NOAA ENTERPRISE ARCHIVE ACCESS TOOL (NEAAT): ACCELERATED APPLICATION DEVELOPMENT (XAD)

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ABSTRACT

A challenge for any consumer of National Oceanic and Atmospheric Administration (NOAA) environmental data archives is that the disparate nature of these archives makes it difficult for consumers to access data in a unified manner. If it were possible for consumers to have seamless access to these archives, they would be able to better utilize the data and thus maximize the return on investment for NOAA’s archival program. When unified data access is coupled with sophisticated data querying and discovery techniques, it will be possible to provide consumers with access to richer data sets and services that extend the use of key NOAA data.

A traditional waterfall methodology is unlikely to keep up with the ever increasing volumes of data and number of data sources, and as a consequence the ever increasing number of access (interface) requirements driven by an ever increasing and diverse set of consumers. A new methodology that is more agile while at the same time preserves the tenets of formal configuration management and appropriate approval and review cycles is necessary to effectively address this challenge.

Index Terms—CLASS, accelerated, application, development

1. PROBLEM

A challenge for any consumer of National Oceanic and Atmospheric Administration (NOAA) environmental data archives is that the disparate nature of these archives makes it difficult for consumers to access data in a unified manner. If it were possible for consumers to have seamless access to these archives, they would be able to better utilize the data and thus maximize the return on investment for NOAA’s archival program. When unified data access is coupled with sophisticated data querying and discovery techniques, it will be possible to provide consumers with access to richer data sets and services that extend the use of key NOAA data.

Theoretically, there are two ways that unified archive access may be achieved. The first approach is to develop a single archive or archiving standard that would replace the current NOAA archives. However, the development of such an archive would pose significant technical and administrative challenges. The second approach is to develop a middleware application that would provide seamless access to all existing archives, in effect allowing each archive to exist “as is” but providing a translation service for the consumer. This approach is deemed more feasible from an administrative and technical standpoint; however, it still presents unique technical challenges due to the disparate architectures that exist across NOAA archives.

Once the technical approach is selected, the next issue is to define the methodology to implement the capabilities. A traditional waterfall methodology is unlikely to keep up with the ever increasing volumes of data and number of data sources, and as a consequence the ever increasing number of access (interface) requirements driven by an ever increasing and diverse set of consumers. A new methodology that is more agile while at the same time preserves the tenets of formal configuration management and appropriate approval and review cycles is necessary to effectively address this challenge.

2. METHODOLOGY

NOAA has selected the second approach described above (middleware) and has begun developing the NOAA Enterprise Archive Access Tool (NEAAT). The purpose of NEAAT is to provide a middleware and a simple standardized API between NOAA archives and data consumers. It is important to note that NEAAT serves two main purposes:

- To provide a single application programming interface (API) that enables designated consumers to write their own custom applications capable of searching and acquiring data seamlessly from multiple NOAA archives.
- To allow archive managers to expose their data to consumers in conjunction with other NOAA resources without modifying their archiving systems or way of presenting data.
More importantly, NOAA has selected the Accelerated Application Development (XAD) methodology to implement NEAAT [2]. Design, development, and transition into operations of the solution are conducted using the XAD process, and within a shortened development cycle. The XAD process provides a process solution that is useful for rapid application development when processes for routine maintenance or other new development process lifecycles are not appropriate due to nature of the problem at hand: dynamic requirements and dynamic users’ frequent changes. XAD allows user requirements to be implemented and tested in a quick-turnaround cycle including feedback from the user and/or user representative, and also allows the flexibility of multiple system updates within a short turnaround timeframe.

The initial phase of the project will define the scope of the project, develop a concept of operations and an initial set of functional requirements, and establish the development and testing environments. Once these are complete, an initial drop (release) of the system will be developed and placed in the test environment for a select group of users to evaluate. This development effort is being managed by the Comprehensive Large Array-data Stewardship System (CLASS) project.

The key principles in supporting the XAD approach include:

- Active user involvement
- Decision making and approval authority has been delegated to the lowest-possible level (users and developers) to ensure fast response to any issue.
- The team is independent and focuses on frequent deliveries, determining which activities are necessary to deliver the right product
- Iterative and incremental development is used to create the solution
- High-level requirements are baselined to control system or product scope
- The system or product is continually tested using both developers and users

2.1. NEAAT Architecture Overview

The NEAAT architecture is based on the three high-level elements necessary for an access API:

- Searching for appropriate data sets
- Ordering data
- Providing a framework for service integration

The diagram below provides a high level overview of the NEAAT architecture. NEAAT is comprised of four key elements:

- Front-End Manager
- Translator
- Back-End Manager
- Security Manager

The Front-End Manager is responsible to managing the interactions between middleware (NEAAT) and the client applications that want to interact with NOAA archives. The Front-End Manager is responsible for providing a stable API to all client applications without regard to the NOAA archive system that they are trying to access data from.

The Back-End Manager is a custom interface between NEAAT and each of the NOAA archive systems that NEAAT interfaces with. This approach facilitates the inclusion of new NOAA archives system to the list of the archive systems supported by NEAAT. As it will be NEAAT the system that will need to accommodate support for the new archive system rather than the new archive system needing to accommodate to support NEAAT’s interface. This is architectural feature is one of main drivers for the need of an accelerated development process for this application.

The Translator servers as its name imply as a translator between the Front-End manager (NEAAT’s published API) and the Back-End Manager (each archive system publish API).

The Security Manager is an umbrella that ensures secure transactions between the Front-End Manager and its external clients and between the Back-End Manager and each of archive systems that are queried by NEAAT.

In the diagram below, each NOAA archive system has a NEAAT Interface (NI). Although these interfaces are labeled all (NI), as explained before, due to the flexibility of the Back-End Manager each NOAA Archive system NI can be, and is expected to be unique. The owner of each NOAA archive makes an API available to NEAAT and possibly to other clients.
2. CENTRAL CONCLUSIONS

The XAD process joins business and project technical experts together into a high-performance team. The XAD process allows use of productive strategies and tools and unconventional approaches in the development environment and life cycle.

- Provides for quick turnaround and success for development
- Reduces the impact to changes that are manageable
- Defines architecture and environment within a boundary
- Delivers defined, specific, and measureable benefits that can be expressed to users, management, and stakeholders
- Delivers defined value to the business as a whole

Once it is operational, NEAAT will provide a number of benefits to NOAA and its customers. These benefits include maximizing the return on investment for the many NOAA archives, providing a capability that enables easier development of customized applications, and minimizing the effort to acquire data.

In summary, NOAA expects this XAD methodology to provide an effective approach to provide users with a much easier path to the data in NOAA’s many data archives, including the CLASS data archive. The CLASS project will also evaluate this methodology for use in other development activities.

3. REFERENCES

[3] CLASS Project Team, NEAAT Requirements, Release 2, July 2010