Benefits of DB2 Stored Procedures and Web 2.0

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Information Management software

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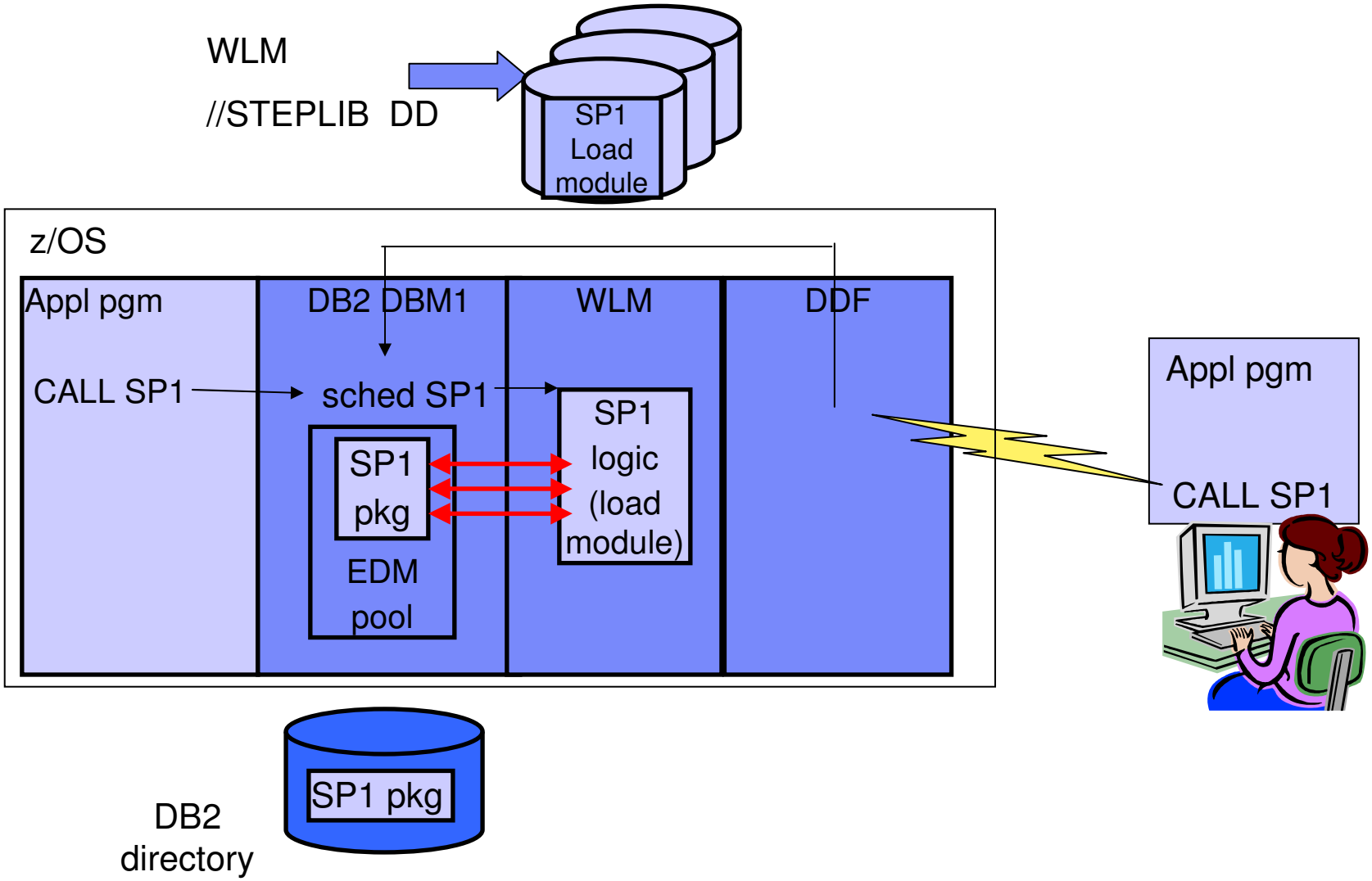
Agenda

- What are stored procedures?
- Benefits of stored procedures.
- What is Web 2.0?
- Stored procedures in Web 2.0
- Summary
- Next steps – more information

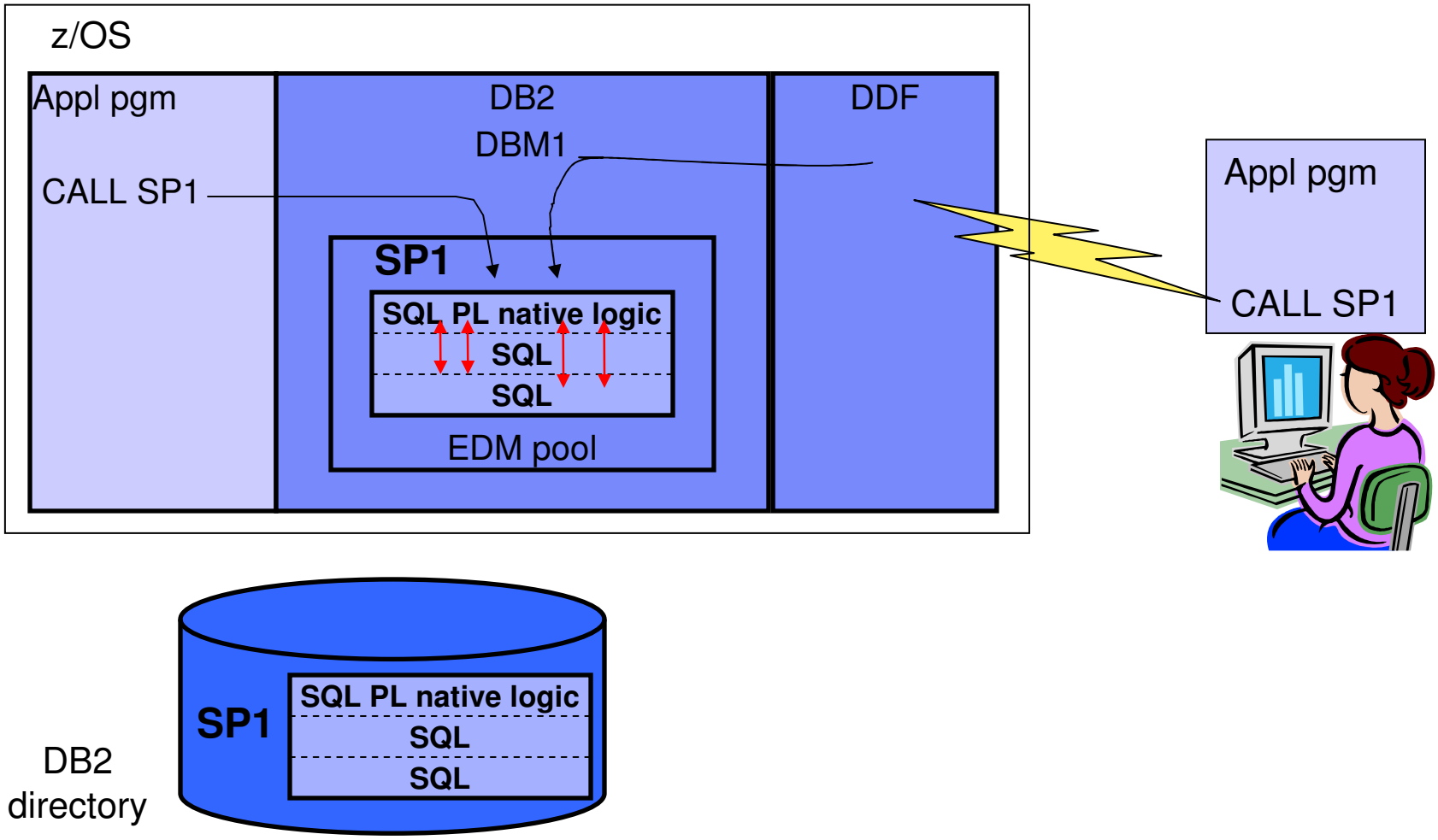
What are Stored Procedures?

- A stored procedure is a user-written program that can be called by an application with an SQL CALL statement.
- It is a compiled program that is stored at a DB2 server
- It can execute business logic and SQL statements.
- Stored procedure types
  - External high level language procedures
    COBOL, PL/I, C, C++, Assembler, REXX, and Java
  - External SQL procedures
  - Native SQL procedures
    Introduced by DB2 9 for z/OS

DB2 z/OS Stored Procedure Processing (External)



Native SQL Procedure Processing (Internal)



Benefits of Stored Procedures

- **Modularity in application development**
- **Data will be processed always in a consistent way according to the rules defined in the stored procedure**
- **Reduced network traffic for distributed applications**
  - Typical application requires two trips across the network for each SQL statement
  - Grouping SQL statements into a stored procedure results in two trips across the network for each group of statement, resulting in better performance for applications
- **Improved application security**
  - Sensitive business logic runs on the DB2 server
  - End users are authorized to execute a stored procedure, they do not need table privilege - similar to static authorization model

Benefits of Stored Procedures ...

- **Application integration solutions**
  - can access non-DB2 resources
    e.g. VSAM files, MQ queues, IMS or CICS transactions
  - Stored procedures can have access to commands that run only on the server.
  - They can access any additional software installed on the server.
- **Enforcement of business rules:**
  - You can use stored procedures to define business rules that are common to several applications.
  - can be an alternative to using constraints and triggers.

Benefits of Stored Procedures ...

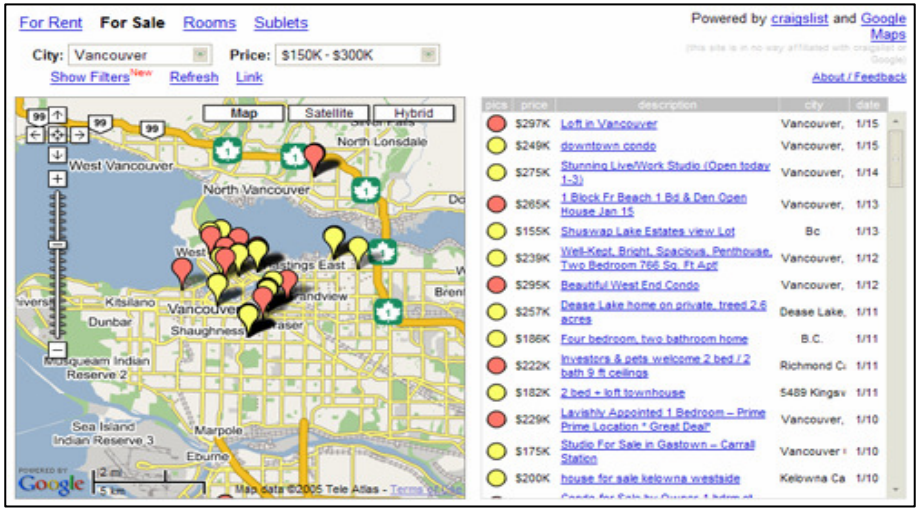
- **Cost of ownership reduction**
  - If stored procedure is called from distributed client via DRDA, a portion is eligible for zIIP redirect. This includes:
    - Call statement processing
    - Result set processing
    - Commit processing
  - Stored procedures written in Java can take advantage of zAAP engines
  - Native SQL procedures run as enclave SRB in DBM1 address space and the SP execution is zIIP off-loadable with DB2 9 for z/OS.
  - For WLM managed stored procedures:
    - SQL processing runs under a TCB hence not eligible for zIIP redirect.

Web 2.0

"A set of technologies and applications that enable efficient interaction among people, content, and data in support of collectively fostering new businesses, technology offerings, and social structures" –Forrester

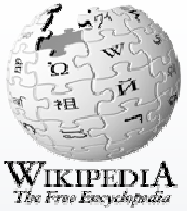
Web 2.0 is about being an active contributor not a passive observer

- Network as a Platform
- Gets better as more people use it
- Rich user experience
- situational applications



Web 2.0 Technologies and Examples

- Technologies
  - **AJAX** – asynchronous JavaScript and XML
  - **RSS and Atom** – provides a way to distribute information via a family of XML file formats for web syndication
  - **Web Services and Service Oriented Architecture** application components that communicate via open protocol, are self describing



- Examples
  - **Wikis –** group of web pages that facility community authoring
    - Wikipedia (http://en.wikipedia.org/wiki/Main_Page)
  - **Blogs –** web-based publication of periodic articles
    - Blogger (http://www.blogger.com/start)
  - **Mashups –** composite application derived by aggregating components or services
    - www.housingmaps.com

Example: Mashups

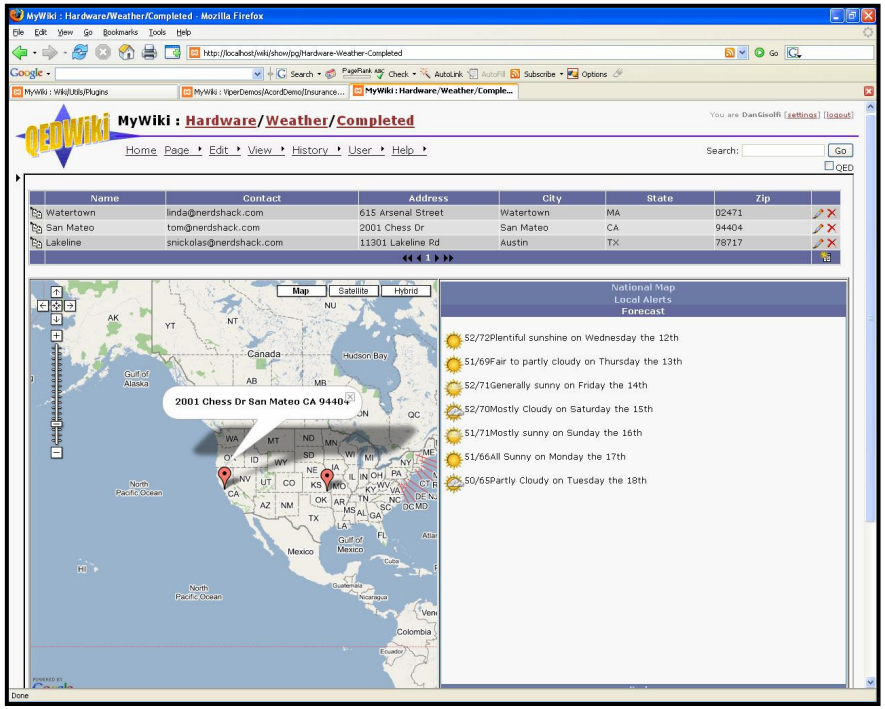
- A mashup application is architecturally comprised of three different participants
  - **API/content providers**
    To facilitate data retrieval, providers expose their content through Web-protocols such as REST, Web Services, and RSS/Atom
  - **The mashup site**
    This is where the mashup logic is hosted, execution can be on the mashup server (e.g. Java servlets) or at the client (e.g. JavaScripts)
  - **The client's Web browser**
    where the application is rendered graphically and where user interaction takes place

Web 2.0 in the Enterprise

- Internal and external facing
- Corporate Communication and Messaging
  - Content delivery via RSS
- Lowering support cost
  - self service and collaborative documantation through wikis
- Dynamic applications sans lengthy IT projects
  - exposing ‘locked up’ data using REST or Web services
- Ever increasing variety of tools to produce Web 2.0 applications efficiently

Technical Challenges of Web 2.0

- Data Integration Challenges: Semantic Meaning and Data Quality
  - mapping done incorrectly
  - inconsistent usage of data
- Security of data access
  - unauthorized usage of data
  - data used in context that is not approved
- Performance, availability,...



Stored Procedures in Web 2.0

- Huge amount of DB2 assets are available in stored procedures that can be “unlocked” and made available if accessible via Web 2.0 technologies
- They act as content provider in Web 2.0 application
- Stored procedures can help to address challenges of Web 2.0 in respect to
  - Data quality: data mapping, aggregation and transformation is done in the stored procedure by owner of the data instead of Web 2.0 application programmer
  - Security: only authorized users can access data in intended way, no direct access authority to raw data
  - Stored Procedures typically go through QA cycle and performance evaluation

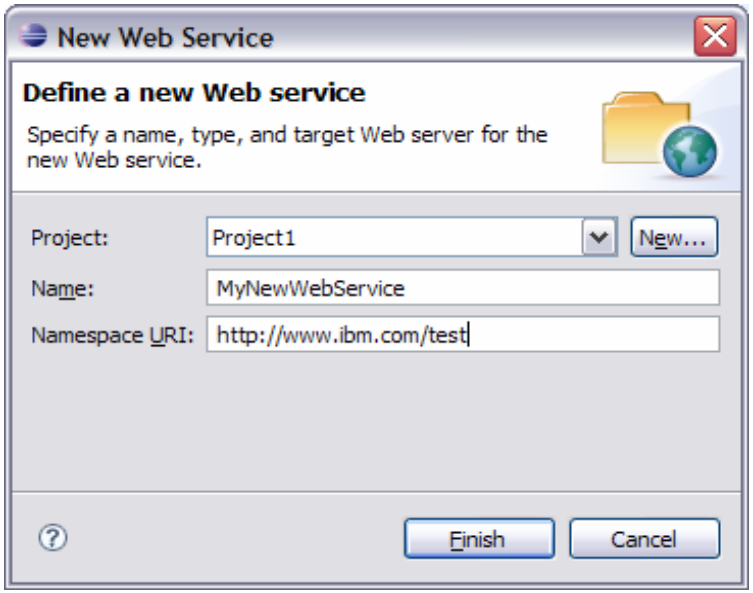
REST or Web Service Enabled Stored Procedures

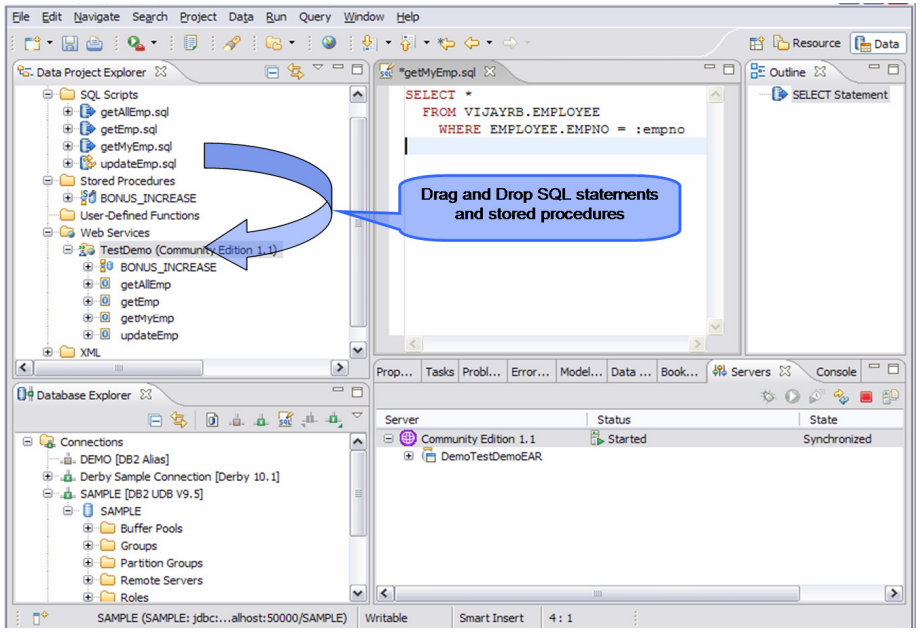
- Tooling integrated in IBM Data Studio
  - Stored Procedure builder
    - Integrated debugger for Java and SQL PL procedures
    - Run and test procedures with DB2 and IDS
- Rapid generation of Web services from database operations using intelligent defaults
- No programming required
- Assembles a “ready-to-deploy” Data Web Services (DWS) Web application
- Integrated deploy and test environment
- Automated Web service artifact creation
  - WSDL documents
- Web service exploration and test tools
- Support for DB2 pureXML and XSLT

REST-style bindings

- Output document similar to SOAP response
  - XML data without SOAP Envelope and SOAP body element
  - DB2 XML data type value weaved-in XML or as string
- URL-encoded input
  - POST/GET bindings with URL-encoded request data
  - Problem: XML needs to be contained in the URL-encoded string
  - Not very well suited for XML data
- POST XML request similar to SOAP request
  - XML data without SOAP Envelope and SOAP body element
  - DB2 XML data type value weaved-in XML or as string

DataStudio Tooling for Enabling Stored Procedures

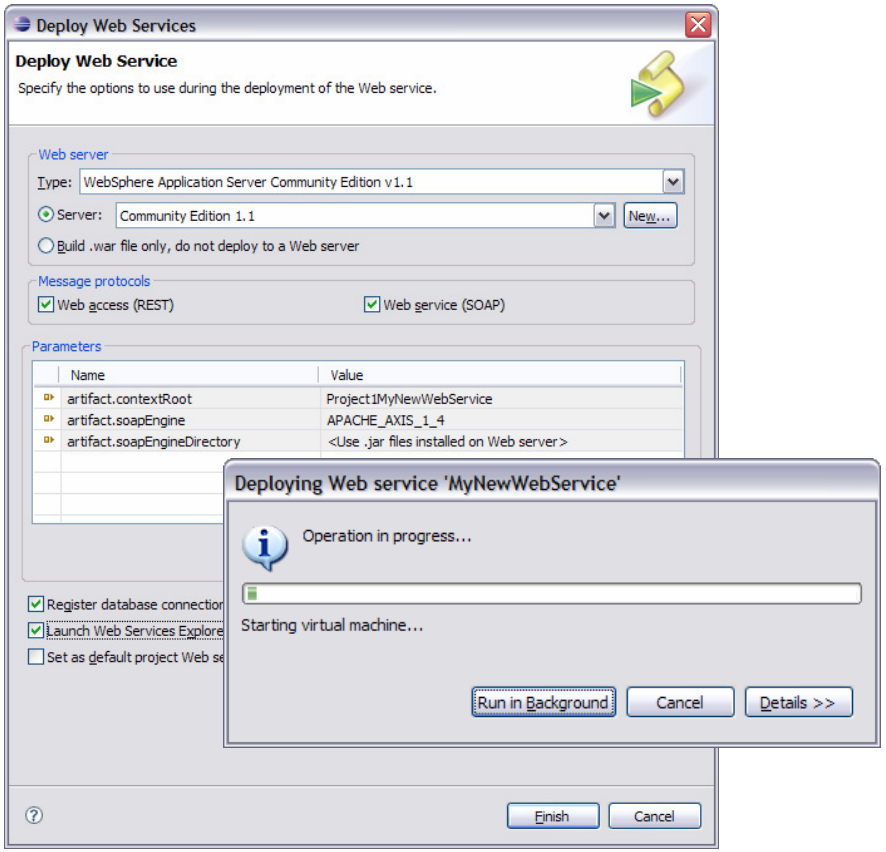




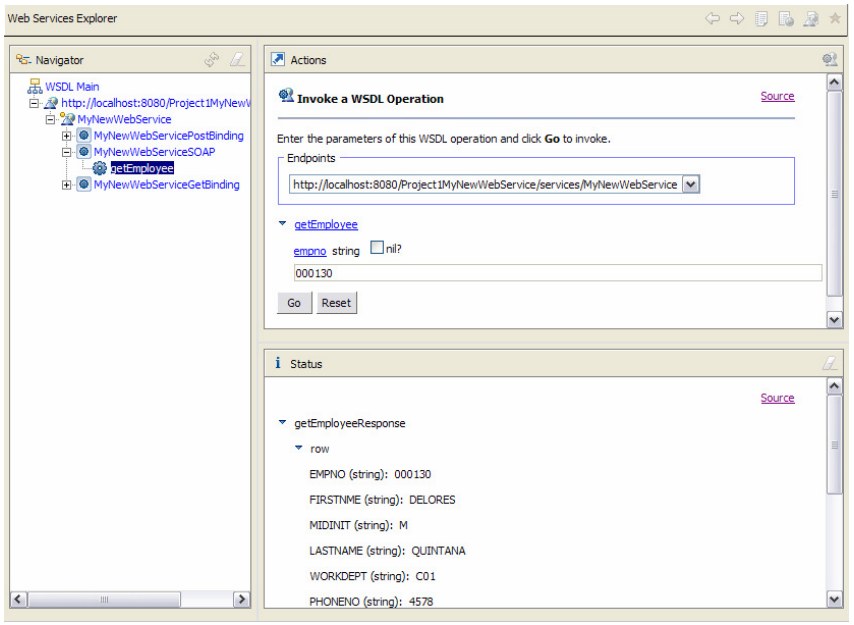
1. Create Service

2. Drag ‘n drop
   Service assembly

DataStudio Tooling for Enabling Stored Procedures ...

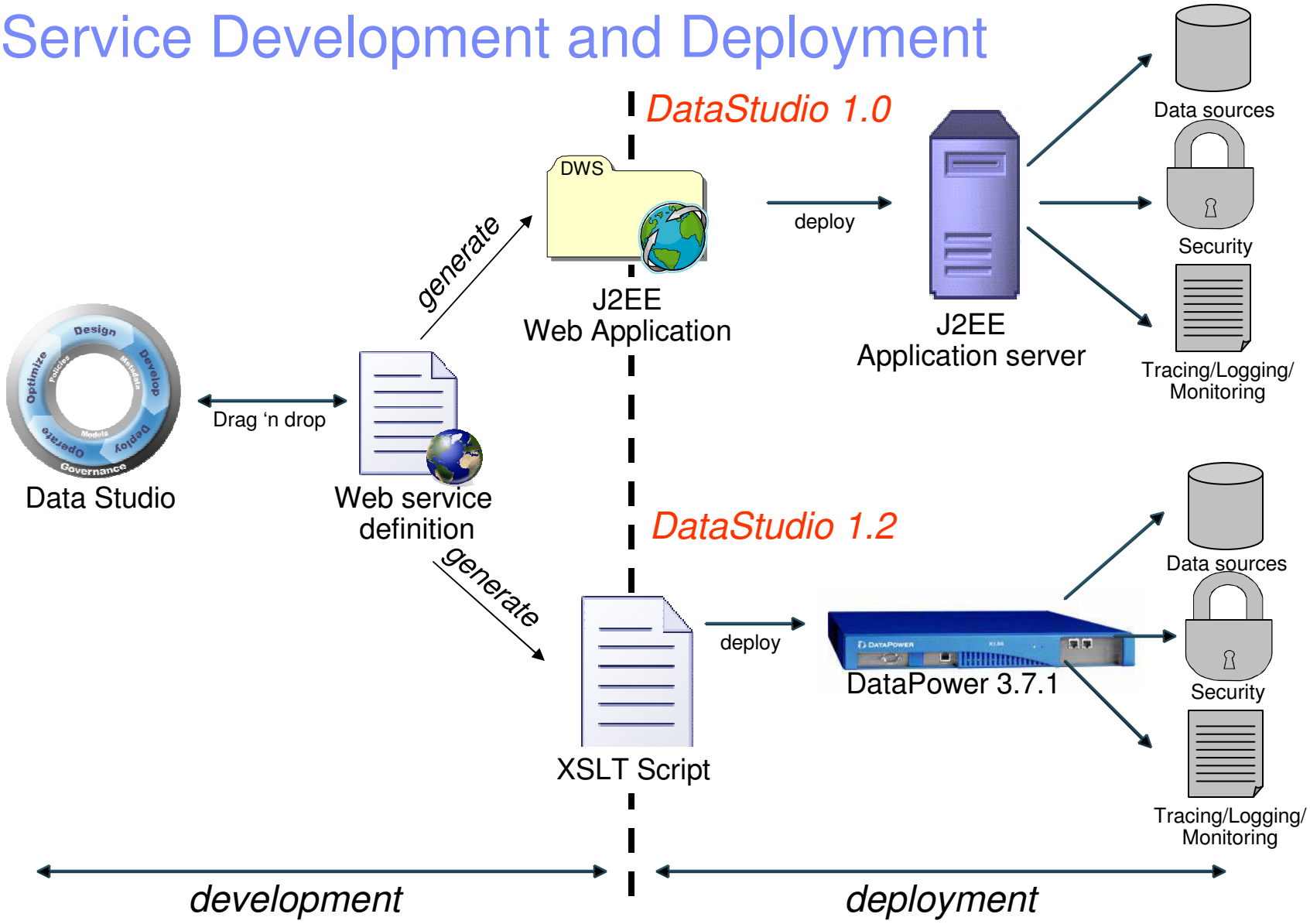


3. Deploy Service



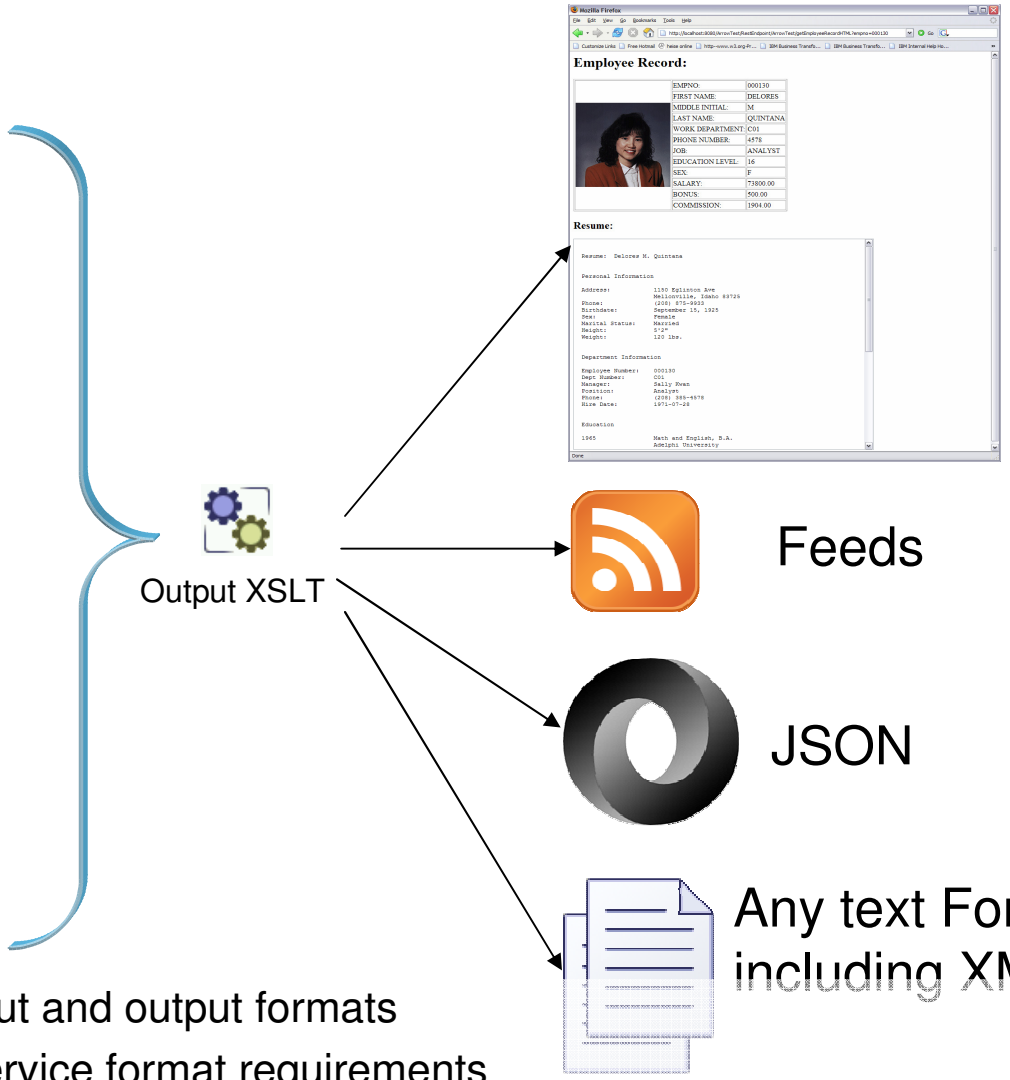
4. Test Service

Service Development and Deployment



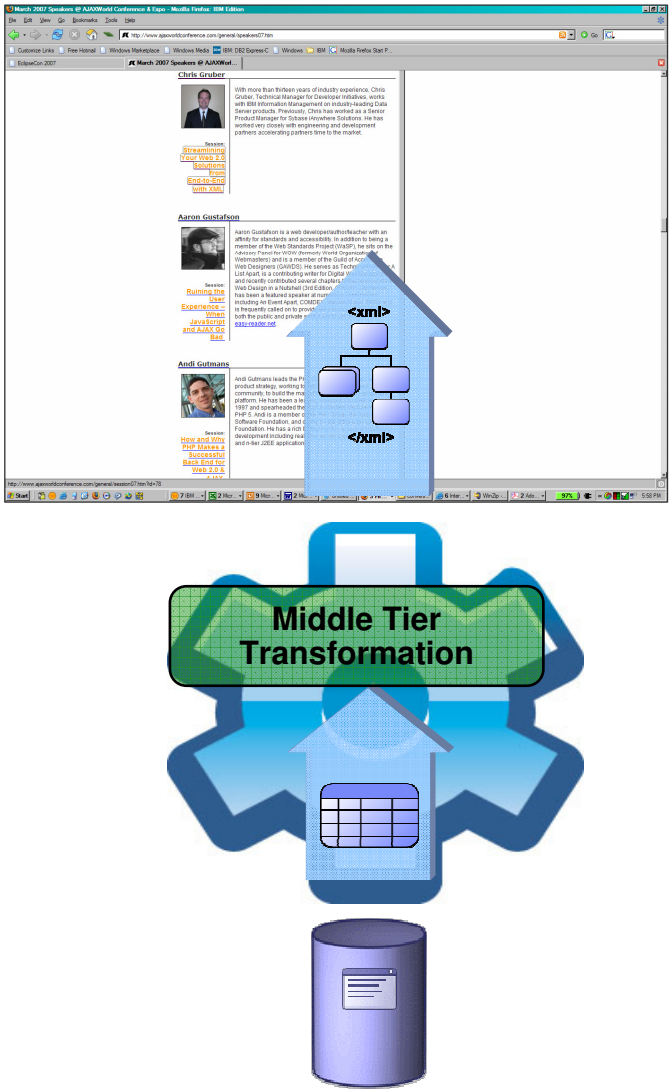
Use Case – XSLT for Transformation

```
<?xml version="1.0" encoding="UTF-8" ?>
<ns1:getEmployeeRecordHTMLResponse
    xmlns:ns1="http://www.myNamespace.com"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <row>
        <EMPNO>000130</EMPNO>
        <FIRSTNME>DELORES</FIRSTNME>
        <MIDINIT>M</MIDINIT>
        <LASTNAME>QUINTANA</LASTNAME>
        <WORKDEPT>C01</WORKDEPT>
        <PHONENO>4578</PHONENO>
        <HIREDATE></HIREDATE>
        <JOB>ANALYST</JOB>
        <EDLEVEL>16</EDLEVEL>
        <SEX>F</SEX>
        <BIRTHDATE></BIRTHDATE>
        <SALARY>73800.00</SALARY>
        <BONUS>500.00</BONUS>
        <COMM>1904.00</COMM>
        <EMPNO>000130</EMPNO>
        <PHOTO_FORMAT>gif</PHOTO_FORMAT>
        <PICTURE>
            R0lGODlh0gDJAPcAAJtfYJJISnotMYU2OllGR4d3eHZoaYI
        </PICTURE>
        <EMP_ROWID></EMP_ROWID>
        <EMPNO>000130</EMPNO>
        <RESUME_FORMAT>html</RESUME_FORMAT>
        <RESUME>
          Resume:  Delores M. Quintana
          ...
        </RESUME>
        <EMP_ROWID></EMP_ROWID>
    </row>
</ns1:getEmployeeRecordHTMLResponse>
```



- Flexibility in Web service input and output formats
- Alleviates ‘top-down’ Web service format requirements

Outgoing Data Flow



Techniques used generating XML from a Database

- Transformation via XSLT
- XML capabilities in database
- REST or web service enabled stored procedures

Ajax Request/Response Sequencing

New Relevant Data!

HTML

(Initial Response)

1

2

XML

(User-Action Context)

Conclusion

- Web 2.0 – merger technology and social networking
- Enterprises leveraging Web 2.0 for a variety of benefits
- Easily enable data driven Web 2.0 with DB2:
  - Huge amount of DB2 assets are available in stored procedures that can be “unlocked” and made available if accessible via Web 2.0 technologies
- Stored procedures can help to address challenges of Web 2.0 in respect to
  - Data quality
  - Security
  - Performance, availability

Next Steps – More Information

- DB2 for z/OS Home page
- **DB2 Stored Procedure Redbooks**

  IBM DB2 Stored Procedures: Through the Call & Beyond

  Triggers and User Defined Functions on DB2
- DB2 Stored Procedures whitepaper
- Telcon available on replay
- DB2 for z/OS: Information Roadmap