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1. BACKGROUND

Every day ECMWF produces a variety of graphical products, ranging from data monitoring, weather forecasts and forecast verification. These products are printed and displayed on the walls of the Centre's meteorological operations room ("Metops room").

In an effort to simplify the provision of these products via the Web, ECMWF developed a prototype of a Web service based on the metaphor of the "Metops room".

This prototype consists of a catalogue that is automatically built and updated as products are created together with a facility that allows users to organise a selection of products to their needs and customise them.

There are two aspects to this application: what the end-users see, and what the meteorological analysts see.

2. FROM AN END-USER VIEWPOINT

2.1. A catalogue of meteorological products

The user can browse on-line through a catalogue that consists of ECMWF meteorological products in a graphical form. Products are organised in a hierarchical manner and navigation is automatically built to traverse the tree in all directions: parent, child and sibling pages, as well as cross-references between related products.

Products are made from one or more images, organised along axes defining spatial or temporal variations. Any product made of multiple images can be animated along any one of its axes.

Searching will be implemented using fuzzy matching on title, descriptions and keywords associated with each product

The catalogue currently contains the following products:

- Analysis fields;
- forecast fields
- forecast verification;
- presentations (training course material, research products);
- a selection of 250 predefined meteograms based on the Ensemble Prediction System and the deterministic forecast, mainly capital cities from all around the world and large cities from the Member States;
- most products are available from different sources such as operational and test suites.

A product can be classified in several ways, therefore the same product can appear in several locations in the catalogue, without duplication.

2.2. User's room

The user's room is a web page based on the metaphor of the real Metops room: it has an in-tray, drawers, a wastebasket, piles of charts and a display wall.

As the user browses the product catalogue, he or she can select a set of products that will be copied into his or her room's in-tray. Products can also be selected from the meteogram or "MARS on the web" on-line applications.

The user can then organise his/her selection by moving the products on the display wall, into drawers or piles. Products can be renamed, deleted and tailored. The interface is very similar to the "desktop" metaphor of personal computers: products are documents, drawers and piles are folders, and deleted products are moved into a wastebasket from where they can be recovered.

1.1.1. Composite

Products can be grouped in a single product called a composite, where images from different products can be viewed side by side. Users will be able to customise the page layout

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of the composites. Composite images will be converted to Postscript and PDF formats in order to enable the printout of documents for reports and presentations.

1.1.2. *Tailored products*

Some products may be tailored. For example, a user may wish to change the threshold of a probability product.

1.1.3. *Product readiness*

Unless readily available from an operational suite, products are only created when the page is visited. Because main users, such as forecasters, are expected to visit their virtual room at about the same time everyday, there is a need for a system to monitor and analyse each user access pattern. This system will make sure that the products are ready a few minutes before the user visits his/her virtual room. The system will also note if a user stops using this service, and will stop scheduling the preparation of the products.

3. FROM A METEOROLOGICAL ANALYST VIEWPOINT

3.1. *What can be a product?*

1.1.4. *All suite plots*

All plots that are generated by the operational suites, usually to be hanged on the walls of the real "Metops room", are automatically added to the catalogue provided that they are described to the system.

1.1.5. *Any graphical file*

A product can be made of one or more graphical files (GIF, PNG, JPG, TIFF, PPM PostScript...). Multi-page graphical files (such as PostScript) are split. Every image can be scaled and rotated before being converted to a format suitable for web display. Axes can be defined to allow navigation and animation of multi-image products.

If the product was originally a PostScript file, a PDF version is created, and both PostScript and PDF are offered for download for high-resolution printing.

1.1.6. *A Metview macro*

Metview is ECMWF data manipulation and plotting package that can be run interactively and in batch mode. Any Metview batch macro that produces a plot can be used to create a product. The analyst can simply build a product using Metview interactively, save the con-

tent of a plot window into a macro, and create a product from it. If the macro has arguments, the end-user will be able tailor the product.

The analyst could decide to make the source code of the macro public. In this case, the end-user could download it in order to run it on a local Metview.

1.1.7. *A Vis5D file*

Products can also be made from Vis5D files and their associated TCL scripts. This may be useful to show complex multidimensional products, such as the Ensemble Prediction System.

The Vis5D file could be offered for download to be visualised locally.

1.1.8. *Anything else...*

Support for any software that can produce one or more graphic files in batch mode can be implemented. The output of the program is then treated like other graphical files as previously described.

If this process can be parametrized, then the product can be tailored.

3.2. *Publishing a product*

The analyst can optionally provide a small description and a list of keywords that will be used for searching. He or she should also decide where this product should go in the catalogue. Cross-reference to other products can also be described.

If the audience of this product is restricted, an access control list should be attached to it. The product is then only visible by this audience. Visibility is inherited from the higher levels of the catalogue hierarchy, so large parts of the catalogue can be hidden simply by restricting access to certain levels.

4. CONCLUSION

A prototype of this application exists and has been successfully used internally. ECMWF plans to offer a limited service to outside users through its public web site. Having this framework in place will allow ECMWF to offer its users new products in a fast and consistent way, while providing its authors with a meteorologically-oriented web authoring tool which hides most web technologies from them.