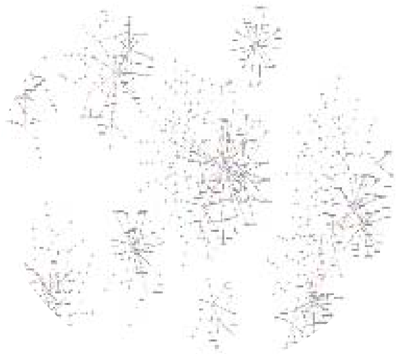
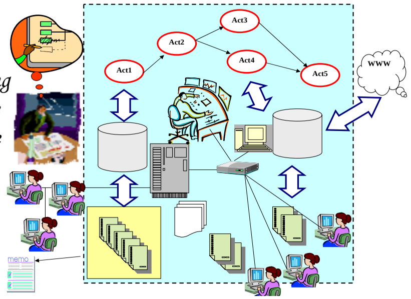
Adaptive Management of Database Evolution



Database Schema Evolution – Query Adaptation

Current database systems are continuously evolving environments, where design constructs are

- *added*
- *removed*
- *modified*



Existing queries are affected:

Syntactically – i.e., they become invalid

Semantically – i.e., a query must conform to the new database semantics

Adaptation of SQL queries and views is

- *a time-consuming task*
- *treated manually by the administrators and the developers, in most cases*

Our Approach

1. *Graph based representation of database constructs (i.e., relations, views, constraints, queries)*
2. *Annotation of graph with rules for adapting queries to database schema evolution*
3. *Mechanism for performing what-if analysis for potential changes of database configurations*

1 Graph-based modeling

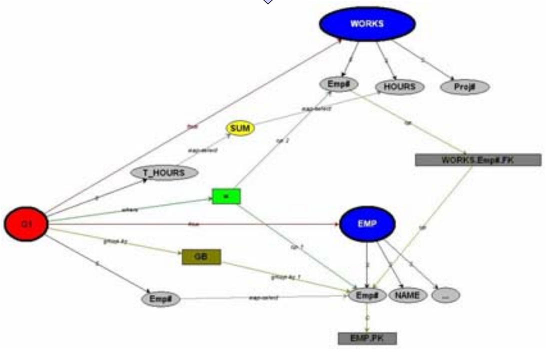
Database Constructs mapped to directed graphs

- *Relations*
- *Conditions (covering database constraints and query conditions)*
- *Queries*
- *Views*

Graph Semantics

- *Nodes represent database constructs, i.e., relation nodes, attribute nodes, query nodes, etc.*
- *Edges represent relationships between constructs, i.e., schema edges, map-select edges, operand edges, etc.*

```
Q: SELECT EMP.Emp#, Sum(WORKS.Hours) as T_Hours
   FROM EMP, WORKS
   WHERE EMP.Emp# = WORKS.Emp#
   GROUP BY EMP.Emp#
```



2 Extending SQL with Evolution Semantics

```
ON <event> TO <element> THEN <policy>
```

```
CREATE VIEW emps-prjs AS
  SELECT E.Emp#, E.Name, P.Projname
  FROM Emp E,Works W,Proj P
  WHERE E.EMP#=W.EMP# AND W.Proj#=P.Proj#
ON Modify Condition TO emps-prjs THEN block
```

Graph elements are annotated with policies

propagate

meaning that an affected element notifies all its dependent nodes for the event

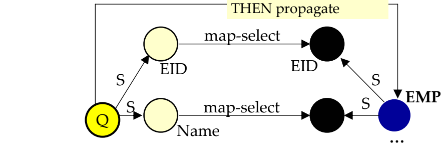
block

meaning that the affected element stops the propagation of the event to other recipients

3 Adapting to Schema Evolution

Q: SELECT EID, Name
FROM EMP

ON attribute addition
TO EMP
THEN propagate

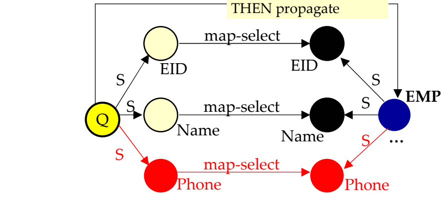


Event

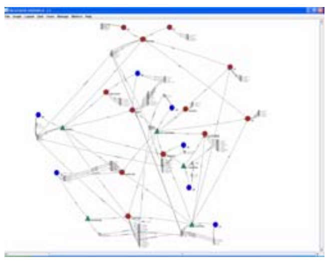
Add attribute Phone to relation EMP

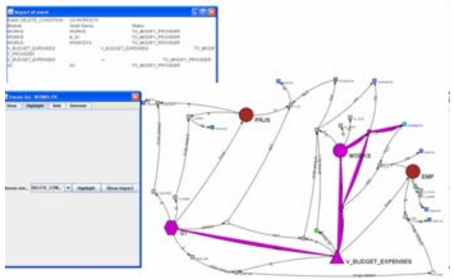
Q: SELECT EID, Name, Phone
FROM EMP

ON attribute addition
TO EMP
THEN propagate



HECATAEUS: a what-if analysis tool





http://www.cs.uoi.gr/~pvassil/projects/architecture_graph

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