TurboIMAGE to Eloquence Migration

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Eloquence at a glance

- Excellent compatibility and performance for IMAGE based applications
- Cost effective
- Supports multiple platforms
- Proven solution

Excellent compatibility

- All TurboIMAGE intrinsics are supported and behave (almost) identical
- HP3000 applications can typically be ported with no or only minor changes

Excellent 3rd party compatibility

- Eloquence is supported by a range of well known 3rd party tools
  - SUPRTOOL (Robelle)
  - Cognos Powerhouse
  - Speedware
  - ASK Plus (Vital Soft)
  - MPUX (Ordina Denkart), AMXW (Speedware)
  - Multiple ODBC solutions available (Marxmeier, MB Foster, Minisoft)
  - BackPack (ROC), Rosetta Store (Allegro)

Cost effective

- Eloquence saves considerable time and effort in the migration process and allows focusing on other tasks
- Eloquence is easy to manage and retains existing know how
- Eloquence is priced attractively

Complete package

- The Eloquence database comes with
  - Comprehensive set of database utilities
  - Structural maintenance
  - Integrated indexing
  - On-line backup
  - MPE migration tools

Product history

- Eloquence was created by Marxmeier Software and sold to Hewlett-Packard
- Eloquence was first released in 1989 as a migration solution to move HP250/HP260 applications to HP-UX
- Marxmeier Software has been responsible for Eloquence development and support
- The Eloquence product was transferred back to Marxmeier Software in 2002

Product components

- Eloquence programming language (based on HP Business Basic)
- Eloquence database (based on IMAGE)
- Graphical User Interface
- Development environment

Product overview

- About 2500+ installations worldwide
- Used by about 60+ VARs / ISVs worldwide
- Covers a wide range of industries and sizes from single user to a few hundred concurrent users

Recent product updates

- Full support of TurboIMAGE btree modes ("superchains")
- MPE client library to transparently access Eloquence databases from MPE applications
- Increased number of concurrent connections on HP-UX
- Improved performance for larger configurations
- New patch bundles, improved patch installation on Windows

Eloquence Database Architecture

An introduction to the Eloquence database architecture

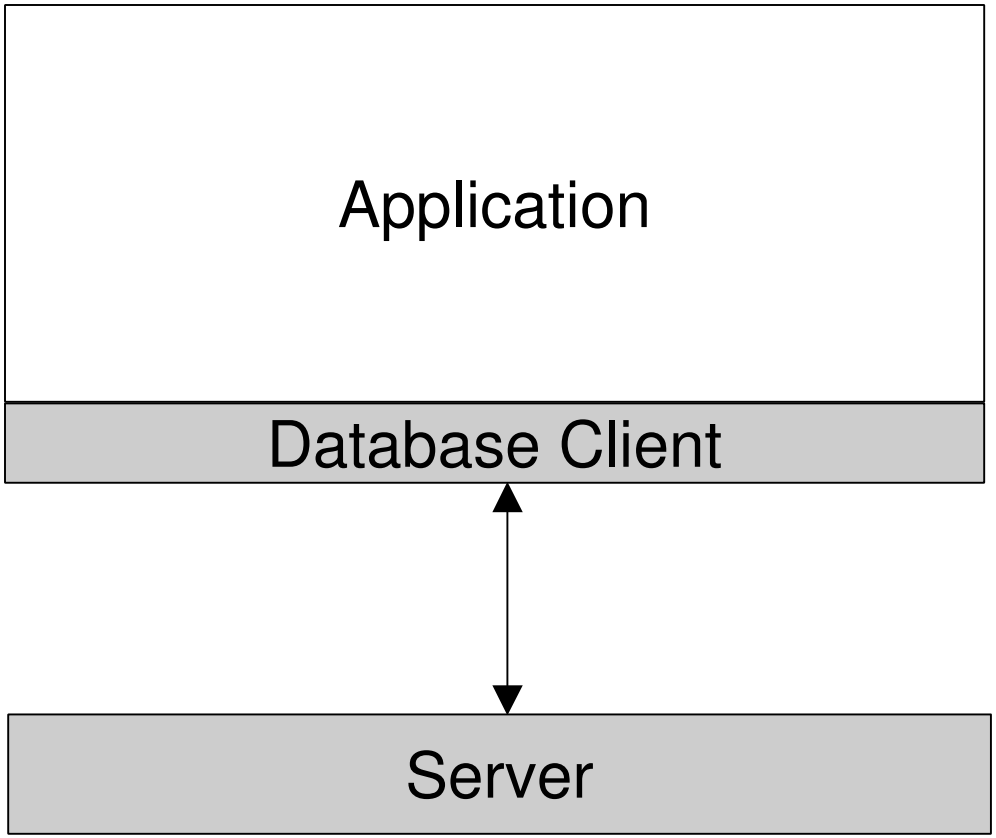
Overview

- The Eloquence database is almost 100% compatible to TurboIMAGE at the application level
- The underlying architecture is different

Client/Server architecture

- Database access is performed by a server process
- The application is linked with the database API
- The server is connected through the network (or shared memory)

Client/Server architecture



Network transparent

- Applications running on different machines and operating systems can access a common database
- Requests and results are translated transparently
  - Character set encoding
  - Byte order conversion

Multiple platforms

- Eloquence is available for multiple operating systems and architectures
  - HP-UX on PA-RISC and Itanium
  - Linux on Intel IA-32 (Itanium)
  - Windows NT/2000/XP/2003 on Intel IA-32
  - Database client library on MPE

Indexing

- Eloquence comes with integrated indexing
- Indexes are used instead of hashing with master sets
- Eloquence implements the TurboIMAGE btree modes and a commonly used subset of the TPI functionality

Locking

- Locking is fully compatible with TurboIMAGE
- Eloquence does not impose a locking strategy
  - Write operations do not require a previous lock. If a conflicting lock is granted, a status is returned
- Additional functionality is available
  - READ locks are supported
  - Selective DBUNLOCK
  - Multiple DBLOCKs are allowed
    - Deadlock conditions are detected and a status is returned

Transactions

- All databases are part of a transaction
- Uncommitted changes are not visible to other processes
- Transactions are not limited in size
- Nested transactions are supported
- Transactions do not require locking

Database names

- A database name is not restricted to 6 characters
- Databases do not reside in the file system but are managed through a server process
- A database name may specify a server instance instead of a file location
- Database names are not case sensitive
- A dot may be used in a database name (eg. SAMPLEDB.TEST) but has no special meaning

Database names

- Database name syntax

  [[hostname][:service]/]database

  – Hostname specifies database server system
  – Service specifies database server instance

- For example

  SAMPLEDB

  localhost/SAMPLEDB

  localhost:eloqdb/SAMPLEDB

  :eloqdb/SAMPLEDB

Database names

- The EQ_DBSERVER environment variable may be used to specify the default server instance
- For example:

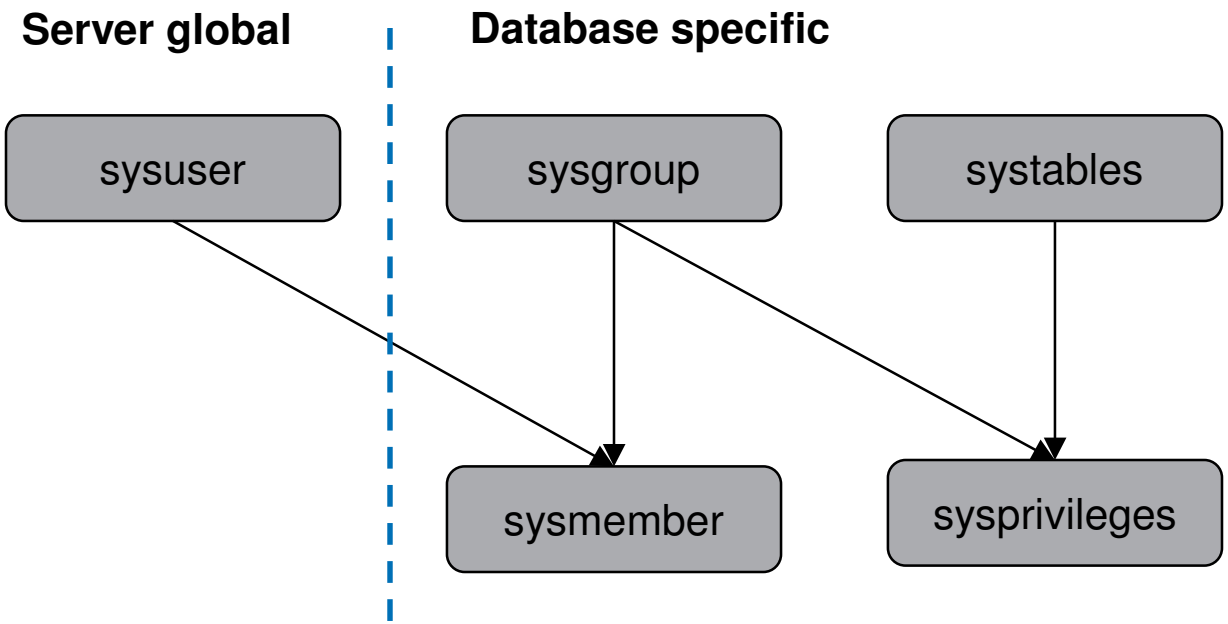
```
EQ_DBSERVER=invent9k.external.hp.com:8102
```

  - Specifies that the default server instance that manages the database
  - The default is used unless a more specific information is provided

Database security

- The database password is not used to grant database access rights
- The DBOPEN password argument is typically ignored
- Schema passwords and user classes become groups that have associated access privileges (read/write/erase)
- The database server maintains a list of users
- A user can be a member of multiple groups

Database Security



Database security

- The new DBLOGON procedure may be used to specify user and password
- A file can be specified to provide the user name or password
- A default user is used if no specific user is provided

Database security

- The EQ_DBUSER and EQ_DBPASSWORD environment variables may be used to specify the default user or password
- For example:

```
EQ_DBUSER=file:/home/mike/secret

EQ_DBUSER=mike
EQ_DBPASSWORD=file:/home/mike/passwd
```

  - The default is used unless a more specific information is provided

Database environment

- A database environment consists of
  - a configuration file
  - one or more data volumes
  - a transaction log volume
- Multiple database environments can coexist on the same machine, each managed by a separate server process

Volume files

- Databases do not reside in the file system but are kept in Volume files
- Volume files are a storage container managed by the database server
- A maximum of 255 volume files are supported in a server environment
- The maximum size of a single volume file is 128 GB (currently limited to 2 GB on HP-UX and Linux)

Server catalog

- Eloquence does not use a ROOT file
- Structural information is maintained in the database environment
- The server catalog is initialized with the dbvolcreate utility and maintained with the schema and dbutil utilities

Database limits

- Eloquence B.07.00 schema limits
  - 2048 data items
  - 500 data sets
  - 64 / 16 paths
  - Entry length 5120 bytes

Scalability

- Database / data set size is limited by the disk space allocated to the database environment
  - Current limit is ~500 GB
  - Hard limit is ~32 TB
- Number of concurrent users per database environment is currently limited to 1000

Database Utilities

An overview on the Eloquence database utilities

Offline utilities

- dbvolcreate / dbvolextend / dbvolchange - volume file management
- dblogreset – reset log volume files to initial size
- dbvoldump - display volume properties
- dbfsck - volume consistency check and simple repair tool
- dbcfix - database consistency check and repair tool
- dbrecover - forward recovery

Administrative utilities

- dbctl - server management utility
  - Communicates with the database server and may be used to change settings or retrieve status information
- HTTP status monitor
  - A web browser may be used to retrieve status information from the database server

Database utilities

- schema - Schema processor
- dbcreate / dberase / dbpurge - create / erase / purge database
- dbtables - database cross reference
- prschema - re-create schema from database
- dbdumpcat - catalog information utility

Database utilities

- dbexport / dbimport - export/import data base content to/from text file
- dbinfo - short overview on datasets
- dbutil - change database configuration and structure, database security
- QUERY utility (different from QUERY/3000)

Database utilities / Examples (1)

- Create a database

```
dbschema sample.schema
dbcreate sample
```

- Purge a database

```
dbpurge sample
```

- Erase a database

```
dberase sample
```

- Re-create database schema file

```
prschema sample >sample.schema
```

Database utilities / Examples (2)

- Export a database

```
dbexport -vs sample.exp sample
```

- Import a database

```
dbimport -vs sample.exp sample
```

- Get a list of data sets and records for a database

```
dbinfo sample
```

- Get a list of all databases

```
dbdumpcat -t31
```

Database utilities / Examples (3)

- Change database structure

```
dbutil sample.chg

DATA BASE "sample";
CREATE ITEM matchcode, X10;
CREATE IITEM imatchcode = matchcode;
CHANGE SET customers {
 SET INDEXED;
 ADD ITEM matchcode;
 ADD INDEX imatchcode;
}
```

  - Add a new item and index definition
  - Mark set customers as /INDEXED and add an item and index

Database utilities / Examples (4)

- Start/stop on-line backup mode

```
dbctl -u dba backup start
dbctl -u dba backup stop
```

- Get a list of opened databases

```
dbctl list db
```

- Get a list of active locks

```
dbctl list lock
```

Installation and Configuration

Installation and Configuration of the Eloquence database

Installation overview

- Install the product and patches (OS or product)
- Configure the operating system
- Configure automatic server startup
- Create the database environment
- Platform differences

Evaluation license

- By default the “Personal Edition” license key is installed
- A temporary license key can be created during installation
- A temporary license key can be requested from the Eloquence web site

Create eloqdb user/group

- Create a user name and a group name (e.g. eloqdb) to be used as the owner/group of the database files
- On Windows the system account is used by default

Server configuration file

- The config file defines server properties
  - configuration
  - scaling and tuning parameters
  - volume files
- Default server configuration file is /etc/opt/eloquence6/eloqdb6.cfg

Simple server configuration

```
[Server]
 Service = eloqdb
 ServiceHTTP = 8103
 UID = eloqdb
 GID = eloqdb
 EnableIPC = 2
 SyncMode = 0

[Config]
 Threads = 100
 IOThreads = 4
 BufferCache = 64
 CheckPtSize = 50
```

Shared memory

- **EnableIPC**
  - EnableIPC=0 (default) disables use of shared memory communication
  - EnableIPC=1 enables use of shared memory
    - Uses a separate memory segment per connection
  - EnableIPC=2 (recommended) enables use of a single shared memory segment
    - Uses a common memory segment for all connections

Sync/Async mode

- **SyncMode**
  - SyncMode=1 (default) pushes all committed transactions to disk immediately and waits for completion
  - SyncMode=0 writes changes to disk asynchronously and does not wait for completion
- **SyncerFlushInterval**
  - Specifies the time (in msec) after which changes to the transaction journal are flushed to disk (used with SyncMode=1). The default is 500 ms

Database server configuration

- **Threads**
  - Defines the max. number of concurrent connections for this server instance
- **IOThreads**
  - Defines the max. number of concurrent I/O operations (default=4)
  - Depends on the I/O capabilities
- **BufferCache**
  - Defines the memory reserved for the database cache

Create volume files

- dbvolcreate /var/opt/eloquence6/data01.vol
- dbvolextend –t log /var/opt/eloquence6/log.vol
- Optional:
  dbvolextend –t data /var/opt/eloquence6/data02.vol

Start the server

- On HP-UX and Linux the server may be started from the command line
  - HP-UX /sbin/init.d/eloq6 start
  - Linux /etc/init.d/eloq6 start
- A configuration file may be used to specify the services that are started
- On Windows the “services” control panel is used to manually start and configure the autostart of the eloqdb6 service.
- The Eloquence eloqsd service is often not needed and should not be started

Troubleshooting

- The Eloquence database writes diagnostic messages to the syslog
  - HP-UX: /var/adm/syslog/syslog.log
  - Linux: /var/log/messages
  - Windows: application event log

Linux installation

- Eloquence uses the RPM package manager
  - RedHat Linux 7.x to 9 and SUSE Linux 7.x to 9 have been certified
  - Other Linux distributions may be used but additional manual configuration may be required
- Temporary license option is not available during installation on Linux

Windows installation

- Eloquence uses the standard Windows Installer
- Different setup programs are used for Windows 2000/XP/2003, Windows NT and Windows 9x
- Different setup programs for download and CD-ROM installations

Administrative Procedures

Database backup

Off-line backup

- Shutdown the eloqdb6 server process
- Backup all volume files
- Re-start the server process

On-line backup

- In on-line backup mode, the data volumes are frozen
- Modifications during on-line backup are temporarily saved into the transaction log volume
- Any backup software may be used to create a consistent backup

On-line backup

- Enable on-line backup mode
- Backup the data volume file(s)
  - Backup of the log volume is optional
- Disable on-line backup mode

- Example backup script

```
dbctl -u file:/root/credentials backup start
tar -cf /dev/rmt/0m /database
dbctl -u file:/root/credentials backup stop
```

Forward logging

- Forward logging is used to record all modifications since a previous backup
- The forward log files can be managed automatically by the server process
- The dbrecover utility is used to apply a forward log to a previous backup
  - Restore the volume files from backup
  - Apply archived transactions

Database maintenance

- Make sure sufficient volume and disk space is available
  - Use the dbvoldump utility if the server is off-line
  - Use dbdumpcat or the HTTP status if the server is active

- The dbutil utility is used to change database configuration or structure

TurboIMAGE compatibility

How to migrate an application to Eloquence

TurboIMAGE compatibility

- All TurboIMAGE intrinsics are supported and behave (almost) identical
- HP e3000 applications can usually be ported with no or only minor changes
- Compatibility goes beyond intrinsic calls. Applications are built on assumptions and take advantage of specific behavior

TurboIMAGE compatibility

- Not supported:
  - DBCONTROL modes which are specific to TurboIMAGE implementation details
  - Item level security (all items considered writable)
- Possibly required changes:
  - Eloquence requires the database name is terminated with a space, semicolon or NUL character
  - IMAGE passwords are usually ignored

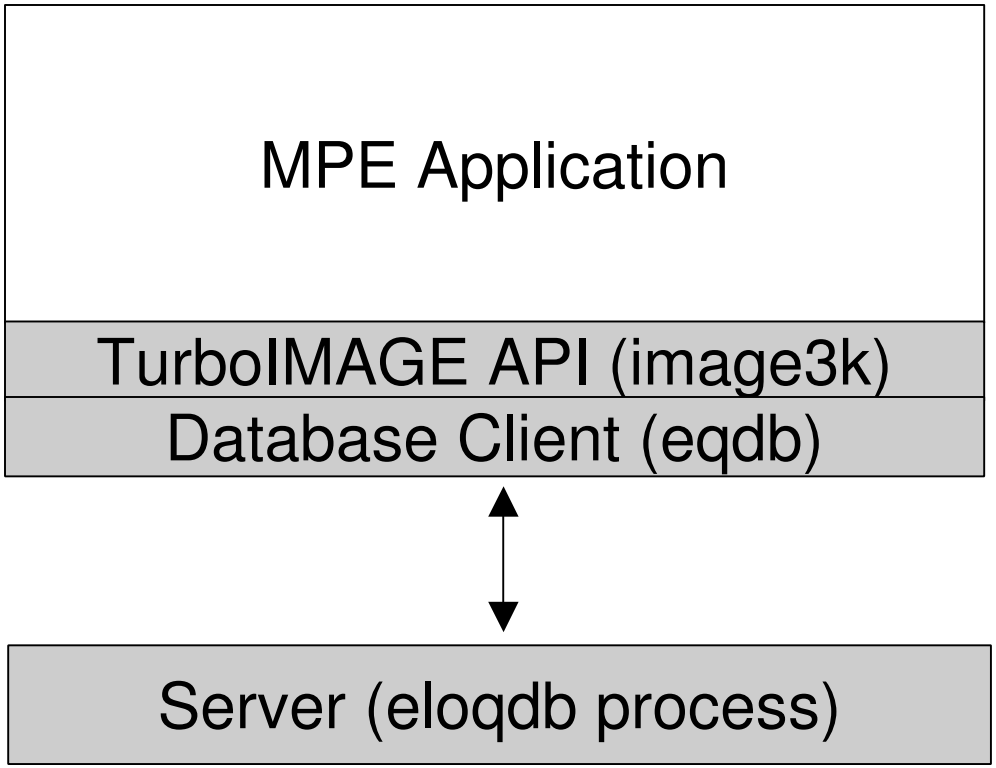
TurboIMAGE compatibility

- TurboIMAGE compatibility is implemented at different levels
  - The database server implements functionality at the backend
  - The database client and utilities provide support for TurboIMAGE functionality
  - The TurboIMAGE compatibility API (image3k) implements source code compatibility

TurboIMAGE compatibility

- The Eloquence image3k library implements the TurboIMAGE intrinsics
  - The image3k library maps the differences between the TurboIMAGE intrinsics and the Eloquence API
  - As IMAGE is implemented at the database core it does not cause a performance impact
- The application (or language runtime) is linked against the image3k library
  - On Windows multiple versions of the image3k library implement different calling conventions
- The image3k.h include file provides the function prototypes (C, C++)

TurboIMAGE compatibility



Using Eloquence with Acu Cobol

- Link the Eloquence image3k library to the ACU Cobol runtime (runcbl)
  - Instructions for HP-UX and Linux are available on the Eloquence web site
- Load the Eloquence image3k library dynamically (using CALL)
- Eloquence currently uses native byte order
  - On little endian platforms (Intel IA-32) COMP-5 type must currently be used instead of COMP
  - The –D5 compiler option maps all COMP to COMP-5

Using Eloquence with MicroFocus Cobol

- Link the Eloquence image3k library to the application
- The SIGN "EBCDIC" compiler directive is required to make sure the binary encoding of 'Z' items is compatible
- Eloquence currently uses native byte order
  - On little endian platforms (Intel IA-32) COMP-5 type must be used instead of COMP
  - A compiler directive may be used to map the COMP to the COMP-5 type

```
MAKESYN "COMP-5" = "COMP"
```

Migration Issues

Real World Issues

Data set capacity

- Data set capacity has a different meaning
  - Eloquence has no concept of a data set specific capacity
  - Eloquence returns the highest record number allocated for a data set as capacity value in DBINFO modes 202 and 205
- Eloquence data sets are dynamic and grow as required

Data set capacity (2)

- Application may check for „enough room“ in a data set
- Solution:
  - Remove or disable capacity check
- Workaround:
  - Trap Eloquence DBINFO 202 and 205 modes and return „expected“ value as capacity

Don’t lie to schema

- TurboIMAGE does not really care what you put in a character field
- Eloquence relies on type information
  - Eloquence may need to convert strings to different encoding
  - Eloquence may need to do a byte order conversion on binary types
  - Eloquence uses indexes which require type specific ordering

Don’t lie to schema (2)

- Solution:
  - Use separate fields for different information
  - Use the correct item type
- Workaround:
  - Use Eloquence on a single platform
  - Use Eloquence binary item type ‘B’

Character set encoding

- On MPE the HP-ROMAN8 character set encoding is often used
  - HP-ROMAN8 encoding is typically not available on other platforms
  - Eloquence defaults to the HP-ROMAN8 character set on HP-UX (and MPE) and to ISO-8859-1 on other platforms
  - Eloquence performs conversion “on the fly”

Byte order

- PA-RISC and Itanium (with HP-UX) use big endian byte order
- Intel IA-32 and Itanium (Linux and Windows) use little endian byte order
- Eloquence performs conversion “on the fly” for binary types if necessary

Record numbers

- Eloquence uses a different algorithm to assign and re-use record numbers
  - TurboIMAGE uses a LIFO (last in first out) order to reuse deleted records (unless HWMPUT is active)
  - Eloquence uses a FIFO (first in first out) order to use available record numbers
  - Eloquence does not support HWPUT, application has no control over record number usage

Record numbers (2)

- DBDELETE / DBPUT sequence likely results in different record number
- Solution:
  - Fix the application
- Workaround:
  - Use DBUPDATE mode 2 (same as DBUPDATE mode 1 and CIUPDATE)

Identical database names

- TurboIMAGE supports to use the same database name in different groups
- Eloquence requires an unique database name per server instance
- Solution:
  - Use multiple server instances (eg. test / production environments)
  - Add the group name to the database name (eg. DBNAME.GROUP)

Access to database files

- TurboIMAGE databases reside in the file system
- Applications could use file system operations to copy databases
- Eloquence databases reside in the volume files and are not accessible separately
- Solution
  - Copy whole database environment
  - Use dbstore to extract single database and dbrestore to restore database in another server instance
  - Use dbexport / dbimport

Parameter alignment

- TurboIMAGE requires most arguments to be 16 bit aligned
- Eloquence relaxes most alignment restrictions
- Eloquence does not require a specific alignment for string arguments

Locking

- Eloquence does not require locking
- An application error may not be noticed unless a concurrent lock exists
- Master sets have no special locking requirements
- Read locks may be used to improve concurrency
- Eloquence transactions do not require locking
- A DBUNLOCK in a transactions is delayed until the transaction ends

Data Migration

Move your databases from TurboIMAGE to Eloquence

Overview

- Schema files are compatible and no change is required
- Eloquence includes MPE tools to export the database content to flat files
- Transfer the schema file and the export files to the target system
- On the target system run the schema processor, the dbcreate utility and the dbimport utility

Export the database

- When running from the POSIX shell the arguments are separated by a space

```
$ DBEXPORT -p SECRET -v TESTDB
```

- When running from the MPE shell (CI) you need to enclose the arguments in quotes

```
: DBEXPORT "-p SECRET -v TESTDB"
```

Transfer the files

- Transfer your schema file and the export files to the Eloquence system
- When transferring by ftp
  - use text mode to transfer the schema file
  - use binary mode to transfer the export files
- Rule
  - Byte files should be transferred in binary mode
  - Other MPE files (containing text) should be transferred in text mode to convert them to byte files

Create the database

- Run the Eloquence schema processor

```
$ dbschema schemafile
$ schema -T schemafile
```

  - Option -T selects TurboIMAGE compatibility mode

- Create the database

```
$ dbcreate database
```

Import the data

- Use dbimport to load the database

```
$ dbimport -v -z roman8 database
```

  - The option -v displays the import progress
  - On the Windows and Linux platform you should specify the -z roman8 option to indicate the source data uses the HP-ROMAN8 encoding
  - This makes sure any national characters ("Umlaute") are converted

More information

- Detailed information is available on the Eloquence web site
  http://www.hp-eloquence.com
- Get in contact:
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