**VA Enterprise Design Patterns**
**Enterprise Architecture**

# End-to-End Application Performance Management (APM)

**OFFICE OF TECHNOLOGY STRATEGIES (TS)**
**OFFICE OF INFORMATION AND TECHNOLOGY (OI&T)**

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**REVISION HISTORY**

| Version | Date | Approver | Notes |
|---|---|---|---|
| 1.0 | 9/25/2014 | Joseph Brooks (ASD TS) | Final version for TS leadership approval and signature, including all applicable updates addressing stakeholder feedback and Section 508 Compliance |
| 2.0 | 12/4/2015 | Tim McGrail (ASD TS) | Update accounting for lessons learned and realignment to current template for Enterprise Design Patterns. |
| 3.0 | 08/30/2017 | Aaron Ibarra (ASD TS) | Updated the current and future state of Application Performance Management (APM) at VA |

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# 1 INTRODUCTION

The Department of Veterans Affairs (VA) needs to transform application performance management (APM) as an end-to-end solution (E2ES), rather than managing disparate stove piped processes and systems that were once used during Information Technology (IT) project development. Improvements in managing the performance and availability of software applications were considered only within an existing and technologically familiar context, and often resulted in redundant functionality. This duplication increased the total cost of ownership (TCO) and APM complexity. APM tools were not deployed end-to-end, hindering VA's ability to evaluate health applications and proactively identify risks.

This Enterprise Design Pattern (EDP) provides guidance to projects applying the end-to-end APM capabilities that are provided by Enterprise Shared Services (ESS). This document guides projects in the use of standard APM capabilities that are provided by VA regional data centers. Prior to deployment, additional coordination on capacity and operations planning is required with the VA Office of Information and Technology (OI&T) pillar, Information Technology Operations and Services (ITOPS), and its Enterprise Operations (EO) office.

## 1.1 Business Problem

There are advantages to using a comprehensive suite of performance monitoring tools, rather than managing separate tools. These include maintaining a single status dashboard and obtaining a more competitive bundled price point for a plethora of available tools and functions

to benefit the enterprise. A consolidated suite of tools also has the flexibility to expand and mature with the organization.

High-quality application delivery requires deep visibility into the performance of applications at all levels. As a best practice, monitoring IT capability performance, both on-premises and in the cloud, is necessary for the optimal delivery of VA business services through applications.

Limited planning for application monitoring during development can present production gaps. In addition to meeting compliance requirements, analytics are important to predicting the circumstances that can contribute to the failure of an application in the production environment. A complete understanding of the performance weaknesses of those applications that may create difficulties, such as those applications under increased user load, can help to support proactive performance monitoring.

### 1.2 Business Need

VA business owners derive a number of benefits from APM capabilities within the agency's IT infrastructure investments. According to *APM Best Practices,* APM provides business owners the following "justification themes" (see Appendix D):

**TABLE 1: APM JUSTIFICATION THEMES FOR BUSINESS OWNERS**

| Justification Theme | Benefits |
|---|---|
| **Availability vs. Performance Monitoring** | • Enhances visibility into the behaviors of distributed systems/subsystems and dependent systems, and how to correlate past observations with current operations in order to identify and predict various incidents<br>• Reduces the time to first alert for a performance or capacity incident<br>• Provides performance monitoring capability across transport protocols and Java/.NET platforms<br>• Availability is increased by monitoring performance changes, but also significantly by monitoring resource utilization of capacity |
| **Resolving Application Incidents and Outages** | • Enables efficient tracking and resolves resolution of performance and capacity issues<br>• Provides separate responses for availability and degradation incidents<br>• Allows more effective use of the monitoring tool infrastructure, through active capacity reporting and planning |
| **Improving Application Software Quality** | • Confirms accuracy and utility of load testing during development, and decreases overall time-to- |

| Justification Theme | Benefits |
|---|---|
| | implementation for new software systems<br>• Improves production experience based on a consistent set of key performance indicators (metrics) |
| **Pre-production Readiness and Deployment** | • Validates low overhead of agent and transaction definitions<br>• Supports definition of the monitoring dashboards and reporting using the same tools in development that are used in production operations |
| **Managing Service Level Agreements (SLA)** | • Enhances relationships with business owners via meaningful dashboards and access to a common set of tools<br>• Enables definition of reliable transactions that are defined and focused<br>• Provides accurate and rapid performance and capacity forecasting |
| **Enhancing the Value of the Monitoring Tool Investment** | • Decreases time-to-implementation schedule<br>• Allows for optimal use of existing and proposed monitoring technology<br>• Helps evolve skill sets and competencies of technical staff by focusing on the standard set of tools |
| **Proactive Monitoring** | • Achieves proactive management by catching performance problems during development and operations for quality assurance (QA) and user acceptance testing (UAT)<br>• Enhances triage of performance problems<br>• Enhances overall software quality from the operations perspective |
| **Trending and Analysis** | • Increases value and use of the monitoring environment<br>• Establishes comprehensive capacity management planning practices<br>• Establishes more capable triage technical practices |
| **Single-View of Service Performance (Dashboards)** | • Gives real-time view of business service performance<br>• Provides visibility into application component interactions and the end-user experience |

### 1.3 Business Case

The following benefits can be achieved by utilizing enterprise APM at VA:

- Proactively identify problems during development and operations that could impact the delivery of Veteran services.

- Reduce operations cost, as opposed to managing separate tools that provide separate functions.
- Support agile delivery of on-premise and cloud infrastructure, which increases return on investment (ROI) for IT investments.
- Adhere to agile principles through initial and continuous monitoring.

### 1.4 Approach

End-to-end APM is currently available at regional data centers to monitor all operational systems and services, including ESS. All new applications are required to integrate the APM capabilities provided by the VA enterprise data centers. The current approach applies to solutions deployed at VA's data centers and will accommodate VA-approved external cloud service providers, as the VA cloud strategy is deployed. More detail on products in the enterprise data centers can be found in Appendix E.

## 2 Current Capabilities and Limitations

### 2.1 Traditional APM Approach

The following figure depicts VA's monitoring approach, as focused on specific domains. Example domains include message queues (MQ), operating systems (OSs), and Java Virtual Machines (JVM). This approach does not provide the full visibility into an entire business transaction that utilizes all domains. Therefore, this approach results in monitoring inefficiencies and a longer mean time to repair (MTTR).

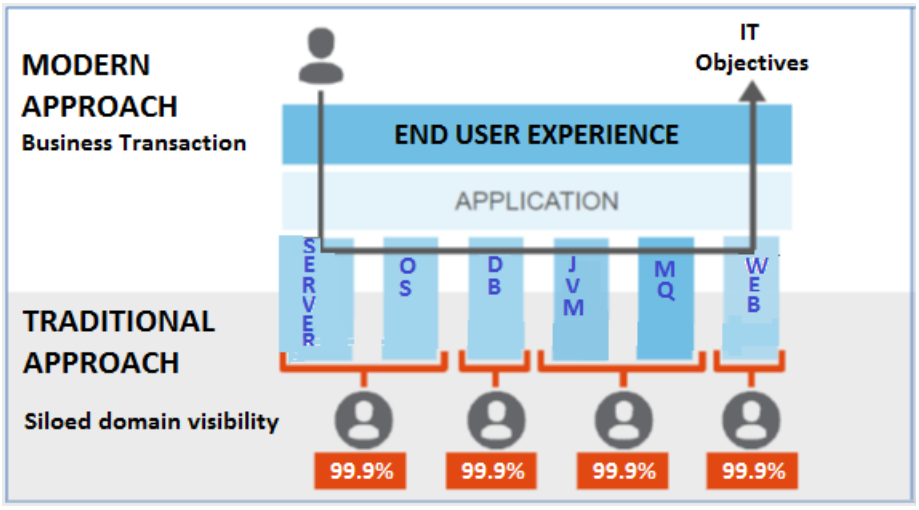


Figure 1: Traditional Monitoring Approach Providing Visibility to Specific Domains of a Typical Business Transaction

Industry best practices recommend end-to-end APM to leverage a top-down approach that focuses on the complete application stack. VA's enterprise data centers offer the full spectrum of APM capabilities to monitor health applications.

### 2.2 Current APM Deployments

The current end-to-end APM tools in VA data centers deliver a holistic view of all user transactions, helping IT stakeholders understand the health, availability, service impact, and end-user experience of critical applications. APM enables projects to diagnose and resolve problems proactively, while optimizing the performance of mission critical services. APM supports prioritization of incidents that are based on service impact, as it quickly pinpoints problems across disparate technology silos.

### 2.3 Common Technical Capabilities

The following figure provides a high level description of the APM products deployed by ITOPS:

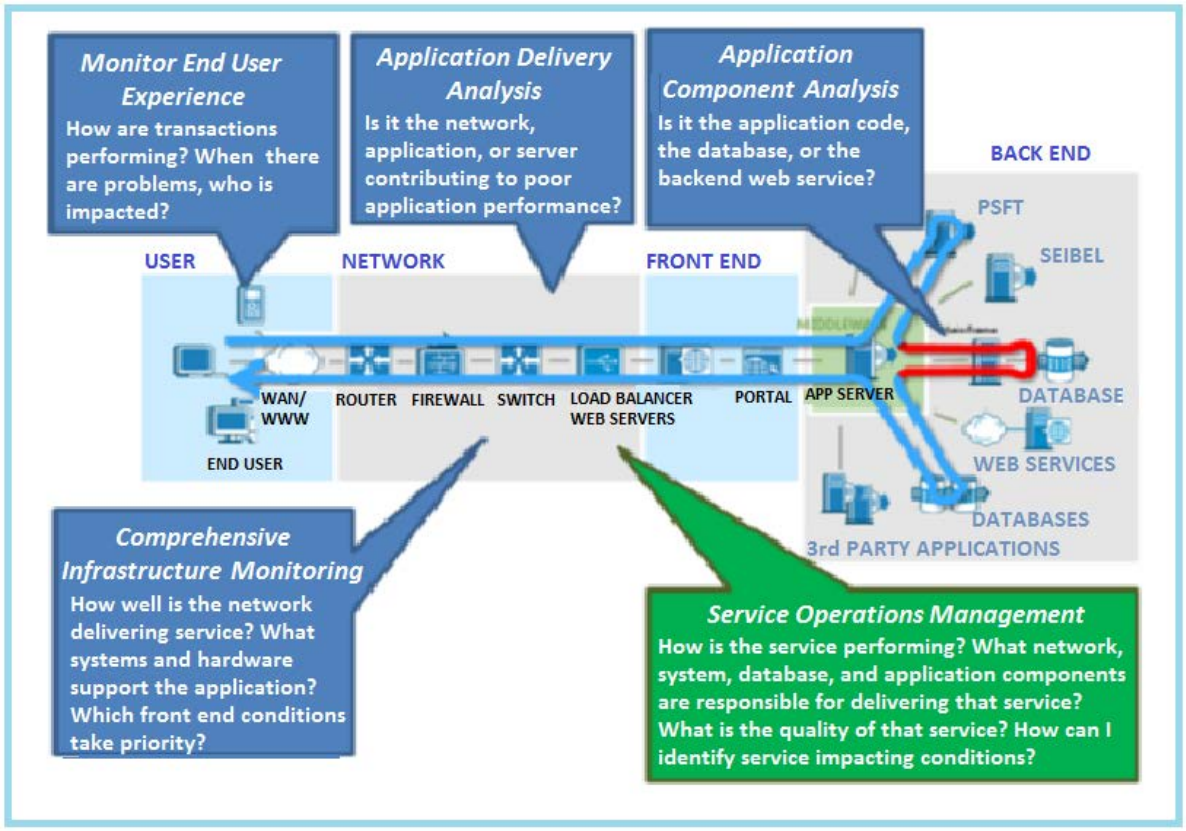


FIGURE 2: APM CAPABILITIES DEPLOYED AT VA

Refer to the Enterprise Auditing EDP for more information on causal analysis between sub capabilities, which is supported by enterprise services (e.g., Splunk).

The following APM capabilities are available as enterprise infrastructure services:

**Application Behavior Analytics** – These analytics discover anomalous application behavior automatically, and proactively alert IT operators of potential problems that could disrupt performance. The instrumentation tools provided by EO automatically mine the vast repository of rich data that is created by APM. Within hours of setup, the tools can begin identifying anomalous behavior in components, providing a view of potential issues between related components.

**Smart Triage –** The smart triage reduces downtime and optimizes the performance of services by proactively identifying, diagnosing, and resolving performance problems, before they impact end users. The EO-provided APM tools map all transactions to the dependent infrastructure in real-time for a single view of application health, business process flow, and the entire transaction path. This quickly triages issues, helps to eliminate problem resolution guesswork, and accelerates mean time to repair.

**Rapid Root-Cause Diagnosis –** This diagnosis improves IT productivity and controls costs by diagnosing problems that occur within the application and infrastructure. End-user experience monitoring capabilities integrate with behavior analytics. The capabilities provide deep-dive problem diagnosis features to understand performance issues in context, pinpoint failures, and accelerate problem resolution.

**Business-Centric Management –** A business-centric approach ensures the highest service levels among high-value transactions. Problems are understood in a business context in order to identify critical transactions that may be at risk, prioritize problem resolution efforts, dispatch the right resources, and fix the problem that is affecting key functionality. APM provides application health metrics that are understood by non-application experts and easily communicated to business users.

### 2.4 Current Limitations

The suite of APM tools does not completely meet end-to-end monitoring needs. APM will need to evolve to support the comprehensive end-user experience. As more applications become mobile and cloud-based, the APM suite of tools will need to adapt to consider these environments. Refer to the Mobility EDPs and Cloud Computing EDPs for more details concerning these topics. With the Veteran-Centric Integration Process (VIP) in place, processes exist that can identify and resolve issues in the end-user experience through proactive testing, SLAs, and metrics. Refer to section 3.5 for more information on VIP.

# 3 FUTURE CAPABILITIES

## 3.1 APM for Mobile and Cloud Services

The future-state operational vision consists of end-to-end APM, covering on-premise, cloud, and hybrid environments, and supporting agile practices for building, testing, and deploying applications. The Enterprise Program Management Office (EPMO) and ITOPS will require upfront coordination prior to conducting capacity planning and establishment of metrics prior to deployment. This involves close collaboration between development and operations staff, especially as VA shifts to a continuous integration and deployment paradigm. The concept diagram below depicts the types of services to be provided by APM capabilities in various hosting environments.[1]

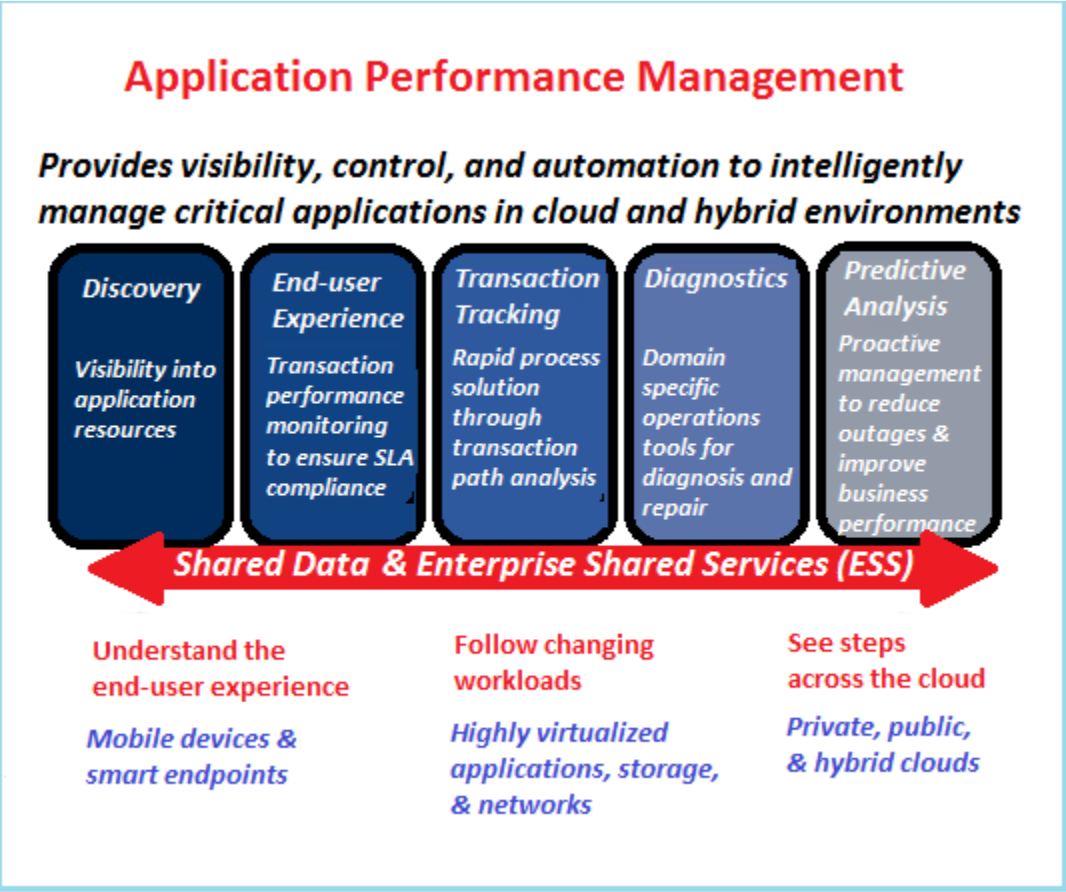


FIGURE 3: END-TO-END VA APM CAPABILITIES AND TRANSACTION VISIBILITY CONCEPTUAL OVERVIEW

APM includes visibility into cloud environments, as discussed in detail in the Cloud Computing EDP. APM integrates predictive analytics capabilities to enhance proactive monitoring and

[1] Graphic reconstructed from material provided by IBM in 2015

trouble resolution. These capabilities support mobile applications and will integrate with enterprise mobile analytics capabilities, as explained in the Mobility EDPs. Specifically, end-user experience monitoring supports mobile analytics, and APM achieves this through the following functions:

- Deploying a mobile performance agent on top of end-user monitoring capabilities, which may require adding a library and recompiling the code to perform APM for the application
- Agent piggybacking on other user service calls through an application programming
- interface (API)
- Generating crash analytics to create a snapshot of device crash statistics

Refer to the Enterprise Auditing EDP for details on how information from the APM tool can be integrated with the enterprise auditing service.

Deploying APM for cloud services will include health endpoint monitoring. This is typically the combination of two factors: (1) the checks (if any) performed by the application or service in response to the request to the health verification endpoint, and (2) analysis of the results by the tool or framework that is performing the health verification check. The response code indicates the status of the application and, optionally, any components or services it uses. Additional best practices include checking the following:

- Storage or a database for availability and response time
- Other resources or services located within the application, or located elsewhere, but used by the application

VA will also perform end-user experience monitoring as part of the end-to-end APM capabilities. This monitoring system ensures consistent end-user experience and high service levels, meeting business objectives by monitoring all end-user transactions (including web-based and non-web-based services) on a 24x7 basis, with minimum overhead. APM measures end-user transaction performance to ensure applications are delivering in accordance with SLAs, using application-specific metrics.

### 3.2 Proactive Planning for APM

Proactive planning for APM enables agile paradigm that includes collaboration with both developers and operations staff. Projects will accomplish this through the following tasks:

- Establish metrics with EO and conduct evaluations in a pre-production test environment.

- Coordinate infrastructure support and conduct operations support planning prior to the planning phase to establish monitoring metrics.
- Develop a monitoring plan with known metrics prior to deployment.

A Business Impact Analysis (BIA) is the part of planning that project teams will perform to address metrics. Teams should reference the BIA EDP for more information on specific metrics that correlate to mission criticality.

Projects require a common set of metrics to monitor, control, and track performance in order to indicate deficiencies or equipment outage, resolve monitoring gaps, and increase the number of SLAs. Within the monitoring tool suite, VA will utilize all of the features that are needed among those that feature metrics and data collection. Increased data availability will expedite testing and suitable APM tool implementation.

Common metrics include the following:

- Number of errors, responses, and stalls
- Structured Query Language (SQL) and other database per-query response times and details
- Response times by application subcomponent
- Java metrics: garbage collection, heap space, and memory
- Back-end vs. front-end triaging and Uniform Resource Locator (URL) monitoring
- Thread, process, authentication, and web service performance

All new applications require load testing in pre-production environments. APM must be available in these environments to measure expected performance and identify potential issues. Projects will work with EO to identify which of these metrics is needed during the testing phase in order to mitigate pre-production performance risks. Appendix D contains technical references on APM.

Incomplete application migration to cloud and mobility devices is an existing gap in APM performance. Collaboration between teams is necessary to determine a scheduled application migration into the cloud environment and its full implementation with the on-premise environment. A tool that addresses the current application status and evolves with future needs will be the most effective.

### 3.3 END USER EXPERIENCE

VA will utilize a comprehensive APM tool that collects metrics on the end-user experience for the following purposes:

- Obtaining real-time, end-to-end visibility, from a user transaction to a single line of code
- Analyzing multiple factors across user sessions to proactively identify errors before users are affected
- Automatically pinpointing anomalies and isolating performance issues by user, network, or computing resource
- Looking at a single user, a specific transaction, or an entire customer group or location for diagnostics, capacity planning, change management, and service level management
- Managing the SLAs of virtualization and cloud-based services

VA will capture and securely store web activity for every user session. The capture includes every page, object, error, and all associated timing. The capture and storage is accomplished through the end-user experience management capabilities that are provided in the comprehensive APM tool. This will provide the following benefits to project teams and ITOPs:

- Gain instant visibility into web applications with views into service-level performance, incidents and errors, and performance metrics with geographic drill-down capability.
- Combine real-time end user visibility with behavior learning analytics to detect problems faster and prioritize issues based on service levels and impacted users. Refer to the Enterprise Auditing EDP for more details on behavior learning analytics.

VA will utilize a comprehensive APM tool that provides dashboards to measure component health through color coded visualization. This will provide the following benefits to project teams:

- Quickly discover transactions that are not properly occurring and isolate reports to determine what is normal for this particular activity.
- Drill down into these deep diagnostics without a separate tool.
- Simultaneously monitor end-user experience and application health.

### 3.4 Alignment to the One-VA Technical Reference Model

All projects will leverage the approved technologies and standards included in the One-VA Technical Reference Model (TRM)[2] in order to comply with the architectural guidance that is provided by this authoritative source from the VA production computing environment. All APM products used in regional data centers are commercial-off-the-shelf (COTS) products that are cataloged in the One-VA TRM. New APM products require One-VA TRM approval.

[2] http://trm.oit.va.gov/

TABLE 2: LIST OF APPROVED TOOLS AND STANDARDS FOR APM

| Tool Category | Example Approved Technologies |
|---|---|
| **Application Management** | Application Lifecycle Management (ALM), Decision Support System (DSS) Enterprise Manager |
| **Monitoring** | NetIQ AppManager, Sensu |
| **Network Performance** | CA eHealth, Event Log Forwarder for Windows, Ixia Qcheck, Shunra Network Virtualization, Shunra NetworkCatcher, Solarwinds Network Performance Monitor, SteelCentral NetProfiler Virtual Edition, Traverse Monitoring |

### 3.5 Alignment to Veteran-Centric Integration Process (VIP)

All projects subject to VIP will leverage enterprise services to support APM, instead of implementing a custom solution. VIP is a lean-agile framework that serves the interest of Veterans through efficiently streamlining activities that occur within the enterprise. The VIP framework unifies IT delivery oversight and will more securely and predictably deliver IT products. VIP is the follow-on framework from the Project Management Accountability System (PMAS) for the development and management of IT projects; it will propel VA with even more rigor toward the Veteran-focused delivery of IT capabilities.

More information can be found here: https://vaww.oit.va.gov/veteran-focused-integration-process-vip-guide/.

### 3.6 Summary

Projects that implement APM should incorporate requirements that are based on this EDP into project requirement documentation. Table 3 highlights key areas of content that can assist projects to develop requirements for future APM capabilities at VA.

TABLE 3: CONSIDERATIONS TO INFORM REQUIREMENTS

| Section # | Requirements Considerations |
|---|---|
| **3.1 APM for Mobile and Cloud Services** | • VA will deploy APM for cloud services.<br>• VA will deploy APM for mobile services.<br>• VA will perform end-user experience monitoring.<br>• VA will obtain end-user experience metrics. |
| **3.2 Proactive Planning for APM** | • VA will perform planning for APM.<br>• VA will establish metrics and conduct |

| Section # | Requirements Considerations |
|---|---|
| | evaluations in a pre-production test environment.<br>• VA will coordinate infrastructure support and conduct operations support planning prior to the planning phase to establish monitoring metrics.<br>• VA will develop a monitoring plan with known metrics, prior to deployment.<br>• VA will make APM available in pre-production environments.<br>• VA will identify which metrics are needed to monitor during the testing phase. |
| **3.3 End User Experience** | • VA will utilize a comprehensive APM tool that collects metrics on the end- user experience.<br>• VA will capture and securely store web activity for every user session, including every page, object, error, and all associated timing, through the end-user experience management capabilities in the comprehensive APM tool.<br>• VA will utilize APM tools that provide dashboards to measure component health through color-coded visualization. |

# 4 USE CASES

## 4.1 Utilizing a Portal for a Veteran's Appointment Scheduling Status

### *4.1.1 Purpose*

The business process below shows a prescriptive flow for how end-to-end APM works within the VA enterprise for three scenarios:

1. End-user experience monitoring
2. Network performance monitoring
3. Back-end infrastructure monitoring

### *4.1.2 Assumptions*

The project team is utilizing an approved APM tool that is included in the One-VA TRM.

### *4.1.3 Use Case Description*

The basic flow of events between application owner and infrastructure actors (e.g., APM capability provider) is as follows:

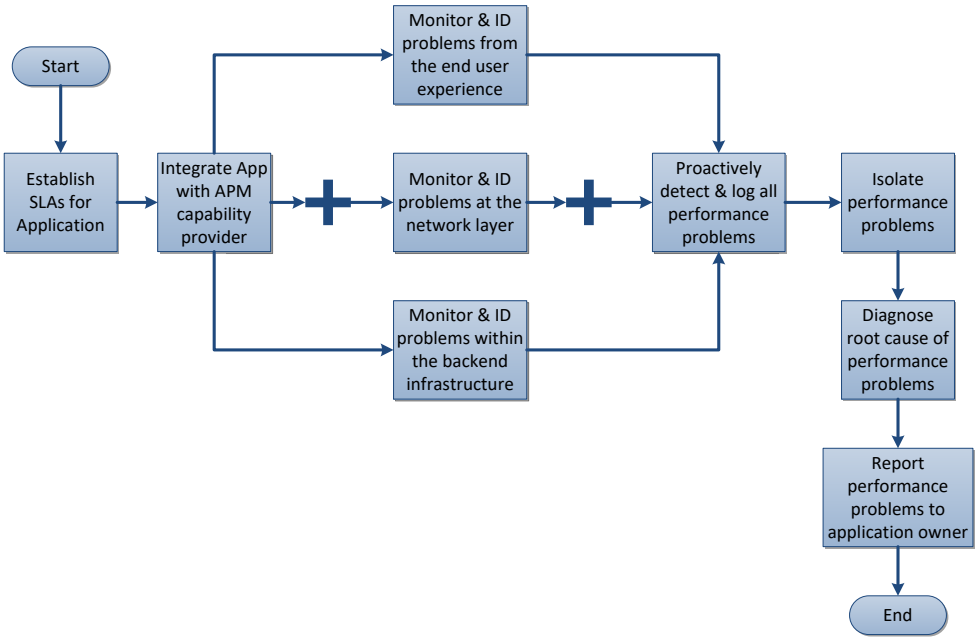


FIGURE 4: PROCESS FOR APM WITH USER EXPERIENCE, NETWORK, AND INFRASTRUCTURE MONITORING

**Step 1**

Application owner establishes appropriate metrics for the application in pre-production, including SLAs between service consumers and providers.

**Step 2**

Application owner deploys application into the VA IT infrastructure production environment, and integrates with APM capability provider.

**Step 3**

APM capability provider monitors all business transactions traversing the entire VA IT infrastructure:

- **Step 3.1**: Monitor and identify problems associated with the application layer (e.g., end-user experience).
- **Step 3.2**: Monitor and identify problems associated with application delivery over the network.

- **Step 3.3**: Monitor and identify problems associated with the back-end infrastructure (e.g., application servers, web services, or databases).

**Step 4**

APM capability provider proactively detects and logs all performance problems in each part of the infrastructure (steps 3.1 – 3.3).

**Step 5**

APM capability provider isolates performance problems detected in Step 4.

**Step 6**

APM capability provider diagnoses root cause of performance problems in steps 3.1 – 3.3.

**Step 7**

APM capability provider reports performance problems to application owner.

# APPENDIX A. SCOPE

The purpose of this document is to provide guidance on using end-to-end APM capabilities that support ESS. Specifically, this document guides projects to use the standard set of APM capabilities provided by VA data centers, and to coordinate with OI&T ITOPS EO early in the development lifecycle to ensure proactive performance monitoring. This applies to all new applications requiring integration into VA's enterprise IT. The guidance in this document applies to both COTS software acquisitions (including open-source) and applications developed by VA Product Development.

This document focuses on APM capabilities provided by VA's regional data centers. It provides high-level guidance for establishing application performance metrics (e.g., central processing unit [CPU] usage, memory trends, input, and output operations). The following content is out of scope for this document, but it is addressed in related EDPs:

- Mobile analytics (Mobility EDPs)
- Log management for auditing and compliance (Privacy and Security EDPs)
- Network traffic monitoring (Privacy and Security EDPs)
- Cloud service monitoring (Cloud Computing EDPs)
- Vulnerability scanning and incident management processes (IT Service Management EDPs)

**Document Development and Maintenance**

This EDP was developed collaboratively with internal stakeholders from across VA, including participation from subject matter experts (SMEs) from OI&T pillars, including the EPMO, the Office of Information Security (OIS), Architecture, Strategy, and Design (ASD), and ITOPS. Extensive input and participation was also received from Veterans Health Administration (VHA), Veterans Benefits Administration (VBA), and National Cemetery Administration (NCA). In addition, the development effort included engagements with industry experts to review, provide input, and comment on the proposed pattern. This document contains a revision history and revision approval logs to track all changes. Updates will be coordinated with the Government lead for this document, which will also facilitate stakeholder coordination and subsequent re-approval, depending on the significance of the change.

## APPENDIX B. DEFINITIONS

This appendix provides definitions for terms used in this document, particularly those related to databases, database management, and data integration.

| Key Term | Definition |
|---|---|
| Enterprise Shared Service (ESS) | A service oriented architecture (SOA) service that is visible across the enterprise and accessed by users across the enterprise, subject to appropriate security and privacy restrictions. |
| Service | Service is a mechanism to enable access to one or more capabilities, where the access is provided using a prescribed interface and is exercised consistently with constraints and policies as specified by the service description. |
| Service-Level Agreement (SLA) | An agreement between two parties regarding a particular service. They contain quantitative measurements that:<br>• Represent a desired and mutually agreed state of a service<br>• Provide additional boundaries of a service scope (in addition to the agreement itself)<br>• Describe agreed and guaranteed minimal service performance |
| Service Oriented Architecture (SOA) | SOA is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with, and use capabilities to produce desired effects consistent with measurable preconditions and expectations. |
| User | The user is a person who accesses information systems (ISs) to use programs or applications in order to perform an organizational task. |

## APPENDIX C. ACRONYMS

The following table provides a list of acronyms that are applicable to and used within this document.

| Acronym | Description |
|---|---|
| ALM | Application Lifecycle Management |
| API | Application Programming Interface |
| APM | Application Performance Management |
| ASD | Architecture, Strategy, and Design |
| BPEL | Business Process Execution Language |
| BAM | Business Activity Monitoring |
| BIA | Business Impact Analysis |
| BPM | Business Process Monitoring |
| CA | CA Technologies (formerly Computer Associates International) |
| CC | Command Center |
| CDM | Central Processing Unit, Disk and Memory Monitor |
| CoE | Center of Excellence |
| COTS | Commercial Off-the-Shelf |
| CPU | Central Processing Unit |
| DB | Database |
| DSS | Decision Support System |
| EDP | Enterprise Design Pattern |
| eMI | Enterprise Messaging Infrastructure |
| EO | Enterprise Operations |
| EPMO | Enterprise Program Management Office |
| ESS | Enterprise Shared Services |
| ETA | Enterprise Technical Architecture |
| ETSP | Enterprise Technology Strategic Plan |
| E2ES | End-to-End Solution |
| IO | Information Operations |
| IS | Information System |
| IT | Information Technology |
| ITOPS | Information Technology Operations and Services |
| JVM | Java Virtual Machine |
| MQ | Message Queues |
| MTTR | Mean Time to Repair |
| NCA | National Cemetery Administration |
| OI&T | Office of Information and Technology |
| OIS | Office of Information Security |
| OS | Operating System |
| PD | Product Development |

| Acronym | Description |
|---|---|
| PMAS | Project Management Accountability System |
| PSFT | PeopleSoft |
| QA | Quality Assurance |
| ROI | Return on Investment |
| SDE | Service Delivery and Engineering |
| SLA | Service Level Agreement |
| SME | Subject Matter Expert |
| SMS | Short Message Service |
| SMTP | Simple Mail Transport Protocol |
| SNMP | Simple Network Management Protocol |
| SOA | Service-Oriented Architecture |
| SOI | Service Operations Insight |
| SQL | Structured Query Language |
| TCO | Total Cost of Ownership |
| TCP | Transmission Control Protocol |
| TRM | Technical Reference Model |
| TS | Technology Strategies |
| UAT | User Acceptance Training |
| UIM | Unified Infrastructure Management |
| URL | Uniform Resource Locator |
| VA | Department of Veterans Affairs |
| VBA | Veterans Benefits Administration |
| VHA | Veterans Health Administration |
| VIP | Veteran-Centric Integration Process |
| WAN | Wide Area Network |
| WSRR | WebSphere Service Registry and Repository |

## APPENDIX D. REFERENCES, STANDARDS, AND POLICIES

This EDP is aligned to the following VA OI&T references and standards applicable to all new applications being developed in VA, and are aligned to the VA Enterprise Technical Architecture (ETA):

| # | Issuing Agency | Policy, Directive, or Procedure | Purpose |
|---|---|---|---|
| 1 | VA | VA Directive 6551 | Establishes a mandatory policy for establishing and utilizing EDPs by all VA projects developing IT systems, in accordance with VA's OI&T integrated development and release management process, VIP |
| 2 | VA OIS | VA 6500 Handbook | Directive from the OI&T OIS for establishment of an information security program at VA, which applies to all applications that leverage ESS |
| 3 | VA ASD | VA Enterprise SOA Enterprise Design Pattern | Provides a reference for the use of end-to-end application performance monitoring as part of the integration with SOA support infrastructure services; these documents standardize and constrain the solution architecture of all healthcare applications in VA |
| 4 | VA ASD | ESS Strategy Document and Directive | Provides the overarching strategy for developing, deploying, and managing ESS throughout VA, located at http://vaww.ea.oit.va.gov/enterprise-shared-services-service- oriented-architecture/ |
| 5 | VA ASD | VA Enterprise Technology Strategic Plan (ETSP) | Provides long-term IT vision for systems management capabilities that include APM |
| 6 | VA ASD | OIT Infrastructure Architecture | Provides a list of instrumentation/monitoring products to be used (based on business/technical requirements) for the monitoring, proactive detection, triage, and diagnosis of performance problems in VA's Data Centers |

Additional technical references are as follows:

1. APM Best Practices: Realizing Application Performance Management by Michael J. Sydor, 2010, CA Press, ISBN-10: 1430231416
2. MSDN Cloud Enterprise Design Patterns: Health Endpoint Monitoring https://msdn.microsoft.com/en-us/library/dn589789.aspx

3. MSDN Application Architecture Guide v2, Chapter 17 Cross-cutting Concerns: https://msdn.microsoft.com/en-us/library/ee658105.aspx

# APPENDIX E. VA INFRASTRUCTURE OPERATIONS PRODUCT CATEGORIES

**Purpose**

This document is intended to detail the standard products that would be deployed for an application or system in the enterprise data centers by the VA Information Operations (IO) Command Center (CC) team.

**Product Domains**

The four domains of performance products that would be involved for active monitoring of a new or existing project can be seen in the figure below. There exists a small amount of overlap, but each is unique in its field for one or more reasons. Details on each domain and the products that fall into that domain follow.

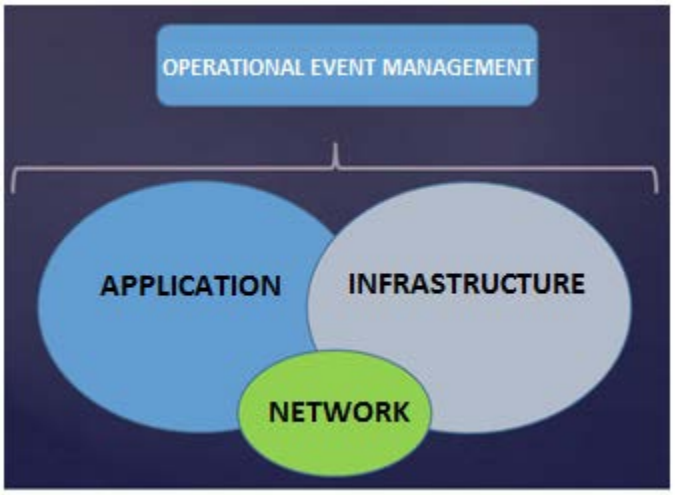


FIGURE 5: OPERATIONS EVENT MANAGEMENT

**Application Performance**

Typically, the agent-based products, such as Java or .NET, shim themselves into common runtimes. There are also other languages where data is seen from within the application, such as SQL Calls, web services, message queues, etc. The products that are currently available include the following:

- CA Technologies APM
    - Introscope Application Agent – The agent embeds itself into the application runtime. Typically, a tar file that is unpacked and then referenced in the application startup is adjusted to make it aware of the agent's location.

    - Introscope EP or Environment Performance Agent – These are typically used to capture CPU/disk/mem types of statistics from the OS. The plan is to retire the use of this agent after successful CA Unified Infrastructure Management (UIM) roll out.
    - CEM or Customer Experience Manager – This end-user transaction monitors by means of constant packet captures from switches/SPANS.
- Appdynamics – The agent embeds itself into the application runtime. Typically, a tar file that is unpacked and then referenced in the application startup is adjusted to make it aware of the agent's location.
- Applicare - An applicare is an agent that embeds itself into the application runtime. Typically, a tar file that is unpacked and then referenced in the application startup is adjusted to make it aware of the agent's location.
- Microsoft Bluestripe (also known as FactFinder, Bluestripe) – An agent that bolts onto the OS Kernel that provides performance statistics by process in real time. Microsoft Corporation (MS) is retiring this product in its current incarnation, but there are still pockets of agents that are still deployed.
- Aternity – Aternity is an application performance agent that is deployed on end-user desktops. There are thousands of agents deployed on Veterans Benefits Management System (VBMS) end-user desktops in the field. It will instrument all processes running on an end-user computer.

**Infrastructure Performance**

The tools gather infrastructure data in the following ways:

1. Simple Network Management Protocol (SNMP) Polling
2. Receiving SNMP Traps
3. Agent/Robot installed on OS – Server only (most major OSs)
4. Probes – Units of work deployed on a robot, (e.g., the UIM product has a probe called "CDM" that by is deployed to every robot by default that is the "CPU/disk/memory unit" probe)

- CA Spectrum – The spectrum is the network and server fault isolation and root cause analysis, plus SNMP trap processing.
- CA UIM – Server performance robots are deployed on servers to gather data, such as CPU/disk/mem. Probe based architecture with more than 150 out of-the-box probes to gather not only standard system metrics, but also unique services, such as storage, DNS, synthetics, databases, and others.

- CA eHealth – Server and network performance data that is gathered via SNMP polling of either native OS SNMP agents, or CA's SysEdge SNMP agent, deployed on many servers. This product is set to retire as soon as CA UIM is fully deployed and verified as operational.
- CA's SystemEdge (also known as Sysedge) – A SNMP agent is deployed on many VA enterprise servers. The plan is to retire the use of these agents actively, or only use them in very special circumstances. Data that was being provided for Sysedge/SystemEdge can be handled by using the native SNMP agent that is available on every device on the VA network.

**Network Performance**

The network performance tools you are used to specify who is talking on the network and how much, as well as how those conversations are being delivered on the network. It tells whether the overall transaction performance is being impacted by the application or the network. If setup should be the first stop to understand where the blame lies – did response time degrade due to server response time or network response time?

- CA's Application Delivery Analysis – The application/server and network response time data are analyzed via constant packet captures from switches (SPANs).
- CA's Network Flow Analysis – The network traffic statistics are analyzed via data from routers (NetFlow/IPFIX).
- Riverbed NetProfiler – The network traffic statistics are analyzed via data from routers (NetFlow/IPFIX).
- Riverbed NetShark –The typical deployment of this constant packet capture device is to have an interface that plugs directly into a port aggregator for data.

The CA stack is used in the ITCs. Also, more access is now available to the Riverbed stack, although ITOPS is receiving its data from some of the Wide Area Network (WAN) devices.

**Event Management**

The event management system is used for aggregating events from all previous categories described. Based on the events received, it provides a single point of communication distribution for Simple Mail Transport Protocol (SMTP), short message service (SMS), and the National Service Desk integration. This also provides a single point of contact for downtime requests, as it will acquiesce to event action, and handle every domain product below.

**CA's Service Operations Insight (SOI)** – Uses a series of connectors to evaluate event values for any product. Connectors are used to extract or receive events generated by application,

infrastructure and network domain products. It is vendor agnostic. Third party integrations are typically handled by using SNMP, REST, or custom connector.

**Configuration**

The configuration information that is gathered is done by an agent from CA called "Configuration Automation." This agent will return change information along with discovering both system and application dependencies. Using these dependencies the product can build a map for visual inspection.

**Software Managed by VA IO CC**

There are several other products that are not mentioned, but are available and being used to satisfy project requirements.

**Reporting and Business Intelligence**

- IBM Cognos
- CA Business Intelligence – (Wrapped version of Jaspersoft BI)
- Elastic Stack (ElasticSearch/Logstash/Kibana) – Primarily used for SLA reporting and operations statistics reporting

**Enterprise Dashboard Technology**

- Edge Technologies "enPortal"— Allows the ability to resurface content that is produced in other products; a wrapper of sorts
- Edge Technologies "AppBoard" – A widget-based dashboard
- CA Business Intelligence Dashboards
- CA Service Operations Insight (Operations view)

**Automation**

CA Process Automation – Used for automating and orchestrating processes across disparate systems

**Log File Analytics**

XPOLog – Intelligent log search, analytics, and reporting

**Links of interest**

- The first place to research any VA IO monitoring product is on the VA SharePoint portal found here:

    - https://vaww.sde.portal.va.gov/sites/eo/Products/AITC/NSM/default.aspx?PageView=Shared&InitialTabId=Ribbon.WebPartPage&VisibilityContext=WSSWebPartPage
- Assistance for any of the products and categories mentioned above for a specific project can be acquired by visiting this list on the SharePoint portal:
    - https://vaww.sde.portal.va.gov/sites/eo/Products/AITC/NSM/Lists/Monitoring%20Assignments%20by%20Project/Project%20Summary.aspx?View=%7b1E39E425-F4C1-4345-9B8D-73F49AFF9366%7d&FilterField1=LinkTitle&FilterValue1=TEM
- Hint: The project column filter can be used to select a distinct project name and identify the name in the category. This list provides telephone, IM, and email contact information:
    - https://vaww.sde.portal.va.gov/sites/eo/Products/AITC/NSM/Lists/Monitoring%20Contact%20Numbers/AllItems.aspx