

Living with P6 Databases

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Abstract

A P6 Scheduler is required to know much more than just how to schedule; he or she must plan, maintain, and repair the database. The alternative is to trust that Primavera and their support staff have done this for you and knows what is best.

This paper explains what a Database Server is and what you need to know to keep your CPM scheduling platform up and running. It covers database types, checking the database size, backing-up your schedules and database, differences between databases, creating a second database, and configuring a database. We will attempt to describe these issues and solutions for both Oracle Express as well as MS SQL Express databases. People running the full-blown database servers ought to have trained IT personnel and their issues are not covered here.

Introduction

Oracle/Primavera P6™ software is a high-powered Critical Path Method (CPM) based scheduling software. It stores all of the scheduling data in relational tables managed by a separate program called a database manager. When one purchases P6 scheduling software, a database manager program and database are also installed if a compatible one does not already exist to support the P6 program. In this paper, we will introduce this second program, the database manager that comes with P6.

This paper explains what a Database Server is and what you need to know to keep your CPM scheduling platform up and running. It covers database types, checking the database size, backing-up your schedules and database, differences between databases, creating a second database, and configuring a database. We will attempt to describe these issues and solutions for both Oracle Express as well as MS SQL Express databases.

It is important to remember that the cute and lovable P3™ scheduling software also used a database manager, just not in a client/server configuration. P3 used a 16-bit third-party database manager called, Btrieve. This low-powered program worked well until three or more users tried to access the same information at the same time. The newer P6 program has only increased the complexity by moving to a much higher-powered server model using a standard language called Structured Query Language (SQL) to communicate between the two programs.

Background

For simplicity, this paper will assume that you are running a stand-alone client/server version of P6. People running the full-blown database servers ought to have trained IT personnel and their issues are not covered here. This paper is concerned with the Prototypical Scheduler or Forensic Expert who never intended to become an IT Manager.

Disclaimer - Every effort has been made to verify the appropriateness and correctness of the following material. Most of the instructions are directly based on Oracle Knowledgebase Articles published by Oracle/Primavera. The Author has personally performed every process detailed in this paper using both formats. Nevertheless, neither the author nor Ron Winter Consulting LLC warrants the following information. We do not guarantee the appropriateness nor accuracy of the material presented in this paper. Furthermore, we are not responsible for any damage that may be caused by following the processes or procedures presented here.

Why is Understanding Database Servers Important?

The reason that it is important to know the basics of managing the database server is that all stand-alone users are sitting on a ticking time bomb that will eventually stop working if you wait long enough. This is due to an intentional design fault that the database developers introduced to limit the size of the 'free' database in order to not take business away from their paid-for versions.

Both Oracle Express and Microsoft SQL Express 2005 will store up to 4GB of user data, use up to 1GB of memory, and use only one CPU on the host machine. Once the database grows to this size, the database manager simply shuts down and will not operate further. There is no warning and very little remediation is available other than start building the database over again. You cannot simply delete the last schedule added. If not prepared beforehand, most users end up deleting and then re-installing P6.

Re-installing P6

Even re-installing P6 is a complicated process. It is important to understand that stand-alone P6 users installed two separate programs when they installed P6; the P6 scheduling software and a database manager program. Even though the software may come in one package, two separate programs were installed.

When it comes time to un-install your P6 program, one must uninstall two different programs from the list of existing programs; the P6 program and the MS SQL or Oracle Express program. Many people fail to uninstall the database server when attempting to delete and start over installing P6 in hopes of fixing a problem. They did not know that they had installed a stand-alone database server and that their database problem was never reset.

What is a Database Server?

A database server is a computer program that provides database services to other computer programs or computers, as defined by the client-server model. The client program such as P6 transmits data requests through Windows to the database server using a text format called Structured Query Language (SQL). The SQL query language is more or less the same in all the database servers that P6 is allowed to use. The server accesses the database and selects, manipulates, filters, and sorts the data according to the SQL request and sends the response back to the client program (in this case, P6) to use.

Oracle XE Version 10 (also called, Oracle Express) and MS SQL Server 2005 Express are only supported for standalone installations and not as a standard network (multi-computer) server. Oracle

Version 10 & 11 and SQL Server 2005 & 2008 are used for networks. P6 has been tested and certified on all of these platforms.

Types of Databases Available for use with P6

To sell their P6 software, Primavera (now Oracle/Primavera) had to supply a database server for those clients who were not currently running one of their own. In the beginning, Primavera installed a free, 'shareware' database server called Interbase. When one installed the P6 Version 3.5 software on a stand-alone machine, one also installed Interbase to handle the data. If other, approved database servers were already installed, then P6 would not install Interbase and would use what you had previously installed.

Since that time, the default database server has changed. P6 Version 5 installed MSDE (Microsoft SQL Express 2003). P6 Version 6 installed Microsoft SQL 2005 Express and later switched to installing Oracle Express (Version G9) sometime after the company was acquired by Oracle. P6 Version 7 uses Oracle Express Version 10 as the default database and new installations of P6 V8.1 use Oracle Express Version 11 as the default.

When a person upgrades from an earlier version to a later P6 version, the database type remains the same and only the structure of the database is modified to accommodate then new schemes. This means that if you started with an earlier version SQL database, then you kept it when you upgraded. On the other hand, if you installed a new copy of P6, you were forced to accept the default type.

As an example, if you want to install MS SQL, on a new P6 V7 or V8.1, then you might want to first install P6 Version 6.2.1. This will automatically install MS SQL as your stand-alone database. Next you would then 'upgrade' your software to Version 7. You will keep your SQL Database for P6 Version 7.

The exact nomenclature of the Oracle databases is also somewhat fuzzy. I have seen the official documents call it "Version 9", "G9", and "R9." Other Oracle products are typically rated as 'releases', so perhaps the "Oracle R9" is the correct nomenclature to use.

Why Does the Database Server Type Matter?

Besides being an excellent source of reading material to help insomniacs deal with their nocturnal problem, why does the type of database server matter to the average P6 user? The answer to this question is that different database servers have large differences in nomenclatures and even in features. The P6 user cannot manage their database unless they know what type of database is involved.

The easiest way to tell what database server you have to is start-up P6 and look at the Login screen. The third box indicates the Database name. Click on the small, square button on the right to Edit Database Connections. At the bottom of this screen, it should state that it is an Oracle XE (Oracle Express) or that it is and SQL Server (MS SQL).

Check Database Size

SQL Express

P6, Version 4 & 5 systems used MSDE, which only have 2 GB of space available. Luckily, SQL Express 2005 and 2008 both support 4 GB. The good news is that SQL Express 2008 R2 now supports up to 10 GB. MS SQL Express 2008 R2 is not automatically installed on P6 systems, but that does not stop one from manually installing it and having P6 use it.

To check the SQL Express database size, click on the Windows Start button, select All Programs, Microsoft SQL Server 2005 folder, and then SQL Server Management Studio Express. All of the necessary information in the Connect to Server window should already be entered for you if you use “Windows Authentication”. If this does not work, you may use SQL Server Authentication with a Login ID of “sa” and the Password, “Prima123Vera”. Click on the Connect button to continue.

The SQL Server information is laid out as an expandable tree. Expand the Databases section and right-click on the database in question. The default P6 database name will probably be “pmdb\$primavera.” Now select the menu item, Properties. The General tab will list the database size with the heading, “Size”. 4,096 MB (4 GB) is your normal limit.

Oracle Express

To check on your Oracle Express database size, Click on the Windows Start button, open the “Oracle Database 10g Express Edition” folder, and click on the “Go To Database Home Page” entry. This will launch Internet Explorer and you will use this strange way to talk to your data server residing on your computer.

You must now login to the server. The Username is, “admprm\$pm” and the password is whatever you set it to when you first installed the Oracle database. This has nothing to do with your P6 passwords. Experience has shown that roughly 95% of all people with an Oracle Express database do not actually know their Oracle Database Password (this figure also includes many professional IT Admin personnel.). There is no default. We will cover this subject in more detail in the Oracle Database Configuration section later in this paper.

Once you click on the Login button, you will see the Home Page. On the right-hand side, is a very easy-to-read storage Usage Monitor. You can easily see how close you are to the 4 GB (4,096 MB). Remember, Oracle Express only supports 4,096 MB of storage. Don’t let the green meter fool you into thinking that you have more space available that you actually do.

Backing up your Schedules

To prevent you having to start over again with a database full error (or any other type of harddisk error,) we recommend that you backup your schedule data before you have a problem. There are many ways to do this, producing different types of backups of varying usefulness. The first method is to use the P6 Export function.

Using P6, first open the schedule or schedules that you want to backup. You can only backup schedules that are currently open. You can backup multiple schedules at the same time (and in the same XER file) if all of those schedules are open at the same time. Now select File / Export.

The Type of export will be your next option. The options include,

- Primavera PM / MM – (XER)
- Primavera Contractor – (XER)
- Primavera PM – (XML)
- Spreadsheet – (XLS)
- Primavera Project Planner (P3)
- Microsoft Project

P6 Export - XER Option

The Primavera PM / MM option will create a backup file with the extension of “.XER” and thus is called, an XER backup. Research has indicated that the extension was named after the original software that P6 is based upon, eXport Eagle Ray. [1]

The version of XER is the next option to consider. Project Manager (PM) and Methodology Manager (MM) versions include,

- 8.1 or later
- 8.0
- 7.0
- 6.2
- 6.1
- 6.0
- 5.0

Why do the versions matter? If you are transferring the schedule to someone with a lower version than the one that you saved it in, then they will be unable to read your XER backup file. Primavera would tell you that the reason that P6 refuses to import later XER versions is that the earlier versions do not support features found in the later versions and might cause a loss or even a corruption of data. Those differences are not published by Primavera and would make a terrific subject for a research paper.

There is a work-around to the problem of P6 not accepting your later-version import. First, make a backup copy of your XER file. Then use a pure-text editor such as Notebook to open the XER file. The first line will contain the version type like the partial line shown below,

| | | | |
|---------------|------------|-------------------|------------------------------------|
| ERMHDR | 7.0 | 2010-09-10 | Project admin Administrator |
|---------------|------------|-------------------|------------------------------------|

Figure 1: Edit XER File Example

To ‘downgrade, this XER file to a lower version, very carefully change the “7.0” to your version and save the file. Now P6 should be able to import it. Be careful to not delete any of the tab characters between the words. While results are very often favorable, this ‘fix’ is not guaranteed to work every time, as there may be version differences that will no longer be handled properly because of our change.

There is one other P6 feature that should be mentioned here; Job Services. Job Services is an optional feature that you can load from your P6 installation disk. It allows P6 Administrators to schedule special services to run at odd hours such as in the middle of the night. One such Job Service is to automatically create XER backups. One can configure Job Services to create a XER backup of a single schedule or even the entire database, if the Root Enterprise Project Structure (EPS) is selected. Backing up the entire EPS structure will typically take many hours and will create a file many times the size of the original database.

P6 Export - XML Option

The XML option creates a web-like HTML description text file containing some of the schedule's information with the file extension of, ".XML". This is supposed to be a new universal standard communication between non-compatible software. Because this is a growing industry standard, some options only found in P6 are not currently supported. Since not all of the schedule's information is saved using this option, this makes the XER backup a better option for maintaining and transmitting backups.

The types of XML backup versions available are

- Professional R8.1
- P6 EPPM R8.1
- P6 EPPM R8

The distinction is very telling and important. As of Version 8 (which Primavera calls Release 8 or just R8), there are two different, incompatible database types; the stand-alone P6 Professional and Enterprise Project Portfolio Management (EPPM). P6 Professional is strictly a client/server model while the EPPM is web based with an optional limited-function client/server module.

Primavera is saying that the two versions will have different features and that the databases will be different and incompatible. By design, one type or XML backup cannot import the other type of XML backup.

Even more telling is the fact that there are no XML settings for P6 versions prior to Version 8. XML backups have been around since 2007 with the release of P6 Version 6. Is Primavera abandoning all Version 6 and Version 7 XML backups?

Even though XML does not backup items such as your CPM settings, it does have one feature that the XER option lacks; saving project layouts. XML backups give the user the option to save current project layouts and filters. This produces a second file different from the XML file and the two files are saved together in a ZIP compressed folder. One can also manually create a Layout and Filters ".plf" backup file for one layout at a time using P6 menu item, View / Layout / Open and clicking on the Export button.

Backing-up your Full Database

Backing up your schedule is a far cry from backing up your entire database. The database contains all of the layouts, user profiles, Work Breakdown Structures (WBS) and Operational Breakdown

Structures (OBS) settings and other enterprise-wide information that would take days or weeks to replicate should you have to restore your P6 database from scratch using XER files.

You cannot back up the database using P6 but you can do so using the provided database management software, depending upon which database manager software you are using. The procedures for each are different and must be discussed separately.

SQL Express Database

To backup your MS SQL Express 2005 database, select the Windows Start Button / All Programs / Microsoft SQL Server 2005 / SQL Server Studio Server Management Express to access the login screen. You will be asked to identify your database and connection type. Thankfully, stand-alone users will find that the information is already provided if you elect the Windows Connection. Just click on the "Connect" button.

It is a simple process to back-up your SQL database. Expand the outline under "Databases" by clicking on the "+" indicator. Right-click on the "pmdb\$primavera" database and then select Tasks / Back Up... . Some users will have a database called just, "pmdb" depending upon if this is a new installation of an older pre-Version 6 one that was upgraded.

Select "Full" backup type and then supply a destination file name. "C:\program files\MSSQL\Primavera\mssql.1\MSSQL\Backup\pmdb\$primavera.bak" is the typical default. (Someone doesn't want just anyone to stumble across this file.) You can add multiple backups into this same file. It took the Author a little over 30 seconds to backup a 500 MB database. The backup file was 200 MB in size. There is enough room on your harddisk to backup the database every week without even making a noticeable dent in the amount of free space let over. You can zip this backup file to a tenth of its original size for transportability.

Restoring the SQL Express backup is a little more tricky for MS SQL Express users than that for those using Oracle Express. From the same SQL Management screen, right-click on the Databases line and select Restore. The restore screen automatically lists all backups that you have made in order and lets you select one. It took the Author around 40 seconds to restore our backup. Next, you must 'resync' the database with P6.

To resync your SQL Express backup, launch SQL Server Management Studio from Start/Programs/Microsoft SQL Server 2005/SQL Server Management Studio (Express.) Connect using either Windows or SQL Authentication. Expand the "Databases" folder on the left and highlight the database name. Then click the "New Query" button at the top left. The type the following script in the blank window on the right-hand side.

```
EXEC sp_change_users_login 'Update_One', 'pubuser', 'pubuser'  
EXEC sp_change_users_login 'Update_One', 'privuser', 'privuser'
```

Figure 2, SQL Express Restore Resync

If you typed it correctly, the words will automatically be colored in the manner shown above. Now, be sure that the correct database name is shown in the drop-down box to the right and just below the New Query button and then click the Execute button to the right of drop-down box.

Oracle Express Database

To backup your Oracle Express database, select the Windows Start Button / All Programs / Oracle Database 10g Express Edition / Backup Database. You will see a scary black window and suddenly realize that you are looking at a pre-Windows DOS window.

The scary black window will eventually display white-colored words streaming out into a full paragraph of technical gibberish. They will then ask you an incomprehensible question, “Are you sure [Y/N]?” (Notice that the question is an incomplete question that omits the object.) Just press the “Y” key and then the Enter key. There is no further action required on your part. You will see pauses and then reams of completely incomprehensible lines that eventually tells you where the Log File is kept but not where your backup was placed. Press any key at the prompt to close the scary black window.

You can use Windows Explorer to verify that Oracle Express left your backup file at, “C:\directory where you installed the downloaded Oracle XE installation program\app\oracle\flash_recovery_area\XE\BACKUPSET\{today’s date}\xxxxx.BKP” where the “xxxxx” actually was a gibberish of 40 characters. Luckily, Oracle remembers this horrendously-named location and the recovery routines go directly to the latest backup area.

The Author’s 3,420 MB database ended-up creating a 1,234 MB sized backup file. You can zip this file down to 207 MB file. You will need to un-zip the file before using it to restore the database, but the compressed format makes it much easier to place your backup someplace where a harddisk crash will not cause you unrecoverable damage..

Restoring the Oracle Express backup is even easier than making the backup. Select the Windows Start Button / All Programs / Oracle Database 10g Express Edition / Restore Database. The scary black window will ask you to confirm that you want to restore the database with a “Y” and the Enter Key and then it completed after 7 nail-biting minutes.

Differences between Databases

Aside from having to learn how to use one type of database server or the other, what is the difference between MS SQL and Oracle? There are minor, technical issues involving ease of installation and maintenance that we will not go into here. Oracle is rather odd with how they store large files such as pictures. The real important difference for the typical P6 user is in the ability to create separate databases.

The full versions of Oracle and MS SQL both support the creation and maintenance of separate databases. The difference is that the Express version of Oracle does not allow the user to create and maintain more than one database while MS SQL Express does.

Why does Multiple Databases Matter?

A schedule database contains all of the schedules, and related information in a single file. This file contains not only the schedules for one project but for all of them. As information such as resources and costs are theoretically shared by every schedule in the database, then it is conceivable that the

only way one could exactly duplicate the installation's schedules would be to have a copy of every schedule and resource used on the other system.

This intermingling of schedule information means that in case of litigation, a discovery order could conceivably require you to turn over the entire database file and not just individual backups. You might be required to share the information from other clients as well as the one whose case is being litigated. [2]

The only way that a scheduling consultant with multiple clients could keep various project isolated would be to create multiple P6 databases and store schedules from separate clients in the separate databases. Legally, Oracle allows you to have as many open databases as you have licenses. As long as you only use one database at a time, this complies with the single-user P6 licensing requirement. The Microsoft SQL Express 2005 license only allows for 5 legal SQL 2005 Express databases per user, but this largely ignored and is not enforced.

As MS SQL Express is the only database server to allow you multiple databases, we only need to explain how to create new MS SQL databases.

Creating a Second SQL Database

You can create a new MS SQL Express database by running the batch file, **dbsetup.bat** located on the installation disk (or in the expanded download directory.) [3] This file is installed in different directories depending on what versions of P6 software you have. P6 Version 7 users should look for

P6_v7_Client_Applications/Install/Database/dbsetup.bat

P6 Version 8.1 users should look for the file at

P6_R81_Client_Applications//Database/dbsetup.bat

Using "My Computer" or Windows Explorer, locate this file and double-click on it to run. Select Database Option: Install a new database with the Server Type Microsoft SQL Server. The connect parameters are as follows,

DBA user name: **sa**
DBA password: **sa**
Database host address: (*your computer's name*)
Database host port: **1433**

Note: We know the computer's name by looking at Windows Start Button / Control Panel / System and Security / System. The Database host port is typically, "1433" but one can confirm this by looking into the Registry (program name, "regedit") at Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\MSQLServer\Client\SN19.0\Via\Property1.

In the new screen, enter the name for new database name. Do not use any spaces in the new name. A typical new name might be, "SANDBOX". For brevity, the file addresses below start with, "C:\Program Files\MSSQL\Primavera\MSSQL.1" and then finish with what is listed below,

Database name: *(your new name without any spaces in it)*
Data file: \MSSQL\DATA*(new name)*_DAT.MDF
Log file: \MSSQL\DATA*(new name)*_LOG.MDF
Database code page: **Database default**

You will then create a list of SQL Server users. Check the box for, 'Use existing privileged user'. You can enter either 'pubuser' or 'privuser' for the user name. Whichever one you choose, that is the name you will later need to use when you create the database alias. The default password is the same name as the user name.

The Configuration Options screen requires the following information,

Administrative user name: **admin**
Administrative user password: **admin**

Click the Install button to complete the process. Now you are almost done. After you finish adding your new database, you will have to create a P6 database alias.

P6 Database Configuration

After you add a new database, you will have to introduce it to P6. P6 may 'see' the database name but it cannot connect to it until you tell it the connection information. This issue sometime arises independently of a new database while trying to log into P6. The program finds that for whatever reason, it cannot connect to the requested database.

To edit the P6 database connection, you must start P6 and get to the P6 Login screen. Do not attempt to login to P6 at this point. Instead, click on the small, square button marked with three periods (an ellipsis) just to the right of the listing for Database name. This brings you to the Edit Database Connections screen. Click on the Add button to create a new database alias.

We now see the Select or Create Alias screen. Database alias can be different that the database name. The alias is the name that will show up in the list of databases when you log in to P6. We suggest that you use a descriptive name suggesting its contents or special use and not just something like, PMDB1. A good name will prevent confusion later.

The Next button brings us to the place where you list the connection parameters. A typical Host name is "localhost\primavera". Some older databases (say from the P6 Version 5 era) do not use "\primavera" after the name. You can confirm the correct name by viewing the Details section of the Edit Database Connections screen displayed two screens ago. You should enter your new database name

The Next button will allow us to tell P6 what database login name and password to 'use' when it tries to connect to your database. The Database Alias will be entered for you. The Username and Password will be 'privuser' or 'pubuser', depending upon what you entered when previously creating the database. Public group ID should be "1".

The validate Database Connection screen should indicate that you are now a proud parent of a brand-new P6 baby database. The next time that you login to P6, you will see your new database

alias in the drop-down list of databases. Select that name and then login using your admin name and password.

Oracle Database Configuration

Even though we will not be adding databases in an Oracle Express environment, we still have situations where P6 cannot connect to the Oracle database. For completeness, we should describe the correct parameters to use to re-connect your Oracle Express database to P6.

Should P6 fail to connect to your Oracle Express database, you will be asked if you want to re-connect now. Click on “Yes” and you will see the Select or Create Alias screen. The default database alias is ORAPMDB and the Driver type is Oracle. The Configure ORACLE Connection screen will ask you for the Oracle Connection String. Enter “XE” in this box.

The Enter Public Login Information screen will ask you for your Username (pubprm\$pm) Public group ID (1), and your password. Right here is where many stout-hearted gentlefolk flounder on the Cold Reality Rocks.

You DO remember the password that you used when you installed Oracle for the first time, don’t you? (Here is a hint; there is no default password and it is not admin, password, or any other P6 password.) In other words, you have just joined the group of long-suffering Oracle users who did not understand that Oracle was asking them to provide the new password during installation. They thought that they were just trying to guess the established password and were so relieved when it ‘worked’ the first time that they forgot to write down what they entered.

You cannot discover the correct Oracle password. You will soon be temporarily locked-out of P6 if you make too many bad guesses. After a set amount of time (perhaps an hour), Oracle will automatically ‘unlock’ and allow further guessing but this lockout procedure becomes tiresome real soon.

You are able to reset the password to a new one. This will require that you get to the DOS prompt (Windows Start Button / All Programs / Accessories / Command Prompt) start-up the Oracle Database Manager and enter a couple of command lines. At the DOS Command Prompt, you would enter,

```
C:\>sqlplus / as sysdba
```

The prompt will turn into an SQL> prompt, i.e. “SQL>”. Type the following:

```
SQL> alter user PUBPRM$PM identified by <new_pass>;
```

Where <new_pass> is the new password you specify for the user. Don’t forget to enter the “;” at the end, or you will be prompted for the 2nd half of your entry “;” with a “?” prompt. (In that case, just enter the “;”.) You can repeat the alter user command for each user password that you would like to change.

To exit SQLPlus, type

```
SQL>exit
```

and Return or Enter. To exit the windows command prompt, also type,

```
C:\>exit
```

and Return or Enter.

Alternate Oracle Database Password Method

You can also download a file called, **ChangeMyP6PasswordTo.bat** from the Oracle Knowledgebase [4] to perform this task with less typing and with less chance of failure. You would open the DOS command prompt in the directory where you saved the batch file and then type,

```
ChangeMyPasswordTo (new password)
```

Once the passwords have been reset for the Oracle Express users, a new connection must be made from Project Management and Methodology Management to the database. When reestablishing the database alias connection to the database, a failure will occur and report a message similar to *'Bad Private Database Username or Password'*. This is expected behavior since the privileged username's password has also been changed. Once you have supplied the correct Oracle database password, a couple of clicks will bring you to the Connection Successful screen.

Alternative to Self-Support

Most people would not try to fix their own car but still will not consider paid computer software support. Considering the complexities of maintaining P6 databases, maybe some should reconsider.

There are many companies with IT expert support who are happy to provide this service for single P6 stand-alone users. They are designated as Primavera Partner Support companies. A little money spent 'up-front' may save you a huge return when you consider the cost of your time. If this is an option, you should also think about contacting one of these companies before you need them.

Conclusion

P6 stand-alone users must be prepared to provide minor maintenance to the associated database server. In this paper we have covered,

- What is a Database Server?
- Types used by P6 Stand-Alone
- Check Database Size
- Backing-up Your Schedules
- Full Database Backup
- Differences between Databases
- Creating a Second Database
- Oracle Database Configuration

These topics are pertinent to the average P6 stand-alone user but frequently even stymie the experienced IT professional.

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