Information Server CDC

La nuova soluzione IBM
per l'integrazione dei dati in tempo reale

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Agenda

- Il significato del Real-Time
- Che cos'è la Change Data Capture
- Caratteristiche della soluzione:
  - Information Server CDC
  - LiveAudit
- Q&A

The Real-Time Challenge

- Need access to information on demand
  - Streamline business processes
  - Improve customer service

- Currently, many companies use batch-based processes to gather data
  - Provides a point-in-time view of the business
    - Data only as fresh as the previous batch cycle
  - Bulk data extracts consume large amounts of system resources
    - Traditional data integration performed only during off-business hours

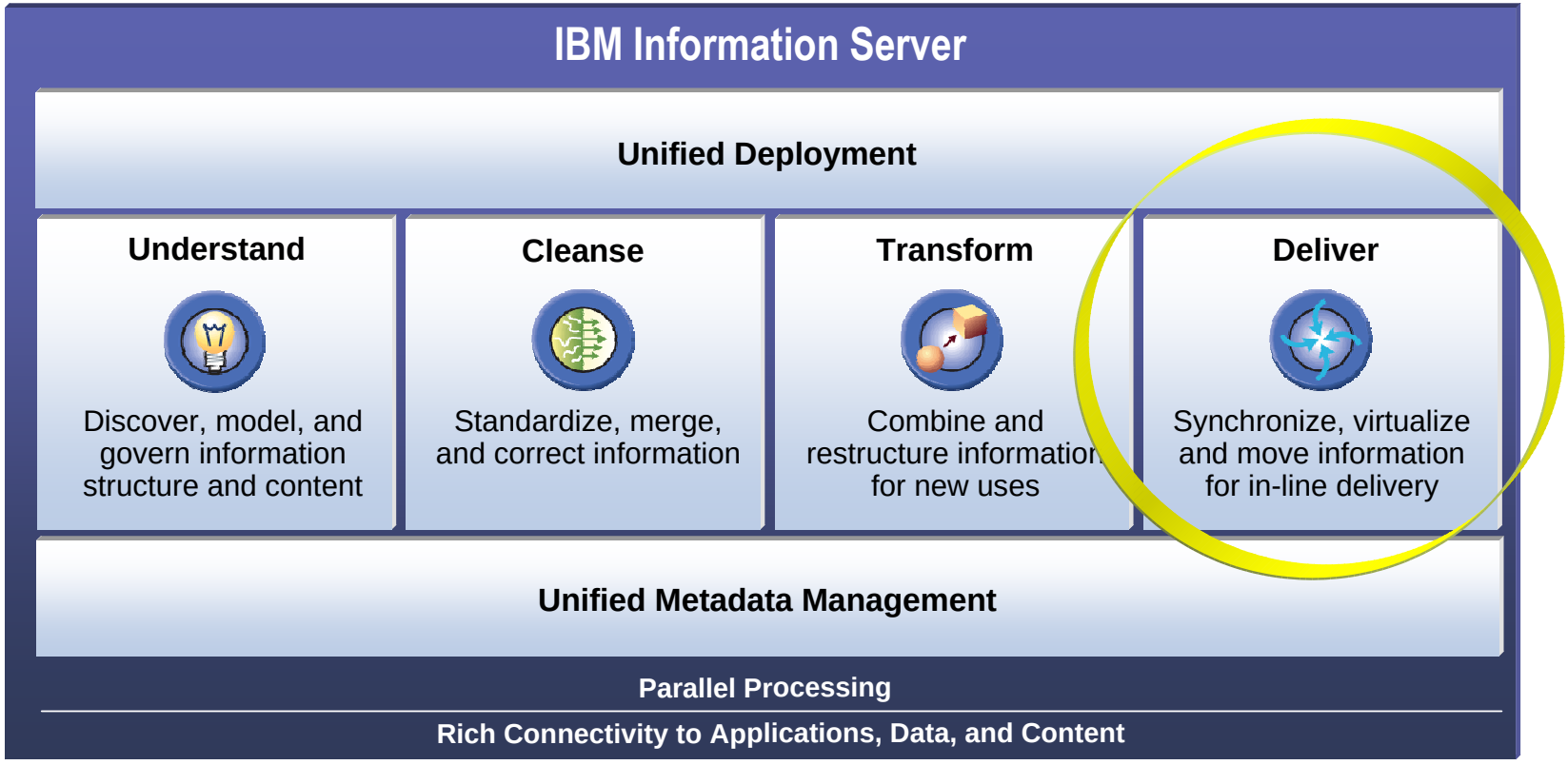
Solution – Real-Time ETL Enablement

- Continuously flow information throughout the enterprise
  - Real-time data feeds into ETL tools
- Real-time event visibility and propagation
- Data traceability and trustworthiness
- Flexibility of delivery

> *"Real-time data integration has a current market penetration of 5-20 percent of the target audience, it is expected to grow to more than 80% of organizations by 2010"*
>
> *- Gartner*

The IBM Solution: IBM Information Server

Delivering information you can trust



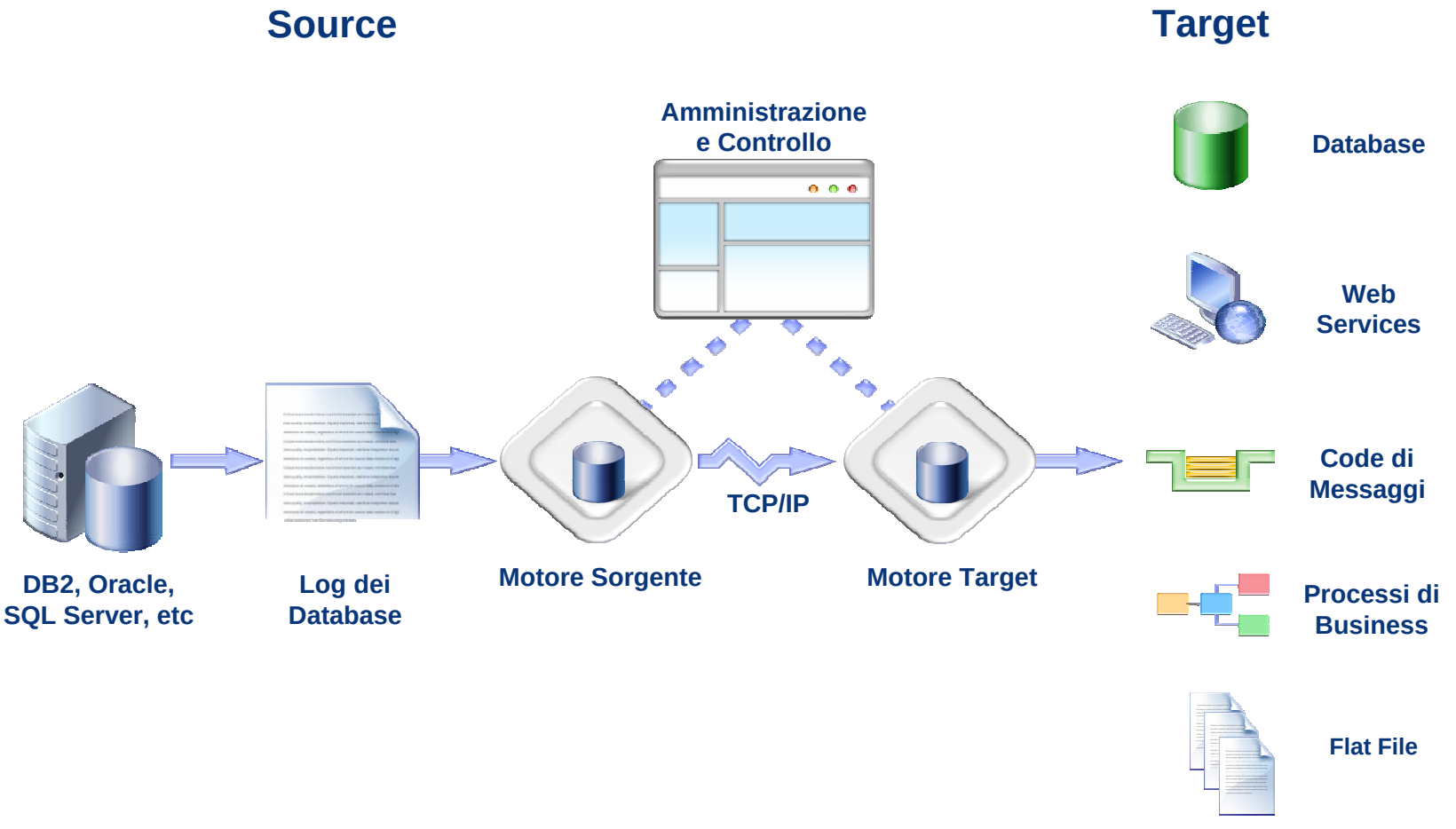
Change Data Capture

- **What is Log-Based Change Data Capture?**
- *"Use of existing native database recovery logs to capture table and row level activity occurring in a relational database".*
  - **Native Database logs**
    - Oracle = Re-do Log
    - DB2/UDB = DB2 Log
    - DB2 (i5) = OS/400 Journal
    - SQL Server = Transaction Log
    - DB2 (z/OS) = DB2 Log
    - Sybase = Transaction Log
  - **Alternatives to Log–Based CDC**
    - SQL Select - based on Date/Time Stamp
    - File Comparison – determine differences
    - Database Triggers
    - Modify Source Application

Change Data Capture

- **What are the benefits of using Native DB Logs for CDC?**
  - Easy deployment
    - No changes to existing applications or schemas required
  - Utilizing existing component of the database
  - Resource efficient
    - Little impact to existing source application and system
    - “0.05% system resources required to process over 300 GB of data”
    - Sending only the changes – efficient use of bandwidth
  - Guaranteed Data integrity – utilizing log position (LSN/bookmark)
  - Before and After Images available
  - Additional Log Information available - documenting the change
  - Scalable – Single Scrape
  - **Enables access to changed data in a timely fashion**
    - **Differentiation from batch integrators**

Log-based Change Data Capture



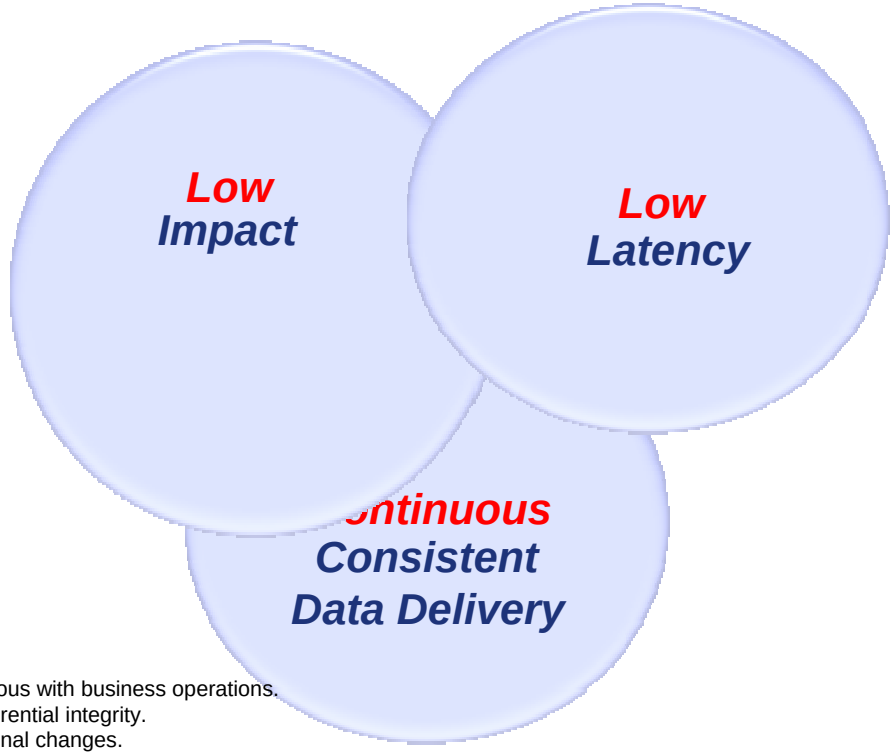
Key Elements Of The DataMirror Value Proposition

LATENCY

1. Near zero latency for pervasive integration projects.
2. ETL can also deliver low latency but at significantly higher impact to product systems and mission-critical applications.

IMPACT

1. Reduces risk to operational systems.
2. Non intrusive to applications and databases.
3. Use of native DB logs, documented overhead of 2-5%.
4. No use of database triggers.
5. Management easily integrated into existing IT operations.
6. Help reduce/manage operational windows.

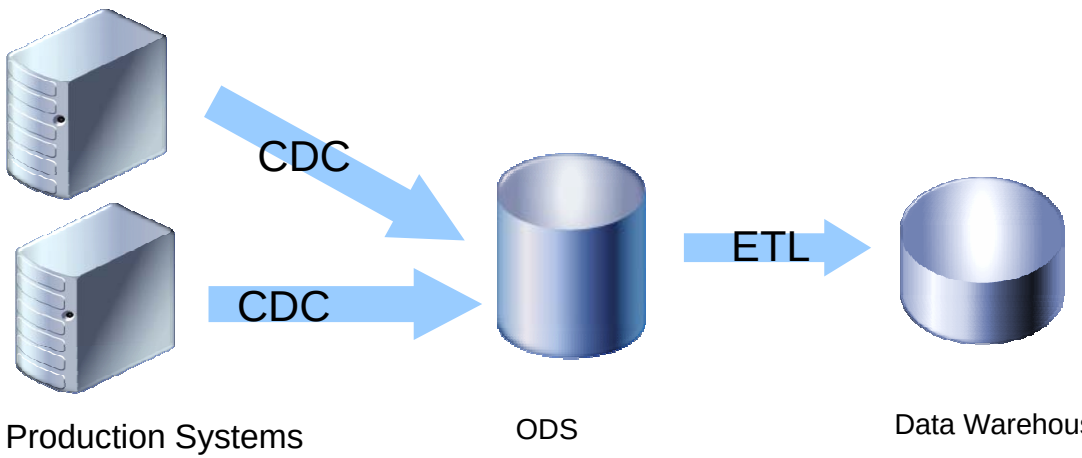


CONSISTENT DATA DELIVERY

1. Data pushed from source, delivered in continuous stream, continuous with business operations.
2. Transaction consistency maintained to preserve units of work, referential integrity.
3. Full transaction granularity, before and after image of all transactional changes.
4. Data event aware, can be used to trigger specific business processes.
5. Fault tolerance, recover to last committed transaction.

Complementary to ETL: The Shrinking Batch Window

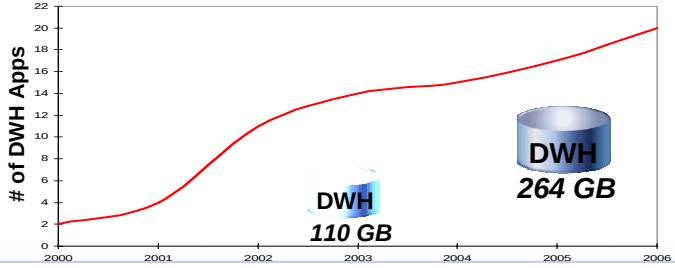
- Problem: Batch window is not long enough to move the data.
  - Customer uses ETL tool to get data out of production systems into a warehouse but as the volume of data to be moved increases, so does the time it takes to move the it.
  - An 8 hour batch window isn't long enough.
- Solution: Move data continuously to ODS, use ETL to extract from ODS



Business Intelligence e Datawarehouse

La necessità:

•Consolidare dati provenienti da svariate applicazioni, appartenenti a regioni e business unit differenti
•La finestra temporale non è più sufficiente per il caricamento batch del datawarehouse



La soluzione:

•E' stata creata una Operational Data Store che contiene la movimentazione giornaliera dei sistemi sorgenti cosicchè i volumi dei dati da trasportare verso il DWH si sono ridotti notevolmente

•Ridotti i volumi, la finestra temporale si è accorciata, rendendo possibile per gli utenti finali di consultare i propri report la mattina del giorno dopo

I benefici:

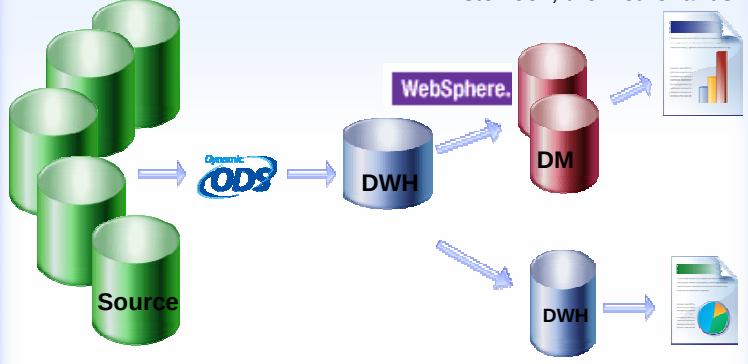
•Ricoh ha potuto ridurre il tempo totale di processing e il volume dei dati, grazie all'estrazione incrementale dei dati stessi

•La soluzione non ingenera il degrado delle prestazioni dei sistemi sorgenti, preservando l'integrità delle normali operazioni di business

•La crescita del DWH non è per il momento motivo di preoccupazione

•Per alcune metriche, è stato possibile avere report aggiornati in tempo reale (esigenza in crescita per il Cliente)

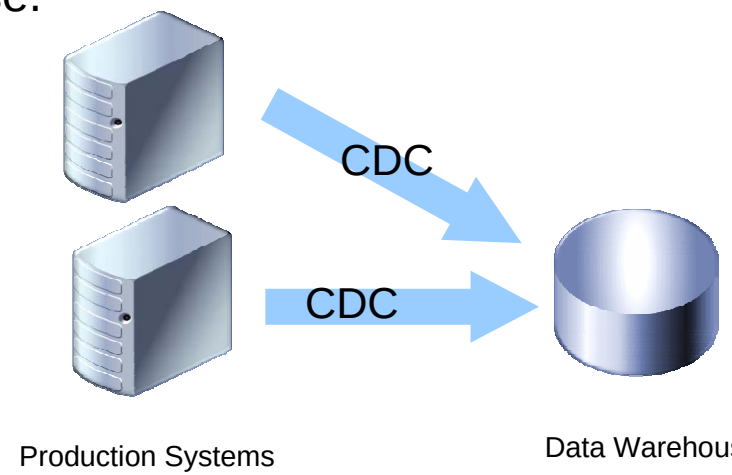
Amstelveen, the Netherlands



Barcelona, Spain

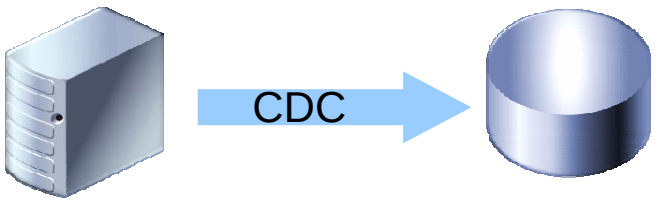
Complementary to ETL : Once a Day is Not Enough

- Problem: Day old data is too stale to meet the business need.
  - Customer needs to analyze shipping, order, inventory information continuously throughout the day.
  - **BUT** – doesn't want to impact production systems by running queries or reports directly against them.
- Solution: Transformation Server to provide continuous ETL flow into Data warehouse.



Complementary to ETL : My Production System is Too Maxed out for Reporting

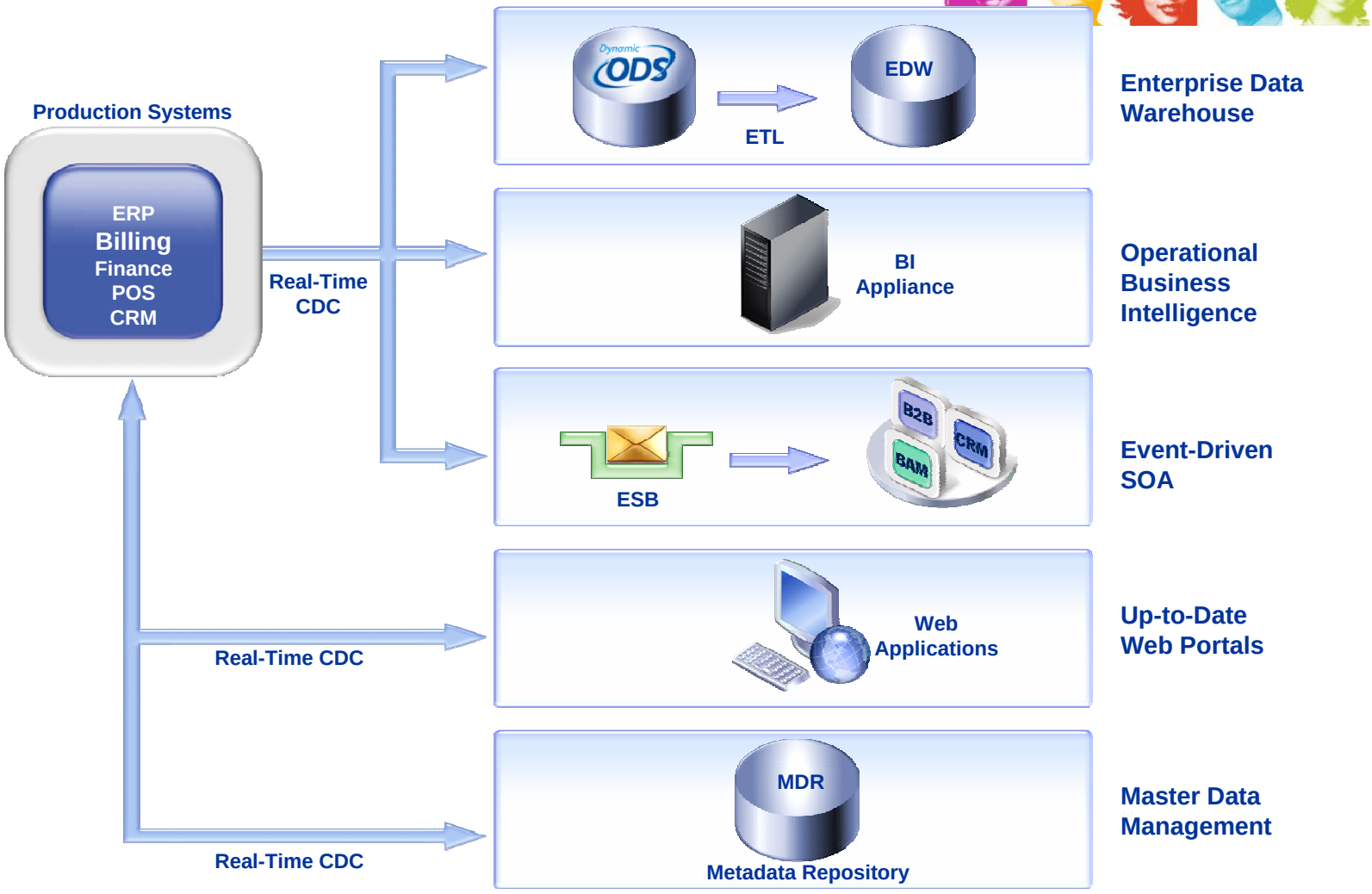
- Problem: Users running queries and reports on production systems are slowing them down.
  - Customer doesn't have a warehouse but is running queries and reports directly against the production system which is impacting system performance
  - Wants a quick, easy, cheap way to offload queries and reporting onto a secondary system or Data Mart
- Solution: Transformation Server to provide easy synchronization to secondary system.



Production System

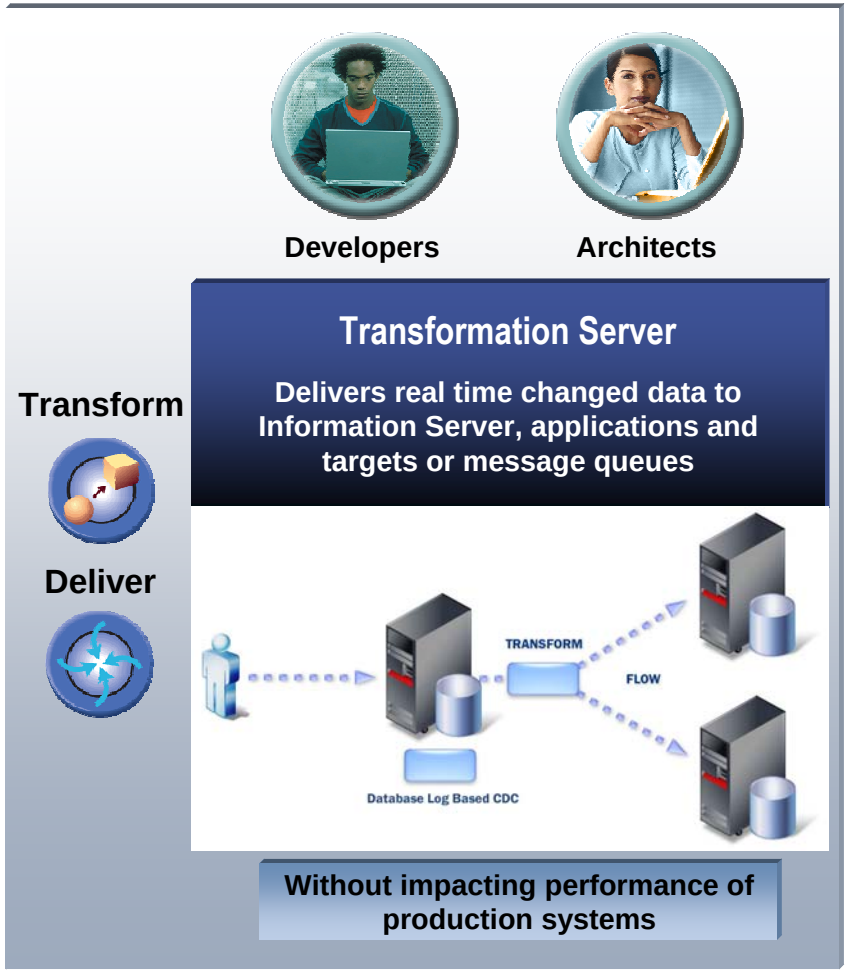
Operational Data Store or Data Mart

Business Application



What is Information Server CDC?

- Provides real time changed-data capture and delivery for
  - Dynamic changed data integration
  - Synchronization
  - Replication
- Minimal impact on production systems
- High scalability and end-to-end performance
- Wide range of RDBMS support
  - Captures for DB2 (i/z/LUW), Oracle, SQL Server, Sybase
  - Applies for these above and more



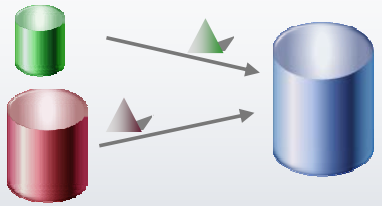
Heterogeneous Platform Support

DATABASES Source & Target	DATABASES Target Only	MESSAGE QUEUE Support	OPERATING SYSTEMS	HARDWARE PLATFORMS	NETWORK PROTOCOLS
DB2 / UDB	Teradata	JMS	i5/OS	IBM System i	TCP/IP
Oracle	Netezza	MQ Series	z/OS	IBM System z	
Sybase	Greenplum	TIBCO	AIX	IBM System p	
MS SQL Server	Informix	WebMethods	HP-UX	HP-9000	
PointBase	MySQL	BEA	Solaris	Intel	
	PostgreSQL		MS Windows	HP Alpha	
			Linux	Sun	
				Itanium	

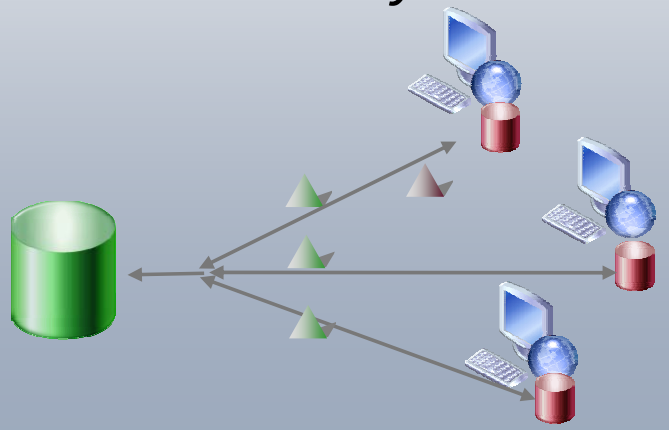
Deployment Topologies

Real-Time Integration

Consolidation



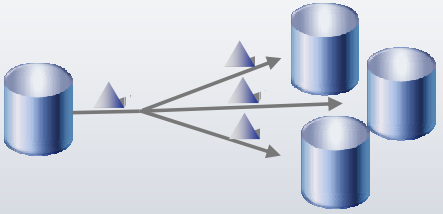
Distribution *Synchronization*

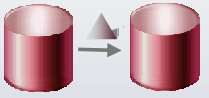


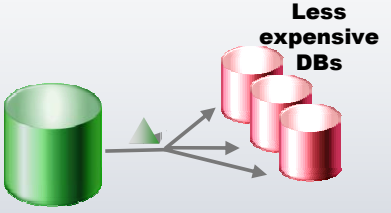
Deployment Topologies

Replication

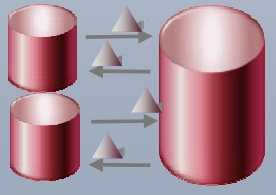
Need to report on operational systems but cannot impact production system – must synchronize data across 1 or more databases

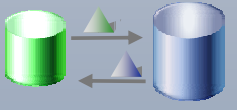




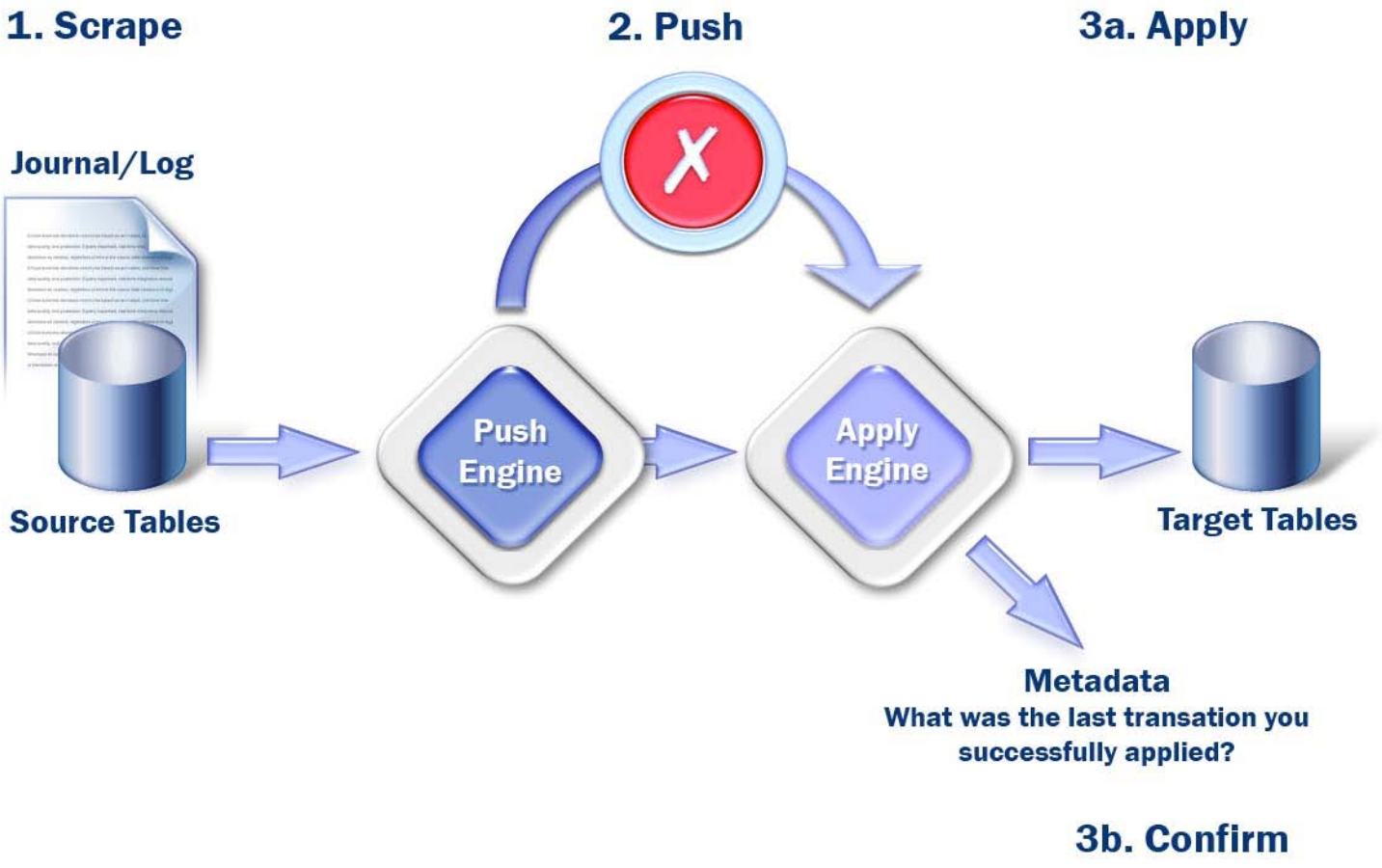


Need to maintain business continuity during application migrations, consolidations, upgrades



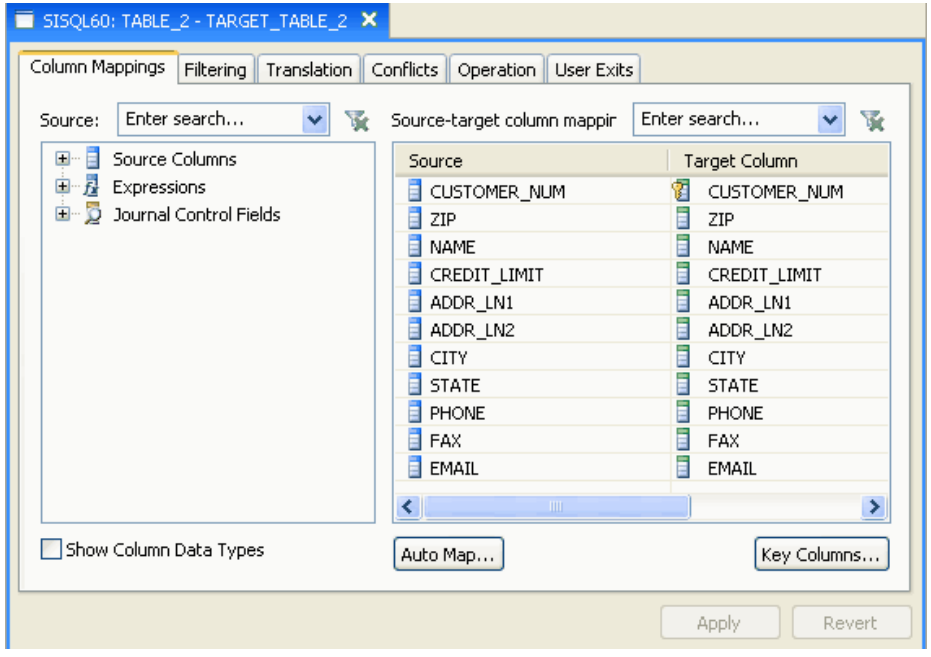


Guaranteed Data Integrity



Subscription - Assignments

- Assignments
  - individual source to target table mappings
  - is associated with a subscription
  - Table and Column level configuration



Filtering

CUST_NO	L_NAME	F_NAME	PHONE	REP_NO
58699	Smith	John	404-555-3874	45
37283	Duggan	Ira	613-555-8367	25
89863	Quinn	Fran	905-555-1296	11
89732	Muntz	Muntz	704-555-2738	25

- Integrate entire systems or only a subset of data
- Table/row/column-level filtering options available

ROW SELECT

REP_NO = 25

CUST_NO	L_NAME	F_NAME	REP_NO
37283	Duggan	Ira	25
89732	Muntz	Josie	25

Transformations

EMP	LAST	FIRST	HIRE_DATE	STAT	SALARY	MAX
1234	Moreiro	Nicole	01/05/97	A	$55,000	$60,000
2345	Ellison	Val	04/12/97	I	$40,000	$50,000

Increase Field Size

Concatenation

Century Dates

Transform Fields

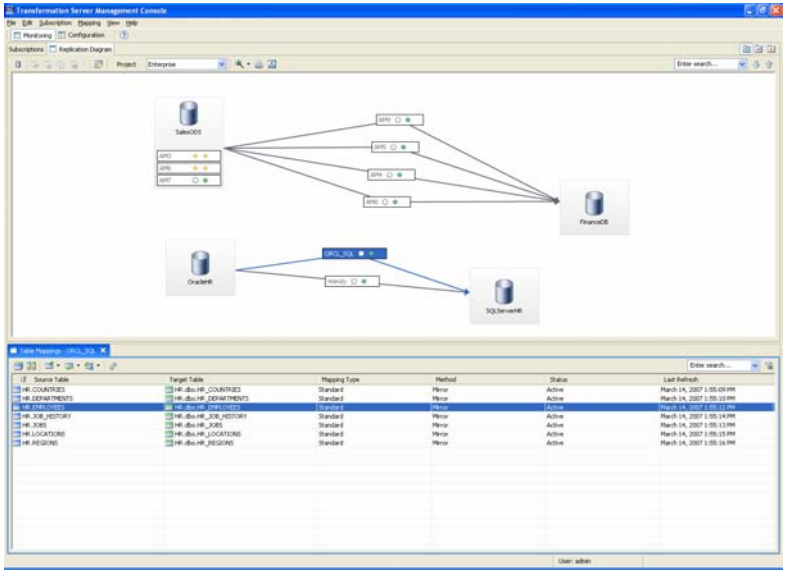
Derived Fields

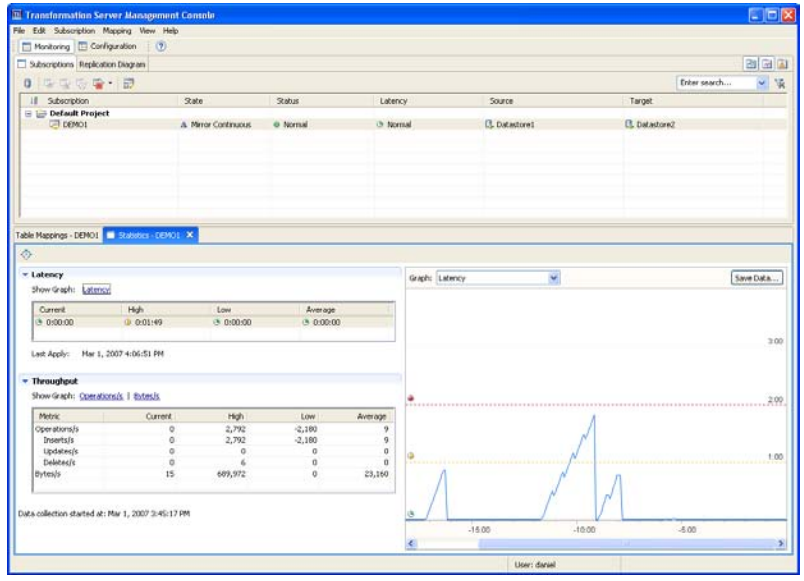
EMP_ID	FULL_NAME	HIRE_DATE	STATUS	%SALARYMAX
001234	Nicole Moreiro	01/05/1997	Active	92%
002345	Val Ellison	04/12/1997	Inactive	80%

Monitoring & Ease of Use

Java based GUI for configuration, administration, and monitoring

- Manage data integration processes from one screen
- Graphical representation of the replication process
- Event logs and Notifications

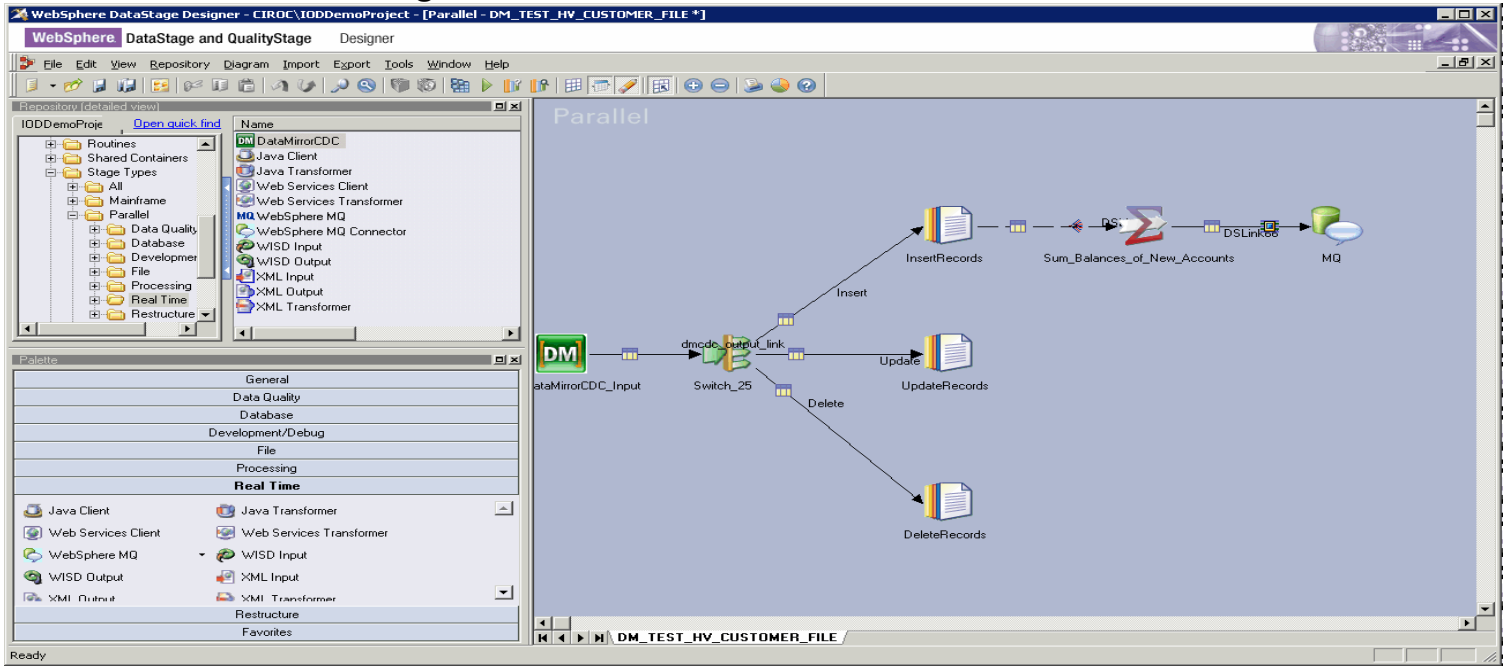




Information Server CDC 6.2 for WebSphere DataStage

Enabling real-time response to data changes and business events

- Low impact log-based changed data capture
- New palette stages on Information Server
- Stream data changes into Information Server



Create Subscription & Table Mapping

DataStage subscription with database source and DataStage target

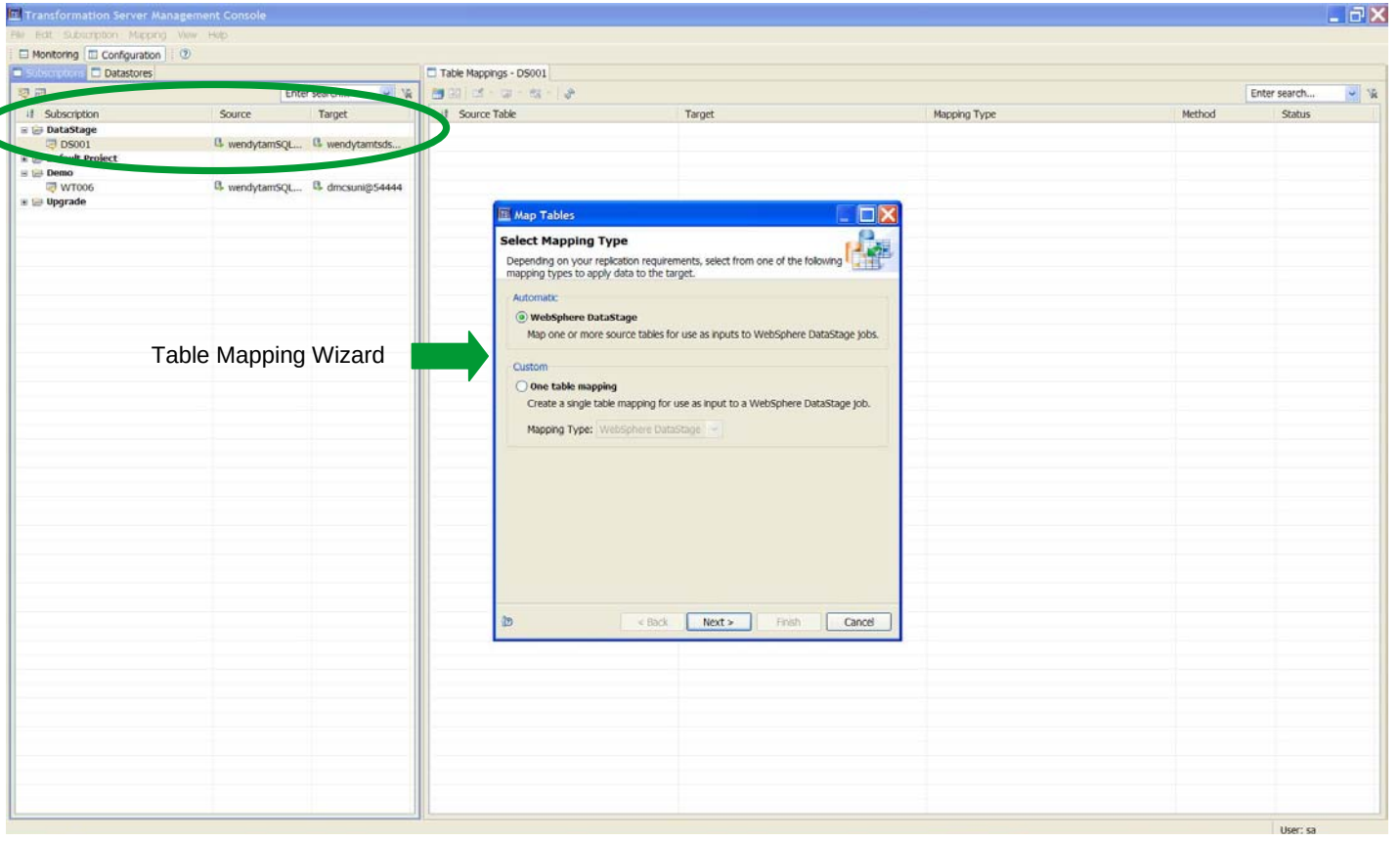
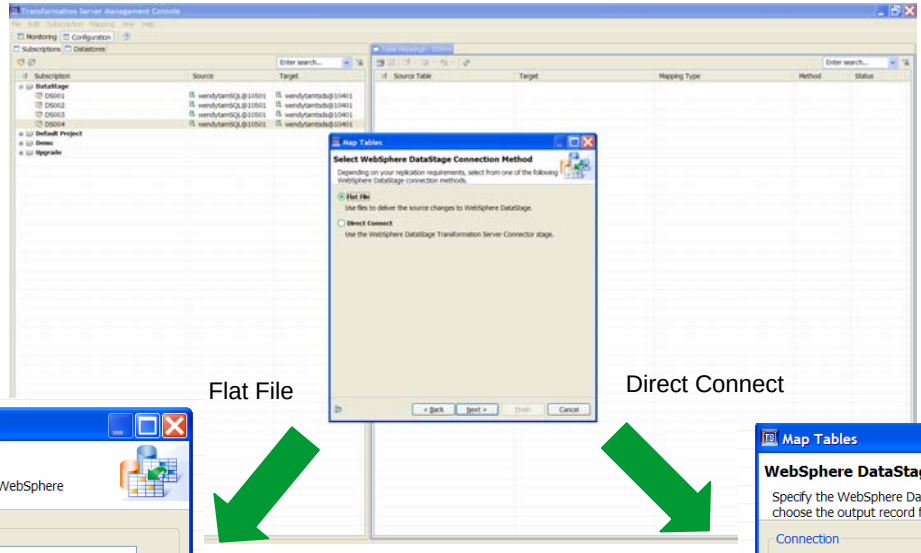


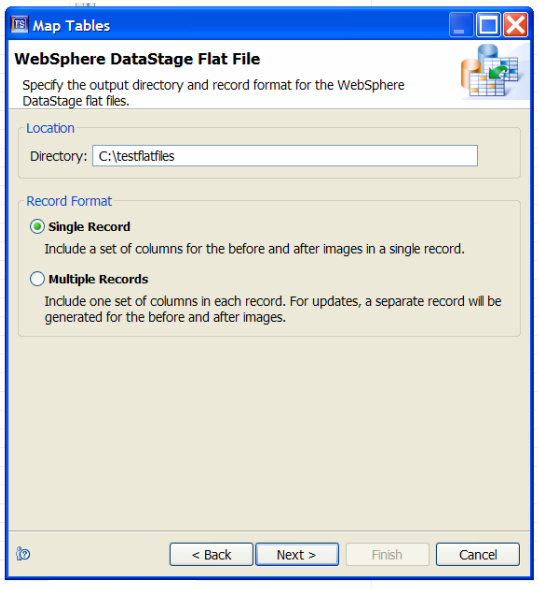
Table Mapping Wizard

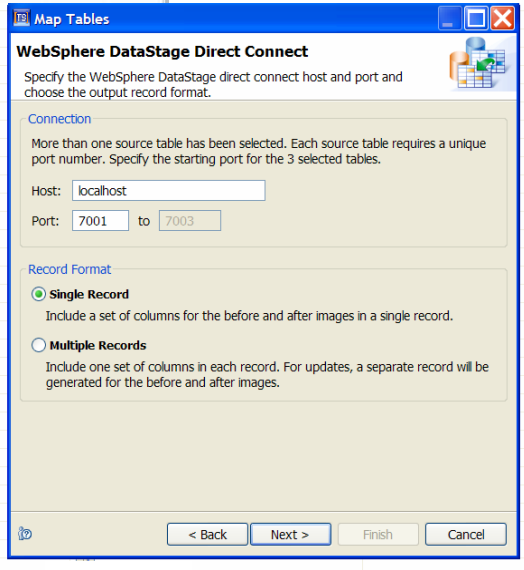
Table Mapping – Connection Methods (continued)



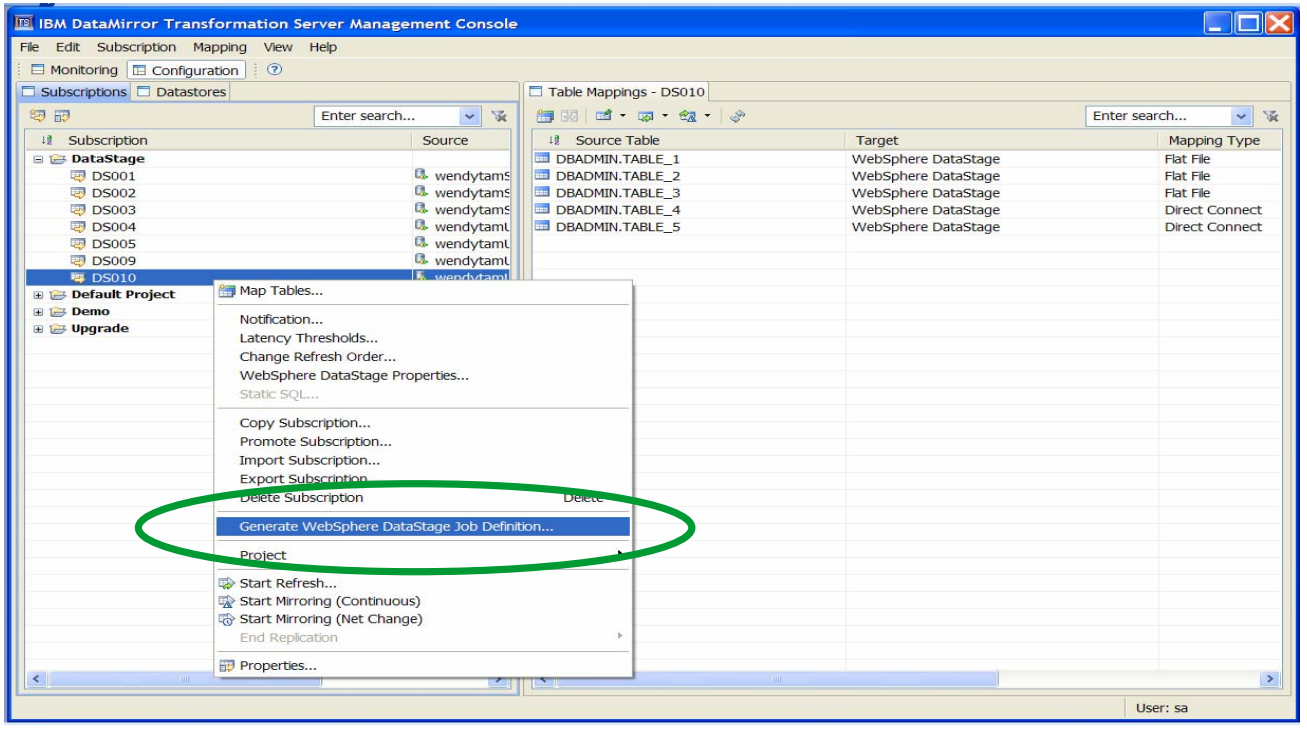
Flat File

Direct Connect





Generate WebSphere DataStage Definition



POV presso una società telefonica

- Versatilità dell'implementazione
  - Il fine ultimo è stato quello di creare unicamente il flat file. Non era richiesta l'integrazione con DataStage.

  - Esempio di Tracciato Record:

    "2008-02-28 17:29:40","663494","I","POC",,,"5","mariano"

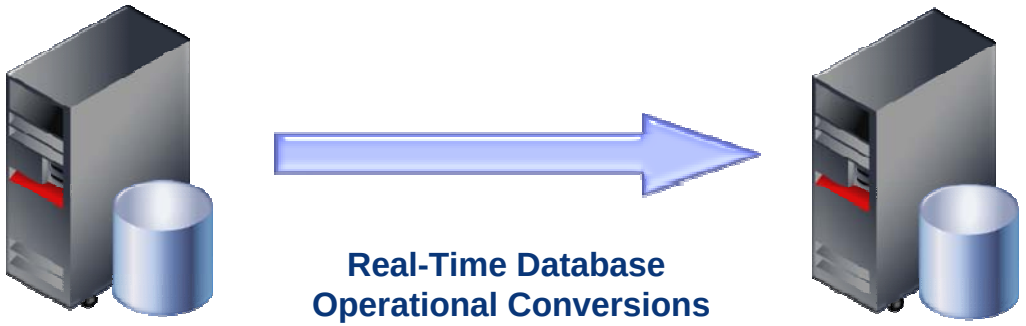
    "2008-02-28 17:31:31","269599","U","POC","5","mariano","5","monica"

    "2008-02-28 17:35:43","531801","I","POC",,,"2","1111"

Information Server CDC/LiveAudit

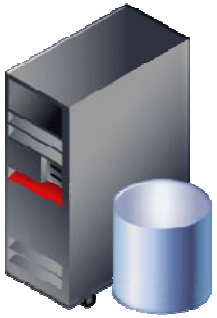
- Real-time data auditing solution
  - Captures data from production systems without impacting performance
  - Creates an audit trail and applies data to target systems in real time
  - Designed to work in compliment with Transformation Server
- Audit trails tracks information such as:
  - Who, what, when, and how data was changed
  - Preserves historical database information
  - Audits metadata as well:
    - Addition/Deletion of tables and columns
    - Changes to database properties

How TS/LiveAudit Works



Insert	→	**Insert**
Update	→	**Insert**
Delete	→	**Insert**

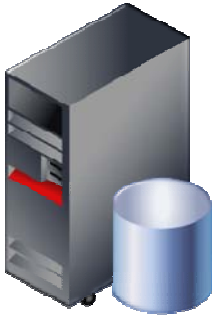
Example



Application Database

Product ID	Action	Qty
Drug001	Make	1000
Drug001	Calibrate Test Eqmt	-
Drug001	Test Initiated	1000
Drug001	Test Result: Passed	
Drug001	Bottle	1000
Drug001	Ship	1000

Regulations require that data is not manipulated and also records that are deleted cannot be reported on to make accurate decisions



LiveAudit Database

Date / Time	Action	User	Prd ID	Event	Qty
05/31/01-0800	I	jwalker	Drug001	Make	1000
05/31/01-1300	I	jwalker	Drug001	Calibrate Test Eqmt	-
05/31/01-1500	I	jwalker	Drug001	Test Initiated	1000
06/01/01-0800	I	jwalker	Drug001	Test Result: Particles Found	1000
06/01/01-0900	D	jwalker	Drug001	Particles Found	
06/01/01-1100	U	swilson	Drug001	Test Initiated	1000
06/02/01-0800	U	swilson	Drug001	Test Result: Pass	1000
06/01/01-1600	I	jwalker	Drug001	Bottle	1000
06/05/01-0800	I	jwalker	Drug001	Ship	1000

Auditing Capabilities

LiveAudit replicates production data to an auditing database and can create new database columns to capture additional data

- Type of data change made, origin of data change, etc

JOURNAL CONTROL COLUMNS

&CCID	An identifier for the transaction with the update.
&CNTRRN	Source table relative record number
&CODE	Always “U” for refresh. Always “R” for mirror.
&ENTTYP	Indicates the type of update.
&JOB	The name of the source job that made the update.
&JOBNO	The operating system user Id of the update process.
&JOBUSER	The operating system user at the time of the update.
&JOURNAL	The name of the journal, as described in Properties.
&JRNFLG	Indicates if before image is present
&JRNLIB	The name of the journal schema.
&LIBRARY	The source table schema or its alias.
&MEMBER	The source table name or its alias.
&PROGRAM	The name of source program that made the update.
&OBJECT	The source table name or its alias.
&SEQNO	The sequence number of this update in the journal.
&SYSTEM	The hostname of the source system
&TIMSTAMP	Time of the update or refresh.
&USER	The user ID which made the update.

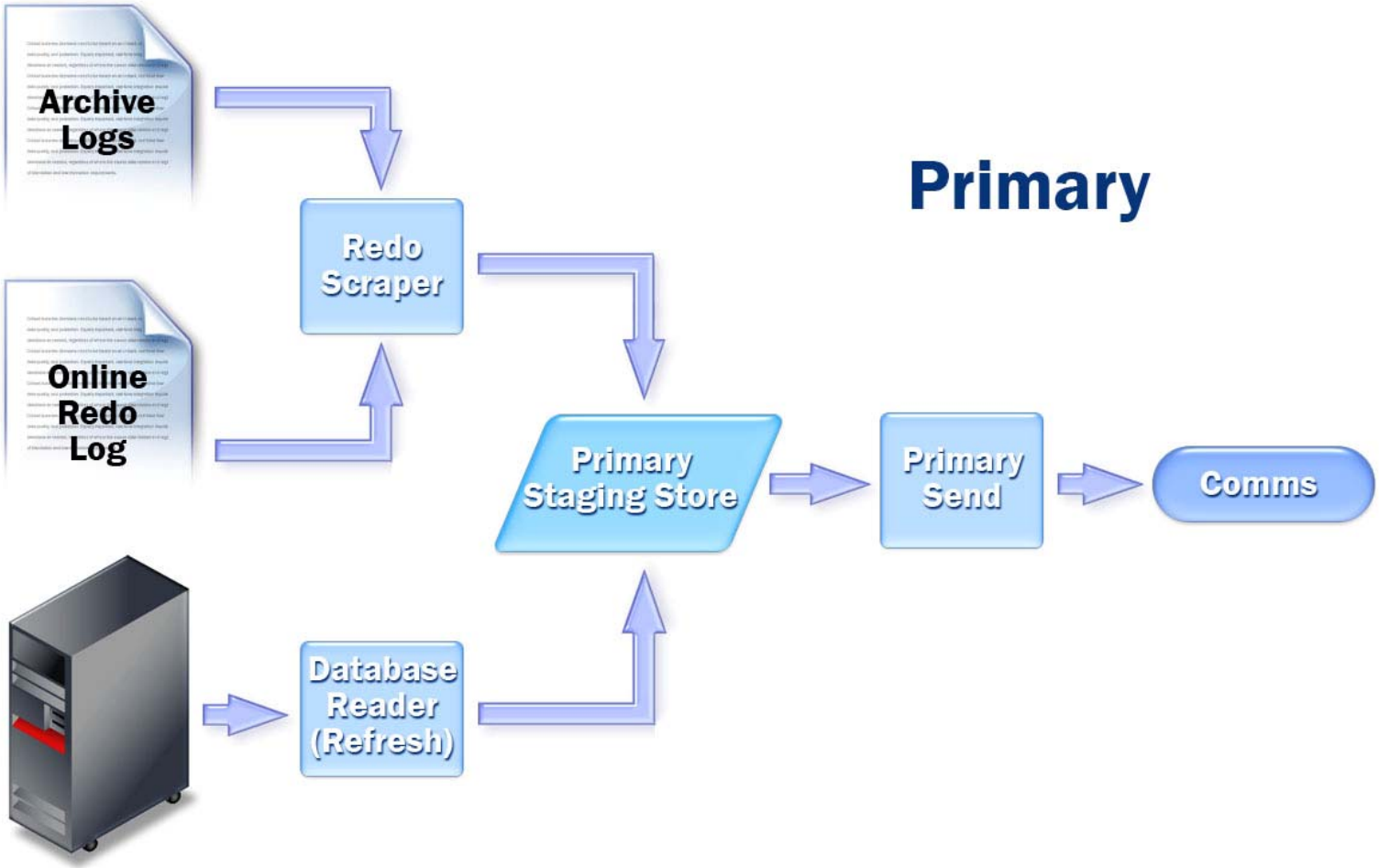
Data Backup And Availability

“Solution deployed to allow organizations to backup copies of critical data for recovery where a full disaster solution is not a requirement”.

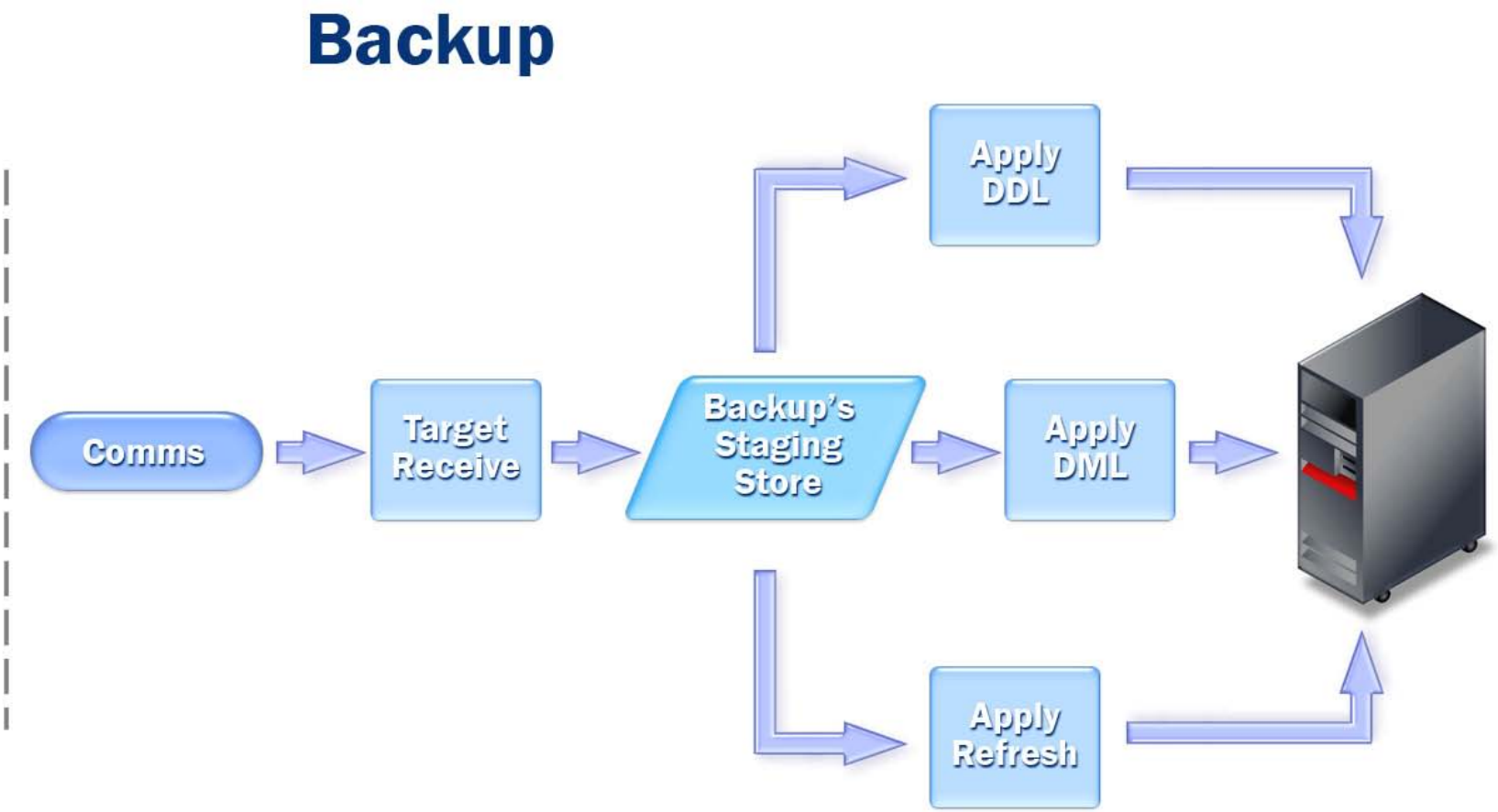
Feature:
Redo and Archive Logs

Business Benefits:
Real-Time, Minimum Resource Utilization

Architecture



Architecture



DML and DDL Replication

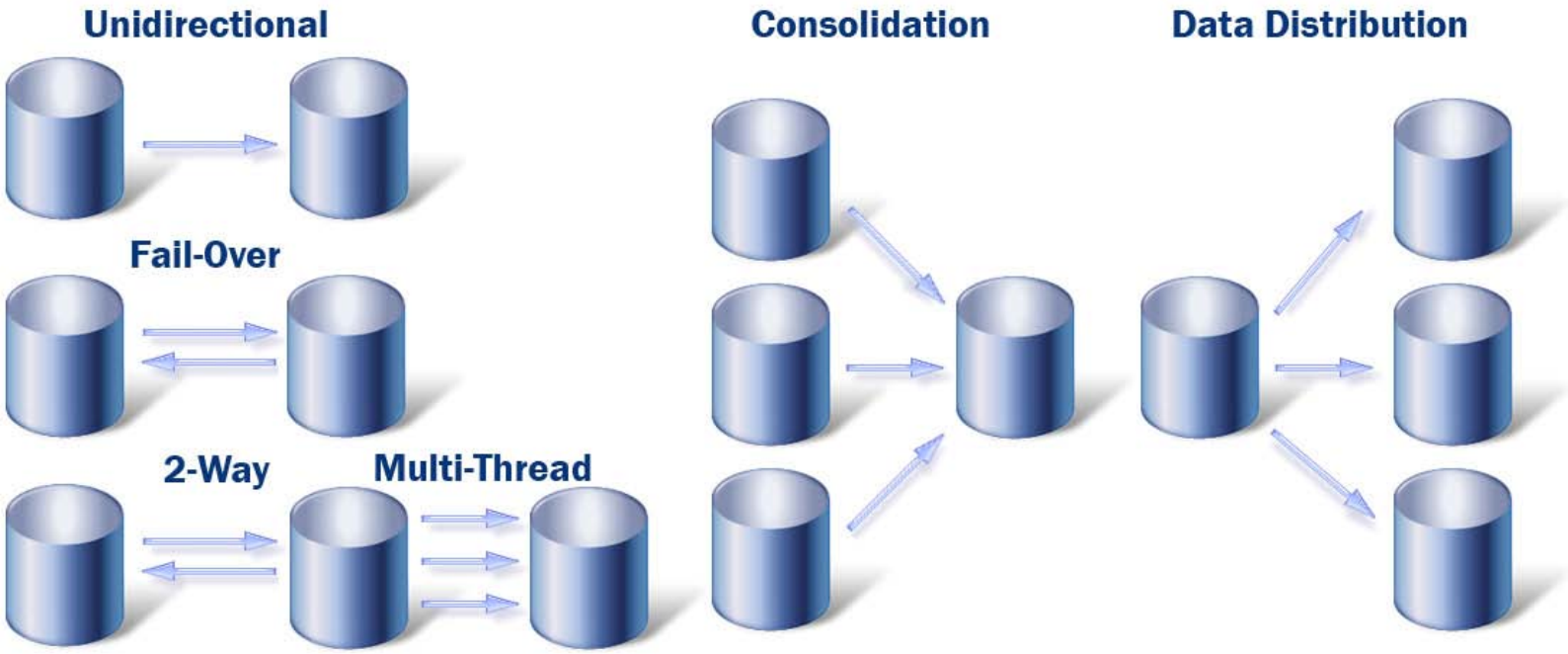
- Table
- Sequence
- Context
- Directory
- Dimension
- Function
- Index
- Library
- Materialized View
- Package
- Trigger
- Procedure
- Profile
- Resource Cost
- Role
- Rollback Segment
- Synonym
- Tablespace
- User
- View

Refresh and Mirroring Support for DDL

Feature:
Database Object/Schema Change Support (DDL)

Business Benefits:
Reduced User Errors and Admin, Better Data Integrity

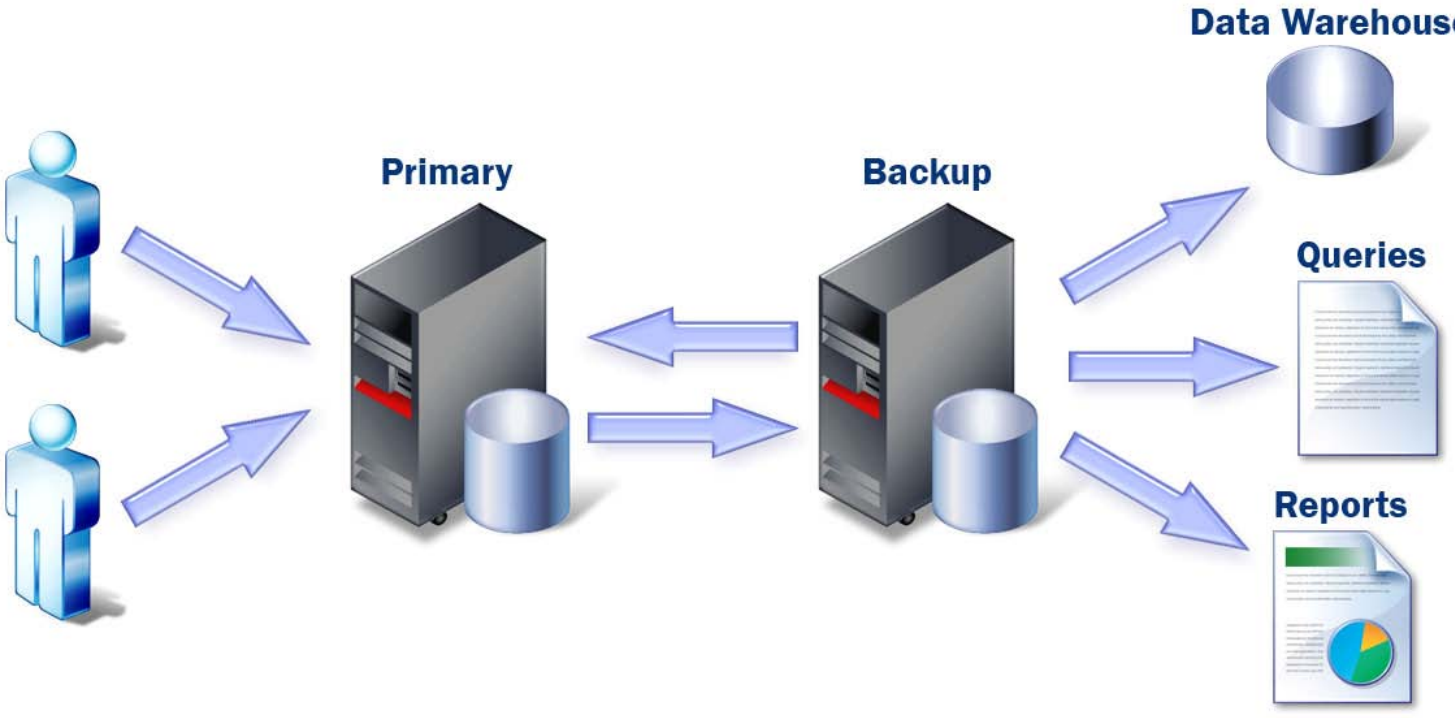
Flexible Implementation



Feature:
Extreme Scalability

Business Benefits:
Non-intrusive / Flexible Arch.,
Geographic Dispersion

Workload Balancing

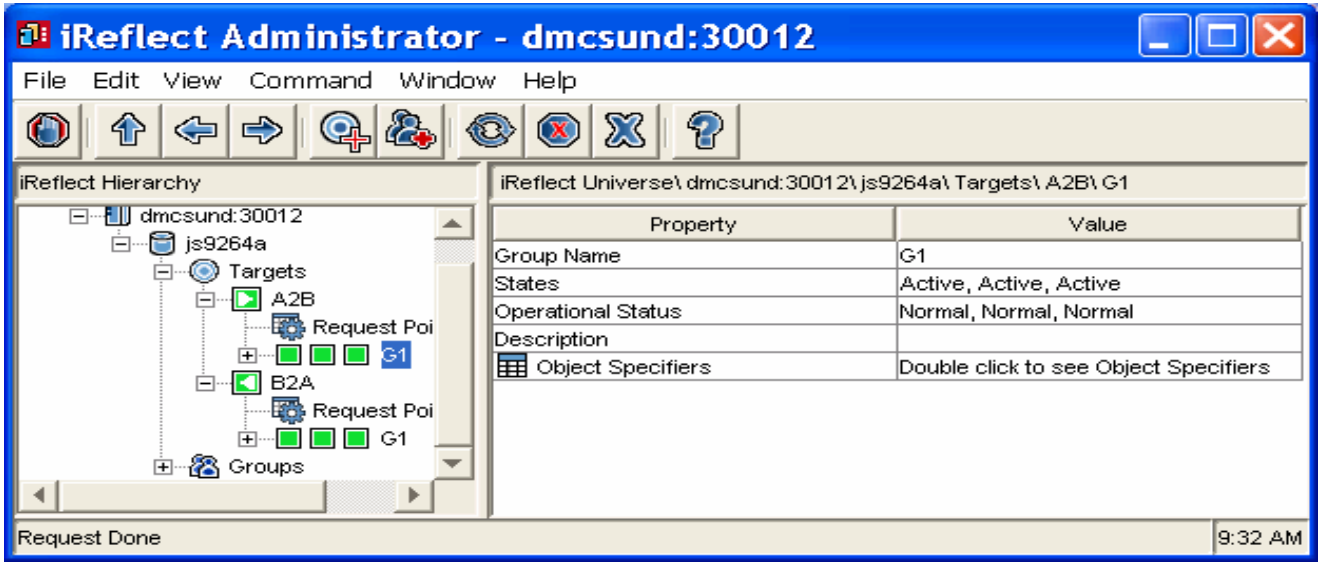


Feature:
Workload Distribution

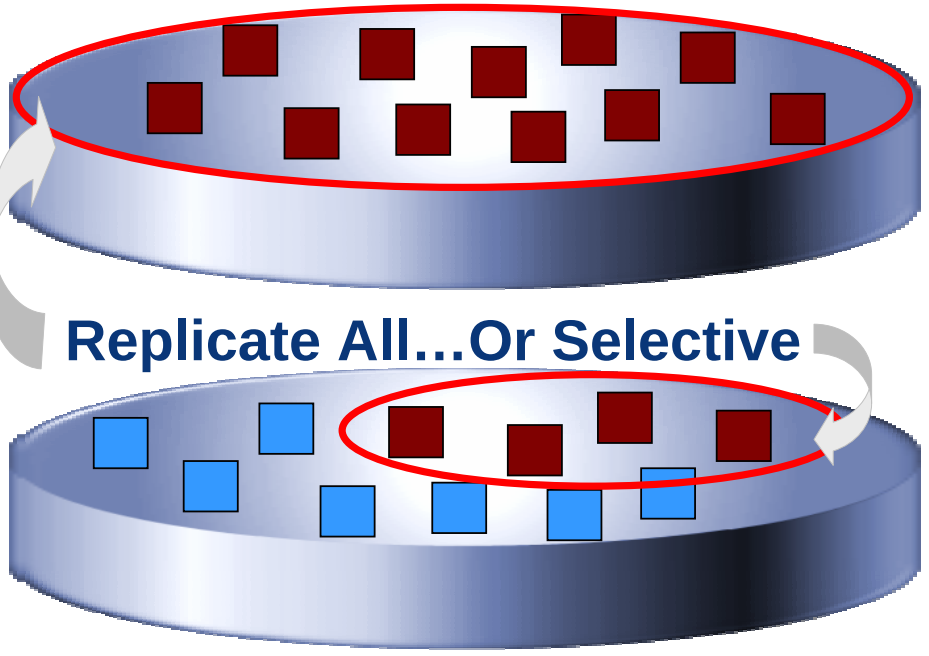
Business Benefit:
Extended Resource Capabilities

Master-to-Master Replication

- Supports any number of masters
- Supports DDL and DML changes
- Distributed Database Applications



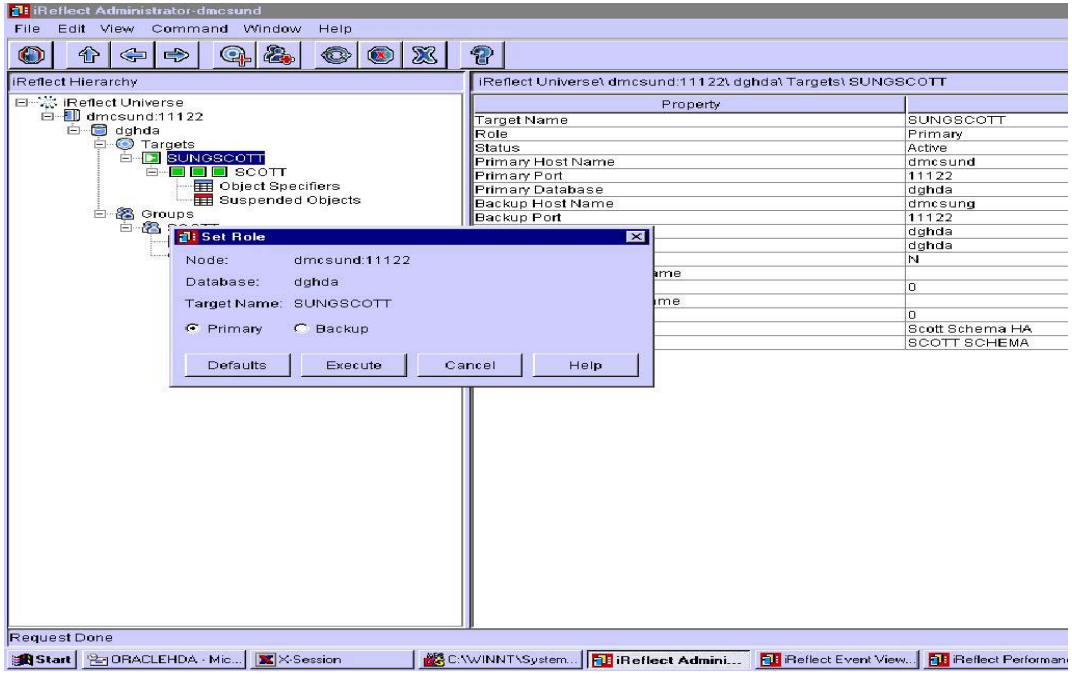
Selectable Replication



Feature:
Selective Data /
Object Replication

Business Benefit:
Flexible to Business Needs

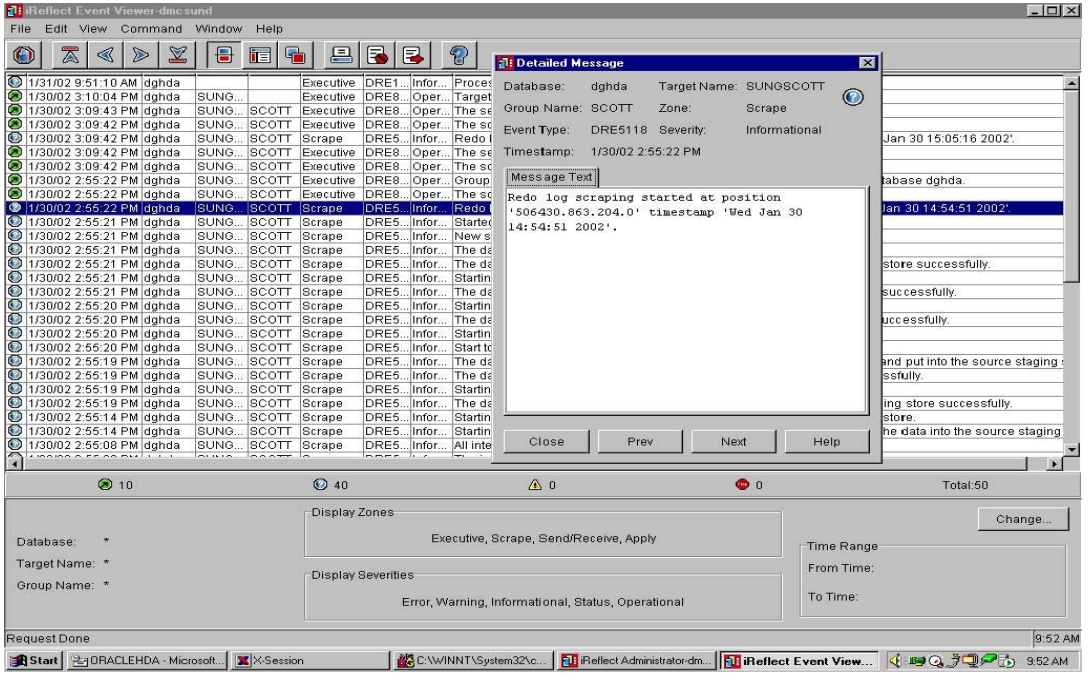
Java-Based Admin GUI



Feature:
Event Driven Administrator

Business Benefits:
Easier / More Efficient Admin.

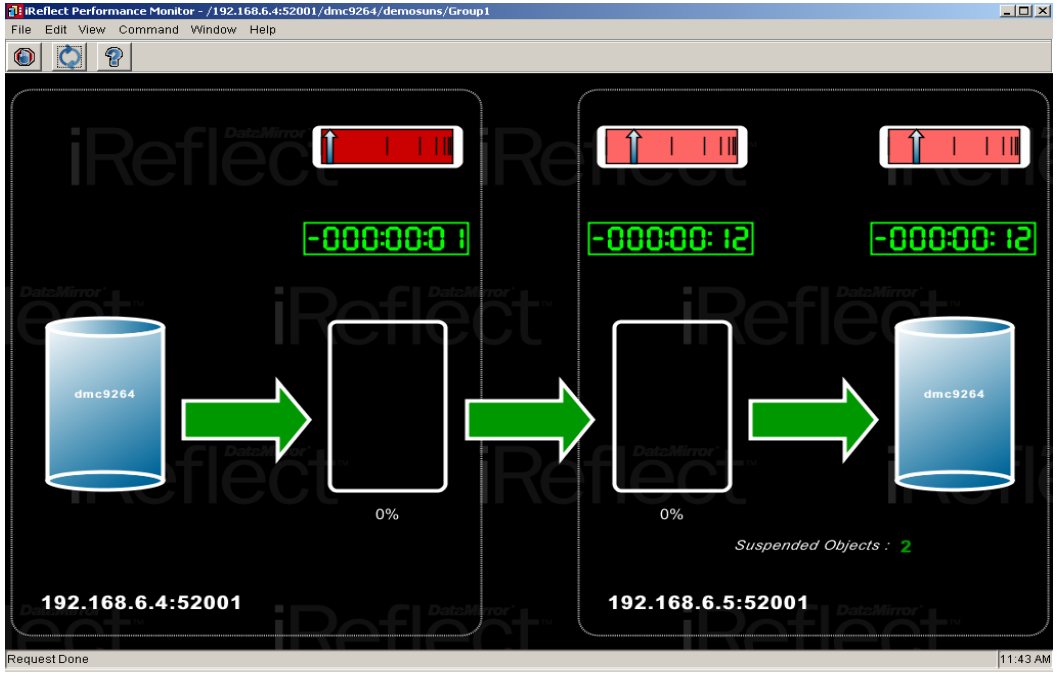
Event Viewer Java GUI



Feature:
Event Viewer

Business Benefits:
Easier / More Efficient Troubleshooting

Digital Graphical Monitor



Feature:
Digital Monitor

Business Benefits:
Easier / More Efficient Monitoring

Thank You

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Milano, 15 aprile 2008