The State-of-the-art of OODB

A. MEHTA - NJIT

- related to an internal timer

- succession dependency

- commit/abort dependency

- conditional execution (i.e., depending on the value of an output variable)

Scheduling dependencies represent control and data flow of a multidatabase transaction.

Failure Atomicity

- user-defined atomicity requirements
- termination states:
  - acceptable states
    - Committed states
    - Aborted states
  - non-acceptable states

Rusinkiewicz, Krychniak, Cichocki '92

Failure Atomicity Example: A Trip

Three transactions:

- reserve flight (RF)
- reserve hotel (RH)
- cancel flight (CF)

Examples of the termination states:

	RF	RH	CF
Committed	C	C	I
Aborted	A C	I A	I C
non-acceptable	A	C	I

Rusinkiewicz, Krychniak, Cichocki '92

The Objectives of a Multidatabase Scheduler

- **Correctness.** The scheduler cannot violate any of the dependencies listed in a multidatabase transaction specification.

- **Safety.** The scheduler must guarantee that the multidatabase transaction will terminate in one of the acceptable termination states.

- **Optimal scheduling policy.** The scheduler should be able to achieve an acceptable termination state in the optimal way.

- **Recoverability.** The scheduler should be able to reach an acceptable termination state even in the presence of failures.

cf: Rusinkiewicz

Scheduling - Approaches in the related work

- **A scheduler based on the Predicate Petri Nets model** ([A. K. Elmagarmid et al. 1990]).

- **An executor in logically parallel language L.0** ([L. Cameron et al. 1991]).

- **Scheduler as an interpreter of a multidatabase transaction specification language** (Vienna Parallel Logic language in [E. Kuehn et al. 1991]).

- **Scheduler as a finite state automaton** ([W. Jin, L. Ness et al.]).

cf. Rusinkiewicz

Example of a MSQL Statement

Assume the following database schemas:

```
Database CONTINENTAL (airline)
  flights (flnu, source, departure, destination, arrival, day,
           maxseats, curseats, rate)
  f838    (seatnu, seatty, seatstatus, clientname)

Database DELTA (airline)
  flight  (fnu, source, dest, dep, arr, day, totseat,
           takenseats, rate)
  fnu747  (snu, sty, sstat, passname)

Database UNITED (airline)
  flight  (fn, sour, dest, depa, arri, day, tots, taks, rates)
  fn727   (sn, st, sst, pasna)

Database AVIS (car rental)
  cars    (carcode, cartype, maxseats, rate, carstatus, from,
           to, client)

Database NATIONAL (car rental)
  vehicle (vcode, vty, vstat, vseats, from, to, client)
```

Example of a MSQL Statement - continued

The MSQL statement that raises by 10% the fares of flights from 'Houston' to 'San Antonio' in Continental, Delta and United:

```
USE       continental delta united
UPDATE    flight%
SET       rate% = rate% * 1.1
WHERE     sour% = 'Houston' AND
          dest% = 'San Antonio'
```

Example of a MSQL Multitransaction

The desired actions of a trip-planning transaction:

1. to reserve a flight on Continental and a car in National (preferred), or

2. to reserve a flight on Delta and a car in Avis (acceptable), or

3. to reserve only a flight on Continental or Delta (as the last resource).

MSQL Multitransaction - continued

```
BEGIN MULTITRANSACTION
  USE       continental delta
  LET       fltab.snu.sstat.clname BE
            f838.seatnu.seatstatus.clientname
            f747.snu.sstat.passname
  UPDATE    fltab
  SET       sstat = 'TAKEN', clname = 'wenders'
  WHERE     snu = (   SELECT  MIN(snu)
                      FROM    fltab
                      WHERE   sstat = 'FREE');

  USE       avis national
  LET       cartab.ccode.cstat BE
            cars.carcode.carstatus
            vehicle.vcode.vstat
  UPDATE    cartab
  SET       cstat = 'TAKEN', from = '07-04-64',
            to = '04-16-92', client = 'wenders'
  WHERE     ccode = ( SELECT  MIN(ccode)
                      FROM    cartab
                      WHERE   cstat = 'FREE');

  COMMIT
            continental AND national
            delta AND avis
            continental
            delta
END MULTITRANSACTION
```


SUARDI, RUSINKIEWICZ, LITWIN '92