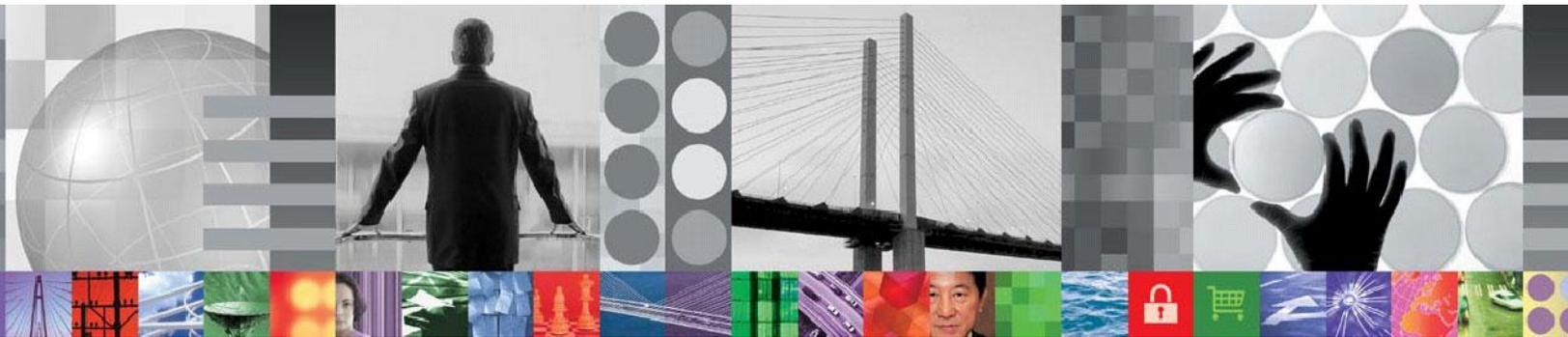


IBM SOLUTION APPROACH
FOR IBM ENTERPRISE ASSET MANAGEMENT
January 28, 2014

Tivoli. software



IBM Solution Approach For Enterprise Asset Management

Document Version 1.2

Katie Doyle
Jerry Saulman
Bill Cary
Cloud & Smarter Infrastructure
IBM Software Group

© Copyright International Business Machines Corporation 2012. All rights reserved.
US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Cor

Table of Contents

Legal disclaimer	iii
INTRODUCTION	1
CHALLENGE	1
OPPORTUNITY of IBM Maximo Asset Management	2
Competitive differentiation	2
IBM Maximo Asset Management	2
IBM Maximo Asset Management Essentials	2
IBM Maximo for Industry (Industry Solutions)	3
Maximo for Transportation	3
Maximo for Oil & Gas	3
Maximo for Life Sciences	4
Maximo for Nuclear Power	4
Maximo for Utilities.....	4
Maximo for Government	5
Maximo for Service Providers	5
Maximo Add-On Functionality	5
Smarter buildings: IBM TRIRIGA Energy Optimization (ITEO).....	5
IBM Tivoli SmartCloud Control Desk.....	5
IBM Advantages: Competitive Differentiators in Smarter Physical Infrastructure.....	6
IBM Advantages: Competitive Differentiators vs. Legacy ITSM Vendors	6
IBM Maximo Enterprise Adapter (MEA).....	6
IBM Maximo for Spatial Asset Management.....	7
IBM Maximo for Archiving with Optim Data Growth Solution	7
Why should Maximo customers invest in Optim?	7
IBM Maximo Asset Management Scheduler	8
IBM Maximo Mobile	8
IBM Maximo Mobile Key Differentiators	8
IBM Maximo Asset Configuration Manager	8
IBM Maximo Calibration	8
IBM Maximo Service Level Agreement (SLA) Manager.....	9
IBM Maximo Monitoring (Usage Monitor).....	9
IBM Maximo Linear Management.....	9
IBM Maximo Health, Safety and Environment (HS&E)Manager	9
IBM Maximo Everyplace.....	10
Introduction to Maximo Tools -- The Power to Grow as You Go	10
Cron tasks	11
Escalations.....	11
Workflows	12
Attached documents	13
E-mail Listeners	13
Preventive Maintenance (PM)	13
Job Plans (JP)	14
KPIs.....	14
Start Centers	14
Security	15

Scripting.....	15
Summary of Maximo Capability.....	16

Deploying Maximo for Performance, Usability, and Stability..... 16

Performance	16
Network.....	17
Hardware.....	17
Operating System.....	17
Services/Middleware	18
Application.....	18
Performance Summary.....	18
Usability.....	19
Searching	19
Screen Design	19
Process design.....	20
Commonly Performed Functions/Tasks/Reporting.....	20
Stability and Availability to Users.....	20
Training	22

Introduction to the IBM Maximo Implementation Success Model..... 22

People.....	23
Process.....	25
Technology.....	26
Success as a Project.....	27
Final Summary.....	28

Legal disclaimer

This document is provided pursuant to the terms of the IBM developerWorks Agreement. It is provided for your internal use only and may not be republished in whole or in part or distributed outside your business enterprise. Its use is subject to those terms as well as the following terms.

The information provided in this document was designed and developed from the existing know-how and experience of IBM. Information provided has been developed as a collection of the experiences of technical services professionals over a wide variety of IBM Client and internal IBM environments, and may be limited in application to those specific hardware and software products and levels.

The information contained in this document has not been submitted to any formal IBM test. The use of this information or the implementation of any of these techniques is your responsibility and depends on your ability to evaluate and integrate them into your operational environment or that of your customers. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Your attempt to adapt these techniques to your own environments or those of your customers is at your own risk, and in some environments you may not achieve all the benefits described. IBM does not warrant or guarantee that any results or performance described in the document will be achieved by you. You are solely responsible for the results obtained from the use of the information contained within the document.

This document is provided “as is” subject to any statutory warranties which cannot be excluded, IBM makes no warranties or conditions, express or implied regarding the document and its content, including but not limited to any implied warranties or conditions of merchantability, satisfactory quality, fitness for a particular purpose, title and any warranty or condition of non-infringement.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of this publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

IBM may not offer the products, services, or feature discussed in this document in all countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785 U.S.A.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials of this IBM product and use of those Web sites is at your own risk.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice and represent goals and objectives only.

Any performance data contained in this document was determined in a controlled environment. Therefore the results obtained in other operating environments may vary significantly. Some measurements quoted in this document may have been made on development-level systems. There is no guarantee that these measurements will be the same on generally available systems. Some measurements quoted in the document may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable for their specific environment.

CONTENT SOURCE OF THIS DOCUMENT

This document is a collaboration of many sources in IBM's Blue Pages, including Wiki's, product literature, solution briefs, Sales Kits, etc. Given that Maximo Enterprise Asset Management is a mature product within a mature market space, there already exist volumes of information about this offering, its market, value drivers, and sales plays. In realizing the wealth of information already available, a decision was made to avoid reinventing the wheel. Therefore, this document is an overview of the Maximo footprint for a non-technical audience who is not likely to know where to begin or how to stitch together a cohesive synopsis. The content is original in some sections, and in other sections is sourced from existing information posted for the IBM community. Below are the known writing/posting/editing credits who are contributors to this overview:

Bill Cary
Katie Doyle
Marvin W. Goodman
Alise Cashman Spence
Sarah A Molnar

Jerry Saulman
Eric Luyer
Dave Calvert
Jingqi Li

INTRODUCTION

Enterprise Asset Management (EAM) addresses the entire lifecycle management of *physical assets* of an organization in order to maximize value. It is a discipline covering areas such as the design, construction, commissioning, operations, maintenance and decommissioning/replacement of a plant, equipment, facility or some other high-value asset. A high-value asset is one that has a significant operational and financial impact on a company's main line of business and profitability. It is "Enterprise", because it spans across departmental, locations, facilities, business units, and geographies. The ultimate goals of managing assets in this way include:

- Improving utilization and performance
- Reducing capital costs
- Reducing operating costs
- Extending an asset's life, and subsequently
- Improving ROA (return on assets).

Asset intensive industries face the harsh realities of operating in highly competitive markets and dealing with high value facilities and equipment where each failure is disruptive and costly. At the same time, they must also adhere to stringent occupational safety, health and environmental regulations. Maintaining optimal availability, reliability, profitability, and operational safety of plant, equipment, facilities and other assets is therefore essential for an organization's success in their respective markets.

Some companies still regard physical asset management as just a more business-focused term for maintenance management. In fact, the term "Computerized Maintenance Management System" or CMMS was commonly used to describe this market space. However, a holistic view that realizes the organization-wide impact and interdependencies with operations, design, asset performance, personnel productivity and lifecycle costs, extends beyond this limiting term. This expansion, or shift in focus, exemplifies the progression from maintenance management or CMMS, to Enterprise Asset Management (EAM). In one particular case, the shift is embodied in the British Standards Publicly Available Specification - [PAS 55](#) (Requirements specification for the optimal management of physical infrastructure assets). See [Institute of Asset Management](#).

Maximo EAM solutions deliver a significant return on investment in relatively short order. Some surveys have shown a 10% to 20% reduction in labor costs, 10% to 15% reduction in inventory costs and up to 25% reduction in time lost to equipment failure. More than simply maintaining plant and equipment, EAM collects data and generates reports for enterprise wide decision making.

This white paper aims to describe the IBM solution approach for Enterprise Asset Management (EAM) specifically through IBM Tivoli's Maximo software offerings. Using non-technical language, this document explains the Maximo EAM solution, as well as its many options and industry add-ons that now expand its applicability into niche industry spaces and operational best practices.

CHALLENGE

Within the EAM footprint, there is something for everyone. The challenge is in evaluating the customer's operations and determining what's working and what's not working, which elements of EAM will bring the fastest return on investment (ROI) and impact the business in a positive way, and establishing an implementation strategy while the business carries on. The software of choice, i.e. Maximo, can only support the underlying business processes, whatever they are.

If those processes are antiquated, inefficient, don't meet industry or regulatory standards, or all of the above, a "business process re-engineering" initiative is the recommended approach (outside the scope of this whitepaper). A business process re-engineering effort may include an overhaul of processes *and* tools, and is a massive undertaking not to be taken lightly. A DIY approach may not bring the best outcome in the shortest timeframe, because the challenge is to see the forest through the trees, and to understand and define an objective and holistic view without being caught up in the politics or day-to-day management of the problems one is trying to solve. Business process re-engineering takes objective industry thought leadership and experience. However, with the right roadmap and tools in place, any company can position themselves for growth, stability and leadership.

Some of the common triggers for a company to consider a solution like Maximo include mandates to:

- Reduce costs and downsize resources in order to operate within budgets that are more limited.
- Take advantage of technological innovation
- Meet regulatory requirements
- Implement automation and best practices

- Provide executive management KPI and reporting insight

OPPORTUNITY of IBM Maximo Asset Management

IBM Enterprise Asset Management (EAM) solutions provide you with the capability to:

- **Support all asset types** with deep enterprise asset management functionality
- Address regulatory and industry-specific needs with ready-made Industry Solutions serving Transportation, Manufacturing, Oil & Gas, Life Sciences, Nuclear, Utilities and Service Providers (see Industry Solution section below)
- Gain visibility and control over critical assets that affect compliance, risk and business performance
- Increase the useful life of physical assets with improved business processes for an increased return on assets and enhanced operational efficiency
- Spread responsibility for operational efficiency across all organizations within a company, beyond the typical MRO stakeholders

The single most important opportunity of IBM Maximo Asset Management is that it can support/manage any and all asset types. The system is extremely flexible and can be tailored/configured/customized to address nearly any asset or organizationally driven needs and requirements.

Competitive differentiation

Why Maximo and not some other EAM solution?

- Maximo was first released in the early 1990's on the then current architecture and computer infrastructure. We're not newcomers to this game.
- Maximo has evolved with technology, providing a solution that's current today and will be in the future.
- Maximo enjoys widespread market leadership with 14% market share in the overall EAM space, and higher market share in some of the individual industries it serves
- Maximo has historical relevance: asset-intensive industries with complex equipment, high investment value, and a need to drive greater efficiency and cost effectiveness
- Scalability allows customers to buy in at an entry level and expand their footprint as needed
- Maximo and Tivoli solutions in the ISM space all sit on the same foundation called Tivoli Process Automation Engine (TPAE), which supports true collaboration between the EAM and ISM product suites and disciplines

IBM Maximo Asset Management

Maximo Asset Management is designed for organizations of all sizes. With Maximo, organizations can take advantage of proven MAM technology and industry best practices using the industry leader in asset management tooling. Maximo delivers all industry standards in asset management while providing the flexibility to configure and customize for your specific business needs

IBM Maximo Asset Management Essentials

Maximo Asset Management Essentials (MAMe) is the "lite" version of Maximo, and is designed for small to medium sized organizations that have very basic asset management needs and require only a subset of the extensive range of features in the full MAM product. With Essentials, smaller organizations can take advantage of proven MAM technology, while also enjoying cost savings.

Generally speaking, there are two candidates for MAMe: 1) a small company (<1000 employees) with basic asset management needs, oftentimes a single facility, and 2) a department within a larger company that has its own unique asset management needs, or they are serving as a Proof Of Concept (POC) implementation or early adopter within a company considering a larger scope with future expansion opportunities.

IBM Maximo for Industry (Industry Solutions)

Maximo EAM supports all asset types but has particularly deep enterprise asset management functionality for key industries including Transportation, Manufacturing, Oil & Gas, Life Sciences, Nuclear, Utilities and Service Providers. Maximo's industry solutions were born out of opportunities to capitalize on Maximo's powerful customization capabilities, and apply them to Maximo within the context of IBM's deep industry expertise. Industry solutions were created in market segments that were clearly definable and repeatable (i.e. common feature requirements throughout that sector) and oftentimes highly regulated - which made it possible to configure and customize to a specific standard. Industry solutions bring tremendous value to such markets with high value assets and mature asset management needs. These ready-made solutions reduce Total Cost of Ownership (TCO), because:

- They eliminate the need for extensive customization
- Are fully supported
- Are upgradeable

The benefits that core Maximo and the Maximo Industry Solutions offer include:

- User access. Knowing how and where users are accessing information is critical
- Auditability. Regulatory requirements make it mandatory for asset management to be both auditable and traceable
- Ease of use. An asset management solution must help speed — rather than impede — business processes and information extraction
- Maintenance. Software standardization must not constrain maintenance processes
- Flexibility. As business processes evolve, your solutions must adapt as well
- Information capture. To extend the life of assets, you must also have a way to capture additional required information

Why are we different?

- The market leader in the EAM space
- The only Enterprise Asset Management (EAM) solution that is integrated with calibration and can be integrated with IT Asset Management through SmartCloud Control Desk on a single platform (TPAE)
- Integrated as a preconfigured solution into the SAP platform as well as an Oracle Financials platform
- Has functionality to support 21CFR (eSig/eAudit).
- Faster time to value relative to other EAM applications.

Maximo for Transportation

IBM Maximo for Transportation provides transportation organizations with best practices to help improve the productivity of their critical assets. This industry solution helps manage critical aspects of each asset's life cycle, while providing key capabilities such as acquisition, automated alerts, campaigns, contract management, life-cycle accounting, labor certification, service level agreements, warranty and disposal.

There is often opportunity for Maximo for Transportation in cases where a company's main revenue generating business is supplemented by a fleet of vehicles. For example, a utility company may use Maximo to manage their transmission/distribution assets, and implement Maximo for Transportation to service their fleets associated with customer service. Both types of assets have interdependencies, and combined, drive success and profitability.

Maximo for Oil & Gas

IBM Maximo for Oil and Gas industry solution provide oil and gas companies with best practices to help improve the productivity of their critical assets. This industry solution helps manage each asset's life cycle including acquisition, work management, inventory control, purchasing and preventive maintenance – all within the strict confines of regulatory compliance. In recent years, regulatory compliance has become increasingly important, as companies strive for environmental sustainability and accountability, as well as operating efficiencies and safety. The oil and gas industry solution has a number of industry-specific enhancements that align to corporate goals and objectives including scalability and standardization, helping to minimize the amount of customization required.

Maximo for Life Sciences

IBM Maximo® for Life Sciences is a complete set of asset management solutions tailored for life sciences organizations that enables operational, service and maintenance managers to track and better manage assets critical to the performance of the business and to help maintain required service levels, all within regulatory compliance. Maximo for Life Sciences helps manage all assets — from equipment, tools and laboratory instruments to maintenance and engineering facilities, to IT equipment such as mobile devices, IP-driven assets and servers.

Asset managers within life sciences organizations need a comprehensive way to centrally manage critical assets throughout the various divisions in which the assets are located — from maintenance, engineering, and research and development to facilities, logistics and IT. Maximo for Life Sciences helps address key considerations including:

Maximizing service delivery, for most healthcare organizations, while managing a sophisticated mix of computerized devices, tools and equipment, systems and technologies is challenging. The ability to proactively monitor these different types of assets in a fast-paced environment is critical to improving quality of care.

Improve care delivery and efficiency

Hospitals that have better asset management can maximize service quality, reduce risk of noncompliance, and manage costs, while assuring the availability of all assets. Using Maximo EA M, organizations can better coordinate the needs of diverse physical facilities within an enterprise while maintaining specific functions within these different facilities. The Maximo solution includes specific capabilities for healthcare. These include:

- Calibration of instruments, tools and special equipment;
- Support for electronic signatures, records and audits;
- Support for asset-related corrective and preventive action (CAPA);
- Validation project support; and
- Integration with document management systems.

Maximo for Nuclear Power

Why IBM Maximo for Nuclear Power?

- Provides clients a unified set of tools and a single infrastructure to manage both IT and operational assets
- Enables management of pervasive devices, RFID & IP-equipped industrial assets on common infrastructure
- Provides innovative, touch-less supply chain management capabilities through automated service delivery
- Enables clients to adopt standard and repeatable processes for lifecycle management of all assets ensuring greater competitiveness and productivity improvements in alignment with business priorities
- Improves client service by leveraging the global reach, deep industry expertise and proven track record of IBM Global Services in the areas of Enterprise Asset Management and IT Service Management
- Increased asset reliability
- Consistency in design and constructions methods
- Revenue enhancements and cost reductions
- Common platform for business units distribution, transmission, power generation (hydro, fossil, nuclear)
- Common platform across all asset types: generation, delivery, facilities, vehicle fleet and IT assets
- Supports right-sizing maintenance inventory
- Improves workforce productivity
- Reduces forced outages and shortens planned outages in generation

The link below describes, in detail, the value proposition of Maximo for Nuclear

[IBM Maximo for Nuclear Power sales kit](#)

Maximo for Utilities

Maximo for Utilities (Maximo T&D) has evolved significantly over the years and has become a leader within the EAM space. Due to the fact that there are multiple disciplines within the broader utility sector, the competitive landscape is important to consider, and varies within the type of utility. Main competitors include

- **SAP – EAM:**
- **Ventrix – Asset Suite (formerly Indus Passport):**

- **LogicaCMG – Asset Information System:**
- **Oracle – SPL World Group:**

Maximo for Government

IBM Maximo® for Government offers a “government-driven” view of assets while helping to address regulatory requirements unique to federal government contracting and personal property management.

- Creates a holistic view of current property ownership, stewardship, location and status, enabling visibility into the entire asset lifecycle
- Facilitates higher asset performance and mission readiness
- Helps to better manage risk and compliance with government, environmental and safety regulations
- Drives accountability and governance through increased visibility and control of assets
- Enables system consolidation and a “government-driven” view from a single platform

Maximo for Service Providers

IBM Maximo for Service Providers helps lower (TCO) and increase profitability and customer satisfaction by managing a customer’s assets either through third-party outsourcing or internally shared services model.

- Provides detailed and accurate billing with a review and approval cycle
- Reduces TCO by leveraging a single deployed instance to manage multiple customers
- Improves efficiency of service delivery with automatic notification and automatic assignments
- Manages multiple customers with many physical locations and provide unique customer agreements and rules to define entitlement of services and pricing
- Automatically bills customers for recurring fees, for asset management, and asset usage

Maximo Add-On Functionality

Smarter buildings: IBM TRIRIGA Energy Optimization (ITEO)

Worldwide, buildings consume 42% of all electricity—more than any other asset. By 2025, buildings will be the largest emitters of greenhouse gases on our planet. In the United States alone, buildings produce 38% of greenhouse gas emissions. So how can we make our buildings smarter?

- IBM's smarter buildings solution capabilities give facilities managers and real estate executives the tools to better manage facility energy and space utilization, reduce operating costs, and prepare for new lease accounting standards that will have a major impact on most organizations.
- IBM solutions for Smarter Buildings also help customers achieve their environmental sustainability goals through key tactics and strategies that help them get there.
- Employing a smarter buildings strategy can help an organization reduce energy use by up to 50%, and increase facilities utilization by up to 85%. In a world where employees are spending less time in the office and more time in alternative workplaces, a smarter buildings strategy can also enhance employee productivity up to 18%.

The ITEO toolset for smarter buildings is based on TRIRIGA, while formerly, the smarter buildings initiative known as IBM Intelligent Building Management, included Maximo. The ITEO offering is now IBM’s standard facilities management offering.

IBM Tivoli SmartCloud Control Desk

SmartCloud Control Desk is IBM’s ISM solution for IT Asset, Service & Change Management. This offering is essentially asset management for the ISM community. There has been multiple re-brandings and re-bundling. Originally, there were three separate solutions that have now been bundled into a single suite:

- TAMIT (Tivoli Asset Management for IT)
- TSRM (Tivoli Service Request Manager)

- CCMDB (Change & Configuration Management DB)

These products are combined to create SmartCloud Control Desk in three flavors:

- SmartCloud Control Desk for Service Providers
- SmartCloud Control Desk
- SmartCloud Control Desk Entry Edition

IBM Advantages: Competitive Differentiators in Smarter Physical Infrastructure

- Single solution to **manage all contributors to business services**, enhancing business agility and **reducing risk to critical services**
- Single platform to manage all types of infrastructure, together bring **one paradigm to both IT, cloud, intelligent, and enterprise assets**
- **Reduced TCO** – common infrastructure, single tool to maintain, reduced training needs

IBM Advantages: Competitive Differentiators vs. Legacy ITSM Vendors

- **Brings together Assets & Configuration Items (CIs)** in a single solution
- Our **platform provides superior time to value** through out of the box process in integration, simple upgrade capabilities and flexible delivery
- Automation enabling businesses to move at the **speed required for cloud** & virtualization environments
- **Broadest set of options for deployment** – traditional install, VM option, SaaS, BP hosting, outsourced
- **Single technology base** for complete solution – no painful rip/replace, and no with legacy code streams
- Benefits of **unified model** – dramatically easier licensing, single install/maintenance stream, allows flexible assignment of tasks

The following link describes these offerings from a Sales perspective:

[SmartCloud Control Desk Overview](#)

While this product suite falls within the IBM Service Management (ISM) product arena, rather than the EAM space, it is mentioned here for two reasons: 1) Uses the same Tivoli Process Automation Engine (TPAE) platform as Maximo allowing it to run in the same environment and interact using the same technology: 2) This is an asset management product, but also addresses ISM IT asset management needs, which are managed significantly different from EAM assets. There is a significant **opportunity** with this product. All companies within the EAM space also have IT assets – i.e. networks, printers, hardware, etc. Maximo for EAM handles physical industrial assets, and SmartCloud Control Desk specifically handles IT assets – all on the same Tivoli Process Automation Engine (TPAE) platform. TPAE originated with the Maximo product, and is often referred to as “Maximo base services”. Cross implementing Maximo EAM and SmartCloud Control Desk with IT Asset Management is a tangible opportunity – as well as a competitive differentiator. No other EAM offering can cover the asset landscape like the Maximo and SmartCloud Control Desk solutions can.

IBM Maximo Enterprise Adapter (MEA)

Maximo data is often exported to other systems or is sourced from other systems and populated in Maximo’s database. To design and manage these integrations, the Maximo Enterprise Adapter (MEA) is used - which provides a complete standards-based integration enablement environment for Maximo providing services for XML, HTTP(S), JMS, JDBC and Web services. This allows clients to connect with other enterprise applications such as Enterprise Resource Planning (ERP) applications.

- Supports both synchronous and asynchronous Web services based integration. Synchronous Web services can be used for real-time querying into Maximo from Portals or from within 3rd party applications.
- Supports multiple integration formats and method with extensive mapping and transformation facilities.
- Rules engine for integration mapping, processing and routing.
- Screen driven integration creations, configuration, customization, and deployment facilities for extending integrations according to your business requirements.
- Built-in auditing, recovery, notification and management facilities.
- Allows quick connect/sharing with enterprise systems.

There is a generic MEA, for developing any integration from scratch, and a Maximo Enterprise Adapter for SAP, and a Maximo Enterprise Adapter for Oracle. The SAP and Oracle MEAs define standard mapping of integration points, and allow customers to modify and add additional integration points, providing a jump start on the integration design/development process.

IBM Maximo for Spatial Asset Management

IBM Maximo Spatial Asset Management allows asset managers to visualize the spatial relationships among managed assets and other mapped features, such as roads, buildings and pipelines. This creates levels of awareness and insight that tabular systems using numbers without graphics cannot provide.

Working closely with the market-leading provider of Geographic Information Systems (GIS) solutions, Esri®, IBM Maximo Spatial Asset Management provides users with visibility into complex GIS information. This solution provides a geospatial context of work, assets and relevant land-based features, which improves reliability, longevity and efficient work execution.

IBM Maximo Spatial Asset Management not only gives Maximo users insight into GIS-related data, but GIS users also gain visibility into the business processes around work and asset management activities, which are equally important.

- Seamless user experience provides access to dynamic GIS functionality, instead of viewing a static maps
- Aligns with the specific business needs and improves work planning and analysis while eliminating the need for data duplication
- GIS functionality inside Maximo can create efficiencies in business processes & improve communication
- Allows organization to take advantage of data that is not maintained in their GIS systems, but provides valuable insights for decision making

IBM Maximo for Archiving with Optim Data Growth Solution

Optim is an IBM data management solution that can be sold separately but may also be included on a limited basis with the Maximo archiving solution.

There are two archive offerings – one includes the Optim Solution, and the other is a Maximo based adapter for customers that already use Optim and don't require the Optim software itself.

IBM Maximo Archiving with Optim Data Growth Solution helps implement policy-driven archiving of Maximo data that will enable you to run Maximo at an optimal configuration while supporting your reporting and data retention requirements. Its unique archiving process allows ongoing archival of Maximo data across configuration changes, versions and upgrades and provides universal reporting and restore of the archives.

IBM Maximo Archiving Adapter for Optim Data Growth Solution is a component of Maximo Archiving that provides the Maximo archive definitions. It is to be used in situations where the customer has existing Optim deployment across their enterprise.

The value-add for this solution includes:

- Allows administrators to upgrade Maximo with greater ease since the data is smaller
- Enables customers to manage smaller Maximo data sets which may improve system performance
- Because archived data is readily accessible, it meets the complex regulatory requirements for data access

Why should Maximo customers invest in Optim?

- Optim is a market leading archiving and data retention solution
- Optim already offers a pre-built integration with Maximo

As Maximo continues to evolve it is taking advantage of new technologies like RFID, barcoding and smart assets that can be automatically discovered. When integrated with the IT Asset Management solution included in SmartCloud Control Desk, the solution serves both the operations and IT sides of the business.

IBM Maximo Asset Management Scheduler

Maximo's planning and scheduling capabilities continue to evolve. Historically, Maximo took advantage of other planning & scheduling tools through integration. These integrations took the form of optional Adapters including

- Maximo Adapter for Primavera
- Maximo Adapter for MS Project

More recently, the Maximo Asset Management Scheduler was released. Its ambitious development path has aligned it quite well within the realm of required capabilities for many of the markets Maximo serves. The Adapter for Primavera will co-exist with the Maximo Scheduler, where hard-core scheduling capabilities are needed, and where Primavera continues to be the defacto standard. In some industries, i.e. Nuclear and Utilities in particular, Maximo might be considered the EAM standard of choice, but Primavera is undoubtedly the industry leader for outage planning and scheduling. For this reason, we continue to offer and support the Adapter for Primavera.

IBM Maximo Asset Management Scheduler is native to Maximo and enables organizations to view and schedule work orders and tasks in a Gantt chart. This enables better prioritization of work, optimal resource usage, decreased asset downtime for maintenance and efficient work planning.

IBM Maximo Mobile

IBM's Maximo Mobile is a collection of mobile applications that extends Maximo functionality into the hands of remote workers. It consists of three applications including:

- IBM Maximo Mobile Work Manager
- IBM Maximo Mobile Inventory Manager
- IBM Maximo Mobile Asset Manager

IBM Maximo Mobile Key Differentiators

- Extends key Maximo applications to mobile devices
- Requires no separate server hardware or 3rd party software components
- Further improves Maximo's overall TCO
- Allows users to operate with/without a connection, and obtain real-time updates when a connection exists
- Enables flexible responses and quicker resolutions.
- Offers consistent Maximo look & feel, and same user experience across devices
- Reduces user training and errors related to switching between UIs

IBM Maximo Asset Configuration Manager

In regulated industries with complex assets—such as transportation, aerospace and defense, nuclear and life sciences—management of asset configuration, component life accounting and equipment operational status is critical to the success of an operation. IBM Maximo® Asset Configuration Manager more accurately tracks the current status of and historical changes to the configuration of assets and their components. As a result, maintenance officers gain an automated asset life-cycle management solution that helps provide a real-time calculation of both an asset's build (from install/remove transactions) and a component's life (from install/remove and usage transactions), including the real-time application of cycle formulas. Maximo Asset Configuration Manager provides key capabilities needed by organizations managing aviation, aerospace and defense, rail, nuclear and pharmaceutical assets.

IBM Maximo Calibration

It provides all requirements for traceability and reverse traceability, all calibration history data, calibration data sheets and required reporting.

- Automate calibration processes across your enterprise to help increase effectiveness and minimize operating costs
- Leverage full traceability and reverse traceability to ease compliance with industry regulations
- Enable technicians to perform mobile calibration using handheld computers to streamline work tasks
- Enhance accuracy and reporting of instrument calibration to help address regulatory compliance

IBM Maximo Service Level Agreement (SLA) Manager

IBM Maximo SLA Manager defines service offerings, establishes SLAs, implements escalation procedures to attain service levels and provides metrics to monitor service level delivery. This product is an option for IBM Maximo Asset Management, IBM Maximo Asset Management for IT and IBM Tivoli Service Desk.

IBM Maximo Monitoring (Usage Monitor)

IBM Maximo Usage Monitor is a utility designed to assist customers in the day-to-day support of their Maximo systems and provides a browser-based problem solving capability across all the major elements of a Maximo system. It can work with Maximo on or offline. Customers can use this tool to increase system availability and reduce the cost of supporting the application by facilitating faster fault diagnosis and repair of problems that may be caused by improper set up of Maximo, or configuration control issues that can be difficult to detect. This tool also helps support personnel to identify server and database issues that could be the cause of a problem with Maximo. This product is an option for IBM Maximo Asset Management.

IBM Maximo Linear Management

For asset intensive and highly regulated industries such as railway, roadway, oil and gas, and utilities, using a top/down or hierarchical approach to manage linear assets is a difficult and complex process. The critical infrastructure in these industries requires a different view and approach than what is typically supported by most asset management systems. Unlike the assets found in a facility, plant or fleet, linear assets have unique requirements that demand a unique asset management approach. This approach is called continuous or linear asset management. IBM Maximo Linear Asset Manager helps manage all linear asset types. Examples include:

- Railways—tracks, switches, frogs, crossovers, signals
- Roads—lanes, bridges, tunnels, variable message signs (VMS), traffic signals
- Pipelines—pipes, valves, pumps, pipeline inspection gauges
- Power lines—electric transmission and distribution systems, substations, towers and poles

Part of the IBM Tivoli® software portfolio, Maximo Linear Asset Manager can help organizations maintain assets more efficiently, extend asset life, reduce operating costs and more effectively monitor and manage their efforts to meet compliance requirements. Maximo Linear Asset Manager integrates seamlessly with other asset management and work management functions through IBM Maximo Asset Management. Maximo Linear Asset Manager and Maximo Asset Management comprise an adaptable asset management solution based on an industry-standard, service-oriented, Internet-ready architecture.

IBM Maximo Health, Safety and Environment (HS&E) Manager

The primary objective of Health, Safety, and Environment (HS&E) initiatives is to reduce overall risk and to comply with appropriate regulations as well as to create a safe and efficient operating environment for an organization. Achieving this objective is as much about standardizing HS&E practices as integrating these practices with day-to-day operations management. IBM Maximo® Asset Management provides a foundational enterprise platform that integrates Health, Safety, and Environment processes with work and asset management data and processes to provide a single view of your processes, production, facilities, assets, personnel and operations. HS&E helps solve safety concerns by:

- Deploying an integrated and sophisticated Enterprise Asset Management solution that has a strong focus on asset availability, reliability, performance, safety, risk and compliance.
- Incident and Change management providing a central application for reporting all incidents spanning work, personnel, safety, health and environment
- Transparency and visibility across operations, safety, maintenance, and engineering domains of all types of changes, including safety plans, environmental controls, mechanical, operating procedures, and job plans.
- Support of all manner of investigations to analyze recurring incidents or defects when Root Cause Analysis (RCA) or After Action Review (AAR) is required.
- Providing complete traceability into historical incidents, defects, work orders, earlier corrective actions/solutions or virtually any other type of HS&E activity pertinent to the investigation.

- Providing an integrated approach to manage and eliminate defects, hazards & precautions, as well as it supports risk management and improved safety principles by creating greater visibility into risk associated with work requirements in hazardous locations and around hazardous assets and equipment.
- Providing iterative document that links with all associated HS&E activities and organizational data. Maximo helps to standardize how an enterprise manages risk in challenging operating environments.

IBM Maximo Everyplace

The opportunity: Maximo customers want Maximo functionality available wherever they are and on any device. Maximo Everyplace is a developers or system administrators' tool that provides application designer functionality for bringing any existing IBM Maximo application to an iPhone, iPad, iPod touch, Android, Blackberry, or other supported device without installing anything on those devices.

Maximo Everyplace enables users to:

- Shorten the lag time between an event's occurrence and the recording of that event in the system. There's no need to wait until they get back to their desk to enter or retrieve data.
- Increase accuracy of data in the system by allowing them to enter information while it's fresh in their minds.
- Offer convenient, targeted access to Maximo for workers who don't regularly sit at a desk or use a desktop computer.

Introduction to Maximo Tools -- The Power to Grow as You Go

Asset management is the practice that many companies and enterprises employ to make sure that they are getting the maximum value out of their operating assets and critical infrastructure that they depend on to run their business. Asset management has to do with improving the availability, reliability, and uptime of different types of operating assets. The structure of technical product functionality can run very deep depending on the level to which the product is utilized and the skills of the team implementing the solution. There are a host of built-in services and concepts that are most often used to deliver functionality. This section discusses some of the most commonly exploited options in the Maximo solution.

Some of the business value from Maximo, as with many others, is the availability and reliability of business data. Question like how many hours does it take to accomplish X, how does that break down across tasks, across groups, how much skill is required, and thus how much it truly costs to do something are often difficult to answer. The path to good asset management answers is a journey, not an immediate destination for most people. The Maximo offerings provide the "grow as you go" ability for a customer to minimally engage components until you are ready to enhance the offering by further exploiting additional function and capability. It's usually not a technical limitation, but typically more of an organization/change/process question.

There are many different elements in the enterprise picture that need to be a part of asset management before you really start to have a complete picture and get a handle on what it will take to maximize asset ROI. Things like asset locations, maintenance plans and history, contracts, warranties, leases, parts inventories, tools, technicians, etc. are critical building blocks to solving the asset management puzzle. As many parts as there are, it's not a mystery why the different approaches to managing each part have thus far been very different across IBM clients as a whole. Some people are more prepared than others to deal with labor cost, or preventative maintenance for instance. One customer may choose to only go out to fix something that breaks. Another whose business could be at risk if any given asset is down (think telecommunications) is more keen on proactively maintaining their assets to prevent any unplanned outages.

As there are many aspects to asset management there are also many different parts of the IBM Maximo Asset Management solution. As important as it is to understand all aspects of asset lifecycle management, it is just as important to understand the tools available to perform that management to maximize the value received from assets. The parts of the process and the management tools work in conjunction with each other to address many different needs around the orchestration of process, monitoring, reporting of the process, and the operation of the tools. The

purpose of this section of the document is to demonstrate some of the more sophisticated concepts in the product and talk about the value to the business in exploiting them, as well as to progress through some of the more important parts of the product that are key enablers of the product value. All of these aspects are touched on in this section though a more in-depth understanding will be required to successfully implement Maximo. The items in this list are some of the "internal applications" to the overall solution discussed in this section. The intended flows of discussions are to progress through the list to try to build upon the previous topics:

- cron tasks
- escalations
- workflows
- attached documents
- e-mail listeners
- PMs
- job plans
- KPIs
- start centers
- security
- scripting

Cron tasks

Cron tasks can be thought of as scheduled processes that can be customized to perform tasks and scheduled to run at the required interval. Cron tasks are a technology piece that underlies the entire offering and function as the engine for automating many aspects of Maximo. As a means of automating functions within the product, this engine exists to drive the execution of these functions. This engine is commonly run in its own separate/dedicated java virtual machine environment and may be clustered for large numbers of executions of those tasks. This engine is referred to as the cron task engine which is represented by a scheduler function and an execution function. The scheduler function watches for the time when the action should be taken or when it is perhaps past due being taken and the execution function is what happens at the action time and how it is recorded for history. The system very intelligently determines as time passes which things have elapsed their time prior to being executed and will attempt to accomplish those activities in a manner that delivers the start of those actions as closely to the desired time frame as possible. Once configured and scheduled, cron tasks execute fully automatically.

Examples which show the value of this technology and how it can add value to the solution include: running and generating scheduled work orders for planned maintenance (PM) when preventive maintenance has been scheduled, generating key performance indicator (KPI) values, escalating processes when service levels are at risk, automating the reception of e-mails and turning them into service requests, monitoring integration points for required activity, and generating work orders on the basis of meter readings or other measurements.

In addition to calling standard built in functionality in Maximo, cron tasks can also be custom developed through the use of java classes to perform functions unique to your organization.

The bottom line value of the cron task engine is that the system is able to do things like police the data for required actions, analyze and report on the data, monitor service level agreement compliance and import more data without any human interaction being required. While the term automation typically does not mean much to the end user, automating tasks can reduce steps to accomplish complex tasks and minimizes errors caused by the incorrect actions of users. When looking at it from a management perspective, it is an almost invisible, extremely powerful component of the offering providing reliability and intelligence while driving much of the functionality of the product. This engine forms the fundamental building block for all of the automation in the product.

Escalations

Escalations represent a means of monitoring of records to determine when to take actions or send notifications. Escalations use the power of the cron task engine to react based on predetermined conditions, take an action to

increase the priority or visibility of a situation or condition. An example of an escalation that could be put into place is when a work request is opened but no person has reviewed it within a certain number of hours, an e-mail notification is sent to the team lead of the team to let them know that there is a work request that is trending towards violation of a service level agreement. If the team lead does not respond within some period of time after that, the escalation could be followed by another escalation contacting the manager of the team, and so on.

Using escalations can help track compliance with service level agreements which in turn helps to make the business case justifying delivery of service charges. The customer can know that someone is watching the SLA for each request, escalating when the SLA is at risk, and notifying the appropriate chain of management to ensure delivery of the agreed upon service levels.

Based upon the asset management strategy of the company, escalations can play very different roles. For instance, at a company where maintenance strategy is only break-fix, the criticality of an asset whose service delivery has been compromised by a break down can mean that someone must respond quickly to get the issue resolved. At another where preventative maintenance is religiously observed, assets whose time for asset maintenance is closely arriving can use escalation where a team lead has failed to make an assignment on the work order.

In summary, escalations are a strong part of the arsenal of functionality within the product. They can be used with any application in Maximo. They provide the ability for the product to have rules that make sure that someone responds, that someone follows up with someone, or that something gets escalating criticality based on the business logic and service level agreements.

Workflows

A very powerful aspect of the product set is the workflow engine. Workflows provide the ability to control, direct and automate the flow of a process using a drag-and-drop builder tool combined with powerful customization capabilities. Workflows support many different types of controls and represent a complete start to finish cycle for any document or process. Individuals can be instructed to act on records (approve this work request,) have a delegate do the response when the original person is unavailable, make sure that the approvals process is flowing according to desired time intervals, and ensure an audit trail exists for each record and process. The workflow can be extremely extendable and you can, for instance, design processes or sub-processes that are specific to an organization or specific to a site, through the use of logical branching. Workflows can also be built for any application including custom applications using the Tivoli Process Automation Engine (TPAE) infrastructure.

Workflows can also extend beyond the normal function of many types of applications by being able to interact with external automation. A workflow process can run a program, such as a batch file or an .exe file that is stored on a local server. A workflow process for one type of record can launch a process for another type of record. For example, a service request can launch a process for an incident. A process can contain sub-processes. When a process requires user interaction, the product can direct a user to a specific application, to a tab, or to an action. Using workflow, users can be walked by hand through a business process from start to finish.

The workflow itself can also be managed manually if there is a requirement to control the flow in some way that was not originally intended (when authorized). For example, if a task must be performed by someone other than called for by the workflow, the task may be re-routed to them or even stopped. In the drag-and-drop builder, you can create all sorts of notifications and messages that are sent at any point along the workflow.

What workflow means at a high level is that business processes can be directly modeled and managed. Processes can be written in such a way that exceptions based on a range of tests can be written right into the logic and thus even an exception can be managed as business as usual. Workflows can minimize the amount of work required to write business processes into the product.

Attached documents

The attached documents functionality provides a way to attach documents that are related to certain types of data and records to that data without storing the documents in the database. Documents may be retrieved from a file server or document management system. This reduces the overall size of the database, permits multiple items to share the same document where it is relevant and allows for external management of the content of those documents. Examples might be materials data safety sheets or Computer Aided Design (CAD) documents. A materials data safety sheet for a cleaning product used on several different assets for cleaning parts could be saved a single time in the document management system and called from every relevant record. A CAD document with parts descriptions for a particular model of equipment could be stored and associated with all plant and equipment of that model. The types of attachments can be text files, flow charts or diagrams, and images. Attached documents can also be used within job plans to attach a document detailing the exacting steps for a preventative maintenance that can be then printed out or reviewed online by the technician. An asset record can be attached to a picture of the asset enabling management of the task at hand to be done by an external checklist or instruction.

The attached documents functionality means that users can augment data entry with pre-existing information, diagrams, graphics, externally-generated documentation, without doing any sort of conversion in order to embed the information into the system. Content can be referenced directly via a file server or document management system delivering high quality intellectual capital reuse to deliver value.

E-mail Listeners

Maximo's email functionality leverages all the power of the previously described functions and more. Email listeners are scheduled using cron tasks to pole for new messages from their associated mailbox and retrieve them from the mail server. The email listener parser pre-processes the content of the email and stages the mail content in a table. The included email workflow determines the appropriate action for the email. Email messages containing free-form text are processed as new Service Requests or updates to existing Service Requests. Email messages containing formatted text (name-value or XML tags) are processed based on the business object and action specified in the message body. The object can be Service Request, Problem or Incident and the action can be Add or Update. In addition to these primary operations, formatted email messages can specify Change Status or Query actions on any business object and are not limited to the core three objects as the add and update actions are.

Another capability of Maximo not described here is Communication Templates. These can be considered patterns for sending email out of Maximo. The email listener leverages the functionality of communication templates for responding with results from email requests. Upon processing incoming email, the listener component ensures that email responses are generated and returned to the sender. Email responses are triggered at appropriate points in email processing. For example, upon creating a new Service Request through email, the listener executes a Communication Template that sends a response to the sender with the new request number

The Maximo Email Listener builds on the value delivered in the solution by leveraging the tools and technology that users are already familiar with through enabled email processing. Organizations can take advantage of existing mobile infrastructure to easily, quickly, and efficiently process work necessary for Enterprise Asset Management without requiring direct access to a terminal to perform work.

Preventive Maintenance (PM)

The IBM solution features a comprehensive maintenance work management solution for planned and unplanned activities including long- and short-term planning, schedule management, resource optimization and key performance indicators. Preventive maintenance is part of this capability which focuses on the ability to create frequency-based records for PM assignments and hierarchies of those records. This in turn allows for the frequency-based records to create work orders. Hierarchies of frequency-based records can create hierarchies of work orders. Complex multi-task oriented work hierarchies can be built to cover many jobs and view them from cost and work management perspectives.

Another type of PM is a route-based PM. This type of PM is typically used to, but not limited to, performing inspections and can group assets or locations. Someone who might have many PM assignments over a day, a week, or a month could have them orchestrated in a way that makes sense along a route where work is routinely being done. Since PMs are performed on a frequency schedule, they can be scheduled by time (Example: 3 months) or meter (example: 3000 miles) or a combination of both (3 months or 3000 miles). Scheduling can also be done using lead times, seasonal work schedules, or by some outside initiation of work. Using Condition Monitoring (CM), the condition of a piece of equipment can be monitored and a PM can be generated based on some threshold like temperature or vibration level.

PMs help manage very comprehensive conditions and can be set to trigger a timely and appropriate preventative maintenance activity in such a way as to allow work to be performed by the right technician using a logistics scheme that makes the most sense. Assets that follow the recommended manufacturer maintenance schedule are shown to have less corrective maintenance and downtime, therefore reducing maintenance costs and increasing the life cycle of the asset. Efficient approaches to performing work combined with appropriate maintenance schedules maximize Return On Assets (ROA).

Job Plans (JP)

A job plan is a planned set of maintenance tasks that identify the right resources (labor, materials, tools, and services) against one or more like assets. All aspects of Maximo will deliver the most value when it is implemented using best industry practices combined with quality data and Job Plans are no exception. Although Maximo supports the most advanced and complex usage of Job Plans, they can also be simplistically implemented for less advanced shops keeping complexity to a minimum. JP work tasks can be as simple as a single task to a more complex detailed set of instructions with attached documents containing specific instructions. As with most aspects of Maximo, Job Plans can start out simple and can grow with the needs of the organization.

As was the case with PMs, a hierarchy of job plans can exist by using nested job plans. This enables coordination of efforts among groups with completely different teams who must pool their efforts to successfully deliver a plan. Job plans can be shared across organizations or can be site-specific. This reduces the need for multiple job plans for similar assets also cutting costs.

The value of job plans is that you can have documented task steps and objectives written into the solution that fit the way your organization is ready to use them. The flexibility of JPs allows for step by step instructions with complex labor calculations projecting costs for work up front to the simplicity just some documentation available for the work person. Either way or both, Maximo can deliver the value you need. The difference between the two options, as previously mentioned, is really about the data and your organizations policies and goals. If you don't know how to do something or you don't know how long something takes, it will push you to the second scenario until you are ready to tackle the additional data gathering and population of that data into your solution.

KPIs

Key performance indicators (KPIs) come pre-configured for some standard business questions: am I trending towards SLA violation, how many open work requests are there for my department, etc. These KPIs are visual graphic representations of the answers to these questions and more. KPIs provide the basis for building "dashboard" views for management or individuals being assigned work within the solution. The power of KPIs in the Maximo solution is that they can be customized to use a wide array of variables including site, unit, system and more options so that the feedback is targeted to the viewer and a person in organization A can be viewing the same KPI as someone in organization B and yet the content displayed is the appropriate data for their organization.

Start Centers

The Start Center for a user is their launch page for commonly used tools and KPIs in the Maximo solution. Does their start center provide them with a graph showing trending information or does it merely bring up a list of the unassigned work requests? Those are but two of the many possibilities that can be configured in a Start Center. A

user can also have multiple start centers based on their roles and job functions. The administrator can assign and configure start centers for users and they can be empowered or restricted depending on organization needs in how much they can/if they can change their start centers. This flexibility allows users to configure their work environment in the most usable way for them.

Power users may not really need a start center with much displayed, if anything. Every function that is available in a start center is also reachable via the product menus and a little configuration. For those users who are only going to use the product occasionally, for example someone who approves a purchase order, a start center that presents POs needing their approval might be the ideal solution. As previously discussed with the e-mail listener, there may be other options and automation to fill this need or facilitate it including the optional use of the mobile solutions.

Start Centers simplify the way a user interacts with Maximo and, in some cases, may allow flexibility to configure for varying job functions. Start Centers will maximize user efficiency.

Security

Security is something everyone thinks should be there but nothing that anyone wants to stand in the way of their job, and it shouldn't. In the solution that will be implemented with Maximo there are very granular capabilities to control what someone sees (fields on the screen), what content they can select/view, whether they can only read records, modify them, or create new ones.

In Maximo, security uses the concept of a role that someone plays in the organization. In order to accomplish their role, they may require multiple security permissions spanning groups. In some cases there may be a need to restrict their data viewing to only a site, or to read records from any site but only edit records for their site.

In addition to standard role and user privileges, it is also possible to restrict users limits and tolerances such as how much a purchase order can be approved for. Combining such rules with other functionality like workflow and escalations, rules like automated approvals and when to seek additional approvals can be built in to the solution.

Through customization, even more security controls can be pieced together. As an example of this type of function; do you want to display the text of a client record but black out the clients credit card information with X's? It can be done without actually removing the credit card information. Users who do not need to see the card numbers can see that one has been entered in the record, but not what the number is while authorized users can see the content.

The value of security in the IBM Maximo offering is that out of the box the security is capable of being configured to very exacting security standards. User actions can be automated and controlled according to business process limiting risk exposure for your organization.

Scripting

Automation scripts are used to implement object rules, field validations, workflow actions, condition logic, escalation actions, and security condition logic. Scripts can reduce the time that you spend on automating tasks because you do not need to recompile Java files or restart the server. Wizards are used to create the components of an automation script. The purpose of these scripts is to automate routine tasks. As an example, consider the case of a pipeline break. Based on the volume of the pipeline, different teams may be dispatched. If the volume of the pipeline is above some level, you may also be required to create a worklog for tracking work detail while less volume may not have that requirement.

The Maximo scripting solution uses two very commonly used scripting languages: JavaScript and Jython and can be extended to support any JSR-223 compliant scripting languages. This means that most development organizations will have resources support any scripting required by the project team. The capabilities of the scripting solution can retrieve business application data without the level of API programming usually associated with products like this.

The real value comes from the time required to create automation. Once the problem and scenarios are defined, scripting delivers above average time to value with little overhead for specialized support. The script code is available to be immediately deployed and does not impact application availability.

Summary of Maximo Capability

The IBM Maximo Asset Management solution is built around industry best practices standards for asset management and contains a very powerful set of tools to make implementation and deployment fast and stable. While the basic standards cover most usual requirements, for those deviations that many business processes have, the power to configure and customize to your specific needs are unmatched. The flexibility of Maximo means you can use the function and power of it as you need it. If this is your first Asset Management implementation, you can choose out of the box functionality that exceeds the power of other products with the least amount of complexity or, if you have a complex organization that needs interfaces to multiple external applications and requires specialized business process, Maximo has the ability to match your requirements using tried and true solutions. This document is about what you can do with Maximo but IBM has a broad library of intellectual capital on how to best meet the specific needs of your organization. You can begin using Asset Management at any level and grow as your organizational requirements grow and change.

Deploying Maximo for Performance, Usability, and Stability

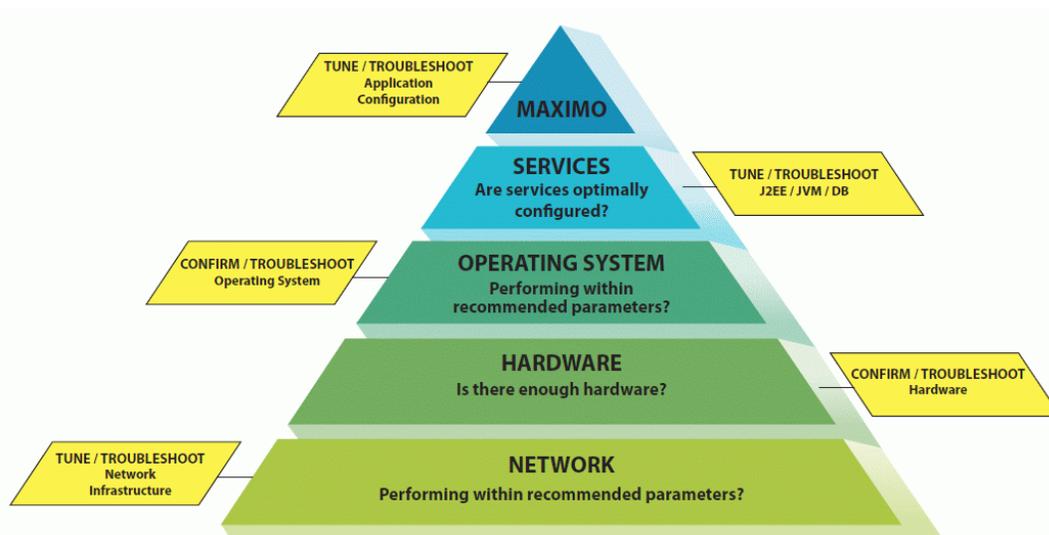
The success of an application that relies on input from its users is directly tied to the usability of the tools. If a user must wait too long for the tool to respond or the process they must follow is too complex or their training on the tools is not sufficient, a natural instinct will be to find ways around using the tools properly. Any negative response by users must be avoided to ensure the tools can deliver their maximum value. Although the intent of this document is not to provide detailed implementation information, the reader should understand the components and critical decision points for deployment to help with the overall understanding of the tools and project planning.

Performance

Maximo is designed for essentially limitless scalability. This means that no matter how many users or how much automated work is added to the system, by adding virtual and physical components, the systems power can be expanded to support the requirements. Maximo was a leader in EAM development when development on the Java platform, now the defacto standard for all web a lot of developments development, began in 1998. Prior to expanding to the new technology, Maximo had already attained a leadership position in the EAM market making it the product of choice for all industries. Moving to the new platform allowed Maximo to not only move the existing capabilities to a more growth oriented technology, it allowed for widely expanded customization options to tailor EAM products to specific business requirements. The new architecture minimized client configuration generating huge savings for companies by minimizing desktop support. In addition, the new capabilities included centralized management, multiple site and organization capabilities reducing installations and providing a more cohesive rollout report capability, and scalability to support larger user communities.

Java technology is driven by Java Virtual Machines (JVMs) which essentially take predefined resources such as processors and memory from hardware and execute code in the predefined area to deliver functionality. When Maximo is running there is at least one defined JVM running with the Maximo code running inside it. The code running in the JVM then connects to a database service where user data as well as parameters that control how the code functions (called metadata) is stored. The flexibility that allows the application to grow as required is made available through the JVM architecture. When additional processing power is required, another JVM with another copy of the Maximo code running can be added which will increase the capabilities of the overall system in terms of processing power. By adding another technology for load balancing, users are shielded from any specifics about how they connect to the system. A single web address (URL) will automatically direct them to the best JVM to service their requests.

Reliant technologies are those technologies that Maximo relies on to execute and provide services. Java applications cannot run as stand-alone tools and, in the case of Maximo, rely on networks, hardware, operating systems, application servers, database servers, and in some cases other function. To understand how to ensure maximum performance of a system, an understanding of reliant technologies and where bottlenecks can occur is required. The diagram below depicts the architecture from a technology stack perspective.



Network

As shown, the network is at the core of any web based application. The users cannot connect to the application without a network to deliver their web browser requests. Additionally, in a typical multi-tier environment, the application may be on one physical server while the database is on a separate server. In this case a network is required for the components to communicate.

Hardware

Physical servers are connected to the network. Physical servers must meet the minimum requirements published in the documentation for maximized performance. In general the hardware must be 64 bit architecture compliant meaning that the processor can process 64 bit words and the associated properties such as boards and memory must be able to support 64 bit processing. Memory is variable, depending on the technology component, and may need to be tuned to specific environments. For application servers, the operating system should have 4 gigabytes (GB) of physical memory allocated to it and each running JVM should have 4GB allocated to it. For example, a physical server that is running two JVMs will require 12GB of memory. If other processes are run on the same hardware, physical memory must be allocated for those processes. Another general rule of thumb is to allocate one processor for the operating system and one processor for each running JVM. The actual requirement may depend on the power of the processor. It is recommended that implementation projects include a plan for load testing prior to making final decisions about hardware purchases. Running a scaled test to determine processor utilization and extrapolating the result for number of JVMs to be supported can provide a better estimate; however, to minimize risk associated with an underperforming system, IBM recommends over estimating hardware requirements as opposed to under estimating. Estimating processor utilization can be a difficult task as it may depend on amount of configuration and customization applied to the product. For database servers, IBM recommends working with the database vendor to obtain hardware requirements for load, throughput, and high availability.

Operating System

The Operating System (OS) is installed on the hardware. In production environments the OS must support 64 bit operations. If the OS is installed in a virtual environment such as VMWare™ the environment will be in a Virtual Machine (VM - different from a JVM). It is critical that the memory allocated to the VM and the JVM is physical, not shared memory. Memory swapping is the most common cause of performance issues in Java applications.

Services/Middleware

Services required for the application to run are also called middleware. This is because they are a requirement of the application but users do not interact directly with those services so they are “in the middle” of the application and the hardware. Maximo relies on at least two types of middleware: application servers and database servers.

Application servers manage multiple JVMs, and provide supporting functionality such as Directory Servers using Lightweight Directory Access Protocol (LDAP) authentication, Java Message Service (JMS) queues for integration, software load balancing as well as others. Database servers are used to hold user and configuration data. Since every user request is passed through the application server and every transaction uses the database server to access or store data, ensuring middleware tools are tuned and architected properly provides a platform for performance.

Application

The Maximo application has many parameters built in to manage and improve the way it interacts with reliant technologies. Caching, network packet compression, database settings, connection pool settings, implementation choices, and functionality isolation are some of the settings that have an impact on how the application performs.

Functionality isolation is the process by which an instance of the Maximo code is dedicated to running just one aspect of the functions the code offers. The types of functionality that can be separated include scheduled tasks (cron tasks) and escalations, User Interface (UI), and reporting. Since many things are controlled by cron tasks, this capability provides great flexibility in how JVMs can be dedicated to work. Most commonly separated functionality includes, incoming integration processing, reporting, and any processor intensive cron tasks such as Preventive Maintenance (PM) work order generation or any intensive custom crons. Separating cron functionality is a simple task of configuring the DoNotRun parameter using the built-in tools and instance configuration. More information on separating scheduled tasks is available at the following link:

[Using System Instance Properties to Control Cron Tasks](#)

To separate reporting onto a dedicated JVM the property “mxe.report.birt.viewerurl” is configured. More information on performance options for the Birt reporting engine is available at the following link:

[V7 Report Performance Considerations](#)

More detailed information about some of the tools discussed here is included in this document in the section entitled “**Introduction to Maximo Tools**”

Performance Summary

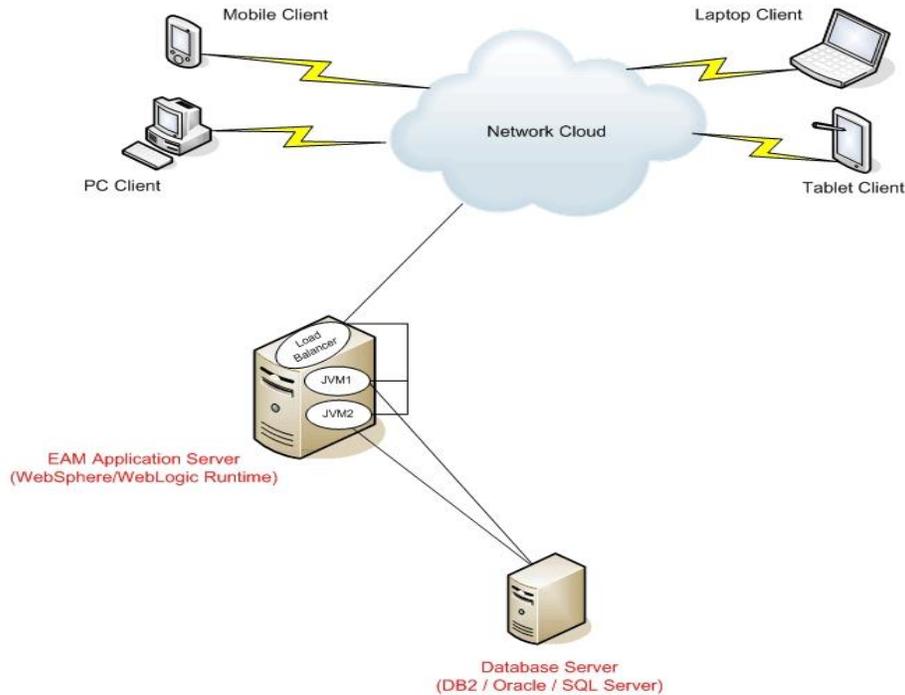
Much of the information regarding a stable, well performing system is technical in nature. This high level view of the known pitfalls in planning are presented for planning purposes. Readers, both technical and management, should now have an understanding of the what, whys, and how’s of planning a successful implementation. When designing a system architecture, it is important to remember that if a product relies on another technology, the product can only perform as well as the technology it relies on. In the case of Maximo, even if the product is tuned to maximum performance, if the network, hardware, operating systems, and middleware are not performing optimally, the perceived application performance for the end user may suffer. IBM has published an extensive white paper to assist with proper performance tuning. Implementers should become familiar with all details of this publication available at the following link:

[Maximo 7.5 Performance White Paper](#)

The value returned by a well performing application is nearly immeasurable. Since the ROI for Maximo is dependent on the adoption by the user community, poor performance could cost all of the intended savings due to reduced adoption.

The diagram below depicts a load balanced environment where JVM1 and JVM2 are fully functional instances of Maximo. Because each JVM is an instance of the Maximo application and maintains its own connections to the database, either one is suitable to service the user request.

- Users connect to the application server through the network cloud.
- An HTTP Server receives the request and determines which of the two Application JVMs the request should be directed to (shown as the load balancer in this diagram).
- The first user will be directed to Maximo instance 1 (shown as JVM1), the second user will be directed to Maximo instance 2 (shown as JVM2), and the third user will be directed to Maximo Instance 1 again. This balances the amount of work either of the Maximo instances needs to perform. It should be noted that because Maximo uses a unique transaction type (called serialized), once a user logs into to a JVM all of their future transactions must be processed through that same JVM until they log out and log back in again.



Because of this alternate redirection of users to the JVMs, the load on each JVM is generally balanced allowing for two JVMs to perform twice the work of a single JVM while the connection details are invisible to the end user.

Usability

A user's perspective of usability and complexity can be fairly subjective. The goal of a good implementation should be to deliver the requirements of the business and minimize any negative impact on a user's ability to perform their job. Performance is one aspect of this but some of the choices made during implementation intended to increase usability may actually impacting performance negatively. A clear understanding of these tradeoffs is required to make the right implementation decisions. Some of the key implementations choices that impact how a user views the application are described below.

Searching

The Maximo product set ships with wildcard searching enabled on many fields. Wildcard searching simplifies how the user finds information in a database. A user can type in the word "pump" and all instances of the word pump, no matter where they fall in the text field, will be found. For example, "pump" might result in "sump pump", "pump house", and "Insulin Infusion Pump". While this appears easy for the end user, it will impact database performance because it removes the ability of the database to use indexes. For smaller user communities, the impact might not be noticed but as the user community and data volume grows, the impact becomes more apparent and changing the functionality after users have become accustomed to it could lead to negative perceptions of the tools.

Screen Design

Common implementations in EAM use different groups of people to perform different types of work. Even though several teams may use a single application, for example Workorder, they may need different fields and perform very

different functions. It is common for implementers to design a catch all screen that may be complex, require scrolling, and perform poorly. An implementation should identify the primary work groups and have application screens designed and targeted to the work they do. Maximo has Graphical User Interface (GUI) tools built into the product to facilitate configuration.

Process design

Defining business process is important to the business. Designing how the tools perform those processes is important to the users. Much like any program can hide the details of how a result is obtained, Maximo processes can be designed to simplify what it takes to accomplish a series of tasks. Using tools that automatically drive work to its desired end (called Workflow), scheduled tasks that automatically perform functions on a scheduled basis (cron tasks), and processes that automatically raise the priority or elevate to the next level (escalations), many tasks can be automated. Automating tasks not only alleviates the user from having to manually perform them but they minimize human error thus improving efficiency. The tools included in the Maximo application make configuring business process flow a simple, successful, and repeatable task.

Commonly Performed Functions/Tasks/Reporting

Maximo provides a wide array of tools to give feedback on data and simplify user tasks. Commands used to search for data are called queries and there are a number of ways users can execute them. Ad hoc queries, query by example, and saved queries as well as Key Performance Indicators (KPIs) and saved reports can be used to bring data to users and analyze the information. All of these tools may be used to develop solutions for requirements but caution should be used to take consistent approaches to similar tasks minimizing any perception of complexity.

Stability and Availability to Users

The reality that for users to be able to use an application it must be available seems so intuitive that often, planning for availability is overlooked. As with performance and usability, availability impacts how a user views the system. If the system is viewed as unreliable, the user may look for other ways to accomplish their work rather than use a system they cannot depend on. The Maximo architecture is built with the concept of "high availability" (also called fault tolerance) in mind. That is, the capability for redundant systems and minimized down time is built in. While some aspects of the high availability model may overlap with the configuration for performance, these concepts are very different. Performance tuning ensures that when a system is available it will perform well while high availability ensures that the system is always available. As with the performance discussion, this section is not intended to provide detailed steps on how to architect a high availability solution but more as a high level view of how the configuration works. Detailed information on these topics are available from IBM but it is important to understand that the capability is part of the solution and can be as highly available as you need it to be.

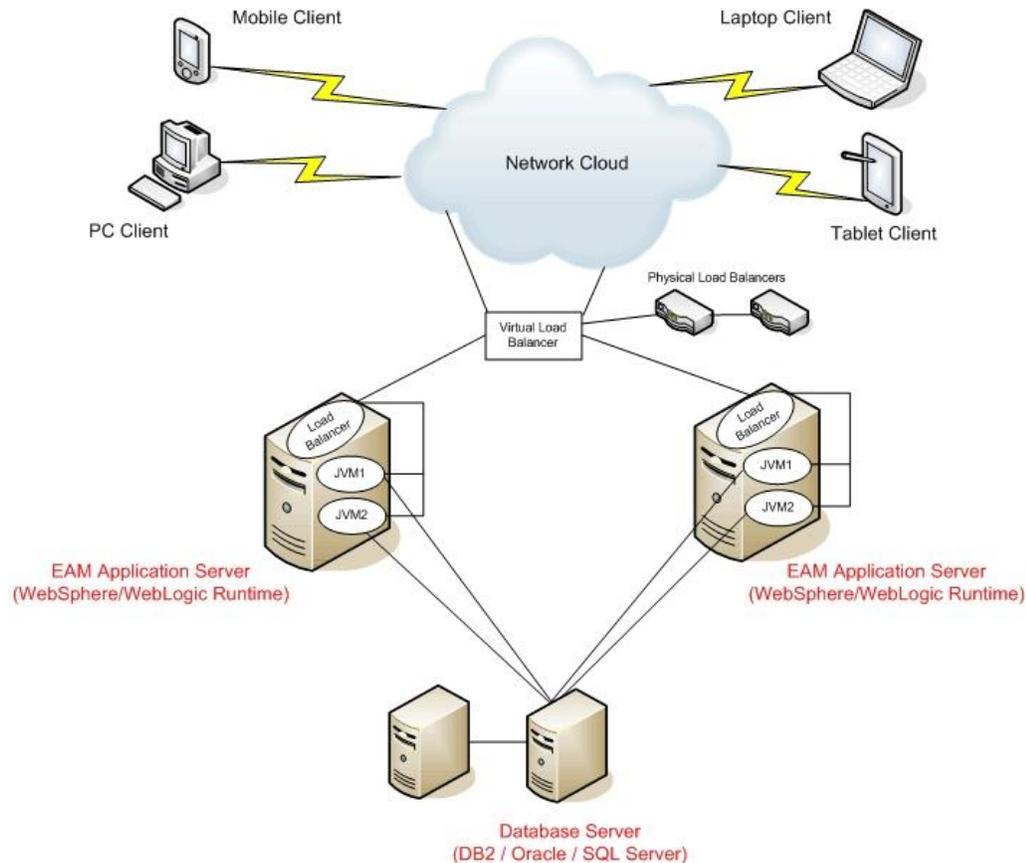
The degree of high availability/fault tolerance to use is a business decision that must be fully discussed and the requirements defined. In a business such as nuclear energy, there may be a requirement for disaster recovery to the extent that multiple redundant physical locations is necessary to ensure that in the worst case scenario, plant and equipment can still be managed. In less critical industries it may only be necessary to maintain a minimum level of fault tolerance so that some down time is acceptable. Only a complete analysis of the requirements can determine the answers to high availability questions and the amount of investment that can be allocated to building and maintain such a system.

All components of the Maximo infrastructure can be duplicated and made redundant. The more redundant components there are, the more fault tolerant the system is as the single points of failure are reduced. In a fully fault tolerant environment there will be multiple network paths and routing from clients to the Maximo servers, there will be multiple hardware load balancers, multiple physical application servers, multiple mirrored database servers, and multiple physical locations for the data centers. For many companies, the cost of a solution that is fully fault tolerant may exceed the value returned by that design. In those cases, choices to minimize the possible faults without choosing full disaster recovery may be substantially less expensive.

In the performance discussion above, the concept of load balancing was described in the context of spreading the load of many users over multiple processing engines to maintain a level of acceptable performance from the system. Load balancing can also be thought of as part of the high availability design. In this context, multiple application JVMs provide redundancy for the application. If the JVMs are running on separate physical servers then redundancy of equipment is attained as well. If the database server is mirrored then data redundancy is attained as well.

The diagram below depicts one approach to high availability but because of the flexibility of the Maximo architecture; it is not limited by the approach shown. In addition to all of the redundant components described here, Maximo supports server virtualization which can open many new opportunities for configuration. It is literally impossible to describe all of the possible scenarios so the approach shown should be viewed as an example but not the definitive solution for all scenarios.

This figure shows clients connected to a network with multiple paths to a virtual load balancer. A virtual load balancer is one that is generated and supported by two or more physical load balancers (in this case 2) so that if one load balancer fails, the virtual load balancer is still available supported by the redundant physical load balancer. The virtual load balancer directs traffic to one of two physical servers where the Maximo application is running. Each physical application server has a software load balancer installed (IBM HTTP Server included the WebSphere) to direct traffic to one of the application JVMs running on that server. The application JVMs are connected to a mirrored database server with failover technology enabled.



Using this approach, if the network fails, there is another path for users to follow. If a load balancer fails the virtual load balancer is supported by the backup load balancer. If a physical server fails users are directed to the other physical server. If a JVM fails, users are directed to one of the other 3 JVMs running. If a database server fails, the failover technology directs traffic to the backup database server. For full disaster recovery, a separate physical location would need to be used for each of the redundancy points in this design.

By maintaining performance, usability, and stability, users are assured their efforts will be supported by the system and adoption will be high. With high adoption the quality of data will be maximized and reports will accurately reflect the status of the EAM environment. Preventive maintenance, labor and inventory management, responses to equipment failures, and planning will be maximized.

Training

Training cannot be over emphasized. There are many aspects to EAM. Supply management, work management, client configuration, best practices for accomplishing tasks, reporting, searching and more. The best car in the world is a dangerous piece of equipment if the user doesn't know how to drive. Maximo includes much functionality and makes every effort to appeal to every approach for use that there are always more than one way to accomplish a task. The choices may be further clarified by implementation options and business processes defined for the application. Users choosing inefficient paths may get frustrated by complexity when simpler options are available.

IBM provides a wide variety of free technical help and training to support clients through Support Technical Exchanges (STE), IBM Educational Assistant (IEA) modules, technical documents, white papers, Red Books, social media, and of course, product documentation. In addition, targeted classroom and web based education is available through IBM enablement. These types of education are important to understand how to use Maximo products but it is important to understand that once a company has identified the primary work groups and made the implementation choices that impact those groups, specific team training should be developed to enable those team members on the best approach to accomplishing their tasks.

Training should be developed as an ongoing effort rather than a one-time roll out effort. As with everything, environments change. Team members, process flows, business requirements and more that affect how the products are used and who uses them are constantly changing. Orientation and refresher training should be provided on an ongoing basis to ensure users are getting the most out of their EAM experience. Imagine a user sitting down for the first time in front of any business application. They may know enough to navigate but they do not know the short cuts that can improve their efficiency. If an untrained user tries to use a spread sheet program they might attempt to add thousands of numbers together using simplistic approaches when they might solve their problem with just the "sum" function. That is a simple example of how training can save a user many hours of work. In Maximo, a user might find a way to accomplish a task using ten clicks when the same thing could be accomplished with two.

The amount to time saved for users is likely incalculable but if a company can save a user an hour a week and they have a thousand users, they can save one thousand hours a week simply by enabling their users to properly use the products. As a byproduct, users are more satisfied with their experience.

Introduction to the IBM Maximo Implementation Success Model

This section is intended to provide some perspectives and overall awareness of the issues that can make or break the success of the implementation efforts. It covers the tri-cornered model of people, process, and technology as being the key components. The importance of utilizing the success recommendations which will follow can be most vividly observed in the most successful customer implementations where the key values can be seen quite clearly.

The success of a Maximo Enterprise Asset Management project can realize great value across the organization. Many customer environments have had very successful deployments of the tool and quite successfully manage everything from nuclear power plants to planes, trains, and automobiles. The level of effort and planning required to achieve success has every bit as much to do with the complete picture (people, process, and technology) as it does with a simplistic view of the software as a tool.

Having successful deployments at thousands of sites with many involving thousands of users and others having two users is a testament to the success IBM can deliver with Maximo. Deployments that have had problems are typically a result of ignoring key aspects of deployment and are completely avoidable. For that reason, this section focuses on clarifying the various aspects and providing the lessons learned so best practices can be taken from the start.

The value of the project is more easily realized when consistently paying attention to deriving the plan from a success model point of view. The success model discussed in this section focuses on the right level of communication and demonstrated commitment from all levels of people to making the investment successful. It also focuses on people (education, training, and product improvement reviews), process (consistent adherence to process) and technology (the right level of automation and development).

People

As mentioned in the Usability section, it is difficult to have success with a tool if the people in the organization are against it from the beginning. The first part of the “people-process-technology” model is people. It is people who will deliver success or failure based on how they accept and use the solution. It is the concerted effort and the choreography of the many individuals and roles they play that bring about success:

- Executive sponsor who owns the application from the standpoint of the business process owners whose processes are implemented/enhanced by the solution
- Architect who designs the overall implementation and has worked with the business process owners to understand what the requirements of the tool are
- Project manager who orchestrates the project so that the right pieces fall into place at the right time
- Process owners whose business process is modeled in the solution
- Tool delivery team who build and deliver the solution
- Project team who review and deliver the further enhancement and iterations of the solution
- Operations team who maintain the solution and supporting technologies
- The users who will ultimately make or break the solution -- they must be on board, must be trained, and must be invested in the success of the project

Executive Sponsor: Strong executive sponsorship is critical. This project will represent the cooperation and collaboration of people from many parts of the organization. It is common for large organizations to have dedicated server, desktop, database, application server, operating system, security, and network teams. The executive must set the course and continue to remove barriers to success brought on by any failure in any part of the team. It is most helpful if this executive represents the true owners of the solution: the process owners. An executive of an IT operations team is not always in a position to effect actual change in the behavior of the employees who work for the operations business.

Lead Architect: There should be an architect who represents the needs of the business in technical fashion and can interface with users to ensure the solution is being built for and with them rather than being pushed on them. It is the job of the architect to understand the solution in a way that appreciates the whole solution:

- The architecture and design of the solution from a software perspective
- The underlying technologies (middleware choices) and support of the middleware
- The business process integration points (where process meets technology)
- The configuration and development of the solution
- The ongoing maintenance and improvement of the solution
- The monitoring of the solution with performance evaluation and review

Project Manager: Not to be understated, the project manager for the delivery of the project will play a critical role in facilitating discussions and tracking delivery of required components on time. There are many different parts and people playing many different roles in the eventual success of this project. A strong project manager can greatly facilitate the delivery of success.

Process Owner: The process owners should work to get their business process requirements put into the delivery of the project. Since the process owners know their requirements best, the architect will rely on them to define what their teams need. The architect can assist the project by keeping process owners focused on the results requirements rather than the procedures for attaining the results.

As an example, one of the goals will be to get or keep asset management under control therefore the asset management team process owner(s) must be front and center of the requirements and user acceptance. Attempting

to drive an asset management tool from a purely IT perspective will not be successful. If process owners have not bought into the solution, it will be important to the success to develop that support before proceeding.

Tool Delivery Team: The tool delivery team is the next important part of this picture. It will take strong technical acumen, a drive to achieve, a commitment to the business, and good people skills to deliver on this project. Most likely, no one person will have all the skills necessary to orchestrate all of these project areas. It will require additional skills which can be both internally and externally to the organization. IT teams will often have existing skilled resources and for those that need to be augmented, external teams such as IBM's service organization or business partners can be leveraged. It may be valuable to consider training new internal resources for long term requirements. The technology delivery team is the kernel of the project interfacing the process aspect (via business process owners and their delegates) and the technology (accomplishing the implementation of the processes).

A subset of the tools delivery team are the people who will support the middleware layer. Typical middleware required by the Maximo solution include an application server (WebSphere) and database (DB2). The middleware team will take responsibility for the construction of the solution in conjunction with the operations team. Understanding how the solution leverages the middleware level is imperative to proper design including deployment, high availability and performance.

Operations Team: After the project "goes live" and the tool is facing actual users, there will be a team of people whose job it is to maintain the day to day operations of the tool. This phase is generally considered "steady state" support. They will be the ones who investigate, communicate, and repair any issues facing the deployment. Operations teams should receive product specific training as well as a clear process plan for managing and tracking issues and resolutions. Operations management should include help desk procedures such as what questions to ask about reported issues, how to track them, and how to communicate with the user population.

Project Team: This team may comprise members of the other aspects of this discussion whose job it will be to continually review and enhance the offering, reconciling the desired outcome with the actual results.

Users: It is the users who will ultimately be responsible for the success of all of these efforts. If a perfectly implemented tool is delivered, but the users don't want to enter the required data, this project will ultimately be at risk of failure. Frequently, internal customer dissent and obstructions to the progress of the project are due to some misperception. The end user may not understand what the reason is they're being asked to do what they're doing. That lack of understanding leads to confusion about how they deliver value. In building the momentum of success, some key strategies must be used. User buy in is driven by good leadership so the roles identified above play an important role in convincing users that a new process is for the good of the organization and for them. Typically, a workshop would be done to introduce the solution when kicking off a project such as this. Workshops, training, and communication about progress go a long way to building end user confidence and support.

Before starting the project, first and foremost, is positioning. The right support of executives and key opinion-makers can go a long way towards realizing the value of the investment. There are several factors that come into play in this positioning:

- A strong executive support message
- Overall management support of the project
- Identifying quick wins for the project and pursuing those up front which helps to build momentum of support behind the project and communicating those quick wins to the other user communities
- Identifying key advocates among the customer groups and finding quick wins to be delivered for them
- Doing the internal sell of the product by meeting with those key advocates and opinion-makers and studying where opportunities to deliver the quick wins will deliver value in their eyes
- Setting milestones that the quick wins will achieve and communicating those to the larger community
- Ensuring that job-specific training is developed so that not only is the product delivered to a group that is waiting for it, but they will know what is the best way to interact with the solution
- Working with the end users to build/automate data entry so that users are doing only what needs to be done but everything that needs to be done is getting done
- Understanding the corporate culture helps to provide perspectives on how the project should be positioned

Using a new tool without training is like putting a young person in a car without driver education. They may figure out how to drive it but not efficiently and safely. End user training must be developed that walks the end user through their use case, not just the basics of tool navigation. Each person should conceptually understand what each screen is about and how it fits into the overall picture of what they are trying to accomplish. Knowledge champions (also called key "expert" users) are identified who will be trained to become Subject Matter Experts (SMEs) for that specific area of the product. End users then have someone they know in their area who can field basic questions and reinforce the messages of why certain information is required.

In addition to understanding how their data contributes to the success of the project, teaching users the most efficient way to use the tools will help them be successful and minimize their apprehensions. Returning to the car analogy, the student may drive on the wrong side of the road, run stop lights, or not know how to brake once they start moving. In the case of Maximo, there are many ways to accomplish tasks. A user unfamiliar with the process might teach themselves how to do something using ten clicks when it can be done in three. Understanding this aspect of implementation will also help project managers determine how to configure Maximo for maximized efficiency. If a complete work order application has thirty fields on it but there are a team of dispatchers that only use ten of them, a dedicated work order screen should be defined for dispatchers to minimize complexity of the screen and reduce the field validation time for improved performance. Training should be reinforced and reviewed periodically. Regular communications with users and follow up on any issues will be an added loyalty builder.

As part of the process for owner's efforts during implementation, a series of "use cases" are built to show how the tool is used to accomplish specific tasks (uses). Additionally, the use cases become the test cases to validate product function following upgrades and enhancements to the solution. When creating training, the use cases should be the driving force behind task driven training of teams.

IBM can also be actively engaged with clients and the people involved with the product. IBM Tivoli education courses can be taught on-site at the client and can be customized for the particular uses of the product that are specific to the environment. Additional training for the tools team may be important where the client does not have significant experience with the middleware layer products (database, J2EE, ldap, etc). IBM can also be engaged to provide supplemental resources and/or training for the middleware.

Process

Of course, it cannot be understated the value in strong business process model maturity. Those customers with weaker business process model implementations will have weaker solutions implemented. This shows time and again where, as an example, change management is weak, utilization of the tool to manage products via the change mechanism will be weak. When change management is lax, change records will not be opened and this is not really the fault of the tool, but instead demonstrates a failure to commit to the success of the process.

Similarly, other business culture model weaknesses will also be visible. Where the culture does not hold people to direct responsibilities well, documentation in the tool will be weak or non-existent. If the intent is to enact business processes rigidly where they are weak before, without strong executive mandate and management support, the product will have limited use and never be viewed as a successful tool deployment. That is not to say that the tool cannot help to correct weak processes, but first and foremost a commitment to change behavior and commit to the process itself must be achieved in order for the tool to be anything but unused window dressing or a database full of garbage. There is a saying in this field, "A fool with a tool is still just a fool." The lesson is that technology alone cannot drive the success of the project. People and process are two equally important parts to this delivery.

Often, a client may be undergoing this type of process revitalization and reform where the Maximo product set is intended to facilitate the strengthening of the process. It helps to make it a part of every person's job to ensure that they are in compliance with the use of the tool where appropriate and in the way that it is intended to be used.

Understanding how the IBM project success model is built begins by looking at the beginning. There is a business problem that your implementation of the Maximo solution attempts to help you to solve. This is presumably why the investment was made. This business problem should be spelled out and communications written to explain the approach that is being taken. It needs to be in writing and frequently referenced in communication.

As a concrete example of this we should begin by asking, "What is the reason you have purchased the solution?" This is deeper than just asking "what was the business case for bringing the product in?" It really needs to get at the heart of the weaknesses of the organization that seek to be bolstered, the rules and regulations that need enforcement and tracking for auditing and legal reasons, and the ways that different parts of the organization can function together to achieve greater returns.

Assume part of the answer is "to deliver a means to get the asset management process under control." Let's suppose that frequently, assets are missing and no one has recognized this until greatly after the fact. Other times it has happened that more is purchased than actually needed because no one realized that there were pallets of some type of asset waiting for deployment in a store room somewhere because inventory has been frequently wrong or incomplete. Thus there should be a message crafted to the entire company sent out by the key advocate executive explaining the problem and the solution that is intended to be delivered.

It is most helpful to think of the solution as an embodiment of the business process... a way to move beyond uncoordinated and uncontrolled process mechanisms and tools into a solution that represents control, auditing, and delivery with a coordinated and communicated to team, empowered to fully interact with the business process.

Technology

There is a tradeoff of course between configuration/customization effort and delivery pace. Something that requires more configuration and customization will require less time to implement. The other side to that picture is that the closer you are to zero customization and configuration, the greater the risk of end-user dissatisfaction with the delivery. The product set contains many more fields and functions than any single customer will require. There is a certain level of "hide this, remove that" which will result in a much more usable offering. Too much configuration/customization and not only are you likely to have incurred great expenses of time and resources, but you also may run the risk of not being able to easily upgrade what you do when the next product release comes. For that reason, it is an extremely worthwhile investment to obtain or "rent" the knowledge and experience of consulting resources even if it is only to review your project plan.

Time will pass. You will move from development to test and then to production. Finally, the implementation is done. The schedule to get there should be realistic, leveraging IBM's skills and expertise to augment the project team if need be and attempt to deliver achievable results. This might take the form of needing to engage with IBM or business partners who are certified deployment experts or hiring or growing your own skills. Also augmenting the project staff, efforts should be made to reach out to other similarly deployed customers as through user groups, forums, and other key customer contacts. In this way, best practices can be shared and utilized to obtain maximum value.

Recommendations for success are provided by IBM across many aspects of the technical deployment (which is, of course, the technology part of the model.) IBM provides a performance tuning guide with some baseline recommendations for tuning the environment. This should be implemented as a part of the install process and most are included as a part of the product installer and installation guide. Because there is no one-size fits all recommendation for J2EE applications, performance tuning needs to happen after the users start using the system with measurements taken and observations made over a period of time. This should be periodically repeated and logging and tuning parameters should regularly be tuned for the latest user patterns which directly influence the performance requirements. By doing the tuning process, you will maximize the end user experience as their application performance will be optimized.

Database tuning is also something that should occur on a regular basis. In some customer environments, the end user can issue ad hoc report queries, create start center queries, and issue ad hoc queries by filtering lists. The DBA should be regularly involved at monitoring database performance to watch for performance issues. The best practice is where end users can issue queries to train them appropriately under the direction of the DBA who will be able to monitor queries issued, performance problems of certain queries, and review report SQL.

In doing the technical tuning measures, optimal performance for the end user can be targeted. This target should be consistently re-evaluated based on regular dialog with the end users. A real performance tuning exercise involves perhaps weeks of data collection to explore the load of the system against a normal set of activities and across the full range of activities.

Success as a Project

This final part is intended to provide additional best practices information for the architect and project manager. There are also best practices around the business service management processes that can be implemented as a part of the project. The flexibility of the Maximo product set is that these best practices which are built into the product can be aligned with existing processes through configuration and/or customization. The more configuration / customization required, the longer the process to deploy into production it will take, but in cases where this is required, some amazing things have been done using the TPAE as a foundation to build applications. A moderated, phased approach which allows for end users to become familiar with the product and process owners to contemplate the means for process or product changes is usually the right way to go.

Strategic choices should be made as to which user base groups should be the first to begin using the product and on what schedule. The factors that should be taken into consideration in building this strategy include things like:

- Number of users
- Sites of users
- Organizations of users
- Business process maturity for the area
- Amount of work to alter product and/or the process to more closely align
- Political clout of the group
- Level of utilization of the product that is intended for these users
- Data that will be used by users and its integration/loading into the environment
- Political clout of the group of users
- Existing product license expiration targeted for replacement with Maximo products
- Hardware availability for all the required infrastructure
- Training requirements and the development of training

Time should be spent in reviewing the solution after each group's introduction into the product. What has worked, what has not worked, what is missing, what appears to be extraneous. All these questions must be considered.

Where the project requires it, IBM's leadership in projects will help to uncover the correct methodology for deployment in your specific case when this method is utilized.

The following chart discusses points to be avoided and presents a solution and what will precipitate failure.

Issue	Success noted when	Failure noted when
protracted project time	specific limited goals are achieved in a milestone delimited project with clearly known goals for delivery of functionality against identified targets	project not clearly defined from the beginning, shifting scope and design on a daily basis, no clear architecture design
faltering positioning of the solution, difficulty getting and maintaining end user buy-in	clear executive sponsorship exists, value clearly communicated, end-user seen as valued part of the process, limitations on the delivered solution are explained clearly and openly (we did this because....) so that people understand it was a choice and a reason exists	solution is purchased with top-down solution being imposed, executive changes, new executive does not have buy-in to the solution, hears reinforcing messages of we don't know why we have to do X in the product... or Y doesn't work in the product (it can't do...)
questions of value arise	the value proposition is known from the beginning, clearly stated, messaged from all levels, end-users understand their role in the use of the tool to deliver against that value	no clear value message exists that is communicated to all levels, key opinion-makers lack buy-in and propagate dissent being echoed from the end user, building levels of dissatisfaction and driving failure perceptions to become failure reality
high costs of ownership for assets	warranty value was known and exercised properly, assets were properly maintained, routine inspections were used to determine status of the asset	warranty costs went under-utilized, assets were not properly maintained, failures came from lack of preventative maintenance, improper utilization of assets
failure to operate and	the staff have the proper training to	the environment is not well understood,

maintain the technical solution	support the environment and/or are augmented by the skills necessary	frequent outages occur due to failure to properly maintain and troubleshoot issues
failure to be able to deliver on some aspect of the solution by reporting	good data is being put into the tool by people who know the value in putting in the data	people don't understand the reasons why and put garbage responses into fields such as "because" answers leading to meaningless reporting
utilization of the tool falls to minimalistic efforts	management stays on top of the items in the list, end users are not allowed to fail to properly document and close; data is valid and trusted	perhaps thousands of records are still in an open status because no one is willing to do the work to properly answer a question and close the record

Final Summary

In summary, the IBM project success model is an attempt to deliver a solution that exercises technical expertise against a strong project delivery methodology to enrich and complement/complete business processes. The best recipe for success is to understand the ways that other projects have failed and to build the underpinnings of the organization and the people and the process so that the technology can be delivered in a way that delivers specific value on a schedule that meets the organization's needs.

The advantages in working the deployment as indicated in this success model are:

- First and foremost, the business value is defined.
- The business value is translated into a problem solved with the tool.
- The low-hanging fruit (which is in the form of easily addressable business problems) is identified to start delivering a return on investment quickly.
- The end-user customer is prepared to use the product and understands why they are asked to do each field thus reducing the perception that it is "busy work" or eliminating the failure to provide valid data due to a lack of knowledge to where that data drives the value.
- The end-user customer is engaged regularly to identify problems and proactively monitor the user experience, dealing with any problems before they have a chance to become larger issues.
- Your process gets executed. (i.e., Inventory is driven through the entire life cycle from purchase orders to disposal (you ordered it, it showed up, it went into inventory, it was used for a certain maintenance task, fixed according to planned maintenance, warranty value was utilized, asset was retired appropriately.))
- Key knowledge champions and the engagement of those champions drive ownership of the product from the tools team to the end user, making the delivery of value their understanding and mission.
- The technology is understood and supported by trained staff.
- The solution is continuously reviewed and enhanced.
- Even in the case of a complete client (self) delivered solution, IBM and/or business partners can and should be involved to provide a historical depth of expertise to the effort in at least an architectural review.

© Copyright IBM Corporation 2012

IBM Corporation Software Group, Route 100, Somers, NY 10589, U.S.A.

Produced in the United States of America December 2012 All Rights Reserved

IBM, the IBM logo, Maximo and Tivoli are trademarks of International Business Machines Corporation in the United States, other countries or both.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Other company, product and service names may be trademarks or service marks of others.

References in this publication to IBM products and services do not imply that IBM intends to make them available in all countries in which IBM operates.

No part of this document may be reproduced or transmitted in any form without written permission from IBM Corporation.

Product data has been reviewed for accuracy as of the date of initial publication. Product data is subject to change without notice. Any statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

THE INFORMATION PROVIDED IN THIS DOCUMENT IS DISTRIBUTED "AS IS" WITHOUT ANY WARRANTY, EITHER EXPRESS OR IMPLIED. IBM EXPRESSLY DISCLAIMS ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT. IBM products are warranted according to the terms and conditions of the agreements (e.g. IBM Customer Agreement, Statement of Limited Warranty, International Program License Agreement, etc.) under which they are provided.

The customer is responsible for ensuring compliance with legal requirements. It is the customer's sole responsibility to obtain advice of competent legal counsel as to the identification and interpretation of any relevant laws and regulatory requirements that may affect the customer's business and any actions the customer may need to take to comply with such laws. IBM does not provide legal advice or represent or warrant that its services or products will ensure that the customer is in compliance with any law or regulation.