# GRID NETWORK SERVICES

## - GHPN Research Group -

Draft-ggf-ghpn-netservices-0

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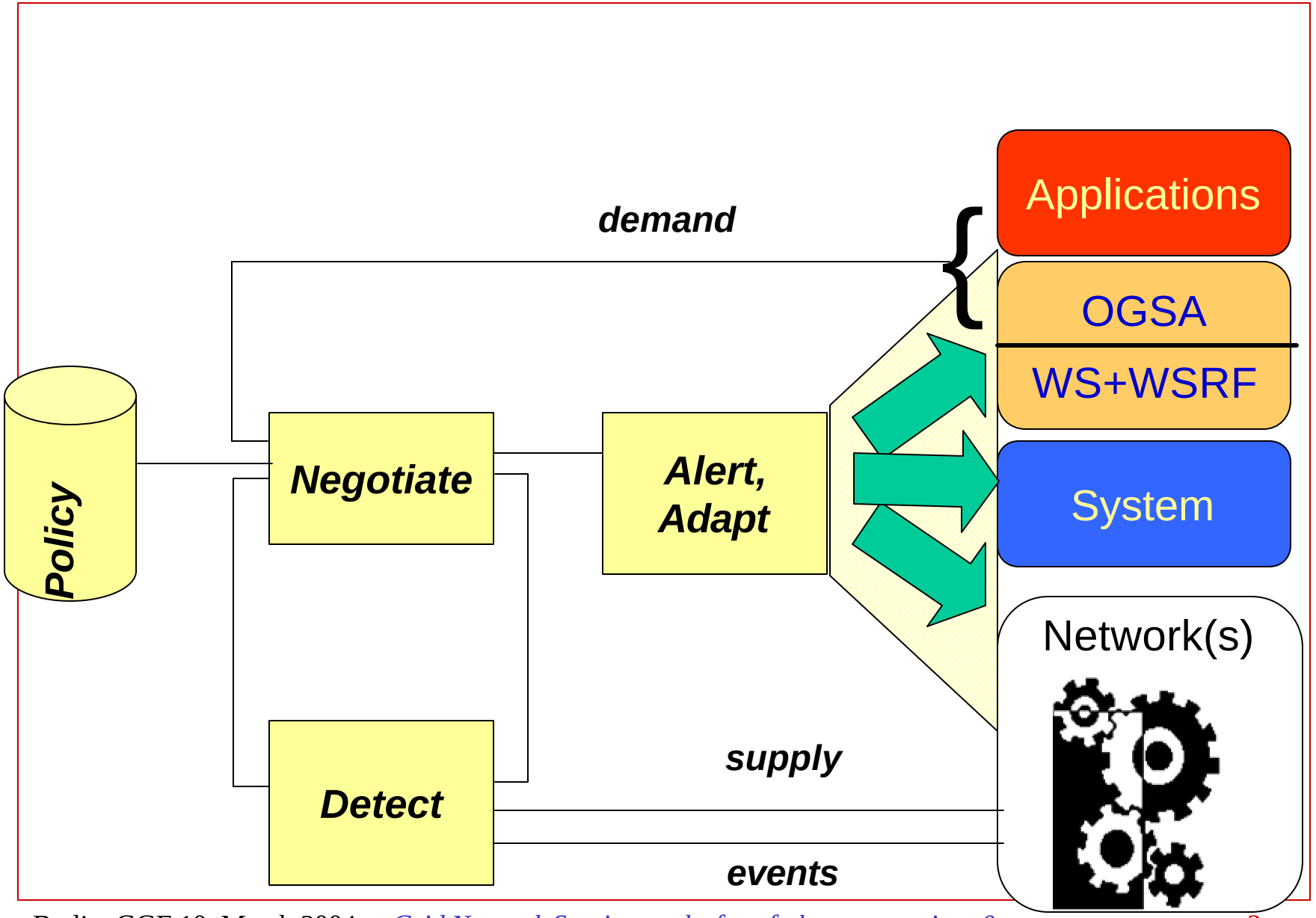
# Goals

- To scope out all the services that are required to elevate the network to Grid-managed resource
  - Dynamic provisioning
  - Dynamic topology discovery
  - Monitoring, AAA, etc.
- A breadth-first exercise !
  - Name the necessary and sufficient abstractions
  - Establish guidelines for new abstractions
  - Use cases
  - Labeling portTypes is a way out

# Other than abstracting, NetServices enact feedback loops



# Network services

1. Network (advance) reservation service
   - Grid network resource service (Network resource management)
2. Connectivity service
3. Network information service
4. Network monitoring service
5. Network cost estimation service

# (1) Network (advance) reservation

- Based on the notion of “Network Resource”:
  - bandwidth
  - connectivity (or equivalently, path)
    - Diffserv QoS, MPLS, lambda, L1/L2/L3 VLAN, ...
  - Network measurement session
- Should extend the agreement service (WS-Agreement) by adding network-specific agreement terms
  - Grid Network Agreement Provider
  - Grid Network (Resource) Service Provider (Network Resource Manager)
  - Grid Network Agreement Initiator: the user or application
- Abstraction of “Network Resource” still to be defined:
    - Peter’s proposal:
      - physical, per-domain, tecnology-dependent
      - Logical, technology-independent, inter-domain

# (1) Network advance reservation (cont)

- Use cases: they depend on the network resources to be managed
  - Connectivity service
  - Deadline file transfer
  - Visualization
  - Network monitoring
  - Co-allocation

# (2) Connectivity service

– types:

- Bandwidth
- path with QoS support
- Optical bypass
- Transparent optical channel
- L1/L2/L3 VLAN
- (Multicast path)
- ...

– Use cases:

- High throughput file transfer with scheduled connectivity
- High throughput file transfer with deadline
- Visualization
- Replica management

# (3) Nework information

- ?

# (4) Network monitoring

- Provides a means of asking for new measurements to be made (network monitoring service)
- Provides access to historical data (as part of network information service?)
- Uses of network monitoring:
  - Set up continuous periodic measurements for status monitoring and shorter-term problem diagnosis by administrators
  - Automated problem diagnosis systems (E2E piPES)
  - Provide up-to-date and even predicted information to network cost services

# (4) Network monitoring (cont)

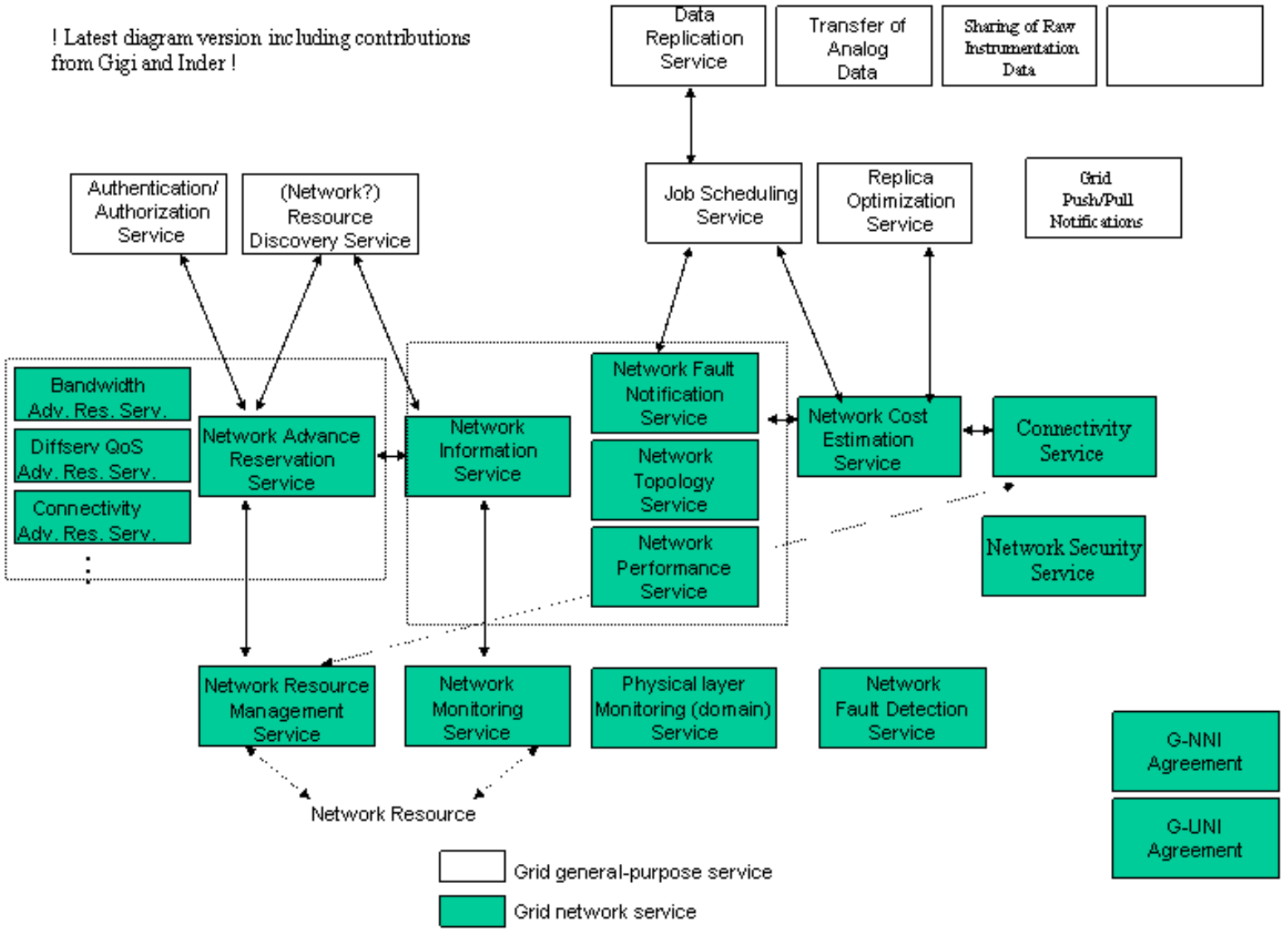
Outstanding Issues:

- Does information service provide capability information about underlying network?
- Where is the line between information service and monitoring service?
- How much network information can be transmitted in a completely generic grid information service
- Is monitoring service a [Clarke] primitive service?
- Can we fit network monitoring into an aggregate network resource service model [Clarke]?

- Do we want reservation service for measurement-making resources?
- How are the capabilities of network monitoring services discovered?

# (5) Network cost estimation service

- Network cost function
  - Specific cost models can be defined for each use case
- Based on network performance information and monitoring services
- Use cases:
  - Data replication
  - Deadline file transfer
  - Job scheduling service
  - Adaptive remote file access


! Latest diagram version including contributions from Gigi and Inder !
Data Replication Service
Transfer of Analog Data
Sharing of Raw Instrumentation Data
Authentication/ Authorization Service
(Network?) Resource Discovery Service
Job Scheduling Service
Replica Optimization Service
Grid Push/Pull Notifications
Bandwidth Adv. Res. Serv.
Diffserv QoS Adv. Res. Serv.
Connectivity Adv. Res. Serv.
Network Advance Reservation Service
Network Information Service
Network Fault Notification Service
Network Topology Service
Network Performance Service
Network Cost Estimation Service
Connectivity Service
Network Security Service
Network Resource Management Service
Network Monitoring Service
Physical layer Monitoring (domain) Service
Network Fault Detection Service
G-NNI Agreement
G-UNI Agreement
Network Resource
Grid general-purpose service
Grid network service

# Current (implicit) hierarchy of the services

- Network services
  - With interfaces to both the user and Network services
    - Network advance reservation
    - Network monitoring
    - Network information
  - With interfaces to other Network services
    - Network cost estimation service
    - Connectivity service
    - Network resource service
    - Network monitoring schedule
    - Network monitoring results
    - Network monitoring negotiation
    - Network monitoring prediction

# (Some) Open problems

1. *Grid* network services vs network services
2. Coherent network services architecture still missing
   - Network services could be organized in layers (Clarke)?
     - Yes, could be applicable to the connectivity service
   - Or: Some network services can be directly accessed by the user/application, others are hidden and provide support to other higher-layer services, better structure needed
3. Network resource abstraction
4. Service schema

- The draft currently mixes use cases, functional description and implementation description
- More services to be added: “grid data transport service”, multicast, ...
- Use cases