The ERA-CLIM data server

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The context



The ERA-CLIM project

- Next episode in the ERA series (FGGE,ERA-15,ERA-40,ERA-Interim)
- ERA-CLIM: European Reanalysis of Global Climate Observations
- A 3-year collaborative research project (2011 2013) towards:

Building observational datasets for the predictability of global atmospheric, oceanic and terrestrial processes using reanalysis techniques, with a focus on the past 100 years.



The ERA-CLIM project

Key objectives:

- Improvement of the observational record for the early 20th century
- Preparation of satellite observations, boundary conditions, and forcing data for a global atmospheric reanalysis of the 20th century
- Production of pilot case reanalyses and data quality information
- Development of an Observation Feedback Archive for reanalysis
- Assessment and reduction of data uncertainties

Additional goals:

- Improving access to climate data, data quality, and transparency
- Developing a sustainable capability for data recovery and reanalysis
- Meeting requirements for future GMES climate services



ERA-CLIM data recovery and digitisation

- RIHMI (Russian Research Institute for Hydrometeorological Information) will recover metadata for the stations in their own archive that cover the Former Soviet Union
- 50 000 tapes
- 2 356 000 paper documents for the period 1734-2006
- 719 000 satellite images for the years 1975-2002
- 288 ooo microfilms for the period 1881-1998







ECMWF and ERA-CLIM

- Development of an Observation Feedback Archive (OFA) A new web-based facility for access to raw input observations, including uncertainty estimates from reanalysis
- Production of pilot reanalyses and data quality information
 - Database facility for input observations with quality feedback from reanalyses
 - A series of long test reanalyses at various resolutions
 - All reanalysis products and input observations available via web services
- Assessment and reduction of data uncertainties
 - Homogenized in-situ data and bias correction techniques
 - Improved ocean observations for reanalysis
 - Tools for quality assessment of reanalysis products



The WREP project - Motivations

Web Re-Engineering Project

- New requirements exist that cannot easily be met
- Increasing use by our supporting states and many commercial customers of our web products
- Users request more tailored products
- Our web service was designed as state-of-the-art in 2001
 - The web has evolved and so have user expectations in usability ...
 - ... New web technologies have evolved to meet these demands
- Our web service cannot currently be relied upon operationally



The WREP project - Goals

- Redesign the web infrastructure so that the web service is highly available
- Provide on-demand plot production
- Provide more interactivity (e.g. zoom, pan, overlay parameters)
- Allow product customisation (e.g. control the event threshold on probability maps)
- Use open (OGC) standards so that ECMWF products can be embedded in users' own software
- Provide an infrastructure that would easily support current and future application



My role



Description of work (official)

- Developing an Observational Feedback Archive (OFA) for observations used in ERA-CLIM reanalyses, including a facility for storing metadata for the observations
- Developing a web-based data server for the OFA data server
- Developing simple visualisations methods for the OFA data server
- Preparing documentation on the web for the OFA data server
- Supporting other data services developments



Description of work (in short)

 Be sure we provide observations, feedback data and plots to users (mainly external) through a nice web interface



Requirements

- The need to start archiving observation data in MARS using ODB
- The need for a catalogue describing this data
- The need for a web interface (possibly reusing what's been done before in terms of web development at ECMWF) that displays the catalogue and allows retrieval of data

The work so far



Current status – data

- Observations can now be archived in MARS using the ODB format
- A first set of 'historical' observations has been archived in MARS.
- A catalogue has been generated for this data



Current status – user interface

- Web-based data servers already exist for different projects (ERA-40, ERA-Interim, TIGGE, DEMETER, ...), however ...
- The infrastructure they are based on is not very maintainable, flexible, modular, nor very scalable. It's also quite a few years old and it shows.
- There is the Web Reengineering Project (WREP)
- My tasks extended to migrating old data servers to the new infrastructure, work which also included migrating Webmars



Start date: 1979-01-01

Select date

ECMWF	15 Years	Re-Analysis
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Select a date range between 1979-01-01 and 1993-12-31:

End date: 1993-12-31

ERA 15's data portal

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TIGGE data portal

TIGGE Data Retrieval

Select date

Select a date range between 2006-10-01 and 2011-10-22:

Start date:	2006-10-01	End date:	2011-10-22

un Jul Aug Sep Oct Nov Dec

TIGGE Data Retrieval Select date Select a date in the interval 2006-10-01 to 2011-10-25 Start date: 2006-10-01 End date: 2011-10-25 Select a list of months Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Select All or Clear Select origin and time BOM CMA CMC CPTEC ECMWF JMA KMA Météo France NCEP UK Met Office 00:00:00 Select All or Clear Select step 12 18 24 30 36 42 48 54 60 66 72 78 84 90 96 102 108 114 120 126 132 138 144 150 _ 156 _ 162 _ 168 _ 174 _ 180 _ 186 _ 192 _ 198 _ 204 _ 210 _ 216 _ 222 _ 228 _ 234 _ 240 _ 246 _ 252 _ 258 _ 264 _ 270 _ 276 _ 282 _ 288 _ 294 _ 300 _ 306 _ 312 _ 318 _ 324 _ 330 _ 336 _ 342 _ 348 _ 354 _ 360 _ 366 _ 372 _ 378 _ 384 Select All or Clear Select parameter 10 metre U wind component 10 metre V wind component 2 metre dewpoint temperature 2 metre temperature Convective available potential energy Convective inhibition Land-sea mask Maximum temperature at 2 metres since last 6 hours Mean sea level pressure Minimum temperature at 2 metres since last 6 hours Skin temperature Snow Depth water equivalent Snow Fall water equivalent Soil Moisture Sunshine duration Soil Temperature Surface latent heat flux Surface pressure Surface sensible heat flux Surface solar radiation Surface thermal radiation Top thermal radiation Total Cloud Cover Total Precipitation Total column water Wilting point

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Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

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	Snow Depth Water Equivalent
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ace Net Thermal Radiation	☐ Time Integrated Surface Sensible Heat Flux
	☐ Total Column Water
	☐ Wilting Point

atch request

378 384

Slide 18



Webmars

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	3			2		Geopotential
	6			3		Ozone mass mixing ratio
	9			5		Potential vorticity
	12			7		Relative humidity
	15			10		Specific humidity
	18			20		Temperature
	21			30		U velocity
	24			50		V velocity
	27	v		70	~	Vertical velocity

View node in the old webmars.

- Check for availability
- View the batch request
- Estimate request cost
- Retrieve the selection

Current selection:

time	00:00:00 , 12:00:00
date	2011-10-01,2011-10-02,2011-10-03,2,2011-10-10,2011-10-11,2011-10-12,2011-10-18,2011-10-19,2011-10-20,2
levtype	ml, pl, pt, pv, sfc
month	jan , feb , mar , apr , may , jun , jul , aug , sep
year	1985,1986,1987,1988,1989,1990,199 2003,2004,2005,2006,2007,2008,200
type	$\underline{4i}$, $\underline{4v}$, \underline{ab} , \underline{af} , \underline{ai} , \underline{an} , \underline{ea} , \underline{ef} , \underline{fb} , \underline{fc} , \underline{fg} , \underline{g}
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stream	amap, ammc, cher, cwao, dcda, dcww, edz ewhc, ewho, fgge, kwbc, lfpw, maed, maw mnfw, mnth, mofc, mofm, msmm, ocea, wamf, wamo, wasf, wave, wehs, weov, wm
class	at, atodb, cs, dm, dt, e4, ei, el, en, er, n

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lat@hdr lon@hdr obsvalue@body
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ERA4o/Interim



ISPD (International Surface Pressure Databank)

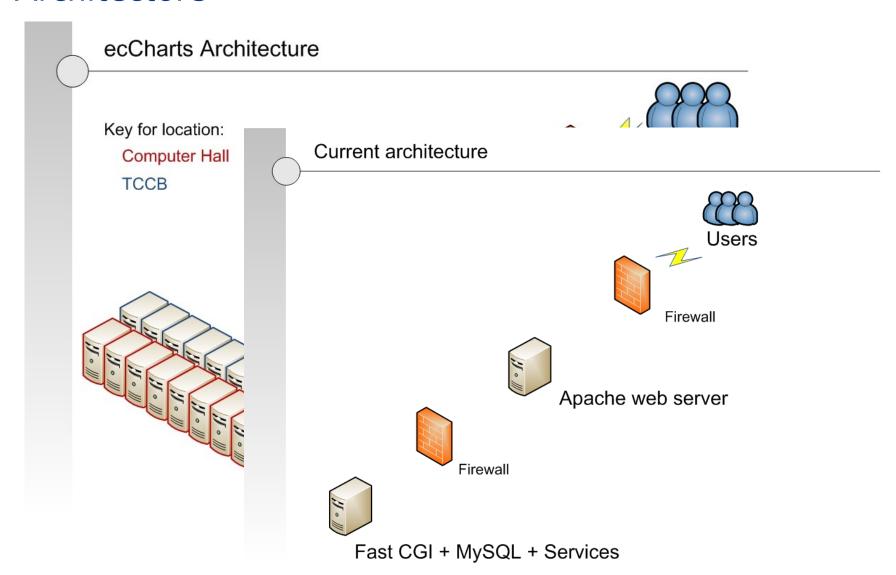




There is more to it than meets the eye



Architecture



Architecture

WREP

Current

- High availability
- Reliability
- Load balancing
- Decoupling of responsibilities
- Scalability
- Extensibility
- Supports more users
- Better performance

Simpler



The software

WREP

- Python
- Django
- Jquery
- Template system
- Broker / worker architecture

Current

- Perl
- Fast CGI



Where it's going

- 100 years of observation and feedback data in MARS (ODB)
- Catalogue this data and make it available through the web interface for download for the ERA-CLIM project
- Fully migrate Webmars and all other web data servers to the new web infrastructure
- Later, make some statistics available and some nice plots



References

- Webmars: http://www.ecmwf.int/services/archive/d/catalog
- Data servers: http://data-portal.ecmwf.int/
- ECMWF ERA activities: http://www.ecmwf.int/research/era/do/get/index
- ERA-CLIM: http://era-clim.eu/



Thank you!

