Consistency management & Standard mapping languages

- Motivation for consistency management
- Frameworks for change management
- XSLT and EXPRESS-X

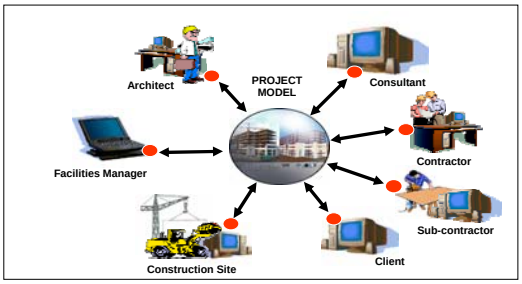
Gray, J. and Reuter, A. (1993) Transaction Processing: Concepts and Techniques, Morgan Kaufmann Publishers, ISBN 1558601902.

Motivation for consistency management

- Mappings describe how data should be transformed
- Utilising mappings we can determine what to do when data is changed in one view of a system
- Can manage dependencies between data and views of data inside a system
- Can manage dependencies between data and views of data across systems
- Can ensure correct propagation of modified data between systems and views

Transaction Management

- Engendering Concurrent Engineering
  - Mapping data back and forth to complete processes
  - Large portions of the design are used by each professional
  - Tasks have long durations (perhaps days)
  - Can't serialise all the tasks



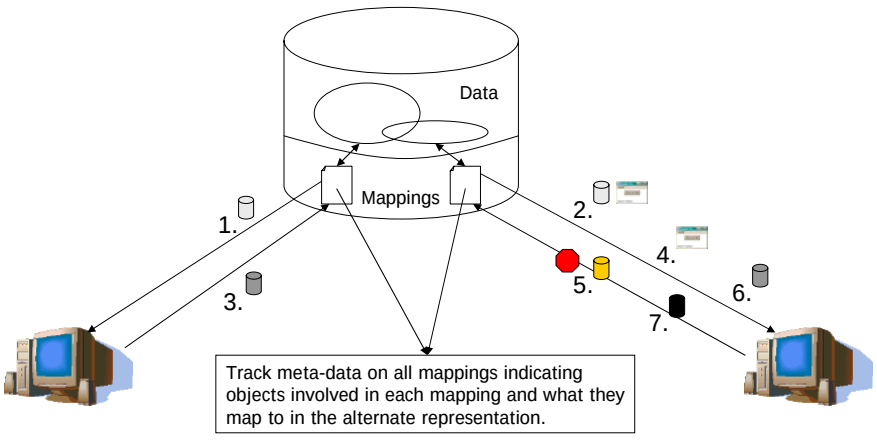
Transaction Management: Issues

- Standard data locking regimes are inadequate
- Professionals require asynchronous updates to the building data
- Paper-based processes manage conflict resolution
  - But are a major source of building problems

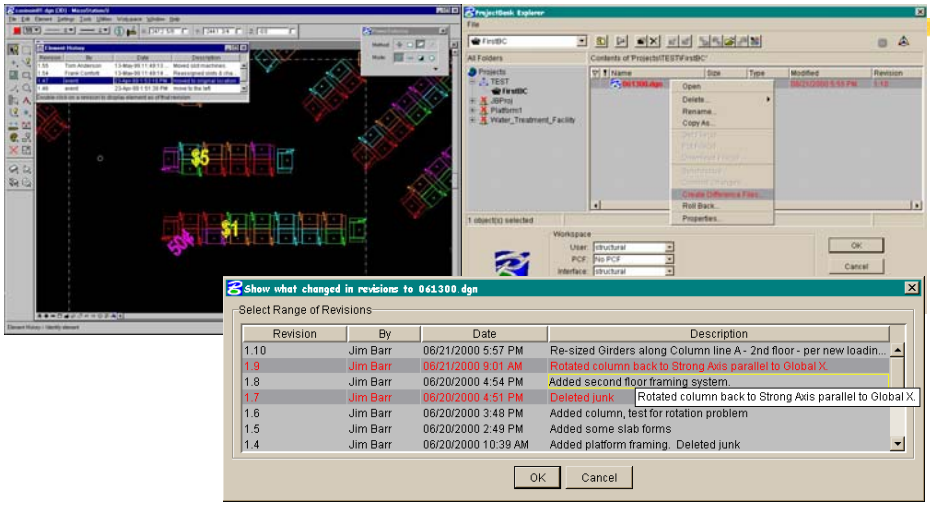
Transaction Management: Solution

- Track data in use by each professional
- Notify when there is a potential update conflict
  - Don't stop the user from completing their task
- Determine actual conflicts when the professional's data is checked in
- Force acceptance (or renegotiation) of prior conflicting changes
  - Then allow data to be checked in

Transaction Management Flows



Bentley's ProjectBank



Transaction Management: Developments

- Bentley's ProjectBank model coordination
  - Conflicts are managed at the data level, not semantics
    - Low level (data based) conflicts notified
    - All changes need descriptions
    - Rotating a beam will produce a conflict
    - Rotating a chair will produce a conflict
- Progressing to:
  - Process-based conflict management
  - Object and attribute aware conflict management

Standard Mapping Languages

- XSLT
- ISO-10303-14

ISO-10303-14 EXPRESS-X

- EXPRESS-X is a structural data mapping language. It consists of language elements that allow an unambiguous specification of a relationship between EXPRESS schemas. The following are within the scope of this part of ISO 10303:
  - mapping of data governed by one EXPRESS schema to data governed by another EXPRESS schema;
  - mapping of data governed by one version of an EXPRESS schema to data governed by another version of that EXPRESS schema, where the two schemas have different names;
  - specification of requirements for data translators for data sharing and data exchange applications;
  - specification of alternate views of data defined by an EXPRESS schema;
  - an alternate notation for application protocol mapping tables;
  - bi-directional mappings where mathematically possible;
  - specification of constraints that may be evaluated against data produced by mapping.

Example mapping

```
SCHEMA_MAP similar;

REFERENCE FROM person_and_org_schema AS SOURCE;
REFERENCE FROM similar_target AS TARGET;

MAP person_org_map AS
po : person_org;

FROM
p : person;
o : organization;

SELECT
po.name := p.last_name;
po.org := o.department_name;

END_MAP;
END_SCHEMA_MAP;
```


Example view

```
SCHEMA_VIEW example;

REFERENCE FROM source_schema;

VIEW items_and_persons;

FROM i : item; p : person;

SELECT
item_number : INTEGER := i.item_number;
responsible : STRING := p.name;

END_VIEW;
END_SCHEMA_VIEW;
```

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