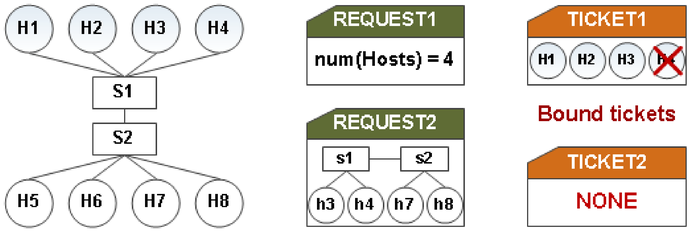
Arosa: testbed resource allocation using late-binding and constraints

Qin Yin, Timothy Roscoe / Systems Group, ETH Zurich

PROBLEM STATEMENT

- Current network testbeds early-bind resources to requests, and return explicit commitments to the clients
- Problem: poor utilization of expensive infrastructure; clients are exposed to failures between allocation and use
- Solution: represent commitments as constraints and late-bind resources

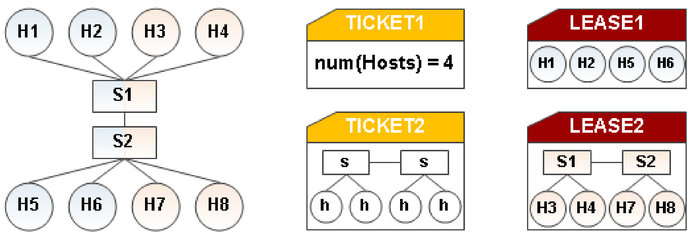
CURRENT SOLUTION: EARLY COMMITMENT



- Drawbacks:
  - Cannot mask network failures
  - Poor resource utilization

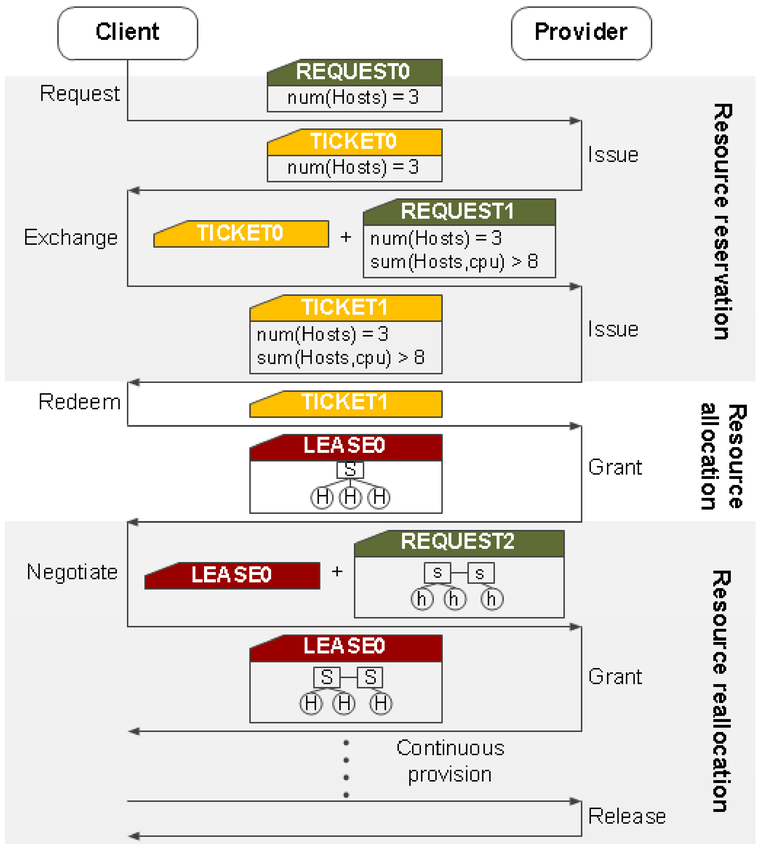
OUR APPROACH: Llate-binding

- Describe requests and reservations (tickets) as constraints
- Bind concrete resources to tickets late



DESIGN OPTIONS

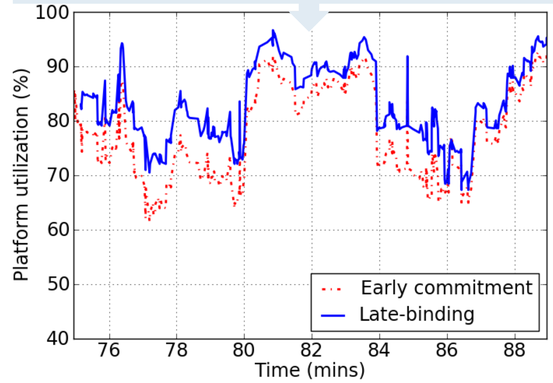
- Incremental assignment of each new request
- Complete reassignment of all unbound tickets
- Arosa: a middle ground
  - Internally maintains a concrete assignment
  - Reconsiders only some unbound tickets



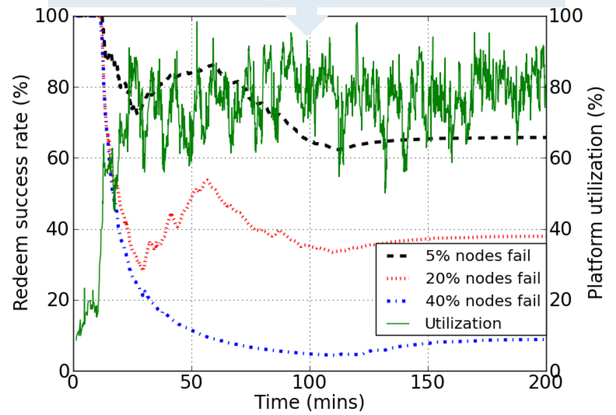
Resource negotiation process

RESULTS

Arosa achieves higher utilization



Subsequent reassignment hides many node failures



CONCLUSION

Late-binding

- Provides flexibility via resource reallocation
- Achieves higher testbed resource utilization
- Can mask physical network failures
- Supports multi-stage resource negotiation