Oracle Primavera P6 Enterprise
Project Portfolio Management
Performance and Sizing Guide

An Oracle White Paper
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Oracle Primavera P6 Enterprise Project Portfolio Management Performance and Sizing Guide

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INTRODUCTION

Oracle Primavera P6 Enterprise Project Portfolio Management (EPPM) is a robust and easy-to-use integrated solution for globally prioritizing, planning, managing, and executing projects, programs, and portfolios.

This document outlines an estimate of hardware and software requirements for deploying Oracle Primavera P6 Enterprise Project Portfolio Management product. Three deployment scenarios are considered – small, medium, and large – and recommendations for each type are provided. These recommendations should only be considered as guidance for planning product deployment.

The following assumptions are made in this document:

- A highly available environment is desired.
- Database specific best practices for high availability, backup, and recovery are being followed.
- Load balancing specifics, software and hardware, is beyond the scope of this document.

Many improvements and feature enhancements have been implemented in the Primavera P6 EPPM product. The P6 Services, Summarizer, and Leveler modules are re-architected to be platform independent, robust, reliable, and highly scalable. P6 R has also introduced a near real-time reporting solution called Publication. There is a full whitepaper that describes this new feature in detail available, it is titled P6 Extended Schema White Paper.

ARCHITECTURE OVERVIEW

Oracle Primavera P6 Enterprise Project Portfolio Management is a Java 2 Platform, Enterprise Edition (J2EE platform) web application. The J2EE platform consists for a set of industry-standard services, APIs, and protocols that provide the functionality for developing multi-tiered, web-based, enterprise applications. The division of tiers enables the application to scale according to customers’ performance demands. Oracle Primavera P6 Enterprise Project Portfolio Management uses the J2EE specification to build a flexible and scalable cross-platform solution.

The main tiers of Oracle Primavera P6 Enterprise Project Portfolio Management are:

- **The presentation tier** – A web server layer rendering JSPs, JavaScript, Applets etc. to present a feature-rich UI accessible through various supported browsers.
- **The middle tier** – A J2EE application server forms the middle tier where all business logic of Oracle Primavera P6 Enterprise Project Portfolio
Management is implemented. This layer runs the business logic for both the P6 Web application and the P6 Services.

- **The data tier** – The data tier consists of a standalone or clustered RDBMS environment utilizing Java Database Connectivity (JDBC) to integrate with the middle tier.

The Oracle Primavera P6 Enterprise Project Portfolio Management application resides on an application server, and the repository of the application data resides on the database server. Figure 1 illustrates the architecture of Oracle Primavera P6 suite of Products.

**Figure 1: P6 EPPM Architecture**

Typical Oracle Primavera P6 Enterprise Project Portfolio Management deployments consist of the following components:

- A clustered web server load, balanced using a load balancing router or software solution. End-users including administrators interact with Primavera P6 through these Web servers.
- A clustered J2EE application server on which Oracle Primavera P6 Enterprise Project Portfolio Management is deployed.
- Oracle Primavera P6 Enterprise Project Portfolio Management uses a RDBMS as its data repository. Depending on the dataset size, the database
server can be a standalone or a clustered server. In the following sample architecture, the database is clustered. For optimized performance, the application servers and RDBMS are co-located, for example, within the same subnet.

**Figure 2: Sample P6 EPPM Deployment**

![Sample P6 EPPM Deployment Diagram]

**PERFORMANCE AND SCALABILITY CONSIDERATIONS**

While there are multiple ways to achieve the desired performance and scalability levels in Oracle Primavera P6 Enterprise Project Portfolio Management, the performance considerations can be grouped in two categories: Vertical and Horizontal. There are several advantages (and disadvantages) for choosing one over the other. Organizations can decide which to use, based on:

- The desired level of performance
- Availability requirements
- Short-term vs. long-term outlook of system usage
- Seasonality and frequently used application areas

**Vertical Scaling (Scaling up)**

Vertical scaling involves adding additional resources, or upgrading resources on an existing system. Vertical scaling is usually a good approach if the application bottlenecks are processor and memory-related.
JVM Heap Size

The application objects (such as Projects, Activities, and Assignments, etc.) are stored in the Java Virtual Machine (JVM) heap allocation. Most of these objects are short-lived, and are periodically cleaned up by the JVM’s garbage collection mechanism. As the number of concurrent users increases, performance and scalability is affected by the available heap space in the JVM. Increasing the heap size is an easier way to achieve the desired performance and scalability.

Hardware Upgrade

Desired performance and scalability can also be achieved by upgrading the CPU, adding extra cores, upgrading to faster I/O devices, and upgrading from a 32-bit to 64-bit hardware. The recommend hardware is 64-bit.

Operating System Upgrade

Another way to achieve the desired performance level is by doing such things as: upgrading to latest versions of the operating system, installing latest patch updates, and upgrading from 32-bit version to a 64-bit version. The recommend hardware is 64-bit.

While vertical scaling is easier to achieve, it does not address the availability requirements. If the desired level of availability is high, then vertical scaling alone will not be sufficient.

Horizontal Scaling (Scaling out)

As the demand for applications grows, additional nodes can be added to an existing application server cluster to handle the increased system load. For high availability requirements, horizontal scaling is the better option.

Adding Application Server Nodes

As the usage of applications grows within the organization, adding additional server nodes is the best way to achieve required performance and scalability. If the organization’s business model exhibits seasonality or periodic variations, the system load will fluctuate accordingly. For example, the average load on the system may quadruple during month end closing, or the plant may be closed for a week every quarter for maintenance. Adding or removing application server nodes should be considered to manage seasonality. To mitigate risk of degraded performance and undesired downtime, it is crucial to understand the business cycles of the organization and to plan for the required level of performance, availability, and scalability.

Database Scaling and Clustering

Database server scaling options are available, and have been widely adopted and implemented. Database clustering enables multiple nodes in a clustered system to mount and open a single database that resides on shared disk storage. This configuration provides high availability in the database environment. One example of database clustering is Oracle Real Application Clusters (RAC).
DEPLOYMENT CONSIDERATIONS

Oracle Primavera P6 Enterprise Project Portfolio Management performance depends on the load faced and response characteristics of each tier discussed in the previous section. Performance-affecting factors are identified and discussed in the following sections. These factors should be considered during deployment planning.

Oracle Primavera P6 Web Client

The number of concurrent users accessing the system directly affects the web client performance. Performance is also affected by the activities being performed within each user session (for example, Activity Gantt, Resource Planning, Scheduling, Leveling, Summarizing, and Reporting, etc.). Concurrent users and their system activities largely affect CPU and memory requirements of the application server.

Oracle Primavera P6 Server

The Oracle Primavera P6 Enterprise Project Portfolio Management server is a J2EE application that uses J2EE technologies for interaction with end-users, target systems, database repository, etc. Following are some areas of server operation that need to be considered during Oracle Primavera P6 Enterprise Project Portfolio Management sizing.

P6 Services

In Primavera P6 R8.2, the service process can run as a standalone application for better performance and scalability, and is platform independent. Services are responsible for executing real-time and scheduled application jobs. The following application areas are processed as jobs:

- Summarizer
- Scheduler
- Leveler
- Publications
The Services are capable of processing large number of projects, activities, and resource assignments. The number of concurrent jobs largely affects the CPU and memory requirements of the application server and the load on the database servers.

- For medium to large deployments, setting up a dedicated application server node for the services is recommended. This application server should not be part of the cluster that processes HTTP requests from the web client. In addition, turning off the services on the application servers in the cluster, which are serving web client requests is recommend. Horizontally scaling out by adding more dedicated Services application server nodes can address increased performance requirements.

- For long- running jobs, off-peak hours job scheduling is recommended. For example, scheduling a job to run, when the load on the system is low.

- For the initial run of the Publication Services, after install or upgrade of P6, running off-peak hours such as over the weekend is recommended.

- For heavily data- intensive jobs (such as summarizing an entire EPS) sequential, rather than concurrent scheduling, is recommended. For example, do not schedule two large EPS summarization jobs to run at the same time.

**Publication**

The newly designed Publication Services allows for near real time reporting of Project data. The following factors could impact the response time and resource for Publication:

- Number of Activities/Assignments
- Length of project
- Length of Publication date range
- Length of Activities/Assignments
- Number of Financial Periods

**Activity Gantt**

The Activity Gantt feature underwent scaling efforts to help large deployments. Small deployments also benefit from this enhancement because of optimization in code to help load data quicker. Releases prior to 8.1 had a limit that enabled the user to load 15k activities. Post 8.1 that limit has been raised to 100k activities.
The following factors could impact the response of the Activity Gantt feature:

- Number of Activities/Assignments
- Number of activity Relationships
- Number of currently opened projects
- Project length
- Depth of WBS Hierarchy
- Activities/Assignments Length
- Amount of client side memory allocated to the JRE and applets
- Other load on the application server

Resource Management

The Resource Management feature allows for a more interactive resource management approach. Resource management is easily and intuitively accomplished. The following factors could impact the response time of the Resource Management:

- Number of Resources
- Number of Resources Assignments to Activities
- Number of currently opened projects
- Filter usage
- Project length
- Depth of WBS Hierarchy
- Amount of client side memory allocated to the JRE and applets
- Other load on the application server

Risks

The Risk feature has been completely redesigned to enable a high confidence level of success by evaluating factors such as cost and scheduling. The following factors could impact the response of the Risk feature:

- Number of Risks
- Number of Activity Assignments to Risk
- Number of currently opened projects
- Number of Risk Scoring Matrix assignments
- Number of Response Plan assignments
- Amount of client side memory allocated to the JRE and applets
- Other load on the application server
P6 Web Services

The P6 Web Services platform employs Web-based technology to handle requests from external programs. External client programs use P6 Web Services by creating a request and sending it to the application server using the SOAP (Simple Object Access Protocol). Having received the request, P6 EPPM uses the appropriate business logic required to service the request. The client application need not understand the semantics of this processing. Responses or requests from P6 EPPM simply follow the same path in reverse.

P6 Web Services can be divided into four categories of services:

- Business Object Based Services (CRUD operations)
- Job Service
- Spread Service
- Import and Export Services

Many data set characteristics can impact the performance of Web Services. All requests should make use of meaningful filters to reduce the amount of data returned by the service. Other aspects that can affect the performance of Web Services are:

- System usage – P6 features in use
- Environment
- Level of hardware

DEPLOYMENT CATEGORIES

Oracle Primavera P6 Enterprise Project Portfolio Management deployments can be classified into three categories i.e. small, medium and large. Some of the factors considered for defining these categories are outlined in the following table.
These factors influence the hardware and software specifications during Oracle Primavera P6 Enterprise Project Portfolio Management deployment.

<table>
<thead>
<tr>
<th>Deployment Categories</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects</td>
<td>200</td>
<td>1,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Active Users</td>
<td>50</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Activities</td>
<td>100,000</td>
<td>1,000,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Activities per project</td>
<td>5,000</td>
<td>10,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Resources</td>
<td>500</td>
<td>1,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Resource Assignments</td>
<td>100,000</td>
<td>1,000,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Resource Assignments per project</td>
<td>5,000</td>
<td>10,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Risks</td>
<td>100</td>
<td>500</td>
<td>2,500</td>
</tr>
</tbody>
</table>

Table 1 – Deployment Categories

**DEPLOYMENT ARCHITECTURES**

**Small Deployment – Single Node**

This deployment model is suitable for a business unit or a division within an organization. It also is useful for setting up a pilot with the intent of moving to a medium or large size deployment. This deployment can achieve the desired performance or scalability, but does not address the high availability requirement due to single point of failure.

**Application Server Configuration**

<table>
<thead>
<tr>
<th><strong>CPU</strong></th>
<th>Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Java Heap Size</strong></td>
<td>2 GB</td>
</tr>
<tr>
<td><strong>Drive Space</strong></td>
<td>25-50 GB</td>
</tr>
<tr>
<td><strong>Operating System</strong></td>
<td>Oracle Enterprise Linux (OEL) 64-bit or Windows server 64-bit or equivalent</td>
</tr>
</tbody>
</table>
**Progress Reporter or Web Services Server Configuration**

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>CPU</td>
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<tr>
<td>Java Heap Size</td>
<td>2 GB</td>
</tr>
<tr>
<td>Drive Space</td>
<td>10 GB</td>
</tr>
<tr>
<td>Operating System</td>
<td>Oracle Enterprise Linux (OEL) 64-bit or Windows server 64-bit or equivalent</td>
</tr>
</tbody>
</table>

**P6 Services Configuration**

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<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent</td>
</tr>
<tr>
<td>Java Heap Size</td>
<td>4 GB</td>
</tr>
<tr>
<td>Drive Space</td>
<td>20-50 GB, depending on log historic log storage</td>
</tr>
<tr>
<td>Operating System</td>
<td>Oracle Enterprise Linux (OEL) 64-bit or Windows server 64-bit or equivalent</td>
</tr>
</tbody>
</table>

**Database Server Configuration**

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<tbody>
<tr>
<td>CPU</td>
<td>Intel Xeon 7000 series (Quad Core 2.66 GHz) or equivalent</td>
</tr>
<tr>
<td>RAM</td>
<td>2 GB</td>
</tr>
<tr>
<td>Drive Space</td>
<td>50 GB</td>
</tr>
<tr>
<td>Operating System</td>
<td>OEL 64-bit or Windows server 64-bit or equivalent</td>
</tr>
</tbody>
</table>

**Medium Deployment – Clustered**

Assuming that high availability is desired for a medium deployment, the application server is clustered. If high availability is not a requirement, desired scalability can be achieved vertically by adding equivalent units of memory and CPU.

The clustered nodes can exist on the same physical machine as separate node deployments when a high-end machine is used for the application server. A load-balancing router can be used to load balance between the nodes for optimal performance.
### Application Server Configuration

<table>
<thead>
<tr>
<th></th>
<th>Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent</th>
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<tbody>
<tr>
<td>CPU</td>
<td>Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent</td>
</tr>
<tr>
<td>Java Heap Size</td>
<td>4 GB per node</td>
</tr>
<tr>
<td>Drive Space</td>
<td>10 GB</td>
</tr>
<tr>
<td>Operating System</td>
<td>OEL 64-bit or Windows server 64-bit or equivalent</td>
</tr>
</tbody>
</table>

### Progress Reporter or Web Services Server Configuration

<table>
<thead>
<tr>
<th></th>
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<tr>
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<tr>
<td>Java Heap Size</td>
<td>4 GB per node</td>
</tr>
<tr>
<td>Drive Space</td>
<td>10 GB</td>
</tr>
<tr>
<td>Operating System</td>
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### P6 Services Configuration

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<tbody>
<tr>
<td>CPU</td>
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</tr>
<tr>
<td>Java Heap Size</td>
<td>4 GB per node</td>
</tr>
<tr>
<td>Drive Space</td>
<td>50-75 GB, depending on log historic log storage</td>
</tr>
<tr>
<td>Operating System</td>
<td>Oracle Enterprise Linux (OEL) 64-bit or Windows server 64-bit or equivalent</td>
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### Database Server Configuration

<table>
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<tr>
<th></th>
<th>Intel Xeon 7000 series (Quad Core 2.66 GHz) or equivalent</th>
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<tbody>
<tr>
<td>CPU</td>
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</tr>
<tr>
<td>RAM</td>
<td>4 GB per node</td>
</tr>
<tr>
<td>Drive Space</td>
<td>100 GB</td>
</tr>
<tr>
<td>Operating System</td>
<td>OEL 64-bit or Windows server 64-bit or equivalent</td>
</tr>
</tbody>
</table>
Large Deployment – Clusters

Assuming that high availability is desired for a large deployment, the application server is clustered.

A large deployment involves a high system load due to such things as large data sets, processing, concurrent users, etc. To handle this load, adding a dedicated clustered web server and a clustered database server, such as Oracle RAC Database, is recommended. Due to the intense computations typically seen at large deployments, a large JVM heap is highly recommended. Horizontally scaling out by adding more nodes can address increased performance requirements. It is not necessary to have application servers on different machines. Multiple nodes with Oracle Primavera P6 Enterprise Project Portfolio Management can be deployed on the same physical machine, assuming that the machine is a high-end one and has adequate physical memory and CPU.

Application Server Configuration

<table>
<thead>
<tr>
<th>CPU</th>
<th>2 Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Java Heap Size</td>
<td>8 GB per node</td>
</tr>
<tr>
<td>Drive Space</td>
<td>25-50 GB</td>
</tr>
<tr>
<td>Operating System</td>
<td>OEL 64-bit or Windows server 64-bit or equivalent</td>
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</tbody>
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Progress Reporter or Web Services Server Configuration

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<tr>
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<tbody>
<tr>
<td>Java Heap Size</td>
<td>4 GB per node</td>
</tr>
<tr>
<td>Drive Space</td>
<td>25-50 GB GB</td>
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<td>Operating System</td>
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P6 Services Configuration

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<td>Java Heap Size</td>
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<td>50-100 GB, depending on log historic log storage</td>
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Database Server Configuration

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<tbody>
<tr>
<td>CPU</td>
<td>2 Intel Xeon 7000 series (Quad Core 2.66 GHz) or equivalent</td>
</tr>
<tr>
<td>RAM</td>
<td>8 GB per node</td>
</tr>
<tr>
<td>Drive Space</td>
<td>200 GB</td>
</tr>
<tr>
<td>Operating System</td>
<td>OEL 64-bit or Windows server 64-bit or equivalent</td>
</tr>
</tbody>
</table>

OTHER FACTORS

This document covers the performance of the overall Architecture of the P6 EPPM configuration. However, the factors around the database setup play a very important role on performance. The following factors could impact the performance of the Database:

- Hardware architecture and OS
- NIC (number of NICs, speed and duplex settings)
- Number of database instances on a server (dedicated vs. shared)
- Disk storage system performance (I/O speed, Buffer, Mirroring)
- Table space layout and extent sizing
- Table data, index, and lob distributions on table spaces
- Table and index fill factor definition
- Database block sizing
- Connection management (dedicated vs. MTS)
- RAM allocations (automatic, SGA, PGA, Shared Pool, Buffer Pool, etc.)
- CBO optimizer parameter configuration setting
- Database table and index statistics gathering mechanism and frequency
- Anti-virus software
- Additional database jobs
ENABLING TECHNOLOGIES

Oracle BPM

For creating and managing business processes and workflows, Oracle Primavera P6 EPPM utilizes Oracle Business Process Management (BPM) technology. For information on hardware and sizing requirements please refer to Oracle BPM documentation, available on the following Web site:


Oracle BI Publisher

For enterprise reporting, Oracle Primavera P6 EPPM utilizes Oracle Business Intelligence Publisher. For information on hardware and sizing requirements please refer to BI Publisher documentation, available on the following Web site:


OBIEE

For enhanced analytical and advanced reporting capabilities, Oracle Primavera P6 EPPM utilizes Oracle Business Intelligence Enterprise Edition (OBIEE) product. For information on hardware and sizing requirements, please refer to OBIEE documentation, available on the following Web site:


Content Management System

For document management and collaboration, Oracle Primavera P6 EPPM can be configured to use Oracle Universal Content Management (UCM) OR Microsoft SharePoint. For information on hardware and sizing requirements for Microsoft SharePoint please contact Microsoft. For information on hardware and sizing requirements for Oracle, please refer to Oracle UCM documentation, available on the following Web site:

http://www.oracle.com/technetwork/middleware/content-management/overview/index.html

Sizing Spreadsheet for BI Publisher Enterprise

Documentation can be found on Oracle MetalinkNote -948841.1

CONCLUSION
Following a systematic approach to evaluating, planning and testing the architecture for your Primavera P6 Enterprise Project Portfolio Management deployment is the only way to assure a successful deployment. With careful examination of the performance and scalability objectives, system availability requirements, short-term versus long-term outlook of system usage, seasonality, data structure, and frequently used application areas, the appropriate hardware choices can be made early in the process.
FREQUENTLY ASKED QUESTIONS

How much hardware does P6 installation require? Tables that describe the recommended hardware for each deployment size are described earlier in this document.

How much disk space does P6 require? The P6 application requires little space. However, you do need enough space to run the Application Server software (such as WebLogic). You will also need enough space to keep historic log files. You must also ensure that you have the appropriate amount of disk space on your database server. Recommendations can be found in the tables described earlier in this document.

Can P6 run in a cluster? Yes, P6 can run in a cluster.

Do the P6 Services affect performance? Yes. P6 Services do affect performance for the P6 Web application. The difference in performance depends on some of the following factors:

- Hardware size
- Data size
- Service recurring schedules
- P6 feature usage
- Data change rate

Should P6 Services be installed on the same server as Primavera P6 Web? Oracle Primavera recommends installing the P6 Service on a dedicated box.

Will I need more space when upgrading to P6 8.2 with Publications? Yes. The Publication feature requires additional drive space on the database. A good estimate is to calculate your currently used disk space and double it.

How can I make P6 Service run faster? You can make the P6 Service faster by:

- Making sure the P6 Services are installed on a dedicated server.
- Separating the P6 Services to multiple servers. If performance is a concern, it would be a good idea to install all global services on one server and the Project Publication service on its own dedicated server.
- Increasing default thread counts, when working with Publication Service this only affect the Project service.
- Verifying that the database has the optimum settings for efficiency:
  - Enough memory
  - Fast disks
  - No other database instance running

What is the best way to monitor performance for P6? You can use Oracle Enterprise Manager to monitor many aspects of the database (Oracle Database only) as well as OS and WebLogic exposed metrics.

What is Considered Acceptable Network Latency for P6? Enterprise environments should have low latency networks, meaning ping times should return in less than 1ms for best P6 performance. P6 has been tested within simulated latency environments and offers acceptable performance up to 100ms (round trip browser to application server). Higher latency environments have been tested, but as with all multi-tier enterprise products, higher network latency will result in slower response of the software suite.

How much disk space will the database schema require for table spaces? You can find the answer for this early in this document in the “Deployment Architectures” section.