2A.3 RECENT DEVELOPMENT OF A NEW METEOROLOGICAL WORKSTATION AT THE MET OFFICE

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1. INTRODUCTION

In the late 1980's work began in the Met Office on developing a powerful interactive graphical workstation for bench forecasters. After many staff-years of internal software development, the Horace system was brought into operational use in 1992.

In the years that followed, right up until very recently, the functionality of Horace continued to increase through further internal software development, driven by user requirements. Previous papers at IIPS conferences by Radford (1996, 2000, 2001), and Smith (1995, 1997, 1999) provide more details of the progress of the system from its inception.

Another system, known as Nimbus, was developed primarily to service the more bespoke production requirements of forecasters working at regional weather centres and defence outfield stations around the UK (and overseas). This was introduced into operations in 1999.

Horace and Nimbus are now coming to the end of their life, with spares hard to come by and major parts of the system infrastructure no longer supported by suppliers. As a result, the SWIFT project is underway to replace them with a unified system for all forecasting staff.

2. CURRENT STATUS OF LEGACY SYSTEMS

2.1 *Horace*

Horace is now a mature operational tool in use at the following forecast centres in the UK:

- Met Office Operations Centre, Exeter
- Defence Meteorological Centre, High Wycombe
- Royal Navy Fleet Weather and Oceanography Centre (FWOC), Northwood

It is also used at several sites outside the UK, in particular at the headquarters of the 21st Operational Weather Squadron of the United States Air Force in Europe (USAFE), Sembach, Germany.

Although originally designed primarily as a tool to facilitate advanced visualisation and comprehensive analysis of observed and forecast weather, its utility as a production system has increased considerably over the years. As an example, high-level significant weather products are created four times a day using Horace, and disseminated in both graphical and BUFR formats to civil aviation users worldwide.

There has also been considerable investment in the development of semi-automation software, which provide 'first guess' forecasts to the user, e.g. the facility to generate meteorological objects (e.g. fronts and jet streams) directly from NWP fields, and automatic TAF (Terminal Aerodrome Forecast) monitoring.

2.2 *Nimbus*

Nimbus is primarily a production platform, but with the necessary visualisation facilities to enable the forecaster to do his/her job effectively.

3. SWIFT

Horace and, to a lesser extent, Nimbus are now coming to the end of their life. As a result, the SWIFT project has been initiated to replace them with a single unified system for all forecasting staff.

An increasing variety and quantity of data, such as higher resolution and ensemble model output, will be introduced over the coming months and years and will need to be presented and refreshed regularly as part of a continuous production cycle. Therefore, the new system must be even more effective and efficient at enabling forecasters to acquire a full understanding of the state of the atmosphere and how it is developing.

The new system must also enable the manual or semi-automated production of some products. The tool might also enable control over automated components used in the production chain – for example, selecting which ensemble member is promoted as the starting point for automated product generation, or modifying model output by 'painting-in' corrections.

3.1 *Current Status*

Our approach to this kind of challenge in the past has invariably been to develop our own software in-house, as we did with Horace and Nimbus. However, recognising that developing with new technologies can

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be high risk, this time we decided to collaborate with others on a solution which has already undergone initial development and prototyping so that the technology risks are already substantially reduced.

Following a short study of the options, we chose IBL, a specialist software company based in central Europe, who already had a basic product called Visual Weather in the market place (see http://www.iblsoft.com/products/visualweather).

Working closely with IBL we have identified the gaps in functionality between Visual Weather and Horace/Nimbus that need to be filled. The new 'SWIFT' workstation can therefore be rolled out across the organisation much more quickly than we could have done if we had built a new system ourselves from scratch.

The functionality gaps have been grouped according to priority into a series of software packages to be delivered by IBL. The first two of these, including functionality such as On-Screen Analysis and 'Roaming Tephigrams', have been successfully delivered. The third is currently being evaluated as a beta release. Future functionality to be added includes On-Screen Field Modification, Trajectories and Aviation Significant Weather.

By the end of 2007, around half of the defence outfield stations had SWIFT platforms installed and running in parallel with their Nimbus systems.

3.2 *Rollout Schedule*

SWIFT will be installed to run alongside the Horace systems in the Operations Centre in Exeter and the Defence Meteorological Centre in High Wycombe by the end of July 2008.

The defence stations in the UK will have SWIFT systems by April 2008, with the overseas stations in Gibraltar, Cyprus, Germany and the Falkland Islands following thereafter.

Horace and Nimbus will be formally retired at the end of 2008.

4. NEW PRODUCTION SYSTEM

The Met Office has recently been investigating the use of a Service Oriented Architecture (SOA) to deliver a new IT infrastructure to support the Met Office business. This has lead to a number of key findings that have shown the very real potential for SOA to help with the redesign of the production process by orchestrating business process flow and connecting services using an Enterprise Service Bus (ESB). The key to the success of this new approach will be the integration of the new architecture with the existing and well established monitoring and scheduling processes currently in place.

The main difference between the existing method and the new SOA approach is that the applications will no longer be hosted on one main computer, but will be distributed across a number of platforms as a set of services. These services will be invoked using interfaces based on the OGC (Open Geospatial Consortium) web services specification, i.e.

- Web Map Service (WMS)
- Web Feature Service (WFS)
- Web Coverage Service (WCS)

Visual Weather will be a key component of this new architecture as it will host the WMS for the provision of rendered weather data, as well as a WCS that will allow access to the gridded data using Web protocols. This new approach will make new demands on the monitoring processes, and in particular the core technology will need to be integrated within the existing monitoring framework.

The key benefits of the approach perceived by the Met Office 'vision' are that SOA:

- Enables our IT capability to be expressed as business services, not technical systems;
- Ensures that IT solutions are modular & loosely coupled by describing business services with clearly defined interfaces ('contracts');
- Allows capability from existing systems to be harnessed to deliver new business services;
- Enables a faster (more agile) response to market opportunities with lower investment.

The expectation is that SOA will become the *de facto* (business-as-usual) mechanism for delivering IT solutions in approximately 2 to 3 years, with a full SOA taking in excess of 5 years to complete.

5. SUMMARY

The UK Met Office is replacing its two ageing forecaster workstation systems (Horace and Nimbus) by one new system, known as SWIFT. The software will be based on an existing commercial product, IBL's Visual Weather, and will be in operational use throughout the Met Office by the end of 2008. The Visual Weather software package will also play a key role in the new production system, based on a Service Oriented Architecture, being developed in the Met Office.

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