



# Managing Unix/Linux with Microsoft System Center Operations Manager 2007 Cross Platform Extensions Beta

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## Executive Summary

Microsoft System Center Operations Manager 2007 Cross Platform Extensions Beta enables organizations to achieve service level goals and gain visibility across their cross-platform environments, including Unix and Linux operating systems as well as Microsoft platforms. With centralized management and monitoring of the IT infrastructure, organizations can maximize uptime and performance while reaping the efficiencies of a single monitoring solution rather than disparate tools for each environment.

This paper discusses how Operations Manager 2007 Cross Platform Extensions can help data centers and large IT organizations:

- More easily identify and resolve issues in a cross-platform environment
- Manage both Microsoft and non-Microsoft environments as simply and efficiently as possible
- Improve service levels and visibility across Microsoft, Unix, and Linux platforms

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## Introduction

From the foundation for running the business to an enabler of competitive advantage, there's no disputing the essential role that technology plays in today's organization. Managing this strategic resource to ensure optimal performance and business continuity in the most cost effective way is one of the top challenges facing IT organizations.

Whether an organization is large or small or somewhere in between, the technology infrastructure required to drive the core processes of the business can be incredibly complex. End-to-end visibility into the health and performance of the infrastructure is imperative to ensure required levels of service. To optimally manage and monitor potentially hundreds or thousands of servers, the data center must find more ways to automate and centralize the management process.

Enabling data centers and IT organizations to manage their IT infrastructures through a single console meets the challenge of ensuring continuous, high performance service while minimizing efforts and cost. Microsoft System Center Operations Manager 2007 brings the power, visibility, and efficiency of centralized management to the Microsoft environment. Now, with Microsoft System Center Operations Manager 2007 Cross Platform Extensions Beta (Ops Mgr Cross Plat), data centers can monitor and manage cross-platform environments including Microsoft, Unix, and Linux all from one "single pane of glass."

This white paper discusses the new capabilities available to data centers for cross-platform monitoring, the benefits of unifying monitoring capabilities under one management tool, and examples of how the cross-platform monitoring capabilities of Ops Mgr Cross Plat can be used to ensure the ongoing health and performance of the IT infrastructure.

## The Challenges of Managing Heterogeneous Environments

Recent research indicates that 86% of large IT organizations have heterogeneous environments – specifically multiple operating systems running on servers across the infrastructure. Today virtually every system and application is now interconnected in some way to nearly every other one within the infrastructure. Managing these interconnected components across multiple platforms within the overall infrastructure is vitally important to the success of service level management and business systems management initiatives.

Accentuating the complexity of managing multiple platforms and technologies is the use of a number of different management applications, tools, and consoles that do not work well, if at all, with one another. At the same time, IT organizations are faced with managing increasing numbers of servers in this more complex environment with the same number or even fewer staff. Additionally, management and/or monitoring technology that doesn't scale as the infrastructure grows can have a serious impact on an IT organization's ability to proactively identify and investigate issues, and respond in a timely manner.

Only by automating the management and monitoring process can organizations and their data centers achieve the scalability in resources required to ensure continuous delivery against service level requirements. An automated solution would aggregate performance data across platforms, enable proactive monitoring and response based on this data, and speed resolution of performance or outage problems with platform-specific insight into root cause analysis.

With many critical applications running on some brand or variant of the Unix operating system, data centers and IT organizations need a solution that delivers a single management console for monitoring both Windows and Unix or Linux environments. This single tool would deliver the consolidated, end-to-end visibility into performance and health information that organizations require to keep the infrastructure running at desired service levels.

## Introducing Operations Manager 2007 Cross Platform Extensions

Microsoft System Center Operations Manager 2007 provides the end-to-end management capability organizations need to optimize efficiency and achieve greater control over the IT environment. Operations Manager provides an easy-to-use environment that monitors and reports on thousands of servers to provide a comprehensive view of the health of an organization's IT environment. The detailed troubleshooting and best practices knowledge included in Operations Manager enable a more rapid response to events that may impact the normal running of business.

Reflecting its commitment to provide greater interoperability, openness, and choice for its customers, Microsoft provides a centralized management solution to monitor both Microsoft and non-Microsoft platforms. Microsoft System Center Operations Manager 2007 Cross Platform Extensions extend the monitoring and management capabilities of Microsoft System Center Operations Manager 2007 to non-Microsoft platforms, including HP-UX®, Sun Solaris™, Red Hat® Enterprise Linux®, SUSE® Linux Enterprise Server, and IBM AIX 5L® V5.3, Technology Level 6, SP5 (PowerPC) server environments.

Now, organizations can utilize the extensive capabilities of Operations Manager 2007 to monitor the entire infrastructure for Windows, Unix, and Linux. With one single console, organizations can be more productive and efficient by eliminating manual processes to aggregate data from disparate tools. This "single pane of glass" delivers the end-to-end visibility required to ensure the performance and availability of the infrastructure meets established goals.

## Unified Monitoring Under a Single Tool

As the IT infrastructures of today's organizations have grown and evolved, many organizations have adopted homegrown or other vendor solutions to monitor non-Microsoft platforms while using Operations Manager to monitor Microsoft systems. Using disparate tools prevents the IT organization from operating in the most efficient, effective manner. And with separate tools, there is no end-to-end view of the performance and health of the entire infrastructure. Manual data consolidation to support analysis and reporting further depletes precious system administrator resources.

Efficiency can be dramatically improved by using one single monitoring tool across Microsoft, Unix, and Linux platforms. Data is automatically aggregated across environments to present one clear picture of performance and availability, speeding resolution times for issues and improving service levels.

## A Commitment to Open Standards

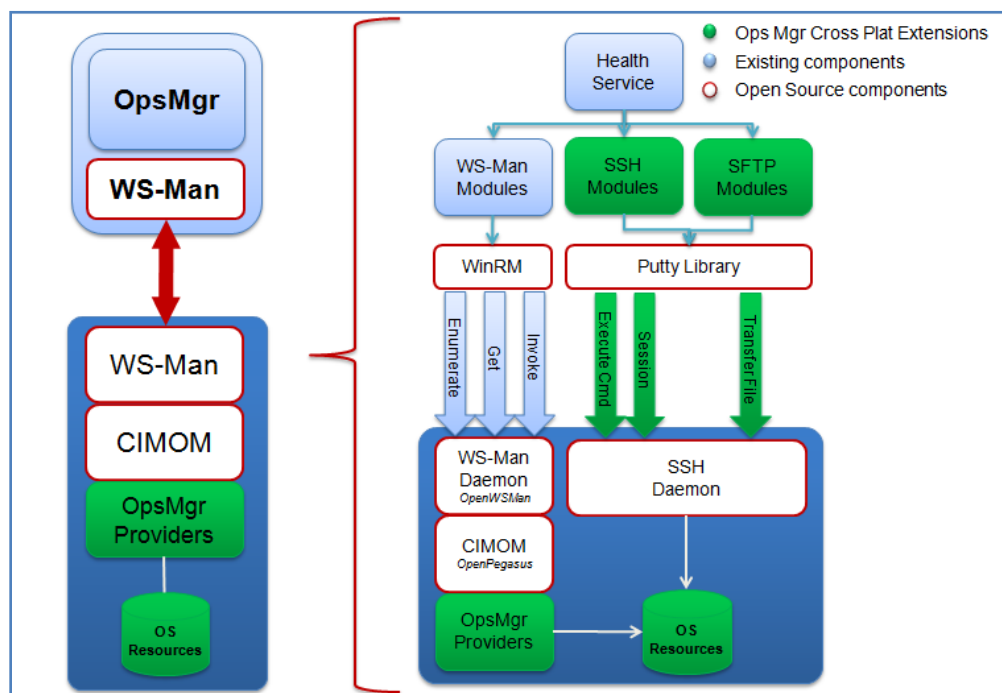
Operations Manager 2007 Cross Platform Extensions are based on open source solutions and standards to ensure the greatest interoperability and extensibility. The new cross-platform monitoring capabilities were developed to take advantage of open source management and communication protocols including WS\_Management, OpenPegasus, and Secure Shell (SSH) to manage non-Microsoft operating systems.

The **Web Services for Management (WS\_Management)** open standard enables interoperability between management applications, such as Operations Manager 2007, and managed resources on monitored systems. It's based on the Distributed Management Task Force (DMTF) open standards and Internet standards for Web Services. WS\_Management was published by a large group of vendors, including AMD, Dell, Intel, Microsoft, Sun, and others. Microsoft's version of WS\_Management is Windows Remote Management (WinRM), and is supported on both Windows Server 2003 and Windows Server 2008. Through Ops Mgr Cross Plat, Operations Manager 2007 uses WS\_Management as the communications protocol between the Operations Manager 2007 Root Management Server (RMS) and OpenPegasus on the monitored server, as shown in Figure 1.

**OpenPegasus** is an open-source implementation of the DMTF Common Information Model (CIM) and Web-Based Enterprise Management (WBEM) standards. It enables management solutions such as Operations Manager 2007 to deliver increased control of enterprise resources across heterogeneous platforms. The CIM and WBEM standards were designed to enable vendor extensions. With this in mind, Ops Mgr Cross Plat delivers providers – software modules that act as a uniform interface between a service and a data source – for the supported non-Microsoft operating systems. These providers allow rich monitoring information to be returned to Operations Manager 2007, while also enabling management commands to be returned to the managed system. Examples of these providers include the ability to monitor the processor of the monitored system, the file system, processes, and memory, among other performance and health indicators.

**Secure Shell (SSH)**, provides for secure communication between two systems, and delivers authentication, authorization, and confidentiality services. Operations Manager 2007 uses SSH in several ways:

- During deployment, the secure copy (scp) capability of SSH is used to securely copy the Ops Mgr Cross Plat agent to the target machine, and then initiate the agent and any required supporting processes (such as OpenPegasus and WS\_Management) should they not be operational.
- During operations, should there be an issue with any of the supporting processes or should the agent process fail, Operations Manager 2007 can communicate with the managed system through SSH and restart the failed service.



**Figure 1. Operations Manager 2007 Cross Platform Extensions Architecture**

With the exception of deployment and restarting of OpenPegasus or WS\_Management processes, or the Ops Mgr Cross Plat agent on the monitored non-Microsoft operating system, Operations Manager 2007 uses WS\_Management and OpenPegasus for the vast majority of its monitoring and management requirements. Using these open standards assures the flexibility and scalability of the solution across multiple non-Microsoft operating systems, and creates an opportunity for partners to further extend the capabilities of Operations Manager 2007 to the monitoring and management of applications running on non-Microsoft operating systems.

## Bringing Non-Microsoft Platforms into the Management Fold

With Ops Mgr Cross Plat, systems administrators can take advantage of the intelligent reporting and monitoring capabilities of Operations Manager for Unix and Linux platforms. Alongside the best-of-breed management for Microsoft-based environments that Operations Manager 2007 provides, Ops Mgr Cross Plat delivers greater control and efficiency of non-Microsoft platforms, while automating routine redundant tasks. With this consolidated monitoring environment, systems administrators can:

- Proactively monitor non-Microsoft platforms in conjunction with their Microsoft-based infrastructure
- Conduct detailed troubleshooting and root cause analysis to drill down into the actual cause of an outage or incident
- Improve service level management with consolidated, cross-platform performance analysis and reporting
- Identify potential capacity issues on non-Microsoft platforms before they affect performance or availability

There are a number of scenarios for how organizations can use Ops Mgr Cross Plat to prevent unplanned outages, avoid performance degradation, and accelerate the time it takes to diagnose problems on non-Microsoft systems. The following examples highlight the capabilities and benefits a typical organization could realize by using Ops Mgr Cross Plat to monitor and manage Unix and Linux platforms.

## Keep Systems Up and Running

Organizations and data centers can leverage the end-to-end management capabilities of Operations Manager 2007 to proactively ensure Unix and Linux systems are healthy and that required processes are running. Through constant monitoring and automatic alerts when issues arise, the data center can respond swiftly – notifying the help desk and any end users potentially impacted and heading off a flood of redundant calls to the help desk.

Operations Manager 2007 with Ops Mgr Cross Plat enables systems administrators to more easily identify and resolve issues impacting the health and performance of systems being monitored, regardless of whether those operating systems are Microsoft or non-Microsoft. Alerts not only provide information about the problem, but include instructions and diagnostics for resolving the issue. Built-in best-practice knowledge helps less experienced administrators handle many issues without requiring the resources of specific platform experts.

To validate that non-Microsoft systems are running in a healthy state, Ops Mgr Cross Plat enables administrators to monitor and assure the health of key components of non-Microsoft operating systems, including:

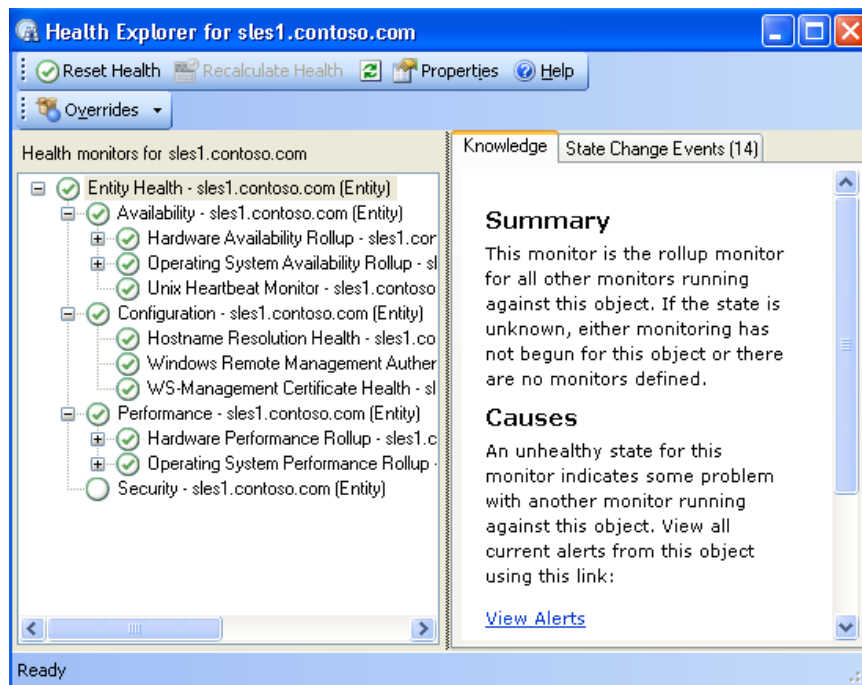
- **File systems:** While these vary according to the configuration of the machine, common examples of file systems monitored are: /, /usr, and /home. Ops Mgr Cross Plat uses the configuration information within the monitored non-Microsoft platform to determine which file systems should be mounted, and reports accordingly.
- **Network interfaces:** Assures that network interfaces are up and available, allowing them to successfully communicate. Ops Mgr Cross Plat examines key configuration files to determine which network interfaces exist, and whether they should be available.
- **Core processes:** Critical processes to the health of the system and the ability to monitor it are tracked. Examples include: ssh, cron, syslog, and others.
- **Key configuration aspects:** Checks that the hostname of the target computer can be successfully resolved, the WinRM authentication is correctly configured, and the Secure Socket Layer (SSL)

certificate used by the WS\_Management component of the agent is valid

- **Core system attributes:** Includes assurance that available disk space is not near maximum capacity, that the processor is performing as expected, and other health-related attributes

The following example highlights how Ops Mgr Cross Plat speeds the identification and resolution of an issue:

1. From the Operations Console, an administrator notices an active alert showing that a Unix or Linux computer is in a Critical state
2. Using the Health Explorer (similar to that shown in Figure 2), further examination of the critical state indicates that one of the network interfaces on that machine is down
3. The administrator views the knowledge information within the Health Explorer, which provides some insight into why the interface may be down, and also provides directions on how to resolve the issue
4. The administrator runs an inline task to bring that network interface back up on the target machine
5. The administrator then verifies that the computer has returned to its normal, healthy state



**Figure 2. The Health Explorer helps administrators understand the nature and root cause of incidents and provides inline tasks to remediate issues (where applicable)**

## Proactively Avoid Space and Memory Issues

To ensure optimal performance of servers as well as to enable data centers to plan for changes and disk capacity requirements, Ops Mgr Cross Plat delivers detailed monitoring of disk space, swap space, and system memory for non-Microsoft platforms.

- **Disk Space:** When disk space is not carefully monitored, it can have catastrophic consequences to an organization's data, the availability of the system, and productivity of end users. Certain situations tend to cause rapid depletion of available disk space making it essential for organizations



to have proactive monitoring in place. For instance the enabling of deep audit information for the system and all applications can lead to sudden changes in available disk capacity.

- **Swap Space:** Given that swap (or paging) space utilizes the hard drive as a temporary memory store, it significantly lacks the performance of physical memory. A high use of swap space is usually indicative of insufficient (or failed) memory for the workloads on that system, and can have potentially long-term effects on the longevity of the drives on which the swap space is located.
- **System Memory:** A lack of physical system memory usually equates to overall decreased performance of the system, particularly as the system starts to page memory to the swap space on the machine. Often, organizations will experience this when there has been insufficient planning for the workload on that system, or from less anticipated causes such as memory leaks within applications running on the machine.

With disk space, swap space, and memory being some of the most critical resources for servers, Ops Mgr Cross Plat enables administrators to monitor and track important metrics on non-Microsoft systems to proactively ensure the continued health and performance of the environment. Table 1 below highlights some of the performance indicators Ops Mgr Cross Plat monitors for disk space. Table 2 presents some of the performance indicators monitored for memory.

Monitored Object		Measured Performance Indicators
Physical Disk	Health	Identifies if disk is unmounted, dead, or bad in any way
	Capacity	Available physical memory in Mbytes (MB) Available physical memory as a percentage (%)
	Performance	Average time of a disk transfer (Avg. Disk s/Transfer) Average time of a read of data from the disk (Avg. Disk s/Read) Average time of a write of data from the disk (Avg. Disk s/Write)
	Utilization	% of time disk is reading data % of time disk is writing data % of time disk is busy
Logical Disk	Health	Identifies if disk is unmounted, dead, or bad in any way
	Capacity	Available memory in Mbytes (MB) Available memory as a percentage (%)
	Performance	Current I/O queue length Total disk Bytes per second (Disk Bytes/s) Bytes read from disk per second (Disk Read Bytes/s) Bytes written to disk per second (Disk Writes Bytes/s) Total I/Os per second (Disk Transfers/s) Read I/Os per second (Disk Reads/s) Write I/Os per second (Disk Writes/s) Average time of a disk transfer (Avg. Disk s/Transfer) Average time of a read of data from the disk (Avg. Disk s/Read) Average time of a write of data from the disk (Avg. Disk s/Write)
	Utilization	% of time disk is reading data % of time disk is writing data % of time disk is busy % of time disk is idle

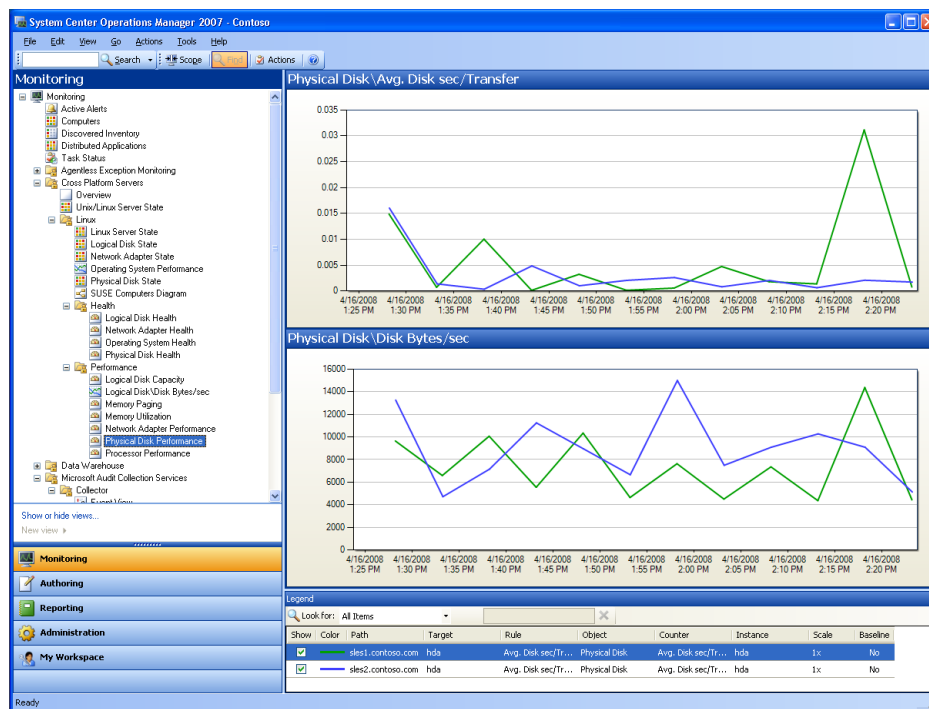
**Table 1. Performance Indicators for Disk Space Collected by Ops Mgr Cross Plat**

Monitored Object		Measured Performance Indicators
Physical memory	Memory Utilization	Available physical memory in Mbytes Available physical memory as a percentage (%) Used physical memory in Mbytes (MB) Used physical memory as a percentage (%)
	Memory Paging	Pages read or written to disk to resolve hard page faults (Pages/sec) Pages read from disk to resolve a hard page fault (Page Reads/sec) Pages written to disk to resolve hard page faults (Page Writes/sec)
Swap space		Available swap space in MBytes (MB) Available swap space as a percentage (%) Used swap space in MBytes (MB) Used swap space as a percentage (%)

**Table 2. Performance Indicators for Memory Collected by Ops Mgr Cross Plat**

Armed with this information, data centers can avoid serious system problems by proactively taking action before the lack of capacity reaches a critical point and causes degradation or failure. The following example shows how an administrator can monitor disk performance on Unix and Linux systems:

1. The administrator selects the Unix or Linux Computer view in the Monitoring Pane of the Operations Manager Operator Console
2. The administrator brings up the Physical Disk Performance View (see Figure 3), and selects the servers that are to be assessed from the list available
3. The administrator adjusts the time scales to view performance for the monitored systems over the past week
4. The administrator assesses that the disks on the selected systems are performing within expected parameters



**Figure 3. Performance views can help administrators understand potential bottlenecks or issues**

## Monitor System & Application Performance

Performance degradation can have a significant impact on user productivity, customer satisfaction, and overall business performance. To ensure smooth operation and performance against service level requirements, Ops Mgr Cross Plat enables personnel to monitor the ongoing health of non-Microsoft platforms across the enterprise.

With Ops Mgr Cross Plat, systems administrators can check for applications that may be causing excessive loads on system resources and degrading performance. The Health Monitor within Operations Manager 2007 provides instructions and diagnostics for identifying and stopping processes that are negatively impacting available system resources.

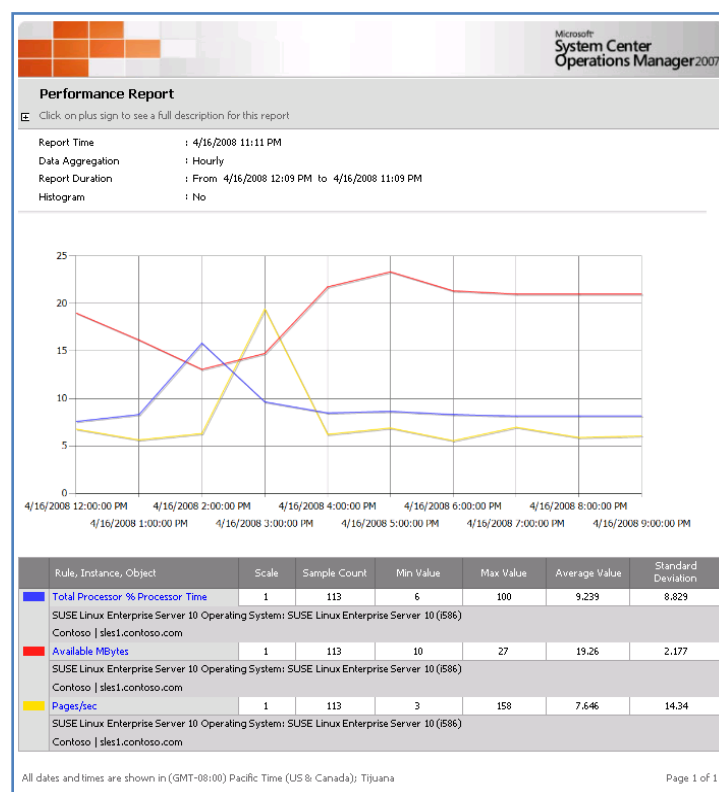
Typically, performance issues will exhibit themselves in overutilization of memory or disk (such as in the examples presented above), or through over-utilization of one (or more) of the available system processors. In addition to the performance indicators relating to memory and disk presented above, Table 3 shows some of the processor performance metrics that are monitored and tracked by Ops Mgr Cross Plat.

Monitored Object	Measured Performance Indicators
Processor	% Processor time % Idle time % User time % Nice time % Privileged Time % IO Wait Time % Interrupt Time % DPC Time Queue Length

**Table 3. Processor Performance Indicators Collected by Ops Mgr Cross Plat**

A typical scenario might include one where users are complaining of a perceived degradation in performance of a Unix or Linux system. The system administrator wants to look to see what kind of performance the system has exhibited over the last week. To do this:

1. The administrator navigates to the report pane within Operations Manager 2007
2. Under the Linux reports, the administrator opens the Operating System Performance report from the list of available reports
3. The administrator sets the time parameters, and selects the system that the report will be generated against
4. The report is then executed, producing a result similar to that shown in Figure 4
5. The administrator notices that the available memory on the machine appears to be rather low. The administrator logs this in the incident ticket, and forwards the information to the owner of that system for further investigation and action



**Figure 4. Powerful reports help identify historical trends and patterns**

## Extending Monitoring to Applications Running on Non-Microsoft Systems

Microsoft collaborated with industry partners in the development of its cross-platform monitoring capabilities. This collaboration enabled the in-depth knowledge and best practices for non-Microsoft systems to be available in Ops Mgr Cross Plat to help speed identification and resolution of issues.

Using the extensible framework of Operations Manager 2007, Microsoft continues to work with its partner ecosystem to further extend the capabilities of Ops Mgr Cross Plat to cover non-Microsoft applications as well as servers. Several Microsoft partners have already developed Management Packs built on the new Operations Manager Unix and Linux agents and infrastructure. These Management Packs deliver additional capabilities to support non-Microsoft applications such as Apache and MySQL. The open standards-based architecture employed by Ops Mgr Cross Plat enables these vendors to rapidly deliver new Management Packs for higher level applications.

## Summary

Technology is a strategic resource critical to the operations and competitive advantage of the company. Organizations of all sizes grapple with the challenge of managing the increasingly complex IT infrastructure in the most efficient, effective way. A single console for monitoring and managing the cross-platform infrastructure prevalent in most organizations is imperative to delivering against service level requirements.

Microsoft System Center Operations Manager 2007 delivers end-to-end monitoring of your IT infrastructure and services, providing increased operational efficiency and managerial control. Operations Manager 2007 is well known for its deep integration and best-of-breed capabilities with Microsoft technologies. Microsoft

System Center Operations Manager 2007 Cross Platform Extensions Beta introduces new, powerful capabilities to extend the comprehensive health and availability monitoring and management of Operations Manager 2007 to non-Microsoft operating systems and applications – using open, industry-proven standards. Now data centers and IT organizations can gain a single view of the infrastructure across Microsoft, Unix, and Linux environments – all through a centralized console. The result is optimized efficiency and effectiveness in the management of IT environments.

## For More Information

The following resources provide more information about Microsoft System Center Operations Manager 2007 and Microsoft System Center Operations Manager 2007 Cross Platform Extensions:

- To download the Operations Manager 2007 Cross Platform Extensions Beta, visit Microsoft Connect at <https://connect.microsoft.com/programdetails.aspx?ProgramDetailsID=2249>
- To download an evaluation of Operations Manager 2007, visit <http://technet.microsoft.com/en-us/bb738014.aspx>
- Additional information on the Cross Platform Extensions can be found at <http://technet.microsoft.com/en-us/opsmgr/cc677004.aspx>
- For more information about Operations Manager 2007, see the Operations Manager 2007 home page at <http://www.microsoft.com/systemcenter/opsmgr/default.mspix>
- See the Operations Manager 2007 Cross Platform Extensions Team Blog at <http://blogs.msdn.com/SCXplat>
- For more information about System Center, see <http://www.microsoft.com/systemcenter>
- For more information about individual System Center solutions, see:
  - Configuration Manager 2007 at <http://www.microsoft.com/systemcenter/configmgr/default.mspix>.
  - Virtual Machine Manager 2007 at <http://www.microsoft.com/systemcenter/scvmm/default.mspix>.
  - Data Protection Manager 2007 at <http://www.microsoft.com/systemcenter/dpm/default.mspix>.
  - Capacity Planner 2007 at <http://www.microsoft.com/systemcenter/sccp/default.mspix>.
  - SoftGrid Application Virtualization at <http://www.microsoft.com/systemcenter/softgrid/default.mspix>