DWDM RAM

Data@LIGHTspeed

Application-engaged Dynamic Orchestration of Optical Network Resources

DARPA

Defense Advanced Research Projects Agency

NTONC

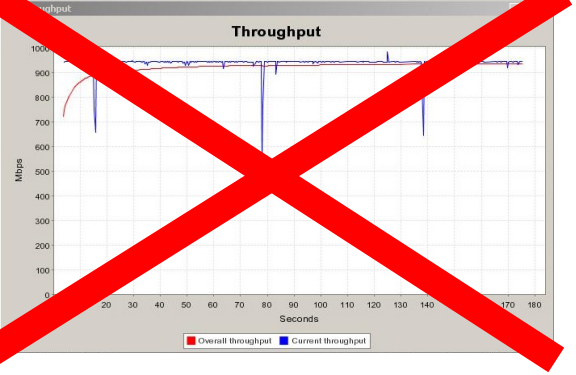
National Transparent Optical Network Consortium

NORTEL NETWORKS

BUSINESS WITHOUT BOUNDARIES

iCAIR

NSF



Grids & C. freed us from the cuffs of bit-blasting races

Apps such as Grids call for a complex mix of:

Bit-blasting

\+ Finesse (*granularity of control)*

\+ Virtualization (*access to diverse knobs*)

\+ Resource bundling (*network AND* …)

\+ Security (*AAA to start*)

\+ Free from GUIs, any human intervention

= λ's are worth a whole new look!

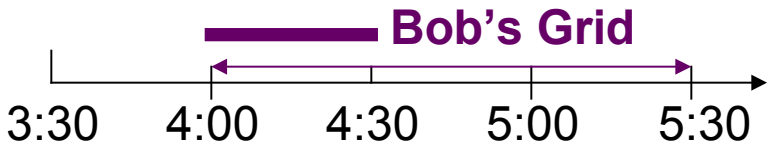
Business Drivers for next-gen λ services

- **Business Continuity/Disaster Recovery**
  - Remote file storage/back-up
  - Recovery after equipment or path failure
  - Alternate site operations due to natural or man-made disaster
- **Storage and data on demand**
  - Rapid expansion of network attached storage capacity
  - Archival storage and retrievals
  - Logistical networking – pre-fetch and cache
- **Grids**
  - Financial: portfolio risk analysis; Manufacturing: CAD; Entertainment: digital rendering; Lifesciences: drug discovery
  - Utility computing for pay-as-you-go business models

We pick role-model dynamics…

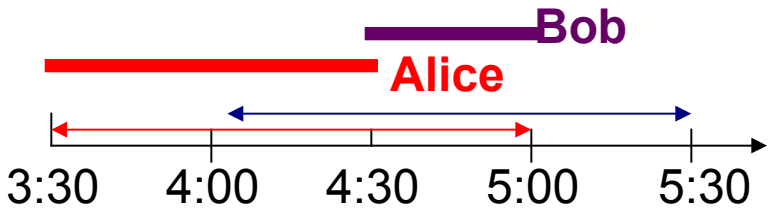
Under-constrained window use-case

- **Request for 1/2 hour between 4:00 and 5:30 on Segment D granted to Bob's Grid at 4:00**



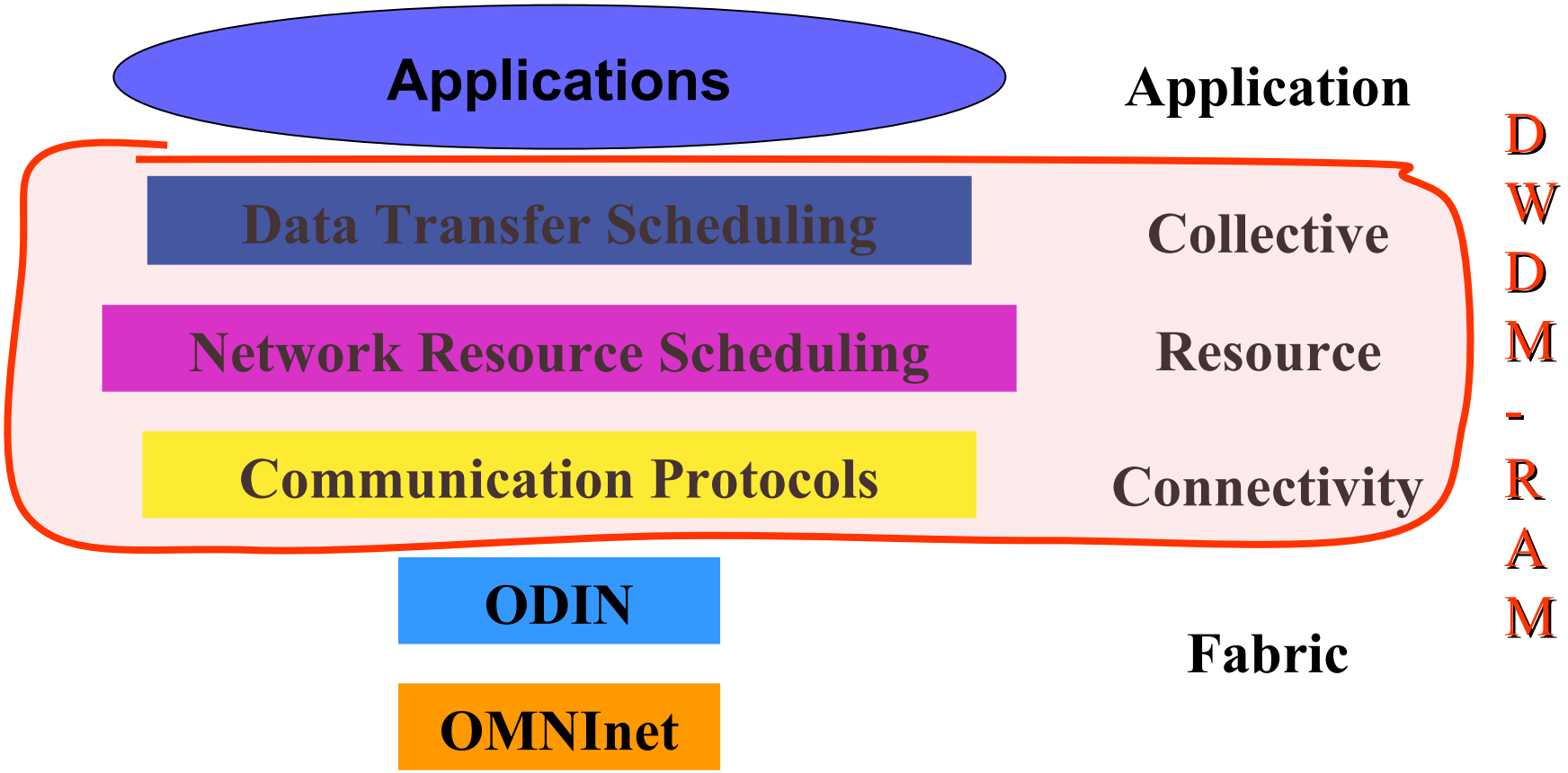
- **New request from Alice's Grid for same segment for 1 hour between 3:30 and 5:00. Alice's credentials support the request**

- **Reschedule Bob's Grid to 4:30; Alice's Grid stays at 3:30. Everyone is happy.**

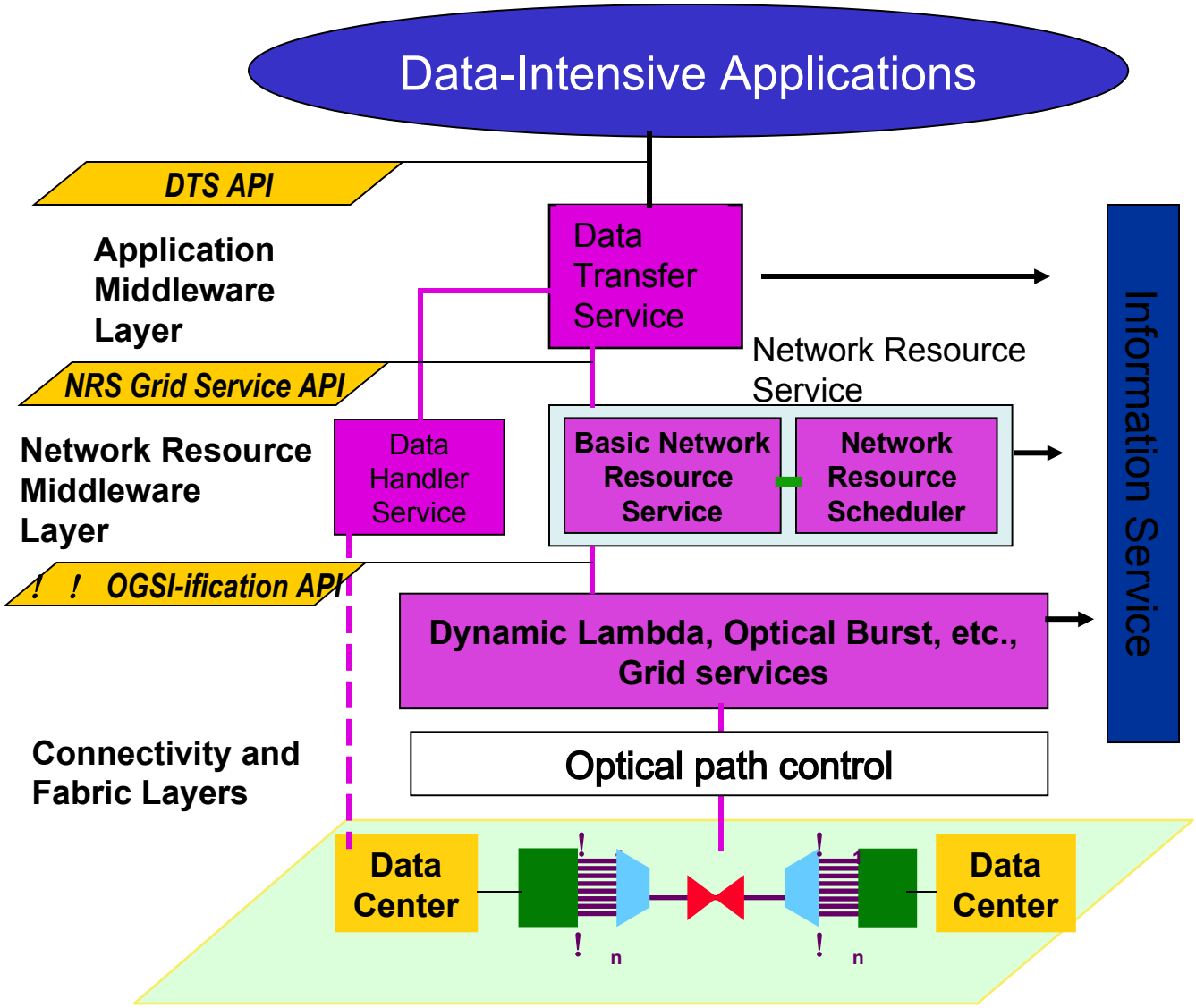


Route allocated for a time slot; new request comes in; former route can be rescheduled for a later slot within window to accommodate new request

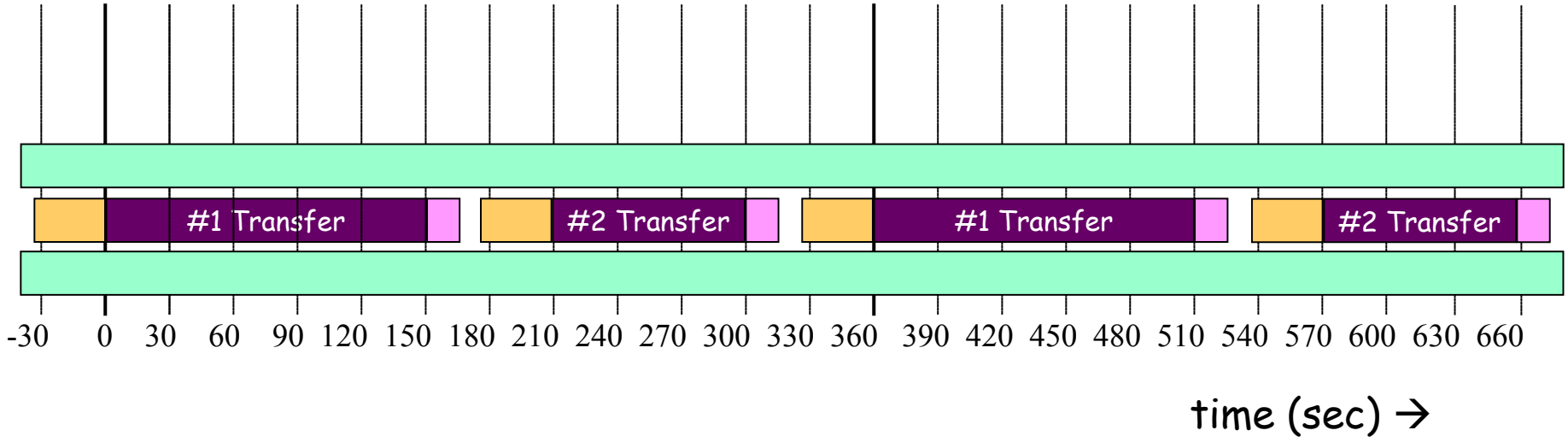
… and map them over dynamic λs



DWDM-RAM Architecture



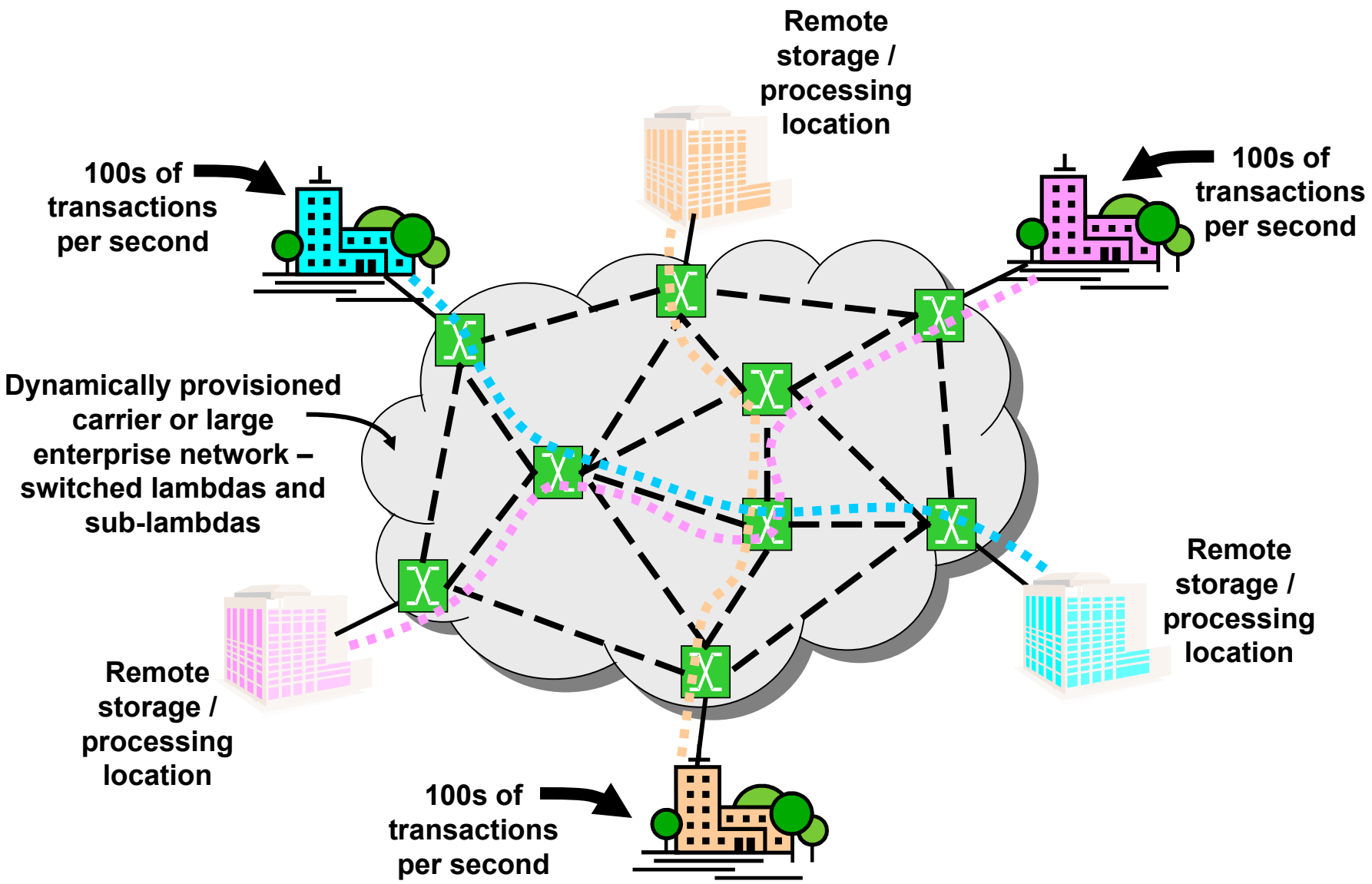
Finesse Task 2: Characterize overall utilization



allocate path

de-allocate path

Demonstrator, a Notional View



Current Demonstrator (Supercomm, 0604)

BIGBANK

Records/second: 16K records/second

Record size: 4 KB

Queue Load: 1,245,726 records

4,982,904,000 bytes

Queue Fill rate: 64 Mbytes/sec

Next Sched. Queue Delivery: 2:35 pm

Delivery countdown: 33 sec

Burst duration: 150 sec

Last burst throughput: 610 Mbps

Accumulation period: constant

Stocks-R-Us

Records/second: 14K records/second

Record size: 2 KB

Queue Load: 70 records

140,000 bytes

Queue Fill rate: 28 Mbytes/sec

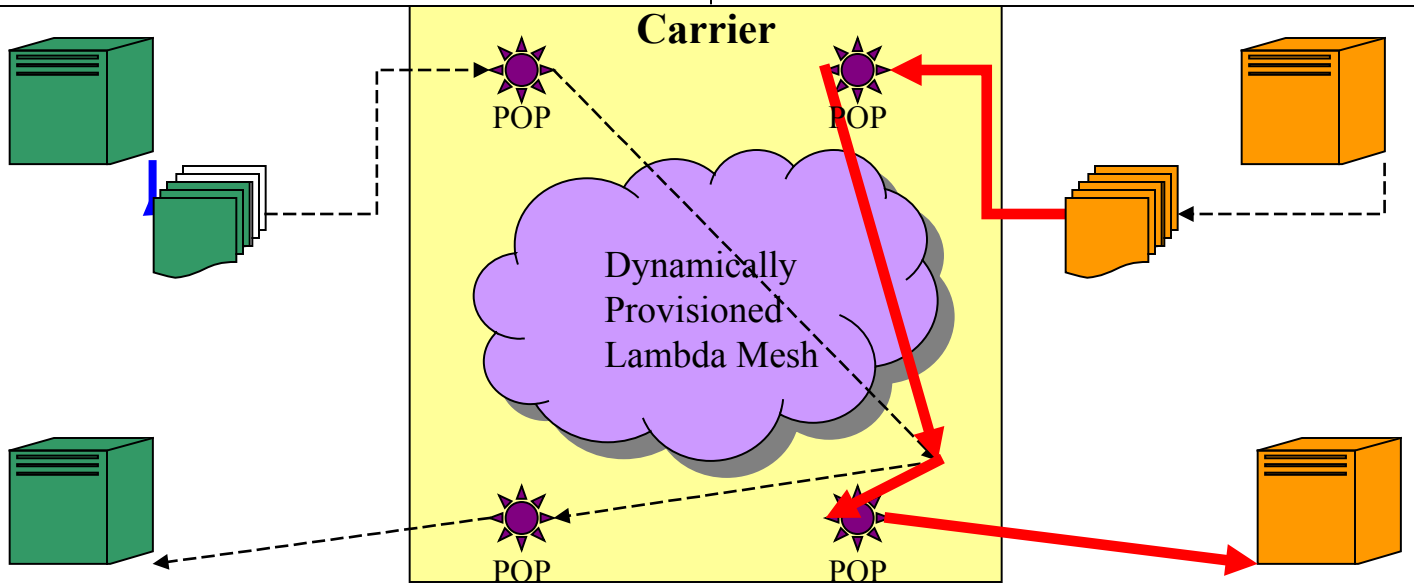
Next Sched. Queue Delivery: IN PROCESS

Delivery countdown: IN PROCESS

Burst duration: 90 sec

Last burst throughput: 580 Mbps

Accumulation period: constant



Conclusions

- **A journey past "bit-blasting" has begun**
- **For rich λ semantics, it's key to define proper layers**
  - Web Service mechanisms dominate the upper layers
  - The ASTN-based OMNInet control plane proves solid foundation and handy separation of concerns
  - The combination gives preliminary confirmation of scaling
- **New work items**
  - Simulation + empirical validation with large(r) populations
  - Integration with workflow languages
  - AAA and data path security
  - Integration with a Grid Community Scheduler