IBM Information On Demand 2007

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IBM Data Servers Application Development and Administration Trends and Directions

Curt Cotner, IBM Fellow, cotner@us.ibm.com

Session 1298A

Act.Right.Now.

IBM INFORMATION ON DEMAND 2007
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Mandalay Bay
Las Vegas, Nevada

IBM Data Servers

Reduce cost of deployment and management of data

- *Innovation to reduce the cost of infrastructure*
- *Innovation to manage the lifecycle of data -*
  from modeling and design through change management and sunsetting

Enable rapid use of data throughout the enterprise

- *Innovation that accelerates SOA and XML initiatives*
- *Innovation that leverages Web 2.0 and situational applications*

IBM Data Studio

What is it ?

IBM Data Studio is a comprehensive data management solution that empowers you to effectively design, develop, deploy and manage your data, databases and database applications throughout the entire application development life cycle utilizing a consistent and integrated user interface

IBM Data Studio

Who will use it ?

Data Life Cycle

Data Modeling	Application Development	Database Development	Database Management	Data Governance
Logical Modeling Physical Modeling Integration Modeling	Java .NET Web Services PHP RUBY COBOL	Stored Procedures SQL XQuery User Defined Functions	Administration Configuration Performance Management Backup & Recovery	Data Auditing Data Archiving Data Masking Data Encryption Security Access Security Analysis
Data Architect	*Application Developer*	*Database Developer*	*Database Administrator*	*Security Administrator*

Design **Develop** **Deploy** **Manage** **Govern**

IBM Data Studio

A Consistent, Integrated Solution

Application Developer

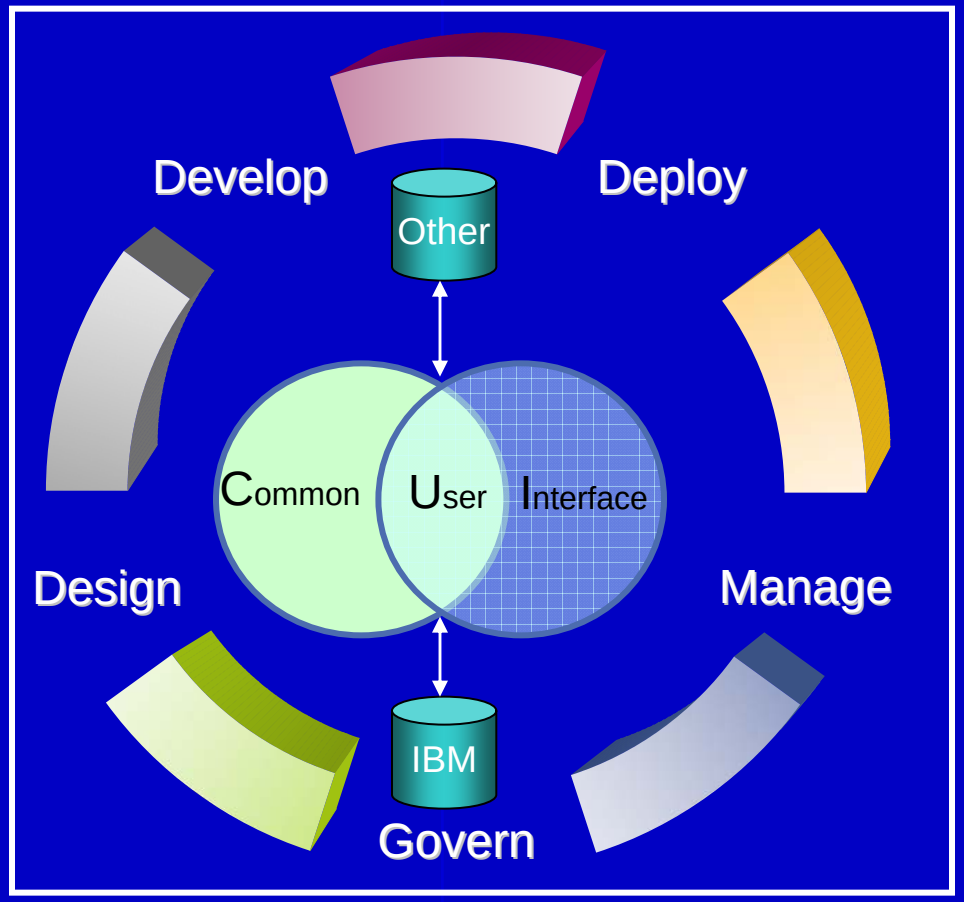
Database Developer

Develop
- Coding
- Debugging
- Teaming
- Testing
- Tuning

Design
- Logical Modeling
- Physical Modeling
- Integration Modeling

Business Analyst

Database Architect



Database Administrator

Manage
- Database Administration
- Data Management
- Change Management
- Recovery Management
- Storage Management
- Performance Management

Govern
- Security Access
- Security Analysis
- Data Auditing
- Data Archiving
- Data Masking
- Data Encryption

Security Administrator

IBM Data Studio v1.1

- Empowering developers and database administrators
- Complimentary and available in October of 2007
- Support for DB2 on all platforms and IDS

DB2 for LUW	DB2 for z/OS	DB2 for i5/OS	IDS
▪ Physical Data Modeling ▪ Data Distribution Viewer ▪ Integrated Query Editor ▪ SQL Builder ▪ SQL Routine Debugger ▪ Java Routine Debugger ▪ XML Editor ▪ XML Schema Editor ▪ pureQuery for Java ▪ Data Web Services ▪ Object Management ▪ Data Management ▪ Update Statistics ▪ Health Monitoring * ▪ Visual Explain ▪ Security Access Controls ▪ Project Management * Technical Preview	▪ Physical Data Modeling ▪ Data Distribution Viewer ▪ Integrated Query Editor ▪ SQL Builder ▪ SQL Routine Debugger ▪ Java Routine Debugger ▪ XML Editor ▪ XML Schema Editor ▪ pureQuery for Java ▪ Data Web Services ▪ Object Management ▪ Data Management ▪ Update Statistics ▪ Visual Explain ▪ Security Access Controls ▪ Project Management	▪ Physical Data Modeling ▪ Data Distribution Viewer ▪ Integrated Query Editor ▪ SQL Builder ▪ SQL Routine Debugger ▪ Java Routine Debugger ▪ XML Editor ▪ XML Schema Editor ▪ pureQuery for Java ▪ Data Web Services ▪ Object Management ▪ Data Management ▪ Security Access Controls ▪ Project Management	▪ Physical Data Modeling ▪ Data Distribution Viewer ▪ Integrated Query Editor ▪ SQL Builder ▪ XML Editor ▪ XML Schema Editor ▪ pureQuery for Java ▪ Data Web Services ▪ Object Management ▪ Data Management ▪ Security Access Controls ▪ Project Management

Why IBM Data Studio ?

Increase productivity for all roles throughout the data life cycle

- Slash development time up to 50% with an integrated data management environment
- Promote collaboration across roles to optimize data server and application performance
- Accelerate Java development productivity with new pureQuery data access
- Simplify development of applications implementing industry specific XML standards
- Monitor data server operation & performance anywhere, anytime from a Web browser

Simplify and speed development of new skills

- Learn once, use with all supported data servers
- Easy-to-use and integrated user interface, compatible with Rational Software Development Platform
- Extensible with Eclipse plug-ins to customize the environment for each team member

Accelerate data as a service for Service Oriented Architecture

- Develop and publish data as a Web service without programming
- Info 2.0 Ready - support for Web 2.0 protocols and format

IBM Data Studio -- Java Database Application Development, Monitoring, Management, Problem Determination

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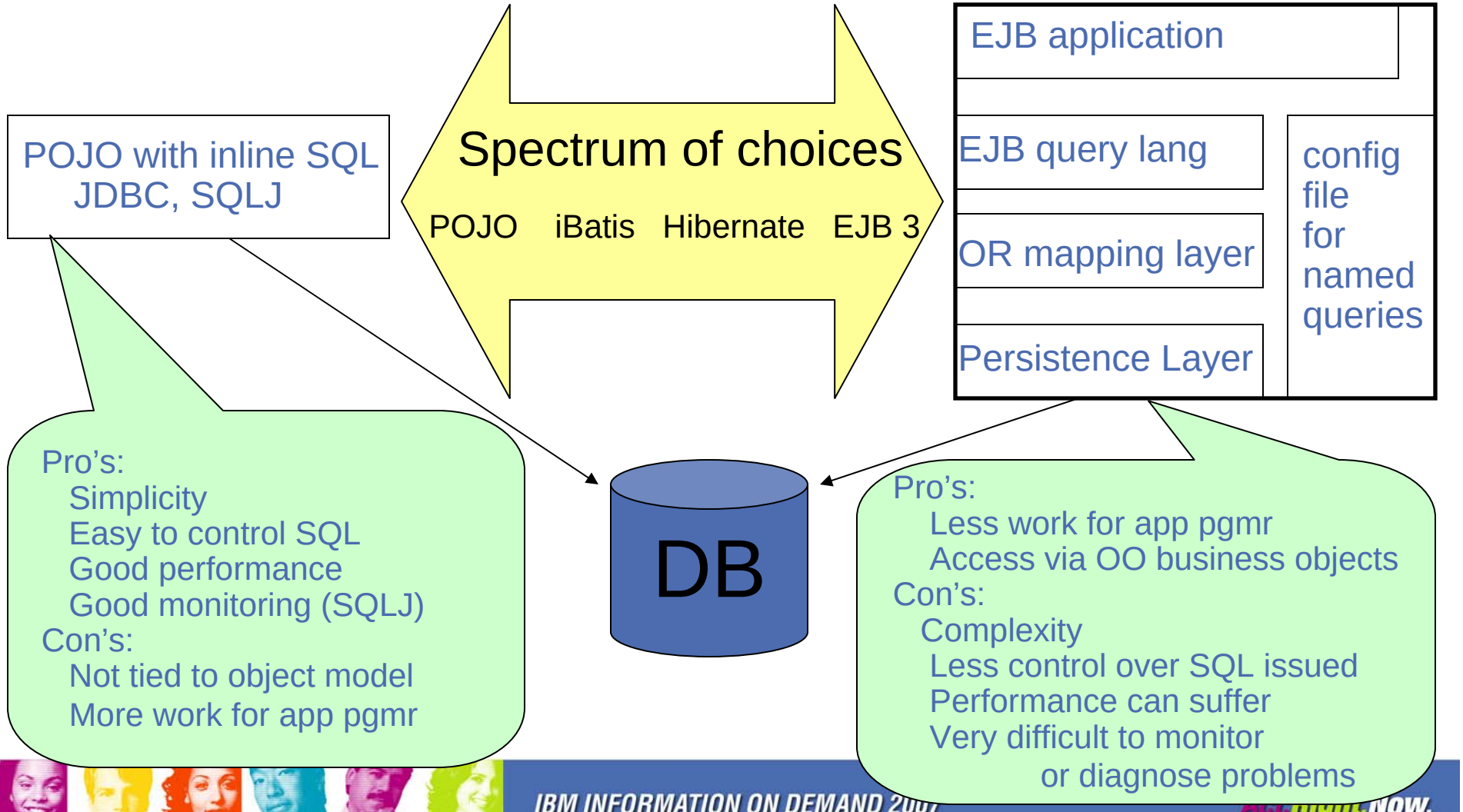
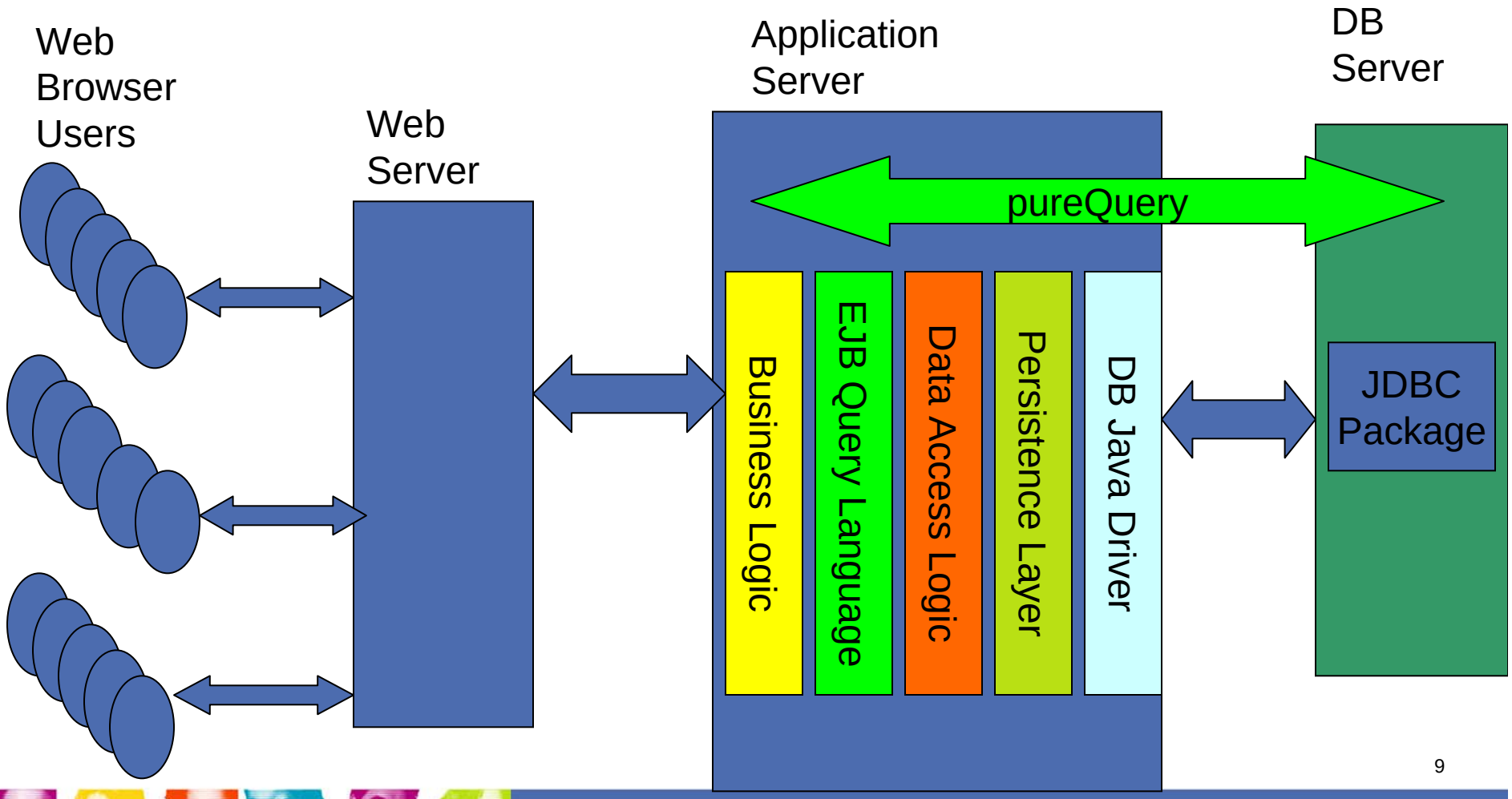
Java Data Access – many forms



Toughest issue for Web applications – Problem diagnosis and resolution



What performance/diagnosis challenges?

EJB Query Language:

```
SELECT object(e) FROM Employee e
  WHERE e.dept=?1 AND e.salary>=?2
```

Query language is a subset of SQL. Doesn't have all the SQL features you want.

App query syntax is different from SQL query. How do you track problem SQL queries back to the app that issued the original query???

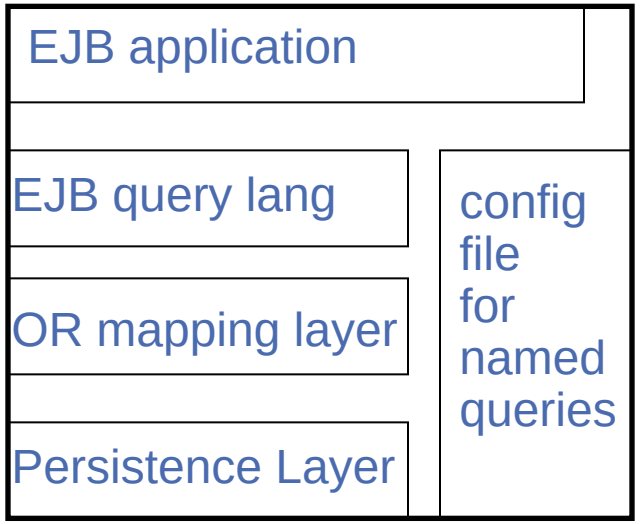
OR mapping, Transform to SQL

In most cases, queries map to JDBC. No ability to lock in access path at program deployment. No ability to search catalog to see which queries are issued by a given program.

SQL issued to database:

```
SELECT * FROM PROD.EMP
  WHERE DEPT=? AND SALARY>?
```

Often, app query is intercepted by persistence layer, and the resulting SQL query looks nothing like the app query.
-- Resulting query might perform badly.
-- Changing app query might not result in a similar change in the SQL query…



pureQuery – Beyond Function

- Development of applications
  - Tools to assist SQL development in .java source file
  - Simple SQL APIs, easy to write to and extend
  - Multiple API “styles” to align with popular Java frameworks
- Query important data sources simply
  - Database, Cache, Collections, XML
- Problem Determination
  - When problems occur, find source quickly.
- Governance / Management
  - Track SQL back to individual apps, lock in access paths with static SQL packages, align with customer change control processes
- Provide high performance/scalability
  - Application: short path length, coding over metadata, optional code gen, JDBC and static SQL runtime optimizations
  - Database: static SQL, batching, pass app SQL directly to database

pureQuery API “Styles”

- Support several API styles to fit well into all of the popular Java programming models/frameworks
  - Inline style (familiar JDBC and SQLJ approach)
  - Method style (similar to JDBC 4 ease of use enhancements)
  - Named query style (similar to iBatis/JDO/Hibernate/JPA)

Retrieve a single row from Database

pureQuery:

Automatically Optimizes for 1 row

```
addr = db.queryFirst("SELECT ADDRESS FROM EMP
            WHERE NAME=:name", String.class, name);
```

-or-

```
addr = getAddress(name);
```

XML file or Java annotation

```
SELECT ADDRESS FROM EMP
    WHERE NAME=?1;
```

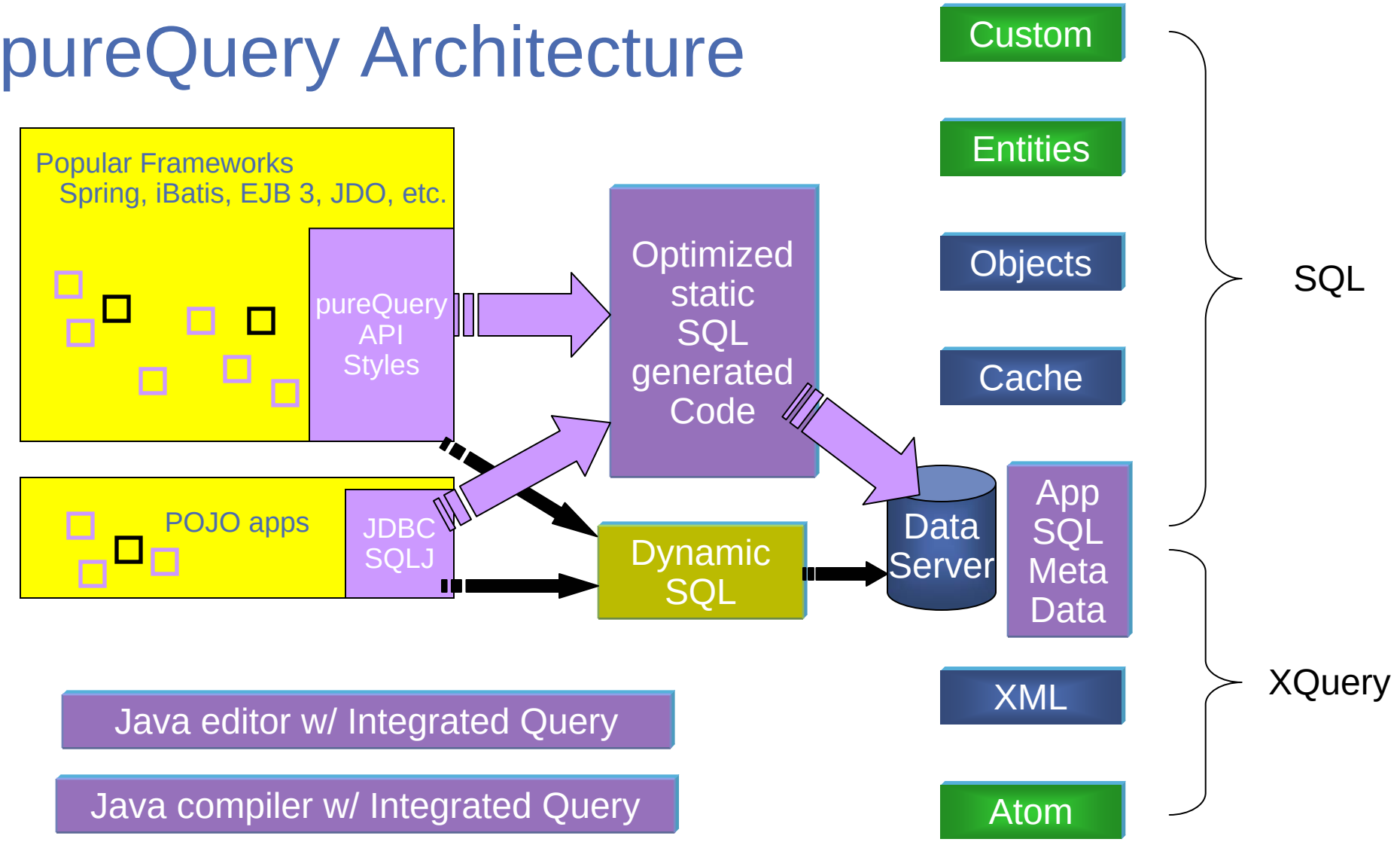
SQLJ:

```
#sql [con] { SELECT ADDRESS INTO :addr FROM EMP
            WHERE NAME=:name };
```

JDBC:

```
java.sql.PreparedStatement ps = con.prepareStatement(
      "SELECT ADDRESS FROM EMP WHERE NAME=?");
ps.setString(1, name);
java.sql.ResultSet names = ps.executeQuery();
names.next();
addr = names.getString(1);
names.close();
```

pureQuery Architecture



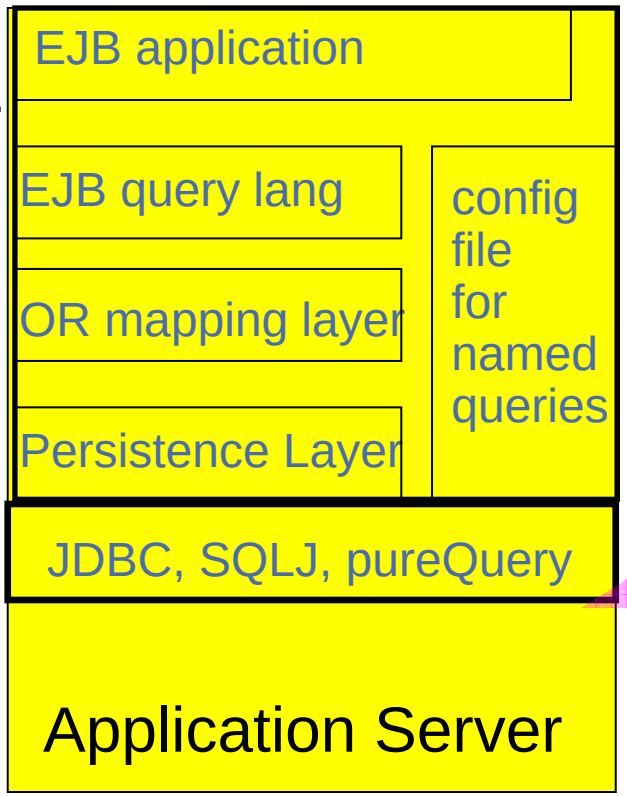
Problem Determination and Monitoring

Original query issued by app
Java class and line number
XML filename and line number
Last compile date/time for app
Full history of all SQL issued by each application

Generated static SQL
-- SQL after O/R mapping and persistence
-- plan lockdown
-- package versioning

Set Client Information APIs
-- end user's ID
-- end user's IP address
-- application name
-- accounting chargeback data

pureQuery



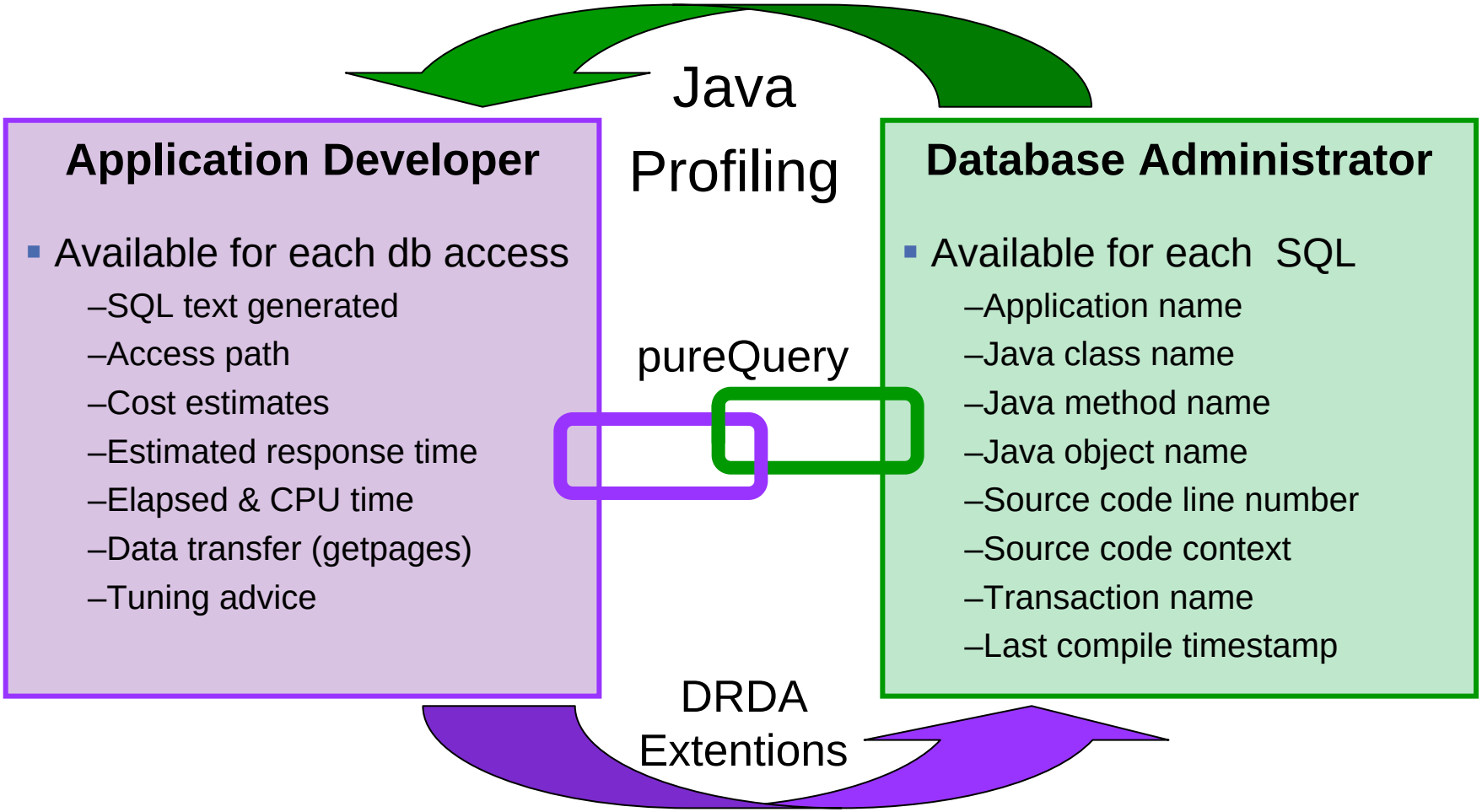
App server IP address
App server connection pool userid
JDBC driver package name

JDBC Static SQL Profiling
-- SQL after O/R mapping and persistence
-- Java stack trace for SQL call
-- plan lockdown
-- package versioning

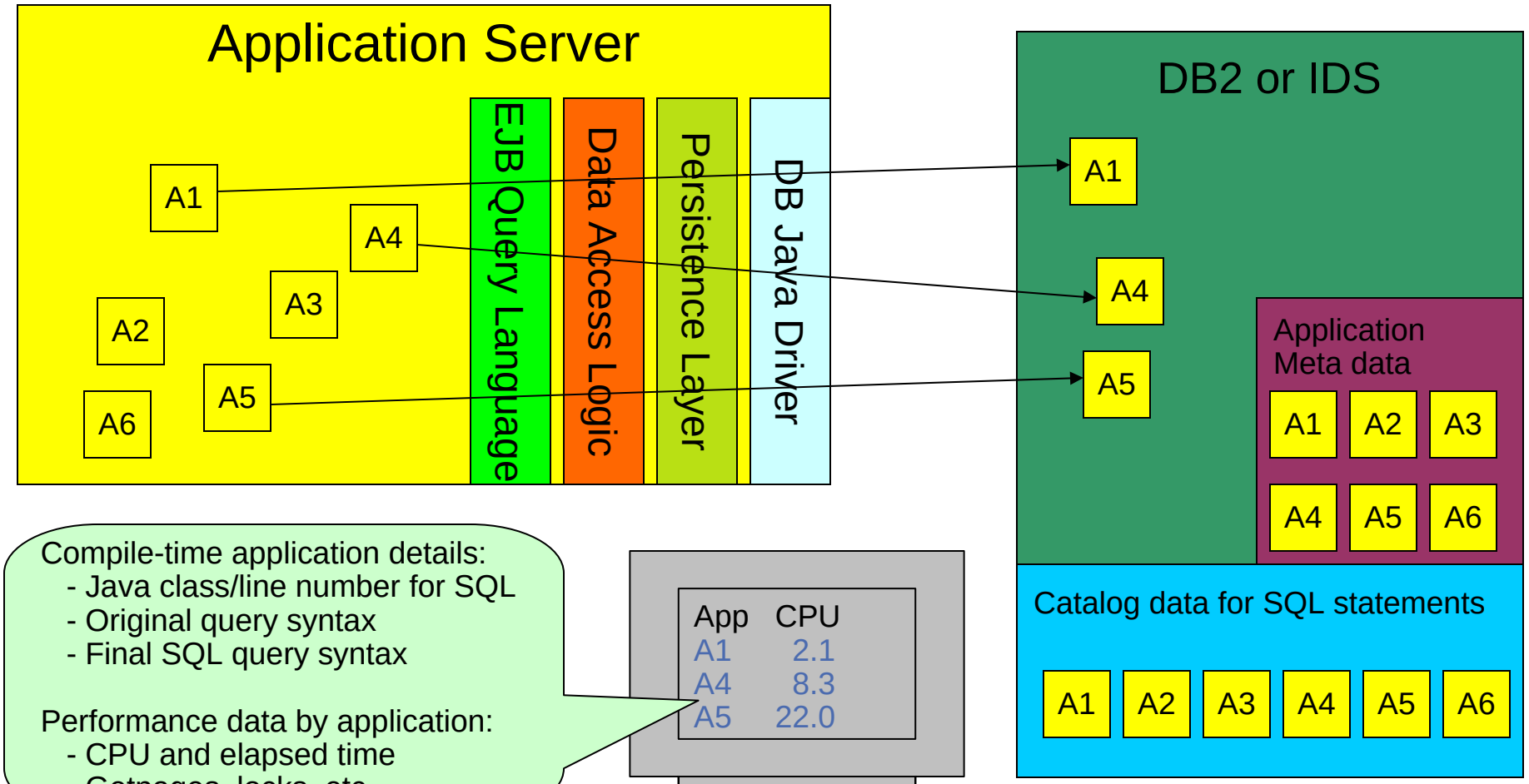
Set Client Information APIs
-- end user's ID
-- end user's IP address
-- application name
-- accounting chargeback data

JDBC

Simplifying Problem Determination Scenario



pureQuery with IBM Runtime/Tooling



IBM Data Studio in 2007

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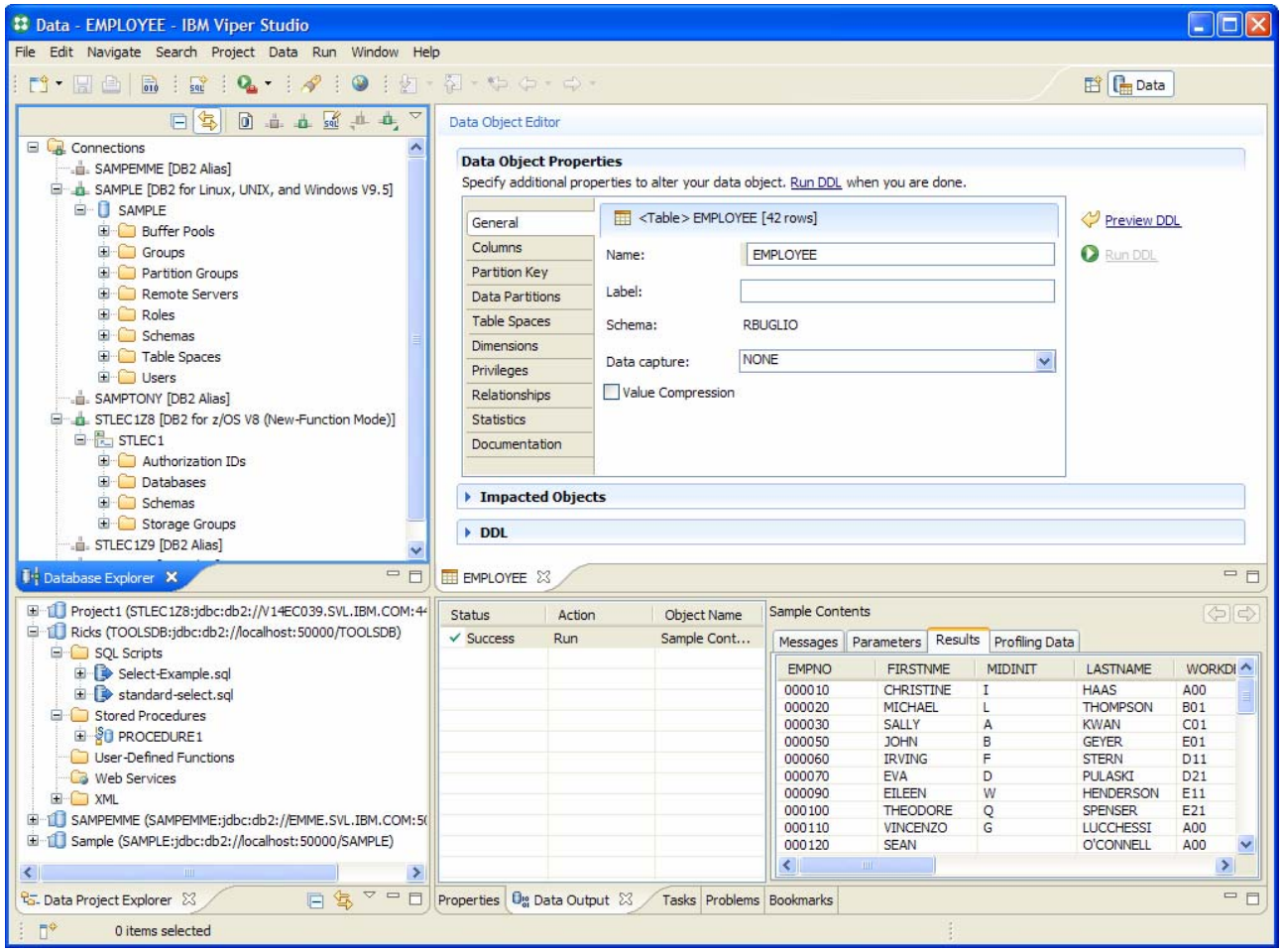
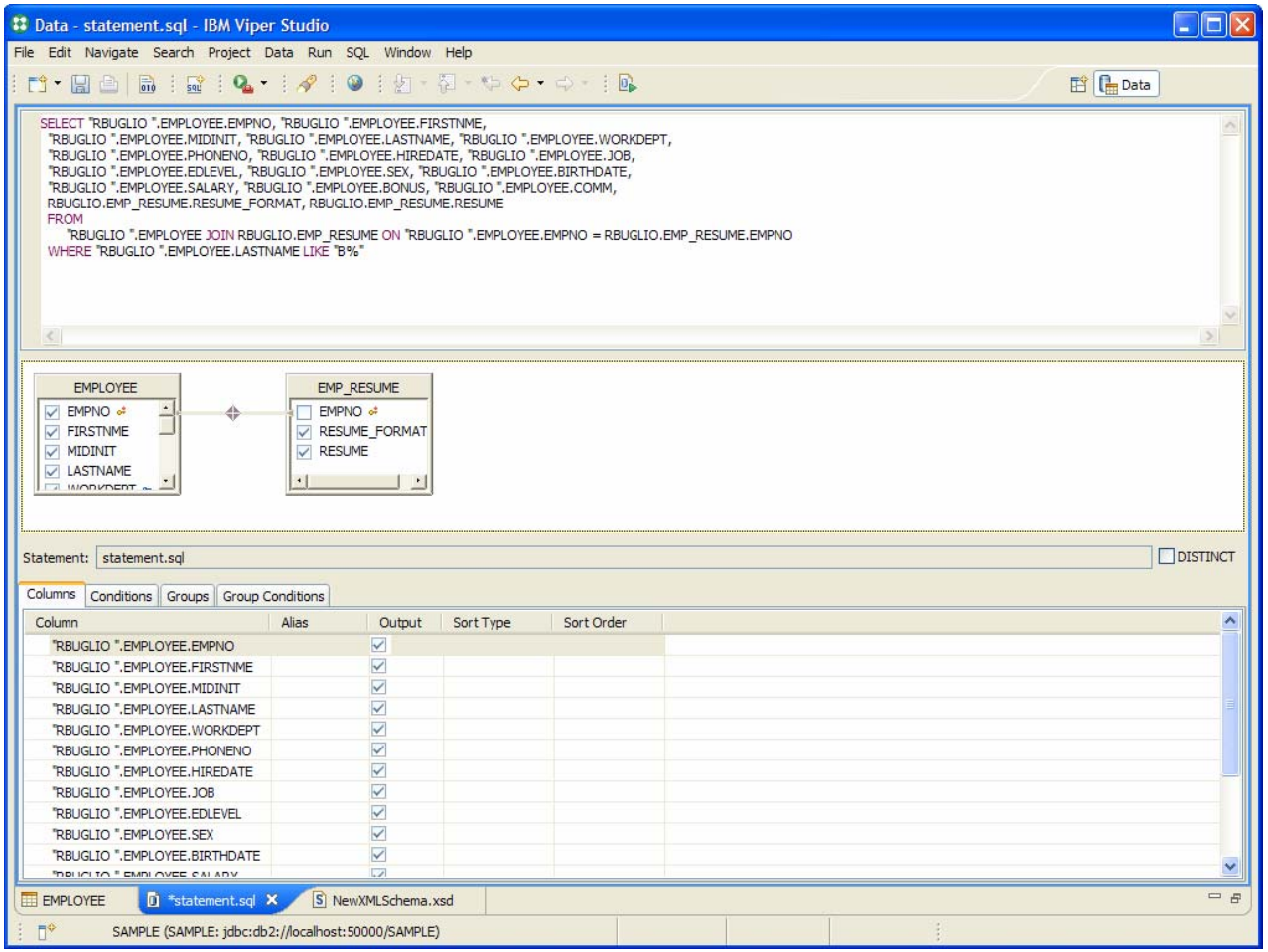
IBM Data Studio – Workbench

A single productive work environment



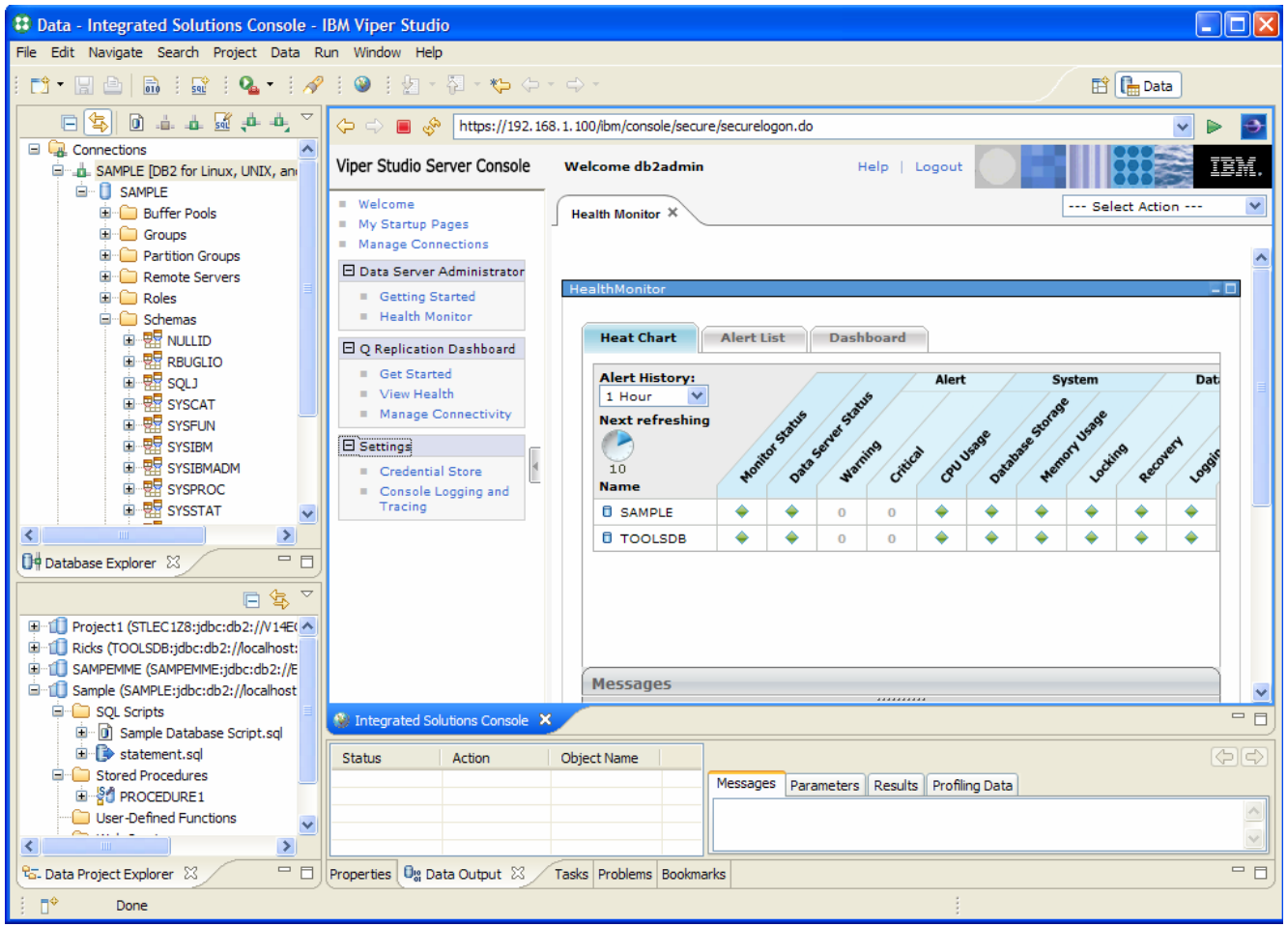
IBM Data Studio – Workbench

An integrated query editor for SQL and XQuery



IBM Data Studio – Workbench

Fully integrated with the Administration Console



IBM Data Studio - 2007

The Administration Console

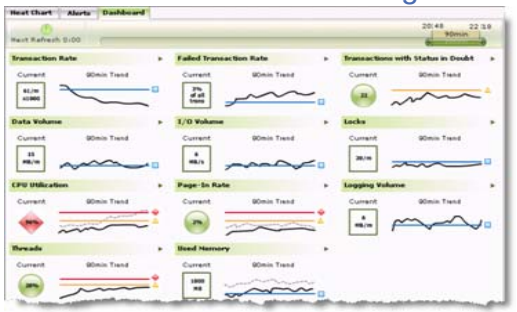
- What is it ?
  - A web based interface to perform operational database management tasks
  - Immediate access to critical data server information and functions from anywhere, anytime
- What's available in the first release
  - Health and availability monitoring
    - DB2 for LUW V9.5
      - Problem determination
      - Problem recommendations
      - 72 Hours of History
      - Ability to monitor up to 100 data servers
  - Q Replication monitoring and administration
- What will be available in the future?
  - Support for all IBM data servers – DB2 for z/OS, IDS and DB2 for i5/OS
  - The future home for all operational database management tasks
    - Performance Monitoring
    - Performance Analysis
    - Configuration Management
    - Utility Management
    - Storage Management
    - Security Management
    - Advanced Deployment Capabilities

Quick & Easy Problem Determination

Heatchart – Overall Health Status

Where are the most important hotspots that need my attention?

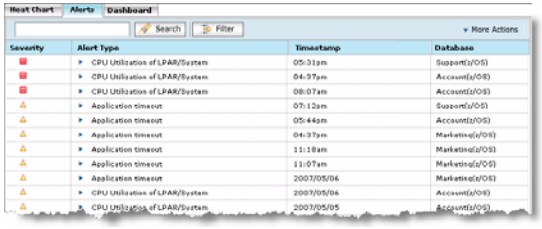
Dashboard – Adhoc Investigation



Something doesn't seem quite right. I wonder what's happening?

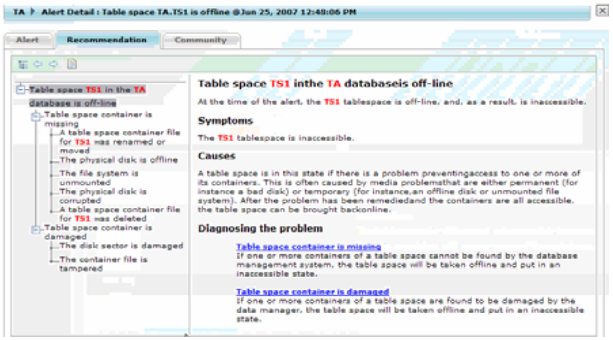
Database Administrator

Alert List – Historical Investigation



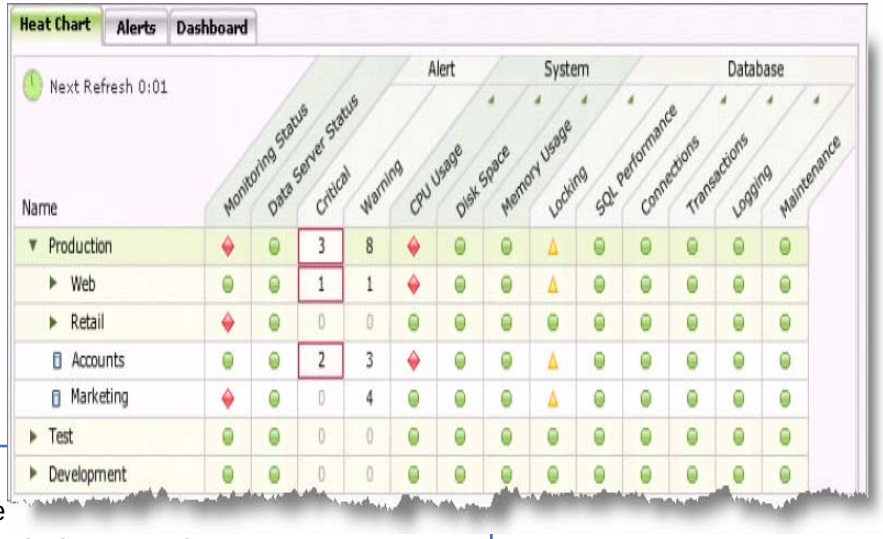
What happened when I was out for lunch? ... Away for weekend?

Recommendations – Root Cause Analysis



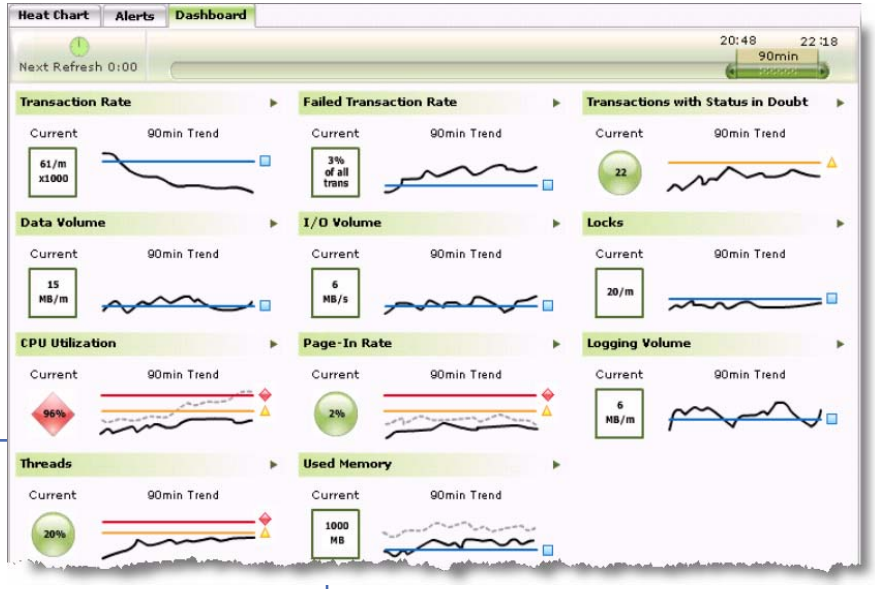
Guide me to the root cause and help me fix it properly; I need to know all the revelant info to make best decision.

The Heatchart
Overall Health Status



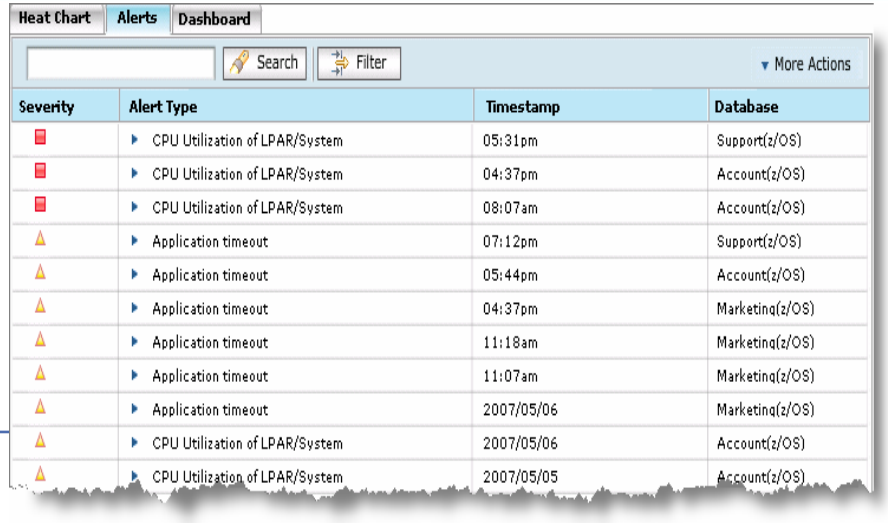
Locking	▪ Application causing lock escalation ▪ Table space inaccessible due to quiesced state ▪ Application waiting indefinitely for lock held by indoubt transaction
Database Storage	▪ Table space inaccessible because it is offline ▪ Running out of database storage ▪ Storage I/O problem
Recovery	▪ Database inaccessible because recovery is incomplete or failed ▪ Table space cannot be updated b/c it is in backup pending state ▪ Table space inaccessible b/c it is in drop pending state
System	▪ Bad response times due to high CPU usage ▪ Bad response times due to high memory usage
Logging	▪ Long running app is using too much log space ▪ Transaction log access problems ▪ Full log held by indoubt transaction ▪ Reduced application performance due to logging problems
Monitor Status	▪ Monitor agent offline ▪ Monitoring turned off by user
Data Server Status	▪ Data server not responding

The Dashboard Adhoc Investigation



Locking	▪ Number of locks held ▪ Deadlock rate ▪ Lock escalation rate ▪ Number of lock waits
Transaction Activity	▪ Transaction rate ▪ Failed transaction rate ▪ Number of indoubt transactions
I/O Activity	▪ Data Volume ▪ I/O Volume
Connections	▪ Number of connections ▪ High-water-mark of connection
System	▪ CPU load % ▪ Used/Free real memory ▪ Used/Free virtual memory ▪ Used/Free swap memory
Logging	▪ Logging volume
Recovery	▪ Days since last backup

The Alert List Historical Analysis



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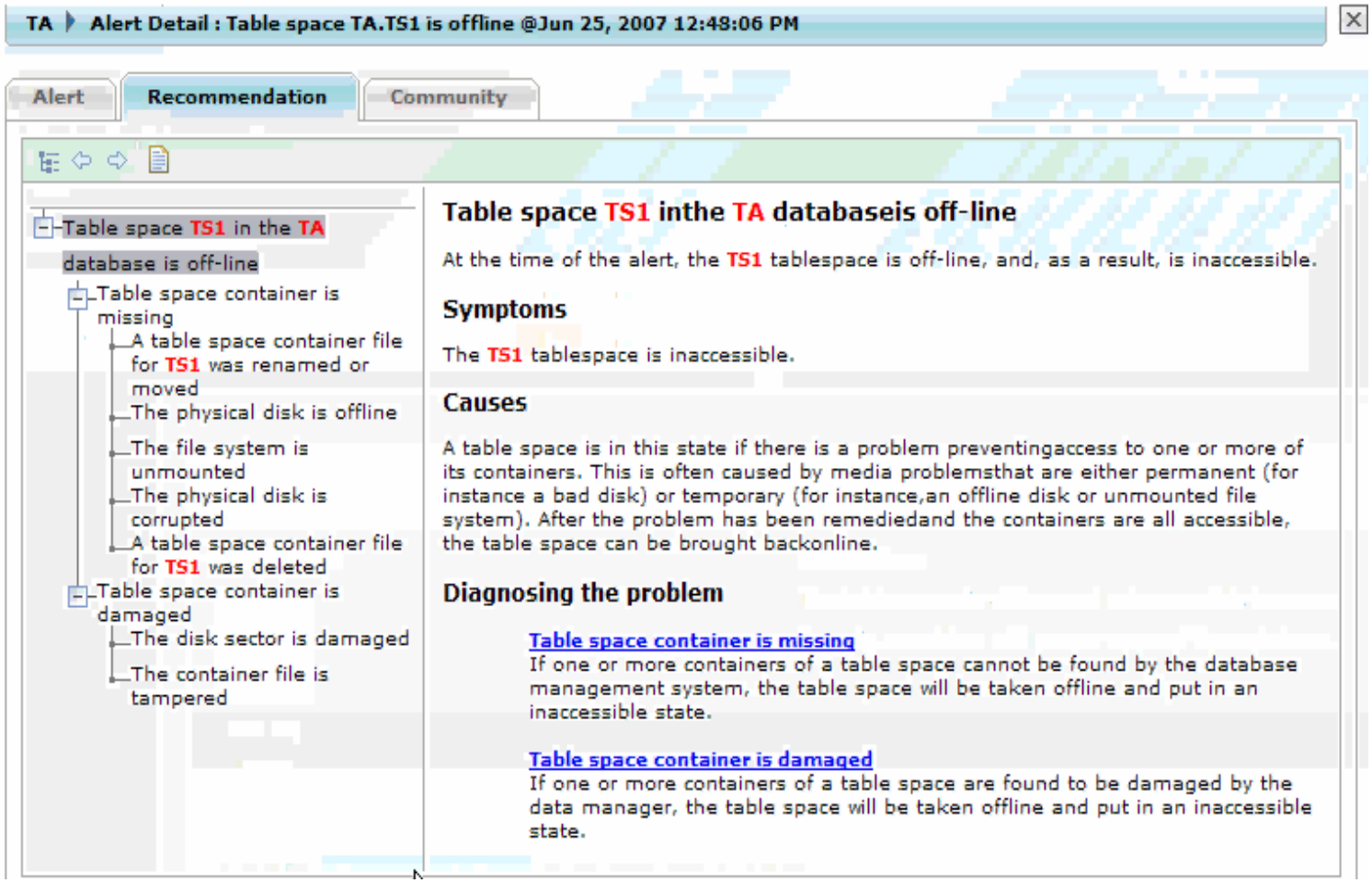
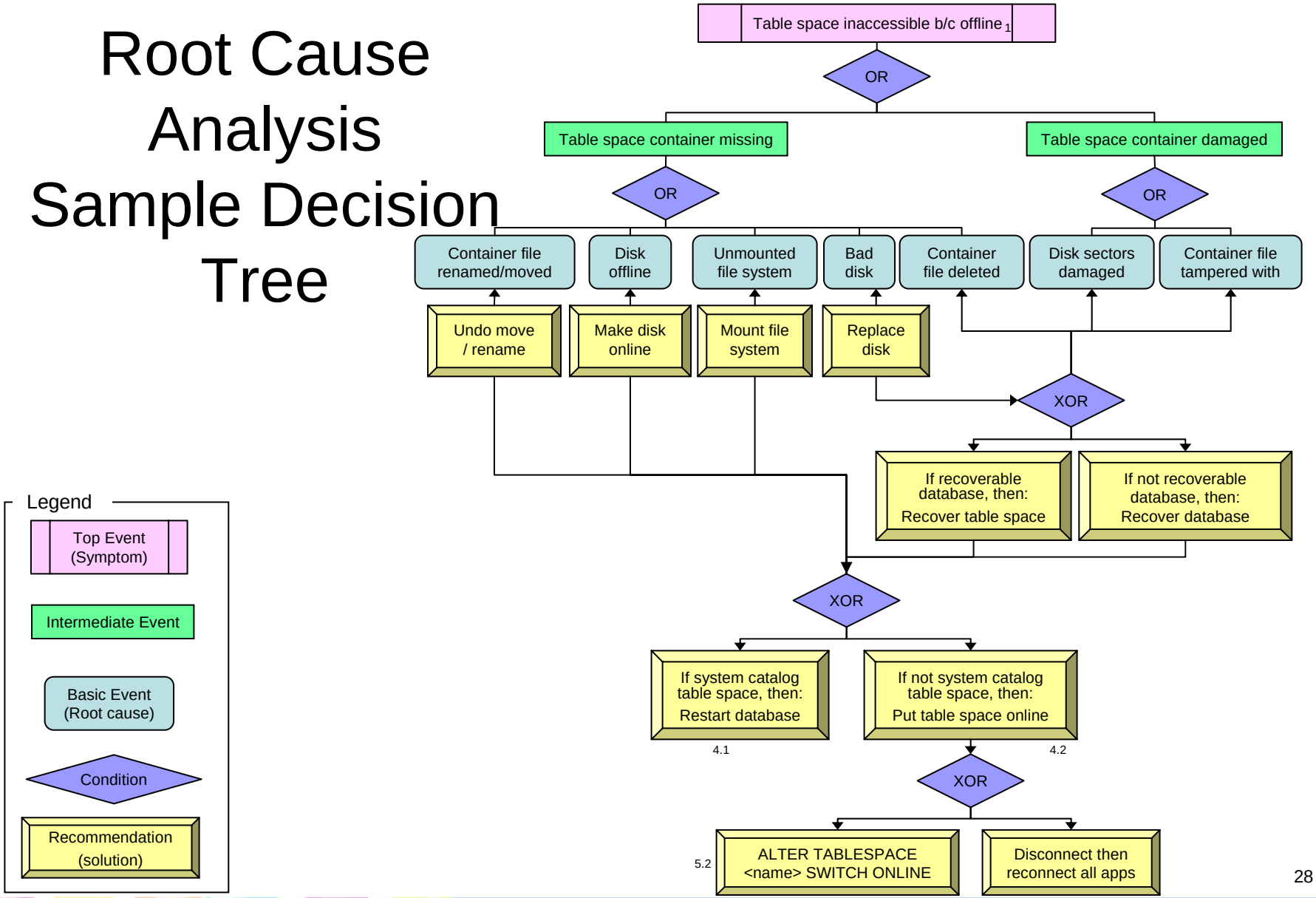
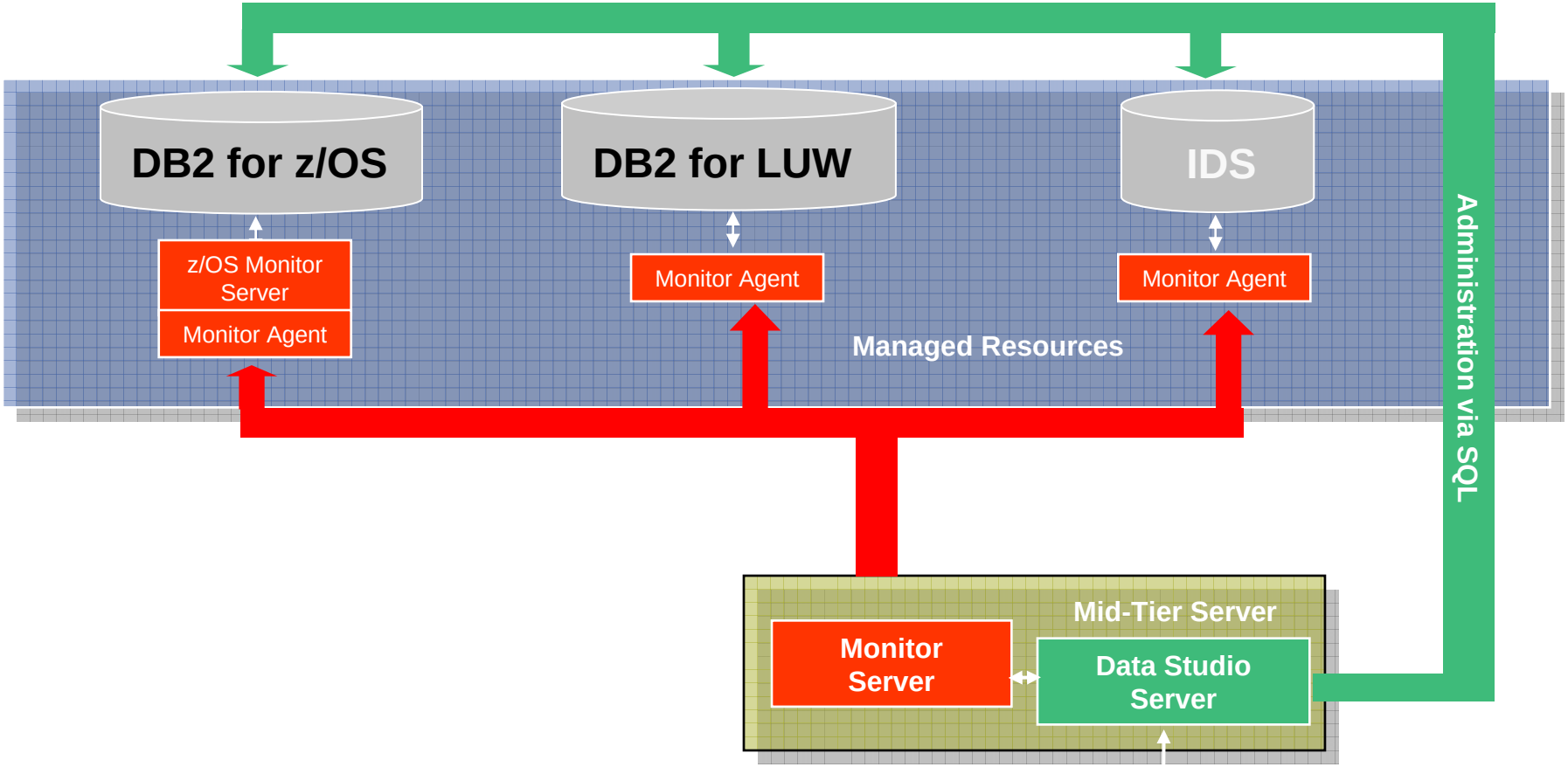
Recommendations
Detailed Root Cause Analysis



Root Cause Analysis Sample Decision Tree



Data Studio
Strategic Monitoring Architecture



Future Direction

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Top priorities for 2008/2009

- Reduce footprint of the client offerings:
  - Eclipse RCP version of Data Studio Developer for the Application DBA
    - SQL stored procedure create/debug, schema admin, etc.
    - No Java development tooling
  - Eclipse plug-in version for the Java developer
    - Plugs into Rational products (RAD, etc.)
    - Plugs into non-IBM Eclipse IDE solutions
  - Greatly reduce Tivoli agent footprint

Top priorities for 2008/2009 -- continued

- Make DB2 and IDS the best choices for WebSphere:
  - pureQuery technology (tooling and runtime)
  - JDBC “capture” to enable pureQuery for any Java progam
  - Significant performance monitoring and problem determination aids (added to DSAC and DB2 PE)
  - openJPA support for pureQuery
  - Spring, iBatis, and possibly Hibernate support for pureQuery
  - Tight integration with Object Grid (SQL syntax to cache, persistence to DB2 or IDS, replication from DB2 or IDS to Object Grid)

Top priorities for 2008/2009 -- continued

- Upgrade DB2 for z/OS and IDS support to current functionality levels
- Separate client offerings from the LUW server deliverable
- Integrate key product offerings into Data Studio
  - DB2 Change Management Expert
  - DB2 Performance Expert
  - DWE
  - Princeton SoftTech
  - High Performance Unload

Top priorities for 2008/2009 -- continued

- Deliver high-value Data Studio Performance Manager
  - SQL statement-level performance detail + historical trends
  - Ability to report database resource use in many ways
    - By SQL statement
    - By package or collection
    - By application
    - By app server
    - By Java class name
- Deliver initial Data Studio Query Tuner
  - Visual Explain of cached statements
  - Visual Plan Hints
  - Technology harvested from OSC and OE

Top priorities for 2008/2009 -- continued

- Expand functionality in Data Studio Administrator
  - Alter anything (DB2 Change Management Expert)
  - View/change config parameters
  - FTAs for deadlock and timeout events
  - CREATE/START/STOP DATABASE and other CC items that improve up and running experience

Where to get IBM Data Studio ?

- **IBM Data Studio**
  - www.ibm.com/software/data/studio
    - FAQs / Tutorials
    - Downloads
    - Forum / Blogs
    - Join the IBM Data Studio user community

- **Meet the IBM Data Studio team at IOD 2007**
  - TLU-1298A
    - Monday | 3:45 PM | Mandalay Bay South Convention Center - South Seas F | Curt Cotner
  - TDN-2627A - IBM Data Servers Application Development : The Details
    - Tuesday | 1:30 PM | Mandalay Bay South Convention Center - Mandalay Bay B | Rick Buglio
  - HOL-1963A Developer Workbench for Application DBAs
    - Tuesday | 1:15 PM - 04:15 PM | Mandalay Bay South Convention Center - Breakers K
  - HOL-2490A DB2 Viper 2 - Data Server Administration - The Next Generation
    - Tuesday | 9:30 AM - 12:30 PM | Mandalay Bay South Convention Center - Breakers C
  - Developer Den and Expo Area

Thank
You