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ENTERPRISE ARCHITECTURE: A FRAMEWORK FOR C2 METRICS

Assessment, Tools and Metrics

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ABSTRACT

Metrics for measuring the success of modeling and analysis has always been a challenge, especially in command and control (C2) where missions and capabilities depend on the testing of real-world scenarios. Historically, there has been a lack of standardization in metrics that measure results in a meaningful manner. Projects face the dilemma of developing metrics that are relevant to their project, overall mission and capabilities, and them adapting these measurements to a changing C2 environment.

Enterprise architecture is as an ideal method for helping the Dept. of Defense collect meaningful information that can then be analyzed and measured in a dynamic fashion. An enterprise architecture serves as a framework for the central collection and dissemination of information about business processes, data flows, applications and systems and their relationships to mission and capabilities as well as strategies. Different sets of metrics can be applied dynamically after the data has been collected allowing for meaningful analysis over time.

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Enterprise Architecture

The use of enterprise architecture throughout the government is expanding as agencies recognize its value as more than a tool for regulatory compliance. Agencies are placing increasing value on architecture as a way to gather and distribute valuable information to internal groups so they can take action.

They are adopting enterprise architecture as a way to incorporate their best practices and experiences into decisions about technology investments, e-government and emerging technologies, such as Web services and service-oriented architectures (SOAs) and business process management (BPM). Agencies are seeing that a properly implemented enterprise architecture program can have a direct impact on their ability to manage their resources in a time of shrinking IT budgets and increasing technological complexity. The end goal is to more closely align IT to missions and capabilities. This is especially critical in the C2 environment, where real-world scenarios are involved.

This trend has given rise to the concept of 'Actionable Architecture.' In this view, the role of enterprise architecture is to act as a central access point for the capture and dissemination of IT and business process information throughout all levels of an organization as a means to improve how decisions are made. Taking this one step further is the concept of architecture as a platform to centralize and visualize information for measurement in C2 environments. The architecture's repository forms an integrated strategic information base for measurement, while supporting traceability of data down to the technical or source level.

Architecture and Metrics

Metrics require a rigorous science based on a framework from which a set of standard measurements can be generated. Enterprise architecture enables the development of a repository of information, from which raw data can be taken for measurement purposes. This

takes metrics out of the 'one-time' measurement into something that is repeatable, dynamic and able to be validated and visualized.

Architecture offers the framework for generating metrics that are meaningful to diverse stakeholder groups. This starts with the architecture repository. Technical (systems, application), process and data information is collected in a repository driven by both modeled and real-time data.

A repository enables the gathering of all the data pieces in one place with links to source documents for traceability. A repository approach separates the measurement from the raw data and makes the relationship between the two dynamic. Using a repository, users can dynamically generate metrics that are relevant to the best practices of the organization and traceable to its original source. They can be designed to measure real-world scenarios and standardized so that they can be shared across the agency. The measurements can be adjusted without affecting how the raw data is captured.

Typically, organizations develop metrics that are tied to certain projects or a certain team. Information is gathered at a point in time. Often, these measurements are not repeatable or dynamic because they must be generated and modified over time. Without the dynamic framework provided by an enterprise architecture, implementing metrics becomes both resourceintensive and static.

Frameworks: Guiding Development

Frameworks are a key part of any enterprise architecture environment. The framework provides the structure for the capture of the information, facilitating a common approach to data collection. Frameworks provide a commonly accepted classification system for enterprise architecture, providing a complete checklist of the people, systems, processes, and internal and external factors that contribute to making an organization function. The most popular frameworks in the defense world are the C4ISR framework and its newest evolution, the Dept. of Defense Architecture Framework (DoDAF).

Frameworks offer not only a standard approach and perspective, but a common vocabulary and a similar set of work products. Frameworks must be a key part of architecture design and metrics because they guide the technically complex process of integrating heterogeneous, multi-vendor architectures and models. They help simplify the architecture development process into discrete, understandable pieces and enable organizations to determine which systems and applications are tied to missions and capabilities. Frameworks enable IT groups to understand how their processes and systems fit within the broader organization. Most importantly, frameworks serve as a basis for a common vocabulary and a common format for information capture and dissemination. This opens the door to supporting metrics that are repeatable and can be used over time by many different groups.

Metrics in a C2 Environment

Metrics should provide a historical perspective and show movement over time. This is especially important in a C2 environment where real-world situations change. A repository enables dynamic measurements because data can be collected and analyzed at various points in time. These metrics may be historical and may be based on mission, capabilities, or organizational structures. They can also be used to measure impacts of change in 'what if' scenarios, essential to the C2 environment.

Metrics applied against a repository of information captured over time are the most valuable. This enables users to compare what has happened in the past to what may happen in the future. These 'what if' scenario are based on data from the repository and can be applied historically to see changes. This also enables metrics to evolve based on mission or capabilities. Users can see how different aspects of a project are evolving and make more informed decisions about adapting to change.

For metrics to be useful, they must also be validated against the real world. Data points need to be studied over time to verify the accuracy and depth of the metrics. This helps ensure that the metrics are measuring what they are designed to measure. By correlating measurement to the real world, agencies can to see what has been successful and examine the reasons for success. This can be applied to the current set of metrics to validate their accuracy and completeness. Architecture-based metrics make this possible because they are drawn from the raw data collected in the structured manner dictated by the framework.

While capturing the data for measurement is key, equally important is the ability to communicate and visualize what the information means to the various stakeholder groups. Different people in the organization have different perspectives on the metrics and how it should be acted upon. Communicating the information in a way the end user understands is key. That's where visualization comes in.

Enterprise architecture establishes a common platform for analysis and collaboration by providing a common vocabulary and common methodologies and techniques for development of mdoels. With one common repository, information can be shared in an understandable format for analysis.

This common platform also enables architecture information to be tailored to the many different user perspectives. Publishing the information—whether on the Web or in simple paper reports—becomes a key part of the collaboration process and fosters feedback from various stakeholder groups, both within and outside IT.

Thus, an architecture- based metric can be easily repurposed for different audiences, whether CIO level, technical management, business analyst or programmer. The information can also be repurposed for different C2 situations. For example, one set of metrics can help teams develop a strategic plan that outlines future missions and capabilities. Another set can be generated to assist CIOs and senior management in assessing costs for budgeting purposes. In another scenario, metrics can help war-fighting projects examine the success of current real-world scenarios against mission and capabilities. The architecture repository is the keeper of the data, from which the information is drawn for reporting and analysis.

Conclusion

Metrics for measuring the success of C2 programs has always been a challenge, especially where missions and capabilities depend on the testing of real-world scenarios. Metrics has grown into a sophisticated and rigorous science that helps users pinpoint changes and validate them.

The next evolution of metrics is a system for standardization for the collection and dissemination of metrics that is tied directly to modeled and real-time data and can be shared throughout the organization. Enterprise architecture helps address this issue. It is the ideal framework for the large, complex projects found in the Dept. of Defense. It provides a standardized means for capturing meaningful information that can then be analyzed and published in a dynamic fashion.

By using architecture as a common platform for metrics, defense agencies benefit from an approach that integrates their measurement systems into their existing architecture process and provides a more flexible, adaptable methodology for measuring and improving the success of their C2 projects.

Jan Popkin

Jan Popkin's name is synonymous with enterprise architecture and modeling. He is considered an evangelist for enterprise architecture as a means for organizations to understand how to align their technology to their business processes and goals and to promote decision support and agility.

Jan is currently a senior vice president focusing on marketing and strategy for Telelogic. In this role, he is the visionary behind the company's technology and marketing strategy as a comprehensive solution for application design and lifecycle management.

Previously, Jan was CEO and founder of Popkin Software for 18 years, until its acquisition by Telelogic in 2004. Under his guidance, Popkin became the leading enterprise architecture and modeling tool vendor, according to both Gartner and MetaGroup. Popkin's tools have been used by more than 70,000 IT professionals in major, multi-national corporations and government agencies.

Jan is a board member of the Business Process Management Initiative (BPMI.org), a leading trade association for business process modeling standards. He is a member of the C4ISR Industry Panel, International Council on Systems Engineering (INCOSE), Association for Computing Machinery (ACM), Institute of Electrical and Electronics Engineers (IEEE), and a charter member of the Architectural Forum of the Worldwide Institute of Software Architects. He is also on the board of the New York Software Industry Association (NYSIA).