



# ERA-CLIM2 GA WP5 Service Developments

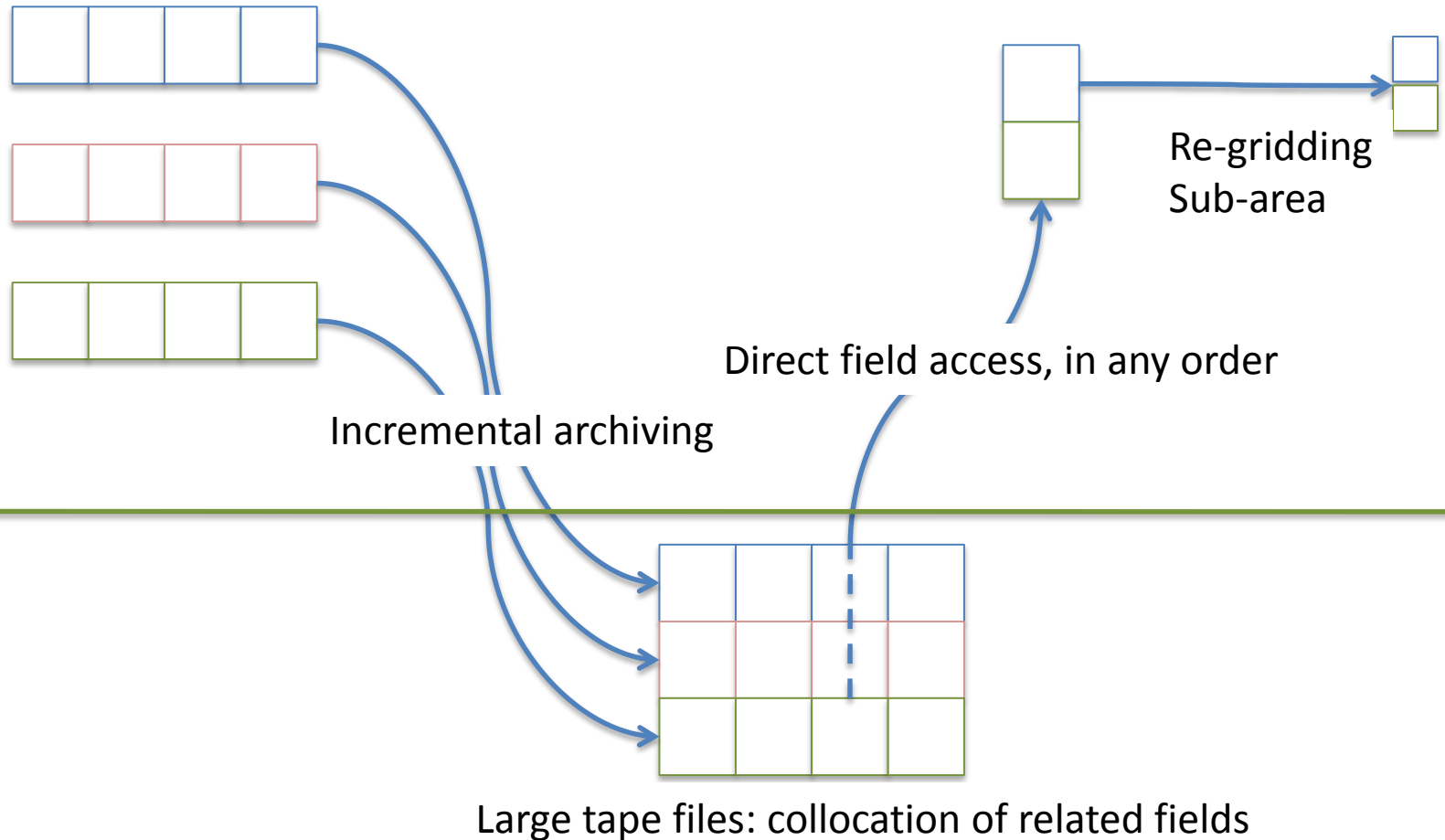
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Products Team - ECMWF

Acknowledgements: Baudouin Raoult + colleagues in  
Products Team, SW Development Section, ERA

# Outline

- D5.1 MARS support for NetCDF
- D5.2 CERA Data Servers
- Link to Copernicus

# What services does MARS offer?



# How is it done

- Currently MARS handles 2D fields in GRIB
- GRIB data are records, not files
- MARS scans archived files, extracts metadata from GRIB headers and keeps an index that tracks where each GRIB field is (file, offset, length)
- GRIBs are reorganised into larger files, to minimise the total number of files and collocate related fields to speed up retrievals
- On retrievals, MARS find the required fields, reads them from tape, and re-assembles them according to the user's request
- MARS can perform re-gridding or sub-area extraction

# Support for NetCDF in MARS

- We should provide the same services for NetCDF
  - Incremental archive
  - Data collocation
  - User can select any 2D fields from the archive and have them delivered in a single file
  - Re-gridding and sub-area extraction
- Challenges:
  - NetCDF is a file format, not a record format
  - Original files contain multi-dimensional variables (often > 2 dimensions)
  - One cannot extract a 2D field from a NetCDF file directly from tape

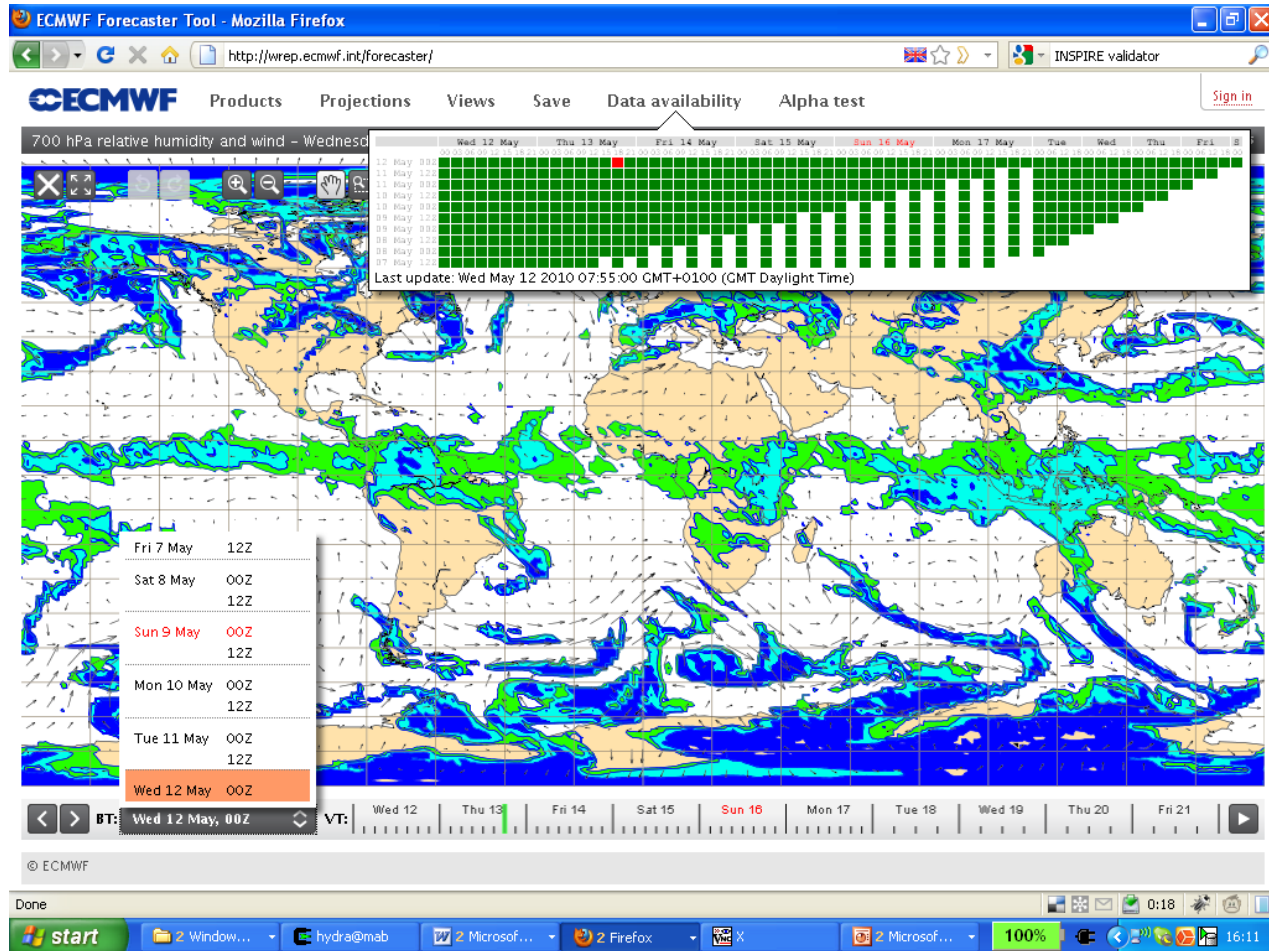
# Solution chosen

- NetCDF files to be archived are transparently split into individual NetCDF files containing a single 2D field
- Resulting NetCDF files are annotated with MARS specific information, using NetCDF file 'Variable' attributes
- These attributes are used by MARS to index the NetCDF files, and treat them as simple binary records
- On retrieval, those records will be assembled in a single NetCDF3/4 file to be delivered to the user
- Re-gridding and sub-area will be implemented at a latter stage (new interpolation sw currently being developed)
- The delivered NetCDF files must be CF compliant (with valid CF “standard name” attributes attached to the variables), and ideally as close as possible to the CMIP5/OGC standards.

# Web Data Servers

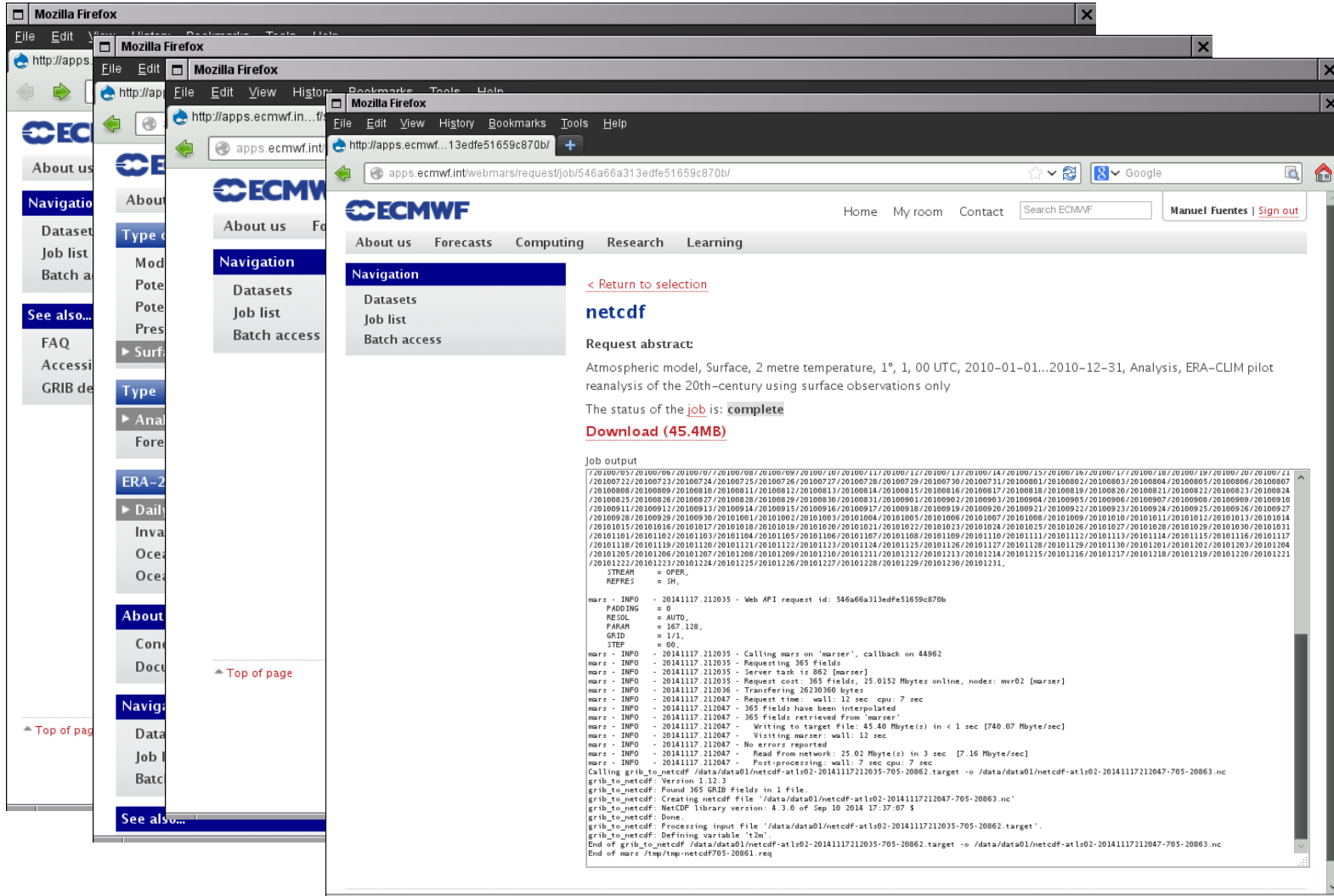
- In recent years, ECMWF has developed On-Demand Web Services under Web Re-Engineering Project (WREP):
  - ecCharts, application for forecasters, to visualise real-time data
  - WebApps/WebAPI, framework to provide access to the MARS archive

# ecCharts





# WebApps Data Server: Fields



The screenshot shows a Mozilla Firefox browser window displaying the ECMWF website. The page is titled "netcdf" and contains a "Request abstract" section. The abstract describes an atmospheric model request for surface temperature data from 2010-01-01 to 2010-12-31. The status of the job is "complete", and a "Download (45.4MB)" link is provided. Below the abstract, there is a "Job output" section containing a large block of text showing the results of the request, including a list of dates and a detailed log of the request processing.

**Request abstract**

Atmospheric model, Surface, 2 metre temperature, 1°, 1, 00 UTC, 2010-01-01...2010-12-31, Analysis, ERA-CLIM pilot reanalysis of the 20th-century using surface observations only

The status of the job is: **complete**

[Download \(45.4MB\)](#)

**Job output**

```
7/20100705/20100706/20100707/20100708/20100709/20100710/20100711/20100712/20100713/20100714/20100715/20100716/20100717/20100718/20100719/20100720/20100721/20100722/20100723/20100724/20100725/20100726/20100727/20100728/20100729/20100730/20100731/20100801/20100802/20100803/20100804/20100805/20100806/20100807/20100808/20100809/20100810/20100811/20100812/20100813/20100814/20100815/20100816/20100817/20100818/20100819/20100820/20100821/20100822/20100823/20100824/20100825/20100826/20100827/20100828/20100829/20100830/20100831/20100901/20100902/20100903/20100904/20100905/20100906/20100907/20100908/20100909/2010910/20100911/20100912/20100913/20100914/20100915/20100916/20100917/20100918/20100919/20100920/20100921/20100922/20100923/20100924/20100925/20100926/20100927/20100928/20100929/20100930/20101001/20101002/20101003/20101004/20101005/20101006/20101007/20101008/20101009/20101010/20101011/20101012/20101013/20101014/20101015/20101016/20101017/20101018/20101019/20101020/20101021/20101022/20101023/20101024/20101025/20101026/20101027/20101028/20101029/20101030/20101031/20101101/20101102/20101103/20101104/20101105/20101106/20101107/20101108/20101109/20101110/20101111/20101112/20101113/20101114/20101115/20101116/20101117/20101118/20101119/20101120/20101121/20101122/20101123/20101124/20101125/20101126/20101127/20101128/20101129/20101130/20101131/20101201/20101202/20101203/20101204/20101205/20101206/20101207/20101208/20101209/20101210/20101211/20101212/20101213/20101214/20101215/20101216/20101217/20101218/20101219/20101220/20101221/20101222/20101223/20101224/20101225/20101226/20101227/20101228/20101229/20101230/20101231/20101231.
STREAM = OPER.
REFRESH = 9H.
mars - INFO - 20141117 212035 - Web API request id: 546a66a313edfe51659c870b
PADDING = 0
RESOL = AUTO.
PARAM = 167.128.
GRID = 1/1.
STEP = 00.
mars - INFO - 20141117 212035 - Calling mars on 'marsr', callback on 44962
mars - INFO - 20141117 212035 - Requesting 365 fields
mars - INFO - 20141117 212035 - Server task is 862 [marsr]
mars - INFO - 20141117 212035 - Request cost: 365 fields, 25.0152 Mbytes online, nodes: mvr02 [marsr]
mars - INFO - 20141117 212036 - Transferring: 26230560 bytes
mars - INFO - 20141117 212047 - Request time: wall: 12 sec cpu: 7 sec
mars - INFO - 20141117 212047 - 365 fields have been interpolated
mars - INFO - 20141117 212047 - 365 fields retrieved from 'marsr'
mars - INFO - 20141117 212047 - Writing to target file: 45.40 Mbyte(s) in < 1 sec [740.07 Mbyte/sec]
mars - INFO - 20141117 212047 - Visiting marsr: wall: 12 sec
mars - INFO - 20141117 212047 - No errors reported
mars - INFO - 20141117 212047 - Read from network: 25.02 Mbyte(s) in 3 sec [7.16 Mbyte/sec]
mars - INFO - 20141117 212047 - Post-processing: wall: 7 sec cpu: 7 sec
Calling grib_to_netcdf /data/data01/netcdf-at102-20141117212035-705-20862.target -o /data/data01/netcdf-at102-20141117212047-705-20863.nc
grib_to_netcdf: Version 1.12.3
grib_to_netcdf: Found 365 GRIB fields in 1 file
grib_to_netcdf: Creating netcdf file /data/data01/netcdf-at102-20141117212047-705-20863.nc
grib_to_netcdf: NetCDF library version: 4.3.0 of Sep 10 2014 17:37:07 $
grib_to_netcdf: Done.
grib_to_netcdf: Processing input file '/data/data01/netcdf-at102-20141117212035-705-20862.target'.
grib_to_netcdf: Defining variable 'tm'.
End of grib_to_netcdf /data/data01/netcdf-at102-20141117212035-705-20862.target -o /data/data01/netcdf-at102-20141117212047-705-20863.nc
End of mars /tmp/mars-netcdf705-20863.req
```

# Data Server: Observation Feedback

The screenshot shows a Mozilla Firefox browser window displaying the ECMWF website. The page title is "Data Server: Observation Feedback". The URL in the address bar is "http://apps.ecmwf.int/webmars/request/job/546b7ae348890d2751d623c6f". The page content includes a navigation menu, a search bar, and a job status page. The job status is "complete". The page also includes an acknowledgement and a download link for 9627.8MB. A table of data is also visible at the bottom.

**Navigation**

- Datasets
- Job list
- Batch access

[Return to selection](#)

## retrieve

**Request abstract:**

Atmospheric model, DRIBU Ocean Bottle And Low Resolution Conductivity Temperature Depth CTD And XCTD ..., 1607, ERA-CLIM pilot reanalysis of the 20th-century using surface observations only, select reporttype, varno, timeseries\_index, date, time, lat, lon, obsvalue, fg\_depar, an\_depar where (source='ISPDv2.2') and (varno=110); all, 1994-04-01...2010-12-31, ODB feedback, 17

The status of the **job** is: **complete**

**Acknowledgement**

Support for the **International Surface Pressure Databank** is provided by the *U.S. Department of Energy, Office of Science Innovative and Novel Computational Impact on Theory and Experiment (DOE INCITE) program*, and *Office of Biological and Environmental Research (BER)*, and by the *National Oceanic and Atmospheric Administration (NOAA) Climate Program Office*. **The Twentieth Century Reanalysis Project** is supported by the *Earth System Research Laboratory Physical Sciences Division of NOAA* and the *Climate Diagnostics Center (CDC) of the University of Colorado's Cooperative Institute for Research in Environmental Sciences (CIRES)*.

**Download (9627.8MB)**

**Preview of the data**

reporttype	varno	timeseries_index	date	time	lat	lon	obsvalue	fg_depar	an_depar
16005	110	66	19940331	220000	52.500000	-132.699997	102270.000000	137.000000	78.300003
16005	110	1767	19940331	220000	39.290001	164.649994	101340.000000	-426.000000	-248.000000
16005	110	244	19940331	220000	-39.040001	163.289993	102440.000000	129.000000	53.299999
16005	110	2309	19940331	220000	20.639999	135.789993	101580.000000	168.000000	143.000000
16005	110	1255	19940331	220000	23.540001	141.110001	101980.000000	115.000000	88.000000
16005	110	4542	19940331	220000	9.480000	159.669998	101200.000000	57.799999	63.700001
16005	110	3745	19940331	220000	-8.140000	114.400002	101120.000000	-4.070000	-12.700000
16005	110	5060	19940331	220000	-12.380000	130.669998	101220.000000	91.900002	28.799999
16005	110	2512	19940331	220000	-11.780000	118.989998	101240.000000	55.599998	28.200001
16005	110	1751	19940331	220000	-13.360000	139.389999	101190.000000	78.500000	39.299999

# Data Access: ECMWF Web API

- Simple API to services using HTTPS
- Batch access to Data Servers:
  - Install a simple library (eg, python)
  - Install a token
  - Download data via scripts
- Access to new services in future, like plots on demand

# Web API sample request

```
#!/usr/bin/env python

from ecmwfapi import ECMWFDataServer

server = ECMWFDataServer()

server.retrieve({
    'dataset' : "era20c",
    'levtype' : "sfc",
    'date'     : "20100101/to/20101231",
    'time'     : "00",
    'param'    : "2t",
    'grid'     : "1/1",
    'format'   : "netcdf",
    'target'   : "data.nc"
})
```

# Total usage October 2014

- Data downloaded by 1,800 users
  - 750,000,000 fields
  - 1.5 million requests
  - 78 TBytes
- Volume by application
  - WebAPI: 70%, WebApps: 30%
- Volume by dataset
  - Reanalysis: 85%, rest: 15%

# Download of Reanalysis datasets in October 2014

Dataset	Fields	Requests	Volume
ERA-15	142,702	2,524	770 MB
ERA-40	14,273,735	71,313	167 GB
ERA-Interim	389,243,904	1,152,642	50 TB
ERA20C	255,887,608	163,762	15 TB

# Copernicus Climate Change Services (C3S)

- ECMWF contribution to the Climate Data Store (CDS)
  - Provision of a **basic infrastructure** (HPC, Archive and Network, brokerage) for the CDS, including support and services
    - Support evolution towards distributed platform, liaison with WIS, ESGF, WMO GFCS, INSPIRE, etc.
  - Support for integration of climate products into the CDS
  - Support for the production of **global reanalysis**
  - Support for **seasonal forecasts** activities to the level required by the C3S

# Amazon marketplace

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DVI-HDMI Adapters  
Monitors  
+ See more...

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Accessories  
Cables  
Battery Chargers  
+ See All 30 Departments

Delivery Option (What's this?)  
 FREE Super Saver Delivery

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 AmazonBasics  
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 HDMI  
 Cablesson  
 BuyinCoins  
 Duronic  
 HDMI KING  
 Generic  
 Wired-up  
 RiteAV  
 B Betron®  
 CSL-Computer  
 iZKA®  
 BlueRigger  
 pip electronics

Monitor Connectivity  
 HDMI  
 VGA  
 DVI

Monitor Screen Size  
 Up to 19"  
 20" - 21"  
 22" - 23"  
 24" - 25"  
 26" & Up

Avg. Customer Review  
★★★★☆ & Up  
★★★★☆ & Up  
★★★★☆ & Up  
★★★★☆ & Up

International Shipping (What's this?)  
AmazonGlobal Eligible

"hdmi"  
Related Searches: hdmi 5m, hdmi cable, hdmi splitter.

Showing 1 - 16 of 746,224 Results Choose a Department to enable sorting

**Wired-up HDMI to HDMI Gold Plated Connectors 1.8m Cable 1.3A by Wired-up (11 Aug 2010)**  
£1.28  
In stock  
More buying choices  
£0.10 new (60 offers)  
★★★★☆ (4,095)  
#1 Best Seller in Hi-Fi & Home Audio Cables  
Electronics & Photo: See all 403,532 items

**AmazonBasics High-Speed HDMI Cable 6.5 Feet / 2.0 m Supports Ethernet / 3D / Audio Return (Newest Standard) by AmazonBasics (15 Oct 2010)**  
£3.99 Add-on item  
Add it to a qualifying order within 10 minutes to get it by Wednesday, May 21  
★★★★☆ (1,098)  
Eligible for FREE Super Saver Delivery.  
Electronics & Photo: See all 403,532 items

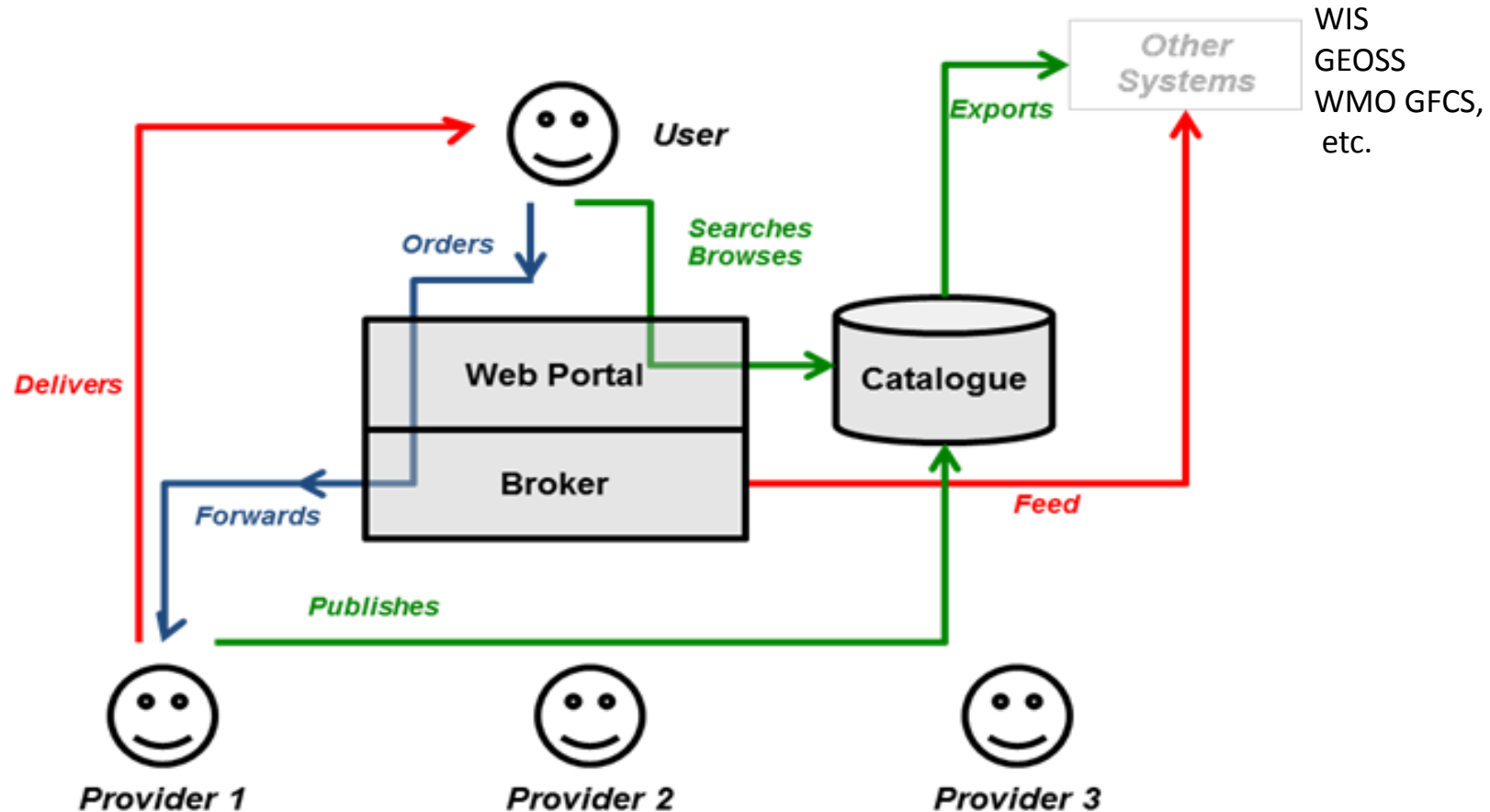
**AmazonBasics High-Speed HDMI Cable 3 Feet / 0.9 m Supports Ethernet / 3D / Audio Return (Newest Standard) by AmazonBasics (11 Aug 2012)**  
£3.49 Add-on item  
Add it to a qualifying order within 10 minutes to get it by Wednesday, May 21  
★★★★☆ (1,088)  
Eligible for FREE Super Saver Delivery.  
Electronics & Photo: See all 403,532 items

**CablessonBasics HDMI (3 Meter) High Speed HDMI Cable with Ethernet - (Latest 1.4a Version, 15.2Gbps) Gold HDMI to... by Cablesson**  
★★★★☆ (1,128)  
Eligible for FREE Super Saver Delivery.  
Electronics & Photo: See all 403,532 items

**High Speed (Category 2) 1.2 Meter Gold Plated HDMI to HDMI cable with 3D, Ethernet and Audio Return Channel by B Betron®**  
Was on: £3.45  
In stock  
More buying choices  
£3.45 new (3 offers)  
£5.00 used (2 offers)  
★★★★☆ (880)  
Electronics & Photo: See all 403,532 items



# CDS infrastructure



WIS  
GEOSS  
WMO GFCS,  
etc.

# Climate Data Store: next steps

- Workshop early 2015
  - Gather user requirements
  - Review existing systems/software/EU projects that are relevant to the CDS
  - Perform a gap analysis, with focus on operations
- Develop/procure the missing parts in the next two years

# Service developments: Conclusion

- WP5 Deliverables well on track:
  - MARS support for NetCDF in development
  - CERA Data Servers: extend current infrastructure and services
- Link to Copernicus CDS:
  - Provision of existing and new data
  - Re-use existing services and procure missing parts

Thank you for your attention