# Planning and Performing Database Migrations

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# Agenda

- Database Architectures
- Migration Planning
- Migration Implementation
- Database Migration Tools Review
- Questions & Answers

# Database Architectures

# Overview

- Most popular databases used on HP e3000 do not exist on HP-UX or Windows
- Migration really means conversion
- Years of experience to learn from

# HP e3000 Databases

- TurboImage
  - Omnidex, Superdex, TPI, others
- Allbase
- KSAM
- MPE Flat Files
  - circular, msg, RIO, temp, etc.

# TurboImage

- Network topology
- Unique features
  - Datasets and Items
  - Master/Detail
  - Keys
  - Chain read
  - Sort items
  - Security paradigm
  - Migrating secondaries, etc.
- 3rd party Indexing
- DBSCHEMA & DBUTIL

# Eloquence

- 95% of Image functionality
  - Supports Image Calls
  - Missing some of the newer features
- Ideal for up to 500 concurrent users
- Interesting to mainly small to mid-sized customers and ISVs
- Many vendors are or will soon be supporting Eloquence
- Upcoming support for Omnidex
- 2000-5000 customers worldwide
  - Only ~200 using Image intrinsic interface
- $7,000 per server

# RDBMS

- Particularities
  - Tables not Datasets
  - Columns not Items, Rows not records
  - Indexes
  - Views and table joins
  - Column Item types
  - No arrays
  - Nulls
  - Triggers
  - Rollbacks
  - Data page and log file caching
  - Administration tools
- Unique features, SQL extensions
- Need a Database Administrator

# Migration Planning

# RDBMS selection

- What DB can support my existing db access needs
- Factors to consider
  - Price
  - Market share and popularity
  - Manufacturer credibility
  - Support track record
  - User license cost
  - Support and upgrade cost

# Technical considerations

- Efficiency / Performance
- Maintenance ability
- Supporting tools
- Stability
- Scalability
- Administration
- DBA Tools

# Choices

- Oracle (Unix/PC)
- SQL Server (PC)
- DB2 (Unix/PC)
- Eloquence (Unix/PC)
- Sybase (Unix)
- Informix (Unix/PC)
- PostgreSQL/MySQL (Unix/PC)
- C-ISAM/D-ISAM (Unix/PC)
- Access and others (PC)
- Flat (Unix/PC)
- Others…

# Migration planning

- Assess current environment
- Understand current HP support constraints
- Timeframe, effort, milestones
  - When can you start?
  - Test machine
  - Completion expectance
    - Prior to end of 2006 or beyond?

# Analyze current system

- CPUs, users, connections, databases, disk space
- Applications (critical, non-critical, purchased)
- 3rd party vendors for all apps and tools
- Types of languages
- User interface
- Data entry screen tools
- Development tools
- Operational tools
- Critical state preservation

# Analyze current DB

- Datasets Relationships
- Security
- Item storage types
- Date items
- Buffer items and redefinitions
- Dirty data
- Arrays
- Data transaction volume and performance (throughput)

# Migration planning

- New database structure
  - Identical copy (Phase 1)
    - Quicker method
    - May have performance issues
    - Not taking advantage of SQL
    - Note: Even a DB replication may require some code adaptation
  - Optimization / Improvements (Phase 2)
    - More effort
    - More efficient
    - SQL features, extensions, etc.

# Migration planning

- Automatic masters disappear
- Manual masters become tables
- Detail datasets of Manual masters become table with a foreign key constraint
- Item -> column type conversion
- Data conversion
- Image SORT items become clustered Indexes
- IMSAM/Omnidex: Indexed keys become Indexes and queried with LIKE operator, unless using Omni-Access

# Migration planning

- What about Omnidex and Superdex?
  - Relational Databases have strong data querying capabilities
    - However, most of the commonly-used Omnidex functionality doesn't exist. (keyword retrieval)
  - Omnidex has a migration path to Omni-Access
    - API compatibility libraries exist, reducing need to re-write queries.
  - Superdex – best option is migration to Omni-Access.
- Omni-Access is not as simple a product to implement as Omnidex

# Migration planning

- Nulls
  - Used with SQL extensions
  - Define columns as NOT NULL
    - Least impact on code
    - Cannot take advantage of NULLs
  - Define some columns as NULL
    - May impact the code
    - Can take advantage of NULLs

# Migration planning

- Arrays
  - Method 1: One big column
    - Some code changes may be required
    - Not recommended for Integer or Pack
  - Method 2: 1 column per occurrence
    - Some code changes required
    - Recommended for Integer or Pack
  - Method 3: New table, one row per occurrence
    - Significant code changes required
    - More flexible

# Migration planning

- Dates
  - CHAR 8
    - Keep as is
      - Does not impact code
    - Change to Datetime/Timestamp
      - Consider if time logging is needed
      - Consider to take advantage of Datetime features
      - Some code changes may be required
  - CHAR 6
    - Similar to CHAR 8
    - Potential problems with new external tools if using HPDATE
  - Julian
    - Keep or Change concept
- *Over 250 ways in which dates have been stored in HP e3000 applications*

# Migration planning

- Integers
  - RISC / Itanium: Keep same format
  - CISC: Little/Big endien issue

# Application DB Access

- Can you keep the code as is?
  - Tools can translate DB access intrinsics to native or general access functions
  - Keep the intrinsics and use a mapper API, which will make the appropriate native translation
- Define access method
  - Native
  - API mappers
  - ODBC/ADO/JDBC/etc.

# Methods of Moving Data

- Export/Import
- DB migration tools
- Write your own transfer programs

# Tests and refinement

- Migration tests
  - Data integrity tests
  - Data transformation tests
  - Application data access tests
  - Performance Benchmarking

# Migration methods

- Data Migration Options
  - Big Bang / Magic Weekend
    - Not usually practical
  - Running systems in parallel
    - Incremental loading
    - Parallel processing

# Migration planning

- Features = changes
- Don’t over do it
- Ensure that new db type and structure will be compatible with the existing apps

# Migration planning

- Second phase improvements
  - Normalization
  - Views and table joins
  - Code optimization for direct SQL access
  - DateTime
  - Null items
  - Triggers

# Migration Implementation

# Setup new RDBMS

- The DBA issue
  - Training, hiring
  - Remote access
- Install new db on new platform
- Make minimum access and configuration adjustments
- Create test database
- Link machines on network

# Migration implementation

- Make copy of source database
- Create new db structure
  - Native RDBMS tools
  - Native Schema scripts
  - Automated tools
- Consolidate and Replicate the data
- Test the applications
- Data mirroring (pre and post production)

# Migration implementation

- Option 1: Manual Data Export/Import
  - Export data to flat files
    - Endian issue
  - Build import scripts
    - Column type conversions
    - Nulls
    - Dates
    - Arrays
    - Security
  - Import data from flat files through scripts

# Migration implementation

- Option 2: Database migration tools
  - GUI
  - Global changes
  - Column types conversions
  - Endien issue
  - Arrays
  - Nulls
  - Dates
  - Security
  - In-flight transformation
  - Mirroring features

# Database Migration Tools Review

# Database Migration Tools

- Focused products for TurboImage
  - Quest/Taurus – Bridgeware
  - Speedware – DBmotion
  - MB Foster – UDACentral
  - OmniSolutions – SqlLink 3000
  - And other bridges (XenoBridge, Robelle, DISC, WRQ, iMaxSoft, VitalSoft, etc.)
- App migration tools that offer some level of DB migration
  - Neartek, Denkart, Transoft, Sungard BI-Tech

# BridgeWare

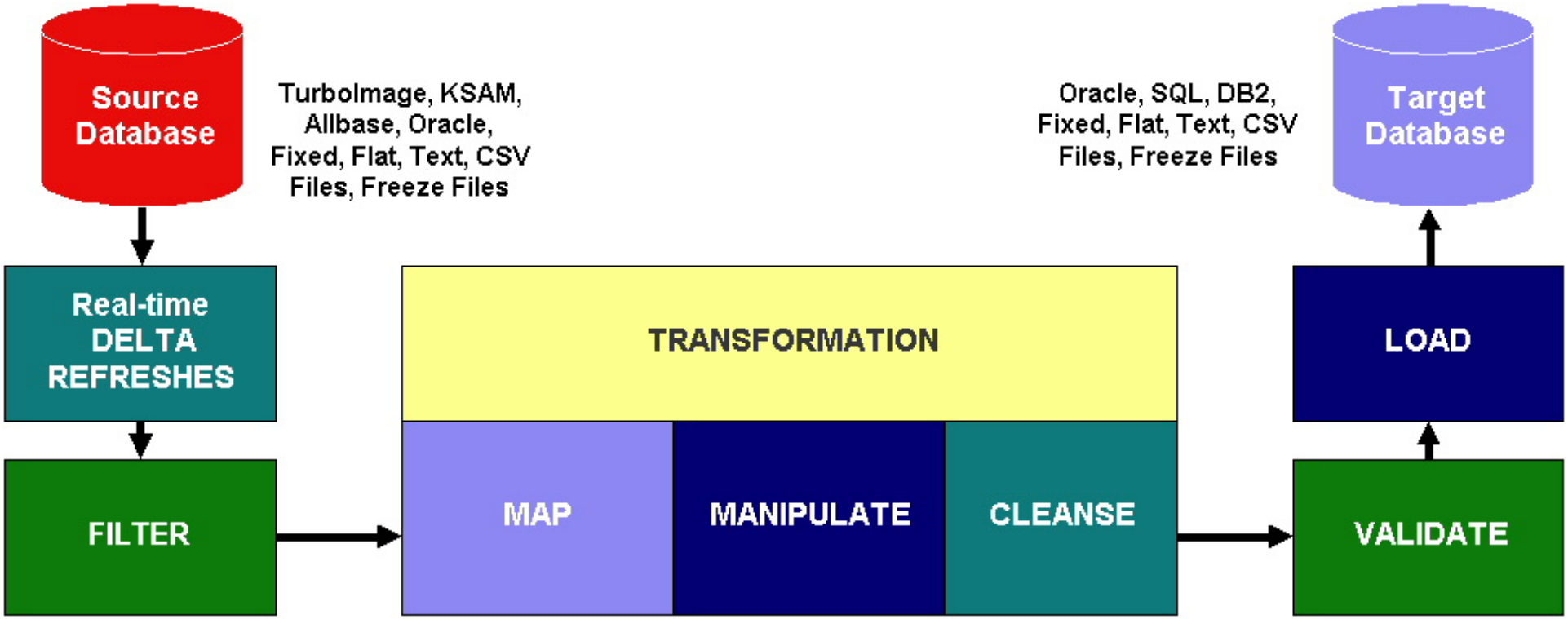
co-product of Quest Software and Taurus Software

- Customer Migrations
- Staged migration = no user downtime
- Fast map and load data with GUI
- No database expertise required
- Highlights “dirty data”
- Complex transformations
- Real-Time MPE data capture
- Bi-directional, high speed data movement

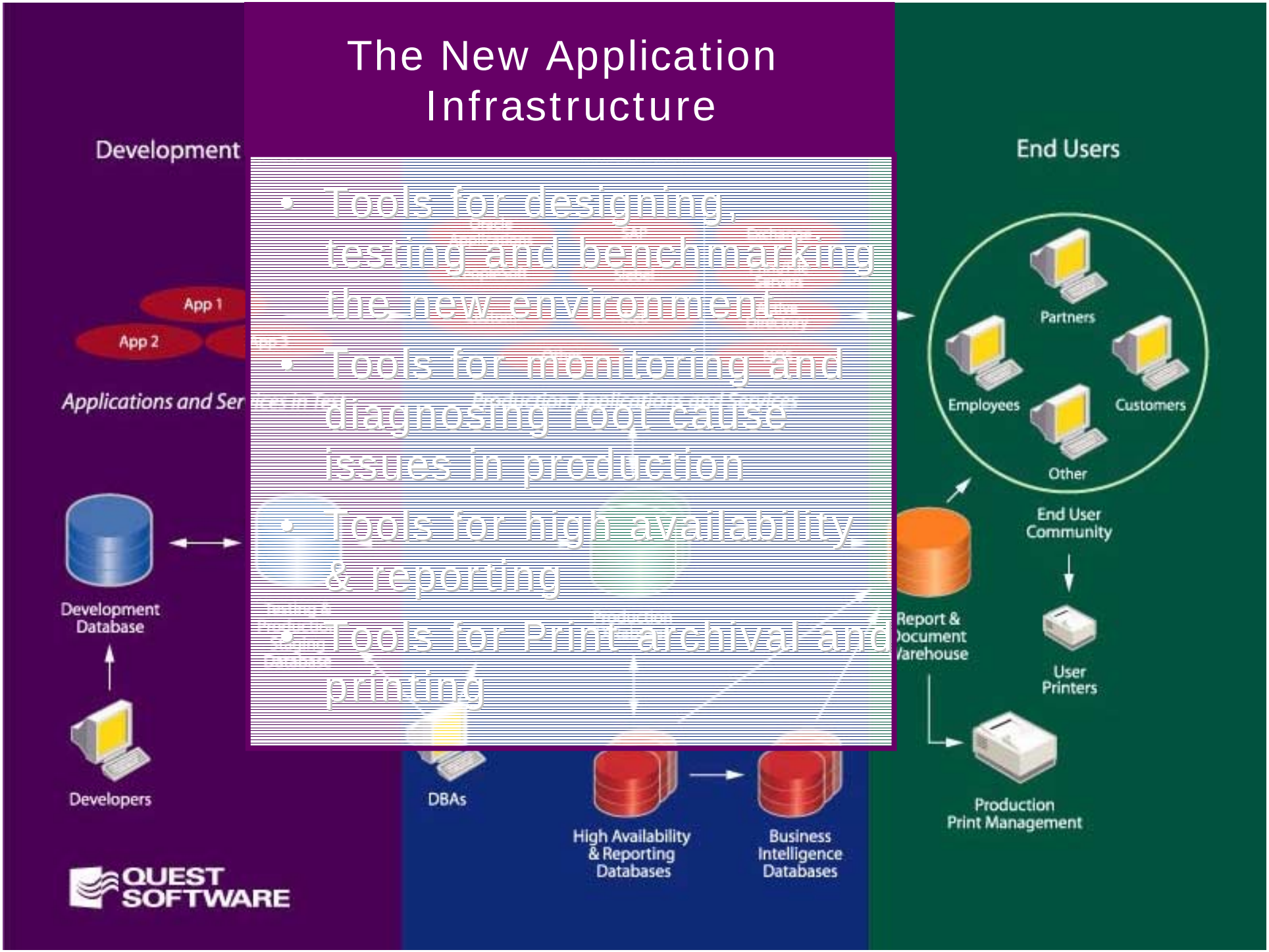
powered by BridgeWare
co-product of Quest Software & Taurus Software

# BridgeWare Process

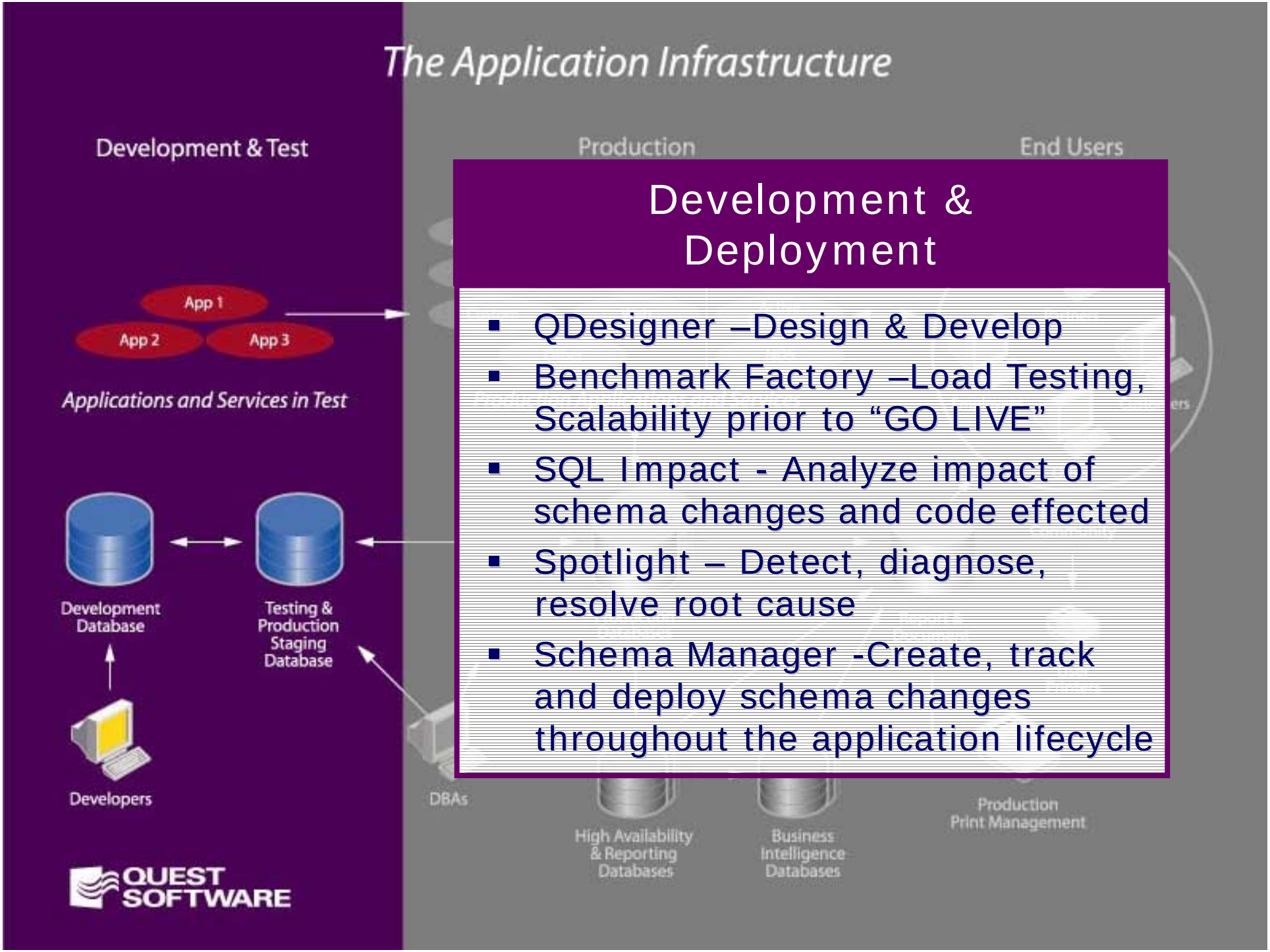
## BridgeWare HP e3000 Migration to Open Systems



# The New Application Infrastructure




- Tools for designing, testing and benchmarking the new environment
- Tools for monitoring and diagnosing root cause issues in production
- Tools for high availability & reporting
- Tools for Print archival and printing




## Development & Deployment

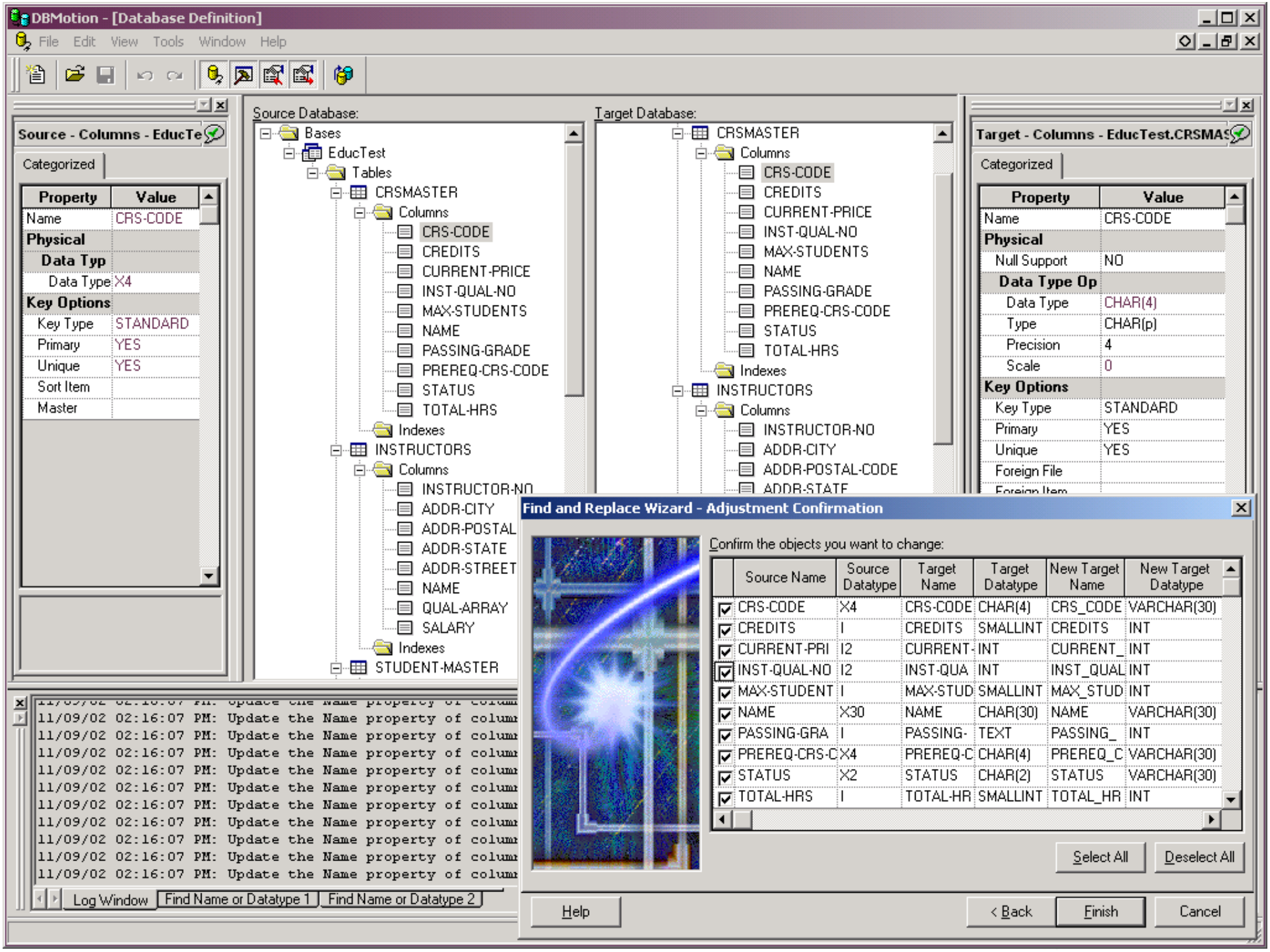
- QDesigner –Design & Develop
- Benchmark Factory –Load Testing, Scalability prior to “GO LIVE”
- SQL Impact - Analyze impact of schema changes and code effected
- Spotlight – Detect, diagnose, resolve root cause
- Schema Manager -Create, track and deploy schema changes throughout the application lifecycle

# DBmotion

from SPEEDWARE

Years of migration experience in one powerful tool

- Benefits
  - Saves you significant time by automating much of the process
  - Designed for e3000 databases
  - Easily fits into your migration budget with it's affordable price
- Features
  - Supports Image/Ksam/Flat to Oracle (any server) and SQL Server. Also automates Omnidex -> OmniAccess.
  - Easy to use GUI interface filled with wizards
  - Automates database structure replication
  - Creates target database
  - Offers complete control of global naming and datatype adjustments
  - Provides default structure and datatype mapping
  - Automates all data transfer and conversion
  - Estimates time to copy rows of tables and whole databases
  - Supports multiple simultaneous database migrations with detachable client
  - Handles arrays, nulls, dates and Omnidex!
  - Merge Databases and files into one target Database
  - Provides reporting features to better understand database files and items


DBMotion - [Database Definition]
File Edit View Tools Window Help
Source - Columns - EducTe
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Key Options
Key Type STANDARD
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TOTAL-HRS
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Type CHAR(p)
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Scale 0
Key Options
Key Type STANDARD
Primary YES
Unique YES
Foreign File
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Log Window
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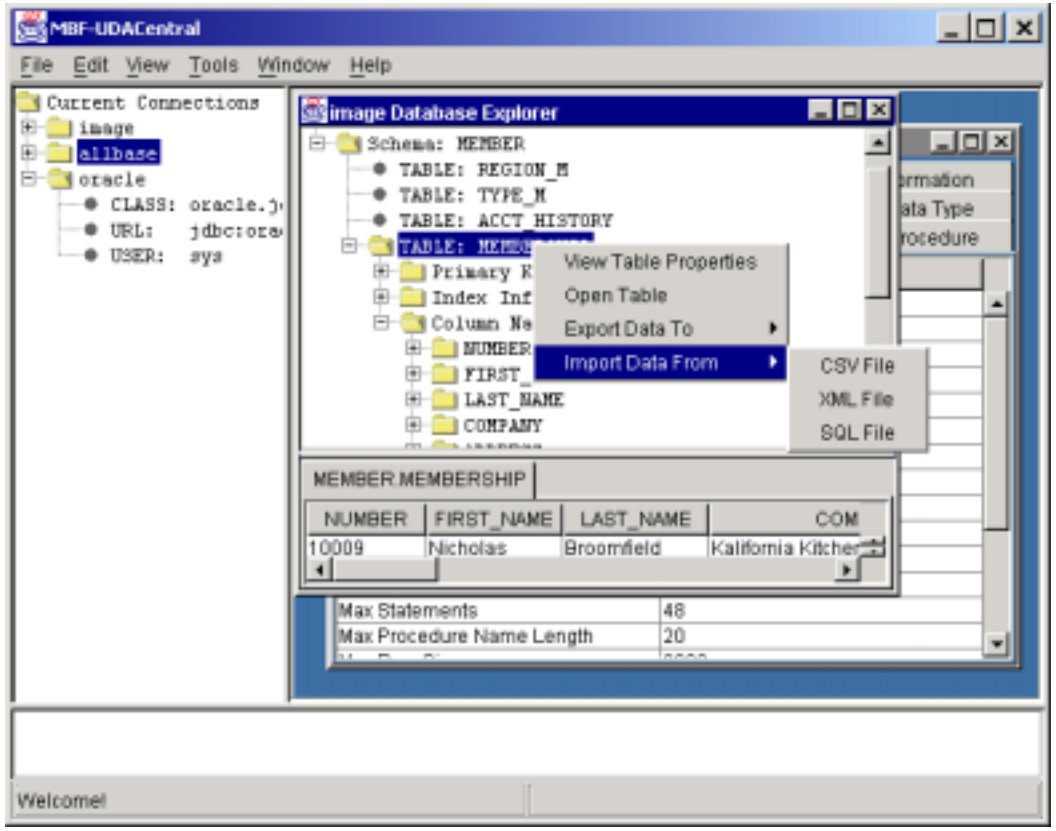
Find and Replace Wizard - Adjustment Confirmation
Confirm the objects you want to change:
Source Name
Source Datatype
Target Name
Target Datatype
New Target Name
New Target Datatype
CRS-CODE X4 CRS-CODE CHAR(4) CRS_CODE VARCHAR(30)
CREDITS I CREDITS SMALLINT CREDITS INT
CURRENT-PRI I2 CURRENT- INT CURRENT_ INT
INST-QUAL-NO I2 INST-QUA INT INST_QUAL INT
MAX-STUDENT I MAX-STUD SMALLINT MAX_STUD INT
NAME X30 NAME CHAR(30) NAME VARCHAR(30)
PASSING-GRA I PASSING- TEXT PASSING_ INT
PREREQ-CRS-C X4 PREREQ-C CHAR(4) PREREQ_C VARCHAR(30)
STATUS X2 STATUS CHAR(2) STATUS VARCHAR(30)
TOTAL-HRS I TOTAL-HR SMALLINT TOTAL_HR INT
Select All
Deselect All
Help
< Back
Finish
Cancel

# MB Foster UDACentral

- MB Foster's UDACentral provides migration capabilities that include :
  - Database Explorer
  - JDBC Explorer
  - Database Converter
  - Data Import/Export with conversion
  - Data Editor
  - Dynamic SQL Supporter
  - Distributed Query Execution

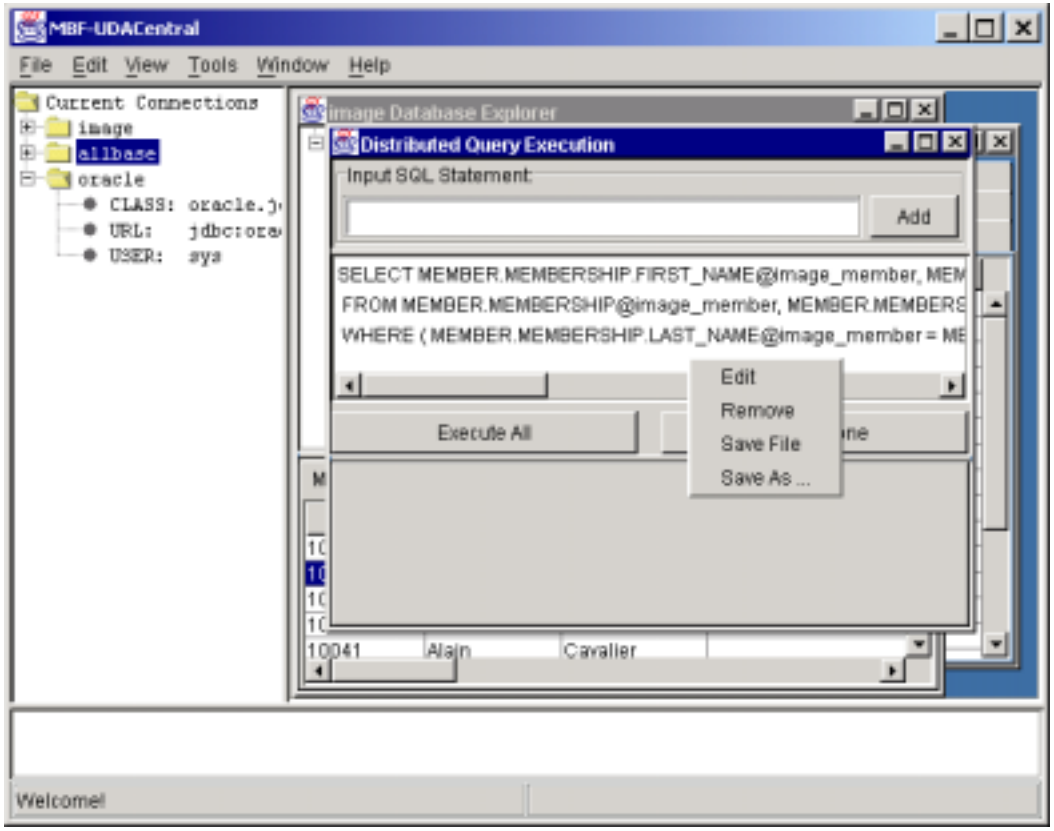
# MB Foster UDACentral




Import/Export Capabilities :

You can import/export data in a number of formats, including XML, CSV, HTML, eMail and SQL.

# MB Foster UDACentral




Distributed Query Execution allows you to create, edit, execute and save distributed SQL queries. You can also re-use queries from the Distributed Query Wizard. Results can be exported in a number of formats.

# SqlLink3000

- SqlLink3000 allows you to access any ODBC compliant SQL database from your HPe3000.
- SqlLink3000 uses Microsoft ADO and TCP/IP to access your Sql data.
- SqlQuery, an interactive ‘query- like’ tool is included, so you can access your data without programming.
- Data server is multi-threaded, giving the highest level of performance.

OmniSolutions, Inc.

GUI INNOVATIONS

hp invent

LUND

MB Foster

mbs

SPEEDWARE

hp e3000

# SqlLink3000

- SqlLink3000 features:
- Read/Write access to your database
- Supports Insert/Update/Delete/Exec statements
- Supports Views
- Supports stored procedures
- All the above available from SqlQuery
- Migrate your data to SQL using GUI3000, and
- then access it from your HPe3000.

OmniSolutions, Inc.

GUI INNOVATIONS

hp invent

LUND

MB Foster

mbs

SPEEDWARE

hp e3000

# Demonstrations

DBmotion Short Demo (1:37)

DBmotion Longer Demo (6:49)

UDA-Central Longer Demo (8:23)

Bridgeware Longer Demo (6:00)

# In Conclusion

- Careful planning will be vital to ensuring success
- Numerous options exist for implementation
- Take advantage of the experts…

# Thank You

Questions & Answers