IBM Systems and Technology Group University 2005

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1/8/2005

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ISV Database Migration Considerations

Course #: CB58

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Learning Objectives

- Learn the current state of the art of ISV database migrations.
- Learn about the latest tools and techniques IBM and Partners are using to migrate large ISV database environments.
- Learn about recent successes using a variety of migration techniques.

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ISV Migrations

1/8/2005

Agenda

- **Migration Basics**
- **Migration Scenarios**
- **Very Large Database Migration**
- **Landscape Complexity**
- **Service Delivery Models**
- **Conclusions**

Agenda

- **Migration Basics**
- Migration Scenarios
- Very Large Database Migration
- Landscape Complexity
- Service Delivery Models
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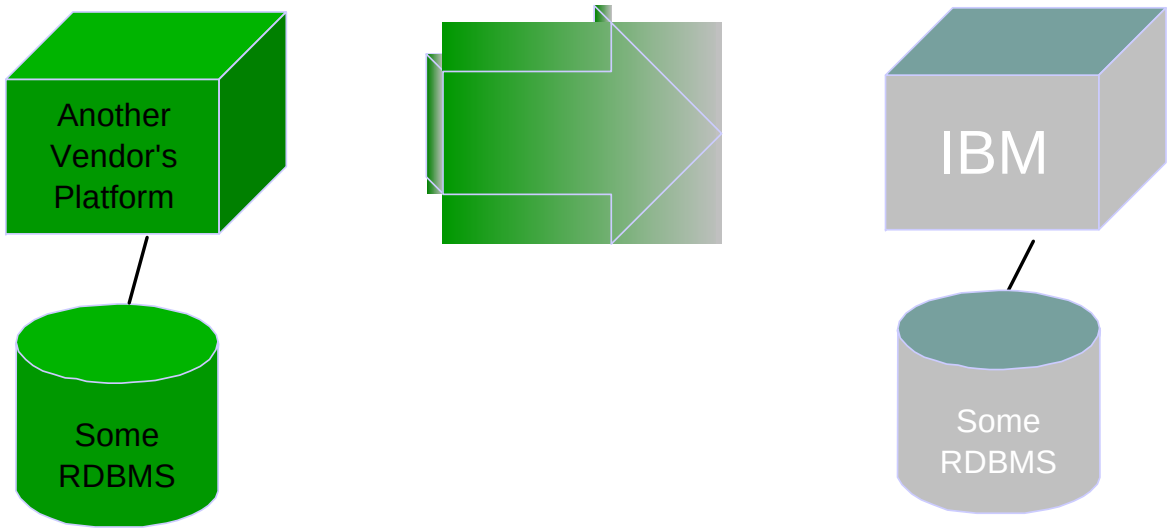
Migration Basics – Goal is Re-hosting



Migration Basics – Setting the Stage

- **Why cant I just copy the data files**
  - Data files have OS and platform dependent data imbedded
  - Notable exception is NT on INTEL
- **Why cant I just copy or restore the database from a backup**
  - Data files have OS and platform dependent data imbedded
  - There are exceptions
    - SAPDB/MAXDB between AIX, HPUX, RELIANT, and Solaris
    - SAPDB/MAXDB between Tru64, Windows, and Linux on Intel
    - DB2 between AIX, HPUX, and Solaris
- **Time**
  - Many partners require 7x24, migrations require downtime
  - May take several months of testing and planning
  - Migration speed may be constrained by old production H/W
- **Test environment**
  - Duplication of the source H/W production environment for testing
  - Early acquisition of target IBM production environment
  - May need to oversize target environment
  - May need to upgrade network
- **Specialized skills and services are required for migration**

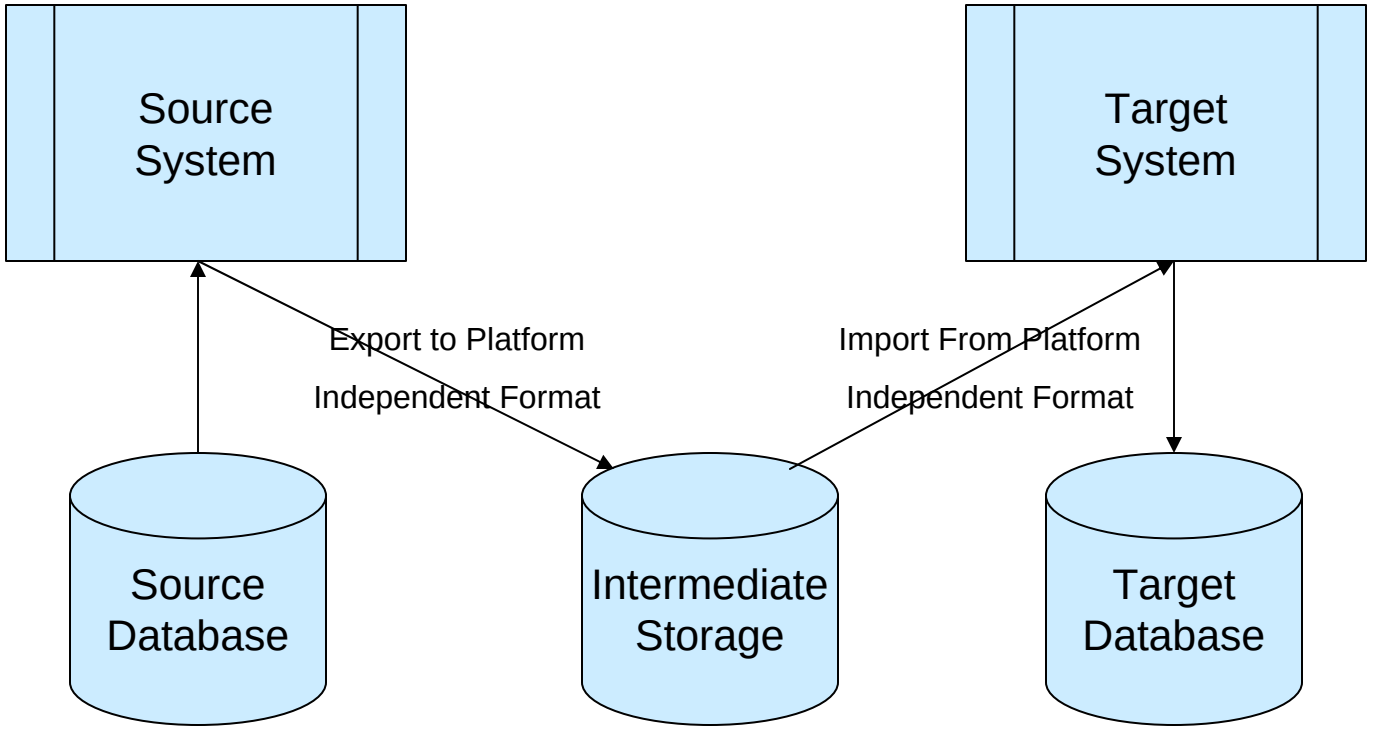
Migration Basics – General ISV Considerations

- **SAP**
  - Has platform and RDBMS independent migration tools
  - Required to use SAP provided tools for support after migration
  - Has larger tables and database then many other ISVs making it more challenging
- **PeopleSoft, Seibel and Others**
  - No tools provided by ISV Ventor
  - Migration is a Variation on the Installation Procedures
    - Building a target environment, and
    - Using basic DB tools for platform independent data movement (i.e. Export/Import for Oracle)
- **Non ISV Databases**
  - Often have very large tables
  - Use basic DB tools for platform independent data movement (i.e. Export/Import for Oracle)
  - Use 3rd Party Replication Tools

Migration Basics – Sales Context

- **The incumbent hardware vendor:**
  - Their sale does NOT depend on a successful migration
  - They will NOT need to consider the cost of migration services
  - They will NOT need to build a full scale copy of the source system for migration testing
  - They will only need to consider their partners immediate and future requirements
- **IBM's "Opportunities"**
  - Think about using the disk from the OEM test/development environment
  - Short term lease of OEM CPU
  - Additional disk space, at a minimum 2.5 times the requirement for the largest database environment
  - Migration services must be funded

Migration Basics – Basic Export/Import



Migration Basics – Migration Design and Planning

- **Determine the migration window**
  - How long do we have to get it moved
- **What has to happen during the migration window**
  - Does anything else besides the DB need to be moved
  - Backups? RunStats? Interfaces? Testing? ...?
  - Recovery from a failure (definition of go/no-go situations)
- **Identify critical migration elements**
  - Largest tables and overall database size
  - Migration technology required to meet 1st two elements
  - Resource availability
- **Data Movement Time is the remainder**
  - Data Movement Time = Migration Window – Post Processing Time – Validation Time – Backup Time

Migration Basics – Migration Design and Validation

- **Each Migration is Designed to Meet Partner Requirements**
  - Outage Window
  - Large Table Isolation to Minimize Single Task Rerun Time
  - Target Database Layout and Design
- **Multiple Test Migrations**
  - Validate Functionality
  - Validate Migration Design
  - Validate Migration Performance
  - Allow Migration Team to Practice
- **Migration Design Includes a Margin of Safety**

Migration Basics – Non-SAP ISV Technique Overview

- **Tools are typically Database Utilities**
- **Target environment setup can be complex**
- **Oracle Techniques**
  - Export/Import used with "Named Pipes"
  - "CREATE TABLE AS SELECT“
  - Both Techniques overlap unload and load
  - Quest Replication
  - "Roll your own" in terms of process control and integrity verification
  - Can yield a reasonably fast migration
- **DB2 Techniques**
  - Directed Restore

Migration Basics – Oracle Export/Import

- **Export & Import are Oracle tools**
  - Have been used by DBA's for years
  - Well understood and frequently used to move or re-org tables
- **Will need to setup parameter files for exports & imports**
  - Table names, Buffers, Logs, Parameters, etc.
  - Named Pipes
  - Each export / import pair runs sequentially (normally run several at a time)
- **Setting up for a migration**
  - Think about restarts (few large exp/imp may take longer to recover)
  - Think about manageability (several thousand difficult to schedule and monitor)
  - The sequence of execution is important

Migration Basics – Oracle Create Table as Select

- **A SQL statement available in Oracle**
  - Commonly used to "clone" all or part of an existing table
  - The "*AS SELECT*" is just an extension to "*CREATE TABLE*"
- **Executes with "*LOGGING NO*" option**
- **Used primarily on very large tables**
- **Does not replicate indexes, views, constraints, defaults**
- **Cannot be used on tables with unsupported field types**
  - raw
  - long raw
  - long varchar

Migration Basics – Oracle QUEST Replication

- Quest Shareplex
  - Oracle Only
  - Product support heterogeneous replication
  - Replication Target DB Need Not Exist to Begin Data Capture
  - Replication to Each Target may be started and stopped multiple times
- Issues
  - Two copies of database are necessary
  - Cost of software
- Near Zero Downtime Possible

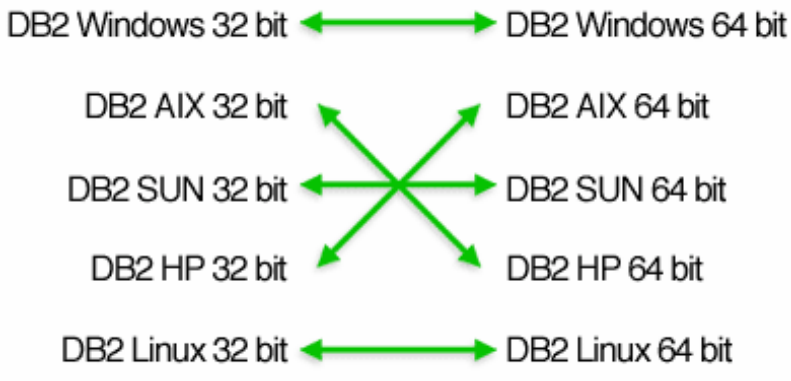
Migration Basics – DB2 Directed Restore

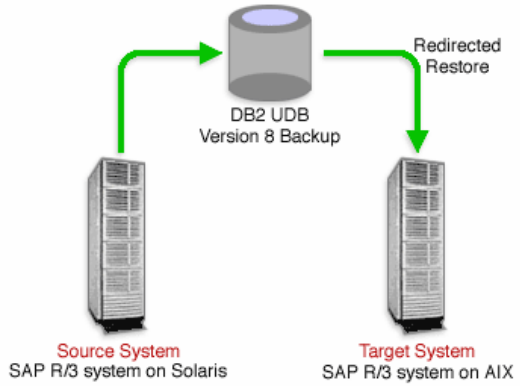
- **With DB2 UDB Version 8, you can use redirected restore to create a Heterogeneous System Copy between two systems running on different platforms**

- **Document:**

  Copying your SAP/R3 System Across Platforms Using DB2 Universal Database V8 Redirected Restore

  http://www-106.ibm.com/developerworks/db2/library/techarticle/0308nesiem/0308nesiem.html





Migration Basics – SAP Migration

- **Tools Supported by SAP**
- **Target environment setup is straight forward**
- **Well understood repeatable process**
- **R/3 Pilot Migrations**
  - IMIG
  - Some Non Core R/3 Environments
- **New Developments**
  - R3jload for JAVA Instance (NW 04 SR1)
  - R3load –socket (Kernel 6.10+)
  - DB2, Informix, and SAPDB Fast Loader Option for R3load
- **Non SAP supported approaches**
  - Same as Non-SAP
  - LAURUS Tool Set

Agenda

- Migration Basics
- **Migration Scenarios**
- Very Large Database Migration
- Landscape Complexity
- Service Delivery Models
- Conclusions

Migration Scenarios – Peoplesoft

- **Setup of environment**
  - Install new target environment (includes certified install of PeopleSoft)
  - Build a test copy of production system
- **Migration requirements / steps**
  - How long allowed
  - What techniques are used
  - What needs doing (i.e. does partner use ad-hoc query / reporting?)
  - Develop test plan and required migration scripts
  - Run trial migration, tune and fix as required
- **Partner application testing**
- **Run final migration test**
- **Run migration event, test it & cutover**

Migration Scenarios - PeopleSoft Examples

- **How long will a migration take**
  - Plan on 2-6 Months from setup, through testing, to completion
- **Retail company running financial suite (AR, AP, GL, Purch..., ...)**
  - 250GB PeopleSoft system migrated in 40 hours
  - Included moving of batch, interfaces, security, private ad-hoc reports
  - Total effort took approximately a month
  - Partner had well defined setup and verification procedures
- **Insurance company running financials**
  - 60GB PeopleSoft system migrated in 2 hours
  - Total effort took 3 months
  - 2 weeks setting up new environment
  - 2 weeks building and testing migration
  - 2 months partner testing

Migration Scenarios – Oracle Applications

- **Setup of environment**
  - Install new target environment
  - Implement application environment, data and patches on Target
  - Build a test copy of production system
- **Migration requirements / steps**
  - How long is required to move the master data
  - What techniques are used
  - How do I verify all patches and changes have been applied
  - Develop test plan and required migration scripts
  - Run trial migration, tune and fix as required
- **Partner application testing**
- **Run final migration test**
- **Run migration event, test it & cutover**

Migration Scenarios – SAP Database Independence

- **SAP Basis layer insulates the application code from the underlying RDBMS, operating system and hardware.**
  - The base code and ABAP programs already in place remain unchanged
  - Standard database calls work for all databases
  - Specific RDBMS interfaces are optimized for each database
- **Specific SAP parameters are set to leverage infrastructure**
  - SAP Basis takes advantage of each RDBMS/OS combination
- **Specific RDBMS and OS parameters are set to leverage SAP**
  - Each RDBMS and OS vendor has specific routines for improving SAP performance

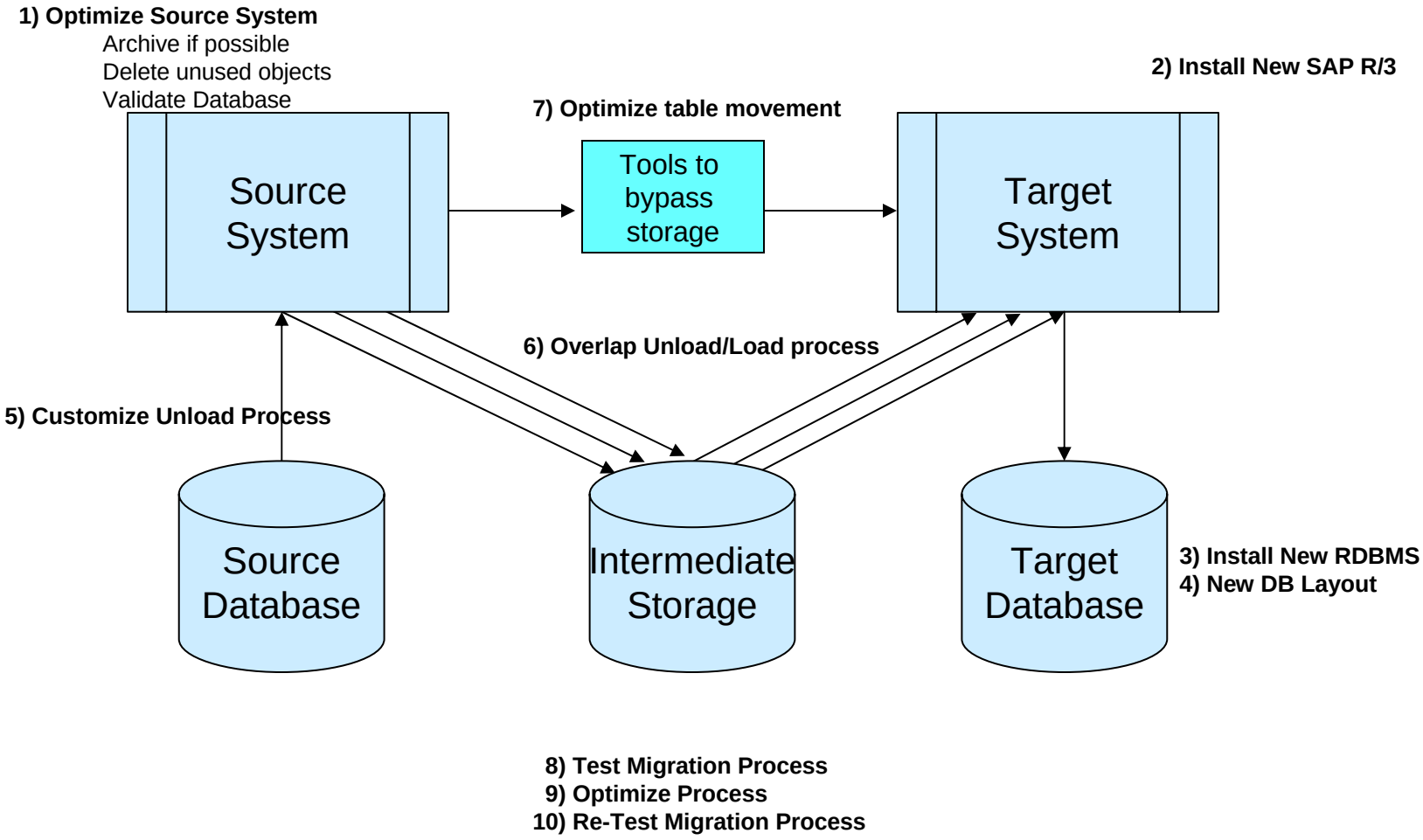
Migration Scenarios – SAP Standard Methodology

- **SAP requires any partner doing a heterogeneous migration to use their DB Migration Tools, but ...**
  - SAP BW < 3.0 recommends oracle tools, no viable cross platform migration
  - SAP Tolerates the use of non approved methods in special circumstances
- **SAP Migration Service offering includes:**
  - Checking the migration plan
  - SAP DB Migration Tools
  - Going-Live Migration check
- **SAP Migration Tools "unload" source data to a neutral file format, then "load" data to the target database. Results in the following for each table:**
  - SELECT * FROM <table> ORDER BY <primary key>
  - ftp data file from source to target
  - Create <table> in target
  - Insert into <table>
  - Create all indexes in target

Migration Scenario – IBM Optimized SAP Migration

- **SAP Standard Migration Optimizations**
  - Aggressive SAP Structure Split
  - Implement Database Controlled Space Management
  - Unsorted Export
  - Parallel Index Build
  - ATS Migration Scheduler (patent pending)
- **ATS Hybrid Migration**
  - Special Handling for Larger Tables
  - Typically 75-100 Largest Tables
  - CTAS or Oracle Export/Import Depending on Structure
  - ATS Hybrid Migration Scheduler (patent pending)
  - Experience with Large Partner Database Migrations
- **Techniques Developed in Lab Environment**

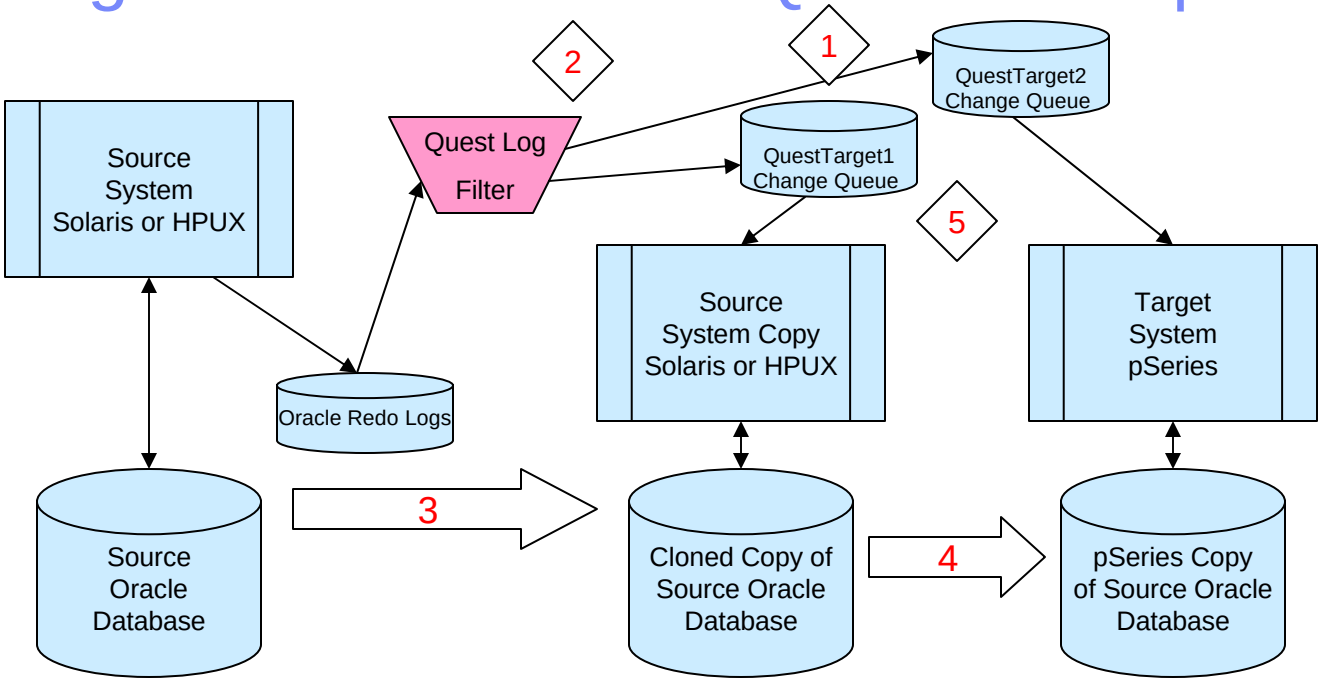
Migration Scenarios – Hybrid Migration



Migration Scenario – Oracle QUEST Replication

1. Create Two Replication Targets
   - Source Solaris/HPUX to Target1 - Solaris/HPUX Database Clone
   - Source Solaris/HPUX to Target2 – pSeries Copy
2. Filters Source Redo Logs, Accumulating Changes to Two Targets
3. Oracle Tools Clone of Source Database After Change Accumulation Begins
4. Cross Platform Copy of Source Clone After Change Accumulation Begins
5. Quest Apply of Accumulated Changes
   - Target1 to Solaris/HPUX Database Clone
   - Target2 to pSeries Copy
   - Cutover to new database can occur when application of accumulated changes is complete
6. Short Cutover Outage
   - Stop Source Database
   - Allow final logs to replicate to pSeries
   - Perform pSeries post processing, tests, backups, etc
   - Start productive operation on new pSeries copy

Migration Scenarios – Quest Shareplex



Migration Scenarios – SAP Examples

Energy Retailer, Refining, Exploration	**SUN/Oracle to AIX/Oracle**	**600gb database** **60 hour outage**
Mining Equipment Manufacturer	**HP/Informix to AIX/Informix**	**500gb database** **48 hour outage**
	AIX/Informix to AIX/DB2	**600gb database** **24 hour outage**
Auto Parts Manufacturer **Hybrid Migration**	**Compaq Alpha/Oracle to AIX/Oracle**	**1.4tb database** **24 hour outage**
Gas and Electric Supplier	**zSeries/DB2 to AIX/Oracle**	**1.2tb database** **30 hour outage**
Pharmaceutical Distribution **Hybrid Migration**	**Sun/Oracle to AIX/Oracle**	**1.7tb database** **14 hour outage**
People transportation	**zSeries/DB2 to AIX/DB2**	**200gb database** **36 hour outage**
Large Retail Partner **Quest Shareplex and DB Tools**	**HP/Oracle to AIX/Oracle and** **SAP 3.1I to 4.7 Upgrade**	**2.5tb Database** **56 Hour outage**
Manufacturer POC **Hybrid Migration**	**Sun/Oracle to AIX/Oracle**	**3.5tb Database** **48 Hour Outage**

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- Migration Basics
- Migration Scenarios
- **Very Large Database Migration**
- Landscape Complexity
- Service Delivery Models
- Conclusions

VLDB Migration – Challenge 2000

- **Non SAP ISV Migrations**
  - Size is generally not the biggest issue
  - Target environment setup is more of a challenge
  - Large Tables more important than Overall Database Size
  - Size can be mitigated by isolating large tables into single migration tasks
- **SAP ISV Migrations**
  - Large Tables more important than Database Size
  - 15-20 GB/Hour achievable if no tables are more than 10-15 GB
  - Sensitive to H/W capacity on source and target
  - Sensitive to Disk Subsystem Performance Characteristics
  - Migration Capability for databases up to 500 GB
    - IBM and SAP Partners generally cannot allow more than a two or three day outage over a holiday weekend for production migration.
    - SAP Migration tests typically required additional down time.
    - Very little real world experience with migrations of very large partner SAP databases existed.

SAP ISV Migrations – Progress 2001/2002

- **June 2001 - ATS SAP Migration Project Complete**
  - Hybrid Migration Techniques demonstrate feasibility of 1 TB SAP migration
- **February 2002 – Automotive Sector Hybrid Migration Complete**
  - 1.4 TB SAP database migrated in 24 hours
  - 107 GB Single Table (COEP)
- **July 2002 – Distribution Sector Hybrid Migration Complete**
  - 1.7 TB SAP database migrated in 15.5 hours
  - 71 GB Single Table (RFBLG)
- **Single Table Performance**
  - SAP R3load 1-2 GB/Hour
  - CTAS 9-10 GB/Hour
  - Export/Import 6-8 GB/Hour
- **Key Concerns**
  - Capacity on both source and target systems
  - I/O Subsystem Capacity
  - Hybrid Migration is technically not supported by SAP, this has proved not to be an issue
  - Test Environment

SAP ISV Migrations – Progress 2003/2004

- **Dec 2003 – Laurus Migration**
  - EMEA New Hybrid Migration Method
  - Migration and Release Upgrade in single 56 hour outage window
  - Quest Shareplex
- **Feb 2004 – First Partner Managed Migration**
  - Partner wants to do their own Migration and desires a single solution to migrate a series of Databases ranging in size from 50 GB to 400GB
  - Source: Sequent DB Server w/ W2K Applications Servers
  - Target: xSeries IPF Central System Running W2K3
  - Standard Tools Export Executed more than 48 hours for 400 GB (Some Tables > 30 GB)
  - Solution
    - ATS Hybrid Migration Tools
    - 400 GB Database Requires 5 Hours
    - Productive Migration Scheduled for Feb 2005
    - Limited IBM Participation from ATS in form of Training and Coaching
- **July 2004 – 3.5 TB Oracle to Oracle POC**
  - Partner said 48 hour outage was OK
  - Migrated database in 36 hours
  - When it came to comparing SUN vs IBM the 48 hour outage gave IBM solution additional costs
  - In hindsight, pitching Shareplex and targeting a 4 hour outage would have been better

SAP ISV Migrations – Looking Forward to 2005

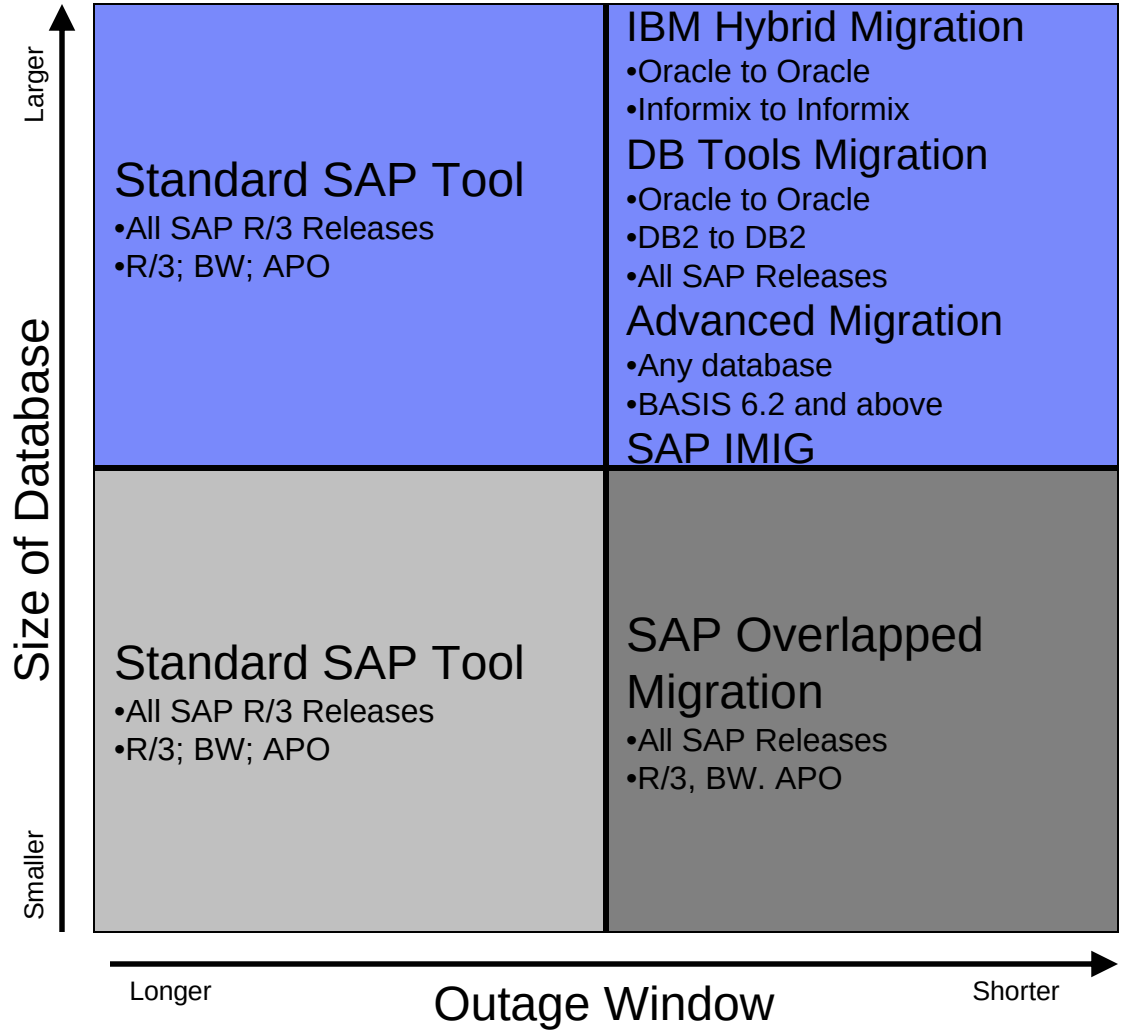
- **Recent SAP Developments**
  - SAP Kernel 6.20
    - R3load based Migration for BW 3.x and Above
    - R3load based Migration for APO based on 6.20 Kernel
    - R3load based Migration not recommended for BW and APO releases using Kernel < 6.20
  - SAP Netweaver 04 SR1 SAPINST
    - JLOAD tool for migration of SAP Java CI
    - New SAP Java Based Migration Scheduler
      - Allows Overlap of Export/Import
      - Includes support for r3load –socket
    - New SAP Step Editor for SAPINST Tool
  - IMIG
    - Has now been used with databases larger than 1 TB
    - IMIG is still a Pilot Migration

SAP ISV Migrations – Migration Approaches

- Tools developed by the IBM competency center or SAP
- Some of the tools are not certified by SAP, but migration will be certified
- Tools vary depending on database – not all tools are available for all databases
- Selecting the right tool is critical to meet your requirements

- **Standard Migration (SAP)**
  - All database combinations
  - All releases above 3.1 COM
  - No APO/BW Kernel < 6.20
- **DB Tools Migration (IBM)**
  - APO/BW Kernel < 6.20
  - Oracle to Oracle (Laurus, Quest, et al)
  - DB2 to DB2 (Directed Restore)
- **Overlapped Migration (SAP or IBM)**
  - All database combinations
  - All releases
  - No APO/BW Kernel < 6.20
- **IMIG (SAP)**
  - Availability Varies by Source/Target Platform, Database, and SAP Release
  - Pilot Migration
- **Advanced Migration (SAP or IBM)**
  - All Database combinations
  - Utilizes R3load --socket for larger tables
  - All Release levels
  - Requires fast, dedicated network
- **Hybrid Migration (IBM)**
  - Hardware/OS migrations only (must be same RDBMS)
  - Requires fast, dedicated network
  - Release 4.0x and above

SAP ISV Migrations – Tool Selection



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- Migration Basics
- Migration Scenarios
- Very Large Database Migration
- **Complex Landscapes**
- Conclusions

Landscape Complexity

- **Database Size has become less important**
  - ISV Migration techniques will easily scale
  - 3-4 TB ISV Database within 48 hour window (DB Tools)
  - 300 GB Large Table within 48 hour window (DB Tools)
  - Any size ISV Database within 8 hour window (Quest Shareplex)
  - Remember migration must be designed to meet Business expectations
  - Continued Shinkage of Acceptable Outage Windows
- **Tools and Techniques Continue to Evolve**
- **Migration of complex landscapes**
  - Sweep the floor details require that everything be migrated
  - Partners have many database instances
  - Increases complexity of migration effort
- **Past Success Creates New Challenges**

Landscape Complexity – Partner Examples

- **Large non ISV partner**
  - 92 databases instances
  - 19 source servers
  - 9 target p690 LPAR
  - Quest Shareplex
- **Large ISV partner**
  - Two SAP Landscapes
  - Peoplesoft
  - Non ISV Databases
  - Largest Database is 3.5 TB
  - All must be migrated from SUN to IBM
  - Size of databases varies from 25 GB to 4.5 TB

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Service Delivery – Three Approaches

- **Partner Migration**
  - Lowest Services Cost
  - Partner must have strong OS, Database and Application Skills
- **Migration Factory**
  - Requires Brand Funding
  - Migration Services Bundled with Hardware Cost
  - Requires some partner resource commitments
- **BCS Turnkey Migration**
  - Highest Services Cost
  - Partner skills less important
- **BCS Assisted Migration**
  - Medium Services Cost
  - Combination of Turnkey and Partner
  - IBM Helps Partner Develop Migration Skills

Service Delivery – Partner Migration

- **Partner Responsibilities**
  - Partner manages the project
  - Partner takes responsibility for staffing and execution of migrations
  - Partner takes responsibility for IT Infrastructure Implementation
- **IBM Services Responsibilities**
  - IBM FTSS and ATS Teams provide assistance with planning and development of migration procedures
  - IBM FTSS and ATS Teams provide assistance during production migrations
  - Costs generally limited to TEA coverage for FTSS and ATS Team members
  - TEA cost recovery can be a problem absent IBM services contract
  - IBM FTSS and ATS Teams have limited resources and specific commitments must be negotiated

Service Delivery – Partner Migration(2)

- **Partner Benefits of Customer Migration**
  - Reduces Total Migration Time and Work Effort
  - Leverages Partner Knowledge of Environment
  - Enables Partner Skill Development on Target Environment
  - Decreases Dependency on non-partner consulting resources
  - Partner decides what consulting services are required
- **IBM Benefits of Partner Migration**
  - Lowers cost of migration
  - Services opportunities still exist for Infrastructure Consulting
  - Partner is better able to manage target environment following migration
  - Partner and IBM act as partners
  - Migration is better integrated into partner IT activities

Service Delivery – Partner Migration Example

- **Environment**
  - Multiple SAP Landsape Partner
  - Largest Database 700 GB
  - SUN to pSeries
- **IBM Activities**
  - FTSS and ATS Teams Assisted in Development of Procedures
  - FTSS and ATS Teams Assisted with some early migrations
- **Migration Techniques**
  - Migration Technique was entirely Oracle Export/Import
  - No SAP Tools were used
- **Results**
  - Migration occurred over a normal two day weekend
  - Partner successfully completed migrations in 2002
  - Very Satisfied Partner, Great Reference

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- **Conclusions**

Conclusions – Setting Expectations

- **Expectation Management Is Very Important**
  - A migration will require testing
  - Consider impact to partner staff
  - Testing may well take months
- **Define the objectives, keep them as simple as possible**
  - Try not to include other environments
  - Only move what is absolutely necessary
  - Try to prevent project creep
- **Plan for recoveries during the migration**
- **Have Go/No-Go criteria written down and agreed to**
- **A production scale full copy of the productive database environment is an important element for a ISV Migration**
- **There is a tradeoff between the cost and complexity of a migration and execution time. Fast hybrid migration is more complex and costs more.**
- **Make certain the Business can really tolerate the outage proposed by the IT organization**

Conclusions – Setting Expectations

- **Today Landscape Complexity and Cost of Migration are a greater challenge than database size.**
- **The incumbent has an advantage because they do not need to perform a migration, so**
  - Partner must buy in to the IBM Value Proposition
  - Partner must want move from SUN/HP to IBM
  - Partner must be want IBM as a Partner
- **Hardware margins generally cannot support a Turnkey Migration, so**
  - Use Migration Factory
  - IBM must partner with partner to execute the migration in the most cost effective manner
- **High level of customer satisfaction came from Colgate, a customer managed and executed migration. Why?**
  - Partner Team was invested in success of project
  - Partner Developed Strong Skills in Target Environment
  - Partner Learned Operational Lessons in non-production environments and was well prepared for production cutover

Conclusion / Wrap-up

- We have covered recent advancements to the current state of the art of ISV database migrations.
- We have discussed the latest tools and techniques IBM and Partners are using to migrate large ISV database environments.
- We have covered recent successes using a variety of migration techniques.

Additional Resources

- **The Campus for more education:**
  - BPs: http://www.ibm.com/partnerworld/sales/systems/education
    - Includes link to IBM PartnerWorld University (Web lectures for key topics)
    - http://www.ibmweblectureservices.ihost.com/pwu
  - IBMers: w3.ibm.com/sales/systems/education
    - Includes links to the Online Universities for Cross-Brand and each Brand (Web lectures for key topics)
  - Partners: www-1.ibm.com/servers/eserver/education
- **User Managed SAP Database Migrations**
  - send email to keimig@us.ibm.com
- **SAP / ORACLE / AIX IBM ATS Hybrid Migration Tools Guide**
  - send email to keimig@us.ibm.com
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