Oracle Primavera P6 Enterprise Project Portfolio Management Performance and Sizing Guide

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INTRODUCTION

Oracle Primavera P6 Enterprise Project Portfolio Management v8.2 is a platform independent solution for the Enterprise.

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 P6 EPPM. 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 P6 EPPM R8.2. The P6 Services, Summarizer, and Leveler modules are re-architected to be platform independent, robust, reliable, and highly scalable. P6 R8.2 has also introduced a near real-time reporting solution called Publication. The *P6 Extended Schema White Paper* describes this new feature in detail.

ARCHITECTURE OVERVIEW

The division of tiers allows the application to scale according to customers' performance demands.

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

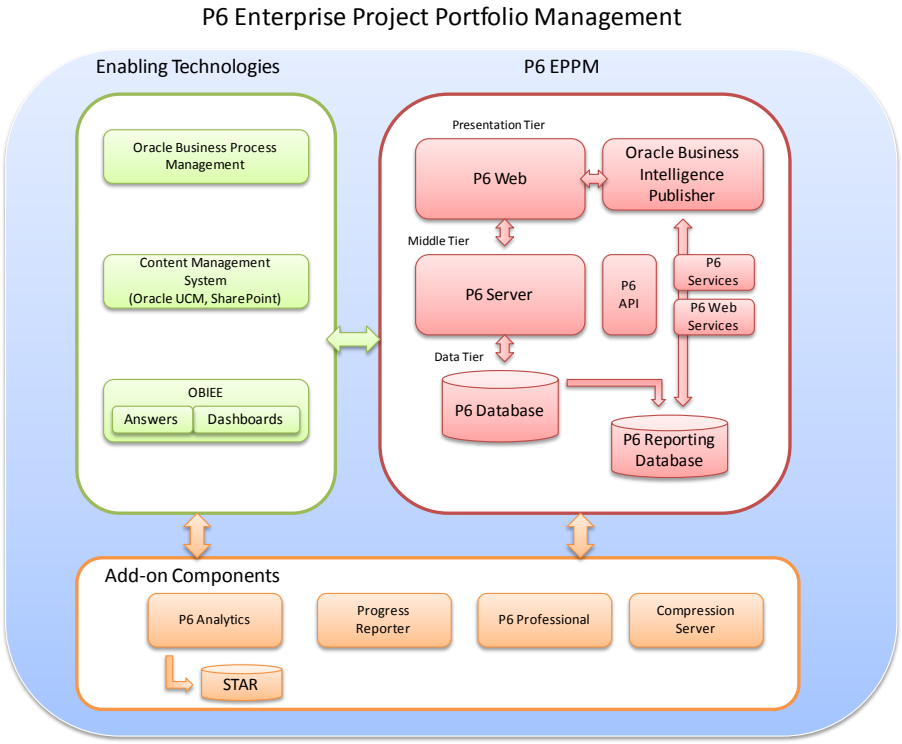
The main tiers of P6 EPPM are:

- **The presentation tier** – A web server layer rendering JSPs, JavaScript, Applets, etc. to present a feature-rich user interface accessible through various supported browsers.
- **The middle tier** – A J2EE application server forms the middle tier where all business logic for P6 EPPM is implemented. This layer runs the business logic for both P6 and 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.

P6 EPPM resides on an application server, and the application data repository resides on the database server. Figure 1 illustrates the architecture of the Oracle Primavera P6 suite of products.

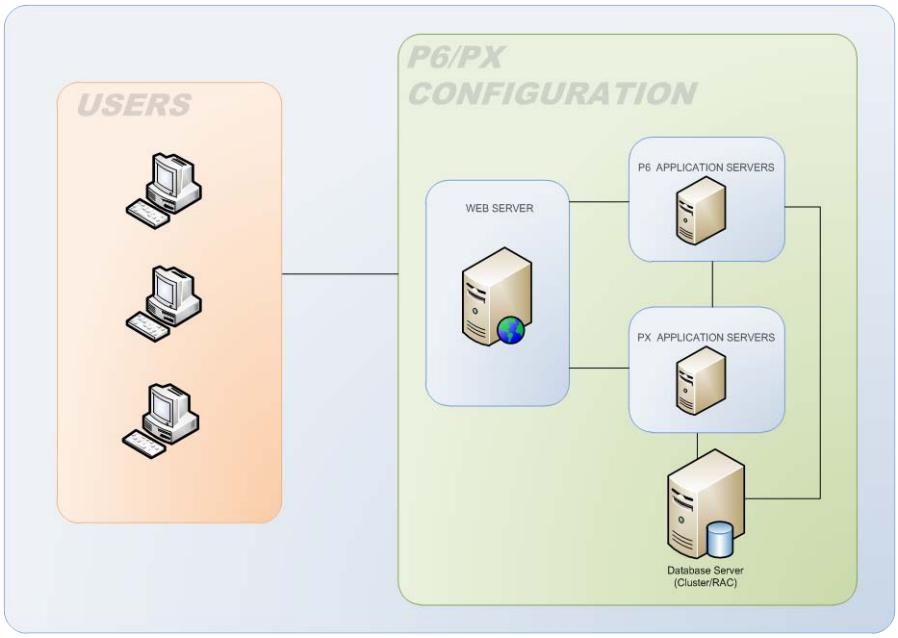
Figure 1: P6 EPPM Architecture



Typical P6 EPPM 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 P6 through these web servers.
- A clustered J2EE application server on which P6 EPPM is deployed.
- RDBMS as a data repository for P6 EPPM. Depending on the dataset size, the database server can be a standalone or 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



PERFORMANCE AND SCALABILITY CONSIDERATIONS

While there are multiple ways to achieve the desired performance and scalability levels in P6 EPPM, the performance considerations can be grouped into two categories: vertical and horizontal. There are several advantages (and disadvantages) for each category. Organizations can decide which to use, based on:

- The desired level of performance
- Availability requirements
- Short-term versus 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, 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 easy way to achieve 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 32-bit to 64-bit hardware. Oracle Primavera recommends 64-bit hardware.

Operating System Upgrade

The desired performance level can also be achieved by upgrading to latest versions of the operating system, installing the latest patch updates, and upgrading from a 32-bit version to a 64-bit version. Oracle Primavera recommends the 64-bit version.

While vertical scaling is easier to achieve, it does not address 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

To mitigate risk of degraded performance and undesired downtime, it is crucial to understand the business cycles of the organization and plan for the desired level of performance, availability, and scalability.

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 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

P6 EPPM performance depends on the load and the response characteristics of each tier. 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 web client performance. Performance is also affected by the activities 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 the CPU and memory requirements of the application server.

Oracle Primavera P6 Server

The P6 EPPM server is a J2EE application that uses J2EE technologies to interact with end-users, target systems, the database repository, etc. Following are some components of server operation that need to be considered during P6 EPPM sizing.

P6 Services

For most deployment categories, Oracle Primavera recommends setting up a dedicated application server node to run a job service.

In Primavera P6 R8.2, the service process can run as a standalone application for better performance and scalability, and it 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

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

- For medium to large deployments, Oracle Primavera recommends setting up a dedicated application server node for Services. This application server should not be part of the cluster that processes HTTP requests from the web client. In addition, Oracle Primavera recommends turning off Services on the application servers in the cluster, which are serving web client requests. Adding more dedicated application server nodes for Services, or horizontally scaling, can address increased performance requirements.
- For long-running jobs, Oracle Primavera recommends job scheduling off peak hours. For example, scheduling a job to run when the load on the system is low.
- For the initial run of Publication Services, after installing or upgrading P6, Oracle Primavera recommends running off peak hours. For example, run Publication Services over the weekend.
- For heavily data-intensive jobs (such as summarizing an entire EPS), Oracle Primavera recommends sequential, rather than concurrent scheduling. For example, do not schedule two large EPS summarization jobs to run at the same time.

Publication

The newly designed Publication feature allows for near real time reporting of project data. The following factors could impact the response time and resources 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 was optimized to help large deployments. As the code was updated to load data quicker, small deployments also benefit from this enhancement. Releases prior to 8.1 can load up to 15 thousand activities. Post 8.1, up to 100 thousand activities can be loaded.

The following factors could impact the response of the Activity Gantt feature:

- Number of activities/assignments
- Number of activity relationships
- Number of open 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 approach to resource management. With this new feature, resource management is easily and intuitively accomplished. The following factors could impact the response time of the Resource Management feature:

- Number of resources
- Number of resource assignments to activities
- Number of open 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 redesigned to enable the user to evaluate factors such as cost and scheduling and thereby be confident of success. The following factors could impact the response of the Risk feature:

- Number of risks
- Number of activity assignments to risk
- Number of open 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 SOAP (Simple Object Access Protocol). Having received the request, P6 EPPM uses the appropriate business logic required to service the request. The client application does not need to 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:

- Business Object Based Services (CRUD operations)
- Job Services
- Spread Services
- 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 factors that can affect the performance of Web Services are:

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

DEPLOYMENT CATEGORIES

P6 EPPM 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 P6 EPPM deployment.

		Deployment Categories		
		Small	**Medium**	**Large**
Number of Objects	Projects	200	1,000	50,000
	Active Users	50	100	200
	Activities	100,000	1,000,000	5,000,000
	Activities per Project	5,000	10,000	20,000
	Resources	500	1,000	4,000
	Resource Assignments	100,000	1,000,000	5,000,000
	Resource Assignments per Project	5,000	10,000	20,000
	Risks	100	500	2,500

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 can also be used to set 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

CPU	Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent
Java Heap Size	2 GB
Drive Space	25-50 GB
Operating System	Oracle Enterprise Linux (OEL) 64-bit or Windows server 64-bit or equivalent

Progress Reporter or Web Services Server Configuration

CPU	Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent
Java Heap Size	2 GB
Drive Space	10 GB
Operating System	Oracle Enterprise Linux (OEL) 64-bit or Windows server 64-bit or equivalent

P6 Services Configuration

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

Database Server Configuration

CPU	Intel Xeon 7000 series (Quad Core 2.66 GHz) or equivalent
RAM	2 GB
Drive Space	50 GB
Operating System	OEL 64-bit or Windows server 64-bit or equivalent

Medium Deployment – Clustered

Assuming 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 balance the load between the nodes for optimal performance.

Application Server Configuration

CPU	Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent
Java Heap Size	4 GB per node
Drive Space	10 GB
Operating System	OEL 64-bit or Windows server 64-bit or equivalent

Progress Reporter or Web Services Server Configuration

CPU	Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent
Java Heap Size	4 GB per node
Drive Space	25-50 GB
Operating System	OEL 64-bit or Windows server 64-bit or equivalent

P6 Services Configuration

CPU	Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent
Java Heap Size	4 GB per node
Drive Space	50-75 GB, depending on log historic log storage
Operating System	Oracle Enterprise Linux (OEL) 64-bit or Windows server 64-bit or equivalent

Database Server Configuration

CPU	Intel Xeon 7000 series (Quad Core 2.66 GHz) or equivalent
RAM	4 GB per node
Drive Space	100 GB
Operating System	OEL 64-bit or Windows server 64-bit or equivalent

Large Deployment – Clustered

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

For optimal system performance, Oracle Primavera highly recommends deploying P6 EPPM on a 64-bit architecture.

A large deployment involves a high system load due to large data sets, processing, concurrent users, etc. To handle this load, Oracle Primavera recommends adding a dedicated clustered web server and a clustered database server, such as Oracle RAC Database. Due to the intense computations typically seen in large deployments, Oracle Primavera highly recommends a large JVM heap. Adding more nodes, or horizontally scaling, can address increased performance requirements. It is not necessary to have application servers on different machines. Multiple nodes within P6 EPPM can be deployed on the same physical machine, assuming it is a high-end machine with adequate physical memory and CPU.

Application Server Configuration

CPU	2 Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent
Java Heap Size	8 GB per node
Drive Space	25-50 GB
Operating System	OEL 64-bit or Windows server 64-bit or equivalent

Progress Reporter or Web Services Server Configuration

CPU	Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent
Java Heap Size	4 GB per node
Drive Space	10 GB
Operating System	OEL 64-bit or Windows server 64-bit or equivalent

P6 Services Configuration

CPU	Intel Xeon 5000 series (Quad Core 3.46 GHz) or equivalent
Java Heap Size	8 GB per node
	50-100 GB, depending on log historic log storage
Operating System	Oracle Enterprise Linux (OEL) 64-bit or Windows server 64-bit or equivalent

Database Server Configuration

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

OTHER FACTORS

This document covers performance for the overall P6 EPPM configuration architecture. However, factors involved in the database setup play a very important role in performance. The following factors could impact database performance:

- Hardware architecture and operating system
- NIC (number of NICs, speed and duplex settings)
- Number of database instances on a server (dedicated versus 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 versus 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, P6 EPPM utilizes Oracle Business Process Management (BPM) technology. For information on hardware and sizing requirements, please refer to the Oracle BPM documentation at:

http://www.oracle.com/us/technologies/bpm/index.html

Oracle BI Publisher

For enterprise reporting, P6 EPPM utilizes Oracle Business Intelligence Publisher (BI Publisher). For information on hardware and sizing requirements, please refer to the BI Publisher documentation at:

http://www.oracle.com/us/solutions/ent-performance-bi/bi-publisher-066551.html

OBIEE/ P6 Analytics

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

http://www.oracle.com/us/solutions/ent-performance-bi/enterprise-edition-066546.html

For information on hardware and sizing requirements for P6 Analytics and Reporting databases, please refer to the white paper on P6 Analytics and Reporting Database planning and sizing, available at:

http://www.oracle.com/us/p6-analytics-and-reporting-db-wp-080572.pdf

Content Management System

For document management and collaboration, 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 UCM, please refer to the Oracle UCM documentation at:

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 P6 EPPM 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 a P6 installation require? Tables that describe the recommended hardware for each deployment size are described in the "Deployment Architectures" section of 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) and to keep historic log files. You must also ensure that you have the appropriate amount of disk space available on you database server. Disc space recommendations can be found in the "Deployment Architectures" section of this document.

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

Do P6 Services affect performance? Yes. P6 Services do affect performance for the P6 application. The difference in performance depends on 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 P6 Services 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 Services run faster? You can make P6 Services faster by:

- Ensuring P6 Services are installed on a dedicated server.
- Separating P6 Services onto multiple servers. If performance is a concern, it is 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 the Publication feature. This only affects the Project Service.
- Verifying that the database has settings optimal for efficiency:
    - Enough memory
    - Fast disks
    - No other database instance running

Should the database be installed in a shared database environment? No. Oracle Primavera recommends a dedicated database server for the P6 Suite.

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) in addition to 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 the 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 a slower response from the software suite.

How much disk space will the database schema require for table spaces? Tables that include the recommended disc space for different configurations can be found in the "Deployment Architectures" section of this document.

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Oracle Corporation
World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A.

Worldwide Inquiries:
Phone: +1.650.506.7000
Fax: +1.650.506.7200
oracle.com