CA WHITE PAPER

Don LeClair, Office of the CTO
November 2005

ENTERPRISE IT MANAGEMENT: THE ARCHITECTURE

BELIEVE AGAIN in the power to move forward.

Enterprise IT Management: The Architecture

Enterprise IT Management (EITM) is a vision for how to unify and simplify the management of enterprise-wide IT, so that organizations can better manage risk, improve service, control costs, and align IT with business needs. To make this vision a reality, an architectural foundation, a platform, is required that enables the integration and sharing of management processes, data and user interfaces. CA is delivering precisely such an open, service-oriented integration platform that enables rapid time to value for CA solutions. It is also open to ensure customers and partners can leverage their existing IT management investments to deliver significantly enhanced value to the enterprise.

EITM: Enterprise IT Management

For decades, new waves of technology have offered companies the opportunity to reach new levels of capability and efficiency. The capabilities and efficiencies realized include lowering the cost of doing business, getting products to market faster by integrating the supply chain, and providing access to information and systems wherever and whenever users need them. The introduction of these new specialized functions combined with the rapid pace of technology change have made enterprise computing environments increasingly complicated, making effective management and security an even greater challenge.

Today's organizations still need, and expect Information Technology (IT) to continue to innovate to support the achievement of the business's tactical and strategic objectives. Additionally, they need to ensure the safety, reliability, efficiency and availability of the IT services they're delivering. To succeed, IT organizations must have a more holistic and pragmatic approach to managing the enterprise — one that is able to unify, simplify, secure and optimize today's complex and evolving infrastructure.

CA's Enterprise IT Management vision[1] is to enable the flexibility and agility to quickly respond to changing business conditions, take advantage of new ways to conduct business, improve productivity, and ensure the optimal utilization of all enterprise IT assets and resources while managing risk and reducing cost. EITM provides a vision and path for the evolution of enterprise-wide IT management from a reactive event-driven approach to one that is proactive, where IT organizations can actually optimize in anticipation of business needs. Achieving the EITM vision will provide tremendous value for any organization:

Figure 1. Enterprise IT Management

- **Manage Risk.** Control who has access to corporate assets, systems and information, and provide a comprehensive approach for information backup, recovery and failover. Enable compliance with consistently repeatable process automation and an audit trail of system actions to enable governance of the IT environment.
- **Improve Service.** Implement an agile management integration platform to facilitate timely response to business change and marketplace opportunity. Enable service level management to match the demands of the business to the delivery of the IT services that support them, ensuring that the needs of the business are met and the greatest value is delivered to the business. Manage the availability and security of IT services based on business priorities. Set IT management policies based on real-time business priorities.
- **Manage Cost.** Apply automation to decrease the labor costs required to maintain IT operations, thus freeing resources for strategic projects and new development to grow the business. Leverage the knowledge of the IT assets you own, what business services they support, and how much they are used to control capital expenses and optimize the financial value from your infrastructure.

- **Align IT Investments with Business.** Make more informed investment decisions regarding IT. When you know how IT is being used and how much it costs to support the business you can apply rigorous management techniques to ensure all of your IT resources, both people and technology, are being more effectively targeted and utilized.

As illustrated in Figure 1, the business value of EITM is based on tying the management of the entire infrastructure together — from business processes down through the IT services, application environments, users and assets that make them work. Achieving these objectives requires a solid architecture and integration platform that enables unification and simplification of management and security for the entire IT environment.

Integration Requirements

The EITM vision is dedicated to the idea that all IT management functions should work together to meet the collective needs of IT and the business. CA delivers the key management functions of EITM in four main categories, each of which addresses management needs in a variety of areas:

- **Business Service Optimization.** Including IT resources and governance, IT services, and business process management.
- **Enterprise Systems Management.** Includes management of systems, networks, databases, applications, workloads, inventory and configuration.
- **Security Management.** Including management of identity and access, security information and vulnerabilities, and threats such as virus and spyware.
- **Storage Management.** Including management of storage resources, backup and recovery, and compliance and optimization.

The underlying integration platform is built on a set of shared services and utilizes a Service-Oriented Architecture (SOA). By developing this set of integrated, yet modular services, the resulting management products benefit from:

- **Proven Components.** Reusing robust components is an effective way to increase quality. This results in reducing the number of failures or bugs, and in greater scalability and performance.

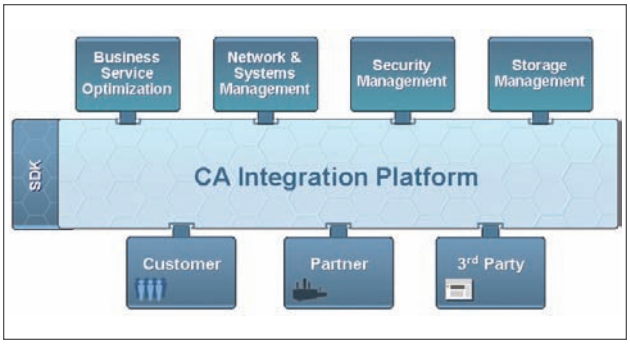

Figure 2. Integration Requirements for EITM

- **Consistent Interfaces.** Providing a consistent user interface for similar functions across many management domains improves the usability and accessibility of management information. This reduces the learning curve and speeds the time to value.
- **Innovative Functionality.** Sharing services and components makes it easier to rapidly deliver innovative capabilities across a broad product portfolio. Focused development efforts result in best-in-class components that enable stronger management products.
- **Multi-Platform Support.** Designing and building functions for portability ensures that new management functionality can be delivered to additional platforms quickly to support evolving technology. This is essential, as each customer must select their own deployment and management platforms, not their vendors.
- **Broad Use.** Using sophisticated shared services raises development efficiency and avoids redundant development efforts. This makes it easier for customers and partners to integrate and extend their management solutions, and speeds the development of new management products.

Every IT organization has management solutions from a variety of vendors, as well as internally built capabilities and integration investments. So, just integrating solutions from CA, or any single vendor, does not align with the goals of EITM. To achieve the goals of EITM, a *standards-based* integration platform is necessary to quickly enable interoperability across a diverse set of management functions from a diverse set of vendors, as illustrated in Figure 2.

Architectural Requirements for Integration

Enabling an advanced management integration platform requires a strong architectural foundation. The platform must be comprehensive, integrated, modular, real-time and united within a Services-Oriented Architecture.

Comprehensive

The platform must support all of the management and security disciplines. Given that these functions must be deployed across the enterprise, it is important to support all major hardware and operating system platforms from Windows, Linux, and UNIX to the mainframe. The platform must also provide the capacity to support management of any IT infrastructure components. Finally, the individual components and their interdependencies need to be managed as a complete IT service. For example, a corporate email service may include Exchange servers, Blackberry servers, a Web email interface, and Outlook clients spread across hundreds of servers and thousands of client machines. This collection of technologies constitutes a single IT service that is provided to the business, and must be manageable as a single logical entity.

Open and Integrated

The platform must support integration at three levels: process, data, and user experience. It is critical to create automated processes that span any combination of management functions, and to modify these processes to respond rapidly to changing business requirements. Data integration provides shared access to the wealth of management data that is collected and is essential to making informed decisions. The user interface and experience should be consistent both within and across management functions and automated processes.

To ensure interoperability, the interfaces to management functions and common services should leverage industry standards such as SAML, WSDM, and SMI-S whenever possible. Since there will always be applications deployed that need to be integrated, but do not leverage standards, the integration architecture needs to provide the development tools and flexibility to enable integration of custom-built solutions as well as commercial offerings from partners and other third parties.

Modular

To maximize efficiency, both the services of the management architecture, and the products comprised of them, need to be modular. This provides the flexibility required to deliver individual products that support a single management requirement, or large scale integrated suites that share a common architecture. Customers should of course receive immediate value from the first product delivered, and receive accelerated value as new products or whole suites are added. Further, customers should have the flexibility to deploy the functions they need at whatever pace maximizes the value.

Real-Time

The ultimate goal is to provide integrated, real-time management of the entire IT infrastructure. To achieve this, the architecture must support dynamic management of the infrastructure and the definition of flexible customized policies that support the underlying business requirements. Flexible, customizable, workflow-driven orchestration of any IT process from beginning to end is necessary to enable dynamic management.

CA's SOA Platform for Enterprise IT Management

To realize the EITM vision, CA is delivering an SOA-enabled integration platform with our products. CA is an established leader in delivering management functions across systems management, security, storage, and business service optimization across a diverse set of platforms. CA is uniquely positioned to deliver products that meet the integration requirements of EITM, because they share and add value to the critical core and management services, as highlighted in Figure 3. In addition, by driving the definition of management standards and implementing them in our products, CA is helping to provide a sound basis for current and future management interoperability.

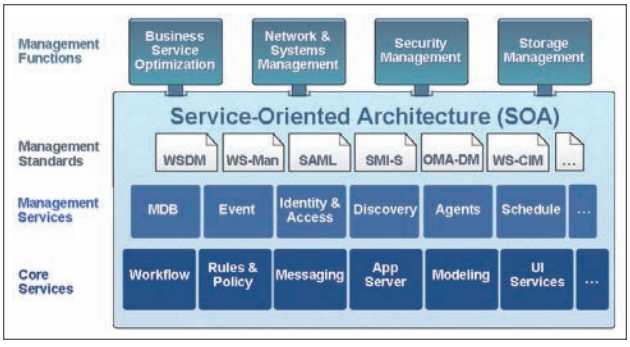

Figure 3. CA's Integration Platform

Leveraging an SOA is a primary focus of the integration platform. This helps ensure that individual components of the integration platform are modular and can easily interoperate. Also, individual services can be deployed as necessary. This means CA's integration platform is lightweight (or "rightweight") so individual products can deploy only the components they require.

Core Services

The core services provide the basic operational framework of CA's Integration Platform. The key services in this area include:

- **Workflow.** This service provides the ability to orchestrate system and human interactions for any IT or business process. The workflow service can drive any combination of industry standard Web services, Java classes, scripting files and command prompts. This flexibility enables integration of management functions from CA and other vendors.
- **Rules and Policy.** The new rules service enables powerful and extensible definition of IT management policy. This portable Java-based service can be run anywhere and is easily used with the workflow service. Prepackaged vocabulary for defining IT management rules can easily be provided with this service. Using this service, the standardization of policy definition simplifies administration and customization across management functions.
- **Messaging.** The messaging services deliver the foundation communication mechanisms for all management functions. They meet the diverse requirements management functions such as events (very large number of short messages) and software distribution (gigabytes of data every now and then). These services provide secured communications that can be leveraged across platforms, and between services written in a variety of languages. This is critical to implementing distributed and federated management.
- **Application Server.** This service is the industry standard runtime to support server based applications. Using a J2EE based application server enables clustering and fail-over support for the manager environment, and of course the J2EE server itself can be managed. Customers have the flexibility to implement CA products on industry-leading commercial solutions, such as WebSphere and WebLogic as well as open source J2EE application servers.
- **Modeling.** The modeling services allow for flexible orchestration of IT and business processes. Modeling tools are provided for many services, including the workflow, rules and management data services. The tools support delivery of prepackaged process and policy and allow process customization to integrate with customers' production environments.
- **UI Services.** The UI services are provided to deliver consistent interfaces across management functions and products. The UI services include Web components to standardize browser-based interfaces, portal services for configurable role-based applications, and reporting and analysis capabilities. These services enable the delivery of a consistent user experience across management functions and the ability to exploit industry standards such as JSR 168, and support usability and accessibility initiatives.

Management Services

The management services provide leading edge implementations of management focused functions for the CA Integration Platform. The key services in this area include:

- **MDB.** The management database (MDB) service provides a consistent integrated schema for managing information required by all management functions including assets, users, and policies. The MDB is deployed on standard relational database technology and is accessible using a variety of tools. The MDB facilitates new intelligence solutions, such as Asset Intelligence, that leverage an integrated view of management data from many products.
- **Event.** The event services provide integration and correlation of events raised by systems management, security and storage functions from across the enterprise. The event management functions are open to integration through support of SNMP and tailored SDKs, as well as emerging management standards such as WSDM.
- **Identity and Access.** The identity and access service provides consistent user management across both CA's management products and customer and partner applications. This service enables administration of users and their associated access rights, tied to their roles as users of the applications. This service includes a high-performance directory or can be deployed with other enterprise directories such as Microsoft Active Directory. Effective user management reduces the administration costs for product deployment and operation and provides effective controls and scoping of user access rights. An industry first, the use of identity and access service of CA's integration platform enables all management applications to share the same user and role definitions.

- **Discovery.** The discovery services enable rapid deployment and time-to-value for management and security solutions. The services operate across multiple levels including network, hardware and software, to capture information about the entire IT infrastructure. In addition, deployments include both agent and agentless approaches to maximize effectiveness. Enhanced capabilities for continuous discovery ensure that the management view of the environment keeps pace with a dynamic infrastructure.
- **Agents.** Agent services provide for direct management of the IT environment. Agent services include the ability to discover information about the environment and execute policy locally. Enhanced capabilities allow the agents to be dynamically reconfigured to support dynamic management and simplify administration.
- **Scheduling.** The scheduling services are built to allow IT management workloads to be controlled. Scheduling services apply to many management functions such as scheduling backup or distributing software updates. These services provide effective control and traceability of periodic management functions.

Management Standards

The EITM architecture was created to leverage and help to drive open management standards. An SOA-based architecture is required to enable flexible automation and integration across management solutions. Some of the most important management standards and initiatives are the following:

- **WSDM.** Web Services Distributed Management[2] is an OASIS standard that provides for both management of Web services and the use of Web services for management. A co-author of this standard, CA provides leading edge solutions for Web service management and as a founding member this committee is helping to drive this initiative in the industry.
- **WS-Management.** WS-Management is a new DMTF initiative focused on management of devices and server operating systems that is being chartered at the Distributed Management Task Force[3] (DMTF). CA and Microsoft are co-authors of the original submission.
- **SAML.** The Security Assertion Markup Language (SAML) specifications[4] are produced at OASIS by the Security Services Technical Committee. SAML provides for interoperable standards for identity management and access control. CA is an active participant and supports SAML in our security products.
- **SMI-S.** The Storage Networking Industry Association (SNIA) created the Storage Management Initiative (SMI)[5] to standardize interoperable storage management technologies. The SMI Specification (SMI-S) leverages the Web Based Enterprise Management (WBEM) architecture and the Common Information Model (CIM), pioneered by the Distributed Management Task Force (DMTF). SMI-S defines an interoperable and extensible management transport, a complete object model that provides for control of LUNs and Zones in the context of a SAN; and automated discovery system. CA is a board member of SNIA and implements this standard in our storage products.
- **OMA-DM.** The Device Management Working Group[6] (OMA-DM) is defining management standards in the Open Mobile Alliance (OMA). Their effort will result in common management interfaces for setting up device configurations, processing management events and information and updating software that is available across the major mobile platforms. CA is participating in these efforts to help build a new generation of management for Smartphones and mobile devices.
- **WS-CIM.** WS-CIM is a new DMTF initiative focused on taking the CIM object model and mapping it to leading management protocols such as WSDM and WS-Management. CA is actively involved in authoring this new initiative for interoperable management interfaces.

The ultimate goal of standards is to simplify interoperability and integration. CA's focus on integration is reflected in actively authoring and supporting the evolution of industry standards and defining an integration platform to enable integration.

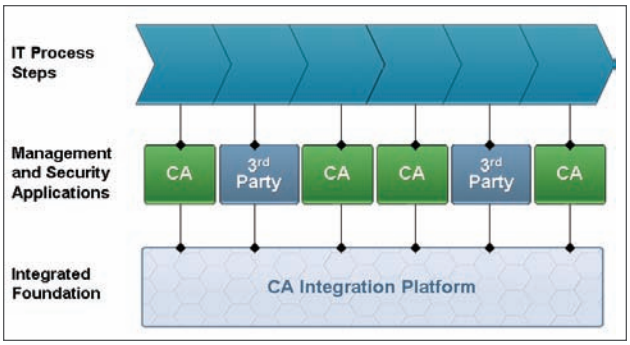

Figure 4. Integrated IT Flows (IIFs)

Open Process-Centric Management

In order to meet the EITM objectives for managing costs and improving service it is critical to have an integration platform that enables flexible automation and implementation of best practices for IT management, as highlighted in Figure 1. CA's integration platform provides key capabilities to deliver automation and integration across both CA and partner products. This ability for effective open integration is fundamental to success.

CA offers EITM accelerators to help customers advance and automate IT processes. The EITM accelerators include capability assessments, return on investment calculators, roadmaps and tools — based on best practices — for the implementation of integrated IT process flows. Key tools within EITM accelerators are CA's Integrated IT Flows[7] (IIFs). IIFs are best practices for IT management instantiated in automated workflows that call upon multiple management and security functions. CA built its IIFs based on ITIL, and other industry best practices such as COBIT, combined with CA's own best practices from extensive experience implementing IT management processes at client sites.

The IIFs are designed to be open and to provide opportunities to work with partners, as highlighted in Figure 4. IIFs are built using CA's integration platform, and heavily leverage the workflow and rules services to deliver effective automation. The workflow services in particular offer great flexibility in being able to invoke interfaces and APIs from both partner and CA products. IIFs also provide a basis for close integration with service partners. Service partnerships provide great opportunities to leverage domain-specific knowledge and best practices across a variety of industry and business application domains. Integrating the expertise and best practices from both CA and its service partners provides tremendous value for customers.

CA Delivers the Architecture for EITM

CA's modular integration platform provides the architectural foundation and services necessary to achieve the vision of unifying and simplifying the management and security of your IT infrastructure. The capabilities of CA's integration platform are deployed across the four main categories of management solutions as shown in Figure 5. The integration platform delivers on the four basic requirements for an integration platform:

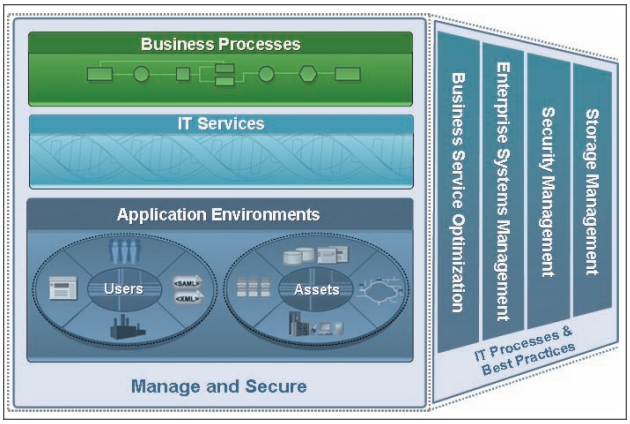

Figure 5. Integrated Management

- **Comprehensive.** CA's integration platform provides the capacity to support management of any IT infrastructure components across all the major deployment platforms.
- **Open and Integrated.** The integration platform delivers the capabilities for process automation and workflow as well as MDB and UI services. CA has taken leadership positions in key interoperable management standards across the categories of management solutions.
- **Modular.** CA has a strong SOA focus to ensure the modularity and flexibility of services in the integration platform. This ensures that products deploy only the components they require, thus "rightsizing" the platform.
- **Real-Time.** The integration platform provides the workflow, rules and policy services that enable integration and real-time management of the entire IT infrastructure. This technology is coupled with the experience encapsulated in IIFs to deliver best practices for IT.

For more information, please visit ca.com.

Cited References and Notes

[1] *Enterprise IT Management — Simplifying and Unifying IT*, November 2005, Computer Associates.

[2] OASIS Web Services Distributed Management (WSDM) Tech Committee. **oasis-open.org/committees/tc_home.php?wg_abbrev=wsd**.

[3] Distributed Management Task Force (DMTF). **dmtf.org**.

[4] OASIS Security Services (SAML) Tech Committee. **oasis-open.org/committees/tc_home.php?wg_abbrev=security**

[5] Storage Networking Industry Association (SNIA) Storage Management Initiative Specification (SMI-S). **snia.org/smi/developers/**

[6] OMA Device Management Working Group. **openmobilealliance.org/tech/wg_committees/dm.html**

[7] Dave Yusef, John Meyer, *Turning IT Vision Into Business Value*, November 2005, Computer Associates.

About the Author

Don LeClair, 100 Staples Dr, Framingham, MA 01702 **(Donald.LeClair@ca.com)**. Don LeClair is senior vice president and principal technology strategist in the office of the CTO. He is responsible for helping to define CA's overall technology strategy. Don joined CA in 1989 and has extensive experience in common services, technical architecture, SOA, database, application development, and business applications. Don earned a bachelor's and a master's degree in business administration with a concentration in technology from Boston University.

MP292171105