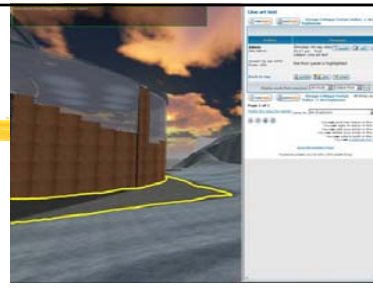
COMPSCI 732 FC - 2005 Data Mapping

Welcome!
Who Am I?
Lecture Outline
Introduction to Data Mapping

Who Am I?

- Robert Amor
  - Associate Professor
  - Computer science & Software engineering
  - 5 years in UK at Building Research Establishment
- Research interests
  - Construction IT (CAD, VR, Project workspaces)
  - Integration (Data mapping, distributed systems)
  - Interoperability (Internet portals, standards)



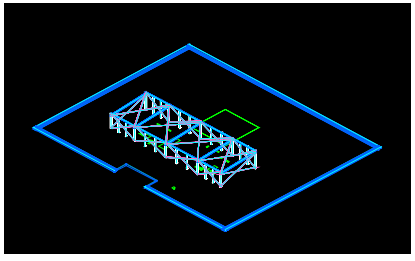
Outline of Lectures

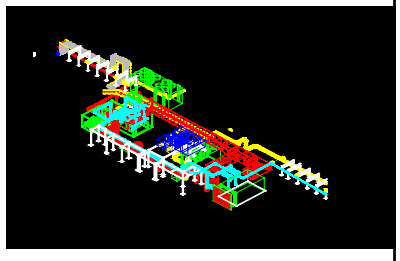
- Introduction to data mapping
- Types of mapping
- Approaches to mapping
- Mapping languages
- Specifying mappings (GUI)
- Automated generation of mappings
- Consistency management

Data Mapping

- Users and tools need information in their own specific formats
- Common data is represented differently in almost each tool
- Need to describe the transformation between representations
- Want verifiable and updateable mappings
- Want to transfer data in both directions

Views to Map





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Data Mapping Issues

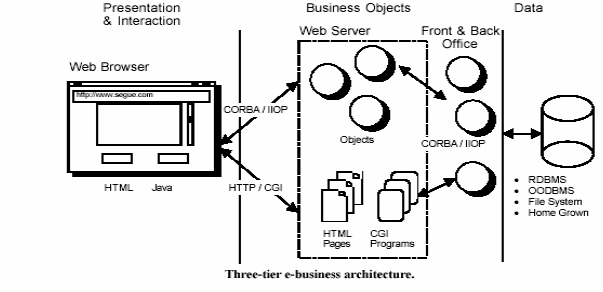
- Syntax
  - Data can be represented in many different encodings
  - E.g., XML, CSV, SQL, HTML, proprietary formats, etc
- Structure
  - Equivalent information can exist in vastly different structures
  - E.g., Point class in Java versus x, y, z variables
- Semantics
  - Meaning and scope of data representations are often incompatible
  - E.g., what does 'door height' encompass?

Where do we need mappings?

- Everywhere!
  - It is a constant task
  - Usually we don't consider it independently
- Thinking about data mapping is another approach to understanding problems in software design
  - High-level specification (= analysis view)
  - Bidirectional data movement
    - No duplication of mapping specifications
  - Specification environment

Multi-tier architectures

- Store and display different views of the same data

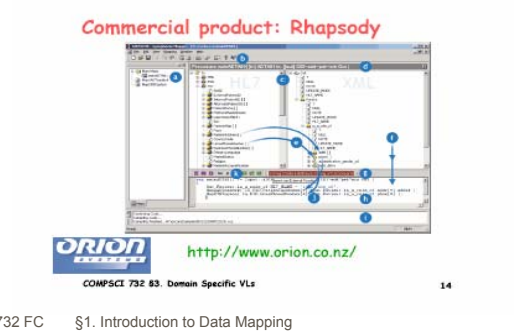


Three-tier e-business architecture.

Segue Software, CORBA Primer 6

EDI (Electronic Data Interchange)

- All domains have their own messaging standards, and often several overlapping standards (e.g. medicine)



Semantic web

- Tim Berners-Lee's vision of a "machine understandable" sea of information
- Data describes itself
  - Points to a standard description of its schema
  - Tools that understand the description can use the data appropriately
  - When data is discovered it may have to be mapped to a suitable form
    - Conversion language
    - E.g., Operating range of equipment in deg F translated to deg C.

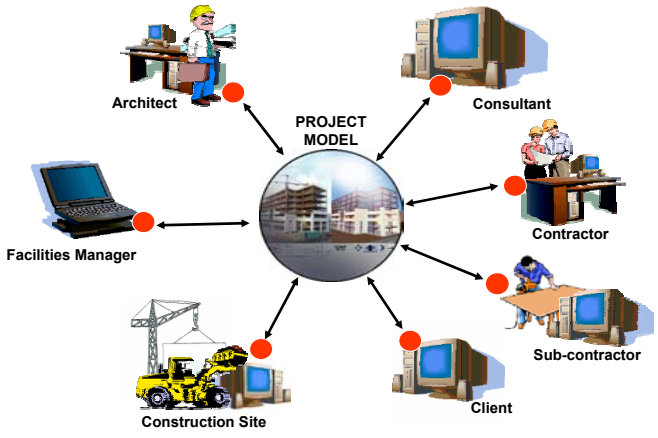
Data model standards

- Standard (ISO) data models exist, or are being developed, for many domains
  - E.g., in construction the IFCs describe major objects in a building. There are currently over 500 classes in the IFC standard.
- Tools in these domains need to map from their internal data representation to the standard, and vice-versa.
- Issues of verification and management of the developed mappings

Schema evolution

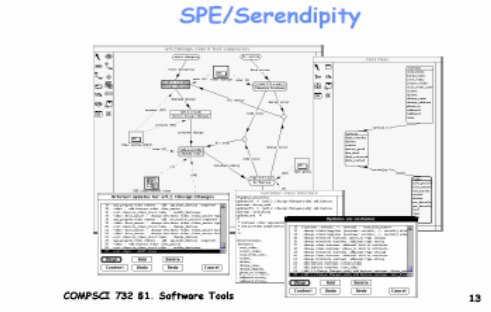
- Domain specific data models evolve over time
  - E.g., IFCs have a yearly update cycle
  - Tools need to handle the new data models
  - Tools need to map between previous versions of data models
  - Data files in old versions need to be mapped to the latest version
  - E.g., in construction domain there are over 4,500 companies developing software for sale

Integrated Environments



Software development tools

- Presentation of multiple-views of underlying form of the software



Learning Goals

- Appreciation of the importance of data mapping
- Understand the factors which impact on data mapping
- Able to specify mappings between disparate representations
- Knowledge of standards, languages, and frameworks that can be used for data mapping
- Knowledge of approaches to maintaining consistency between mapped data