6A.2 APPLICATION MIGRATION WITHIN NEW AWIPS ARCHITECTURE

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1. INTRODUCTION

Advanced Weather Interactive Processing System (AWIPS), the integrating element of the National Weather Service (NWS) modernization, is undergoing an extensive software re-architecture and conversion to a Service Oriented Architecture (SOA). Raytheon Company is converting the AWIPS infrastructure into a SOA and migrating the current baseline functionality into that architecture by June, 2009. Deployment of the next generation of AWIPS (aka, AWIPS-II) is expected to be complete in FY2010.

Software applications are developed at national laboratories and locally at the Weather Forecast Offices (WFO) or River Forecast Centers (RFC) for AWIPS. Each application allows the forecaster to execute the operational mission of the NWS. These applications, whether national or local, must be migrated into the new architecture prior to deployment.

This paper provides an overview of the planning and strategies necessary accomplish this migration.

2. BASELINE APPLICATION MIGRATION

Raytheon Company approach the baseline application migration as a "black-box" conversion ensuring that the end-user (e.g., forecasters, hydrologists) functionality appear the same as today's AWIPS while the behind the scenes capabilities change significantly. This approach is fully described within the Product Improvement Plan (PIP) Version 3 dated June, 2007. The remaining parts of this section summarize the contents for Section 6 of the PIP.

2.1 Baseline Application Migration Approach

In order to determine the appropriate approach to baseline application migration, Raytheon Company executed a detailed analysis of the existing baseline code base. This analysis considered the various migration methods available to the developers. These methods included:

- Do not migrate obsolete code or applications which are to be retired;
- Encapsulate legacy code; or
- Re-engineer and re-implement within new architecture.

The portion of the baseline software which assigned the last category was decomposed into discrete functions. This allowed the Raytheon Company developers to identify redundant funcationality to be re-engineered using the AWIPS Development Environment (ADE) capability for implementation within AWIPS-II.

The concept behind this approach does not support a one-for-one conversion of applications into the new infrastructure. As a result, Raytheon Company used the existing code to develop a "capabilities matrix" which ensures that all of the needed functionality is preserved within AWIPS-II. Another result of this approach is that the larger applications (e.g., Display 2-Dimensions (D2D), Graphical Forecast Editor (GFE), and Hydrologic programs) are migrated over the migration period. This approach provides the benefit of allowing for the maximum integration and reuse of the developed software.

For GFE and the Hydrologic programs, Raytheon Company supports advanced development of particular capabilities earlier in the migration period in order to reduce the risk associated with the migration of these critical applications.

The baseline application migration is spread out over a 2-year period which began in June, 2007. This period of time is divided into 4 separate migration efforts approximately 6-months in length.

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During these periods of time discrete work packages known as Task Orders (TO) will be executed under the AWIPS contract and the results provided to the NWS for testing and evaluation.

The first migration TO focused on the core workstation capabilities. It replicates a significant portion of the D2D capabilities. This TO also implements key decoders associated with Satellite Broadcast Network datasets. The next TO provides a significate portion of the functionality associated with GFE. The third TO addresses the WFO and RFC hydrologic capabilities including Standard Hydrometeorological Exchange Format decoding and the encapsulation of the River Forecast System. The final TO completes the migration of the remaining capabilities as well and provides for the communication and dissemination functionality.

At the completion of these four TOs, Raytheon Company delivers AWIPS-II which is functionally compatible with the then current AWIPS baseline.

3. LOCAL APPLICATION MIGRATION

A local application is a locally developed piece of software (i.e., script, compiled code, etc.) that augments and/or enhances AWIPS baseline capability. This software is developed and maintained outside of the AWIPS baseline. There are several unique categories of local applications, which include but are not limited to RFC and WFO specific applications, WFO GFE Smart Tools, GFE Smart Initializations, production "work arounds", data decoders, and other Graphical User Interface based applications. Given the diversity of local and regional requirements, it is unrealistic to expect a single national baseline application to satisfy these needs. As a result, AWIPS-II provides a software environment that:

- Minimizes the need for "work-around" code for production operations;
- Allows for "peaceful co-existence" of Baseline and Local Application code; and
- Allows for easier adoption into baseline where appropriate.

3.1 Local Application Migration Challenge

Migrating local applications into AWIPS-II architecture is a NWS responsibility. The initial goal of this migration is to support an on schedule deployment of AWIPS-II. Consequently, only those local applications that are critical to the local site's operations must be migrated upon installation.

In August, 2007, NWS' Office of Science and Technology (OST) conducted a survey of the WFOs and RFCs to assist in defining the local application migration problem. The analysis of the data received from this survey is identified the following:

- Approximately 4200 local applications identified;
- Approximately 3300 unique local applications; and
- Approximately 1300 local applications considered critical by an operational site.

Further analysis of the critical local applications shows that the problem is not evenly distributed across the local application developers. As shown in Figure 1, at least 1 developer has produced over 100 local applications.

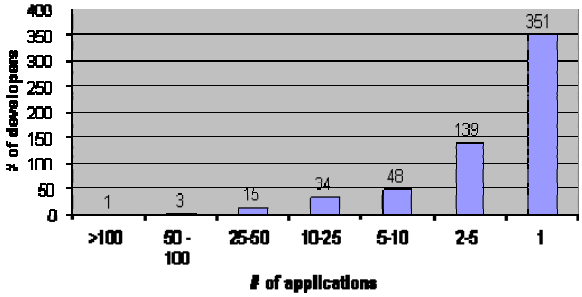

Figure 1: Local Applications per Developer

Another view of these data shows that a relatively few operational sites have more than 10 critical local applications in need of migration prior to deployment of AWIPS-II (Figure 2). This further shows that the use of local applications is not evenly spread across the NWS. It is possible that select local applications are considered critical at one operational site but not other sites. As a result, the local application migration challenge must take into consideration what is necessary to support an individual site's needs.

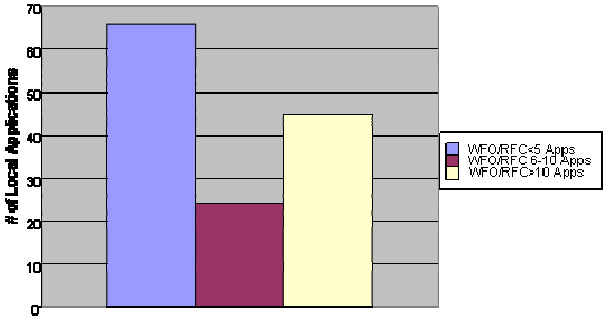

Figure 2: Critical/Important Local Applications

3.2 Local Application Migration Techniques

Local developers will use the same tools and techniques for migrating the applications that will be used by baseline development organizations in creating future applications and enhancements. The plug-in and microEngine scripts provide the optimal usage of the ADE to support the necessary modification on a local level to the AWIPS-II capabilities. In order to use these techniques, the functionality associated with the local applications must be re-implemented using Java or JavaScript. In some cases, it might not make sense to re-implement the local application. In these cases, legacy adaptors can be created to allow existing C or FORTRAN programs to execute while accessing data within the system. All of the techniques described above are considered to be integrating with the system. The final approach provides an interface to the system via a command line. When using this technique the local application can remain in the original language and "exec out" to retrieve data from the AWIPS-II database.

3.3 Local Applications Migration Planning

Given the size of the challenge and the multiple migration techniques available, the development of a detailed plan is in order. The first phase of this planning activity is to further define and attempt to minimize the local application migration problem. This is to be achieved by collecting additional information about the critical local applications, identifying those local applications for which the developer is not available, etc. In addition, OST plans to identify the infrastructure pieces necessary to support the local application migration. With additional information about the local application and available infrastructure "building block" understood, it is possible for the NWS Regions to draft a detailed plan which defines a schedule, identify resources, and participate in the training necessary to support the migration. The resultant regional plans are consolidated by OST for signature by the regions and office directors. OST then begins to track progress on the accomplishment of the activities outlined in the Local Applications Migration Plan.

4. CONCLUSION

The baseline and local application migration presents a significant challenge to the successful deployment of AWIPS-II. By defining the problem, conducting a through analysis, and migrating the necessary capabilities, Raytheon Company and the NWS prepare to support the deployment of AWIPS-II.

5. REFERENCES

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