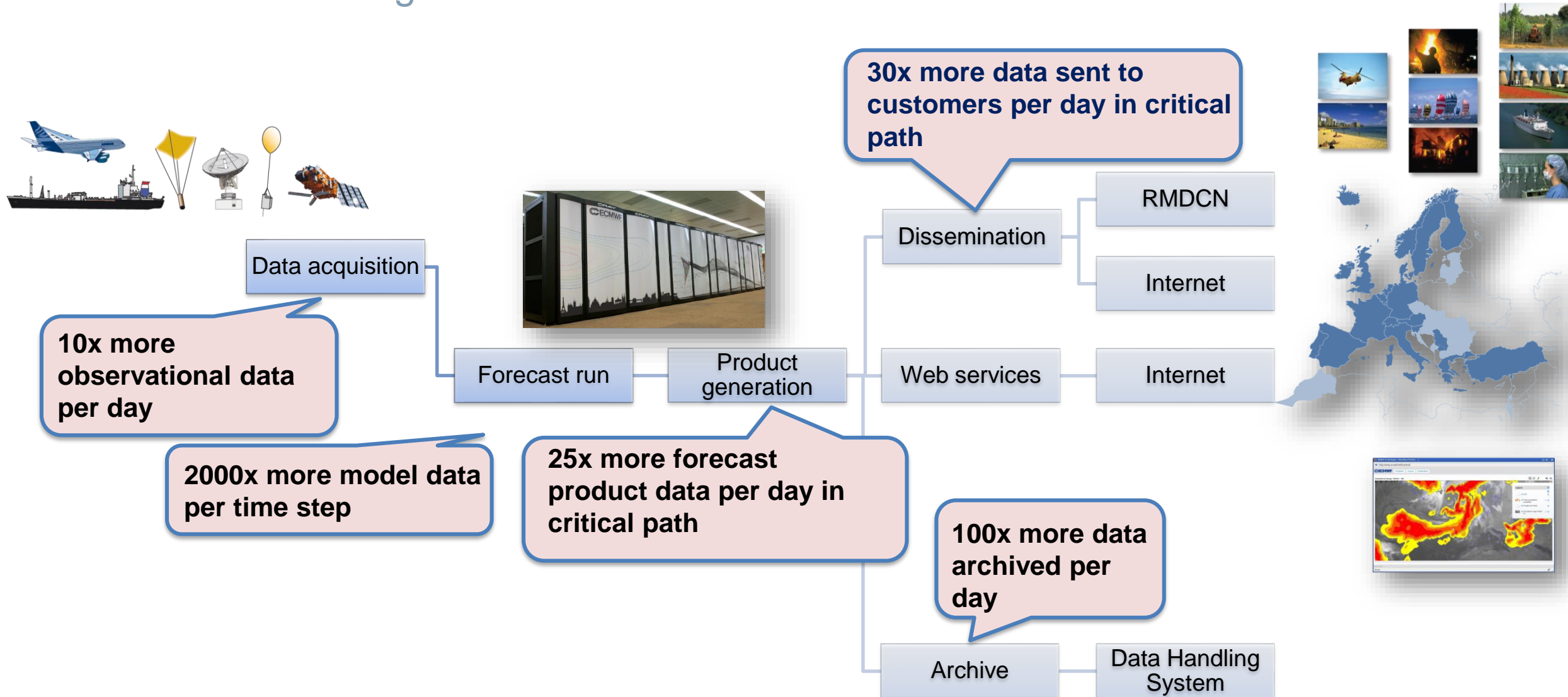
The European Weather Cloud: services

- Two year pilot project started in January 2019 in collaboration between ECMWF and EUMETSAT

- Aiming at building a cloud computing infrastructure focussed on the needs of the European Meteorological Infrastructure (EMI)

- To experiment with providing services at different levels, from data access to hosted processing and hosted services
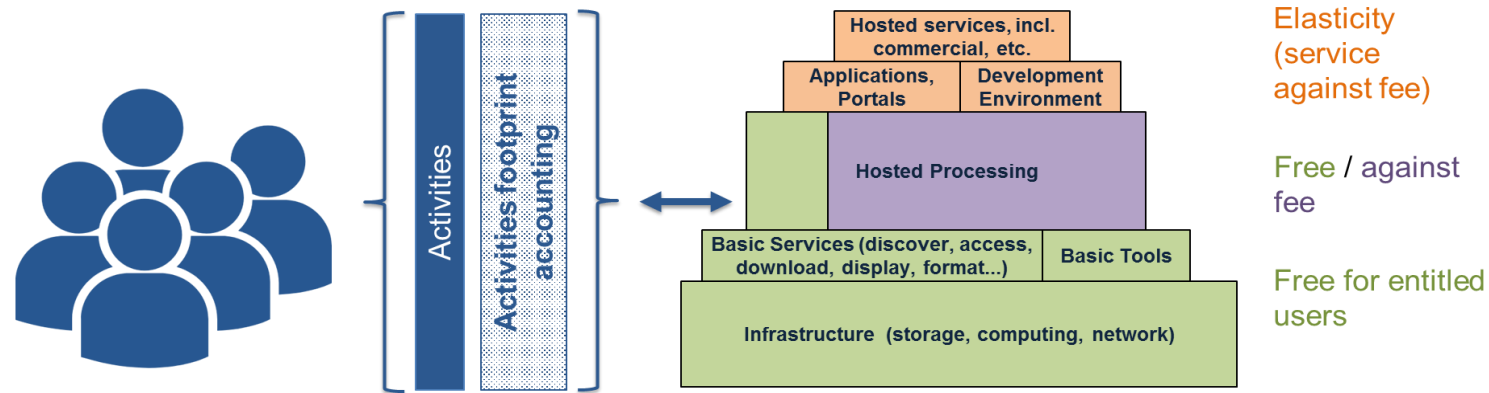
- basic services (data discovery, data access, display and reformat, download, registration to offered services, user helpdesk, etc.) supported by a set of tools
- hosted processing (catalogue of VMs for performing key tasks...)
- hosted applications, possibly supported by hosted portals and by development environments
- complete hosted services, including hosted commercial activities

The European Weather Cloud: use cases

Use cases collected so far by ECMWF and EUMETSAT to test the capabilities of the cloud include:

- OGC Web services (various data sources, including ECMWF)

- Data processing for a dispersion model (various data sources, including ECMWF)

- Distribution of the output of a Limited Area Model running at ECWMF

- Cloud cover forecast (ECMWF and EUMETSAT data)

- Visualisation of ocean surface winds ((ECMWF and EUMETSAT data)

- Distribution of surface observations in near-real time (EUMETNET/ECOMET data sources)

- Distributed model data processing and blending (various data sources, including ECMWF)

- Historical dataset machine learning model training (various data sources, including ECMWF)

- Limited forecast production in the event of total outage at an NMS's data centre (external data sources)

The European Weather Cloud: next steps

- **June 2019**: first tests on prototype pilot infrastructure at ECMWF

    - More hardware procured

    - Integration with internal Morpheus cloud management platform.

- **Summer/Autumn 2019:** development of policy for use of the cloud by NMSs of Member States. Study possible use by other users.

- **Mid-September 2019**: federated pilot infrastructure at EUMETSAT and ECMWF opens

    - Start working on use cases

- **Beginning January 2020**: process to add one or two additional members in the federated infrastructure

Operational plans

Model and software developments
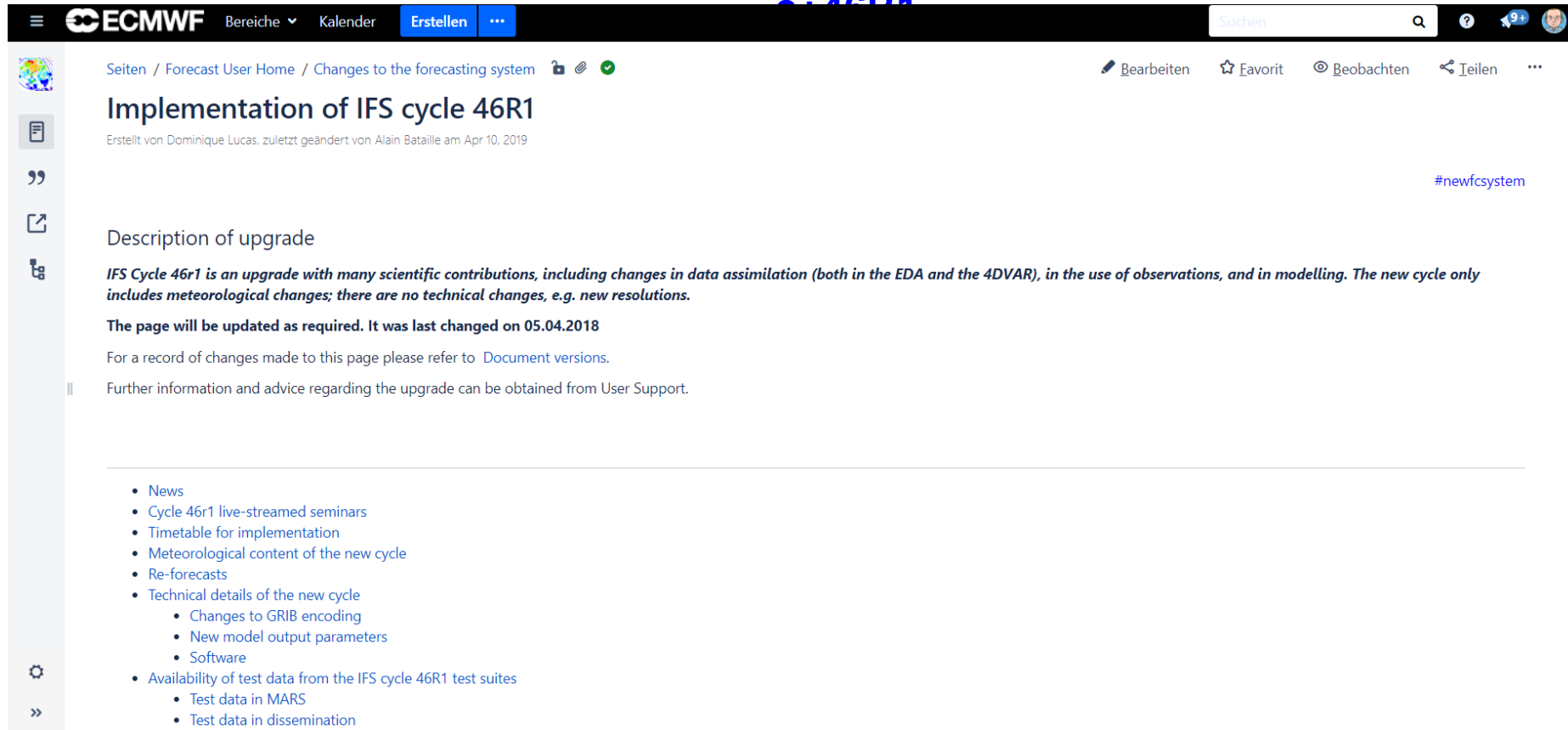
IMPLEMENTATION on 11th June 2019

Information to new cycle 46R1

All information is published on the website

https://confluence.ecmwf.int/display/FCST/Implementation+of+IFS+cycl e+46R1

Webinars on Science and Implementation (Reminder)

Download Presentation
or/and
Watch recording

Cycle 46r1 live-streamed seminars

We will organise two live-streamed seminars to introduce the new IFS cycle 46r1. The first seminar has mainly covered the Scientific changes made in the new Cycle (see recording and slides below). The second seminar will focus more on the meteorological impact and scores of the new cycle, with details on how to access the Cycle 46r1 release candidate test data. This second seminar will take place on Wednesday, 📅 15.05.2019 at 09:30 BST and repeated on Thursday, 📅 16.05.2019 at 17 :00 BST. You will have the opportunity to raise any questions during all these seminars. Please do not hesitate to contact us for additional questions.

To attend any of these seminars, please follow the link below:

https://ecmwf.adobeconnect.com/ecmwf-46r1

There is no need to pre-register.

The recording of the first cycle 46r1 seminar is available at https://ecmwf.adobeconnect.com/pgy081jw03ya/. The presentation slides are also available separately at https://www.ecmwf.int/sites/default/files/medialibrary/2019-02/46r1_overview_AndyBrown.pdf.

ecCodes new Python interface & GitHub

- CFFI based

  - Separates Python interface from main source code

  - Full Python 3 compatible & all functionality of Python 2 interface

  - We suggest Python 2 users to continue with old interface

- **Now also under Windows**

- ECMWF now offers their codes through GitHub

  - https://github.com/ecmwf

- Allows users to see up-to-date codes, fork & issue pull requests

- Automatics tests with repos
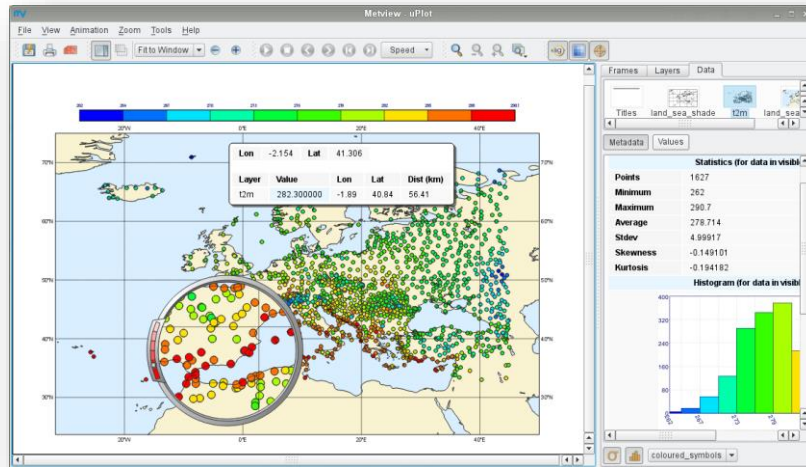
  - TravisCI (Linux & MacOS) and AppVeyor (Windows)

ECMWF EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS
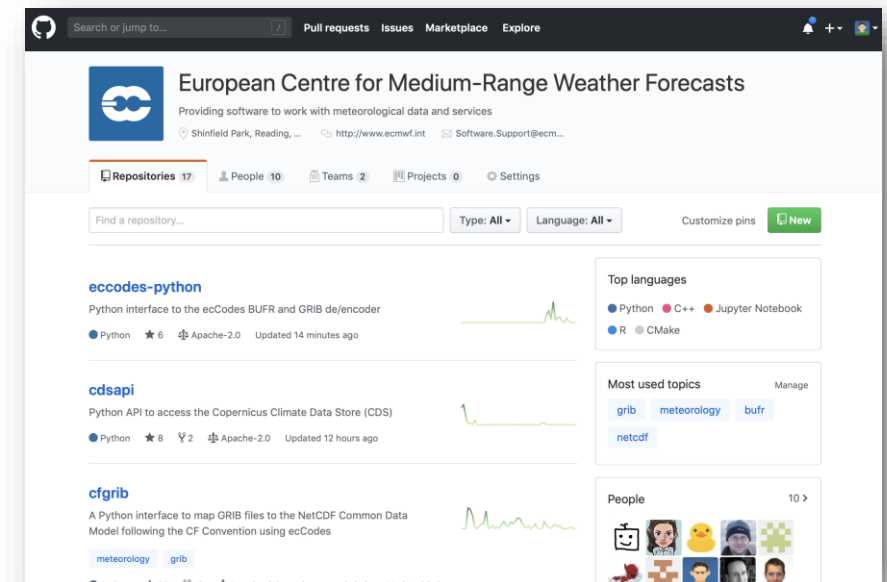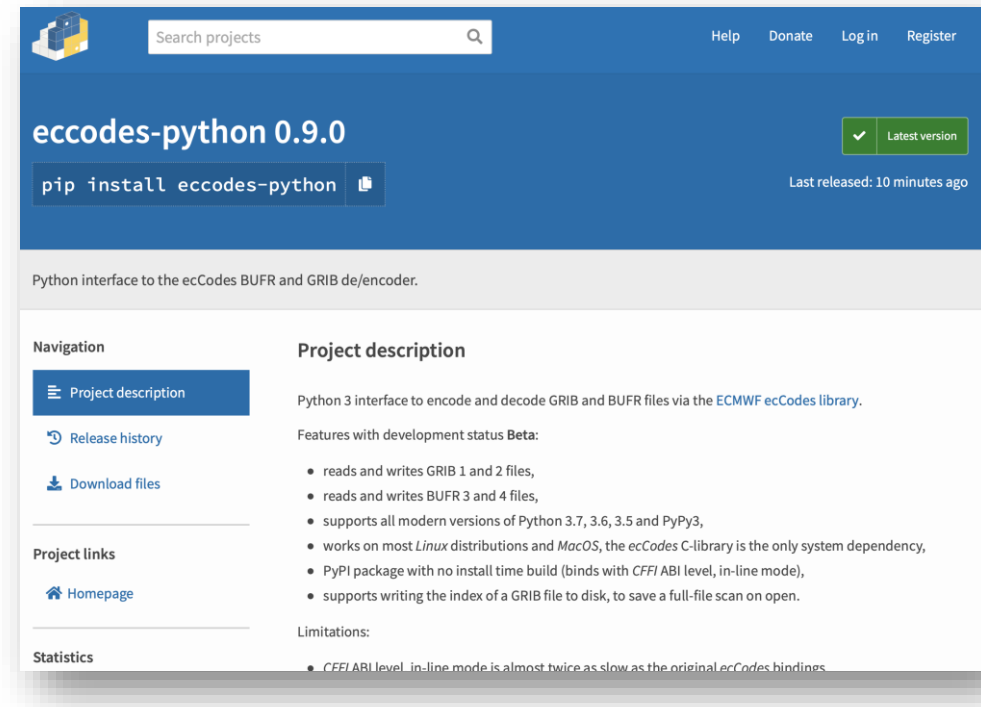
cfgrib – linking xarray and ecCodes

• Essential building block to bring GRIB model output data in the PyData stack

• To embrace xarray for all our field data, we needed to know that we could handle
all our GRIB data

The Metview Python framework

- A high-level Python 3 interface for processing and visualising ECMWF data → makes use of all other packages

- Aim is to allow users of Metview to use easily the power of Python but still have all functionality of Metview; including visualisation

New product Generation & Interpolation Software (MIR)
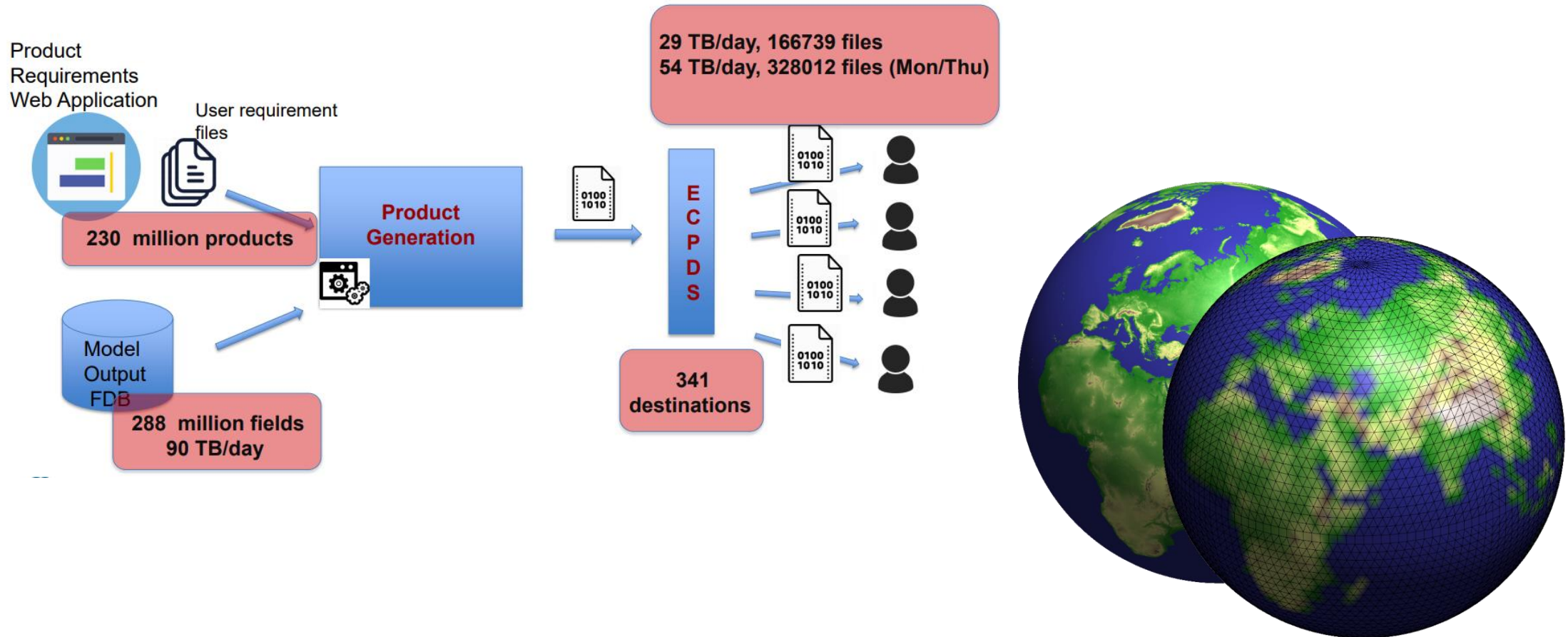
Disseminate our data to you

ECMWF has currently s fixed dissemination schedule determining at which time individual products are released

This fixed schedule has served us well and allowed the arrival of ECMWF products to be predictable which has been considered an advantage

Many of our data users have asked to have products earlier

We are now in a position to consider this request and we would like to collect some feedback on this. ← Visit the interactive poster by Jenny Rourke in the weather room

Early availability of ECMWF data "interactive poster"

ECMWF

Dr Jenny Rourke
Head of Production Services Section, ECMWF, Reading, United Kingdom

Copernicus

Working with the EU: Environmental information
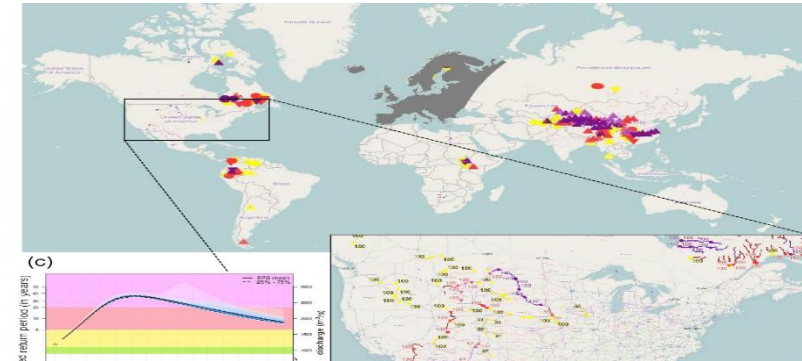
Atmosphere Monitoring Service
(CAMS)

Climate Change Service
(C3S)

Flood and fire forecasting
(CEMS)
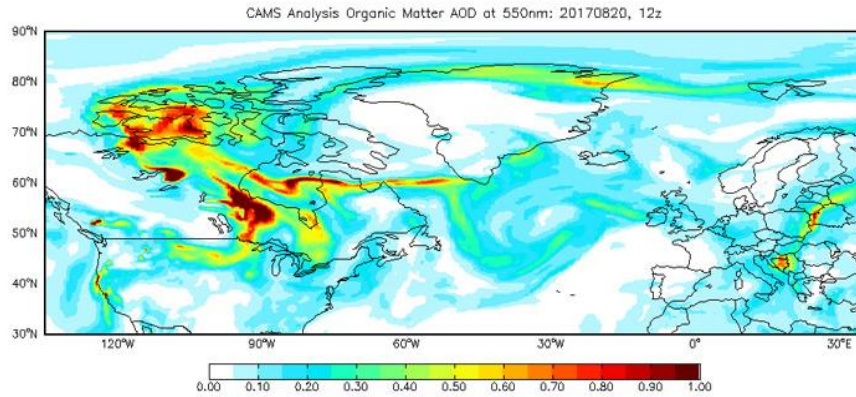
High-resolution mean sea level
pressure and ensemble spread
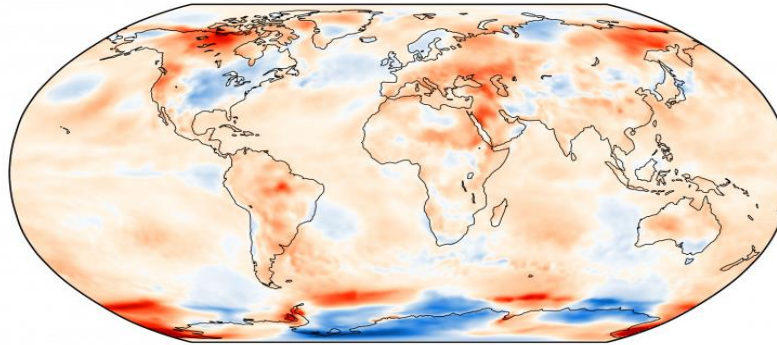
Total precipitation (mm) –
ensemble distribution

Main GloFAS interface

Establishment of User Needs / Requirements for Copernicus evolution

• The EC conducted in 2016-17 a wide initiative to identify long term, "user-driven" requirements for evolution of Copernicus services and space segment => user consultations, workshops, etc.

• Copernicus will continue to be a public service, driven by the needs of policy and public administrations, and fostering economic development in Europe

• Stability of the programme and long term commitment

  • (Enhanced) continuity of current data and services;

  • Continuity of full, open and free data policy

• Emerging needs

  • Climate change and sustainable development;

  • Monitoring CO_2 and other greenhouse gas emissions;

  • Land use and forestry;

  • Changes in the Arctic;

  • Security and Defence: Improving the EU's capacity (border control, maritime surveillance);

Copernicus development, example of CO2 monitoring

TOWARDS AN OPERATIONAL CO$_2$ EMISSION MONITORING SERVICE

Space component

GF-5
MicroCarb
FY-3D
TANSAT/-2
Chinese operational missions
GOSAT/-2
OCO-2/-3
Sentinel

2018 2019 2020 2021 2022 2023 2024 2025

Modelling/information system component

CHE
VERIFY
SPACE-5-EO-2019
Copernicus CO$_2$ service

System performance analysis

In-situ network design

Definition of system components, spatial temporal scales

Early Prototype, country / region emissions

Prototype system(s) for hot spot emissions and country-region scale emissions

Pre-operational system

Operational system

ECMWF Copernicus Europe's eyes on Earth European Commission

ECMWF: the STRENGTH OF A COMMON GOAL

#UEF2019