The Operational Data Store
Tactical Analysis at Your Fingertips

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Agenda

- Architectural Differences Between the ODS and the Data Warehouse
- Classes of the Operational Data Store
- ODS Interfaces–What Comes in and What Goes Out!
- Which do You Build First – ODS or Data Warehouse?
Challenges

- New data requirements that do not appear to support traditional analytical BI
  - Membership number?
  - Customer name, address, and phone number?
  - Current status of problem?
- Increasing demands for data freshness, currency
  - Daily
  - Hourly
  - Up-to-the-second
Challenges

- Increasing demands for availability
  - 24 X 365!
  - 99.999% up time stats!
- Increasing demands for query response
  - Sub second
- New requirement to manage data in the data warehouse that was produced by the data mart
- An old user with a new look asking *unusual questions*
CIF - Some Unusual Requests

I need hourly reporting on call center performance.

I need access to the status and results of previous contacts with the customer.

I need to be notified immediately if fraud is detected against a customer’s account.

I need the Data Mart rebuilt daily!

I need to know what products belong to a customer.

I need the customer’s name and address.

I need the Data Warehouse updated daily!

I need to be able to assign and manage campaigns.

I need to know what orders from the 30 day backlog are scheduled to be shipped today?
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Major Business Functions

- Library & Toolbox
- Information Workshop
- Workbench

Business Operations

- Business Intelligence
- Business Management

- Systems Management
- Data Acquisition Management
- Service Management
- Change Management

- Operational Systems
- Operational Data Store
- Data Warehouse
- Exploration Warehouse
- Data Mining
- OLAP Data Mart
- Oper Mart

- External ERP
- Internet
- Legacy
- Other

- Business Operations
- Business Intelligence
- Business Management
The Operational Data Store is a subject-oriented, integrated, current, volatile collection of data used to support the tactical decision-making process for the enterprise.
Operational Data Store

... is a:

- subject-oriented
- integrated
- current
- volatile

... collection of data used to support the tactical decision making process for the enterprise.

*as defined by W. H. Inmon, Claudia Imhoff and Greg Battas in Building the Operational Data Store*
Operational Data Store

Role
- Is the central point of data integration for *Tactical Analysis*
- Delivers a common view of enterprise data
- Current data
- OLTP capabilities

Observations
- Supports actions resulting from *Business Intelligence* activities
- Relatively simple to deploy but expect more difficulty as data currency demands grow
- Provide access from anywhere in the corporation via common messaging interface
Operational Data Store

Organizations are building Operational Data Stores to:

- Provide operational data integration or consolidation to facilitate the sharing of critical data (e.g., integrated customer or product data)
- Provide integrated operational reporting across the organization (daily batch reporting)
- Provide integrated operational level tactical analysis that does not require time-series data.
Operational Data Store is NOT...

- The **ODS is NOT** used for strategic analysis
- The **ODS is NOT** the lowest level of detail in the data warehouse architecture
- The **ODS is NOT** a staging area for the data warehouse
- The **ODS is NOT** a department-specific application
Summary

- The ODS is a different structure than a data warehouse.

- The ODS is not a staging area for the data warehouse.

- The ODS is subject oriented, integrated, volatile and updated.
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- **Classes of the Operational Data Store**
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Classes of Operational Data Stores

- Frequency of update
  - Synchronous with source systems
  - Asynchronous with source systems

- Degree of integration and transformation
- Degree of summarization

**NOTE:** Managing users frequency expectations can be difficult!
Class I - Characteristics

- Updated synchronously
- Updates appear within 2 to 3 seconds after entered into source system
- Uses messaging middleware or enterprise application interface (EAI)
- Little – if any – integration and transformation
- High-performance, transaction dominated environment
- Limited on instantaneous summarization
Class I - Example

Airline Flight Information ODS: A flight delay updated in the flight scheduling system in New York shows up both in San Francisco airport’s gate management system and on the airline’s web site within seconds

- Sophisticated middleware or EAI makes this feasible
- Resource intensive
- High maintenance overhead
- Difficult to get initially synchronized
- Difficult and complex to maintain
- An expensive system!
Class II - Characteristics

- Data is stored and forwarded later
  - Refreshment multiple times a day
  - Anywhere from 15 minutes to several hours

- Not the immediacy of Class I ODS

- Some integration and transformation can occur as the data flows into the Class II ODS
Class II - Example

Bank Consolidated Accounts ODS: *Consolidated information on bank’s corporate customers with numerous dispersed accounts*

- The customer has many accounts with a nation-wide bank
  - Multiple branches
- The bank has disparate source systems
  - Customer information everywhere
  - Consolidation is needed!
- ODS will contain relatively simple data structures and integration
- Less load on network than a Class I ODS
- Less expensive
Class III - Characteristics

- Most asynchronous class of ODS
- Overnight data movement to the ODS
  - Once a day and ONLY once a day
  - Data is trapped in the operational environment and updated into the ODS
- Some source data may be a snapshot at end of the day
- Usually updated in batch mode
- Significantly more integration and transformation possible
Class III - Example

- Integrated Customer – Product Profile ODS: Computer peripherals manufacturer needs customer product profile information on a national basis for better customer support and enhanced sales opportunities
  - ODS is fully integrated and complex transformations are possible allowing integration
  - ODS has complex data structures
  - Easiest to maintain
Class IV - Characteristics

- Analysis (profiling) completed in the data warehouse
  - Via Feedback loop knowledge is applied to current list on the ODS

- Data movement at regular/irregular intervals

- A Class I, II, or III can become a Class IV

- Requires the data warehouse to be in place
Other ODS Renditions

- Refresh daily
  - Truncate tables and reload
  - Easy to build
  - No integration
  - Data starts aging immediately
  - Short life

- Combining a Class I, II, III and/or IV
  - Very powerful
  - Difficult to construct
  - Challenging to maintain
  - Frequency of updates can be global
# Class Comparisons

<table>
<thead>
<tr>
<th></th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Refresh Frequency</strong></td>
<td>Seconds to Minutes</td>
<td>Minutes to Hours</td>
<td>Daily</td>
<td>Whenever</td>
</tr>
<tr>
<td><strong>Technologies</strong></td>
<td>Real-time messaging middleware and ETL products</td>
<td>Store and forward middleware and ETL products</td>
<td>Batch oriented, store and forward middleware and ETL products</td>
<td>ETL</td>
</tr>
<tr>
<td><strong>Degree of enterprise integration and transformation</strong></td>
<td>None to Low</td>
<td>Low to Medium</td>
<td>Medium to High</td>
<td>High</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>High</td>
<td>Moderate to High</td>
<td>Moderate</td>
<td>Minimal</td>
</tr>
<tr>
<td><strong>Summarization</strong></td>
<td>None *</td>
<td>Very Little **</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Summary

- Classes of ODS
  - Different technologies and purposes
  - Based on different refresh needs and strategies
- Class I is instantaneous updates
- Class II has a frequency of 15 minutes to several hours
- Class III is updated once a day
- Class IV feeds information from the data warehouse to any class of ODS
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Data Acquisition is the set of processes that capture, integrate, transform, cleanse, and load source data into the data warehouse and operational data store.
Messaging Products

- IBM MQSeries
- Tibco
- Neon
- Tuxedo
EAI Vendors

- BizTalk – Microsoft
- Data Junction – Integration Architect
- iWay – IBI
- SeeBeyond
- Virtuoso – OpenLink
- Vitria
- WebMethods
- WebSphere - IBM
ETL Tools and the ODS

- IBM – Visual Warehouse, Data Propagator, Data Joiner
- CA – Data Mover
- Data Junction
- Eti
- Informatica – PowerCenter
- Ascential – DataStage
- Oracle – Warehouse Builder (Carleton)
- Sagent – Group 1

- Coglin Mill – Rodin
- Data Mirror - Constellar
- Ab Initio
- Embarcadero – DT/Studio
- Microsoft – DTS
- Hummingbird – Genio
- Business Objects – Data Integrator
- SAS
EAI and ETL Together

- ETL can use the logical goodness of EAI to pull data
- Real-time integration and consolidation for the ODS
- ETL becomes the ‘heavy-lifter’
- EAI becomes the connectivity

NOTE: Will these technologies merge into one?
The Oper-Mart is a subset of data derived from the operational data store used in tactical analysis and usually stored in a multidimensional manner (star schema or hypercube). They may be created in a temporary manner and dismantled when no longer needed.
Oper-Marts or ODS “Data Marts”

- Reporting cubes (OLAP), summary tables, small star schemas
- Not synchronous or dynamic
  - Rebuilt often
- Reflect the data as of a point in time
- Will likely lag in currency from the rest of the ODS
Cubes and the ODS

- Drill thru to Operational systems
- Digital Dashboards
- Plug in ODS, Oper Mart with a portal
- Vendors
  - Cognos – PowerPlay
  - SQLServer – Analytic Services
  - Hyperion – Essbase
  - Packaged Analytics
Managed Query Tools and the ODS

- Business Objects
- Cognos - Impromptu
- Crystal Reports (Business Objects)
- Brio Query (Hyperion)
- SAS
- CA – Forest and Trees
- CA – Info Beacon
- Oracle Reports
- Microstrategies
ODS to DW and DW or Data Mart to ODS
The Transactional Interface is an easy-to-use and intuitive interface for the end user to access and manipulate data in the operational data store.
Transactional Interface Programming Tools and the ODS

- Microsoft - Visual Basic
- Sybase – Powerbuilder
- JAVA
- C, C++
- COBOL
- Oracle Forms
The Decision Support Interface is an easy-to-use, intuitive tool to enable end user capabilities such as exploration, data mining, OLAP, query, and reporting to distill information from data.
Summary

- Interfaces will need to be created:
  - From the operational systems to the ODS (and back)
  - From the ODS to the oper-mart
  - From the ODS to the data warehouse
  - From the data warehouse or data mart to the ODS
  - Transactional interface
- Middleware software – a very useful where frequency of update is extremely important
- ETL tools (with meta data) – a large part of work effort
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Reasons to Build an ODS

- Integration of corporate data
- Tactical decision support
- Data sharing and accessibility
- Reporting to off-load the operational system
ODS First

- Complex operational systems

- Multiple merges and acquisition

- CRM – current customer information
  - Attention to customer touch processes

- Objective: Integrated, high-quality, current accessible data
Reasons to Build a Data Warehouse

- Need for historical analysis – trends, patterns
- No clear picture of profitability
- Losing customers and market share but don’t know why
Data Warehouse First

- **Strategic marketing analysis**
  - Attract and retain a customer
    - Needs
    - Wants
    - Desires
  - Determine customer buying habits
  - Determine customer profitability
  - Perform demographic profiling

- Assumption: well integrated operational systems
Hybrid Environment?
Hybrid Environment

Can’t I build a hybrid environment?

The answer is - Of course you can.

A hybrid environment (mixing tactical OLTP and DSS with strategic DSS) CAN be implemented.

However, just because you CAN do it doesn't mean you SHOULD.

The massive differences in these two constructs should make it clear that they should NEVER be combined.
Hybrid Environment

- ODS and Data Warehouse differ greatly in:
  - Table space allocations
  - Referential integrity strategy
  - Row level locking
  - Amount of detailed data (historical versus current)
  - Currency of the data
  - Backup and recovery strategies
  - Indexing schemes
  - Disaster recovery strategy
  - Reorganization of the database
Implications of mixing the two together:

- Architectural objectives will not be met.
  - Environment developed may not meet ANY client requirements (for either OLTP or OLAP).
- Credibility and validity of analytical information may be compromised.
- Performance becomes a big issue.
- The cost in terms of technology and resources to maintain and monitor this hybrid are great.
Summary

- An organization builds an ODS for various reasons, one of the most important is an integrated customer database.
- The ODS plays an important role in CRM for customer integration.
- An integrated corporate operational data store can become crucial for day to day business in every industry.
Questions?
Recommended Reading
Books

- Mastering Data Warehouse Design - Relational and Dimensional Techniques, by Claudia Imhoff, Nicholas Galemmo, and Jonathan G. Geiger (John Wiley & Sons, 2003)
  - Claudia Imhoff, Nicholas Galemmo, and Jonathan Geiger
- Corporate Information Factory
  - W. H. Inmon, Claudia Imhoff and Ryan Sousa
- Building the Customer Centric Enterprise: Data Warehousing Techniques for Supporting Customer Relationship Management
  - Claudia Imhoff, Lisa Loftis, and Jonathan G. Geiger
Books

- Data Warehousing for e-Business
  - W. H. Inmon, R. H. Terdeman, Joyce Norris-Montanari, Dan Meers
- Building the Data Warehouse
  - W. H. Inmon
- Building the Operational Data Store
  - W. H. Inmon, Claudia Imhoff and Greg Battas
Books

- The Data Warehouse Lifecycle Toolkit
  - Ralph Kimball, L. Reeves, M. Ross, W. Thornthwaite

- Mastering Data Mining
  - Michael J. A. Berry, Gordon Linoff

- Data Warehouse Performance
  - W. H. Inmon, Ken Rudin, Christopher K. Buss, Ryan Sousa

- Building and Managing the Meta Data Repository
  - David Marco
Books

- The Data Model Resource Book (Volumes 1 and 2)
  - Len Silverston
- Improving Data Warehouse and Business Information Quality
  - Larry P. English
- Data Warehouse Management Handbook
  - Richard Kachur
- Data Warehouse Project Management
  - Sid Adelman and Larissa T. Moss
  - Addison Wesley – ISBN 0-201-61635-1
Articles

- “Just Plug in the Data Appliance and GO! By Claudia Imhoff (DM review, May 2003)
- “Keep your friends close, and your enemies closer” by Claudia Imhoff (DM Review, April 2003)
- “All Parallelism Is NOT Created Equal!” by Joyce Norris-Montanari (TDWI Flashpoint, March 2003)
Articles

- “Growing Pains” by Claudia Imhoff and David Imhoff (DM Review, February 2003)
- “Take a Trip and Never Leave the Farm” by Claudia Imhoff (DM Review, January 2003)
- “We are fam-i-ly – Managing Corporate Relationships for Better CRM” by Claudia Imhoff & Lisa Loftis (DM Review, December 2002)
- “Crystal Clear Customers – The Role of the Operational Data Store” by Claudia Imhoff (DM Review, October 2002)
Articles

- “CRM Analytics” by Claudia Imhoff and Lisa Loftis (DM Review, August 2002)
- “Where’s the Brain? The Role of the Program Management Office” by Claudia Imhoff (DM Review July 2002)
- “Analytical Applications – The New Kids on the Block” by Claudia Imhoff (DM Review June 2002)
- “The Oper Mart Application – Continuing the Story” by Claudia Imhoff and Joyce Norris-Montanari (DM Review May 2002)
- “Sharing the Wealth: Putting it all together in the Corporate Information Factory” by Claudia Imhoff (DM Review April 2002)
Articles

- “The Corporate Information Factory Comes of Age” by Claudia Imhoff and the Intelligent Solutions Team (DM Review March 2002)
- “The CRM Maturity Scale” by Claudia Imhoff (DM Review, February 2002)
Articles

- “Instant CRM – Just add vendors!” by Claudia Imhoff and Lisa Loftis (DM Review, November 2001)
- “Do It My Way or the Highway…Evolving from Personalization to Customization” by Claudia Imhoff (DM Review, October 2001)
- “Subject-Orientation in a Data Warehouse” by Jonathan G. Geiger (The Data Warehousing Institute Flashpoint, September 26, 2001)
- “Oper-Marts – An Evolution of the Operational Data Store” by Claudia Imhoff (DM Review, September 2001)
- “Getting to Know You, Getting to Know All About You” (DM Review, August 2001)
- “All Mach – No Vector” by Claudia Imhoff (DM Review, July 2001)
- “CRM ROI – Oxymoron or Management Mandate?” by Claudia Imhoff (e-Business Advisor, July 2001)
Articles

- “CRM – Technology is not Enough” by Claudia Imhoff and Lisa Loftis (DM Review, June 2001)
- “The Good, the Quick and the Easy” by Claudia Imhoff (DM Review, May 2001)
- “Create an Enterprise Portal Infrastructure” by Claudia Imhoff (eBusiness Advisor, May 2001)
- “Mass Customization – The Next Technological Advance for Business Intelligence” by Claudia Imhoff (DM Review, April 2001)
- “Creating a Truly Customer-Centric Enterprise - The Role of Analytical CRM” by Claudia Imhoff (Microsoft Executive Circle, Q2 2001)
Articles

- “Quality Relationships Begin With Quality Data” by Claudia Imhoff and Jonathan G. Geiger (e-Business Advisor March 2001)
- “Howdy Pard’ner” by Claudia Imhoff and Jonathan G. Geiger (DM Review March 2001)