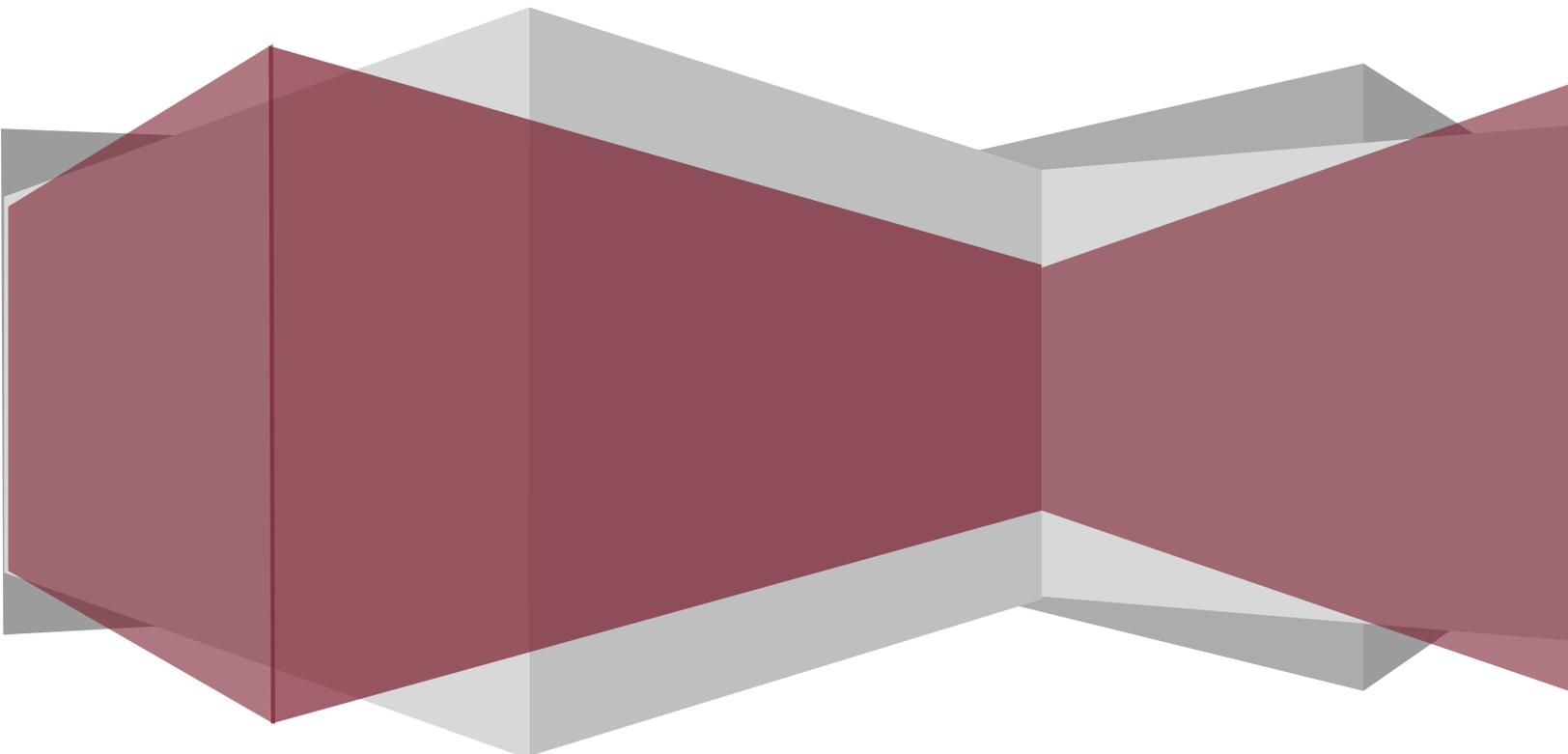




White Paper

How Denver International Airport Uses Tivoli Monitoring with
Maximo

26 March 2013



Abstract

This paper is about how a world-class transportation facility, Denver International Airport (DIA) found a solution to their asset management monitoring issues by learning to manage Maximo service delivery using ITM (IBM Tivoli Monitoring).

The IT personnel at DIA experimented with monitoring their preventive maintenance process. However, they found that Maximo, on its own, could not do the job the way they had hoped. A solution presented itself in ITM. As it turned out, ITM could be effectively used to interact with Maximo to provide the monitoring solution the DIA IT department was looking for.

This paper is based on a PowerPoint presentation: *Managing Maximo Service Delivery with Tivoli Monitoring* presented by Rayna Brannon of DIA and Jennifer Gatza of Maven Asset Management, the consulting firm that helped with the ITM transition. Screen shots of the ITM portal are included.

Introduction

Denver International Airport is in the northeast corner of Denver. It is the fifth busiest airport in the US and the eleventh busiest in the world. It serves over 50 million passengers each year. It encompasses 53 square miles which makes it the largest US airport by total area. DIA includes six runways (runway 16R/34L is the longest public use runway in the US at 16,000 ft.) and a 1.5 million square foot terminal.

Maven Asset Management provides asset management solutions for large enterprises. The Maven team has implemented IBM Maximo® for clients in several key industries, including air & rail transportation, life sciences, healthcare and government.

Maximo

IBM Maximo Asset Management provides a single point of control over assets for production, infrastructure, equipment and facilities of communication, transportation and other industry verticals. They are all managed on a common platform using six management modules (from <http://www-142.ibm.com/software/products/us/en/maximoassetmanagement/>):

Asset management: Achieve the control you need to more efficiently track and manage asset and location data throughout the asset lifecycle.

Work management: Manage both planned and unplanned work activities, from initial request through completion and recording of actuals.

Service management: Define service offerings, establish service level agreements (SLAs), more proactively monitor service level delivery and implement escalation procedures.

Contract management: Gain complete support for purchase, lease, rental, warranty, labor rate, software, master, blanket and user-defined contracts.

Inventory management: Know the details of asset related inventory and its usage including what, when, where, how many and how valuable.

Procurement management: Support all the phases of enterprise-wide procurement such as direct purchasing and inventory replenishment.



Maximo has developed a solution geared toward the complexities of managing airport assets. It's a total, efficient lifecycle management process that cost-effectively helps managed assets. Areas Maximo focuses on are managing the conditions, locations, availability and status of airport assets. The key is bringing the assets into a single place to track, monitor and manage them.

To do this Maximo uses:

- A modern, integrated J2EE technology platform that supports both physical and IT assets
- End-to-end asset lifecycle management including asset procurement, deployment, maintenance and retirement
- A dynamic, interconnected suite that features consolidated solutions for asset management
- Service-oriented architecture that can provide operational flexibility and help speed deployment

Maximo and DIA

DIA has been using Maximo for 10 years, establishing a mature set of business processes to go with it. Among the airport assets managed by Maximo are the major business areas including:

- Maintenance
- Operations
- Purchasing
- Materials Management
- Fleet

Maximo for Transportation is being used for the following applications:

- Interfaces to PeopleSoft and various other airport systems
- Fuel Force meter imports
- Airfield inspections

The technical architecture is:

- Maximo 6.2.8 (Transportation 6.3.1 with an upgrade to 7.5 in progress)
- Eight-node dual cluster
- WebSphere 6.1
- Oracle 11g
- MEA and Oracle SOA Suite to accomplish all integration

Maximo Monitoring and DIA

DIA set up a monitoring process with Maximo. Short term, the idea was to identify and resolve system issues before being reported by users. From that they would be able to categorize trends and any recurring issues which they hoped would facilitate permanent resolutions. DIA also wanted to figure out a way to routinely monitor tasks so that the IT support area could stay focused on servicing their internal customers.

For the long term, DIA wanted to support all ITIL initiatives which at that time included service level, availability and capacity management. This would serve as information to provide input to the IT balanced scorecard.

Manually monitoring Maximo processes did not go as well as DIA had hoped. For example, they tried monitoring preventive maintenance work order generation. . They reviewed log files and used database queries to identify issues. Because PM data and Cron failures had different resolutions, they had to differentiate between invalid PM data and Cron failures.

What happened was that the Cron task intermittently failed, the system did not report errors and there was no evidence of any issue until it was reported by users.

IBM Tivoli Monitoring

IBM Tivoli Monitoring is an independent product from Maximo Asset Management. However, by using Tivoli Monitoring and the Monitoring Agent for Maximo, users found they could monitor aspects of their Maximo infrastructure and applications. Aspects that could be monitored include:

- Server memory statistics
- Cron tasks
- User and database connections
- Installed products and licenses
- Maximo system information

What worked out great for DIA (and many Maximo users) was that ITM was a part of IBMs Solution Health Initiative. This meant that any Maximo customers were entitled to use ITM for their Maximo environment. It supported Maximo 6.2.5 or higher and Maximo 7.1.1.6 or higher. The IBM-developed monitoring agents targeted unique Maximo needs enabling users to retrieve an in-depth level of information around the:

- **Application Server:** JVM Status, error log monitoring, memory usage

- **Database:** Memory usage, slow running queries, performance settings
- **Maximo Environment:** Number of connected users, escalation errors
- **Servers (physical or virtual):** Memory usage, running processes, disk space used

ITM logging and notifications includes data warehouse and messaging capabilities. So, DIA chose to integrate ITM with its own data warehouse because:

- A centralized repository strengthens analysis capabilities
- A centralized warehouse reduces maintenance overhead

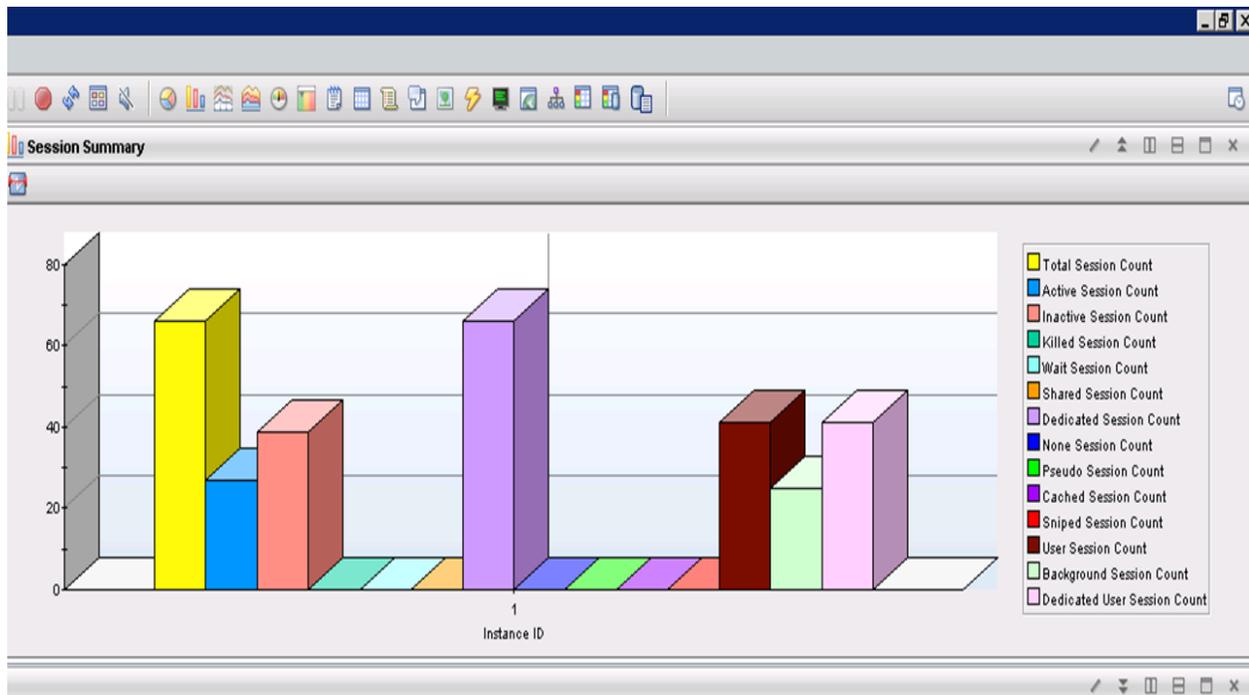
DIA also established central monitoring via the Airport Information Hub (AIH). They found that ITM supports web service integration via SOAP so DIA uses web services to transmit alerts from ITM to the hub. Alerts and notifications are also disseminated via the hub.

Tier 2 support also monitors the ITM portal for quick, easy-to-analyze synopsis of environmental health.

ITM Portal

Following are five screen shots on various aspects of the ITM portal.

Database Connections



Long-running queries including a drill down for SQL

Top SQL By Elapsed Time								
Instance ID	Elapsed Time Delta(s)	CPU Time Delta(s)	Executions Delta	Elapse Time(s) Per Execution	(%) Total DB Time	SQL ID	Module	
1	3461	784	1	35	49	ahf9wd0wrxpnd	oracle_monitor@diamx11gdev01 (TNS V1-V3)	
1	1370	536	4	3	19	7j1b3wm2sww5g	JDBC Thin Client	
1	472	412	118	0	7	5yv7yvjgkugg		
1	339	318	24	0	2	00rqnc3hrb7a9		
1	198	152	59	0	3	6gvch1xu9ca3g		
1	172	163	12	0	2	av3jp9pzytg3u	DBMS_SCHEDULER	
1	169	159	12	0	2	6rv36682gsqhp		
1	83	63	6	0	1	77nbshknaxk50	DBMS_SCHEDULER	
1	40	25	2899	0	1	cm5vu20fthnq1		
1	39	34	12	0	1	94t1rz2fs48rg	oracle_monitor@diamx11gdev01 (TNS V1-V3)	
1	38	39	12	0	1	6ap0tw76sjayy	emagent_SQL_oracle_database	
1	34	18	1	0	0	dayq182sk41ks		
1	34	18	1	0	0	bm2pwrpcr8ru6		
1	34	32	11	0	0	7j23tu2qk35zj	emagent_SQL_oracle_database	
1	32	3	1	0	0	fnk7155mk2jq6		
1	30	16	310	0	0	3f24whg0wsv0n	emagent_SQL_oracle_database	
1	28	20	2	0	0	8p908gp3h35z7		
1	26	24	24	0	0	bfp995vu4rmtn7		
1	26	17	118	0	0	aykvshm7zsabd		
1	26	24	24	0	0	b4kt8g8fau8hb		

WebSphere Application Server Status

The screenshot displays the WebSphere Application Server status monitoring interface. It is divided into two main sections: 'Resources' and 'Applications'.

Resources Section: This section shows five resource monitors, each with a green checkmark icon and a progress bar. The monitors are labeled as follows:

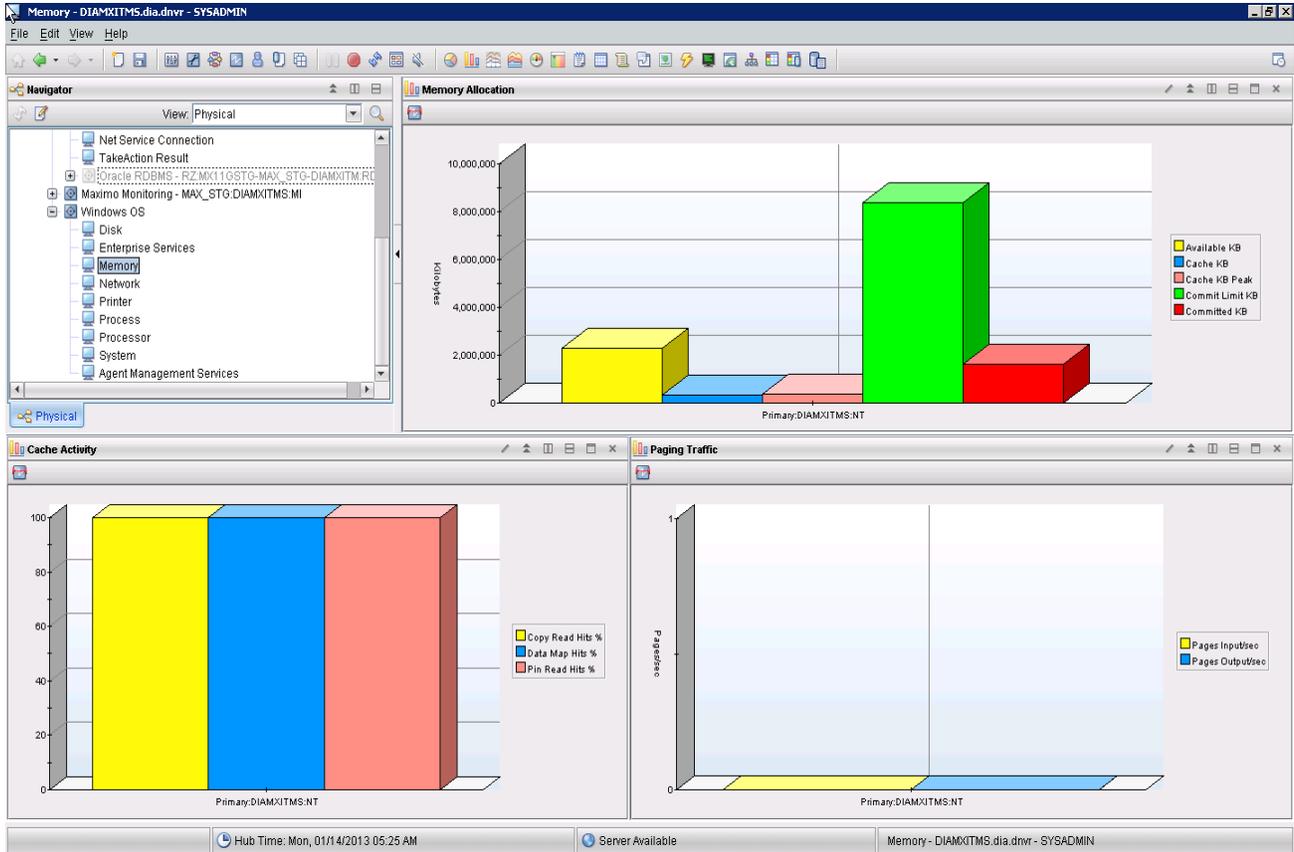
- OS:** Shows a value of 200/0.
- JVM:** Shows a value of 0.0/0.
- Datasources:** Shows a value of 0.
- Threadpool:** Shows a value of 0.
- Services:** Shows a value of 0.

Applications Section: This section shows two application monitors, each with a green checkmark icon and a progress bar. The monitors are labeled as follows:

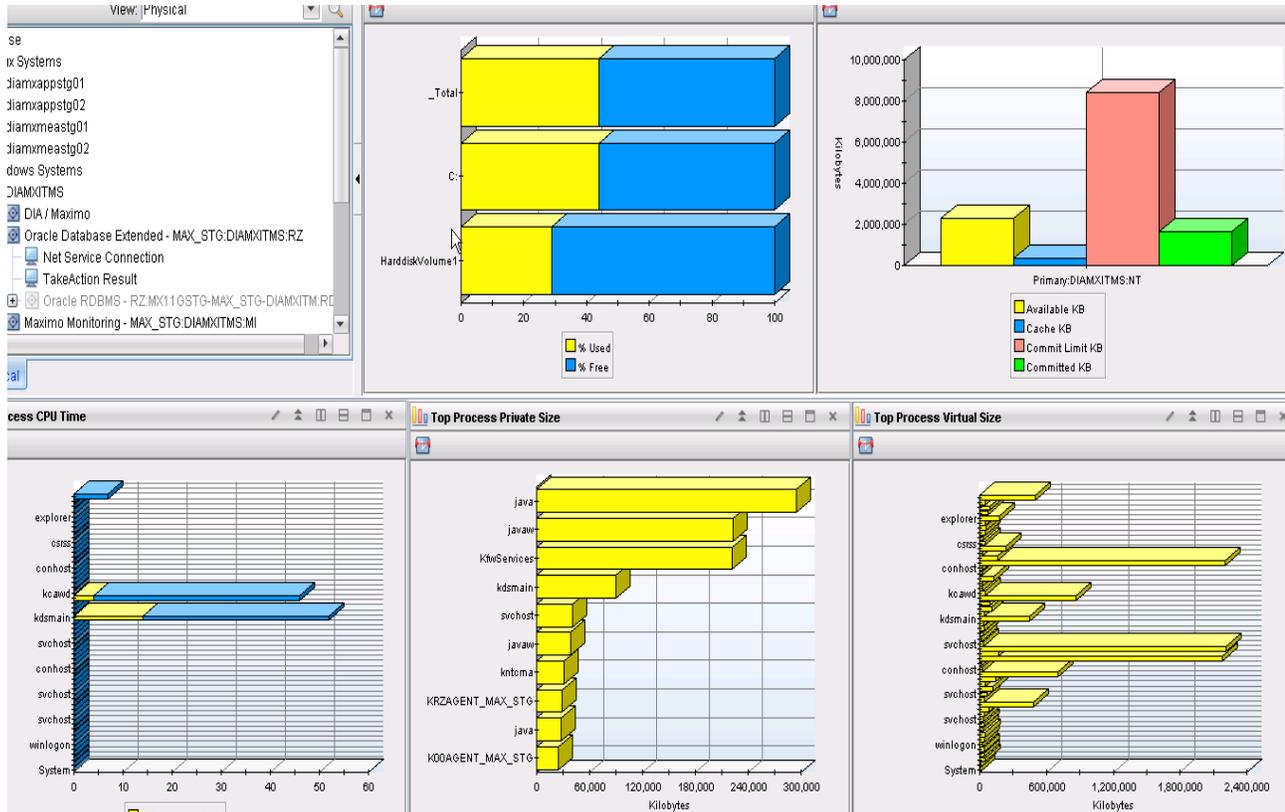
- MAXIMOHELP:** Shows a value of 0/0.
- MXSTGUI:** Shows a value of 0/0.

At the bottom of the Resources section, there is a summary bar that reads: "Total: 5, Selected: 0, Hidden: 0" and "Last refreshed: 01/14/2013 05:21 AM".

Memory Usage



Operating System Health



DIA ITM Agent

In addition to the basic monitoring provided by ITM's Maximo agent, DIA used ITM's Agent Builder to create an additional agent, enabling them to proactively monitor key resources, such as:

- Interfaces, JMS and data-related objects
- Linked document server availability
- Active Directory/LDAP synchronization
- Maximo database maintenance tasks and job reporting

Plus, their agent design allows for additional Maximo monitoring points to be added without custom programming.

Conclusion

DIA found that using ITM greatly improved the efficiency of their IT troubleshooting efforts. It allowed IT to:

- Identify issues more quickly
- Use trends to uncover common root cause(s)
- Focus on customer service instead of manual log reviews

As usage continues and the data warehouse is built up, DIA expects the improvements to IT monitoring and troubleshooting to continue.

For more information about managing Maximo service delivery with Tivoli Monitoring please contact:

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