



Enabling Grids for E-science

EGEE II - Network Service Level Agreement (SLA) Implementation

*4th TERENA NRENs and Grids Workshop
- AMSTERDAM, 2006-12-06*

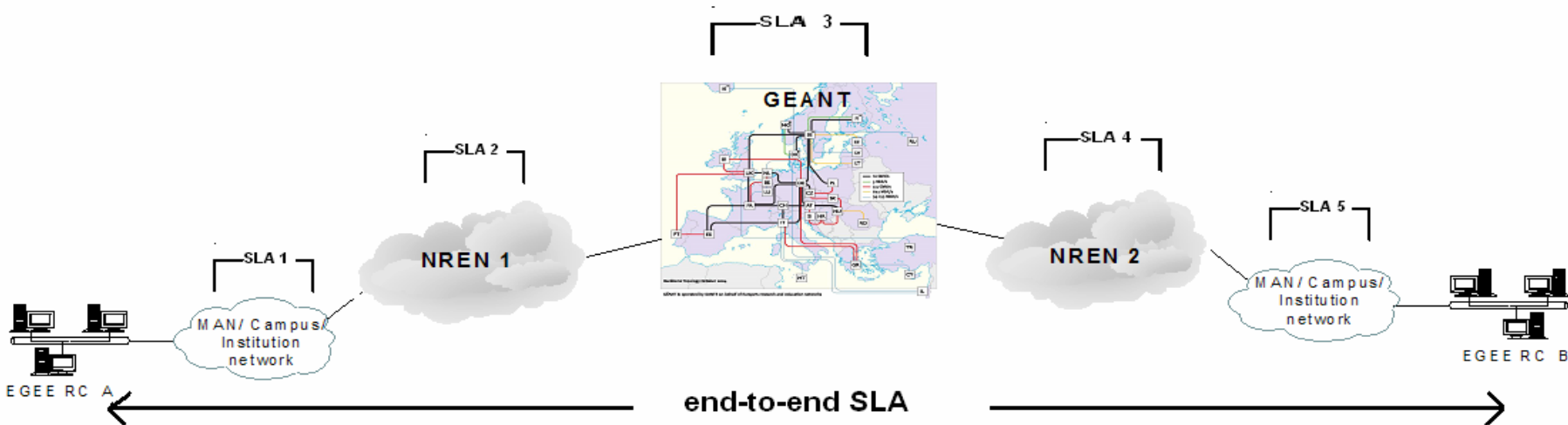
Vassiliki Pouli (GRNET/NTUA)

www.eu-egee.org



- **Introduction**
- **SLA parts**
- **Model of SLA establishment**
- **Monitoring of SLAs**
- **Questions**

- Whenever an amount of traffic is transferred from one EGEE RC (Resource Centre) to another, a Network Service Instance (NSI) is established.
- For every NSI an end-to-end SLA in IP layer is defined providing the technical and administrative details to perform
 - Maintenance
 - Monitoring
 - Troubleshooting
- Synthesis of end-to-end SLA based on individual domain SLAs

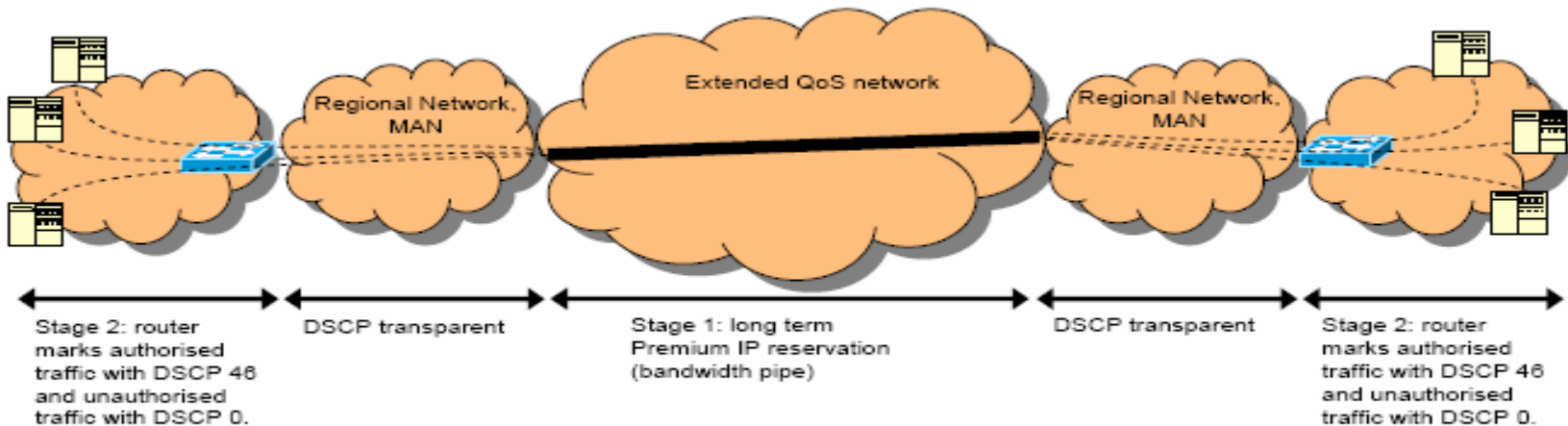


- **ALO (Administrative Level Object)**
 - Contacts
 - Duration
 - Availability
 - Response times
 - Fault handling procedures
- **SLO (Service Level Object)**
 - Service instance scope
 - Flow description
 - Performance guarantees
 - Policy profile
 - Excess traffic treatment
 - Monitoring infrastructure
 - Reliability guarantees: max downtime (MDT), time to repair (TTR)

- **Preliminary agreement of ENOC with participating domains & RCs**
 - Made once for the whole project lifetime
- **2-Stage Provisioning Model**
 - Stage 1: Service Request (SR)
 - PIP (Premium IP) reservation in extended QoS network (GEANT/NRENs)
 - Stage 2: Service Activation (SA)
 - Activation of the service ↔ Configuration of the routers in the last mile network

2-Stage Provisioning Model due to:

- Manual configuration of the routers
- Lead time between service request and service reservation (currently 2 working days)



Two stage provisioning process

1. ENOC asks from every participating domain and RC to formulate an agreement
2. Each domain NOC provides
 - the ALO (Administrative Level Object)
 - max bandwidth allocated for EGEE

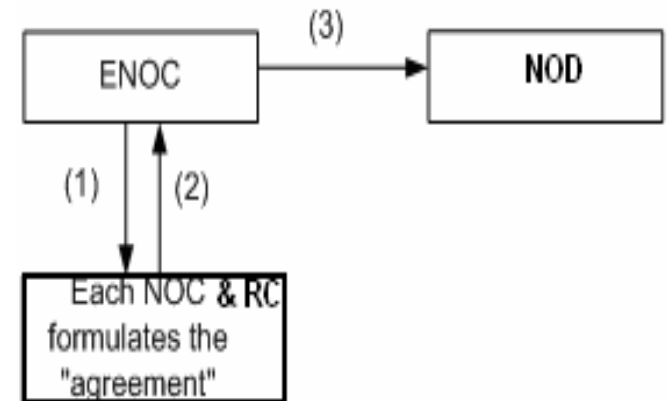
Each RC

- provides administrative and technical details
- signs Acceptable Use Policy (AUP)
 - Provisioned network resources used only for EGEE purposes

3. ENOC stores the received information to the NOD (Network Operational Database)

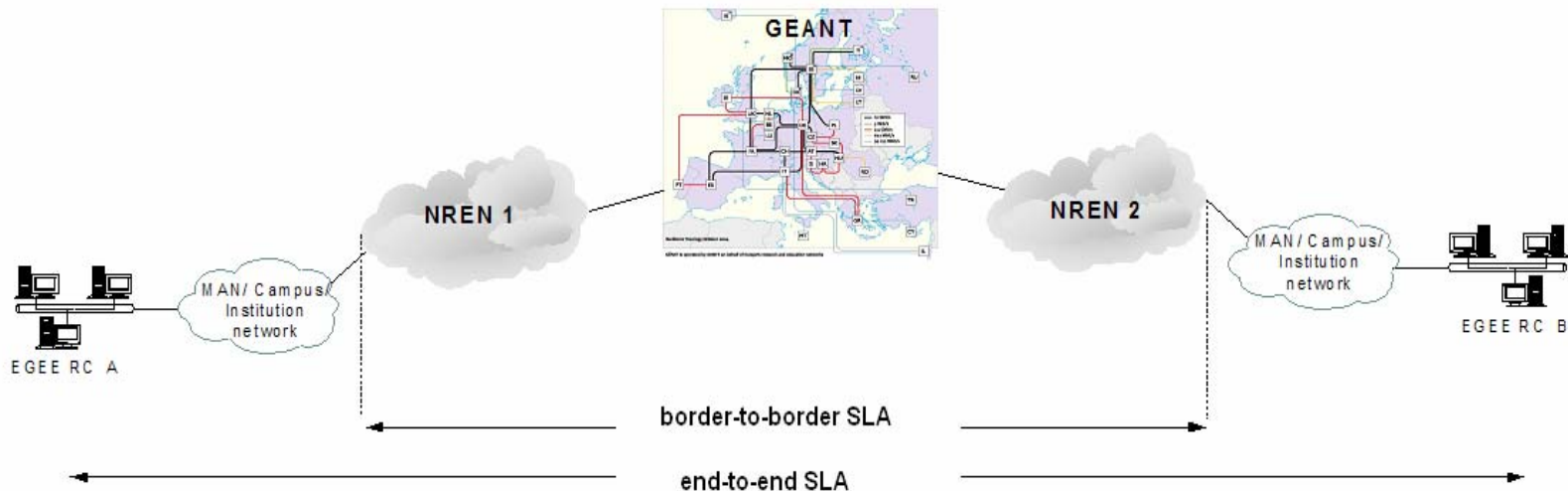
Preliminary agreement

(once for the whole project life)

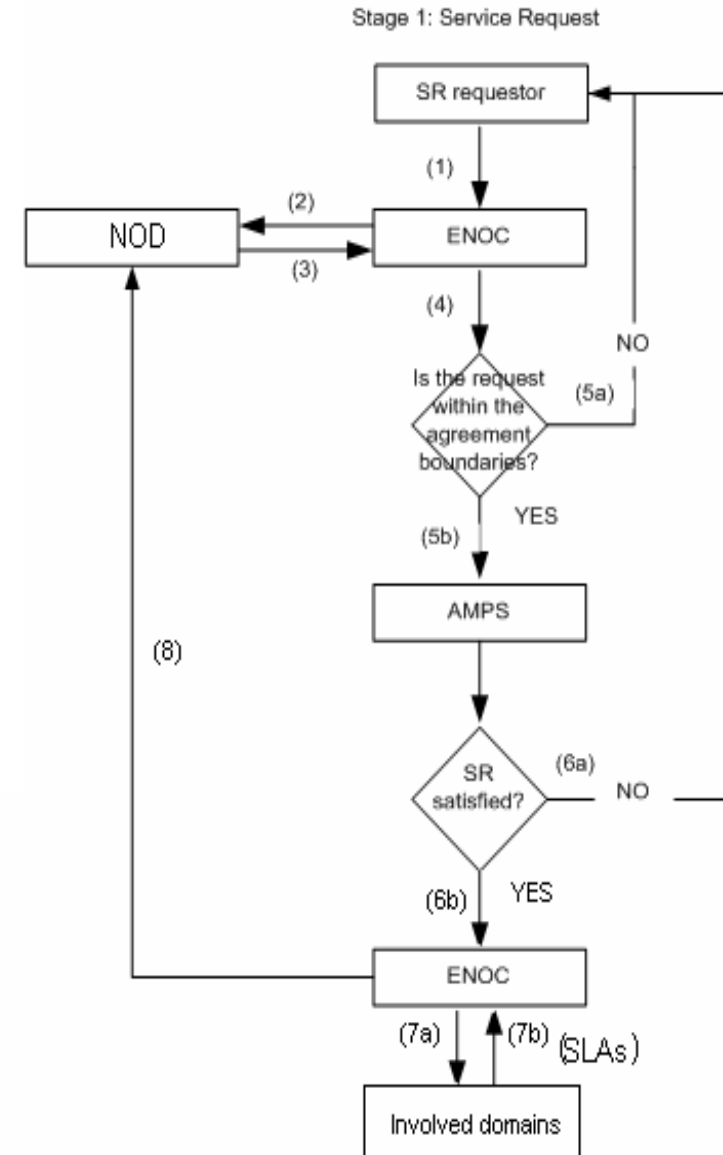
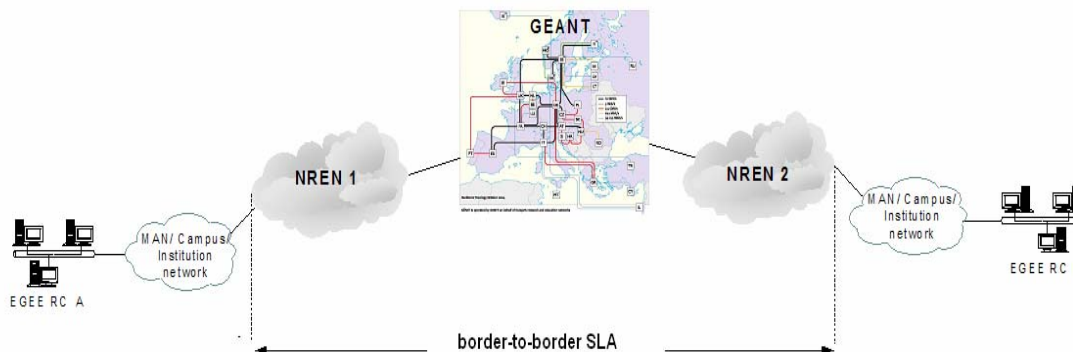


- **Stage 1: In the Service Request (SR) stage:**
 - PIP reservation in extended QoS network
 - Case 1: automatic reservation
 - Case 2: manual reservation
 - border-to-border SLA (GEANT/NRENs SLAs)

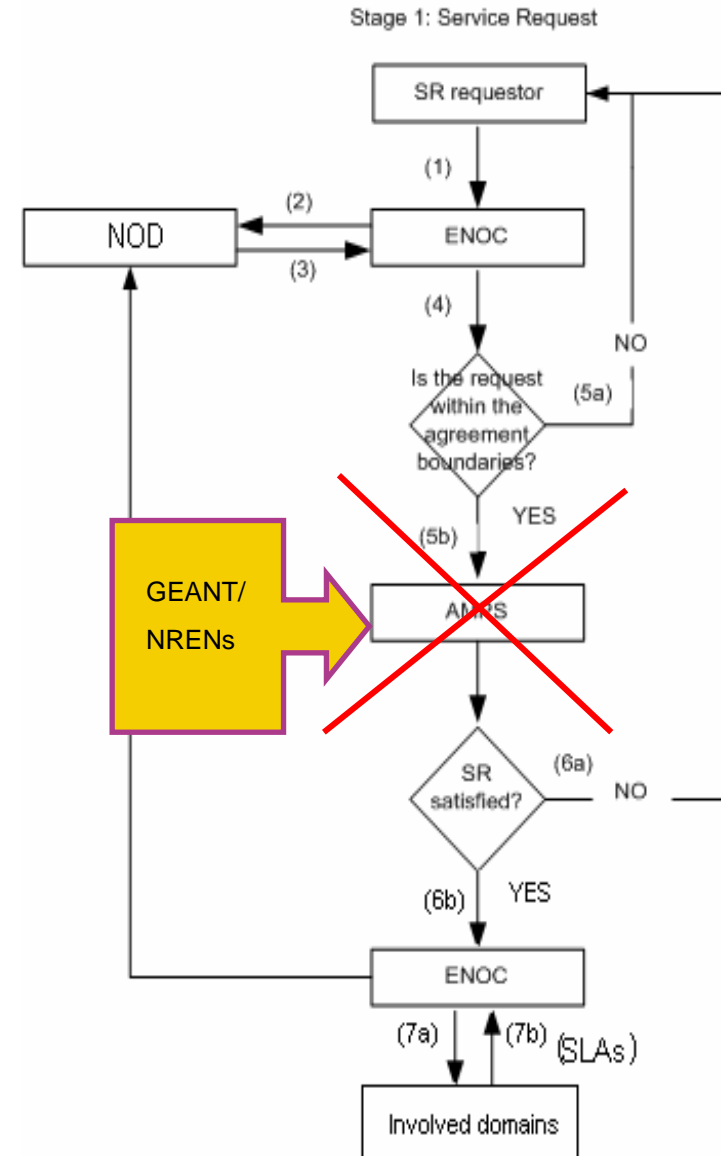
- **Stage 2: In the Service Activation (SA) stage :**
 - Configuration of the routers in the last mile network
 - end-to-end SLA (b2b SLA + NREN client domains' SLAs)



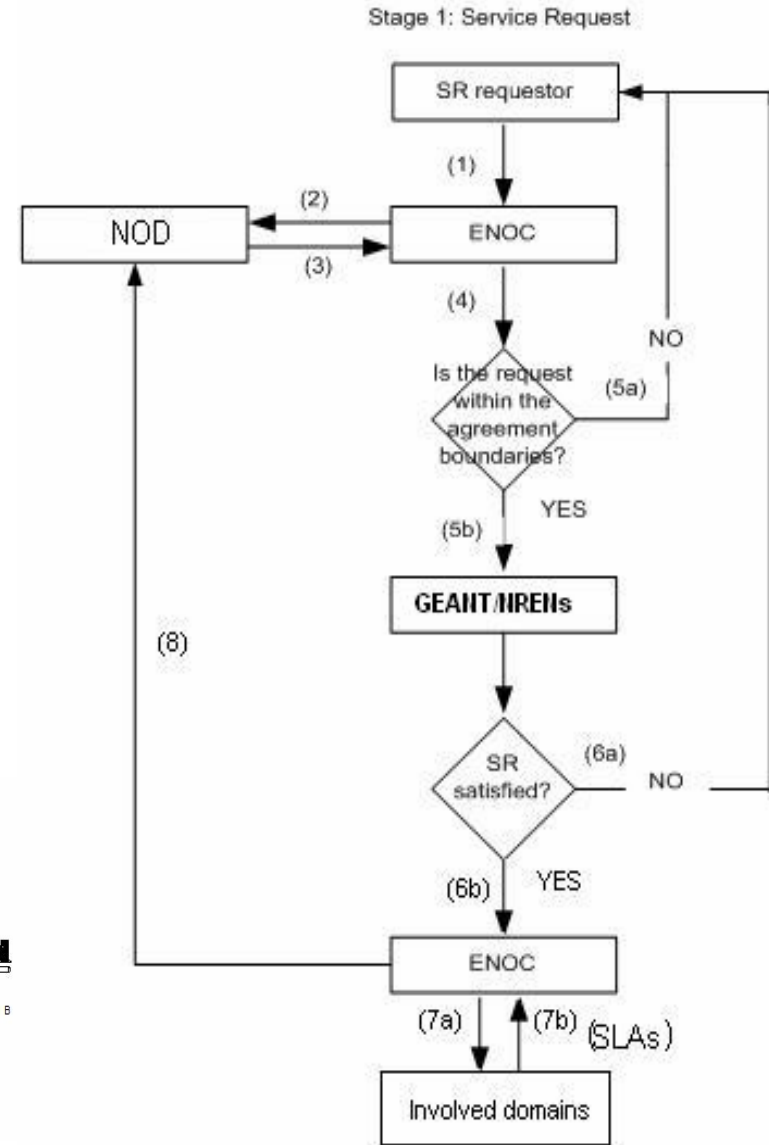
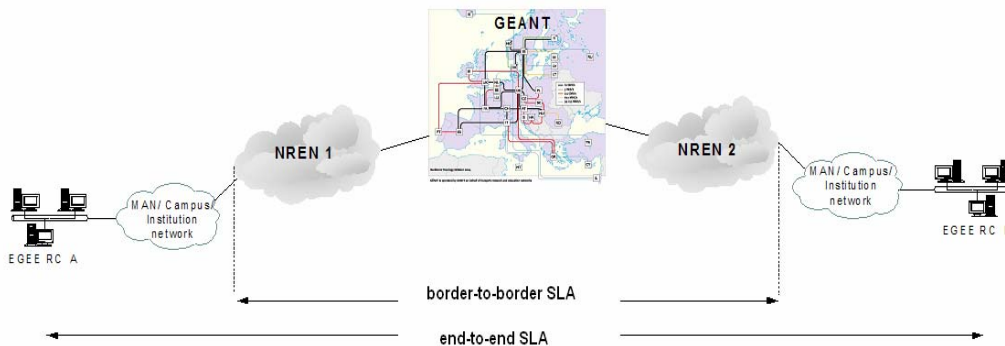
- **Reservation via AMPS (Advanced Multi-domain Provisioning System) servers of hosting NRENs and GEANT**
- **AMPS system:**
 - In development stage by the GEANT project
 - Management of the whole PIP provisioning process from user request through to the configuration of the appropriate network elements
- **ENOC identifies involved GEANT/NREN domains**
- **GEANT/NRENs provide individual SLAs**
- **Synthesis of b2b SLA: performed by ENOC based on reported GEANT/NRENs SLAs**



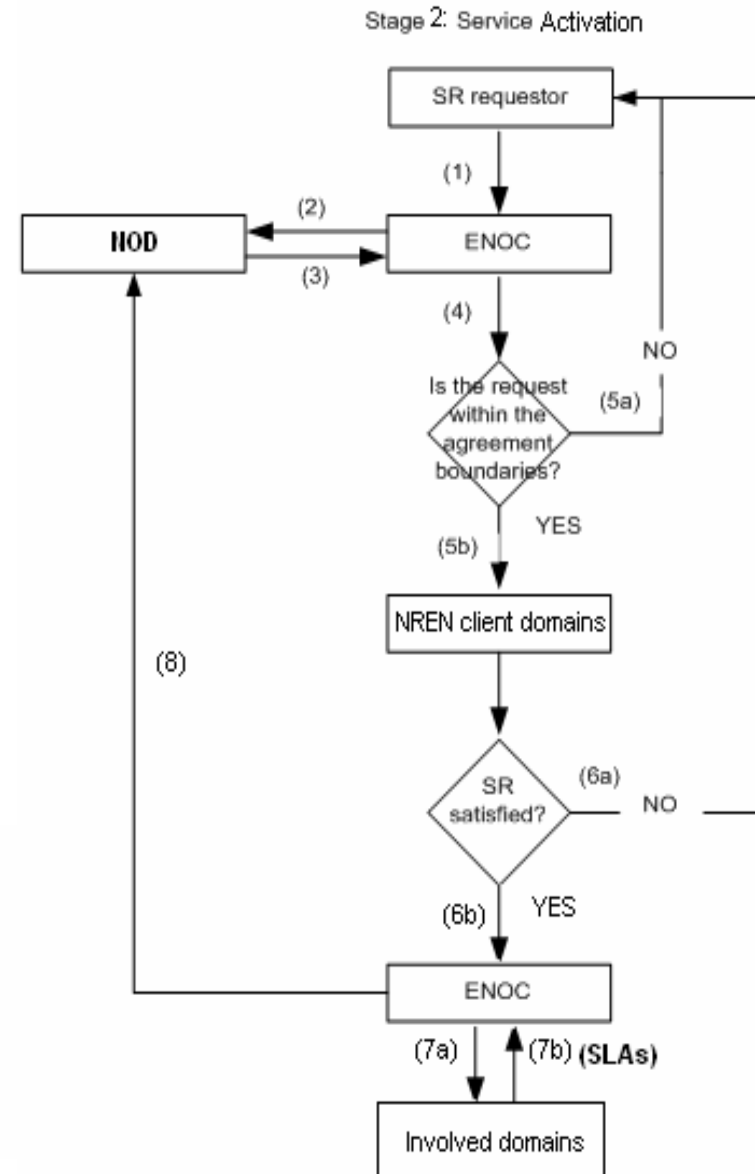
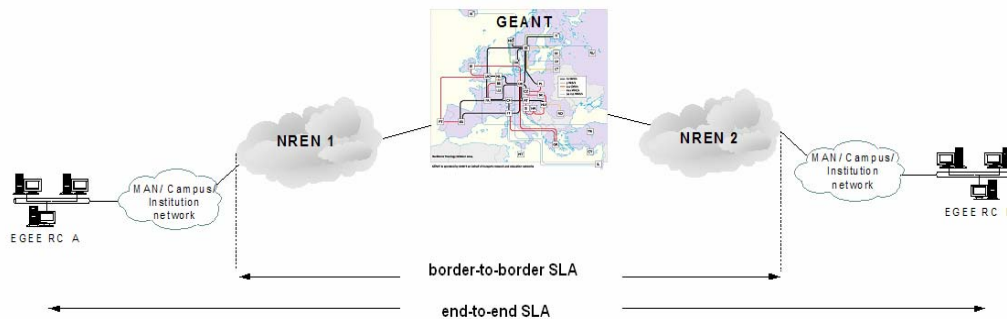
- Cases with no AMPS servers installed in NRENs



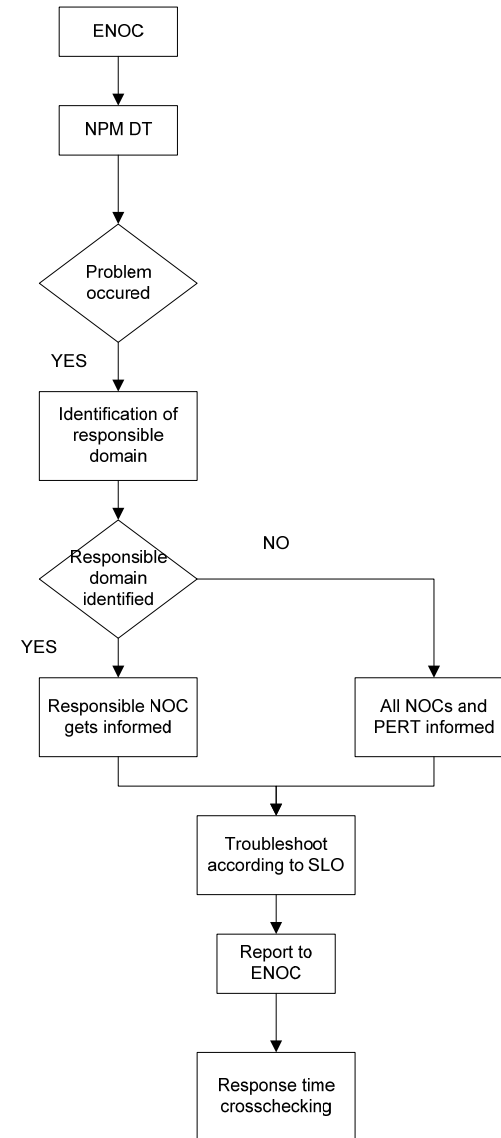
- No AMPS servers installed
- ENOC identifies involved GEANT/NREN domains
- ENOC initiates manual requests to individual domain NOCs
- NOCs reply by email and provide individual SLAs
- Synthesis of b2b SLA: performed by ENOC based on reported domain SLAs



- ENOC identifies the involved NREN client (MAN/campus/institution) domains and queries for the max bandwidth allowed for EGEE traffic
- Checks if NREN client domains can support the request
- NREN client domains provide their SLAs
- ENOC produces e2e SLA based on:
 - reported NREN client domains' SLAs
 - b2b SLA from stage 1

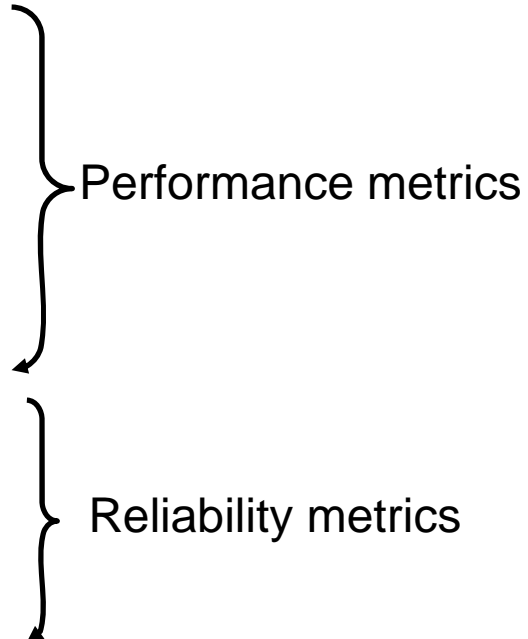


- ENOC queries NPM DT (Network Performance Monitoring Diagnostic Tool)
- NPM DT provides measurement data from *perfSONAR* (GEANT/NRENs) and *e2emonit* (RC-to-RC) monitoring frameworks
- **Fault Identification/Notification**
 - Case 1: ENOC identifies & notifies responsible domain
 - Case 2: ENOC (not able to isolate the problem) informs all domains and GEANT PERT (Performance Enhancement Response Team)
- **Reaction-Repair according to SLAs**
- **ENOC checks SLA compliance**



- **e2e Metrics:**

- OWD (One Way Delay)
- IPDV (IP Packet Delay Variation)
- RTT (Round Trip Time)
- Packet Loss
- Available bandwidth
- Achievable bandwidth
- TTR (Time To Repair)
 - From trouble ticket issue to recovery, per violation
- MDT (Maximum DownTime)
 - Maximum total TTRs for all violations in a given period



- **Monitoring features**

- Frequent e2e and partial domain monitoring of performance metrics (e.g. every 15') in agreed service availability period
- Capability of setting thresholds on metrics to generate violation alarms
 - Different severity levels (?)
- Trouble tickets, triggered by users and ENOC operators on alarms, managed via TTM (Trouble Ticket Manager)
- Statistics from trouble tickets to infer MDT & TTR

