Overview

• Integration issues
• Solution options with pros and cons
• WEAR short-term solutions
• WEAR long-term solution
• Summary
WEAR Group

• WEAR stands for World Engineering Anthropometry Resources
  – A nonprofit organization based in France to promote sharing and using of its members’ anthropometry resources
  – A dozen members located around the world
  – Members have huge collection of anthropometry survey data over a large span of time
Integration Issues

- Data extraction and search
- Network accessibility
- Data representation
- Data quality
- Security
- Data analysis
- Data autonomy
- Financial and manpower constraints
Integration Solution Options

• Examine three possible integration solutions for the WEAR group integration
  – Linked servers
  – Data warehouse
  – Service-oriented architecture (XML Web services)
• Examine how the solutions can address the above integration issues
• Envision potential anthropometry applications for the integrated WEAR
Linked Server Structure

• Use four-part name syntax in a query instead of only table name
  - LinkedServerName
  - DatabaseName
  - Owner
  - TableName

Linked Server Pros & Cons

- **Advantages** – conceptually easy
  - The ability to issue distributed queries and transactions on heterogeneous data sources across the enterprise

- **Disadvantages** – tight integration and direct access
  - Maintenance and update nightmare
  - No data autonomy
  - Require direct access and reliable connection
Data Warehouse

- Main objective of data warehouse is business intelligence analysis of integrated data over time
  - Business trend and variance analysis through OLAP (On-Line Analytical Processing)
  - Data mining – automated discovery of implicit patterns and interesting knowledge hidden in the large amounts of data
Data Warehouses

• Characteristics of data warehouse
  – Specialized database built on top of operational databases.
  – Integration process through ETL (Extract, Transform, and Load)
  – Optimized for over time data analysis
  – Highly normalized structure
• Anthropometry database application of star schema
  – Find groups of anthropometry measurements as biometrics identifier
Data Warehouse Pros & Cons

• Advantages – strong analytical capability
  – A platform for many potential anthropometry applications of OLAP and data mining

• Disadvantages – tight integration and high cost
  – Difficult to build ETL processes with various systems platforms and database structures as well as different locales
  – Lack of data autonomy
Web Service Architecture

• Web service architecture adheres to the principles of service-orientation
  – Services are loosely coupled, autonomous, stateless, and discoverable.
• Consists of three basic types of entities
  – Service requestor, service provider, and service registry
  – Communicate through TCP/IP
WEAR Application of Web Services

- Member 1 requests survey data & shape descriptors

Diagram:

- Member 4 (Shape Descriptor Tool) requests survey data & shape descriptors from Member 1 (US Survey).
- SOAP Message - Request Calculation of Shape Descriptor and Data
- Discover and Retrieve WSDL
- Publish WSDL
- SOAP Message - Request Survey
- Publish WSDL
- SOAP Message - Return Survey Data
- SOAP Message - Return Shape Descriptor & Data
- Discover and Retrieve WSDL
- Publish WSDL
- SOAP Message - Return Survey Data
- Discover and Retrieve WSDL
- Publish WSDL
Loosely Coupled Integration

• XML Web service architecture is a loosely coupled integration
  – Integration is done through the service contract (WSDL) instead of open connection
  – Work is requested/delivered as payloads in the SOAP messages
  – Messaging mechanism brings
    • Autonomy
    • Statelessness
Web Services Pros & Cons

• Advantages – autonomy and scalability
  – Solve the problems that are difficult to handle by a tight integration

• Disadvantages – security and performance
  – Challenge in performing and propagating user authentication and authorization
  – XML documents are slow to create and process
  – Evolving standards and specifications
WEAR Integration Objectives
Short-Term

• Real world – two types of integrations
  – Enterprise systems integration
  – Business to business (B2B) integration

• Short-term WEAR integration objectives
  – Integrate and share anthropometry survey data automatically
  – WEAR members maintain and control independently their databases and existing web application
WEAR Integration Solution
Short-Term

• WEAR has to be treated as a federation

• Web service architecture is inherently federated because of its loosely coupled nature
  – Best solution to make the WEAR integration satisfy the short-term objectives
    • Universal anthropometry data sets – XML
    • Autonomous
WEAR Integration Solution
Implementation Issues

• Limit services to data sets only without RPC (remote procedure call)
• Real-time performance is not a concern
• Use restricted UDDI registry to increase security
• Implement user authentication using X509 digital client certificate
• Implement user authorization through SOAP header
WEAR Integration Objectives
Long-Term

• WEAR integration long-term objectives
  – Build analytical models to produce anthropometry solution toolkits
  – Offer these toolkits as Web services accessible by the public and special industry groups
Conclusions

- WEAR integration is a type of federated integration
- XML Web service is the best solution due to its loosely coupling nature and service orientation
- Data marts have great potential for discovery of anthropometry data
- Hybrid Web service/data mart model is a solution to combine analytical models and XML web services
- XML is the foundation of the entire integration solution