

## Executable Integration of the FEA Reference Models in Composite Applications

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### Introduction

The purpose of this pilot is to demonstrate the practical automation of the Federal Enterprise Architecture (FEA) to drive composite applications using semantic technologies. Four use cases are described:

- Intelligence Community Composite Applications
- Voting/Census Data Composite Applications
- Water Resources Composite Applications
- Federal Enterprise Architecture Management Composite Applications

The goal of the **Federal Enterprise Architecture (FEA)** is executable integration of performance and measurement with FEA reference models, providing “line of sight” interoperability across business lines, services, technology platforms, and data sources, to enable up to order of magnitude improvements in measures of IT portfolio business value such as mission attainment, effectiveness, cost, risk, and return on investment.

In concrete, every day business operation of government programs, these benefits most often will be experienced through **composite applications**, which enable knowledge workers, executives, and communities of interest (COIs) to easily fuse data and processes from multiple existing stove-piped systems into a unified solution, quickly connect-the-dots across information silos, and provision information in context for better decision-making.

The cross-cutting mission of the FEA’s DRM, BRM and PRM demands cross-cutting IT as shown by the pilot use cases following this page.

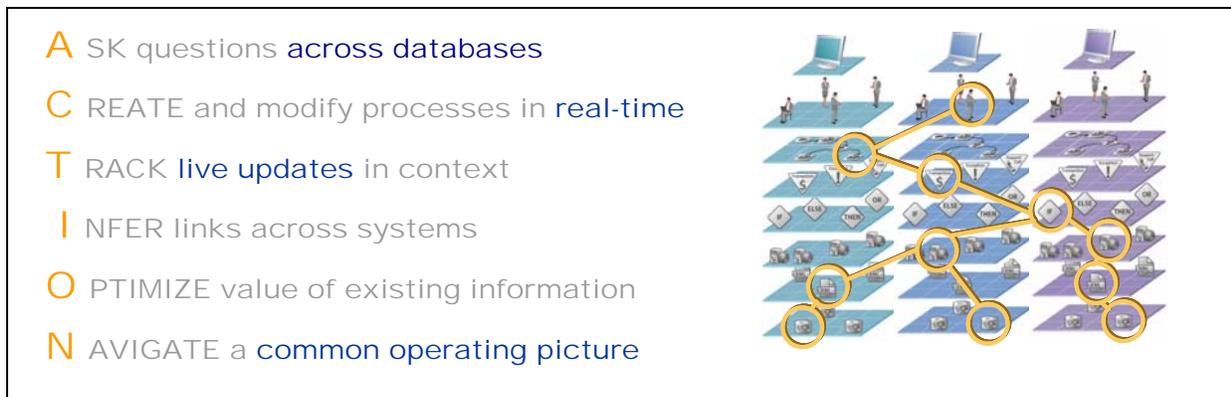


Figure-1: Capabilities of Composite Applications

## Usecase-1: Intelligence Community Composite Application

Combining data from diverse sources into dynamic composite “living” reports

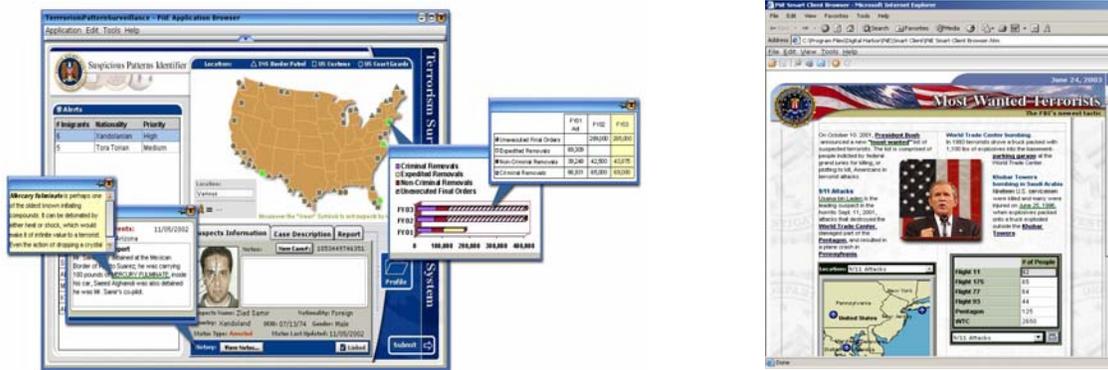


Figure-2: Examples of Composite Reports

This use case illustrates the capability to quickly and inexpensively develop active composite reports from diverse data sources and applications once they have been exposed and shared using semantic models based on the FEA ontology.

The capability of a composite application across agencies was demonstrated at the First Public Forum on the FEA DRM on June 13<sup>th</sup>, 2005 by Digital Harbor. The composite application was one developed as a report for the intelligence community on data related to terrorism. The composite report demonstrated a number of key features:

- The ability to directly interact with, and introspect the content of a report within the context of the other data elements being presented;
- Integration and semantic linking of both static and dynamic data from a variety of live data sources;
- Integration of both structured and unstructured data within a single interface;
- A graphically-rich, hyper-media environment that, through the use of application linking and embedding, allows for content such as ESRI GIS maps and Quicktime movies to be embedded within the report and in the context of the data being introspected;
- The ability for the consumer of a composite report to perform true train-of-thought analysis by asking questions about the data being presented within the report;
- Demonstration of an environment that is capable of empowering a knowledge worker with the capability to perform live situational analysis and make intelligent decisions based on the most current information available.

An automated demonstration of this use case can be downloaded from the following location: <http://web-services.gov/pilots/DigitalHarbor/terrorismdemo.zip>.

## Use case-2: Voting/Census Data Composite Application

*Citizens accessing information from multiple agencies in context*



Figure-3: G2C E-Government — Sample Semantic Composite Portal Showing Interagency Data Integration and Presentation in Multiple Contexts

This use case demonstrates how ontology can provide a framework for information integration of different datasets that need to be fused to support a correlated business context for both research and operational decision making.

The DRM provides a framework to facilitate data sharing between different agencies. It does so by specifying a standard for metadata describing the structure of the data as well as its business context. The end-use case here is to integrate publicly available data from several data sources including EAC, FEA, and Census to discover organized relationships between money and politics. This pilot is based on an ontology relating citizen demographics DRM (Census), Electoral profile DRM (EAC), and campaign contributions DRM (FEC). The pilot illustrates how provider agencies can create and publish their DRM schemas in XMI and how the end-user agency can create a harmonized campaign ontology to support the objective business context. A Composite Dashboard can then be created by mapping this ontology to the underlying data sources where they exist.

An automated demonstration of this use case can be downloaded from the following location: <http://web-services.gov/pilots/digitalharbor/campaignfinance.htm>.

## Use case-3: Data Reference Model Water Resource Composite Application

*Demonstrating the maturity of FEA for multi-agency and community-of-interest information sharing and issue analysis*



Figure-4: Sample EPA Water Resource Portal

This use case demonstrates how semantic models (ontology) can provide a framework for data interoperability where similar datasets need to be combined to support an aggregated business context for tactical decision making, analysis, and policy making across multiple communities of interest.

The FEA Business Reference Model provides a framework that facilitates a functional (rather than organizational) view of the federal government's lines of business (LoBs), independent of the agencies, bureaus and offices that perform them. This pilot focuses on the specific business function Environmental Monitoring and Forecasting (1-108-023). The end Use Case is to provide an interactive Composite Report on the Environment (EPA ROE 2006) that combines data about water indicators from a number of agencies into a coherent picture reflecting the status of nation's waters in the social, economic and environmental context. Recently started, the pilot will illustrate how indicator ontology can be created for water that uses ontological relationships to relate different indicators based on their properties, use and the type and quality of impact. The ontology can then be used to drive an interactive report that supports seamless navigation across the indicators and their cumulative impact on a particular area of concern.

## Use case-4 : Federal Enterprise Architecture Management Composite Applications

*Demonstrating “line of sight” to integrate budget and performance for IT investments*

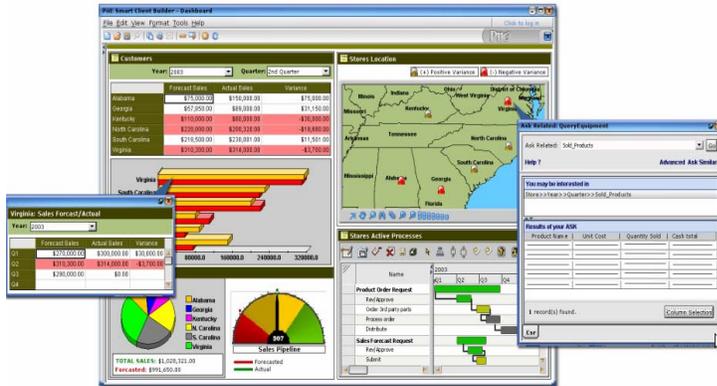


Figure-5: Sample FEA Management Portal

This use case provides tangible evidence of the FEA ontologies as an integrated, executable environment for end-to-end automated measurement and assessment of budget and program performance. FEA ontology provides line of site across the lifecycle of an investment, across programs, across agencies, delivering a framework for contextual knowledge integration to support predictive business context for strategic decision making. Use cases 2 & 3 will provide the domains to visualize the first set of outcomes.

The FEA Performance Reference Model (PRM) is one of five references modeling being used by OMB and agencies in the Federal Enterprise Architecture information technology budget approval process. The PRM provides framework to clearly articulate the cause-and-effect relationships between inputs, outputs, and outcomes. This “line of sight” is critical for IT project managers, program managers, and key decision-makers to understand how, and to the extent, key inputs are enabling progress toward outputs and outcomes. While the PRM process has been defined, it is currently disconnected from the actual OMB artifacts associated with the inputs and outputs associated with the process namely the PART and the A300. This pilot would create the first-of-its-kind digital instrumentation of the PRM process by relating the concepts defined in the PRM ontology with the concepts within PART and A300. The pilot would then create a composite application focusing on managing outcomes based on this linkage.

## About Digital Harbor and TopQuadrant



<http://www.dharbor.com>

Digital Harbor develops and markets PiiE™, a semantic platform for building, deploying and using composite applications. Semantic portal, process, and integration technologies fuse data and processes from multiple existing stove-piped systems into a unified solution, so that knowledge workers and executives can easily connect-the-dots across information silos. Composite applications also transform the enterprise by providing operational and strategic awareness to make real-time decisions.

Digital Harbor was accepted for the Semantic Web Applications for National Security (SWANS) Conference Trade Show, April 7-8, 2005, because of its support for Semantic Web Standards (RDF/OWL). Digital Harbor was characterized in the "Business Case for Semantic Technologies" presentation by Mills Davis, TopQuadrant (Team Lead for the SICoP Business Case White Paper) as follows:

- Next-Generation software platform for building and using composite applications
- Composite Application Solution: EII, SOA, and Portals
- 6 years and over \$50M in investment R&D and over \$100M in partner R&D
- Supports 22 industry standards including OWL
- Delivered 24 business templates over six domains
- Government customers include Navy, Air Force, NSA, DISA, DIA, NRO, NGA, CIFA, and DHS (see example in Section 2 below)
- Prominent Endorsement: "The most exciting thing I've seen since Mosaic." Vinton Cerf, Father of the Internet.



<http://www.topquadrant.com>

TopQuadrant is a premier semantic web solutions consulting firm. We implemented the FEA reference models as executable ontologies using RDF and OWL standards for the semantic web. TopQuadrant advises clients on semantic enterprise architecture for net-centric operations. We help evaluate, select and integrate new capabilities for enterprise search, community portals, policy management, asset reuse, and ontology-driven applications. We prototype, develop, and deploy semantic environments that enable systems and people to quickly fuse relevant information from diverse sources, put knowledge into context, collaborate effectively, and make better decisions.