Issue 8

Oracle Scene

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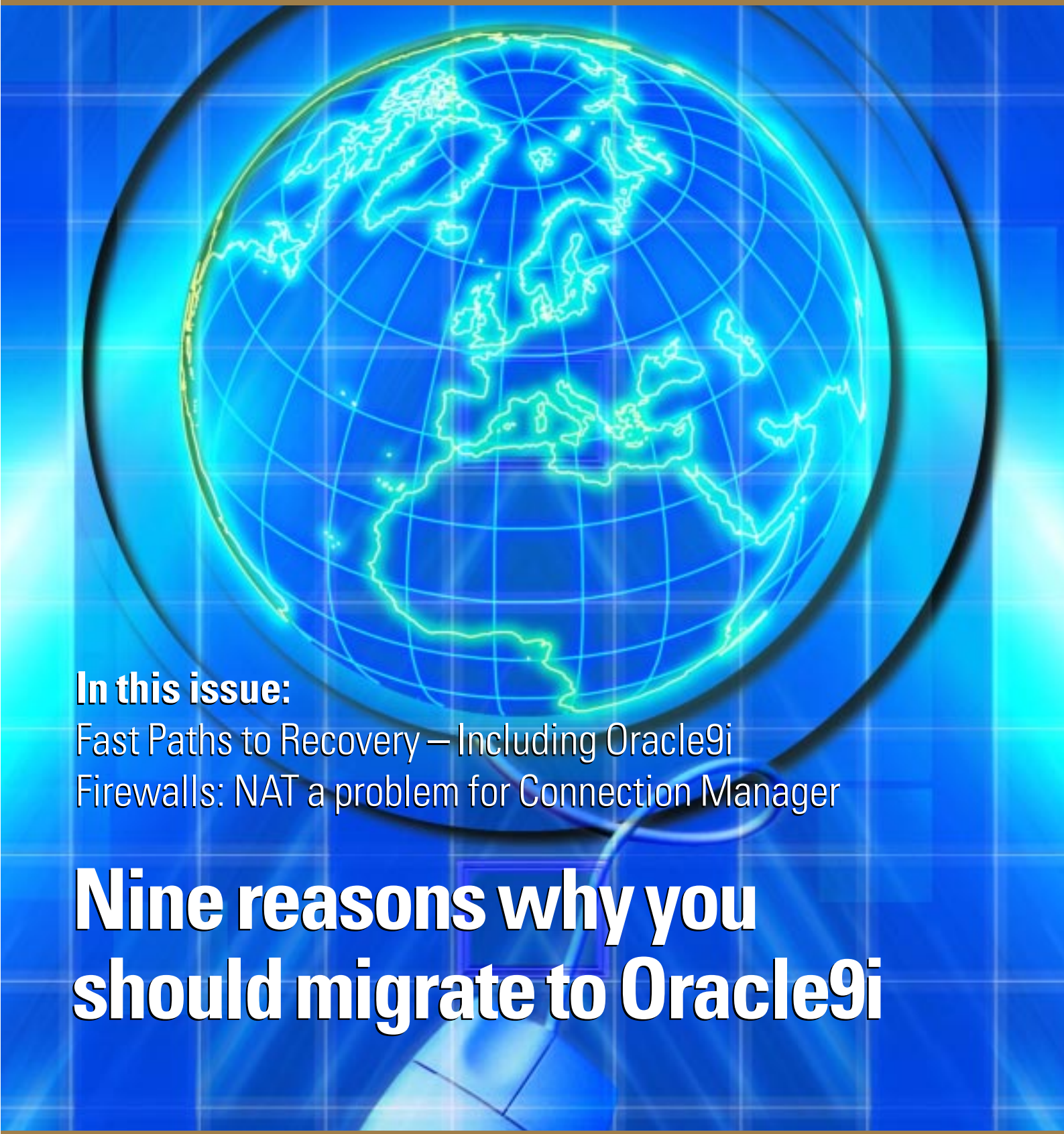

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Welcome

to Issue 8 of Oracle Scene

Howard Latham
Editor

Welcome to the Conference Issue of Oracle Scene. As you can see we have dedicated part of the magazine to 9i. I am sure not all of you will be migrating in the short term but many of the new features may make it hard to resist, and you will find some of the discussion relevant to Oracle8/8i users too.

There's a fascinating article about emailing from a database, which I found very technically interesting but I must admit introducing another layer that could fail within a database frightens me a little. Other vital topics in this issue include recovery, connection manager, locally managed tables and data warehousing.

It is not often I rush out and buy a book about Oracle. Indeed the last time I mentioned a book it was in the same series and also cost only £8.95. It's called Oracle Checklists and is exactly what it says on the cover, a bunch of useful Database checklists. As I was in the middle of writing some checklists, it has been very useful to me.

In the last issue I asked you to email me with your views on Oracle Support, so far I have only had 12 emails!

I look forward to meeting many of you at the conference. I have three predictions for this conference:

1- Oracle staff will turn up for 99% of presentations – they hold The UKOUG in high respect
2- It will rain in Birmingham
3- It will be the best ever UKOUG conference.

This time around the best article award goes to Bob Mycroft – for a very educational but still unnerving article!

Howard Latham Bsc is editor of Oracle Scene. He has worked with Oracle in a variety of roles for over 15 years. Howard can be contacted at hlatham@dircon.co.uk or on 020 8693 9727.

9 Reasons Why You Should Migrate to Oracle9i

By Robin Murgatroyd, Oracle Corporation UK Ltd

On Wednesday 20th June at Oracle OpenWorld in Berlin, Oracle CEO Lawrence J. Ellison debuted the Oracle9i Database, this was closely followed by the UK launch of Oracle9i in the 'Big Top' on the 12th July at Oracle UK's Thames Valley Park headquarters.

Today the Oracle9i Database is in production on IBM's AIX, IBM's OS/390 MVS, Sun SPARC Solaris, HP-UX 11i, Compaq Tru64 5.1a and Linux[1], with NT/Windows 2000 planned for September 2001[2]. All of which raises the question should I consider migrating and just how complex is the migration?

Should I Migrate?

When considering migration you have to review the benefits first. The Oracle Database has for the last twenty-five years been able to deliver the very best information technology platform. It was the first to implement a commercially available SQL language in 1979 and to be written in a language that made it portable and available on any platform. It was also the first to implement client-server support, integrate the Internet and Java natively into the RDBMS, have the first commercially viable distributed transaction and parallel operation support, OLTP and data warehouse VLDB capabilities all in a single RDBMS. The Oracle Database was also the first to embrace integration technology and open standards such as XML and SOAP. Finally, it was in 2001 the first to implement the revolutionary, transparent or real application clusters.

Today Oracle9i has been designed with a focus on:

1. Scalability

Oracle9i is available with Real Application Clusters, Oracle9i Real Application Clusters. is the first database software than can run most packaged applications with unlimited scalability and total reliability across multiple computers. Customers can grow the performance, scalability and availability of their database on demand, by using the Oracle9i Database on low-cost hardware clusters and so dramatically cut costs. To date, more than 100 ISVs have already successfully tested their applications on Oracle9i, citing scalability, availability and ease of migration as key reasons to upgrade. In addition Oracle and Compaq have worked together to deliver Out-of-the Box Oracle9i Real Application Clusters Certified Configurations on the Compaq AlphaServer and ProLiant platforms. Customers today can purchase out-of-the-box, pre-integrated, pre-installed Compaq systems with Oracle9i Real Application Clusters resulting in faster-time-to-deployment and less risk[3].

2. Performance

Oracle announced that Oracle9i Database is the fastest database on a single server, delivering 90 percent more performance than a recent Microsoft SQL Server 2000 clustered TPC-C benchmark federated database on 32 processors. Simply, it is the fastest performing database on a single processor using the latest version of the TPC-C benchmark. But performance also extends to capacity, Oracle9i has achieved the world's first three-terabyte TPC-H Data Warehouse benchmark!

3. Availability

Online, immediate access to information is vital to the success of the modern business. Oracle9i Data Guard provides 100% protection from all situations that can cause data loss – protecting not only against natural disasters, but also providing the same level of protection against software corruption, program malfunction and viruses. The Oracle9i Database also provides built-in protection against the leading cause of data loss – Human Error – by allowing any user to immediately go 'back in time' to access and bring forward previous versions of business information that may have been erroneously changed or deleted.

4. Manageability

Self Managing Database

Oracle9i databases are capable of managing their own undo (Rollback) segments – no longer will administrators need to carefully plan and tune the number and sizes of rollback segments or bother about how to strategically assign transactions to a particular rollback segment.

Improved and Streamlined Operational Management

With the introduction of a persistent INIT.ORA feature in Oracle9i, parameter changes persist across multiple shutdowns. This feature also allows the administrator to startup the database from remote machines without a local copy of INIT.ORA.

Management Tools and Techniques

Oracle9i Oracle Enterprise Manager's web-based graphical interface makes it simple to adopt and manage critical new

components such as Oracle iFS, Oracle Internet Directory, Oracle Express, and Oracle iAS. Oracle Enterprise Manager has been enhanced to include guided, expert diagnostics and problem resolution. Oracle has consolidated the wealth of expert knowledge and experience of its development and consulting teams into Oracle Enterprise Manager. Advice and recommendations about properly configuring an Oracle environment, effectively monitoring its performance, and quickly resolving problems have been incorporated directly into the Oracle Enterprise Manager management tools.

End-to-end System Management Solution

This capability is critical to users such as Application Service Providers, eBusiness sites, or any business whose success depends on maintaining superior response time, performance, and availability of its IT systems. Enterprise Manager has been significantly enhanced. A comprehensive set of pre-defined web reports are included that document the configuration and health of the entire Oracle environment. Reports can be generated, for example, on the configuration of databases, the performance of applications over the last week, or the current load on the system. Customised reports can also be generated.

5. Security

The fact that modern organisations can derive exceptional competitive advantage from their business information, is a double edged sword – the information that a business uses to ensure its competitiveness can also be used against it by its competitors. In addition, the push towards more and more consolidated customer information being shared with larger numbers of users dramatically increases the requirement to guarantee privacy of sensitive personal information.

The Oracle9i Database addresses these requirements by being fully LDAP enabled, allowing all users to be centrally managed in a standard corporate directory solution. For strong user authentication, Oracle's Advanced Security Option supports the ability to use digital certificates to determine the true identity of all users. Oracle Advanced Security Option also supports full encryption of all network traffic between the user, the business application and the Oracle9i Database, protecting sensitive information from being intercepted or tampered with while being transmitted across private and public networks.

Oracle9i database also has the unique Virtual Private Database capability, which allows advanced security policies to be built directly into the database itself, ensuring that users can only access data relevant to their specific security realm.

6. Content Management

The challenge faced by all organisations today is how to manage the thousands of documents and electronic assets scattered across all of its information's systems – just how do these organisation manage, maintain and use these assets effectively?

The Oracle9i Database stores and manages not just characters, numbers and dates, but also location information, email, documents and files, and media such as image, audio, video and spatial data. In addition, the Oracle9i Database includes the ability to integrate organisations' third-party information sources through transparent gateway technology. By providing an integrated and complete solution for all business information, the Oracle9i Database significantly reduces the cost of storing and using all the different types of business information modern organisations have come to depend on.

In summary Oracle9i centrally manages content and the new Oracle9i Application Server for performance caches information locally – the very best of both worlds!

7. Partitioning

Partitioning enhances the data management environment for OLTP, data mart, and data warehouse applications by adding significant manageability, availability, and performance capabilities to large underlying database tables and indexes.

Oracle9i Partitioning permits large tables to be broken into individually managed smaller pieces, while retaining a single application-level view of the data. Range, hash, composite (range combined with hash) and list partitioning methods are supported.

8. Business Intelligence

The effectiveness of business decisions entirely depends on the completeness and richness of the information used.

Oracle9i Database provides a complete suite of extraction, transformation and load capabilities (ETL) fully integrated into the database. For immediate, 'in-place' analysis of business data the Oracle9i Database also provides Oracle OLAP Services, a scalable, high-performance OLAP calculation engine that is also fully integrated into the Oracle9i Database. And the Oracle9i Database also includes new data mining capabilities enabling any business to implement accurate, real-time recommendation capabilities into its online operations. By integrating these new types of usage capabilities directly into the database, the Oracle9i Database significantly reduces the time it takes for organisations to extract, transform, load, store, analyse and mine their business information.

9. Rapid Application Development

As a development platform Oracle9i adopts open Internet standards for all communication, definition and language. Oracle9i is SQL ISO/IEC 9075-1:1999 or ISO/ANSI SQL:1999 compliant, it supports J2EE through use with Oracle9i Application Server OC4J container for deployment, EJB 1.1 (1.2 is planned in 9i

AS V2), Java Server Pages 1.1, Servlet 2.2, W3C XML and SOAP 1.1. This means you can develop your applications on Oracle9i to these standards and guarantee that your code can be deployed within other compliant containers – true "write once run anywhere".

The Oracle9i Developer Suite (DS) provides a complete integrated, suite of development tools for the IT development community to use to build their applications to these open standards. One key component of 9i DS is JDeveloper 9i; this has been enhanced with an integrated UML modeller. This extends the Java integrated development environment to the complete development life cycle – from analysis capturing the UML Class Diagrams, design, code generation, implementation with code testing and finally application deployment.

How Complex is the Migration?

So that's Oracle9i, but just how complex is the migration to get these benefits? To understand this we first have to ascertain if we require a migration or an upgrade.

For the purpose of this paper, Migration is the process of transforming an installed version of an Oracle7 database into a later version. For example, transforming an Oracle7 database into an Oracle9i database requires a migration.

Upgrading is the process of transforming an installed version or release of an Oracle database into a later version or release. A migration is not required, for example, when transforming a version 8 database into an Oracle9i database – this is an upgrade.

Step 1 – Prepare your Migration

Plan and prepare your Migration first!

As with everything in life planning is the key.

- First become familiar with the new features of the Oracle9i database. See http://otn.oracle.com/products/oracle9i/pdf/9i_new_features.pdf
- Decide which migration method to use, this is based on considerations involving the current production database, your migration objectives, and the behaviour and capabilities of available migration methodologies.
- Estimate and secure the system resources required for the migration. See the Oracle9i Database system release bulletin for full details by platform.
- Develop a plan for testing the migration with an Oracle9i test database and a plan for testing the migrated Oracle9i production database.
- Prepare a backup strategy so that you can recover quickly from any unexpected problems or delays.
- Plan for a test migration using a test database. The test migration should be conducted in an environment created for migration testing and should not interfere with the actual production database. Test the Migrated Test Database. Perform the tests you planned in Step 1 on the migrated test database. Ensure you allocate time to compare test results, noting anomalies on the version 7 or version 6 test database and on the migrated Oracle9i database. Finally, ensure you allocate time to investigate ways to correct any anomalies you find and then implement the corrections.
- Ensure you plan to check and test that the Oracle9i database works with any required applications.
- Schedule the downtime required for backing up and migrating the version 7 or version 6 production database to Oracle9i.
- Perform a full backup of the current production database. This step is required only if either the Oracle Data Migration Assistant or the Migration utility is used for the migration.

Step 2 – Install Oracle9i software

Whether doing a migration or an upgrade you must first install the Oracle9i software into a NEW Oracle home. It is not possible to install release 9.0.1 products into an existing Oracle7 or version 8 Oracle home. Also, you cannot have more than one release per Oracle home. Oracle Corporation recommends that you adopt an Optimal Flexible Architecture (OFA)[4] when creating multiple Oracle homes (see Fig. 1).

Step 3 – Migrate Oracle7 Databases

Migrate a Version 7 Database to a Version 8 Database. You can migrate your version 7 database to a version 8 database and have both version 7 and version 8 clients connecting to the version 8 database. You cannot migrate your version 7 database to a version 8 database in the same Oracle home (see Fig. 2).

Step 4 – Upgrade 8.0 Databases

Upgrade a Release 8.0 Database to a Release 9.0.0 Database. You can upgrade your release 8.0 database, for example release 8.0.6, to release 9.0.1 and have both version 7 and release 8.0 clients connecting to the release 9.0.1 database. You cannot upgrade your release 8.0 database to a release 9.0.1 database in the same Oracle home (see Fig. 3).

Step 5 – Upgrade 8i Databases

Upgrade a Release 8.1 Database to the Current Release. You can upgrade a release 8.1 database, for example, release 8.1.5, to the current 9.0.0 release and have version 7, release 8.0, release 8.1, and release 9.0.1 clients connecting to the release 9.0.1 database. You must use a separate Oracle home directory for the new 9.0.1 release.

Step 6 – Run the Migration Utilities

There are a number of ways you can migrate.

1. Use the Migration utility to migrate

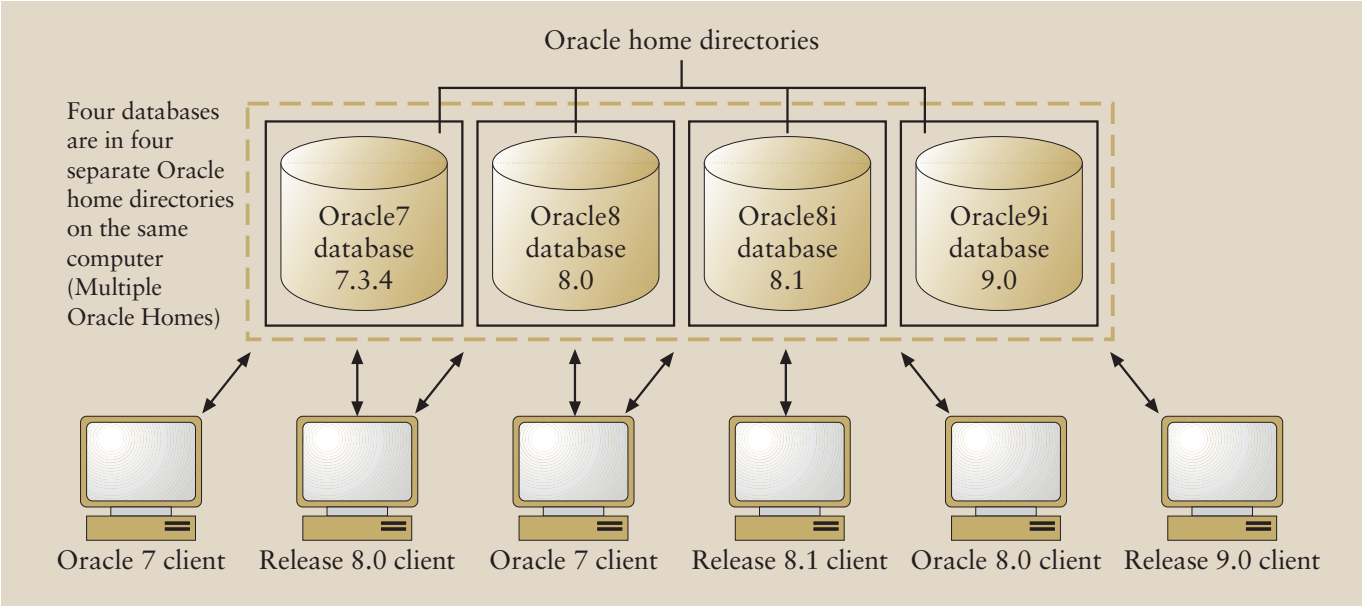

Fig 1: Version 7, Version 8 and Version 9 – Databases in Multiple Oracle Homes

an Oracle7.3 database to Oracle9i. The Migration Utility is a command-line utility (MIG) for migration of a complete database from Oracle7 to Oracle9i. It changes datafile headers but leaves actual data unchanged. It does not copy data. Full details of how the Migration Utility works can be found in Oracle9i Database Migration Release 1 (9.0.1) A90191-02 and Chapter 4 "Migrating from Oracle7 Using the Migration Utility".
The advantages of MIG is that it is and takes significantly less time than Export/Import, the total time taken is a property of the number of objects in the data dictionary rather than the size of the database.

2. Use the Oracle Data Migration Assistant (ODMA) to migrate an Oracle7 database to Oracle9i.
The Oracle Data Migration Assistant has a graphical user interface (GUI) for migration or upgrade of a complete database. It changes datafile headers but leaves actual data unchanged. It does not copy data. ODMA behind the scenes calls this the Migration utility. Full details of how the Data Migration Assistant works can be found in Oracle9i Database Migration Release 1 (9.0.1) A90191-02 and Chapter 5 "Migrating from Oracle7 Using the Oracle Data Migration Assistant".

These first two methods cannot be used to downgrade nor migrate to different operating systems. These two utilities support migrations of the last 7.3 release and higher databases on your operating system. The exact maintenance release number of the last 7.3 release varies from operating system to operating system. Contact Oracle Support Services[5] for confirmation of the release on your platform.

3. Perform a full or partial export of an

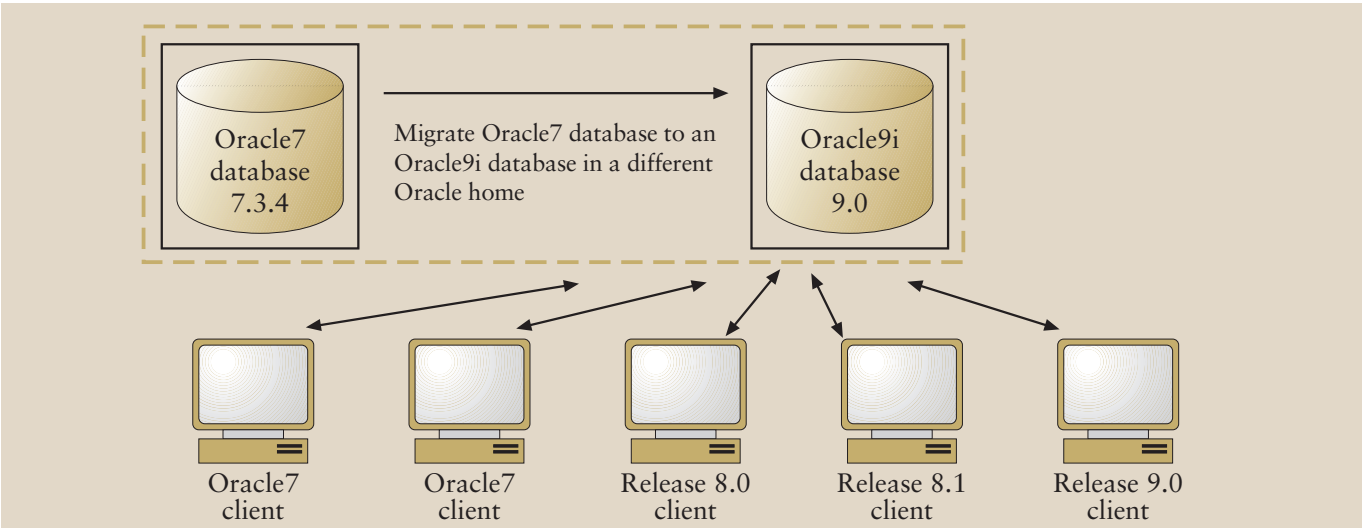

Fig 2: Migrate a Version 7 Database to a Version 8 Database

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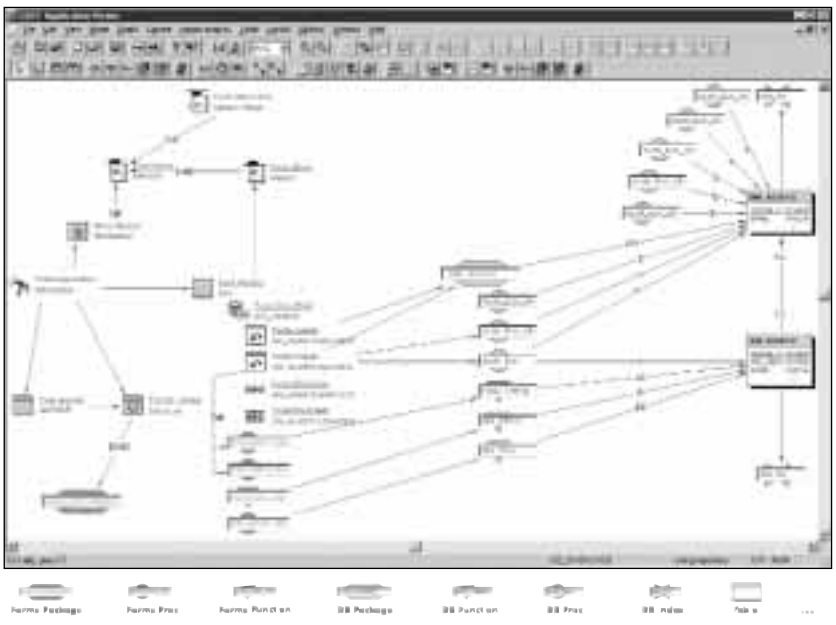

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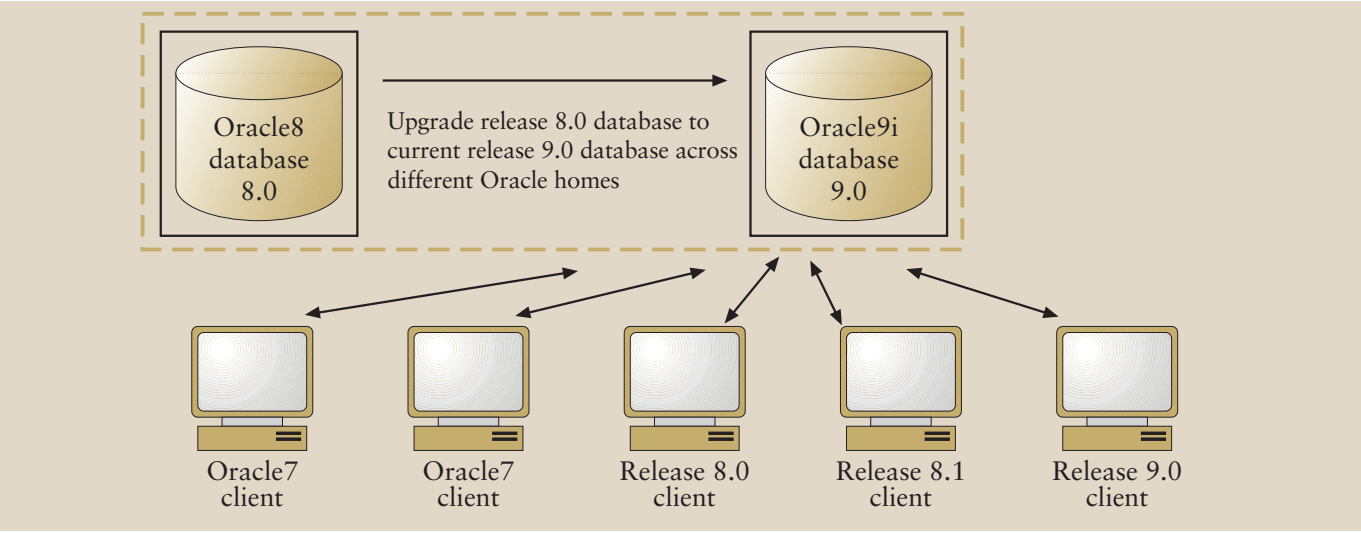

Fig 3: Upgrade a Release 8.0 Database to Release 9.0.0

Oracle7 (or version 6) source database, followed by a full or partial import into an Oracle9i target database. Export/Import can migrate parts of the database.

Export/Import leaves datafile headers and

```
exp SYSTEM/password
FILE=expdat.dmp
TABLES=(scott.exp,blake.dept)
GRANTS = y
INDEXES = n
```

actual data unchanged, and makes a new copy of the data. The advantages are that you can selectively migrate your database and specific objects or schema. Disadvantages are the time taken to manually perform each export and import as SQL is parsed and data validated as it is passed from the source to the target instance.

4. Copy data from a source database into an Oracle9i database using the `COPY` command or the `CREATE TABLE AS` statement. Data copying can migrate parts of the database.

Data copying leaves datafile headers and

```
CREATE TABLE new_emp
AS
SELECT empno
       ,ename
       ,job
       ,mgr
       ,hiredate
       ,sal
       ,comm
       ,deptno
FROM emp@v7db
WHERE deptno in (10.20)
/
```

actual data unchanged, and makes a new copy of the data. Again the advantages are that you can selectively migrate your database and specific objects or schema. Disadvantages are the time taken to manually perform each export and import as SQL is parsed and data validated as it is passed from the source to the target instance.

Step 7 – Perform another Full Backup

After the migration, perform a full backup of the production database. Finally, change the passwords for all Oracle-supplied accounts!

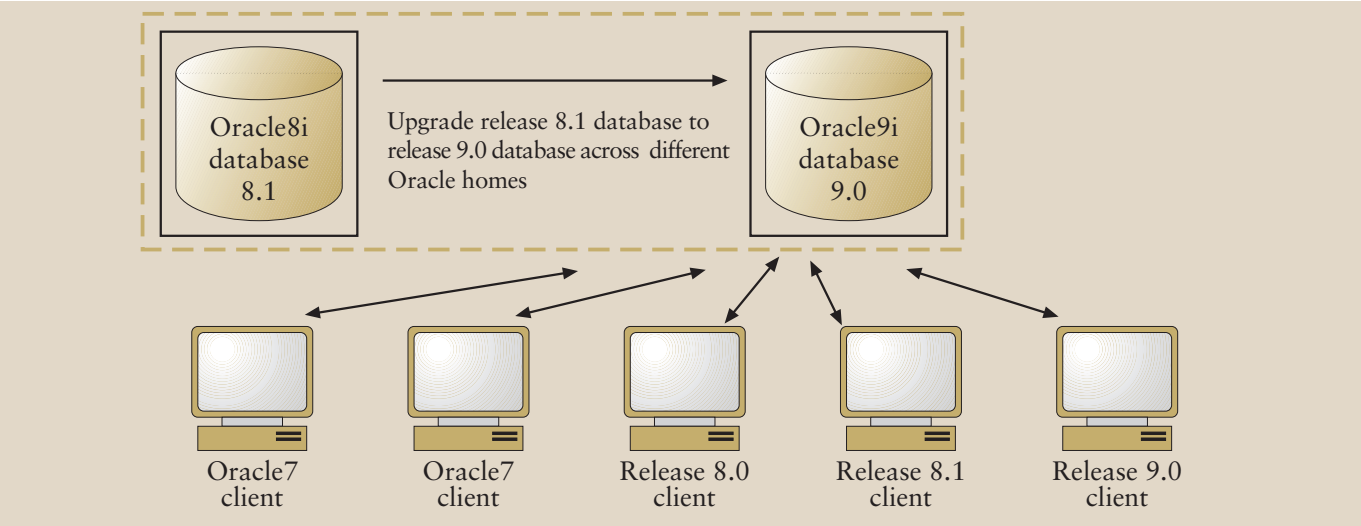

Fig 4: Upgrade a Release 8.1 Database to the Current Release

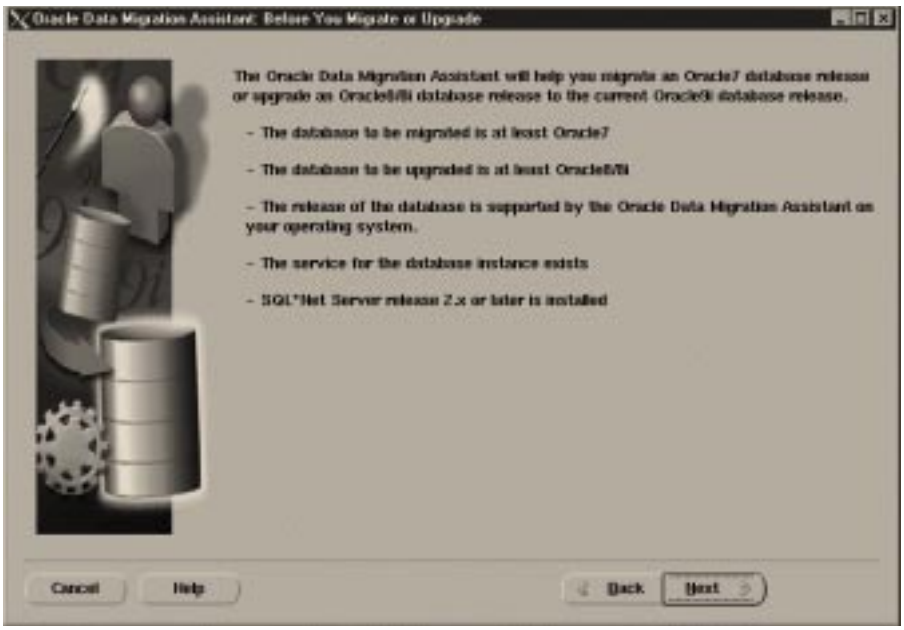

Fig 5: The Oracle9i Data Migration Assistant

Step 8 – Tune and Adjust the Oracle9i Database

Tune the new Oracle9i production database. The Oracle9i production database should perform as well as, or better than, the Oracle database prior to migration. Determine which new features of the Oracle9i database you want to use and update your applications accordingly. Ensure you convert your traditional initialisation parameter file to a server parameter file. This is done by using the Oracle9i command CREATE SPFILE statement. This statement reads the initialisation parameter file to create a server parameter file. Start up the instance using the newly created server parameter file.

Step 9 – Tasks to Complete Only After Migrating Your Database

Check for any invalid objects, for example `VIEWS`, `INDEXES`, `TRIGGERS`, `PROCEDURES`, `FUNCTIONS`, `PACKAGES`, `PLSQL` and `JAVA SOURCE` and correct these!

Finally, implement the test plan developed in the migration planning stage and compare the results on the database prior to and after migration.

Summary & Conclusion

Larry Ellison recently called Oracle9i Database "the last database"[6], given key features designed for virtually unlimited scalability and near-perfect fault tolerance. It certainly promises to be one of the most important developments in Information Management since the advent of the relational model. However, one thing that is true is that the Oracle9i Database coupled with Oracle9iAS is rapidly becoming one of the most popular software development platforms for the next generation of Internet applications. So there is at least one very good reason why it's time to consider a migration!

Bibliography and References

Oracle9i Database Migration Release 1 (9.0.1) Part Number A90191-02 Oracle Corporation

MetaLink Support Bulletin – Note:144804.1 Oracle Support Services Oracle Corporation

About the Author

Robin Murgatroyd is an Oracle9i Database Solutions Pre-Sales Manager at Oracle UK.

He has more than 17 years of software and applications development experience, with the last 15 years devoted to Oracle UK Oracle Designer/CASE, Repository, Developer, Server, Java, OAS/9i AS, Internet Portals and most recently the Oracle9i Platform.

He has written numerous papers and presented at the IOUG-A, Open World (OOW), European Oracle Users Group (EOUG), ODTUG, UKOUG and UK Designer, GUI SIG's and Internet SIG's

[1]Oracle9i for Linux is certified on SuSe7.1, Kernel 2.4.4 and the operating system library GNU Lib C 2.2 only.

[2]Source the Oracle Technology Network – http://technet.oracle.com/software/products/oracle9i/content.html

[3]The ProLiant DL580 RAC configuration is a pre-defined four node cluster made up of ProLiant DL580 servers and StorageWorks RA4100 storage arrays interconnected with a fibre channel hub. http://www.compaq.com/solutions/enterprise/linux-rac.html

[4]The OFA standard is a set of configuration guidelines for efficient and reliable Oracle databases. If you are not currently using the OFA standard, then switching to the OFA standard involves modifying your directory structure and relocating your database files.

[5]http://metalink.oracle.com/

[6]Oracle Corporation EBusiness Network "Watch It On E-Business Network" – "Lawrence J. Ellison announces availability of Oracle9i Database" http://www.oracle.com/ip/index.html?content.html

Fast Paths to Recovery – Including Oracle9i

By Kirstie Banerji, Freelance Consultant

Successful recovery from system failure means restoring the system to operational status in the shortest possible time. For today's very large databases [VLDBs] it can take several days to bring the full database back from tape. Many companies invest great time and effort in securing sophisticated backup solutions for their critical systems, only to find in the event of failure that the fastest backup solution actually produces an excessively long recovery time. This paper goes beyond the need to secure data with offline storage and focuses on how to achieve the fastest recovery path for failure scenarios in Oracle8i and 9i databases. The keystones of database recovery are examined:

- How to configure the database for rapid recovery?
- identifying the failure
- choosing the correct recovery path
- staying in control of the recovery.

The cost of downtime is high in any IT dependent business. Take each minute the system is down and multiply that for each business user, batch process and customer who can't function and the true picture starts to emerge. Successful recovery in the shortest time is a primary recovery goal.

This article covers both recovery features and hands-on practical advice, combined with site examples and troubleshooting tips to aid on-site database administrators [DBAs].

Configuring for Recovery

Disk Backup

Securing the data is the first step in configuring for recovery. This scales up to include total loss of the server and disaster recovery [DR] generally. DR is a very particular requirement that is often treated as a final solution to all backup requirements. Disk backup has no use in total loss situations, and yet it is well worth considering for less severe failures.

The majority of the time in most recoveries is spent reading files from backup tape. Reading from disk can be done with a high degree of parallelism. In addition, when only a subset of the database files is required it may take inordinate amounts of time to read from long, multiplexed tapes. A disk backup can dramatically reduce your recovery times.

Taking both a tape and a disk backup is unacceptable within the backup window for most sites. Online (previously referred to as 'hot') backup to disk would make the database available at the cost of increased log generation, making this unattractive within batch and online transaction processing [OLTP] windows. The 8i rman backup utility will take an online backup without increasing the archive log generation. Since rman is part of the Oracle toolset it does not use the standard interface whereby the data file is frozen and changes are recorded in the log files. Oracle guarantees that rman can correctly copy open data files without this overhead. This makes the use of rman to perform an additional disk backup a real, operational option. 9i rman offers block media recovery [bmr] where the smallest unit of recovery is the data block itself. During this recovery only the affected blocks are unavailable. This is not intended for recoveries where the scope of the corruption is unknown or where the entire file may be affected but it does provide an excellent answer for limited block level corruptions. This greatly improves recovery times for disk backup although tape recovery times are unlikely to improve.

For effective disk backup the required configuration would include:

- Separate data files across disk sets to maximise i/o throughput. Since most applications require data to be split out into many data specific tablespaces this should be extended to include an analysis of the application specific data locations
- Sufficient CPUs on the server to support parallel processes during backup and restore operations. Parallel processing can be achieved either through custom scripts, written for your site, to restore files in parallel or through the parallel options offered by most major backup packages
- Backup disks located on their own disk controllers
- Compression techniques to reduce the disk space required.

Standby databases

In 8i the standby database includes the facility to automatically ship logs to the

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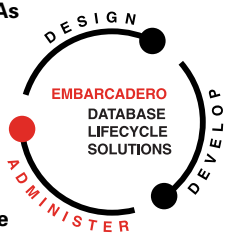

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standby and update the control file with the logs received. The logs can be automatically applied by putting the standby into sustained recovery mode, giving faster switch over times. In 8i it is also possible to open the standby in read only mode. The usefulness of this depends on how far you are prepared to lag behind the primary database while the standby is being used for reporting. These features are expanded in 9i and a new view v$archive_gap is available to track the gap in log sequence between the primary and standby databases. In the 9i data guard environment the initialisation parameter archive_lag_target can be used to force log switches to ensure the logs are shipped to the standby, in keeping with the required recovery times.

In 9i (forecast 9.0.2 release) the logical standby database joins the standby solution set. In this offering the archive logs are translated into SQL statements and applied to an open standby database. This database can have a different physical structure to the primary and can be used concurrently for other tasks. This is a data protection solution that allows the standby to be optimised for other purposes, with different indexing and other optimisation strategies. In Oracle9i there is also an archival standby database on offer. This consists of an instance and a standby control file with no physical database attached. This is used as a repository for archived logs and is an effective alternative to the custom code often used to secure these essential items on a remote server.

This array of standby offerings allows the business to consider the offset of recovery time and cost of committed hardware. The standby solution now provides a highly effective availability strategy, giving increased data access without enforcing the cost of fully mirrored hardware.

Using Read Only Tablespaces

Read only tablespaces are not new, but in 8i it is no longer necessary to have a quiescent database before converting a tablespace to read only mode. This is now a far more operational feature. The options, to move tables as well as partitions and indexes without resorting to export and import, are also a welcome feature. This makes it more achievable for the DBA to identify read only tables and move them into dedicated table spaces. Read only table spaces need only be backed up once, although prudence suggests twice is better. This will cut down your backup times.

For major warehouses, it can take a significant amount of time for the database to open. In Oracle8i the parameter read_only_open_delayed changes the default behaviour where all data files are accessed at the time the database is opened. This causes data files belonging to read only tablespaces to be accessed for the first time when data is read from them. This allows large warehouses to open more quickly. Missing or bad files will not be detected at database open time and information on the delayed open files will be less complete in the v$ views. DBAs should note that when this parameter is set it is possible to switch the database into noarchivelog mode even if a read only file needs recovery.

In some applications, much of the data is online history. The read write database files can be restored in a relatively short time, while the history data residing in read only tablespaces requires many more hours to restore. The database can be opened once the read write files are restored: the read only tablespaces can be taken offline, whether or not the database is in archivelog mode. The read only table spaces can be brought online again later, once the files have been brought in. This requires care and should only be carried out by an experienced DBA.

Failures

Media Failure

Modern disk technology is very reliable, although not infallible. Very active disks can error or fail and new servers can suffer from undetected hardware problems that make them unstable. Media failure is not uncommon and must be included in recovery plans.

In earlier releases, failure of the archive log disk was only protected through mirrored logs on the database server. In 8i, archived logs can be written to multiple locations including remote servers. Each location can be declared as mandatory or desirable. The DBA can specify a minimum number of destinations to succeed in archiving the log, whether or not all these locations are mandatory. It is possible to dynamically disable an archive destination. This will catch up as far as possible when it is enabled again. This lets you deal with a single failed (or full) disk location. Use the views v$archive_dest and v$archive_processes to monitor these settings.

The keys to fast media recovery are:

- Fast file restore: use a disk backup if this exists
- Document the database: the DBA must document the database file structure. This means knowing the tablespaces, file names and sizes for the current database structure – it may not be possible to get this information during the recovery. Keep this documentation up to date and ensure it is accessible in and out of hours to all support staff that may need access to this information
- Diagnose the failure: know which files need to be restored
- Know the impact of the loss of each disk for your own systems: the loss of read only data files has far less impact than the loss of a read write data file. It may make more sense to rebuild index tablespaces rather than recover the database.

Tip: Make sure that index recreation includes indexes resulting from constraints. If you are using non-unique indexes in support of unique constraints to facilitate disabling constraints then make sure this is reflected in the index recreation or you will have a production showstopper.

Tip: Index creation time can be reduced by specifying nologging in the create statement. If you do not want the index to remain in nologging mode remember to issue the 'alter index logging' command. If the table data is sorted in ascending order after a fresh data load you can reduce the creation time still further by specifying the nosort option.

Accidental file deletion of a database file will have the same effect as media failure. The database files should not have permissions that allow any account other than Oracle, root on UNIX or the administrator account on NT to delete the files.

Tip: Even in Oracle8i the circumstances required to roll forward across a log reset are extremely constrained and you should still backup the database immediately after opening with a log reset.

Block Corruption

This can result in a minor or major database failure. It is important to identify the extent of the block corruption, which objects are affected and whether it is a hardware error or soft corruption only. When memory corruption is a recurrent problem it is likely that there is some process on the server that is consistently violating the memory reserved by Oracle for the System Global Area [SGA]. This is hard to trace since the discoverer of the corruption is rarely the corruptor.

Improved block checking is available in Oracle8i. There are two useful parameters to look at:

db_block_checksum: this helps to give early warning of media problems and is worth setting if you can. There is a small performance overhead with this, which is highly dependent on the nature of the data access. Try this out on your volume test system to get a figure for your system. In 8i this parameter will also enable checking on the archived database redo logs. Valid logs are essential for recovery and all online backups, which is a strong argument for using this.

db_block_checking: this replaces event codes used in earlier releases. This enables block checking for all tablespaces. There are some bugs in 8.1.6.0 and 8.1.6.1 that discourage using this parameter on these releases. Before setting this parameter you must check for existing block corruption using a low impact approach such as the dbverify utility. This stops you throwing the brakes on your production system for existing issues.

In 9i the block media recovery [bmr] offered by rman is an effective recovery for this type of failure. Where disk backup is used the recovery times for bmr are greatly reduced.

The dbms_repair package is a useful tool when dealing with block corruption issues, although it does not carry out any repairs in this release. DBAs should be aware that the early package releases don't handle table names of 27 or more characters.

Failures involving block corruptions are highly specific to the nature and extent of the corruption. Important points to remember are:

- Identify which objects are affected: this will identify the extent and severity of the problem
- Check disks and controllers: investigate hardware problems to avoid further corruption
- Check all database files on affected disks using the dbverify utility
- If you use export to check for corruption remember it will not check unused blocks or some parts of the data dictionary
- On some platforms memory can be protected, causing the corrupting process to fail
- Media recovery may be required.

Sample code to detect segments affected by block corruption:
Use the file number and block number reported either in the ORA-1578 error or as supplied by Oracle support for ORA_600 errors and trace files

```
select owner,
       segment_type,
       segment-name
from   dba_extents
where  file_id = <file number>
and    <block number> between block_id
       and (block_id + blocks -1)
/
```

Instance Failure

If the instance run time environment fails then the database must perform instance recovery. Changed [dirty] data in memory is safeguarded, being written back to disk under certain conditions to ensure that no committed data is lost. This process is known as a checkpoint. The time needed for instance recovery depends directly on the amount of work done since the last checkpoint. In 8i there are some new circumstances for initiating a checkpoint. These are intended to reduce the time required for instance recovery:

- 8i initiates a checkpoint when the work done reaches 90% of the smallest redo log size
- The parameter fast_start_io_target lets you specify the maximum number of dirty blocks to be held in memory. This parameter is only available in the 8i Enterprise Edition. Use this to safeguard service level agreements. The view v$instance_recovery shows the estimated i/o required
- The existing parameters log_checkpoint_interval and log_checkpoint_timeout have changed the way they measure the work done

and should be reviewed. In 8i they relate to how far behind the last log entry a checkpoint should be initiated
- The existing parameter recovery_parallelism allows the DBA to specify the number of concurrent recovery processes to use in instance or crash recovery. This has had some bug issues but looks stable in the later 8i releases. Remaining bug issues in the 8i releases mean it is better to leave this unset on 64 bit platforms
- The parameter fast_start_parallel_rollback allows the smon process, which carries out instance recovery, to use parallel query slaves to roll back transactions that have a lot of undo blocks.

Tip: Monitor v$transaction to see when rollback completes: as the rollback progresses the values for used_urec and used_ublock decrease. When they reach 0 rollback is complete and the entry will disappear from v$transaction.

User Error

This covers dropping objects or otherwise structurally invalidating the application. This should be prevented through the permissions granted to users and by protecting the accounts that own the application itself. Data corruption and loss through legitimate actions that were wrongly applied is a far greater problem. Large databases cannot use export as a means to protect individual objects, although from Oracle8i onwards it is possible to specify a volume size for export files using the volsize parameter. This produces several dump files equal to or less than the maximum file size given. This overcomes the need to export through named pipes to avoid exceeding file size limits. Export has little use for dynamic objects since the snapshot will be out of step with the rest of the application.

The LogMiner tool is useful when investigating data loss and corruption through the user interface. It can help to identify exactly what happened although it does not help with recovering the data. Clustered tables and chained rows are not handled.

Tip: The results of LogMiner are held in the program global area [PGA] and accessed through the view v$logmnr_contents. Since this is held in the PGA the information is lost when your session ends. Insert this data into your own table if you want to hold on to it.

Transportable tablespaces are introduced in 8i. These allow a tablespace to be plugged into another database. This is a simple process that needs the DBA to check all objects are completely contained within the transportable tablespace set [tts].

Sample code to identify objects not fully contained in the tts:

```
Select obj1_owner,
       Obj1_name,
       Obj1_subname,
       Obj1_type,
       Ts1_name,
       Obj2_owner,
       Obj2_name,
       Obj2_subname,
       Obj2_type,
       Ts2_name,
       Constraint_name,
       Reason
From   sys.ts_pitr_check
Where  (ts1_name in
        ('TSP1','TSP2','TSP3')
       And ts2_name not in
        ('TSP1','TSP2','TSP3') )
Or
       (ts1_name not in
        ('TSP1','TSP2','TSP3')
       and ts2_name in
        ('TSP1','TSP2','TSP3') )
/
```

A clone database can be used to perform point in time recovery. The required tts can then be plugged in to the primary database. Before choosing this recovery the DBA should confirm the data integrity with the application experts and check for objects created after the intended recovery time. These objects will be lost in the recovery unless they are exported from the primary database.

Sample code to identify objects created after the intended recovery time:

```
Select tablespace_name,
       Owner,
       Name,
       To_char(creation_time,'
       DD/MM/YYYY:HH24:MI')
From   sys.ts_pitr_objects_to_be_dropped
Where  tablespace_name in
       ('TSP1','TSP2','TSP3')
And    creation_time > to_date
       ('intended time','
       DD/MM/YYYY:HH24:MI')
Order by tablespace_name
       ,owner
       ,creation_time
/
```

In Oracle8.1.5 there is a bug that can leave the target database unable to create new objects. Check the metadata export file before importing to the target database.

Process to check the metadata export file: Import statement to check the metadata export file:

```
Imp FILE=expdat.dmp
SHOW=y
LOG=check_oid.log
TRANSPORT_TABLESPACE=y
```

Check the log file for sys.dbms_plugts.beginImport: the 6th argument is the maximum object Id to be imported:

- If this value is negative the export is corrupt
- If any object has an object Id greater than this number the export is corrupt. On Unix you can extract the object Ids using:
  grep -i objno_reuse check_oid.log >all_oids.lst

The file all_oids.lst will contain all the object Ids for the export file.

Reference: Oracle Note 76670.1

Tip: Use tablespaces to separate out objects to support tablespace point in time recovery. This is a powerful feature that can also be used proactively to take a tablespace backup. For example, prior to an upgrade affecting only a few

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4 Reports for CFO
17 end user report requests
28 changes to sales reports

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tablespaces within the database you could consider putting the tablespace files into read only mode, exporting the metadata and taking a copy of the files. If the upgrade fails the tablespace can then be recovered from this backup without the need to open with a log reset. It is important to check that you have a valid transportable tablespace set before proceeding with this – it is a non trivial task to identify where all inter-related segments actually reside, including object references, object partitions and overflow segments.

The 9i logical standby database also provides object level data recovery and should be seen as a valuable addition to object level recovery techniques.

Staying in Control of the Recovery

Recovery situations always acquire a high profile within the business. It is important to the IT department to be able to show that:

- Recovery procedures must be current and tested: if it's not tested, it doesn't work
- All agreed service levels are documented and understood by the business and the IT department. Commitment to achievable timescales for recovery is as important as signed agreements. Without this the business will sign elsewhere next time round
- Recovery timings on tested scenarios should be known and agreed with the business.

The recovery procedures should include how the recovery is to be co-ordinated and should define the scope of each individual involved. I once took part in a lengthy recovery that involved many hours of reading tapes. In fact, the tape restore time was so long that one shift of administrators handed over to the next shift. This shift loaded the next set of tapes, but unfortunately these were not for the same day and the logs were not restored for these earlier-than-intended files. Once the problem was identified it could be handled, but it was an extra, time consuming step to figure out what had happened and get the additional logs to fix the problem. Co-ordination and communication are essential to controlling the recovery.

It is important to demonstrate control to a nervous business and this is helped if the recovery milestones and timings are known to the business. This should be included in the service level agreement [SLA] but if you are in uncharted territory it is important to give informed estimates together with the basis behind them. Advise the business of the accuracy of the estimates and likelihood they will be revised, depending on your situation. This allows you to revise your estimates without losing credibility.

A common error is to overlook the need for regular testing. If there have been any failures or changes in procedures, that have not been identified as a risk to the recovery procedures, then this is the best way to find it. Over time it is common for installation disks to be 'borrowed' by other departments or left in the CDROM drives of servers when staff work under time pressure. Upgrades to applications can require changes to the recovery procedures, DBA skills may vary over time and tapes may not be readable on new tape drives – regular testing is the only way to ensure that the recovery procedures are still valid.

About the author

Kirstie Banerji has worked with Oracle systems since the mid eighties, when she was part of Oracle's first consultancy team in the UK. Kirstie has both devised, implemented and tested backup and DR strategies for blue chip companies across the UK and across many market sectors including manufacturing, commerce, telecoms and banking. She has worked extensively with highly available systems, where both performance and process efficiency are critical to service provision. She is OCP7, 8 and 8i.

Another Fine Myth…What's New in Oracle9i

By Jonathan Lewis, J L Computer Consultancy

One of the most important strategies you can adopt when designing for a new version of Oracle is to list every assumption you made in your previous design and see if it is still true. Oracle9.0 has introduced a new indexed access mechanism called the "skip scan" which makes this a particularly useful exercise, and this article describes its significance. In presenting this article, I would like to thank Julian Dyke of Simulus Ltd. for passing on to the rest of the Oracle community, in the recent run of BMC/Simulus Technical Seminars, the results of his tests of index skip scans.

Everybody knows…

It is virtually an article of faith with Oracle designers and programmers the world over, that the optimiser cannot use an index if your query does not include the first column of the index in the *where* clause.

Another claim, with almost the same weight of history, is that multi-column indexes should be built (all other things being equal) with the most selective column as the first column.

Unfortunately (as I describe in my book) neither belief is true.

Except for one special case which affects the effectiveness of branch block compression, the logical I/O needed to acquire a single row through an index is independent of the column ordering, and has been since Oracle version 6 – and Oracle8.1 introduced index leaf compression, which introduces various performance benefits if the index columns are ordered least-selective first. Similarly, starting with Oracle7.3, Oracle Corporation has been introducing optimiser strategies that allowed indexes to be used effectively even when the initial column is not referenced in a *where* clause. (In particular the *full scan* to avoid sorting for *order by* clauses, and the *fast full scan* where the index could be treated simply as if it were a narrow table containing a sub-set of the columns of the base table).

In Oracle9.0, however, Oracle Corp. has introduced a most dramatic change in the optimiser's use of indexes.

```
create table skip_test
nologging
as
select
    trunc((rownum-1)/5000) n1_bad,
    mod((rownum-1),2000)   n2_good,
    rownum                 n3,
    rpad(rownum,10)        vc_small,
    rpad('x',100)          padding
from
    all_objects
where
    rownum <= 20000
;
create unique index st_pk on
    skip_test(n1_bad, n2_good, n3)
    compress 1
;

alter table skip_test
    add constraint st_pk
    primary key(n1_bad, n2_good, n3)
;

analyze table skip_test compute
statistics
;
```

Fig 1: Creating the sample data set

Fig. 1 is an extract of some SQL I used to create a sample data set in an Oracle9.0.1 database with an 8K block size. (The view *all_objects* holds a lot of rows in Oracle9.)

By defining the *n1_bad* column with the *trunc()* function, I have created a column which has only four different values. The *n2_good* column, by comparison is defined through the *mod()* function to be pretty selective, with 2,000 different values, however my use of the *mod()* function also ensures that any specific value is widely scattered across the table. Finally, the column *n3* is a simple, unique, ascending number. I have then created a primary key constraint with a matching unique index, listing the very-low-selectivity *n1_bad* column first.

The question is, what happens when I execute a simple query that requests data based only on the *n2_good* column ? Fig. 2 reveals an optimiser path that is now possible in Oracle9.

You will note that the estimated cost of this query (21) is not extreme, and the calculated cardinality (9) is fairly close to the actual result size, so Oracle has clearly NOT used a complete scan of the index to find the correct rows.

If we examine the 10053 trace file for this query, we find that Oracle has calculated three possible costs:

Table scan	55
Full index scan	53
Index skip scan	21

```
set autotrace on explain

select vc_small
from   skip_test
where  n2_good = 999
;

VC_SMALL
————————————
1000
3000
5000
7000
9000
11000
13000
15000
17000
19000

10 rows selected.

SELECT STATEMENT Optimizer=CHOOSE
       (Cost = 21 Card = 9)
 TABLE ACCESS (BY ROWID) OF SKIP_TEST
       (Cost = 21 Card = 9)
  INDEX (SKIP SCAN) OF 'ST_PK' (UNIQUE)
       (Cost = 11 Card = 9)
```

Fig 2: Querying on the 2nd column of the index

So what has happened, and what is a *skip scan*?

Effectively, though this is not a strictly accurate description, Oracle has detected from the table and index statistics that our index can be treated as if it were four small, fairly precise, indexes. (There are only four distinct values for the first column – index *skip scans* are most likely to appear where the leading column of the index has very low selectivity).

```
select vc_small from      skip_test
where  n1_bad = 0 and n2_good = 999;

select vc_small from      skip_test
where  n1_bad = 1 and n2_good = 999;

select vc_small from      skip_test
where  n1_bad = 2 and n2_good = 999;

select vc_small from      skip_test
where  n1_bad = 3 and n2_good = 999;
```

Fig 3: A 'manual' skip scan

If you executed the four separate queries shown in fig 3. You would find that the total of the four sets of costs came remarkably close to the cost of our single skip-scan access.

There is an overhead to this algorithm, of course, as Oracle has to scan across extra branch blocks to identify those occasions when it needs to descend to the leaf blocks; but the potential benefits are huge – provided the statistics are in your favour.

Consider all those cases where you have created a set of indexes according the 'triangular rule' (a term coined by Dave Ensor, I believe, to describe a strategy proposed by Chris Ellis) such as the set shown in fig 4:

```
Create index i1 on t1 (col1,col2,col3):
Create index i2 on t1 (col2,col3):
Create index i3 on t1 (col3):
```

Fig 4: Triangular indexes

It is quite possible that under Oracle9, and allowing for the effects of the index *skip scan* path, the indexes *i2* and *i3* could both be dropped.

The decision on which indexes to drop is not easy, though. Clearly, if the only columns available for a query are *(col2, col3)*, then the cost of using index *i1* with a *skip scan* is likely to be higher than the cost of using index *i2*. On the other hand, the fact that you need only maintain one index instead of three indexes at data entry time may be of much greater significance.

Moreover, if you no longer have to worry about indexes *i2* and *i3* being buffered for queries, the increased *'logical'* cost of accessing the data via index *i1* may be more than offset by the fact that there is only one index to buffer, so the overall *'physical'* cost of data access may be dramatically reduced. (Historically this might then introduce the threat of increased 'hot-latch' contention on a *cache buffers chains* child latch – but this should not be an issue in Oracle9, which introduces shared-read latches).

Interestingly, on our original example, Oracle will also perform skip scans using the index when addressing the query:

```
select n1_bad
from   skip_test
where  n2_good = 999;
```

This allows Oracle to access only the index without any need to address the table itself. Actually, with the statistics of the data created above, I had to use one of the (as-yet undocumented) hints to get this to work:

```
/*+ index_ss_asc(alias index) */
/*+ index_ss_desc(alias index) */
```

This too, suggests a new strategy for the case of the two-column *'join table'*. There may be cases where a single IOT (index organised table) will now be an adequate physical representation of a *'join table'* instead of the more traditional mix of a heap-table, and the two indexes shown in fig. 5:

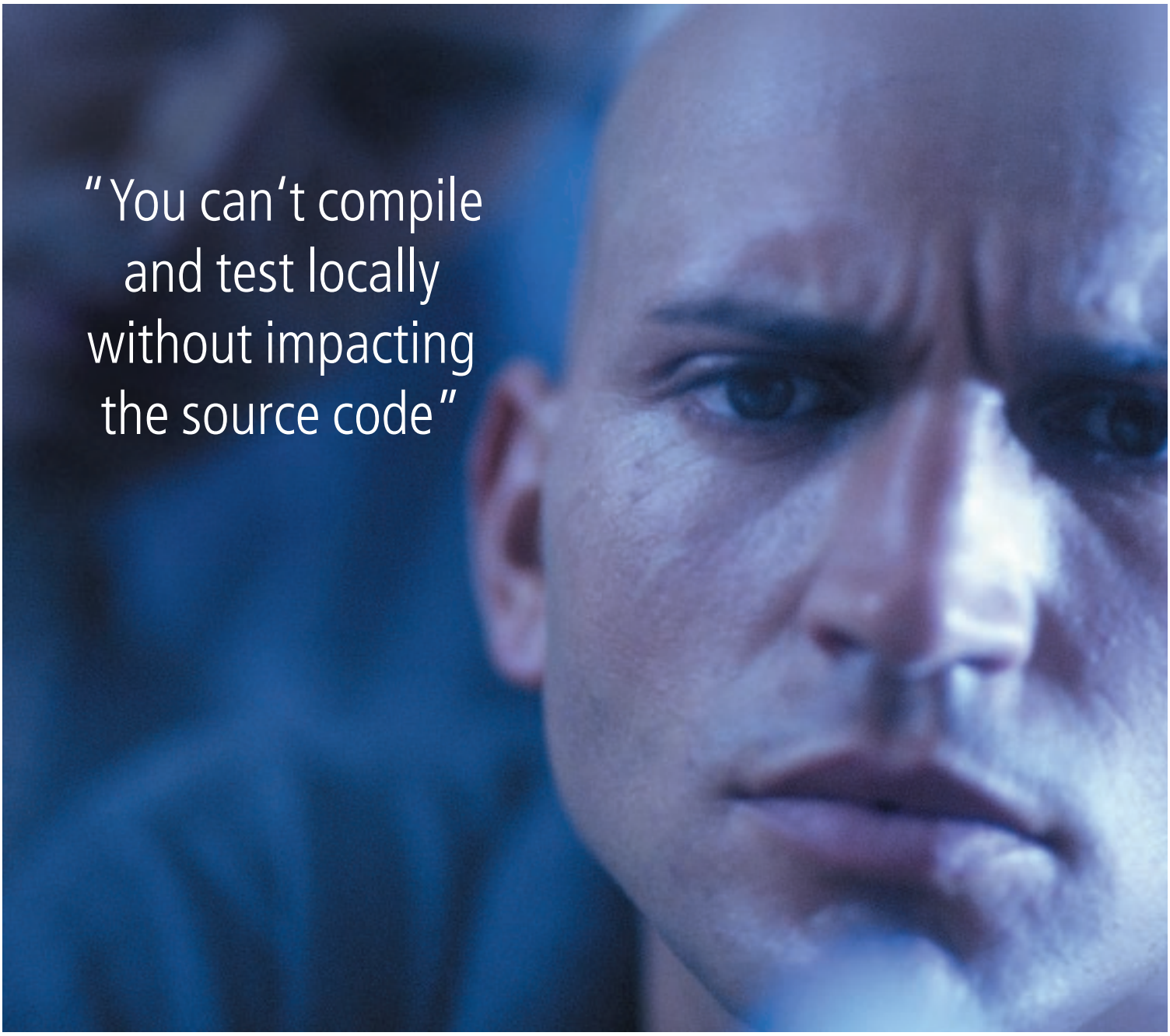
```
create table join_table (
a   number,
b   number
);

create index join_1 on
   join_table(a,b);

create index join_2 on
   join_table(b,a);
```

Fig 5: The old 'join table' implementation

Inevitably there will be bugs. Index skip scans are built in to the optimiser, they are NOT an option (although there is a '10,000' event to switch them off). Sometimes, no doubt, Oracle will manage to use an index skip scan where you least expect it; and the effect on performance may be negative. Remember this when doing regression testing.



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Conclusion

Oracle continues to introduce features that turn yesterday's axioms into today's errors. The index skip scan is one of the most dramatic changes in recent years to impact on the old beliefs that:

"a query cannot use an index if its leading column is not in the where clause"

"all other things being equal, an index should have its columns ordered with the most selective first."

In Oracle9.0, neither statement is even close to true – and if you fail to appreciate this you will make some big mistakes in the number, and column ordering, of the indexes you generate for your system.

About the Author

Jonathan Lewis is a freelance consultant with more than 15 years experience of Oracle. He specialises in physical database design and the strategic use of the Oracle database engine, and is author of 'Practical Oracle8i – Designing Efficient Databases' published by Addison-Wesley. He can be contacted by e-mail at jonathan@jlcomp.demon.co.uk

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Considerations for Building a Real-time Oracle Data Warehouse

By John Vandermay, DataMirror Corporation

In the new economy, companies are only beginning to fully understand that knowledge is power. Customer wants and needs, and how they want to get what they need, is the kind of critical information that can help firms sell more goods and services. Staying ahead requires you to understand your customer better than your competition does.

An effective real-time business intelligence infrastructure that leverages the power of an Oracle data warehouse can deliver value by helping companies enhance their customer experiences. By designing an Oracle data warehouse with the end-user in mind, you can better understand customer needs.

What is real-time data warehousing?

Until recently, there were no viable tools to provide real-time data warehousing nor a current picture of an organisation's business and customer. The dominant method of replenishing data warehouses and data marts is to use extraction, transformation and load (ETL) tools that "pull" data from source systems periodically and provide a "snapshot" of business data at a given moment in time. That batch data is then loaded into a data warehouse table, completely refreshing the warehouse table whether the data has changed or not.

The Internet era is about having current and up-to-date business intelligence information. Data is a perishable commodity: the older it is, the less relevant. Businesses need tools that can change the data warehousing paradigm and provide real-time business intelligence and a current, comprehensive picture of their organisation and their customers.

Components of real-time data warehousing

An up-to-the-second view of customer data is fast becoming a reality for businesses implementing real-time business intelligence solutions. An intelligent warehousing solution and framework can commonly be divided into three fundamental layers with data flows between them. The data access/query presentation layer, architecture layer and middleware layer must be seamlessly integrated and function as one to ensure the immediate success and long-term benefits of the Oracle warehouse.

Presentation layer

The presentation layer manages the flow of information from the warehouse to the analyst, providing an interface that makes it easier for the analyst to work with the data. The presentation layer encompasses proven business intelligence tools such as Oracle Express, Oracle Discoverer and Oracle Reports.

This layer is where graphical user interface (GUI) tools are most important. Front-end query tools should provide an easy and efficient way to visually represent data for decision making in two or more dimensions. Expert systems, pattern recognition and analytic algorithms can highlight areas for close human analysis, but in the end humans still have an edge on improvisation, gut feeling and trend forecasting. Warehousing assists users in the analysis of sales data so they can make informed decisions that have real-time impact on company performance.

Architecture layer (structure, content/meaning)

The architecture layer describes the structure of the data in the warehouse. An important component of the architecture layer is flexibility. The level of flexibility is measured in terms of how easy it is for the analyst to break out of the standard representation of information offered by the warehouse, in order to do custom analysis. Custom analysis is where semantic thickness becomes important. Semantic thickness is the degree of clear business meaning embedded in both the database structure and the content of the data itself.

Data structure and content need to be clear to the analyst at the presentation layer of the data warehouse. The underlying data schema for the warehouse should be simple and easily understood by the end-user of the data.

Middleware layer (interfaces and replenishment)

The middleware layer is the glue holding the data warehouse together. It integrates the data warehouse with production and operational systems. Data needed for warehouse applications must often be copied to and from computers in different locations and of different types. Warehousing often implies transformational data replication.

Production data needs to be secure and is frequently not in the format needed for warehousing. Real-time integration and replenishment tools that help businesses deal with the data management issues of implementing a data warehouse can add real value.

The rest of this paper will focus on how a real-time integration and replenishment solution – or a CTF (capture, transform and flow) tool – contributes to the simplicity and efficiency of a real-time data warehouse.

Efficient business intelligence replenishment

Web-based architectures must routinely handle large volumes of concurrent requests, whilst maintaining consistent query response times and being able to scale seamlessly as the data volume and number of users grows over time. In addition, data warehouses need to remain available 24 hours a day because the web makes it cost-effective for global corporations to provide data access capabilities to end-users located anywhere in the world. This is where data resiliency and replenishment tools come in to provide real-time access.

Even if an organisation does not wish to implement real-time data warehousing, it is important to consider how efficient a current extract tool is at replenishing the data warehouse. Most ETL tools are batch processors, not real-time engines. This method can be both resource intensive and time consuming. The larger the data warehouse, the longer it takes to replenish with this method. In some cases, the volume of data being loaded into the warehouse begins to exceed the batch window allotted for it.

Capture, Transform and Flow (CTF)

Change Data Capture

In order to compete in the Internet era, organisations must employ solutions that offer the option of updating databases as incremental changes occur, reflecting those changes to subscribed systems. With advanced CTF solutions, every time an add, change or delete occurs in the production environment, it is automatically integrated or "pushed" in real-time to the Oracle data warehouse. By reducing batch window requirements and making incremental updates, users regain computing time once lost.

Beyond real-time integration, change data capture can also be done periodically. Data can be captured and then stored until a predetermined replication time. An organisation may schedule its changed tables to be replicated hourly or nightly. Only data that has changed since the previous transaction needs to be transformed and flowed to the subscriber. Subscribers can therefore be kept current and consistent with the source databases.

Transformation

Companies are beginning to realise the benefits of sharing data between enterprise resource planning (ERP) systems and relational data stores housed in databases including Oracle. The problem is that ERP systems use proprietary data structures that need to be cleansed and reformatted to fit conventional database architectures. Rows and columns may have to be split or merged depending on the database format. Data transformation and integration software can accommodate these requirements in order to make data more useful and meaningful to users.

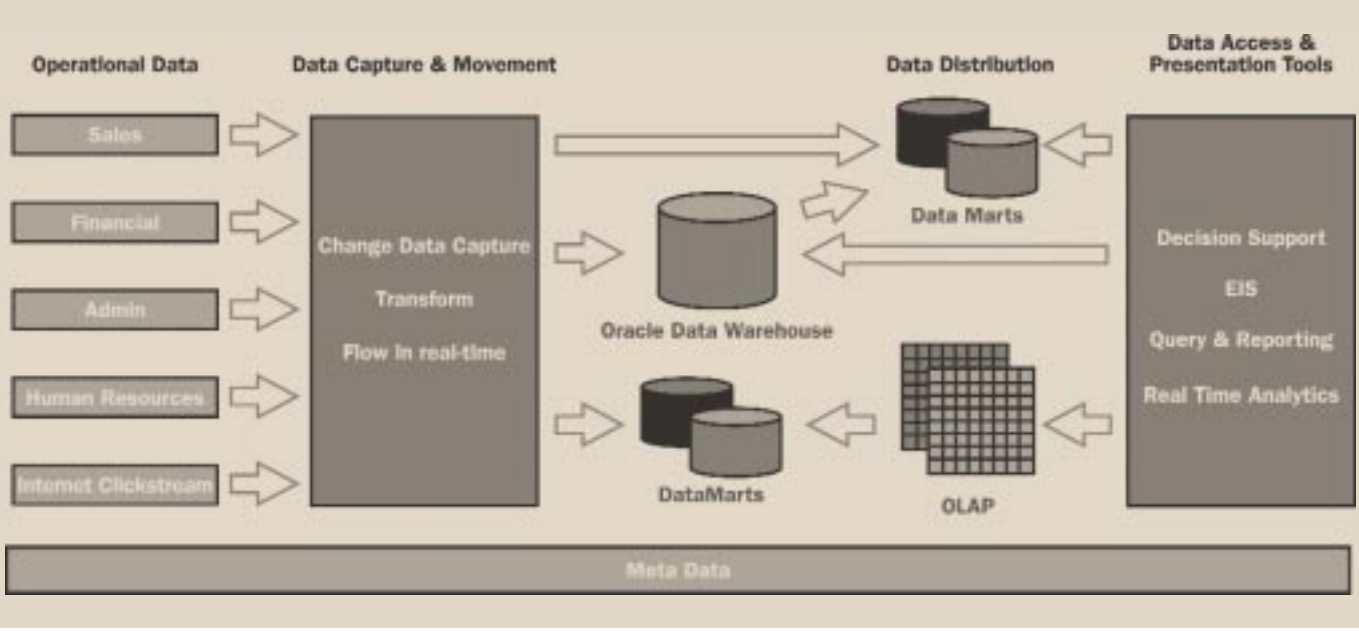

Fig 1: Typical Oracle datawarehouse implementation utilizing capture, transform and flow (CTF) technology for real-time replenishment

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Fig 2: Sample data transformations.

Data warehousing projects often require operational data to be reformatted, enhanced and standardised in order to optimise warehouse performance and make business intelligence content more meaningful to end-users. Effective real-time replenishment tools should perform data transformations on-the-fly without requiring data staging.

Other applications of data transformation software include changing data representation, visualisation and preparation for loading multidimensional databases. Transformational data integration software can conduct individual tasks such as translating values, deriving new calculated fields, joining tables at source, converting date fields and reformatting field sizes, table names and data types. All of these functions allow for code conversion, removal of ambiguity and confusion associated with data, standardisation, measurement conversions and consolidating dissimilar data structures for data consistency.

Flow

This refers to replenishing the feed of transformed data in real-time from multiple operational systems to one or more subscriber systems. Whether a data warehouse or several data marts, the flow process is a smooth, continuous stream of bits of information, as opposed to the batch loading of data conducted by ETL tools.

Evaluation criteria for an efficient real-time CTF solution

Real-time capabilities for Oracle environments are ideal in maintaining a current record of customer profiles and consumer needs. But, many vendors offer tools that are capable only of straight database copies, unidirectional integration or database snapshots. While these tools are useful for some projects, they often fall short once the organisation begins to outgrow its original transformation needs. More robust and powerful capture, transform and flow (CTF) software exists that can facilitate the real-time delivery of meaningful information to subscribed systems, movement among heterogeneous platforms and databases and the selecting and filtering of the data transmitted.

Selectivity

Business solutions like data marts and warehouses require the ability to select and filter which data is moved throughout the organisation. Efficient CTF software offers an array of features including built-in data filtering and selection functions, in addition to data enhancement and transformation capabilities. This allows source data to be selectively filtered by row and/or column before replenishing the Oracle warehouse.

For example, a company planning to implement an Oracle data warehouse may want to filter out specific information. By limiting access to sensitive information, row and column selection enables users to populate data warehouses and data marts with user-centric information, or integrate location-specific data to particular sites.

Support for heterogeneous environments

The fact is there are few pure Oracle environments. Because of changes in technology, corporate mergers and acquisitions, most organisations now bear multiple computing platforms and databases, each storing separate pockets of information entirely incompatible to the next. Choose a data integration solution that is capable of moving data among a wide range of databases and systems and offers real-time capabilities.

Ease of administration

Some integration software can be awkward to install and set up. A serious consideration when evaluating transformational data replication tools is the work required for set-up and implementation of the software. IT staff and end-users seek an 'out-of-the-box' experience from data warehousing tools. A good thing to keep in mind is that solution software is meant to avoid time-consuming, resource-intensive and costly custom extract programming. Vendors that offer portable utilities for the wireless management of replication software can empower businesses and ease the strain of constantly being on-site to view and control replication status. Organisations can focus on driving their business – not their technology.

Metadata management capabilities

Metadata is information about data. It allows business users as well as technical administrators to track the lineage of the data they are using. Metadata provides information about where the data came from, when it was delivered, what

happened to it during transport, as well as other descriptions.

There are two types of metadata: technical, or administrative, metadata and business metadata. Administrative metadata includes information such as data source, update times and any extraction rules and cleansing routines performed on the data. Business metadata allows users to get a clearer understanding of the data on which their decisions are based. It provides information about calculations performed on the data date and time stamps, as well as metadata about the graphic elements of data analysis generated by front-end query tools. Both types of metadata are essential to a successful data mart or warehouse solution.

Scalability

In the Internet era, as business environments change so will the kinds of decisions that need to be made and the information that influences them. Businesses need to think ahead and look for a scalable solution when searching for an efficient data integration tool. Organisations should not look at data warehouse development as having a beginning, middle and end, but as a continuous process that must evolve with the organisation.

Flexibility

Change is inevitable in the business world. It is important to choose a tool that is flexible enough to be applied to potential future initiatives. Organisations should anticipate that their users will eventually want to look at the information in a different light or on a different level. What is necessary is a flexible real-time data infrastructure that can accommodate these needs with minimal re-work. These may include e-Business, high systems availability, and other data distributed applications.

Summary

Developing a robust, scalable Oracle warehouse with consistent data and the ability to answer all user-information needs is not an easy goal to achieve. Indeed, keeping data current is one of the most difficult and time-consuming challenges in managing data warehouses and data marts. But if organisations fail to take advantage of real-time data capabilities for business intelligence, they will lose the opportunity to respond quickly to changing market trends. These businesses will be less agile and will have difficulty meeting the customers' rising expectations for 24/7 service. By understanding the relevant issues and staying informed of current practices in data warehouse development, organisations can harness the power of Oracle and attain a cost-efficient, profitable computing environment. In a very short time, businesses can be well on their way towards meeting customer needs and generating a competitive edge in the new economy. *For more information please visit www.datamirror.com, or E-mail uksales@datamirror.com.*

About the Author

John Vandermay is Vice President of Development for DataMirror Corporation, a leading provider of enterprise application integration and resiliency solutions. He is responsible for all software development activities across the DataMirror product family as well as quality assurance. Prior to DataMirror, he held senior development and management positions at Marcam Solutions. Mr. Vandermay holds a Bachelor of Science degree in Physics and Computer Science from Wilfrid Laurier University (Canada) and has considerable experience developing mainframe applications and Windows client-server programs.

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Firewalls: NAT a Problem For Connection Manager

By Ian Adam, SAIC Ltd

Connection Manager can be used to get around problems with firewalls and Network Address Translator (NAT). This feature is not clearly described in the documentation. The documentation does mention that client connections can be routed through connection manager but it does not make clear that in certain situations it is the only way to connect. Given that the problem only affects some operating systems you may not have realised there was a problem. I had been making direct connections to a remote Unix server through a firewall and NAT for over a year. It was only when a third party wanted to make a connection to a VMS box on the same network that I discovered there was a problem.

The Problem with Firewalls

To understand the problems that can occur you first have to understand how Oracle connections work. The sequence described here does not happen on all operating systems. A client makes a connection on the usual SQL*Net port (e.g. 1521). The listener on the database server will obtain a free port from the Operating System and send back to the client the new port assignment. The client will then try to connect to the database on the new port. This process is called port redirection.

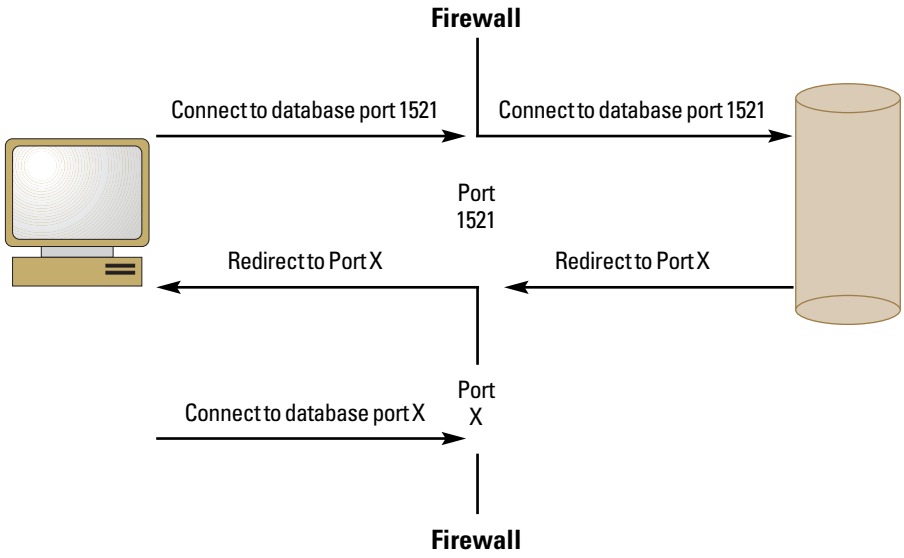
The problem is that only required ports are opened through a firewall. The SQL*Net port will be opened so that the initial client connection request will get through but the redirected port will not, so the connection will fail at this stage.

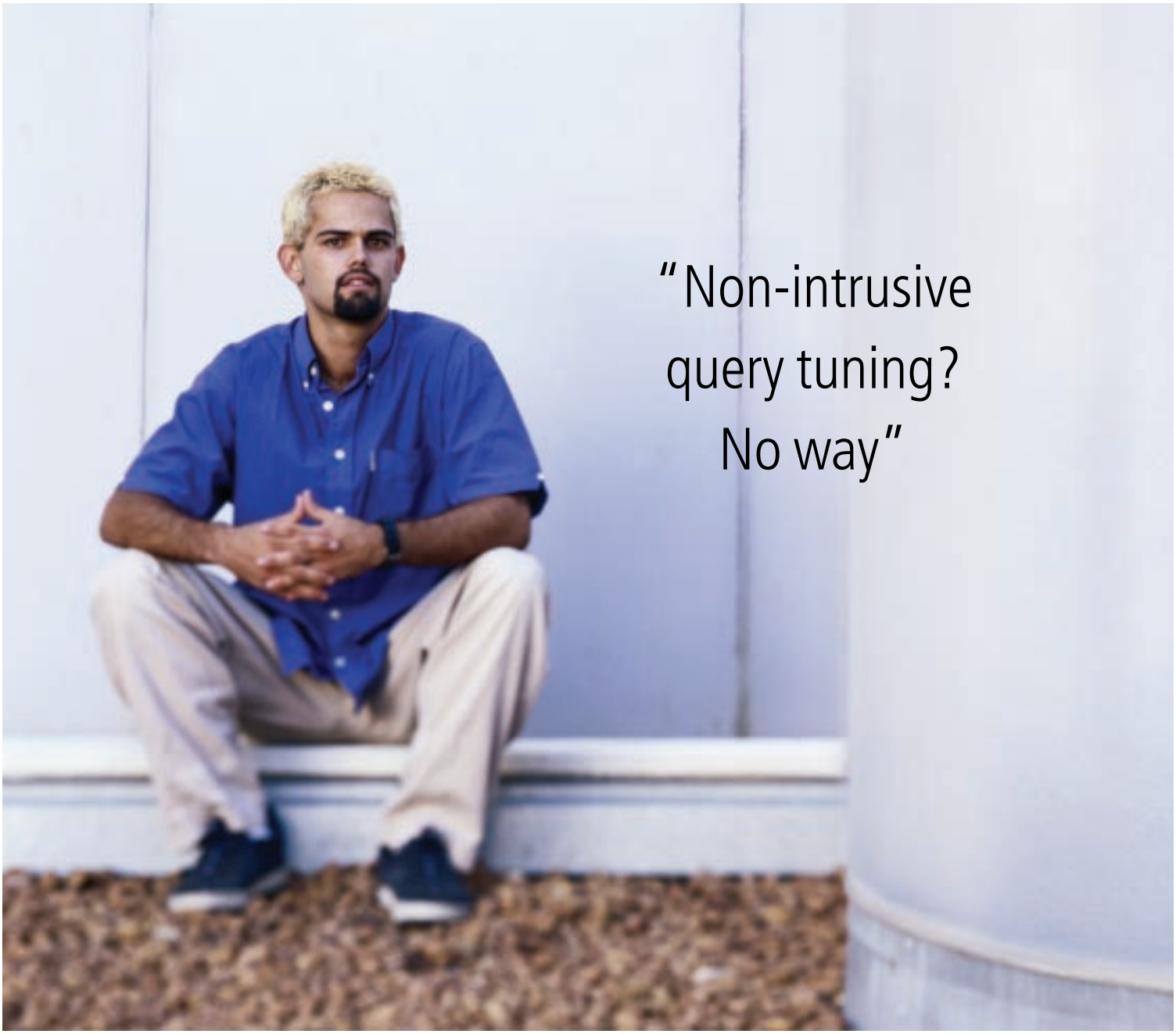
You may not notice that all this is happening as some firewalls have a Net8 proxy provided by the firewall vendor. The Net8 proxy will let Net8 traffic through the firewall – regardless of what port number is being used.

One workaround is to open the firewall on all ports. Try getting that past your corporate firewall guys!

A workaround for UNIX is to disable the Multi-threaded server, as UNIX is only affected when this is in use. However, this isn't really a solution because you must have enabled it for a reason, right?

A solution for Windows servers is to add use_shared_socket = true into the registry. This will allow the OS to share the





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listener port and clients will then stay on listener port when connecting to the databases, not be port redirected. You need to restart the databases and listener services to make this registry setting take effect. A real downside is that if the listener is stopped or restarted all the connections will be disconnected from the databases.

Connection Manager provides a much better solution that works with all Operating Systems as we will see later.

The Problem with NAT

When two networks need to be connected together and one network uses private IP addresses, these private IP addresses need to be converted to legal IP addresses for the other network, before packets are forwarded onto that network. Basically IP addresses on the private network are translated to IP addresses on the public network.

For example, in the case where a network is set up before a legitimate Internet address is registered, and the network subsequently needs to be connected to the Internet, a Network Address Translator (NAT) acts as a router connecting the two networks together, converting IP addresses between the two.

When port redirect takes place the server sends back a different port and its private IP address, which the client does not know how to reach.

The Problem with NAT and Firewalls

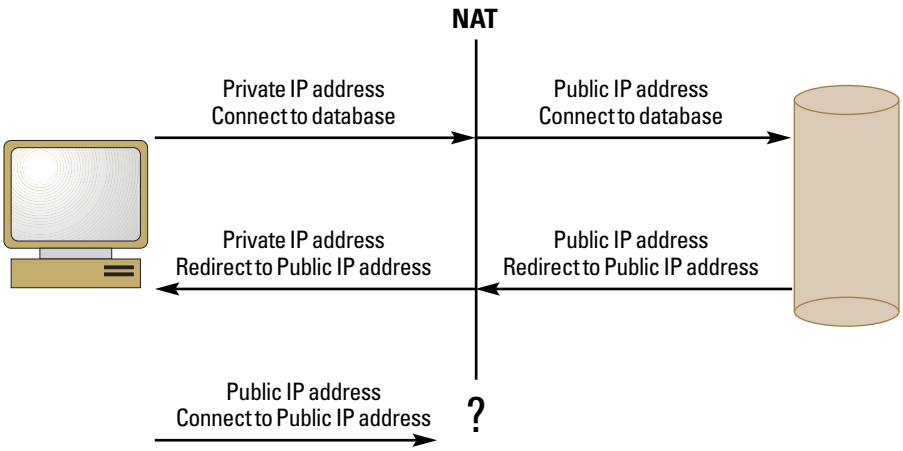
Of course you could be afflicted by both problems. The port redirections could be asking your clients to connect to an IP address they cannot reach, on a port that is not opened in the firewall!

The solution

Configure Connection Manager on the same network as the server. With Connection Manager, all connections would go through the firewall on port 1630 and connect to Connection Manager. Connection Manager would then forward the connection to the server. Any redirection would occur between the server and Connection Manager. Data would then leave Connection Manager, back to the client, on the same port of 1630. Therefore, only port 1630 needs to be open on the firewall. NAT can occur without a problem, as the client always uses the address it knows and the NAT software does the translation in the background.

Connection Manager can provide connections to any Oracle7 or Oracle8 databases on any platform.

If you had one machine running Connection Manager providing services for several databases there is a danger that it would become a bottleneck. It is usual to connect directly to a database from clients on the same network and only to connect through Connection Manager from clients that are through a firewall. This gives a combination of connection methods where the most efficient method is used at each client. It is possible to run Connection Manager on every host, providing service for only the databases on that host. This removes the reliance on a separate Connection Manager host.



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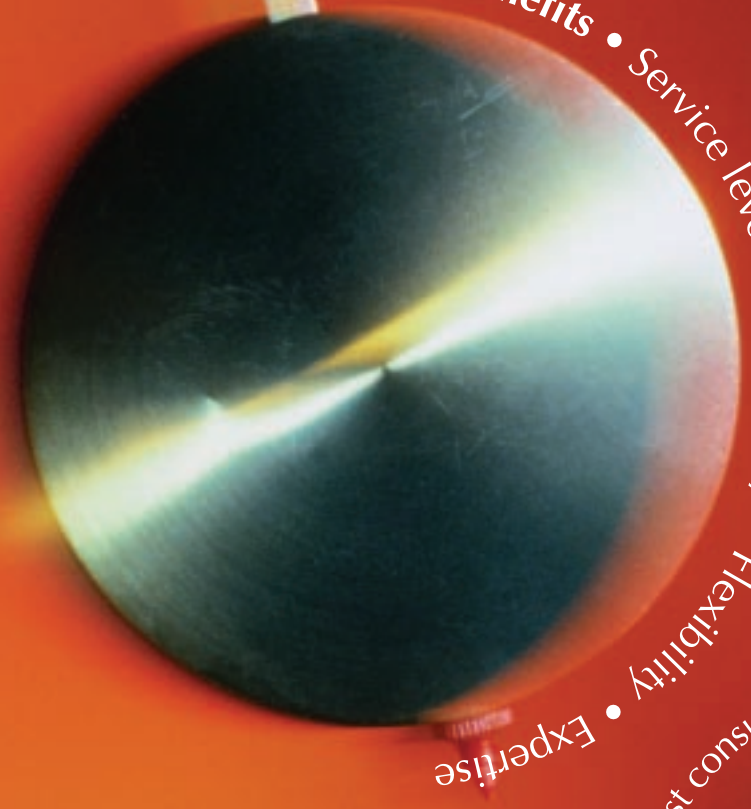

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Configuring Oracle Connection Manager

1. Install the Oracle8i Connection Manager software onto the server that will host the connection Manager. You don't need a full install of the Oracle software and you don't need to create an Oracle8i database on this server.

2. Destination listener requires no change as it makes no distinction between a direct connection and a connection though Connection Manager.

3. Configure Connection Manager
   Locate the cman.ora file which should be in `$ORACLE_HOME/network/admin` on UNIX or `ORACLE_HOME\network\admin` on Windows. Edit it to contain required values, see below for samples. Net8 Assistant does not support configuration of the `cman.ora` file, so changes must be made manually. Note you may see some documents reference port 1610, as the default listening port has changed from 1610 to the officially registered port of 1630 in release 8.1.

4. Configure Client by creating a tnsnames entry with 2 ADDRESS lines, the first for the Connection Manager and the second for the listener. It also needs SOURCE_ROUTE=YES which instructs Net8 to use each address in the order presented, until the destination is reached. Remember it is Connection Manager which will connect to the database so the ADDRESS line for the listener should be configured for it.

5. Start Connection Manager
   Cmctl start

Configuration Files Connection Manager cman.ora

It is possible to alter the default ports by changing the cman and cman_admin entries. I always include a CMAN_RULES section as this restricts the databases that can use this Connection Manager as a proxy.

```
cman  = (ADDRESS_LIST=
            (ADDRESS=(PROTOCOL=tcp)(HOST=)(PORT=1630)(QUEUESIZE=32))
         )

cman_admin = (ADDRESS=(PROTOCOL=tcp)(HOST=)(PORT=1830))

#
#     cman s configurable params
#
#     MAXIMUM_RELAYS          defaults to 128
#     LOG_LEVEL               defaults to 0
#     TRACING                 defaults to no
#     TRACE_DIRECTORY         defaults to .../network/trace
#     RELAY_STATISTICS        defaults to no
#     SHOW_TNS_INFO           defaults to no
#     USE_ASYNC_CALL          defaults to yes
#     AUTHENTICATION_LEVEL    defaults to 0
#     MAXIMUM_CONNECT_DATA    defaults to 1024
#     ANSWER_TIMEOUT          defaults to 0
#     MAX_FREELIST_BUFFERS    defaults to 2048
#

cman_profile = (parameter_list=
        (MAXIMUM_RELAYS=128)
        (LOG_LEVEL=0)
        (TRACING=no)
        (RELAY_STATISTICS=yes)
        (SHOW_TNS_INFO=no)
        (USE_ASYNC_CALL=yes)
        (AUTHENTICATION_LEVEL=0)
        (REMOTE_ADMIN=FALSE)
      )

CMAN_RULES =
      (RULE_LIST=
        (RULE=(SRC=x)(DST=10.10.1.200)(SRV=db1)(ACT=accept))
       )
```

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Client tnsnames.ora for NAT

The placement of the IP addresses in this example are very important. The first host (200.20.1.30) is the IP address that the client knows for the Connection Manager machine. This address will be converted by NAT to the real address of Connection Manager (e.g. 10.10.1.50). The second host is the address that the Connection Manager machine knows for the database server. The client will contact the first host on its Connection Manager port (1630). Connection Manager will use the second ADDRESS line to contact the database server. All traffic between the client and database server is routed through the Connection Manager host.

```
Example1 =
   (DESCRIPTION =
     (ADDRESS_LIST =
       (ADDRESS = (PROTOCOL = TCP) (HOST = 200.20.1.30)(PORT = 1630))
       (ADDRESS = (PROTOCOL = TCP) (HOST = 10.10.1.200)(PORT = 1521))
     )
     (CONNECT_DATA = (SID = db1) (SERVER = DEDICATED))
     (SOURCE_ROUTE=YES)
   )
```

Client tnsnames.ora for Firewall

Both the hosts listed are on the other side of the firewall. The first host (10.10.1.50) will be contacted on its Connection Manager port (1630). You don't need to have any firewall access to the second host as all traffic to it is routed through the Connection Manager host.

```
Example2 =
   (DESCRIPTION =
     (ADDRESS_LIST =
       (SOURCE_ROUTE=YES)
       (ADDRESS = (PROTOCOL = TCP) (HOST = 10.10.1.50)(PORT = 1630))
       (ADDRESS = (PROTOCOL = TCP) (HOST = 10.10.1.200)(PORT = 1521))
     )
     (CONNECT_DATA = (SID = db2) (SERVER = DEDICATED))
   )
```

Notice from the two examples above that the SOURCE_ROUTE parameter can be in various positions in the entry.

Other Uses for Connection Manager

If you want to configure Connection Manager for its other uses: Protocol conversion, connection concentration, and access control then please refer to the Oracle "Net8 Administrator's Guide".

About the Author

Ian Adam is an Oracle8i Certified Database Administrator and MCDBA. He works for SAIC's Information Management Practice based at their office in Aberdeen, Scotland. He can be contacted at Ian.Adam@saic.com

Sending email from within your Oracle Database

By Bob Mycroft, Oracle DBA

In this article I want to talk about some functionality that came in with Oracle8i – namely the ability to send emails directly from the database using PLSQL. This is functionality that I would have killed for when I was a developer.
With the arrival of the supplied package UTL_SMTP, all this has been made simple. Sending emails from the database is straightforward, quick and easy.
All you need is an 8i database with the Java Virtual Machine in place and access to an SMTP email server.

1. Overview and SMTP

This article should be of interest to both the developer and the DBA. To try and shed some light on why I have thought of a couple of examples where the ability of the database itself to send emails would add value to an application or system.

Firstly, imagine a simple stock control system. With email functionality available from within the rdbms, you could code triggers that would email the supplier when stock of a particular item fell below a threshold level. This would be ideal for a 'just-in-time' warehouse system where the levels of stock must be tightly controlled.

Next, imagine a database/web application where the customer is notified by email when their order has been accepted, the goods are packaged and when the goods are dispatched. In addition, the database could email customers with promotional material based upon their profile.

For the DBAs out there, email can be used to notify you when an important overnight job has failed, or for that matter to email you at fixed points in the process so that you know how the job is progressing. It could be used to tell you when hit ratios have dropped, or if there are space issues or when there is a locking problem. The power here is that although much of this will be possible via Oracle Enterprise Manager, you can bring your own expertise in writing PLSQL procedures to bear, to write your own monitors, as opposed to having to know tcl (tool control language) to write your own jobs in OEM.

None of these ideas are new and certainly I imagine that they are all used out there in the real world. However, I just wanted to pick the first three that came to mind as an example. I am sure that you can think of a dozen other situations where there is the need for notification, of an event, of a point in a process being reached, or to contact your clients, where this would make your life either easier, or would add value to your system.

2. SMTP – So what the hell is it?

Well hopefully I have whetted your appetite for what may in reality be a dry subject. Let's get the theory out of the way quickly and move onto the code! I have deliberately not gone into too much detail with the SMTP protocol, as there is masses of information available on the Internet. What I have done though is attempt to give an overview of the protocol, as this will help later when we look at the UTL_SMTP package.

SMTP is an acronym for Simple Mail Transfer Protocol and has been around since about 1982. The RFC 821(Request for Comment) states that "The objective of Simple Mail Transfer Protocol (SMTP) is to transfer mail reliably and efficiently." Hence SMTP is simply a protocol for sending email across networks (such as the Internet). The protocol itself is an ASCII protocol which uses TCP port 25 to communicate between the client and the server.

Most of the email systems that send email via the Internet will be using SMTP. Many of you out there probably use SMTP without even realising it. If you have ever used mailx in Unix to send emails then you have certainly used SMTP.

The original SMTP (Simple Mail Transfer Protocol) specification is RFC821 and the latest is RFC2821. For a fuller and more in depth discussion of the SMTP protocol refer to these documents.

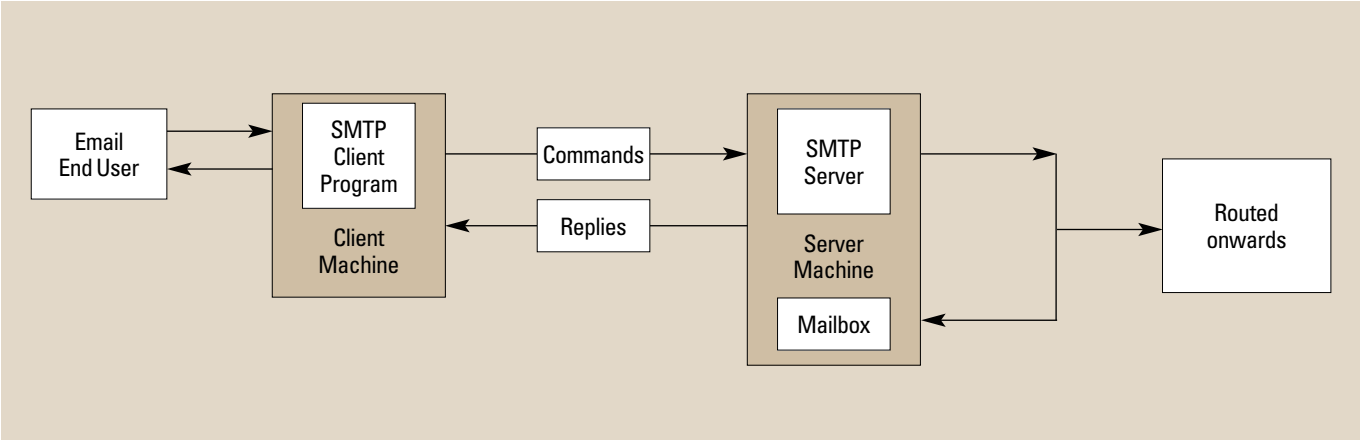

Fig 1.1: A typical SMTP mail system showing the client and the server.

2. 1 The email structure

An email message consists of three distinct parts: The envelope, the header and the body.

The envelope consists of the originator and recipient information – for example the MAIL From: and RCPT To: parts of your email.

The Header contains information about the message – for example the Subject line, the date sent and the Sender name (From), and 'Reply To'.

The Body contains the actual text of the message.

Each of these three parts of an email message are required for a complete email message.

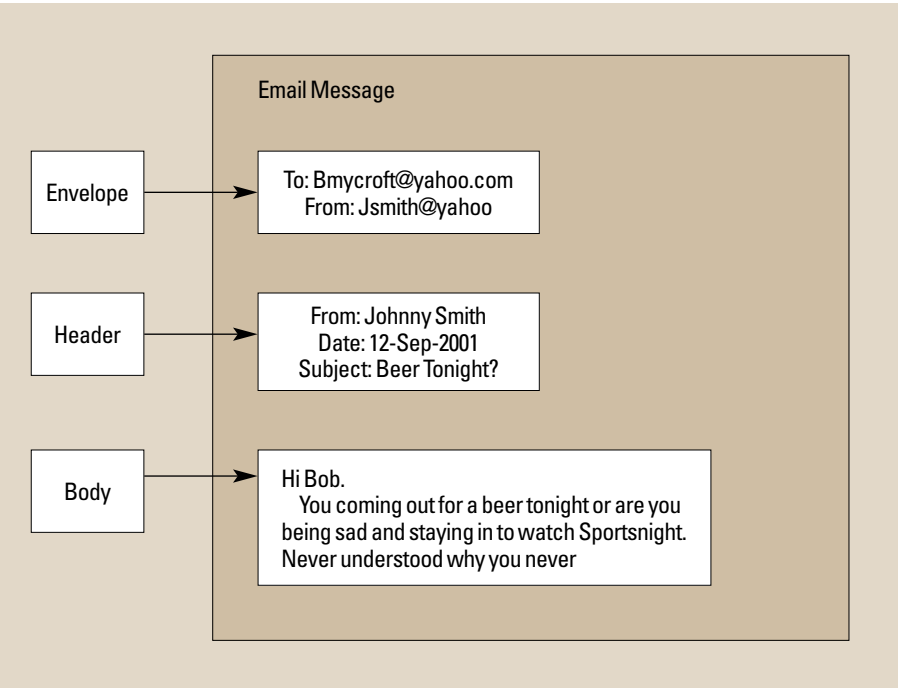

Fig 1.2: Email structure

2. 2 The steps in sending an email

SMTP is implemented with a basic set of commands that I will cover later. Extended protocols do exist but the commands used by UTL_SMTP package use the basics that are used everywhere. At its simplest level, the client 'handshakes' with the server and initiates an SMTP session. For each command the client sends, the server sends a reply. The reply is a three digit code with text that tells the client if the command was successful or if it had failed. When the server has replied the client sends information to identify the originator, to identify the recipient(s), and the actual message. After each command a reply is sent back. Assuming all goes well, the session is concluded and the email is sent. One important thing to note is that SMTP requires <CR>+<LF> (carriage return and linefeed) to terminate a line.

So the email session is as follows

```
HELO MyServer.co.uk
MAIL FROM: Bjmycroft@yahoo.com <CRLF>
RCPT TO: Santa@Northpole.org
RCPT TO: TheLads@GetYourPresentRight.com
DATA <CRLF>
Hi there Santa, where s my Harley then eh?
I asked for it last year and it never
came. Maybe this year you can do better or
I send the boys around...know what I
mean.<CRLF>
. (terminated with a period)<CRLF>
```

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2.3 SMTP commands

Very briefly then the commands are as follows:

Command	Description
HELLO: (HELO)	This command is used for the handshake process and identifies the sender to the server.
MAIL:	This command initiates the actual mail transaction in which the data is sent to the mailboxes.
RECIPIENT (RCPT):	Use this command to identify the recipients of the message. RCPT is called once for each recipient.
DATA	All lines following the DATA command are treated as text for the email body.
RESET (RSET)	Aborts the current mail transaction.
NOOP	This makes the receiver send an OK message. Good for testing the connection is in place.
QUIT	Closes the transaction.

This is not a complete listing but covers most of what you will need. For a complete listing refer to the RFCs.

2.4 SMTP Replies

A reply is simply the way that the SMTP server tells you that a command was successful. The codes are numeric three digit numbers. In general the codes fall into broad bands as follows: Numbers in the 2-300 range are used for information – ie 250 is the 'OK' reply code. Codes in the 400 range are more permanent errors – for example mailbox unavailable. Reply codes in the 500 range are more to do with syntax – for example, 502 is 'command not implemented', 503 is 'bad sequence of commands'. For a full listing of the reply codes and what they mean, look at chapter 65 of the *"Supplied PLSQL Packages Reference"*.

3. The UTL_SMTP Package and some sample code.

3.1 Prerequisites

Before you can use the package UTL_SMTP there are some prerequisites that need to be in place. The database that you want to use for email has to be configured first. The UTL_SMTP package is installed into the database by default on database creation but in order for the package to work you will need to install the Java Virtual Machine into the database. An excellent guide on installing the Java Virtual Machine can be found in *"Note :105472.1 Setup, Configuration, and Use of the Java Virtual Machine"* on metalink.oracle.com . In essence, there are three scripts you need to run to install the JVM. These are:

```
$ORACLE_HOME\javavm\install\initjvm.sql,
$ORACLE_HOME\javavm\install\init_jis.sql
and
$ORACLE_HOME\javavm\install\initplsj.sql
```

3.2 The UTL_SMTP package.

Within the UTL_SMTP package, the commands are represented as both functions and procedures. In the code I have used the procedures. A more tightly controlled example might capture return codes and use them in error reporting. Instead I have prompted for using the supplied exception handlers. I am not covering every procedure/function that is included in the package as there are many and you will probably never need most of them. What I have tried to do is single out the ones that you will use for the basic implementation, and explain how to put them together.

TYPE CONNECTION: A CONNECTION is a record containing port and host information. You will use the connection object in all the other procedures but will never have to look at the contents of the connection object returned by the server.

TYPE REPLY, TYPE REPLIES: A REPLY is a PLSQL record representing an SMTP reply. It is made up of the reply code and the reply text. A REPLIES record is a PLSQL table of reply records.

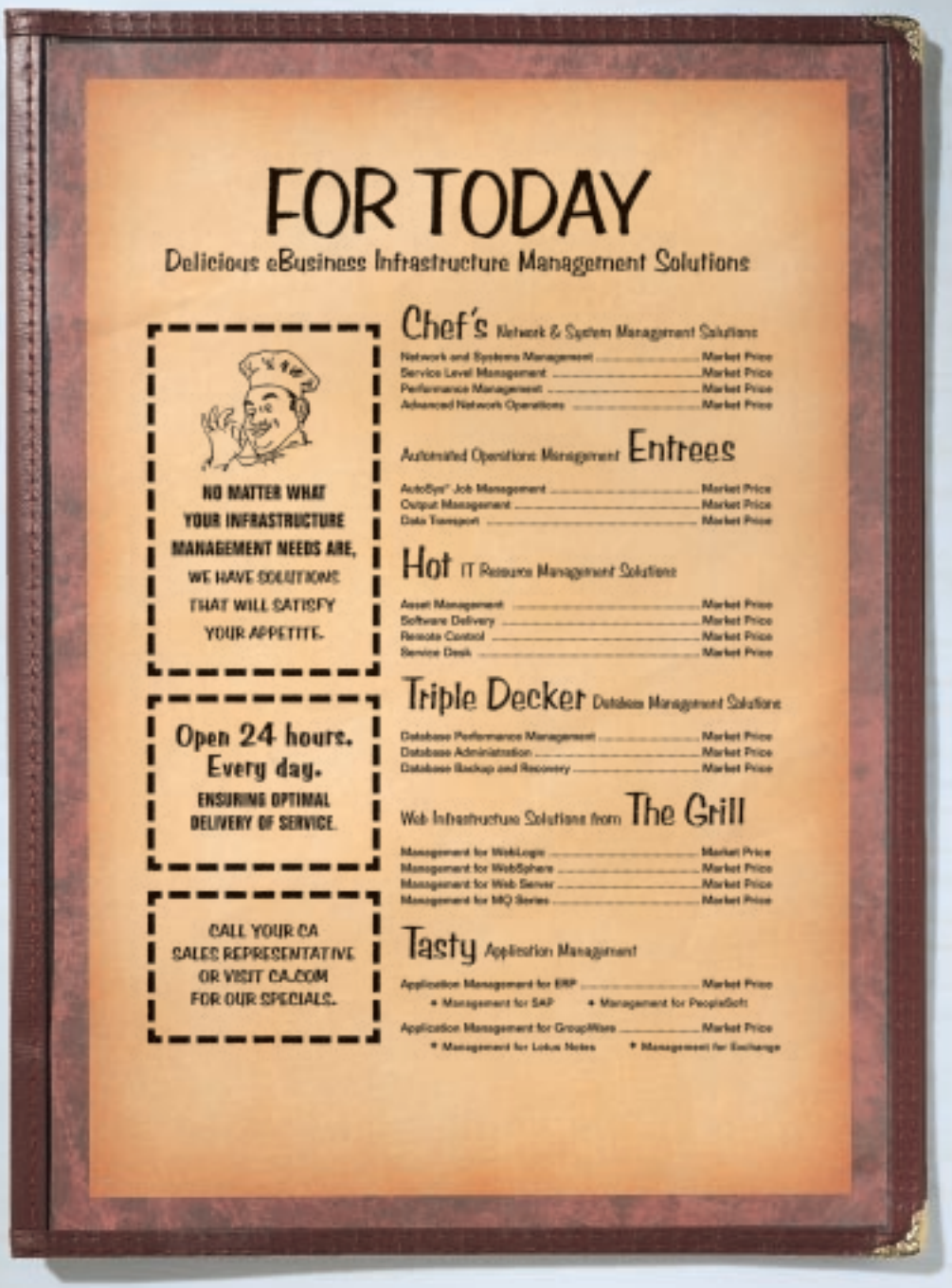
UTL_SMTP.OPEN_CONNECTION(): This is a function only and returns a record of type CONNECTION. This is always the first thing you will do in an SMTP transaction.

UTL_SMTP.HELO(connection IN, domain IN): This is the Handshake procedure. Pass in the connection object from earlier and a string that identifies the sending host. This is overloaded as a function which returns a REPLY. HELO, and is always the next thing called after an OPEN_CONNECTION()

UTL_SMTP.MAIL(connection IN, sender IN, parameters IN OUT): MAIL initiates the SMTP transaction. Sender is the email address of the sender, parameters is used for extended SMTP as per RFC1869.

UTL_SMTP.RCPT(connection IN, recipient IN, parameters IN OUT): RCPT specifies the recipients of the email. Recipient is the email address of the recipient. You can call this procedure for every recipient of the message. You must call MAIL before RCPT so that the SMTP transaction has started. Again, RCPT is overloaded as a function.

UTL_SMTP.OPEN_DATA(connection IN): Sends the DATA command. All subsequent calls to **UTL_SMTP.WRITE_DATA(connection IN, data IN):** adds data to the string to be sent and finally **UTL_SMTP.CLOSE_DATA(connection IN)** ends the message by sending a period enclosed in <CR><LF>. WRITE_DATA may be called as many times as you wish. An alternative to the above is a single call to **UTL_SMTP.DATA()**. There is no function



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```
CREATE OR REPLACE PROCEDURE mailout
  (
  sender     IN VARCHAR2,
  recipient   IN VARCHAR2,
  ccrecipient IN VARCHAR2,
  subject    IN VARCHAR2,
  message    IN VARCHAR2
  ) IS

  crlf VARCHAR2(2):= UTL_TCP.CRLF;
  connection utl_smtp.connection;
  mailhost VARCHAR2(30) :=  MyMailHost.com ;
  header VARCHAR2(1000);

BEGIN


    Start the connection.

  connection := utl_smtp.open_connection(mailhost,25);

  header:=  Date:  ||TO_CHAR(SYSDATE, dd Mon yy hh24:mi:ss )||crlf||
     From:  ||sender||  ||crlf||
   Subject:  ||subject||crlf||
       To:  ||recipient||crlf||
       CC:  ||ccrecipient;


    Handshake with the SMTP server

  utl_smtp.helo(connection, mailhost);
  utl_smtp.mail(connection, sender);
  utl_smtp.rcpt(connection, recipient);
  utl_smtp.rcpt(connection, ccrecipient);
  utl_smtp.open_data(connection);

    Write the header

  utl_smtp.write_data(connection, header);

    The crlf is required to distinguish that what comes next is not simply part
    of the header..

  utl_smtp.write_data(connection, crlf ||message);
  utl_smtp.close_data(connection);
  utl_smtp.quit(connection);

EXCEPTION
  WHEN UTL_SMTP.INVALID_OPERATION THEN
    dbms_output.put_line(  Invalid Operation in SMTP transaction. );
  WHEN UTL_SMTP.TRANSIENT_ERROR THEN
    dbms_output.put_line(  Temporary problems with sending email – try again
    later. );
  WHEN UTL_SMTP.PERMANENT_ERROR THEN
    dbms_output.put_line(  Errors in code for SMTP transaction. );
END;

SQL>  execute mailout(   Bob Mycroft   , bjmycroft , bmycroft@ccMeIn , The
Subject line  ,  Your text here );

PL/SQL procedure successfully completed.
```

version of WRITE_DATA as the text isn't sent until the **CLOSE_DATA** is sent.

UTL_SMTP.QUIT(connection IN): This closes the transaction.

One other procedure that you may use is **UTL_SMTP.COMMAND**() This allows you to send generic SMTP commands. If there are SMTP commands that do not have an equivalent in the UTL_SMTP package then use this procedure.
One further thing is that as <CR><LF> is used to terminate lines, it is a good idea to define this early in the code. In the UTL_TCP package there is a constant called UTL_TCP.CRLF already defined.

There are some limitations to the package though. Firstly, you cannot send attachments with the email. Also all text data is converted to US7ASCII before being sent. Later SMTP extensions (8BITMIME – RFC1652) allow 8-bit communication. This has to be negotiated with the EHLO() command – an extension of HELO().

3.3 An Example Procedure

In my example procedure I have split out the header from the body of the email and posted the two parts separately using WRITE_DATA. This is just done for personal preference, as the whole lot could have been submitted via a single call to DATA. Note how the string for header is formatted to include To:. From: etc.

4. In Conclusion

Hopefully this article will have given you an appetite to give it a go. Sending emails from the database is such a useful piece of functionality that I'm sure you will all be thinking of uses for it. For more information on SMTP and UTL_SMTP I would suggest that you look at the Supplied PLSQL Packages' manual and search the web for the relevant RFCs.

About the Author

Bob Mycroft is an Oracle DBA with over seven years' experience as a DBA and developer. Bob can be contacted at Bmycroft@yahoo.com

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Partitioning Data Within Oracle Manufacturing

By Owain Thomas, Sony Manufacturing Company UK Limited

For an Oracle Applications site faced with millions of monthly transactions on its Manufacturing and Supply Chain database, there is a clear danger of severe degradation in application performance.

Sony uses 'CheckMate Archiver for Oracle Applications' from BitbyBit International Limited, to migrate large amounts of historical transactional data to a separate tablespace. Partitioning is an ongoing process in the three key areas of Materials Transactions, Work Order and Purchase Order/Accounts Payable.

The process allows the historical data to be quickly and simply purged – as a monthly task – from the current system, while retaining live access to that historical data when required.

The problem with too much data

Sony, as with other Oracle Applications sites, has had to be proactive in planning for the growth of the database. Very high growth – unchecked – can lead to:

- degraded response times for online screens;
- extended run times for batch jobs;
- great human and other resource costs in system maintenance;
- extremely long and complex backup procedures.

Nevertheless, you cannot easily remove data without a host of other problems. Data has to be removed safely so that the relationships inherent to the applications are not broken. The question of which data to remove must also be answered. And what if we want the data back?

The balance between performance and 'history'

High performance demands that as little unwanted data as possible should exist in your system. However, you need historical data for reporting purposes, and where 'current data' refers to historical data. The balance between the needs can be summarised as follows:

Requirements for 'keeping' data

- Legal requirement
- Business requirements
- Operational requirements.

Performance issues

- Degradation in response times
- Slow batch runs
- Difficult system maintenance and backup problems.

A balance therefore needs to be struck between the removal and retention of data. The question of if there is a possibility of needing the data 'back' at some stage in the future is key. In reality the answer to this question will come from another set of questions:

1. Will we need the data back in the live database?
2. Could we cope with just seeing the data in read-only format?
3. Are there any areas where we are just interested in summary data, and historic transactional information is of little value?

If the answer to question 1 is "Yes" or "Probably", then the set (or type) of data that you are looking at should probably remain in the database. However, you should find that there is another mass of data that it is safe to remove, or move.

Whatever the answer to any of these questions, the possibility of **partitioning** should be explored. If you can highlight a 'set' of data that can be moved to another set of tables, possibly in another database, then there is very little danger of losing the data. Everything is still on-line and can be queried. It is also possible to move the data back into the live database if it is required. However, the initial selection of data to be archived should be such that the likelihood of this future requirement is minimised.

The 'CheckMate Archiver for Oracle Applications' solution provided by BitbyBit International Limited adheres to these principles. Sony could not identify another provider with a track record of archiving from Oracle databases, who had thought about these issues in such depth.

The Oracle Purge routines

Oracle Applications have built in purge routines, and these can be used to remove data. However, there are the following problems with the purge routines:

- Some routines do not address the largest and most problematic tables
- Most of the routines literally 'purge' and the data can never be seen again
- Sometimes there is so much complex validation taking place that very little is purged after running the process.

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the Oracle purge routines as a solution to the problem. This was the case at Sony. During its development, the solution from BitbyBit was cross-checked with the Oracle purging routines and, where possible, the Oracle routines were enhanced. However, the fundamental difference is that the BitbyBit solution always keeps the data 'alive' in a historical database or, if preferred, as flat files that can be restored to a database on demand.

Identifying the causes of the problem at Sony

Initially, by looking just at the growing database and the vast amount of tables with complex relationships, finding where the problems lie can seem an intimidating task. However, BitbyBit developed its solution by examining the tables that are the largest, or growing the fastest. Then the developers looked at the possibility of removing data from these tables in a referentially-intact manner. It was found that archiving processes could then be designed that hit these, and only a handful of other tables, to select 'intact' data.

There are around 1000 tables across the modules that are in use at Sony, UK. The modules that have been investigated regarding the archiving and purging project are WIP, INV, BOM, AP and PO.

It turned out to be true that only a few tables were causing the problems. These are outlined below.

Problem areas in WIP

The Work Order tables related to WIP_ENTITIES and WIP_DISCRETE_JOBS were the culprits in WIP, with WIP_REQUIREMENT_OPERATIONS being the largest. This can be explained by Sony's very large bills of materials and the large throughput of the factory.

Problem areas in INV

The Materials Transactions tables MTL_MATERIAL_TRANSACTIONS and MTL_ TRANSACTION_ACCOUNTS contain huge amounts of data at Sony, and between them are growing at just under two million rows per month. This equates to just under one GByte of data and indexes. Again, this is due to the manufacturing process with such large bills of materials. For every material transaction, there are two transaction account entries made.

Problem areas across purchasing (AP, PO)

The following tables were identified as the fastest growing across these modules:

- PO_ACTION_HISTORY, PO_HEADERS_ALL, PO_LINES_ALL, RCV_TRANSACTIONS, PO_DISTRIBUTIONS_ALL
- CHV_HORIZONTAL_SCHEDULES, CHV_SCHEDULE_ITEMS, CHV_ITEM_ORDERS
- AP_TRIAL_BALANCE, AP_INVOICE_DISTRIBUTIONS_ALL, AP_PAYMENT_DISTRIBUTIONS_ ALL, AP_INVOICES_ALL, AP_PAYMENT_SCHEDULES_ALL, AP_INVOICE_PAYMENTS_ALL

How to 'move' the data safely

Archiving to files or to a real 'historical' database?

The 'CheckMate for Oracle Applications' solution provides for the extraction of data to files and/or to a historical database. Archiving to files means that the data is 'safe', but examining the data can pose a problem. BitbyBit has solutions where archived flat files can be 'browsed' and queries run, before – if it becomes necessary – a selective data restore is carried out. Nevertheless, at Sony, it was decided to adopt the historical database approach as this keeps the data 'live' and easily accessible. In actuality, the method used has been to reproduce the tables in another tablespace within the same Oracle instance.

Using the CheckMate for Oracle Applications solution

The methodology employed is to first select the data that is deemed historic, and to 'flag' the data in the tables. Then the flagged rows are copied to the historical tables. Once the rows have been copied, the purge routine is initiated. Before any deletion takes place, a great deal of validation occurs to avoid problems with historical data being out of synch with the live data. This is discussed below in the 'What can go wrong…' section of this paper.

One major advantage of the 'CheckMate Archiver' solution is that all design work is done on a Windows PC in an easy to use graphical environment. However, all *processing* of data is carried out on the database server, making use of the powerful CPU and avoiding network problems of moving data via a PC. The archiving routines are moving megabytes of data around and this must be handled by the server. Some similar tools to CheckMate Archiver actually move the data across the network and to (or via) the PC.

Setting up the architecture for marking

Creating the 'flag' columns

The CheckMate Archiver solution implemented at Sony requires a column to be created that is later used as a 'flag' or marking column to highlight the rows to be archived and purged. This is done simply by running ALTER TABLE SQL, as in the following example for the MTL_MATERIAL_TRANSACTIONS table.

```
ALTER TABLE mtl_material_transactions
ADD (cmoa_arch_seqNUMBER (15)
CONSTRAINT
mtl_material_transactions_cmoa UNIQUE)
/
```

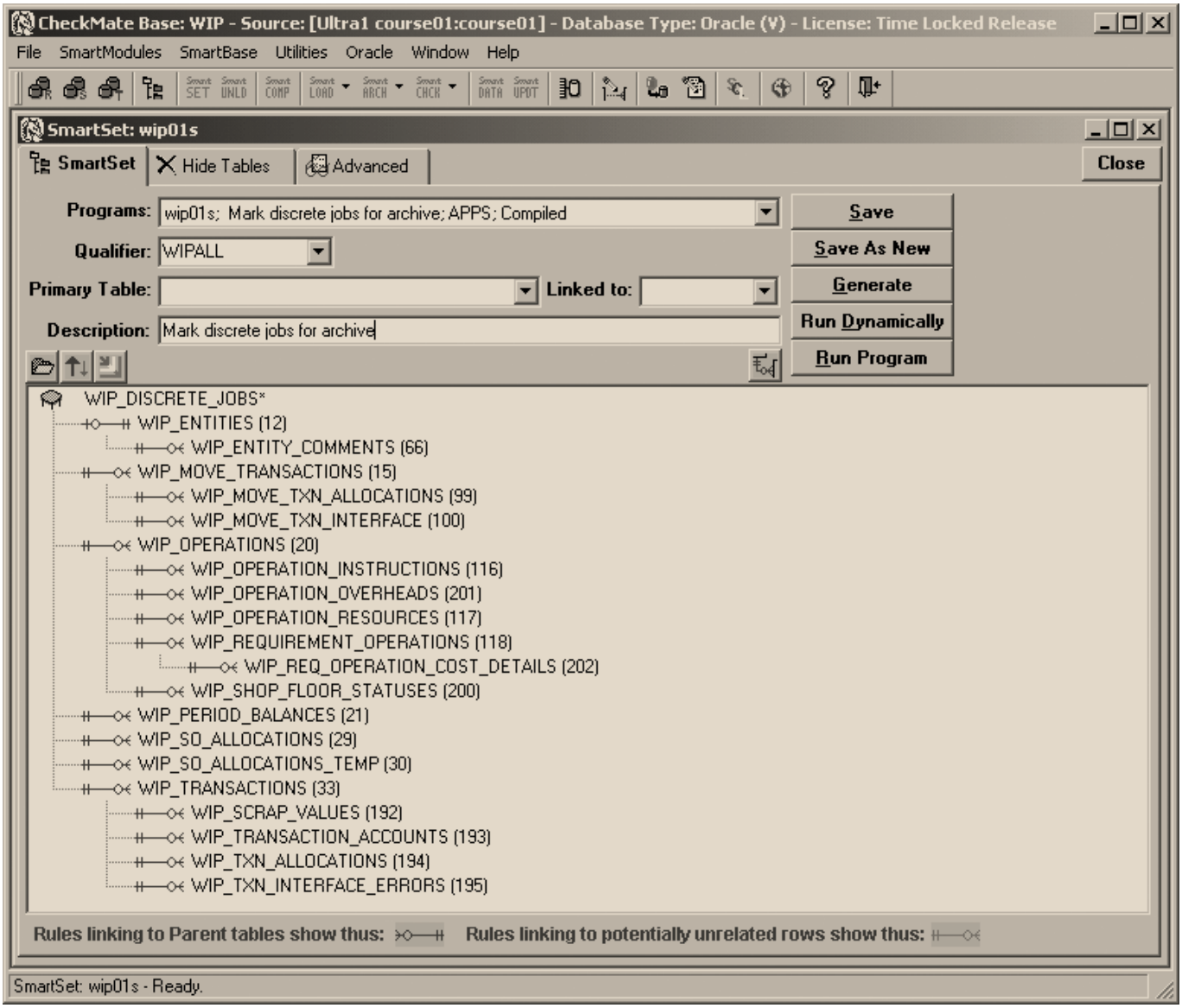

Fig 1: Selecting the WIP tables for mark-up.

Adding these columns to the tables at Sony has not proved problematic.
If, at any time, the columns are no longer needed, the tables can be exported and re-built without the flag columns.
The columns spend most of their lives containing no data, anyway. BitbyBit has other methodologies that do not involve adding columns or amending anything to do with the data model, but the added column method has a robust approach that proved the best choice for Sony.

When the CheckMate Archiver 'SmartSet' process runs, it finds a row that meets the criteria placed upon the set. (These criteria run against a primary table and ensure that the selected transactions defined in that table are within certain parameters and are flagged as 'closed' etc.). When a row in the primary table has been selected, a sequential number is placed in the flag column. In this way, that row is said to have been 'marked'.

Then the SmartSet process finds related rows in other tables and marks these in a similar manner.

This initial selection and marking procedure is the most complex step. The following sections show how the processes are designed to mark the correct data in the right tables.

Selecting the correct data for archiving/purging from WIP

The process of selecting the SmartSets of rows within the works orders tables is the most complex that is run at Sony. The design is as in Figure 1. However, bear in mind that the full set of criteria are not shown in the figures that follow, but in this SmartSet, the primary driver is the WIP_DISCRETE_JOBS table and rows are selected according to 'status' and a date range.

Once most of the WIP tables have been marked (and copied and purged – see below), some WIP_ENTITIES can be removed from the live database. However, a complex set of validations has

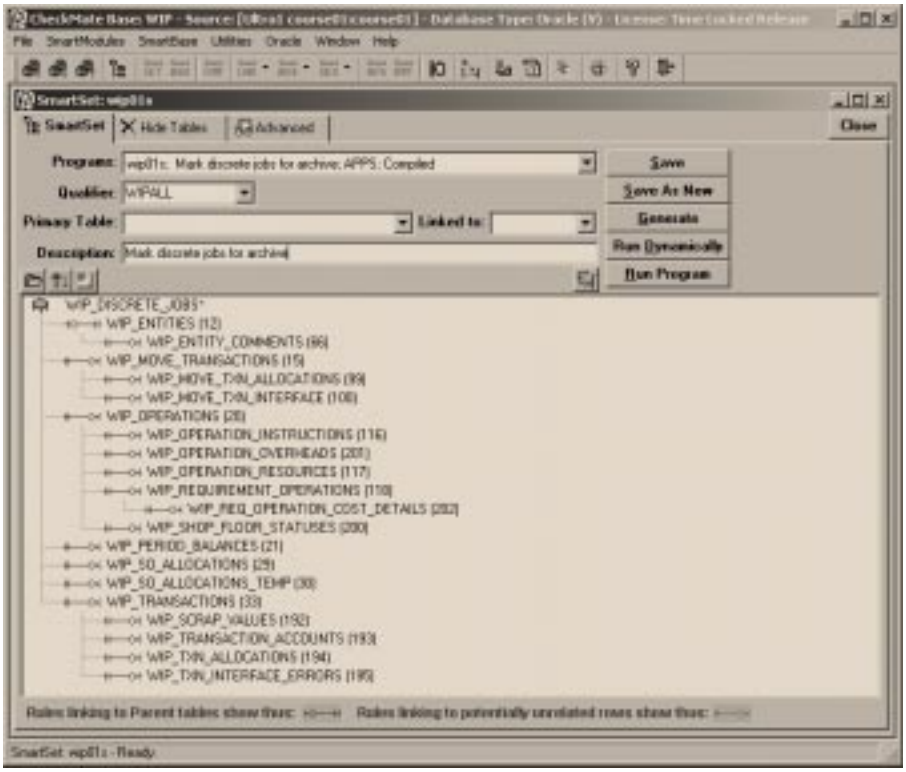

Fig 2: Identifying WIP_ENTITIES that are now free to be archived and purg

to be undertaken before these entities can be removed. Any WIP_ENTITIES that are not related to any rows within 23 other tables are then marked for removal. Figure 2 shows an 'exclusion' SmartSet used to identify the WIP_ENTITIES that have now become available for archiving.

Selecting the correct data for archiving/purging from INV

The design of selecting the 'set' from the inventory/materials transactions tables is the simplest of the processes at Sony. Only six tables are accessed to form the set. The relationships are as shown in Figure 3. Again, the exact selection criteria are not shown but the set of data is driven from date and 'closed' criteria on the ORG_ACCT_PERIODS and MTL_MATERIAL_TRANSACTIONS tables.

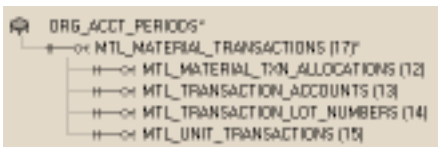

Fig 3: Selecting the material transactions rows across five tables (driven by the account period).

Selecting the correct data for archiving/purging from AP and PO

Identifying the problem areas across the purchasing modules was especially interesting. A CheckMate Archiver purge across AP and PO failed to select any rows because there were no closed purchase orders! This was reassuring in that the methodology relies upon closed 'flags' across the modules, and that was why the archive/purge was fruitless. Nevertheless, it was decided that some data should be purged from some of the tables.

We then focused on 'supplier schedules'. Sony creates many transaction rows for supplier schedules, due to the nature of the business processes. It was decided that a purge process should still be introduced to address the historical supplier schedules.

Thus, the SmartSet shown in the figure below was developed to remove historical supplier schedule transactions, based upon initial criteria centred around schedule horizon dates.

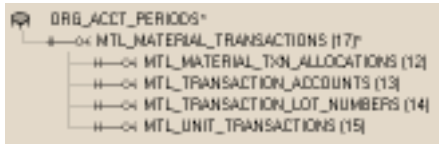

Fig 4: Selecting and marking the supplier schedules tables.

Copying the data

The data that has been flagged to be copied and purged is selected and loaded directly to the historical tables. This is a simple and quick process that merely selects rows based upon the existence of a sequential number in the 'flag' column.

Purging the data

A separate process then selects all of the 'flagged' rows and deletes these from the live database. However, a sophisticated validation step is performed immediately before the deletion begins (see 'What can go wrong...' below for more details).

The speed and performance of these tasks

Sony is using an HP/UX machine with dual processors. Most of the logical or 'intelligent' work is carried out in the marking or SmartSet stage. This is where the referential links are explored and data is flagged for archival and deletion. Because of the very large number of monthly transactions (millions of rows), the data is marked up in discrete 'monthly' slices. The mark up (SmartSet) processes typically take about 1.3 hours for the largest extracts, with the copying step taking about 1.5 hours. The associated purges are typically much faster at around 45 minutes.

These timings are dependent on the activity of the database. However, these readings were for the largest sets of data, and were taken while users were on the system during a typical production day.

Accessing and using the data in the live and history tables

Once data have been moved across to the history tables, it is possible to establish a 'joined schema' whereby a 'virtual'

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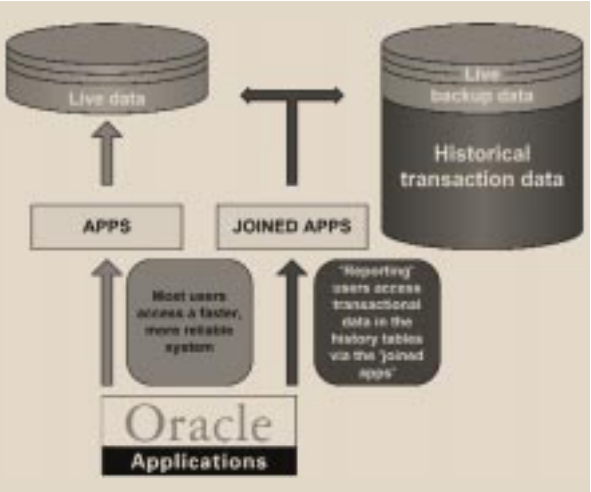

Fig 5: Accessing the live and history tables using a joined schema

complete database of live and history is created. Everyday users and processes interact with the purely live database, and do not connect with any of the historical data.

The optional 'joined schema' environment may be required by reporting users who wish to be able to select data from the live and the historical tables simultaneously. With the 'CheckMate Archiver for Oracle Applications' solution, this schema has a dedicated user and a large set of synonyms (to tables that have not been reproduced) and union views to both sets of tables in live and history.

Figure 5 shows the 'CheckMate Archiver for Oracle Applications' solution to reporting functions, accessing the live and history databases via a joined schema. Despite this useful functionality on offer, users at Sony who wish to access and report on historical data have done this directly to the live and historical tables via ODBC using spreadsheets. Live and historical data can be manipulated at the spreadsheet level. Therefore, the functionality of the joined schema and connecting to this via the Oracle Applications interface has not been implemented at Sony.

What can go wrong with such a solution?

There are several points where mistakes can happen with such a project design. These could be:

- Selecting the wrong data for archiving
- Selecting an incomplete (i.e. not referentially intact) data set
- Not purging the same data that was selected and copied to the archive
- Purging the same data, but after some rows were updated by a user.

The first two problems can be identified easily if you use the same staged approach as adopted at Sony with 'CheckMate Archiver for Oracle Applications'. The data may be selected and copied, and eyeballing and system tests may be carried out on the data before any purges are run. CheckMate Archiver's primary purpose as a tool is to select referentially intact data, so the refinement of these processes is quite easy.

The second two problems in the above list must be tackled by the mechanics of the purging processes. With CheckMate Archiver, this is done by three validations:

1. Check that the same number of rows exist in the historical table as are flagged for deletion in the live table.
2. Check that the sequence numbers are the same in the historical table and the live table.
3. Check that the values in certain key columns (checksums) add up to the same for the data in the historical table and that flagged in the live table.

The first two validations are variations on row count methods, and check that there is no data in the live table that has not been copied to the historical table. These also check that a user has not deleted a row in live that may now exist in the historical table.

The final validation checks that the data has not changed between copying/archiving and the purging step. Thus, if a user had changed a value (often a 'quantity', total or financial value) – i.e. a row update – the CheckMate Archiver process detects this and the purge is not initiated. If any validations fail, then the delete process does not proceed.

Keep it simple

At first, the problem of safely archiving from such a complex data model appears intimidating and complex. However, the CheckMate Archiver solution is to find the roots of the data growth, and adopt a simple, staged approach.

The 'CheckMate Archiver for Oracle Applications' solution from BitbyBit International Limited has 'belt and braces' approaches to safety everywhere, and one of its most attractive features is that it uses a simple partitioning approach. This partitioning avoids some of the inherent anxiety in any archiving project that data may 'disappear' and be difficult or impossible to recover.

BitbyBit advises that, even though the same tables exist at sites with the same modules of Oracle Applications, customisations are rife, and the business processes may vary. This means that a small degree of tailoring is needed at each site, but the fundamental project design remains the same.

About the Author

Owain Thomas, General Manager (IS) at Sony Manufacturing Company UK, has managed Sony's implementation of the Oracle Applications Manufacturing modules over the last two years. This paper was presented, in Owain's absence, at the UKOUG in December 2000 by Paul Blundell of BitbyBit International Limited. Paul can be contacted at paul.blundell@bitbybit.co.uk.

B2B using Oracle Integration Technologies

By Paul Colton, Senior Consultant, Unilog Ltd.

Ever had the thought "I understand B2B integration but where can I realistically start?", or are you being pressured to deliver XML integration but can't see that an enterprise-wide 3rd party middleware solution can be justified. By considering what B2B integration means and by looking at a real world example of the type of issues that a company may face this paper explores the Internet based B2B integration solutions that are available for Oracle eBusiness Suite users.

This paper is aimed at people who recognise the value of the Internet as an enabler of their business, and are considering the options for improving the level of B2B integration between their own company and their trading partners.

When viewed from the standpoint that B2B integration via the Internet is purely another step in the evolution of the way in which companies interact, it becomes easier to consider what level of B2B integration is realistic for your particular company. Equally, the range of options becoming available means that a B2B project does not have to be an all or nothing venture.

In the past two years much has been written about B2B integration and how this new paradigm will change the face of business. Much of the focus has been on major solutions, initially eMarketplaces and then on enterprise wide solutions that encompass all the companies in the extended supply chain. While all companies are aware that a fully integrated extended supply chain would bring major benefits, this area is still at the early adopter stage and as such there are no standard road maps to follow. By taking an evolutionary view of B2B integration this paper demonstrates how a company can begin the move to this next level of inter-company interaction with an incremental approach.

B2B integration

In the last two years many papers and editorials have been produced highlighting the need for all businesses to embrace the New Economy and the Internet. The message has prophesied that all businesses must change the ways in which they do business to enable them to survive the disintermediation, disaggregation and reaggregation that would be a result of the New Economy. The message has been a resounding one of 'be on the Internet or be nowhere' and on the Internet, 'eMarketplaces will be the place where all business takes place'. Companies would buy and sell goods and services through these electronic marketplaces with no need for human interaction. Availability and price would be the determining factors.
More recently the message has been tempered slightly and the word collaboration has started to appear. No longer would the business world be a completely eMarket driven environment in which existing relationships no longer mattered. eMarketplaces have began to develop collaborative features and trading partner management came to the fore. Collaborative supply chains and trading partner webs became the new ways in which the business world would exist in the New Economy. The approach may have changed but the message is still the same – businesses can only survive if they embrace B2B and the Internet.

Stepping back from this wave of acronyms and new words that need to be added to the spell checker – what does it all really mean? Are the current ways of doing business no longer valid? Will all interactions take place on the Internet within pre-built environments or within extensive integrated networks with information flowing between each organisation?

By considering these questions and by taking a more pragmatic view of the opportunities presented by the new wave of technologies this paper explores the approaches available to companies using the eBusiness suite and how to take advantage of them.

There are bigger questions that arise with the move to the Internet, but these are left for others to answer. Will the Internet and the New Economy cause the disappearance of the middlemen and the direct connection of buyers and sellers (disintermediation)? Will it see the breaking up of existing business relationships (disaggregation) and the formation of new and possibly transient relationships (reaggregation) to deliver new goods and services? It is not the intention to answer these questions here, but it is very likely that these questions will continue to form the high level debate about the nature of the new economy for the next few years.

Recently, the faltering growth in the pure play Internet companies and the slowing

in the expansion of the Internet orientated-businesses has caused a reassessment of whether the business models that have been defined for the Internet-centric companies of the future are realistic. The realism is that the Internet is here to stay and that the relatively low cost, standards based disciplines and ease of access that accompany it, mean that it is very unlikely to be replaced or superceded by a new communications medium. Changes will be incremental and will add to the power of the Internet.

eMarketplaces, trading webs and other approaches to providing methods for the electronic interaction of companies are valid business models, however, they are not a panacea and companies need to consider their individual objectives and relationships. By considering an incremental move into Internet based interaction with the customers and suppliers a company trades with, achievable goals can result.

B2B interaction – a wider perspective

The first thing to consider in the excitement over B2B is that business to business interaction isn't a new concept that has arrived with the Internet. Companies have been interacting electronically since the invention of the telegraph. Each new technology whether it be telephone, fax, EDI, e-mail, ftp, etc. provides improved or different ways to address some of the key issues of commerce – timeliness, accuracy and availability of information.

Each of these technologies brings with it features that improve the ease of doing business, and some technologies are better than others in certain situations. EDI isn't a medium to allow the easy resolution of a query over an order, the telephone conversation doesn't guarantee error-free transmission of data from one system into another, and the facsimile needs further technology to allow it to be electronically imported into a computer system. B2B interaction is required whenever a company decides that it would be more effective for a third party to perform part of the work involved in the process of wealth creation than to perform the work within the company. Even at the high point of the huge conglomerates that diversified into every aspect of the vertical market that comprised their industry, at no point did it reach the stage where one single company operated in isolation. Since the peak of the conglomeration approach in the 1970s the business landscape has changed as BPR, outsourcing and other approaches have been used to improve the efficiency of the production process. As the business landscape continues to fragment further, into companies that specialise in a particular element of the value-chain, so the requirement for business to business interaction will continue to grow.

The Internet and its associated technologies present companies with new opportunities and ways to approach their businesses. To decide how best to make use of these opportunities it is necessary to understand what these new technologies provide.

B2B – what's new?

One of the key features of the Internet is that it provides an easily available network that is global in reach and with a low cost of access. This can be used to create means of interaction and integration between companies in a way that EDI with the need for a private network has not been able to. The flip side is that this ease of use brings with it security issues. However, EDI overcomes these through the use of private networks. The availability of technologies such as PKI and SSL can provide the necessary security layers on top of the openness of the Internet.

By lowering the cost of entry, the benefits of increased interaction and closer integration with trading partners can be reassessed, as the balance of the investment versus the benefits achieved is altered. The Internet puts new levels of interaction and integration in reach of all companies and widens the scope of interactions that can be considered, beyond the business critical ones that have been the focus to date.

As well as revisiting the level of integration used for existing business processes, the Internet also makes it feasible to share information that has historically not been made readily available to business partners. The ability to share accurate and timely supply and demand information between trading partners moves the supply chain to a wider level of collaboration and transparency. This improves on the previous management methods that resulted from Just-In-Time type approaches, which often resulted in simply moving the location of buffer stocks, rather than improving inventory levels across the supply chain. While this improvement will not result solely from the Internet based B2B integration and requires significant agreement and collaboration between trading partners, without a timely and accurate way to exchange information, it would not be feasible.

The global reach of the Internet also brings interaction with new trading partners and markets into scope. Again, the Internet does not deliver on its own, as many dotcoms found out when they pushed global sales without thinking through the physical logistics of delivering the goods. eMarketplaces or Exchanges are a further example of how the Internet extends the potential number of companies and organisations that a company can do business with. While the closure of some eMarketplaces and the reports of difficulties being faced by a number of players in this space serves to support the view that eMarketplaces are not going to be the only way that business takes place, there are also opportunities. In some industries or sectors where there

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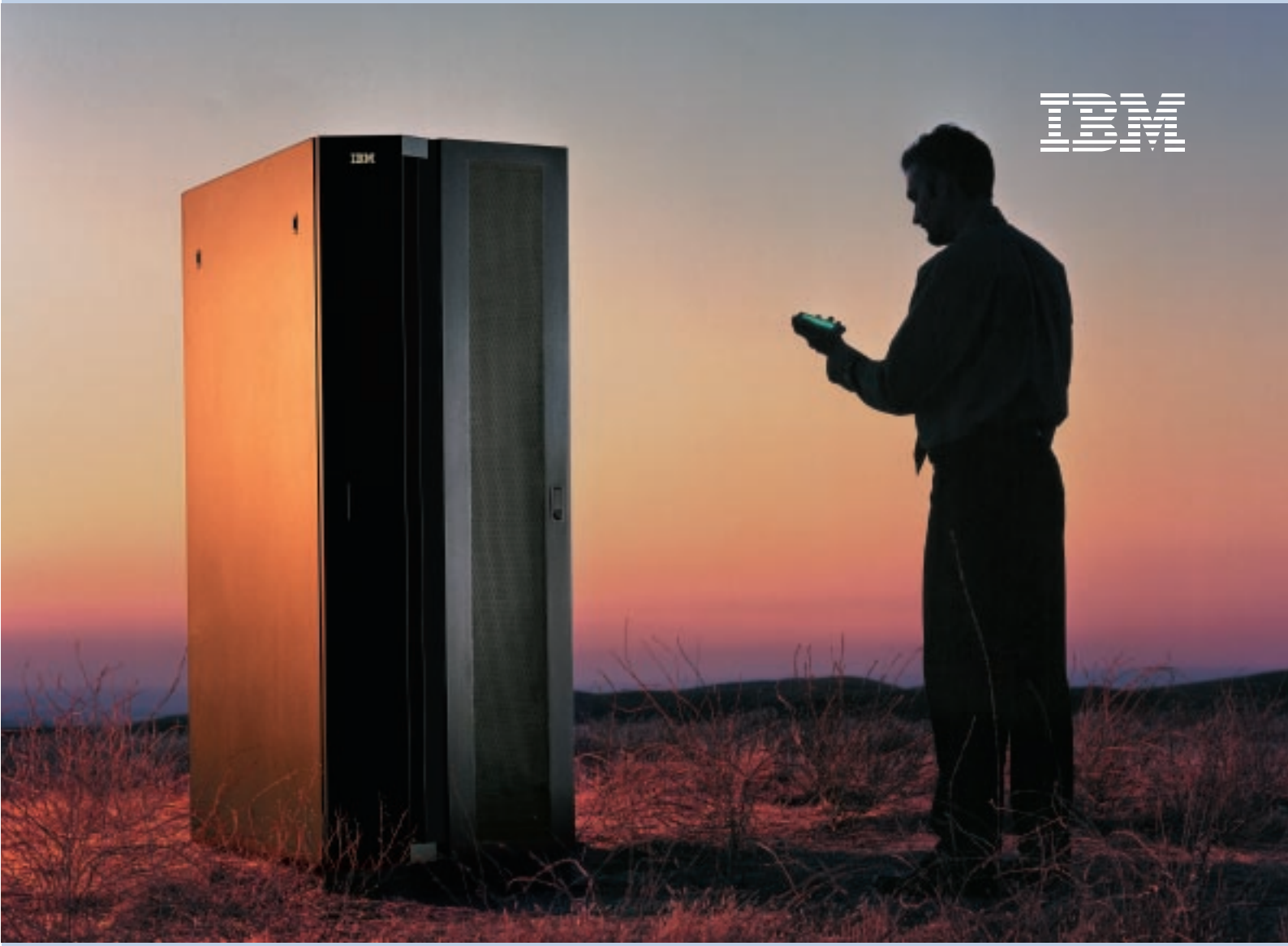

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is a dominant buyer, or group of buyers, eMarketplaces will be the primary means of B2B interaction. The recognition that B2B interaction is not just about buying and selling can also be seen in the way many eMarketplaces and Internet based Exchanges are seeking to extend their range of services into collaborative supply chains, transportation optimisation and product development.

The rise of the Internet has also seen the development and acceptance of standards such as Java and XML and associated technologies. While these technologies alone do not enable companies to interact and integrate their systems, their wide availability help to make automated interaction and higher degrees of interaction achievable. XML is a significant factor in these new technologies as it makes it easier to share information through its ease of adoption, flexibility, wide support and availability of tools such as XSLT and DTDs.

B2B – what are the options?

Taking the view that B2B integration does not have to be a major project and may extend only as far as the automation of an existing line of communication between your company and a trading partner, the question is where to go next?

Until recently companies using the eBusiness suite had only two options (Table 1). The first option was to code from scratch, ascending the learning curve required to build XML compliant applications and accepting that the result could potentially be an application with low scalability and with limited opportunity for reuse. The second alternative was the selection and implementation of an EAI solution that overcomes the limitations of the bespoke application, but implies that integration must be considered at the enterprise level in order to produce a reasonable return on the investment.

Option	Description	Benefits	Issues
Bespoke Application	Develop application to manipulate XML documents passing data to and from the Oracle database. **Technology** Java or PL/SQL DOM or SAX APIs XML and XSLT	• Low cost investment • Standards based • Uses Internet architecture • Consider for limited scope projects	• Requires detailed Java and XML skills • Code and business knowledge reuse must be part of the design • Low scalability • Web/application server layer required to provide integration engine
3rd Party Integration	Implement 3rd party software package to deliver the integration. **Technology** Adapters Data transformation and manipulation Messaging/message broker Business process management	• Reduced development times • High scalability • Provide metadata layer to support business knowledge and code reuse • Generally support a wide range of standards • Aimed at enterprise and supply chain wide integration projects	• Large number of vendors – vendor selection process critical • Significant implementation and licence costs • Package skills and experience need to be acquired • Ongoing vendor commitment to relevant standards • Completeness of integration solution

Table 1

Oracle Integration Server

Oracle8i Release 3 provides the installable option Oracle Integration Server, which bridges the gap between the bespoke development and the 3rd party integration solution. This product combines a number of products, some of which were already available, enabling an Oracle technology based integration solution to be developed. These are:

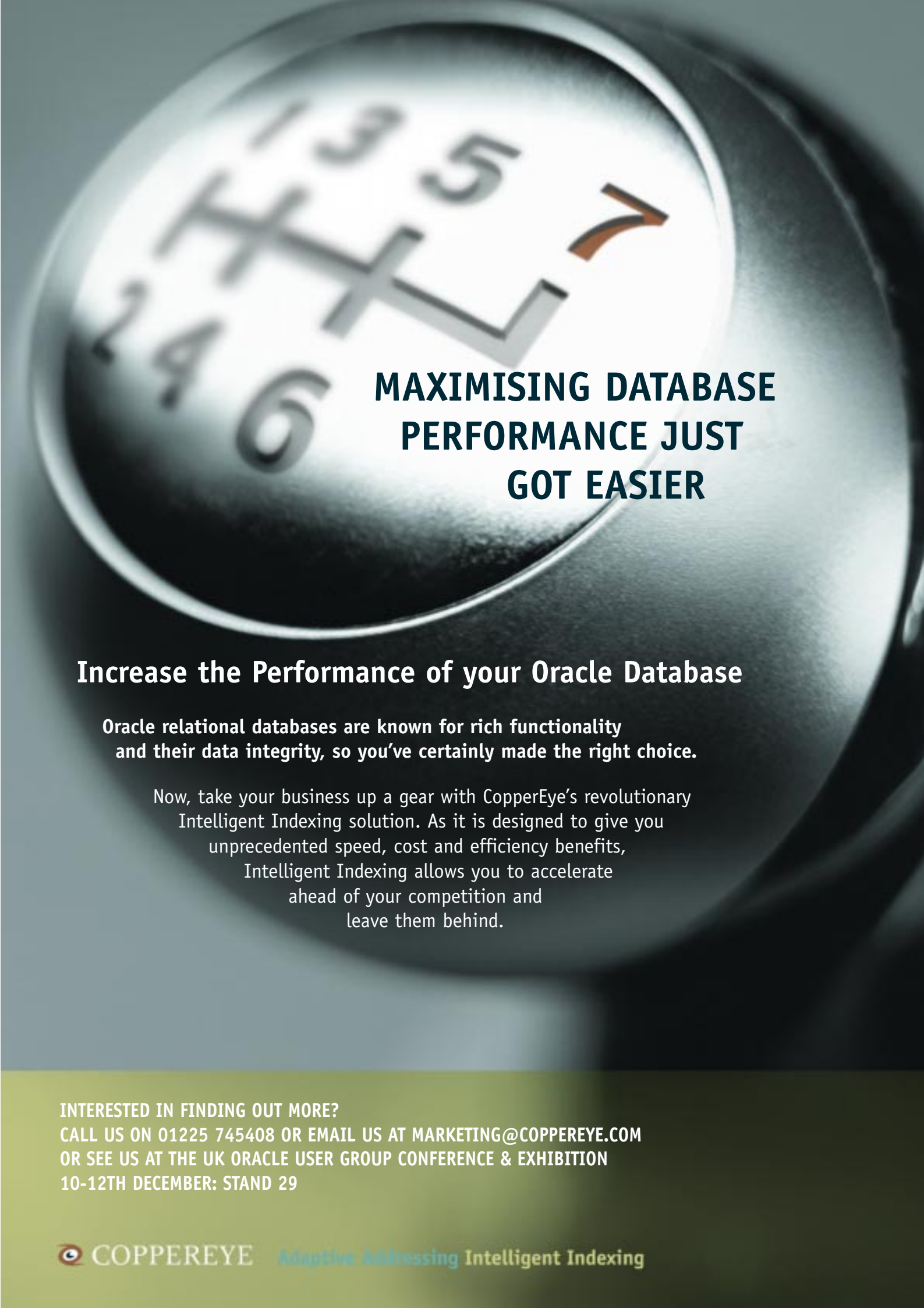
- Oracle Advanced Queuing
- Data transformation and manipulation technology
- Oracle Message Broker
- Oracle Workflow Builder
- Oracle Workflow Engine.

These products, along with Oracle's support for XML provide a middle way to achieve the benefits of B2B integration, overcoming the need for significant amounts of basic development, and do not require an enterprise-wide commitment to integration.

Considering the example of a company that currently has the following integration points with trading partners:

- EDI data exchange with a Current Supplier
- Web self-service access to enable a Current Customer to access the Sales Catalog.

Our company has also signed up with the Oracle B2B Exchange to gain exposure to a wider customer base. To support this, a web-browser connection is being used to upload and maintain our sales catalog and to take orders.



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Our Current Customer now decides to move to an e-procurement solution that uses a master catalog. The agreed requirement is that our company will provide catalog data as an XML document, using an agreed XML format to be known as ourXML, and defined by a set of DTDs. The advantage of using the Internet and XML for all new integration projects has been recognised, and in this example can be used for:

- Cataloging information to our current customer, using ourXML definitions
- Sales orders from our current customer, using ourXML definitions
- Cataloging information to the B2B Exchange, using OAGIS XML definitions
- Sales from the B2B Exchange, using OAGIS XML definitions.

Implementing this B2B integration using Oracle Integration Server will typically result in the scenario shown in Figure 1. The key features are:

- Single piece of development required to extract the catalog data from the database
- Transformation technology available within the OIS used to transform the outbound data into the XML definitions required for the destinations, i.e. ourXML and OAGIS formats
- Creation of the transformation routines from the DTDs that define the formats of the XML dialects
- Scalable solution in which new trading partners can be readily added, irrespective of the XML format that they support
- Business process level definition of the routing of the processing of sales orders
- Workflow engine and messaging technology to manage the flow of XML documents within our systems.

Using Oracle Integration Server also opens the options of increasing the level of integration with our companies internal systems. Opportunities include:

- Using the Workflow engine to route the sales orders directly to other in-house applications, removing the need for the nightly batch update and increasing the immediacy of the information. This can use the transformation technology to format the data and message queuing to perform the delivery of the data
- Integration with other messaging technologies such as MQSeries and TIBCO Rendesvous, allowing the creation of an integration-hub.

This approach delivers XML based B2B integration using Oracle technologies and provides a scalable approach by providing a middle way between the bottom-up coding and the implementation of a 3rd party integration solution.

In addition to Integration Server, Oracle is also developing Oracle Applications InterConnect. OAI provides out-of-the-box integration for the eBusiness suite and

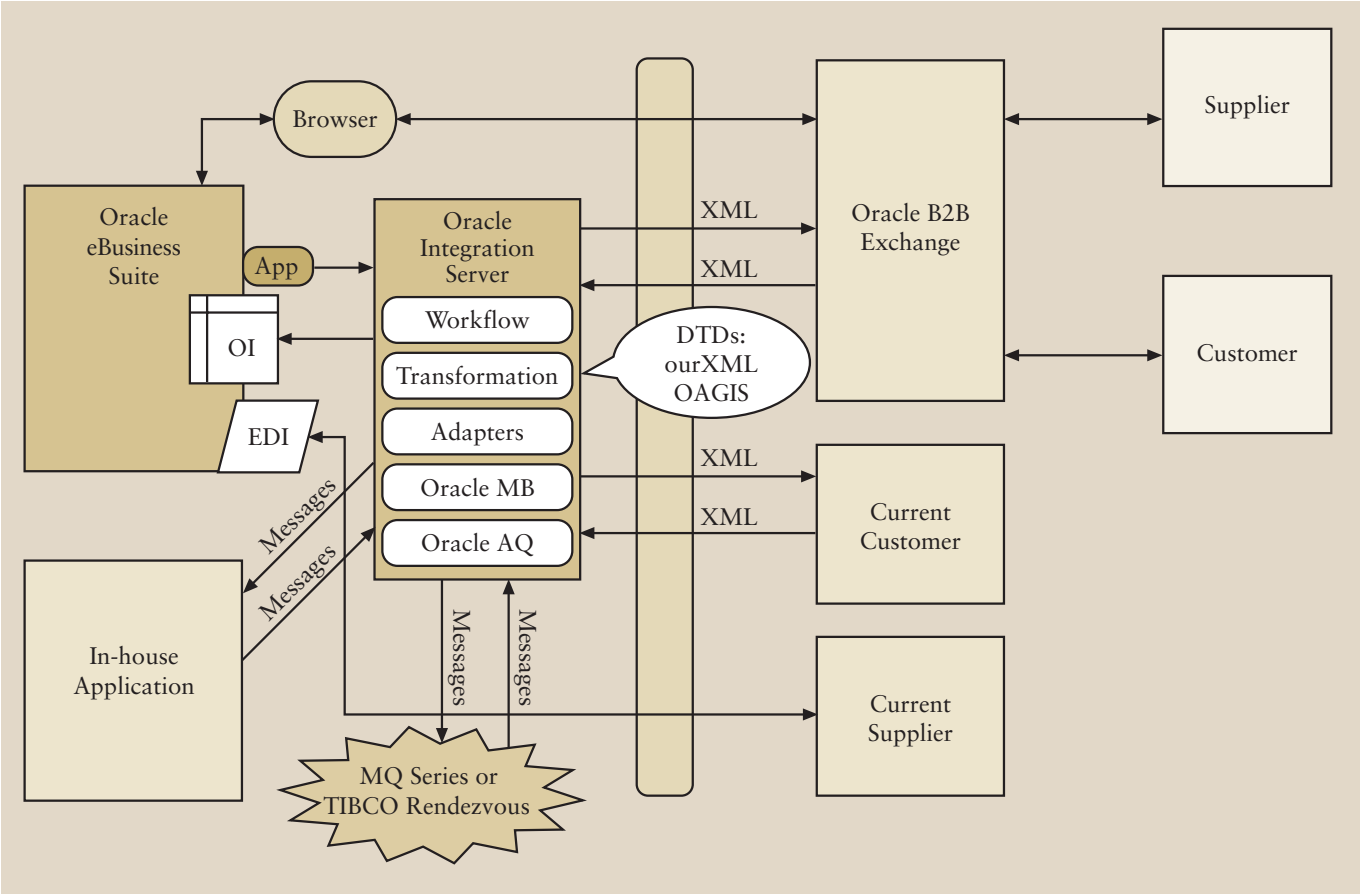

Fig 1

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is based on XML interfaces. Oracle has targeted integration with SAP R/3 for the Oracle CRM and iProcurement modules as being the first areas for integration and this approach is also likely to be extended to the B2B Exchange and a number of other 3rd Party Applications.

While not directly addressing the issues presented in the example used in this article, Oracle Applications InterConnect is based on the same Oracle integration technologies and provides a complementary route when considering an integration strategy.

Conclusion

The Internet and XML have provided a significant number of opportunities to revisit and extend the interaction and integration that takes place between current trading partners. It also opens up new opportunities and new ways to improve the efficiency of the business process. By understanding how your company interacts and integrates with trading partners and by mapping that to the ways in which Internet based integration can be implemented, an achievable and realistic strategy can be developed.

About the Author

Paul Colton is a Senior Consultant at Unilog Ltd. He has wide experience in the development and implementation of solutions using Oracle technologies and the eBusiness Suite. Paul can be contacted at paul.colton@unilog.co.uk

Glossary	
BPR	Business Processing Reengineering
DOM	Document Object Model – programming model used to represent XML documents in memory as a tree structure, enabling manipulation and construction
DTD	Document Type Definition – document to define the content and structure of an XML document
EDI	Electronic Data Interchange – standards for business documents used in electronic transfer of data, e.g. ANSI X12 and EDIFACT
OAGIS	Open Application Group Integration Specification – standard business documents defined as XML and DTDs
PKI	Public Key Infrastructure – encryption method using public and private keys
SAX	Simple API for XML – programming model used to perform serial access on XML documents
SSL	Secure Socket Layer – widely used Internet security implementation using PKI
XML	Extensible Markup Language – an open standard from the W3C used to identify and describe data. Analagous to HTML, XML specifies a rigorous text-based way to represent the structure inherent in data using a simple tag-based approach
XSLT	Extensible Stylesheet Language Transformations – templating language providing the ability to transform an XML document into another XML, HTML, WML or text format document

Global Data Warehousing: UNICODE

By Seamus P Lysaght, Motorola HRIS

The world is a diverse and interesting place. The subject of languages alone intrigues me; consider how many languages you can say "hello" and "thank you" in? More so, how many languages can you write "hello" and "thank you" in? I am certainly extremely limited in the art of languages but over the last couple of years the world of computer science has had to begin to appreciate this as a major issue for systems.

With the onset of globalisation, we are challenged to cater for multi-language, multi-script and multi-cultural requirements in our systems. To be a truly global system we need to be able to interact with our customers in their language and script. We need to be able to store this information and of course we need to be able to process this information.

The organisation that I belong to, within Motorola, manages and maintains human resource information systems; globalisation of our systems has been one of our key strategies. Motorola has a staff presence in over sixty countries worldwide. It was only a couple of years ago that each country had their own HR system. Standardisation of processes, removal of duplicate work and global reporting were key driving factors to consolidate all these systems into one.

On the road to achieving a truly global system, requirements concerning languages, scripts and country specific legal requirements became paramount. It became apparent early on that we would not be able to consolidate all countries to a "USA only" functional system (I say "USA only" in the sense that Motorola is an American company with over 50% of its staff in the United States). Why? Mainly because of country tax laws, country benefits, legal data element requirements and the fact that data security laws are so varied! For example, Israel has a legal requirement that all employee names and addresses need to be stored in Hebrew, France has a 13-month payroll cycle, the United States has a legal requirement for military service information.

Certainly, core data elements and business processes could be identified. This would make up the heart of our global transactional system. A key decision was made to use English and extended ASCII (western European languages only) as our base language and character set. Detailed exercises would then need to be carried out for each country to identify legal requirements, specific data elements, specific business processes and of course specific language requirements.

Since the global transactional system would not have true multi-language capabilities, an alternate environment needed to be identified. The global transactional system's data warehouse environment was awarded with the task. In fact, all requirements not possible in the transactional system landed under the data warehouse charter. Typically though 95% of the country-specific requirements could be handled by the transactional system.

The global data warehouse, a single Oracle instance needed to be able to store multiple languages and scripts. Typically character sets cater for one or more relatively similar languages. ASCII, which has been around for a long time, was initially 7-bit, giving the capability of providing space for 128 characters. Many systems now use Latin-1 Supplement also known as 8859-1 which provides 256 characters. For most Western European systems Latin-1 has been sufficient, but what if you had offices in China? Extended ASCII would not suffice since there are thousands of characters in Chinese scripts. To resolve this problem, double byte character sets evolved, which could cater for specific languages and also ASCII. None of the three character set types mentioned so far accommodate global applications. For example, what if you want to store Western European, Chinese dialect, Hebrew and Arabic character sets in a single database? What is required is a single universal character set that will encompass all major scripts of the world.

The Unicode standard defines a character collection that includes all major scripts of the world. Unicode Version 2.1 contains 38,887 characters from the world's scripts and 94,140 encoded characters in Unicode 3.1. It can be represented in a number of different formats, UCS-2 is a fixed 2 byte format and UTF8 (Oracle's NLS supported version) is a variable byte format. The Oracle character set name for Unicode 2 is "UTF8". It followed Unicode standard version 2.1 between Oracle8.0 and 8.1.6, UTF8 was upgraded to Unicode version 3.0 in both 8.1.7 and 9i, and it will remain at Unicode version 3.0 in future releases. AL32UTF8 is the new UTF-8 encoded character set for Oracle9i, and is the database character set which supports the latest version of the Unicode Standard (3.1), it also provides support to the newly defined supplementary characters. All supplementary characters are stored as 4 bytes. At a database level UTF-8 will store the ASCII range in a single bytes. Characters from the European scripts are represented in either 1 or 2 bytes;

characters from most Asian scripts are represented in 3 bytes, while supplementary characters are represented in 4 bytes. Another interesting thing about the Unicode standard is, primarily symbols are encoded rather than languages, and these symbols serve as a repository to whatever language requires them.

Motorola's HR global data warehouse was created using the UTF8 database character set. This was done at the create database statement stage. We were now in a position where we could truly store global data.

To interrogate this data from a user perspective requires settings to control how the user interacts with the database. Oracles NLS features control this from server and clients sides. NLS_LANG is the most common environment setting to control this. With the NLS_LANG parameter you can specify language, territory and character set. In essence, NLS_LANG can configure your language and cultural surroundings. This is often referred to as your locale. Client and server character set can differ and the conversion carried out by Oracle is seamless and automatic.

Oracles NLS features are very important in achieving a global environment. Currently Oracle supports 57 languages, 88 countries and territories, 63 linguistic sorts, and 200 encoded character sets.

As I mentioned earlier, UTF8 is a multi byte character set. This has a direct impact on storage requirements for your objects within the database. Since size specification of characters is in bytes and not characters, extreme care must be taken when creating objects to ensure the fields will be large enough to hold the data.

Figure 1 shows H_FIRST_NAME's length in characters is less than the number of bytes used to store it. For this reason we trebled the length of character fields that stored multi-character set data. By the way, the above field H_FIRST_NAME stores Hebrew first names.

```
Select lengthb(H_FIRST_NAME)  Number of Bytes ,
       length (H_FIRST_NAME)  Number of Characters
from OUTS_EMP.USER_IDS
where rownum < 5

/

      Number of Bytes        Number of Characters
                    6                           3
                    6                           3
                   10                           5
                   12                           6
```

Fig 1

Database performance is pretty much the same; some string operations would be faster with fixed length character sets. Disk performance can also be slightly impacted, since UTF8 is variable in length more bytes may need to be read and written. A reason why Oracle chose a variable byte (UTF8) character set, is that since it is used to identify and to hold SQL, SQL metadata, and PL/SQL source code, it must have either single byte EBCDIC or single byte 7-bit ASCII as a subset, which ever is native to the deployment platform. Therefore, it is not possible to use a fixed-width, multi byte character set (such as UTF-16) as the database character set. In Oracle9i UTF-16 is supported via the National Character Set (SQL NCHAR) which is exclusively Unicode. You can choose either UTF8 or AL16UTF16 as the National Character Set, the default character set is AL16UTF16.

The thing we struggled most with was how to implement multi-character set tables. Only one NLS_LANG can be set at a time; if your client environment is not UNICODE compliant then you need to specify a locale. The solution we use is to separate languages by table. Hebrew data is stored in a separate table to French data. Another solution is to store all languages in one table and have a language key. Which user you are and what language keys you are set-up with, controls which rows you see. This can be easily achieved using Oracle's Fine Grained Access features.

Another hurdle we encountered was the fact that all of Oracle's client software needed to be greater than version 7.3.4, other wise you will get a fatal two-task error. Depending on the number of clients you have this can be a minor or major problem.

For down stream systems and other databases, having a UNICODE data warehouse can cause headaches! A lot of these systems were developed years previously and supported ASCII or Extended ASCII. Characters can be silently lost, sqlloaders can fail and where Oracle can it will translate the characters to the closest match. This can lead to unpredictable results and confusion for most post production support teams!

Though the UNICODE standard had been around for quite a while we have found it very difficult to source UNICODE compliant software packages to support our environment. We have been running with UTF8 databases for over two years now and in that time we have faced a number of problems with vendor software due to the fact we need to run a UNICODE environment. With Oracle, Microsoft and SUN increasingly adopting the standard hopefully more and more vendors will also take the step. If globalisation of our systems is to be a success I think we need more vendors and a lot more reading material on the subject. Oracles NLS features and UNICODE character set have enabled our group to go most of the way to achieving our goal, it is in the vendors' hands now!

About the Author

Based in Cork City, Ireland, Seamus P. Lysaght is the development DBA for the Global Information Delivery team providing data warehouse solutions to Motorola's HR function. He can be contacted at slysag01@email.mot.com

High Temporary and Possibly Permanent

By Brian Cowell, Head of Technology, DPP Solutions Ltd

Our diarist gets enthusiastic about locally managed tempfiles, and speculative about the effect on DBAs as Oracle adds automation.

It's only temporary

I wish Oracle had called a Temporary tablespace something more precisely descriptive. Yes, I know it's there to contain temporary segments, but there are people who don't entirely appreciate the full significance of that phrase. On more occasions than I care to think about I have typed "ALTER TABLESPACE TEMP TEMPORARY" in a client database only to be greeted with the message that I can't do that until I have got rid of the permanent segments which have somehow found their way in there. And many mumbles of wrath have been audible when I have discovered that some (no doubt well-intentioned) Developer has decided that a tablespace called TEMP is the ideal and obvious place to put all the temporary tables in their application.

But, of course, for a while now we have all had a new toy to play with in the temporary line (and here I have to become even more careful with the rather confusing terminology). As well as being able to create a genuine TEMPORARY tablespace that can't contain permanent objects, in 8i we can create a temporary tablespace using tempfiles instead of datafiles. The strange thing is that not everyone seems to be taking advantage of this. Amazing though it seems, in my healthchecks I find that tempfiles are still only being used in about 50% of 8i databases.

OK, there are DBAs out there who have still not cottoned on to TEMPORARY tablespaces, so it's not too surprising that they haven't moved even further on. Yet given the distinct advantages of this (not so) new Oracle life form, surely the question should be – if your 8i Temp tablespace isn't locally managed and using tempfiles, why not?

In case anyone is still in any doubt about the exact nature of the beast under discussion, perhaps I should clarify the fact that I am talking about a locally managed, temporary, tablespace created by a statement such as this:

```
CREATE TEMPORARY TABLESPACE TEMP
TEMPFILE
 /app/data/data1/tsps/  temp01.dbf
SIZE 512M
EXTENT MANAGEMENT LOCAL UNIFORM SIZE 1M;
```

Let's just take a brief glance at the enormous advantages this gives you:

- Because it is locally managed there is no overhead in the SYSTEM tablespace, since Oracle does not have to track all its individual extents in the data dictionary. You never need to coalesce it, either, because all the extents are the stipulated size (local management can be useful for other tablespaces, too).

- Still not convinced? Then consider this – because it's a tempfile you never need to back it up, or to Recover it. (How many backups do you know that still take ages and miles of tape backing up multi-gigabyte Temp tablespaces? We used to work round that problem differently, but now that we can use tempfiles it's a snap). What's more, the Creation statement for a tempfile runs in the twinkling of an eye.

If there is a downside to these friendly little creatures, it's probably that it makes some of your old scripts look dated – you know, the ones which check DBA_DATA_FILES and V$DATAFILE and so on, blissfully unaware that these days they also need to look at the TEMP equivalents.

But if you, gentle reader, should by any chance be one of the those who still haven't got around to deploying locally managed tempfiles for your (8i) Temporary tablespace, then do give it a try – you'll appreciate the difference!

DBAs – an endangered species?

Maybe I'm getting a sudden (and uncharacteristic) attack of benevolence, but several examples recently made me aware of the extent to which DBA standards have improved over the years. Oracle have always been extremely good at supplying the technology, but noticeably less good at applying that technology in the real world – except, of course, in the specific case of someone who happens to be named Scott and has a rather unusually small and simple database. So it has also been amusing to note the way in which techniques invented and deployed by creative DBAs have later appeared as Oracle products or party line (I suppose partition views are the most well-known example).

Gradually, then, we have seen a distinct improvement in the way in which Oracle has been used. For example, I am pleased to be able to say that it has been some years now since I turned up to do a healthcheck and found everything

residing in an enormous multi-datafile tablespace called SYSTEM (and for those who never encountered this phenomenon, it could be a tedious job to disentangle it all, believe me!). Although I suppose a modern equivalent is that I do currently find lots of tablespaces called TOOLS which are entirely empty – but that's much less tiresome to fix.

Yet, following all these improvements in DBA standards – which have usually been led (or driven) by DBAs themselves – our reward seems to be attempts by Oracle to bring about a reduction of DBA morale, or perhaps even of DBA numbers. I noted the start of this process a little while ago when Recovery Manager first hove into view over the horizon, trumpeted in its early days by the marketing-speak "Oracle are moving Recovery back into the kernel" – in other words, trying to totally automate it so that inexperienced or just plain over-tired DBAs don't mess it up. Then we had Enterprise Manager and modules such as "Oracle Expert" – and what a misnomer that could be! And this line of thinking within Oracle is evidently continuing, with ever more blatant marketing claims being made. Yesterday a flyer arrived on my desk for the "Oracle Application Server Appliance" (such a pretty name, to be sure) enthusing about how it "automatically configures itself and distributes the workload to improve performance in real time".

Now no experienced DBA is going to greet that last statement and others like it with anything other than an arctic smile and a slow shake of the head. But the people to whom such flyers are sent could hardly be blamed if they started to wonder what those expensive DBAs are doing to justify their existence, since everything is now becoming automatic. (The generalisations and non-sequiturs of which management are capable are sometimes astounding).

One of the discouragements which we suffer when doing our job well is that we become invisible: after investing considerable effort and numerous long and lonely (not to mention unobserved and generally unappreciated) weekends in making sure that our databases keep running with good performance and a minimum of unscheduled downtime, it is far too easy for those who run IT departments to blithely assume that everything seems fine, so therefore we can't be doing much. OK, they would soon discover otherwise if they were to base any actions on such a facile assumption, but nonetheless by then the damage could well have been done. And damage, in this context, could be extremely Company-threatening if sufficient data went walkabout in the process.

I recently found myself at an Oracle marketing briefing (don't ask – it's a long story) in which it was baldly stated that Oracle had three strategic prongs of attack – at the IT Director level, the IT Manager level, and last (and very much least) at the DBA and Developer level. I suppose it is understandable, therefore, that Oracle would want to try and give the impression to the top two tiers that their ability to 'cut the cost of ownership' and 'increase the ROI' and hit all the other hot buttons in the bean-counters' lexicon could partially be delivered by a reduced dependence on expensive techies.

Therefore, I do worry a little that Oracle may be contributing to a situation where DBA numbers and DBA morale could both diminish following a supposedly increased reliance upon simplistic automation. Having been monitoring Oracle databases since version 5.0 I know very well that I can almost smell trends in an Oracle database by looking around in it for a while, whereas an automated script of some sort will only send out a warning when a pre-determined limit gets exceeded – some time later (I flatter myself) than would have been the case if I had been poking around in there. I also know that many performance issues are not straightforward to detect, relying very much on a DBA's experience along with a keen appreciation and knowledge of Oracle's internal mechanisms, and hence are not all that susceptible to the brute force methods of a battery of scripts – even those with a pretty GUI interface pasted over the top.

Perhaps Oracle is beginning to appreciate how immensely wide its technical scope has now become, and it is this realisation which is driving them to include more automation – although this could, of course, at times be a good thing. Those of us who recoiled in horror from what happened to Parallel Server (as it was known in those days) between version 7.3 and version 8.0 – things that were subsequently much improved by the addition of some automation in 8i – will be unwilling to carp about automation when it is entirely helpful and appropriate. The problems arise when increased automation is boasted about to those whose understanding of the technical complexities of the product are, at best, somewhat limited.

Therefore I can't help feeling that to brag to IT Directors that Oracle will "automatically configure itself in real time" is not going to make the DBA's job any easier. Trying to justify or explain a highly complex series of tasks to someone with insufficient knowledge to understand what we're talking about could become a sport not just for review time…?

But time (as they say) will tell.

To a beginning DBA

I was recently asked (by email) what I felt to be the most important aphorism for a DBA who had just finished the course-work and was embarking on our chosen profession, I came up with this (which I pass on for what it is worth, and in the hope of raising a faint smile in these troubled times):

"Bear in mind that you start off as a DBA with two (metaphorical) buckets. The first bucket is full, and that one is labelled 'LUCK'. The second is empty, and is labelled 'EXPERIENCE'."

"The object of the game is to fill bucket two before you empty bucket one".

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Oracle Tutor Profile with Hertfordshire County Council

By Janet Allison Brown, Freelance Consultant

"We are very impressed with Tutor. It has been particularly helpful for training and has enormous benefits in terms of holding – and helping us to implement – policy statements issued by the government."

Pat Hamblin, Operations Manager, Community Information, Hertfordshire County Council

Oracle Tutor is a tool that helps organisations to document their business processes and generate and maintain user manuals and training materials. It has recently been one of a number of work packages used to help Hertfordshire County Council implement a radical reorganisation of its internal departments and systems. On 1st April 2001 the council launched a new department called Children, Schools and Family, which replaces the Social Services and Education departments for children's services. "Hertfordshire County Council spent most of 2000 thinking about what changes were required, and what they would mean for the staff working for the council," says Pat Hamblin, the council's Operations Manager for the new CSF/A systems. These changes in organisation, systems and, inevitably, procedures, implied lots of changes for the council's staff, and a significant need for training.

Using Tutor as a repository

One of the main benefits of Tutor is its role as a repository of good practice and procedures. This is particularly important in an environment where government directives must be adhered to, and may change at any time. Tutor provides a set of standard business processes, plus macros to help you build role-based procedures.

Pat Hamblin and her team were responsible for training and online support for those using new Oracle systems. Hamblin says,

"One of the key attractions of Tutor is the fact that it helped us to understand and explain our own activities, as well as Oracle software."

In January 2001 the team began to document the processes to be carried out in the new Child, Schools and Family department, within the framework of government guidelines, and then map the new Oracle applications onto them. They began with the standard Tutor documents, applying them to the activities already carried out and using the flowcharts to do a gap analysis. "Tutor's standards helped us to look at what we were already doing, and at the flow of activities and information within our organisation. This helped us to write our processes and procedures."

In the event, no significant customisation of Tutor's standard processes was required. By April, Tutor had become a repository for the new department's processes, and the team was ready to begin training.

Creating training materials

Tutor creates tailored documentation for each installation based on the way a company uses Oracle software. The material can then be made available at every desktop. At Hertfordshire County Council, this online material was chosen to replace the costly alternative of manuals on every desk.

Hamblin says, "Tutor enabled us to create the student guides efficiently, and then maintain the information online. Now the user just has to go to their desktop and tap into the electronic copy for up-to-date information."

In addition to the council's head office at County Hall, there are four front-line offices, each with its own set of satellite offices, plus hospitals. The new system, which went live in April 2001, was rolled out quadrant by quadrant and, as each new function came on board, its staff underwent training.

Hamblin says, "To date we've trained around 500 people in how to do their job using the new system and procedures, and in how their activities fit into the overall process."

The next round of training, scheduled for mid-October, deals with how to use Workflow.

Advantages of using Tutor

Pat Hamblin calculates that using Tutor saved several precious weeks in the challenging schedule. "Without Tutor the whole process of documenting procedures, producing training material and working out a training plan would have been far more time-consuming. Tutor provides so much material for you up-front – it would have taken us an age to start from scratch. As it was, Tutor's standard processes were pretty close to what we were already doing. We had to create a few bespoke

Continued on page 64

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Hertfordshire County Council call centre – to date over 500 people have been trained

items, and do a little tweaking, but not a lot had to be changed."

She estimates that the key benefits of using Tutor were:

- **speed** – "It helps you to write things quickly."
- **conventions** – "The conventions and headings are set for you so you don't have to spend time organising your information."
- **ease of use** – "Tutor was quick and easy to use."

The timescale, and the sheer scale of the project, presented their own challenges and meant that ease of use was of particular importance. "We were training a range of people," explains Hamblin. "Some were highly proficient at using Word, whilst others had no IT experience at all. In addition, we were establishing new processes and ways of working." Tight schedules meant that people had to learn quickly.

"Some of our staff had never written processes before, but everybody was able to produce useful material using Tutor."

Oracle Tutor at a Glance

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Quest Software with Inland Revenue and EDS

"The knock-on effect of implementing Schema Manager, and thus reducing lead times for schema changes, has been immeasurable. Quest's product gives us total confidence in the quality of our schema changes – ultimately, it means we're delivering better quality systems, and doing it faster." David Pember, Data Base Administrator (DBA), EDS Inland Revenue Account

Synopsis

EDS is implementing Quest Software's Schema Manager to reduce the time and effort required in making schema changes to Oracle databases in their Inland Revenue Account. Their DBAs now claim a success rate for schema changes of almost 100%, whereas with the manual systems previously used up to 10% of changes could result in errors.

Change tasks that previously involved three to four weeks' work are now being completed in just a few days. The time saved by automating schema management has meant more time for system testing, and therefore better quality systems are delivered.

Company Overview

Since 1994, EDS has been the IT strategic partner of the Inland Revenue, managing its IT services from development and delivery through output production and distribution. Inland Revenue applications cover the entire remit of UK taxation, both personal and corporate: Pay-as-you-earn (PAYE), self-assessment, maintenance and compliance, investigation and enforcement, and property valuations.

As a leader in the global information technology services industry for more than 37 years, EDS provides solutions for complex business issues. The company delivers management consulting, business process management, electronic business solutions and information solutions to help clients improve their performance and solve the complexities of the rapidly changing digital economy. EDS has more than 9,000 business and government clients in about 50 countries and in the UK, EDS employs over 13,000 people at more than 140 locations. Other UK clients include Vauxhall, BP, the BBC, the Department of Social Security, the Employment Service and Rolls Royce.

The Challenge

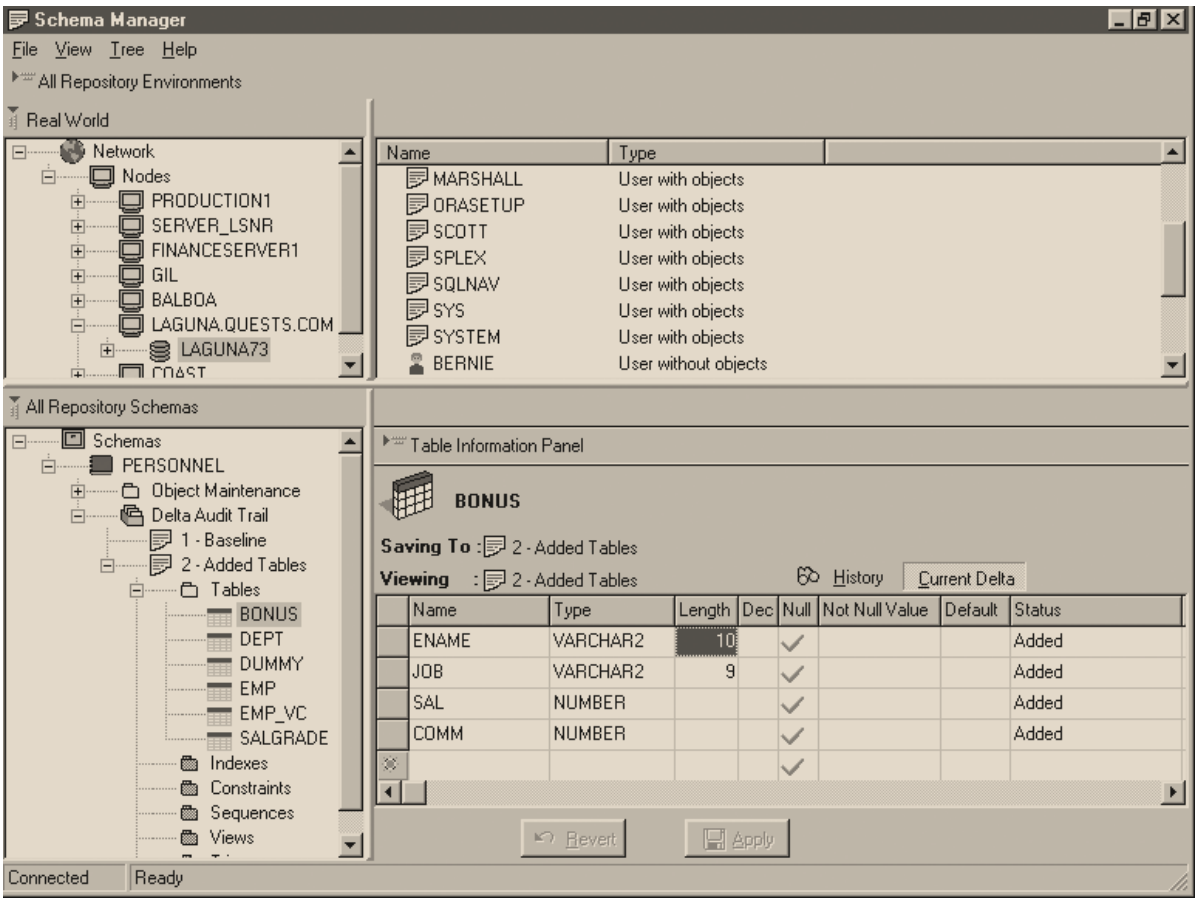
The EDS Inland Revenue Account employs around 45 DBAs in various locations across the UK. Much of their work at present involves re-engineering older systems, and at any one time the team has around 60 projects ongoing. A typical project will include logical design, schema modelling, development, and implementation into the 'live' systems environment.

The re-implementation of large hierarchical systems onto relational database management systems (RDBMS) – predominantly Oracle, but also including SQL Server – was proving a labour-intensive burden on the DBA staff. Any one change requested to a schema could mean a huge manual effort in making the changes and documenting each step of the process. Each change had to be assessed in terms of the work required and its potential impact on other parts of the system. The EDS Inland Revenue Account estimated that up to 100 man-days effort was required for every schema change requested.

The EDS Inland Revenue Account realised that automating the routine tasks involved in schema management would free up DBAs to spend their time more effectively on systems testing and implementation. Implementing the right schema change management product would lead to a reduction in lead-times, increased time for testing, and ultimately greater confidence in the quality of the systems being delivered.

The Quest Solution

Quest's Schema Manager is designed to allow organisations to create, track and deploy schema changes throughout the application lifecycle. A single 'complex' change, such as renaming a column, can take hours to implement manually. Schema Manager automates all the key tasks involved, including documentation, schema comparison and versioning, auditing (pre-and post-change), and roll-back generation. The Oracle DBAs at the EDS Inland Revenue Account assessed several leading products based on their suitability for their working environment, including Quest's Schema Manager. The EDS team knew that future developments were likely to involve SQL Server as well as Oracle databases so initially a competitive product, with its open database interfaces, seemed an attractive solution. On discovering that Quest was itself planning to introduce SQL Server support for many of its offerings, this issue became less important. "The fact is, we really only needed support for Oracle and, eventually, SQL Server." explains David



Pember. "So a higher priority than open database support was the functionality and performance of the products. At the end of the day Schema Manager delivers between 75 and 90% of the functionality we originally identified as desirable – significantly more than the competition."

The EDS Inland Revenue Account needed a tool that addressed the entire schema management process: applying, removing and renaming objects, as well as generating changed Data Definition Language (DDL), the code required to perform the change itself.

"Overall we found Quest's Schema Manager to be the most rounded offering in terms of functionality," continues David. "We liked the way it creates a baseline schema, and clearly identifies changes in different versions.

Schema Manager kept a copy of the DDL being generated by Sterling's COOL: Gen, which can be useful during system testing. It makes it easy to see 'the big picture' if you like, because a 'version 2' of a schema will actually be the whole of 'version 1', plus all the changes, not just the changes alone." Schema Manager made the DDL code accessible at the touch of a button.

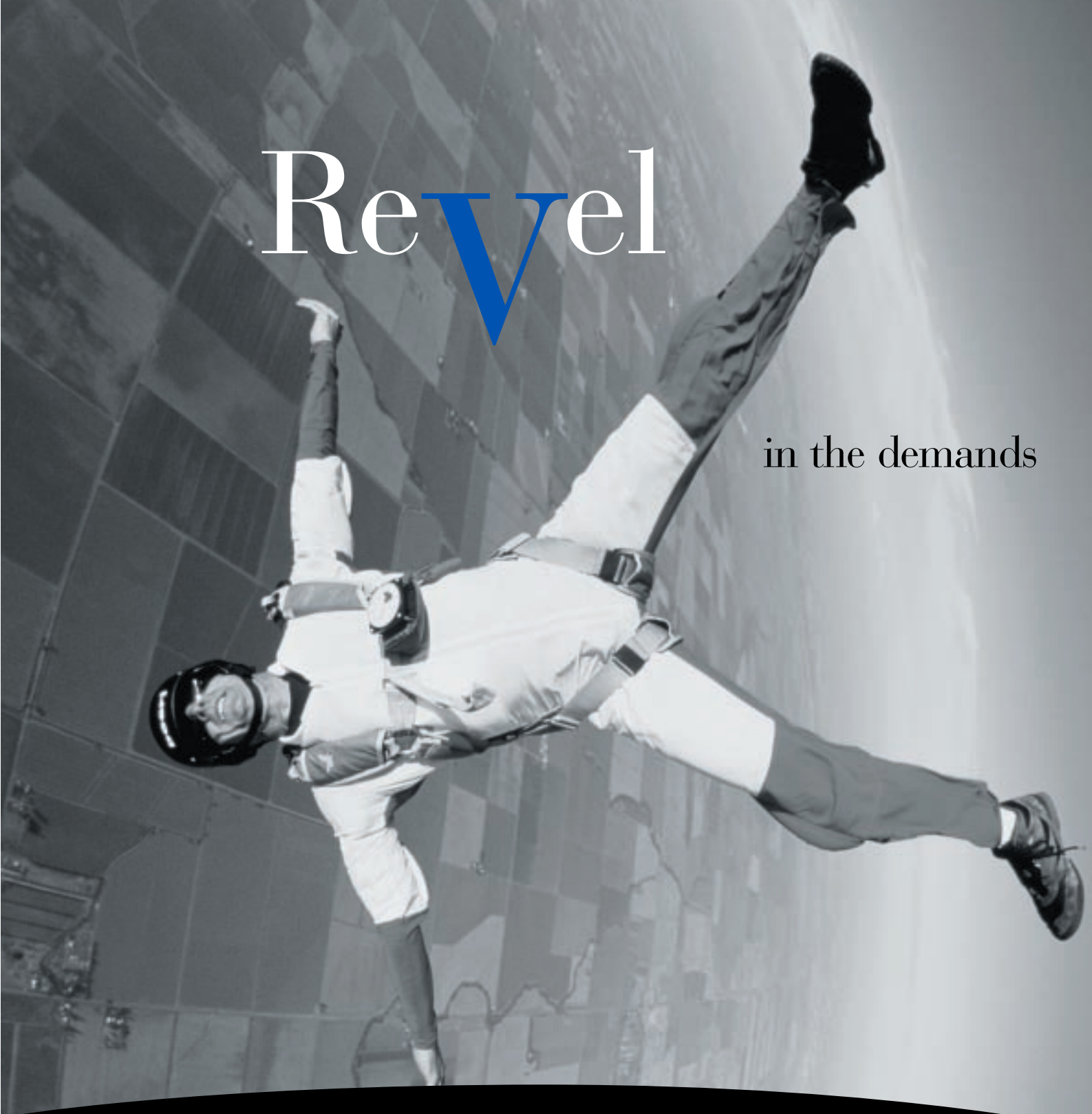
More importantly for the developers and DBAs alike, Schema Manager's performance far outclassed the competition. "We were able to generate DDL much faster with Quest's product," continues David.

The Bottom Line

"Schema Manager frees up our DBAs from routine time-consuming tasks such as pre-audit and post-audit documentation of changes, which we used to do manually," concludes David. "This means we're able to deploy them more usefully doing the jobs that DBAs are really there for, i.e. the planning and implementation of database systems. We're getting a better return on investment from our staff, as well as our systems." Quest's Schema Manager automates more than just documentation tasks. It manages industry standard quality checks throughout the schema change process. The EDS Inland Revenue Account has seen the number of schema errors reduced from around 10% to almost zero. Equally important, David estimates that since the introduction of Schema Manager, change-related tasks estimated to take three to four weeks are now being completed in under two days: "Some competitive products may have seemed cheaper, but they would ultimately have been a false economy – because of the additional effort required, we wouldn't have seen the time savings we have with Schema Manager."

The EDS Inland Revenue Account is currently implementing new working practices to facilitate the introduction of Schema Manager across all of its UK offices.

For more information on Quest Schema Manager visit www.quest.com



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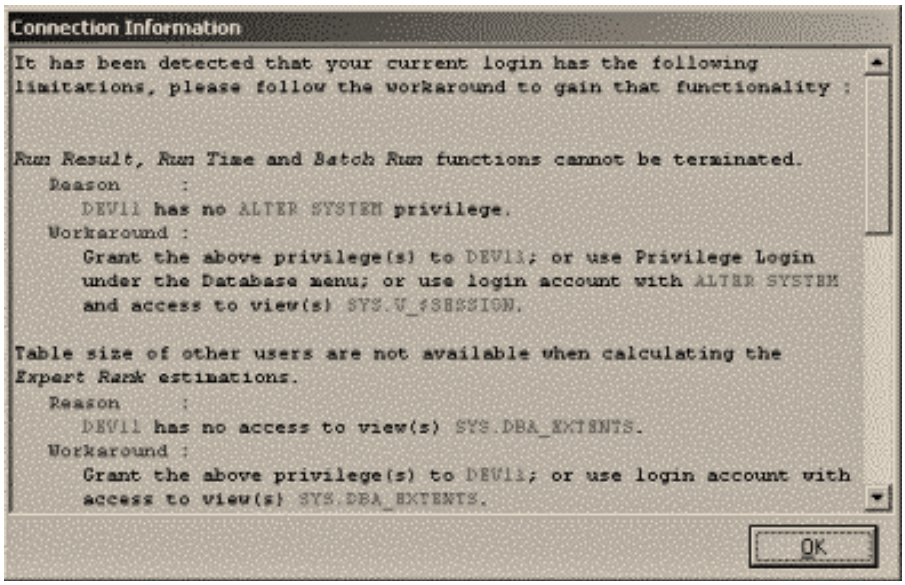
LECCO SQL Expert Professional for Oracle

Reviewed by Tim Onions, SpeechMachines Limited

Probably the first product on the market of its nature SQL Expert, from Leccotech has grown beyond a clever but niche DBA tuning tool into something closely resembling a fully fledged SQL and PL/SQL development tool. SQL tuning is still there making this a slightly unlikely combination of tools – heavyweight, potentially mission-critical, tuning alongside a highly useful and productivity enhancing PL/SQL and SQL development environment.

To run SQL Expert requires fairly minimal hardware resources in terms of today's mega-powerful desk-top PCs. It should run on a mere 486DX or above on a 32bit Windows environment in as little as 64Mb of RAM. Disk space footprint is similarly light weighing in at only 50Mb. Access to the database is done via a regulation NET8 connection.

Installation is an absolute breeze – three or four clicks and you are ready to connect to an Oracle version 7 or above database for the first time. On connecting the product checks the necessary database grants and permissions for it to run properly and it will display an alert window if the account being used is found lacking. This is helpful at first but becomes really annoying when you are ready to accept these limitations as you are deliberately using only part of the tool. Despite searching I could find no way of turning this 'feature' off. To balance that slight negative with a large positive the online help is very good via the Lecco Assistant (which, in this case, can be turned off at startup if desired). You can use the Assistant to guide you through any of the tasks and it is always succinct and accurate in telling you exactly what you need to know.



SQL Expert tells you what grants and privileges you lack each time you log on

The DBA's Bit – SQL Optimizer, Scanner and Inspector

SQL Expert's database tuning works on the brilliantly simple idea that if you ask any two programmers to construct all but the most trivial of single table SQL statements you will almost certainly get semantically different solutions (hopefully) producing the same result set. Thus, if you extrapolate this somewhat and use a bit of imagination it is clear that for any moderately complex SQL statement there must be a wide range of alternatively constructed statements that give the same result – yet some will perform better than others. Add to this the ability to add optimiser hints in Oracle with a resultant positive or negative effect on performance and you quite quickly get to a situation whereby there are conceivably many hundreds (or thousands) of permutations of SQL to meet any given requirement. The clever/ tricky bit is finding the best (where best may mean quickest or least resource intensive). SQL Expert is able to take any SQL statement, work out alternatives that produce the same answer, add appropriate variations of optimiser hints, filter out statements that end up using the same execution plan and "score" what remains. The score is there to give you some indication of how "good" the alternative is relative to the original. However, Leccotech recommend that you take it one step further and actually run the SQL produced and compare actual run time data. This is easily done with the tool's batch run facility, which is configurable, allowing the user to choose (amongst other things) which of the statements to actually run and how long to allow each to run for before giving up on it. Set this going, make a cup of strong,

database objects, auto-indent, 'auto-fill', auto correction et al. Code templates and snippets can be enhanced with your own personal favourites but come ready supplied with a good selection to get you started with. You can even highlight SQL statements and have them validated and formatted to a 'standard' layout. This last feature, though useful in its own right, would have been even more so had you been able to take a complete unit of PL/SQL code (say an entire package) and have that formatted – at present this option stubbornly only accepts single SQL statements.

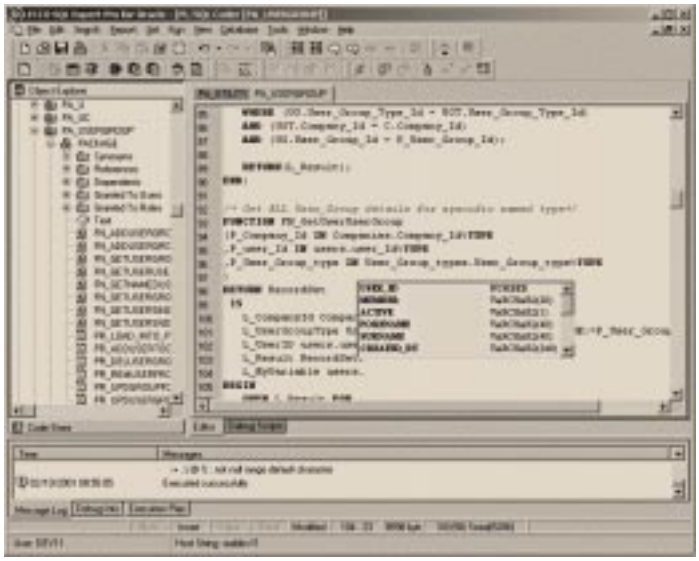
Having written the code you can have it compiled against the database, with any resulting compilation errors listed and the error lines highlighted. Once it has compiled then you can use the integrated debugger to test out what you have developed and monitor the results. Advanced features such as variable watch, break points, step out/over, run to exception etc make this yet another desirable feature.

So this is programmer's paradise then? Well, not quite. Admittedly there are too many features designed to aid in SQL and PL/SQL development for me to list here and the resulting code not only looks good in SQL Expert but should work too, if it has been stressed via the debugger. However, there are some rough edges and annoyances that frustrated me, when trying to use it and still turn out the code demanded of me by the project timescales. Little things I'll grant you but they add up. One example is the indentation. As you write your code, the environment ensures nested blocks of code are indented automatically each time you press RETURN, which is great. However, load the code into another environment, say a bog standard text editor, and see that very same code seemingly randomly spaced from your left hand margin. Another annoyance was the way it handled comment blocks on code taken from flat files. This seemed to confuse the compiler and resulted in it highlighting the wrong lines of code when compilation errors were encountered. Sometimes it even prevented compilation occurring at all. I don't want to harp on about these things, I'm sure they will be fixed very soon in subsequent releases and the overall benefits of an integrated development and debugging environment would far outweigh my minor whining.

Verdict

The SQL tuning piece works and works well. It can tune troublesome SQL and will save hours of precious DBA time in the process. Being able to identify poorly performing SQL (or potentially poor performing at any rate) in both application code and within the database (running or not) can save yet more time. I would want this, or a tool very much like it, available to me on any but the most trivial of projects/applications.

The development tool still has the ring of a version 1.0 release. Undoubtedly it does what it sets out to do on the whole and it includes a useful set of utility tools, but there were too many minor annoyances to make me fall in love with it. The most telling observation must be that even though PL/SQL Programmer was on my PC at work for three months, throughout that period I would still run dear old Notepad as my editor of choice (sad but true). Full integration with the leading configuration management tools would also be a 'must have' if I were to become a convert. I found it hard, no very hard, to understand the relationship between the DBA piece and the Developer piece. You cannot purchase Developer on its own – only as part and parcel of SQL Expert with SQL Optimizer. You cannot purchase the Optimizer without PL/SQL Programmer – so who is the tool aimed at? The marketing literature attempts to justify this by stating that developers will be "trained" in the art (or is it a science? – no, it is voodoo!) of SQL tuning (or writing efficient SQL in the first place) due to the presence of SQL Optimizer. Hmm! That being said the pricing is quite reasonable given the amount of functionality available in the two, which means it will compete strongly with the other players in this market space.



SQL Expert in the PL/SQL Editor with the auto-fill feature in operation

Product Details: *SQL Expert Professional*
Supplier: *Leccotech*
Price:
– Three user Developer's Edition £3,695
– Single user Professional Edition £3,285 (three user £5,195)
– Bundle pricing available on application
Web-site: *www.leccotech.com*

really hot, tea and sit back and watch the tool's windows flash, re-fresh and fuss about. When it is done you will not only know which of the alternatives runs quickest but also invaluable stuff like the amount of CPU used, sorting done, blocks read etc.

I tried the SQL Optimizer on the most complex piece of SQL I could find, in the system I was working on at the time – a multi table join, with added in-line view and a couple of sub-queries thrown in for good measure. This query had been seriously tuned in the past and included a number of optimiser hints already – these were removed for the purpose of the test. SQL Optimizer came up with just under 200 alternatives, which I then tested via the batch run facility (albeit not on the production server but a clone – I value my job, some days!) Each of the alternatives was either run and the runtime statistics recorded or aborted automatically when it became clear the particular SQL was a dud. The end result was a clear winner, two to three time faster than the others. To my surprise, SQL Expert had found the exact same statement and hints as the manually tuned version – brownie points shared equally between the programmer and Leccotech!

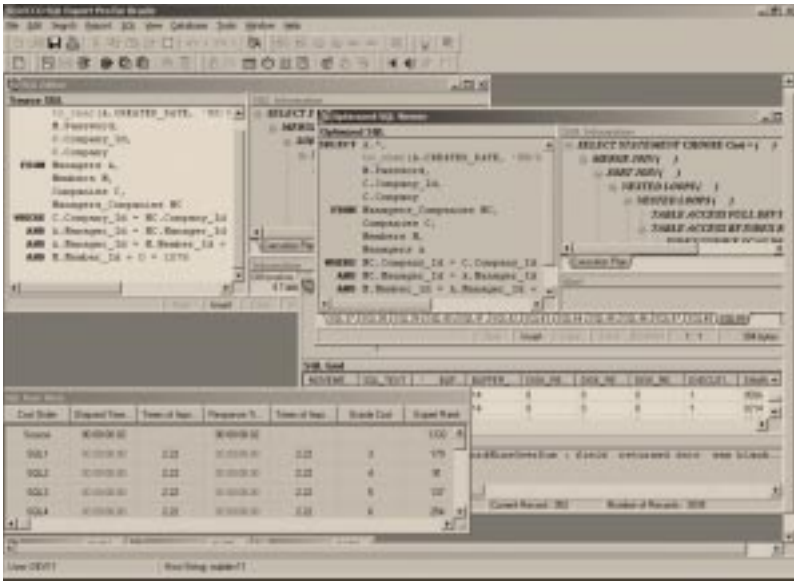
Undaunted, I ran a few more tests on other troublesome SQL which there had not been time to manually tune to such a degree. Each time SQL Optimizer suggested valuable alternatives that either ran quicker or used less system resources than the original. So the product really does work and given that it does it 'automatically' and, once set going, can be left to its own devices can result in huge savings in programmer and/or DBA effort. Using a product like this will enable any development shop to tune its SQL far quicker and with much less human resource than manually checking each statement.

To further increase tuning productivity there are features to extract SQL from database objects and/or external files (the SQL Scanner) and extract SQL from within the Oracle SQL Area (the SQL Inspector). These seek out statements that are deemed offensive or complex, based on some configurable rules, and make them available for optimisation. So you can automate the task of trawling through an applications code base or analysing a troublesome system and direct your tuning efforts accordingly. Each of the three components integrate well with each other and SQL found by the Inspector can be passed on to the Scanner and then into the Optimizer (albeit via copy-and-paste in the last instance). I'd recommend careful configuration at this stage. On the same system as before, with my initial SQL Optimizer test, I ran the SQL Inspector followed by SQL Scanner with their default settings and got nearly 700 complex or offensive statements! Some of these were listed because they were four table joins or full table scans on tables of more than eight blocks. This, to my mind, seemed a little unfair and can be changed by setting preferences. However, the preferences available seemed somewhat simplistic as I had expected to be able to set things such as number of logical and/or physical reads, but not so. It should be noted that such information is available for each statement retrieved by the SQL Inspector from the SGA but is not used in the judging process.

I found the interface to these a bit clunky, with windows floating around continuously refreshing themselves, making it virtually impossible to read their content. To be fair, the ability to schedule some of the tasks as 'jobs' suggests that Leccotech expect its tools not to be run interactively so much as automatically as backgroud tasks.

The Developers's Bit – PL/SQL Editor, debugger, SQL Formatter, Database Explorer

If you write a lot of PL/SQL then you will certainly appreciate SQL Expert's PL/SQL editor. It is a fully featured one-stop development environment for packages, procedures, functions, triggers, DML statements and anonymous blocks of code. Code can be retrieved either from the connected database data dictionary via an obligatory explorer type view or from flat operating system files but not, unfortunately, from a configuration management tool. Almost every possible productivity enhancing need has been thought of with the ability to use template code, snippets, drag-and-drop of



SQL Expert in operation having found sematically equivalent statements and run each to assess relative performance

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Excerpt from Expert One-on-One Oracle

By Tom Kyte

Reverse Key Indexes

Another feature of a B*Tree index is the ability to 'reverse' their keys. At first, you might ask yourself, 'Why would I want to do that?' They were designed for a specific environment, for a specific issue. They were implemented to reduce contention on index leaf blocks in an Oracle Parallel Server (OPS) environment.

It is a configuration of Oracle where multiple instances can mount and open the same database. If two instances need to modify the same block of data simultaneously, they will share the block by flushing it to disk so that the other instance can read it. This activity is known as 'pinging'. Pinging is something to be avoided when using OPS but will be virtually unavoidable if you have a conventional B*Tree index, this is on a column whose values are generated by a sequence number. Everyone will be trying to modify the left hand side of the index structure as they insert new values. In an OPS environment, modifications to indexes on columns populated by sequences are focused on a small set of leaf blocks. Reversing the keys of the index allows insertions to be distributed across all the leaf keys in the index, though it tends to make the index much less efficiently packed.

A reverse key index will simply reverse the bytes of each column in an index key. If we consider the numbers 90101, 90102, 90103, and look at their internal representation using the Oracle DUMP function, we will find they are represented as (fig. 1):

```
tkyte@TKYTE816> select 90101, dump(90101,16) from dual
2  union all
3  select 90102, dump(90102,16) from dual
4  union all
5  select 90103, dump(90103,16) from dual
6  /

90101 DUMP(90101,16)
                 -
90101 Typ=2 Len=4: c3,a,2,2
90102 Typ=2 Len=4: c3,a,2,3
90103 Typ=2 Len=4: c3,a,2,4
```

Fig 1

Each one is four bytes in length and only the last byte is different. These numbers would end up right next to each other in an index structure. If we reverse their bytes however, Oracle will insert (fig. 2):

```
tkyte@TKYTE816> select 90101,dump(reverse(90101),16) from dual
2  union all
3  select 90102, dump(reverse(90102),16) from dual
4  union all
5  select 90103, dump(reverse(90103),16) from dual
6  /

90101 DUMP(REVERSE(90101),1
                 -
90101 Typ=2 Len=4: 2,2,a,c3
90102 Typ=2 Len=4: 3,2,a,c3
90103 Typ=2 Len=4: 4,2,a,c3
```

Fig 2

The numbers will end up 'far away' from each other. This reduces the number of instances going after the same block (the leftmost block) and reduces the amount of pinging going on. One of the drawbacks to a reverse key index is that you cannot utilise it in all of the cases where a regular index can be applied. For example, in answering the following predicate, a reverse key index on x would not be useful:

```
where x > 5
```

The data in the index is not sorted before it is stored, hence the range scan will not work. On the other hand, some range scans can be done on a reverse key index. If I have a concatenated index on X, Y, the following predicate will be able to make use of the reverse key index and will 'range scan' it:

```
where x = 5
```

This is because the bytes for X are reversed and then the bytes for Y are

reversed. Oracle does not reverse the bytes of X || Y, but rather stores reverse(X) || reverse(Y). This means all of the values for X = 5 will be stored together, so Oracle can range scan that index to find them all.

Descending Indexes

Descending Indexes are a new feature of Oracle8i that extend the functionality of a B*Tree index. They allow for a column to be stored sorted from 'big' to 'small' in the index instead of ascending. Prior releases of Oracle have always supported the DESC (descending) keyword, but basically ignored it – it had no effect on how the data was stored or used in the index. In Oracle8i however, it changes the way the index is created and used.

Oracle has had the ability to read an index backwards for quite a while, so you may be wondering why this feature is relevant. For example, if we used the table T from above and queried (fig. 3):

```
tkyte@TKYTE816> select owner, object_type
2  from  T
3  where owner between  T  and  Z
4  and object_type is not null
5  order by owner DESC, object_type DESC
6  /
46 rows selected.


Execution Plan

0     SELECT STATEMENT Optimizer=CHOOSE (Cost=2 Card=46 Bytes=644)
1   0   INDEX (RANGE SCAN DESCENDING) OF  T_IDX  (NON-UNIQUE)...
```

Fig 3

It is shown that Oracle will just read the index backwards, there is no final sort step in this plan, the data is sorted. Where this descending index feature comes into play however, is when you have a mixture of columns and some are sorted ASC (ascending) and some DESC (descending).

```
tkyte@TKYTE816> select owner, object_type
2  from  T
3  where owner between  T  and  Z
4  and object_type is not null
5  order by owner DESC, object_type ASC
6  /
46 rows selected.

Execution Plan

0     SELECT STATEMENT Optimizer=CHOOSE (Cost=4 Card=46 Bytes=644)
1   0   SORT (ORDER BY) (Cost=4 Card=46 Bytes=644)
2   1     INDEX (RANGE SCAN) OF  T_IDX  (NON-UNIQUE) (Cost=2 Card=
```

Fig 4

For example (fig. 4):

Oracle isn't able to use the index we have in place on (OWNER, OBJECT_TYPE, OBJECT_NAME) any more to *sort* the data. It could have read it backwards to get the data sorted by OWNER DESC but it needs to read it 'forwards' to get OBJECT_TYPE sorted ASC. Instead, it collected together all of the rows and then sorted. Enter the DESC index (fig. 5):

```
tkyte@TKYTE816> create index desc_t_idx on t(owner DESC, object_type ASC )
2  /
Index created.

tkyte@TKYTE816> select owner, object_type
2  from  T
3  where owner between  T  and  Z
4  and object_type is not null
5  order by owner DESC, object_type ASC
6  /
46 rows selected.

Execution Plan

0     SELECT STATEMENT Optimizer=CHOOSE (Cost=4 Card=46 Bytes=644)
1   0   INDEX (RANGE SCAN) OF  DESC_T_IDX  (NON-UNIQUE)...
```

Fig 5

Now, once more, we are able to read the data sorted, there is no extra sort step at the end of the plan. It should be noted that unless your compatible init.ora parameter is set to 8.1.0 or higher, the DESC option on the create index will be silently ignored – no warning or error will be produced as this was the default behavior in prior releases.

Bitmap Indexes

Bitmap Indexes were added to Oracle in version 7.3 of the database. They are currently available with the Oracle8i Enterprise and Personal Editions, but not the Standard Edition. Bitmap indexes are designed for data warehousing/ad-hoc query environments where the full set of queries that may be asked of the data is not totally known at system implementation time. They are specifically not designed for OLTP systems or systems where data is frequently updated by many concurrent sessions.

Bitmap indexes are structures that store pointers to many rows with a single index

key entry, as compared to a B*Tree structure where there is parity between the index keys and the rows in a table. In a bitmap index, there will be a very small number of index entries, each of which point to many rows. In a B*Tree, it is one-to-one – an index entry points to a single row.

Let's say you were creating a bitmap index on the JOB column in the EMP table as follows:

```
scott@TKYTE816> create BITMAP index
job_idx on emp(job);
Index created.
```

Oracle will store something like the following in the index:

Value/Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANALYST	0	0	0	0	0	0	0	1	0	1	0	0	1	0
CLERK	1	0	0	0	0	0	0	0	0	0	1	1	0	1
MANAGER	0	0	0	1	0	1	1	0	0	0	0	0	0	0
PRESIDENT	0	0	0	0	0	0	0	0	1	0	0	0	0	0
SALESMAN	0	1	1	0	1	0	0	0	0	0	0	0	0	0

This shows that rows 8, 10, and 13 have the value ANALYST whereas the rows 4, 6, and 7 have the value MANAGER. It also shows me that no rows are null (Bitmap indexes store null entries – the lack of a null entry in the index implies there are no null rows). If I wanted to count the rows that have the value MANAGER, the bitmap index would do this very rapidly. If I wanted to find all the rows such that the JOB was CLERK or MANAGER, I could simply combine their bitmaps from the index as follows:

Value/Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CLERK	1	0	0	0	0	0	0	0	0	0	1	1	0	1
MANAGER	0	0	0	1	0	1	1	0	0	0	0	0	0	0
CLERK or MANAGER	1	0	0	1	0	1	1	0	0	0	1	1	0	1

This rapidly shows me that rows 1, 4, 6, 7, 11, 12, and 14 satisfy my criteria. The bitmap Oracle stores with each key value is set up so that each position represents a row ID in the underlying table, if we need to actually retrieve the row for further processing. Queries such as:

```
select count(*)
from emp
where job =  CLERK
or job =  MANAGER
/
```

will be answered directly from the bitmap index. A query such as:

```
select *
from emp
where job =  CLERK
or job =  MANAGER
/
```

on the other hand will need to get to the table. Here Oracle will apply a function to turn the fact that the i'th bit is on in a bitmap, into a row ID that can be used to access the table.

About the Author

Thomas Kyte is an Oracle professional who works for Oracle Corporation in the US. He specialises in database architecture, implementation, and tuning. Prior to working for Oracle, Tom worked with a contractor developing database applications and tools using many different commercial database products.

Expert One-on-One Oracle

Reviewed by Jonathan Lewis, J L Computer Consultancy

There are several books about Oracle that run to 1000+ pages. There are very few which pack the pages with small print, and make every paragraph count. This is one of those rare books.

Thomas Kyte is an Oracle employee who uses Oracle frequently and spends a lot of his time sorting out real problems for real clients; and he has used this book to pass an enormous amount of his experience on to the reader. He understands how Oracle works, he knows where the problems will be, and he turns this into practical advice on getting the best out of the database engine. Not only does he *tell* you how things work and how features should be used, he supplies you with endless straightforward coding examples to *prove* his point. If you have any desire to be a good developer, development dba, or even project manager, this book will put you on the right lines.

The book starts with general architectural issues, examining some ways in which a few of the well-known commercial database products differ and the problems that this can produce for programmers struggling to port an application from one database to another. After the general introduction, we move on to Oracle's adopted strategies for locking, concurrency and transactions, and have an in-depth view of how Undo (rollback) and Redo play a major part in the internal workings of the database engine. When you reach this point, you should have achieved an enormous insight into how much work Oracle is doing on your behalf to make it possible to build highly concurrent, large-scale applications. After this review of infrastructure, the book moves on to physical storage, with a couple of chapters on the options for building tables and indexes, deciding what type of physical implementation is most appropriate for different kinds of use, and pointing out how you may need to handle maintenance and house-keeping to get the best out of the system. In line with the rest of the book, these chapters do not merely say "here is a good idea", they tell you why it might be a good idea, and show you how to build and run a test to prove to yourself that it is a good idea.

After a couple of chapters on import, export, and loader, we come to Chapter 10 (Tuning Strategies and Tools), and perhaps my favourite line in the whole book, the comment near the start of this chapter, *"Tuning is part of development that starts before the first line of code is ever written and ends the day before deployment; it is not a post-deployment activity."* If you study this book, and follow its precepts, then you will be able to live up to that ideal.

From this point onwards, the book moves from infrastructure to features. There are chapters covering Plan Stability, Analytic Functions, Materialised Views, Partitioning, Autonomous Transactions, Dynamic SQL, interMedia (rarely found in 3rd party Oracle books), C-based external procedures, Java stored procedures, Object-Relational features, Fine-grained Access Control, n-Tier authentication, Invoker and Definer rights – and as a final bonus an appendix covering all the most useful PL/SQL packages that Oracle Corp. has already written for you.

Whatever your project, there will be chapters in this collection that you really ought to read before you start work. Each chapter follows the same principle – it describes a feature, it explains how it works, it teaches you how to use it, it walks you through worked examples, and it gives you a few warnings about the mistakes you might make and the things that go wrong. In every case, not only do you find out how to do something useful – you are also lead to a much better understanding of how things work.

If you read the chapter on autonomous transactions, you end up with a mechanism for auditing select statements – finding out not only who looked at some data, but exactly what data they looked at.

If you read the chapter on external procedures, not only do you get a step by step guide to setting up and using external procedures, you also find you have coded an application to pass all types of data back and forth between Oracle and the external procedure without leaking memory and crashing your system.

If you want to find out how to use Java stored procedures, you also end up with utilities to expand on the *utl_file* package so that you can not only read operating system files, you can find out what files exist to be read (or, in fact, run any operating system commands from within the Oracle server).

If you are a 3rd party developer building an application server, then Chapter 22 (n-Tier Authentication) will be a gold-mine to you. Not only does this chapter describe how you use OCI to implement n-Tier Authentication (a feature that arrived, almost totally undocumented in Oracle8.0 with the *alter user xxx grant* connect through yyy command), but you get a complete code framework, wrapped around one of the existing OCI demo programs, that allows you to run a 'mini-SQLPlus' with a feature to login as a trusted user, and execute SQL as another user *without* supplying the second user's password.

And so it goes on through the book, turning features into benefits, right up to a tremendous appendix on a collection of the PL/SQL packages that Oracle supplies as part of the standard installation. And even here, the author is not content simply to tell you about the packages, he gives you solid examples of getting real value with minimal effort – for example, if you want to use email from an 8.1.6+ database, the section on utl_smtp alone should be sufficient to justify the cost of the book.

In summary then, this book contains a veritable feast of information about the Oracle database engine and how to use it. It will obviously be of tremendous use to developers in particular, allowing them to do a better job in a shorter period of time; but it will also be of great benefit to dba and managerial roles, helping them to understand the infrastructure of their environment and working arena.

The book is supported through the Wrox 'peer to peer' website http://p2p.wrox.com as well as the main Wrox web site http://www.wrox.com where errors, corrections, and code downloads of sample code can be found.

The Book

Expert one on one: Oracle, Thomas Kyte, Wrox Press Ltd, ISBN 1-861004-82-6, price £47.99. Available now.

The Reviewer

Jonathan Lewis is a freelance consultant with more than 15 years experience of Oracle. He specialises in physical database design and the strategic use of the Oracle database engine, and is author of 'Practical Oracle8i – Designing Efficient Databases' published by Addison-Wesley. He can be e-mailed at jonathan@jlcomp.demon.co.uk

www.ukoug.org

Designer / Model Driven Development Tools Special Interest Group

Tuesday 12th June 2001
Meeting Minutes

This was the first time that the D/MDDT SIG has met at the Oracle UK headquarters at Thames Valley Park, 62 delegates in all assembled. The SIG Chairs were due for re-election and new candidates were invited to come forward. None emerged and the existing SIG Chairs, being willing to continue for another term, remain as Jeremy Duggan and Sue Yates.

The first presentation of the day was iAS Configuration for Designer 6i Web PL/SQL Generator, given by Javed Hussain, Oracle UK. Javed's presentation covered the architecture involved, installation of the Web PL/SQL generators and configuration of iAS for Web PL/SQL Generator. Javed discussed the different types of Database Schemas available, namely Application Owner and the PL/SQL Toolkit schema. He explained that one of the Web PL/SQL Generator Library Packages, WSGOCOL, enables formatting with the Web SQL generator. Javed also pointed out that Oracle iAS need not be on the same server as the database. During set up of the PL/SQL Toolkit user, the script owaload.sql installs the PL/SQL Gateway toolkit packages. Then the Designer Web Generator Library should be installed. The next step is for the Database Access Descriptor to be created and configured. Javed then described the steps required to test the Toolkit, before presenting the audience with a checklist of activities. The final few steps of the process were to install the Database Design, install the Table API and to generate and install Web PL/SQL Modules.

The next presentation was Support Update & How To Get The Best Out Of Oracle Support, given by Lisa Pearson of Oracle Support. Lisa first gave an update on current versions of Designer and support announcements. There was general concern from the audience that Designer 6.0 will be de-supported at the end of 2001, but Sue Harper from Oracle UK pointed out that this was in keeping with the Oracle database 'de-support strategy' of only having two versions of database certified at any one time.

Lisa described changes to the support organisation, whereby there is a UK-wide phone system, and that Oracle India take iTARS (although this does not affect Designer yet). Future changes include an EMEA based delivery operation controlling utilisation of available skills and maintaining country based premium support.

The final session of the morning was Building an Intranet Application using Designer & Developer – A Case Study, given by Hugh Griffiths and Mark Waite of Griffiths Waite Ltd. This started with an overview of the project, which was to build a Customer Management System for a financial organisation, with 160 sites and 600 users. Known constraints included little or no training for users and a four month timeframe to build!
The requirements analysis was performed using a storyboarding technique, which promoted change and feedback and facilitated quick and easy iterations.
The user interface design was both graphical and visual. A brief demonstration of the user interface was given, showing workloads and assignments of tasks to people. Mark explained that a demonstration of the Customer Management System for the customer had to include workflow and be very visual and graphical as well as easy to navigate. It took two weeks to build the storyboards shown to the users, amendments from feedback taking a further week to build. The demonstration was re-presented to the users and it was agreed by all that the changes made the demo much simpler. Much use was made of component re-use and code generation techniques, with bespoke design only when required.

The presentation continued by going into more technical detail. A three-tier architecture was used and CPU and memory usage were reviewed for performance. A brief demonstration of running web forms outside of the browser was given by generating some forms then amending the layout. Hugh explained that the forms were 100% generated and that extensive use of generators had been made throughout the project. APIs were used to create module definitions using in-house standard templates having a Forms front-end. Finally, Mark and Hugh gave a demonstration of building spreadsheet components where the axes were driven by SQL statements.

The first presentation after lunch was Migration of Designer 2.1.2 to 6i Release 3, given by Peter Wilkinson of Mercury International Ltd. Peter started by giving an overview of the migration project, which was for a Sales and Marketing system. Expected benefits included intranet usage for home working and the use of 8i database features. Peter then covered some migration steps including:

- Removal of old users AND unused applications
- Setting up of an intermediate repository incorporating more tidying up such as no shares and no users
- Assessment of corruption in the repository
- Use of a step-by-step (application by

application with relevant users) approach, which may require a strategy for the migration of 'teams' of users
– Migration of Developer 5 (compatible with Designer 2.1.2) to Developer 6i.

Peter described some of the problems he had with the migration process, some of which are noted as bugs (1715599, 1818344 and 1807236). There were many instances of modules no longer working for a variety of reasons including:
– Unexpected changes to preferences that occurred during the migration
– 6i code added and/or bespoke code not added to modules
– Unreadable report prompts
– A warning not to combine relative tab stops and item groups tab stops
– Mandatory associated items on POP lists (which were null before migration)
– Current record indicator not lining up (client/server only).

The second session of the afternoon was a brief Update on Designer Courses and Education, given by Joe Murphy of Oracle Education. There are new Designer 61 courses available, including a three day New features course and a five day First Class course. He then described Ementor, an online mentoring facility giving delegates access to an instructor up to six weeks after a course, the ability to learn from peers in a FAQ area and 'guaranteed' responses to questions within 48 hours. There is to be a new Designer course, with a title along the lines of 'Repository Migration/ Installation', that will be a two day theory only course.

The final session of the day was Oracle Designer: A Product Update (6i, 9i and Beyond), given by Dominic Battiston and Susan Duncan of Oracle Product Development. Dominic started by explaining internet Development Suite (iDS). Today's changing environment has two drivers – internet (web) and wireless (mobile). Oracle sees the three 'Products' they have available as providing a solution for future developments, those products being:
– Oracle9i Database
– Oracle9i Application Server
– iDS.

The 9i Database will manage relational data, multimedia and documentation. The 9i Application Server covers portals, transactional applications and business. iDS incorporates:
– Portal
– JDeveloper
– Designer
– Forms/reports Developer
– Discoverer
– Repository.

Dominic described the 'way forward', which includes Oracle9i Developer Suite with enhanced Repository integration. Designer is seen as a mature component of 9iDS and will generate to a 9i platform and will generate web PL/SQL as portlets. These are seen as strategic enhancements within the context of 9iDS. New features will include:
– UML
– XML metadata interchange
– Model Business Components.

Susan Duncan gave a demonstration of JDeveloper 9i covering the class modeller and the activity modeller. A complete diagram can be generated to produce XML code for implementation – adaptors can also be generated.

This session flowed in to an 'Open Forum', which was more of a Q&A session involving the many Oracle personnel present and tackled many topics of interest to the delegates. The Open Forum continued until 4.30pm with a large number of delegates still present – testimony to the benefit and appreciation of the number of Oracle personnel who made themselves available to the SIG audience.

The UKOUG announces… its new Tutorial Day: 13th December 2001, ICC, Birmingham.

By Peter Phillips, UKOUG Events, Director

Have you ever wished that you could find out more about a particular Oracle topic? Have you attended a presentation at The UKOUG Annual Conference and wished that the speaker had more time to answer your questions? Have you wished to raise a question but didn't want to spoil the flow for the others in the audience?

Then here is your chance!

The UKOUG is launching a new service to its members – a Tutorial Day, on 13th December, the day after The UKOUG Annual Conference 2001, at the International Convention Centre in Birmingham.

Internationally renowned speakers will each be giving a full-day tutorial on topics, of which they are experts in the field. The audience numbers for each tutorial will be strictly limited to a maximum of 25; the format will be interactive, and each delegate will have ample opportunity to consult the Tutor about his or her own particular problem.

Although the Tutorial day is immediately following Conference, it is independent and separately priced and registered for. Places will be open to all people attending or not attending conference.

Places on the tutorials will be very competitively priced, compared with other such training seminars, and will be available on a first-come first-served basis.

Tutorials will run from 9:30 a.m. to 4:30 p.m.; the delegate price will include refreshments; sit down lunch; binder with paper, handout materials, pen/highlighter; and a certificate of attendance.

The Tutorial topics will encompass a wide range of technical and application subjects, such as, Master Production Scheduling (MPS), Back-up and Recovery, J-Developer and many more; each area will be investigated in depth by the presenter. For example, if you are a DBA and would dearly love to know the details of the new 9i list partitioning, fast start, flash back query, user defined events and dynamic SGA tuning, why not attend Mike Ault's 'Advanced DBA' tutorial? Mike, who has over 450 hours of classroom training in Oracle as well as twelve years of hands-on experience, and authored 10 acclaimed works on Oracle topics, will be including these features as well as many classic features that apply to Oracle7, 8 8i and 9i. He will also cover topics such as monitoring and tuning the SGA structures, Oracle processes and shared pool, the use of multiple buffers, custom block sizes and large pool. And if time permits, he may also discuss critical bugs, alerts and fixes for 8i for 2001.

Of course, much as you might want to hear all these experts, you will be able to attend only one tutorial during the day; you may well feel that you need to bring along a colleague so that your company does not miss this golden opportunity.

For further information, on the topics and speakers visit www.ukoug.org/tutorials

Registration is under way for this new training day. You can register online at the Tutorial Day website.

Remember, places are limited, so do not delay. This day arguably is the best-value, in-depth training on Oracle, available in the UK today.

At the time of going to print the following topics/presenters are expected:

- DBA 101 – Marlene Theriaut
- Advanced DBA Tutorial – Mike Ault
- XML – Roger Hipperson
- Back-up & Recovery – Rama Velpuri
- Oracle 9iAS Portal for Beginners – Craig Warman
- Business Rules – Dr Paul Dorsey
- Jdeveloper – Simon Heyes.

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calendar of events

January

15th	Internet SIG Meeting, London
15th-18th	Appsworld, Amsterdam
24th	Manufacturing SIG Meeting, Midlands
29th	BIW SIG Meeting, Oracle City Office, London
31st	CRM SIG Meeting, London

February

4th-7th	Appsworld, Singapore
5th	UNIX SIG Meeting, London
7th	D/MDDT SIG Meeting, London
12th	Financials SIG Meeting, Midlands
14th	Scottish SIG Meeting, Edinburgh
26th	HR SIG Meeting, Reading
28th	Development Engineering SIG Meeting, London

March

1st	Irish Apps, SIG Meeting, Ireland
7th	OFLGUG SIG Meeting, London
12th	HE SIG Meeting, Oracle City Office, London
14th	DBMS SIG Meeting, Reading
21st	Irish Tech SIG Meeting, Dublin

April

8th-10th	Appsworld, San Diego, USA
16th	OFGUG SIG Meeting, Oracle City Office, London
25th	CRM SIG Meeting, Midlands

May

9th	Manufacturing SIG Meeting, Midlands
14th	Internet SIG Meeting, Midlands
16th	BIW SIG Meeting, Oracle City Office, London
19th-22nd	OAUG Spring, Toronto
23rd	Financials SIG Meeting, Reading
28th	Development Engineering SIG Meeting, Midlands

June

7th	Irish Apps SIG Meeting, Ireland
11th	UNIX SIG Meeting, Midlands
17th -21st	ODTUG
18th	Scottish SIG Meeting, Edinburgh
20th	OFLGUG SIG Meeting, London
25th	HR SIG Meeting, London
27th	Irish Tech SIG Meeting, Dublin
27th	D/MDDT SIG Meeting, Reading

July

2nd	DBMS SIG Meeting, London
9th	HE SIG Meeting, Oracle City Office, London

August

No SIGs Scheduled

September

5th	Internet SIG Meeting, Reading
10th	CRM SIG Meeting, Reading
17th	OFLGUG SIG Meeting, London
19th	Development Engineering SIG Meeting, Reading
24th	UNIX SIG Meeting, Reading or Leeds
26th	Manufacturing SIG Meeting, Midlands

October

1st	BIW SIG Meeting, Oracle City Office, London
3rd	Scottish SIG Meeting, Edinburgh
8th	HE SIG Meeting, Oracle City Office, London
10th	Financials SIG Meeting, London
15th	D/MDDT SIG Meeting, Midlands
18th	Irish Tech & Irish Apps SIG Meeting
22nd	HR SIG Meeting, Midlands

November

5th	OFGUG SIG Meeting, Oracle City Office, London
7th	DBMS SIG Meeting, Midlands or Leeds

December

9th-11th	The UKOUG Conference & Exhibition 2002

Full details of UKOUG events can be found at www.ukoug.org

Conference issue? Conference time ? No, this cannot be happening, can it? Surely conference was only a few weeks ago (at most the odd month or two)! Summer has not started yet, there are many, many shopping days left before Christmas, 9i is still in beta – but yet it IS true and Conference 2001 is shaping up to be bigger and better than ever before.

If you read your copy of Oracle Scene serially, page-by-page, cover-to-cover (over whatever timeframe suits you lifestyle) then you will have read both the extract from Tom Kyte's book, Expert One-on-One Oracle, and perhaps the most glowing book review ever to have been printed by the UK Oracle User Group. The inevitable result has to be Wrox press's first ever Christmas number one book best seller. Now, if Tom was to release a companion CD single he could even knock Bob the Builder off the top come the 25th. He could do it – he is that good (Tom not Bob).

Issue 7 carried an article, called 'Past Blast', on the early UK Oracle Group publications. Jeremy Duggan, long term UK Oracle User Group supporter and currently joint-chair of the curiously named D/MDDT SIG, emailed that he does remember Karen Furze, editor of the UK OUG newsletter in 1988. Jeremy himself worked for Oracle UK at the same time as Karen and recalls that she married another Oracle employee and moved to sunnier climes. So the hunt for Karen Furze ends here – simply because logic dictates that the odds are that that is no longer her name and it has not been so for some time. We would still, however, love to hear from or about anybody mentioned in 'Past Blast'.

Jeremy also gave an answer to the question posed in issue 7's '…and finally!' about the future of Oracle Designer. Politely pointing out that Oracle are always open and direct to those who attended the hilariously named D/MDDT SIG events as to the direction of Designer and related tools and products. In fact at the June meeting held at TVP this point was covered by Oracle's representative, and in a nutshell the answer, in Jeremy's own words, is:

Essentially Designer with its Information Engineering modellers will stay as is, with little future development…the focus being on keeping Designer in step with the DBMS and Developer versions to be able to generate DDL and (web) Forms etc at the same release/time as these products evolve. After many hours of discussion I don't think Oracle have killed off Designer…the good news is they are not announcing its death as they have with Client/Server GUI Forms: it's not in 9i Developer but will be supported through to 2006.

Full minutes of the June Designer SIG are available on the UK Oracle User Group web site at
http://www.oracleuser.co.uk/member_area/download/sigcase.htm
with a summary of the meeting printed elsewhere in this issue.
Now those of you who know me (and since this section of Oracle Scene usually goes uncredited then that might not be as straight-forward a statement as it first appears) will realise that I do not pull any punches when I think Oracle are not delivering value or the kind of service expected from them. Well, for once, there is a case for credit where credit is due. Having not used MetaLink since February/March time, when performance and response times (if that is what they can be called) were truly atrocious, and laughably statements of 'explanation' were posted on the unreachable site itself, a recent trip back to cyber-support was pure joy. Getting through to the MetaLink front page (the one with all the lozenge shaped buttons down the left-hand side) only takes a few seconds and any option, even the search pages, come back long before tedium and boredom overcome me. So it looks like the pain and suffering of MetaLink users earlier in the year turns out all right in the end. Now if only I could work out why every page gives me a script error "top.corner.help is null or not an object" error in IE6 – well you can't have everything can you?

I have always been a disciple of the rule 'bind variables are good'. Notwithstanding certain caveats whereby the optimiser will not and can not make good use of bind variables the belief is that, in general, OLTP applications are going to run into shared-pool woes without them. That was until bug 1747011. Imagine the horror of having completed the enhancement of an existing application to use bind variables, where before it had not, only to find dedicated server connection PGA usage shooting to 20, 30, 40 even 50Mb for no apparent reason. The problem gets fixed in 8.1.7.2 and 9.0.2 with back-ports available for 8.1.6.3 on certain platforms and only surfaces under certain circumstances but keep one eye on those PGAs just in case.

Oracle Scene in general, and '…and finally' in particular, would like to wish Brigit Wells all the best in her new career outside of the UK Oracle User Group. Brigit worked tirelessly in the production of the last few issues of Oracle Scene and the set-up of the web site. It won't be easy but somehow we'll cope without you, Brigit.

Until next time…

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