



Enabling Grids for E-science

GRIDCC testing EGEE II' SLA framework through GEANT infrastructure

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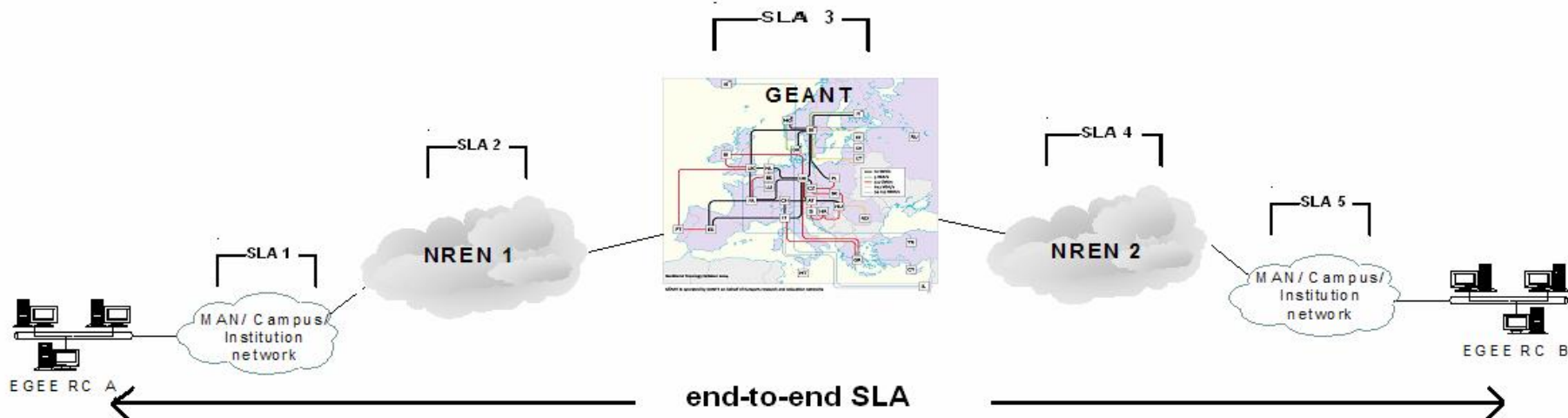
CERN, SWITZERLAND

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- **A briefly reminding on SLA structure (EGEE II - SA2)**
- **AMPS (Advance Multi-domain Provisioning System) preparation at each collaborative domain**
- **A briefly introduction to GRIDCC project**
- **Simple Scenario describing SLA testing**

- 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: time to repair (TTR)

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

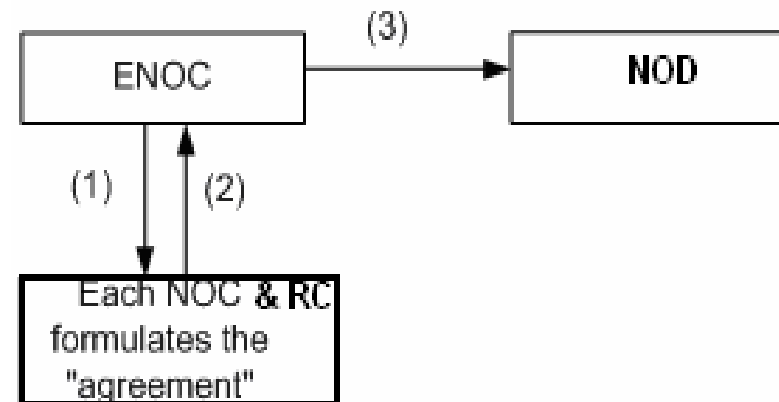
Each RC

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

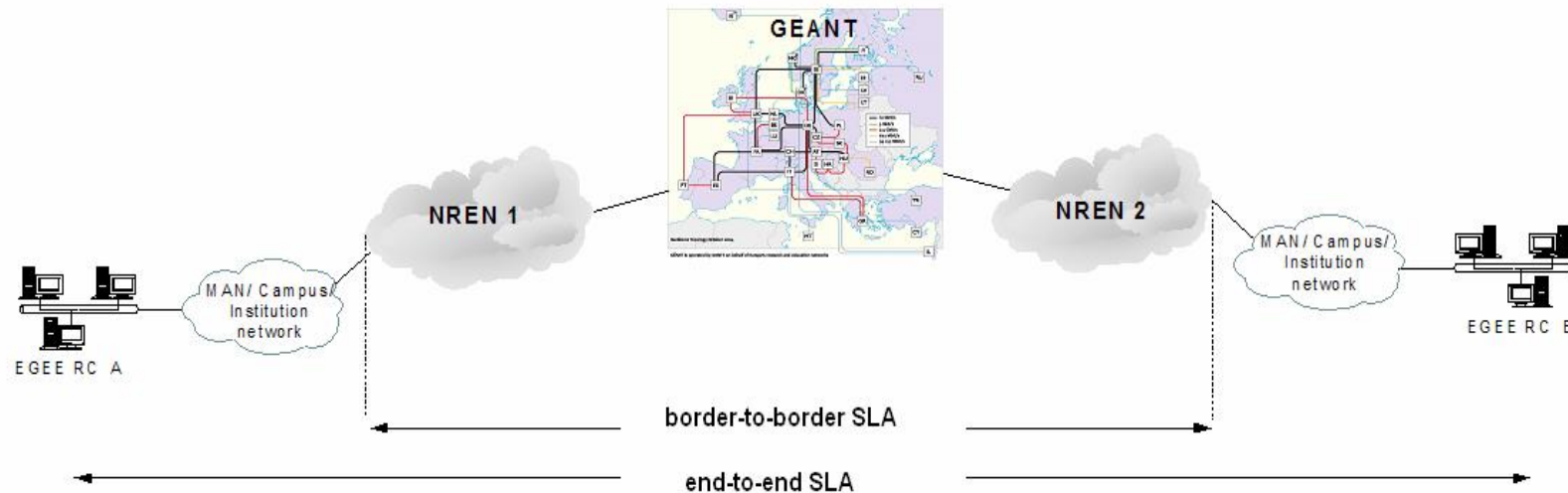
3. ENOC stores the received information to the NOD (Network Operational Database)

Preliminary agreement

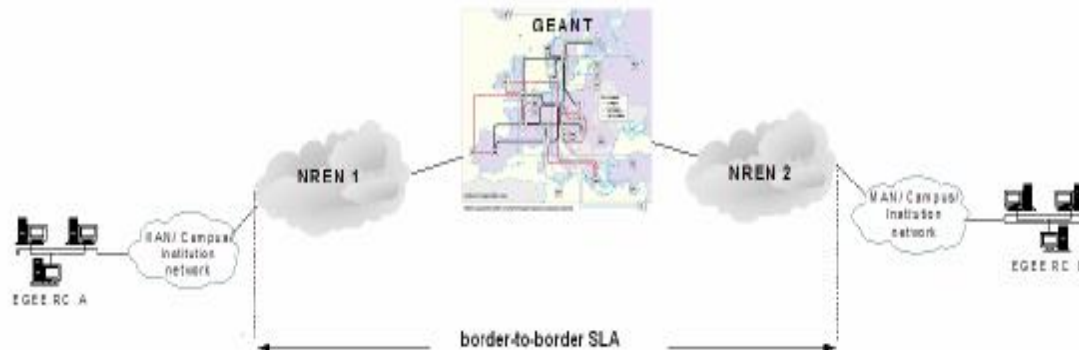
(once for the whole project life)



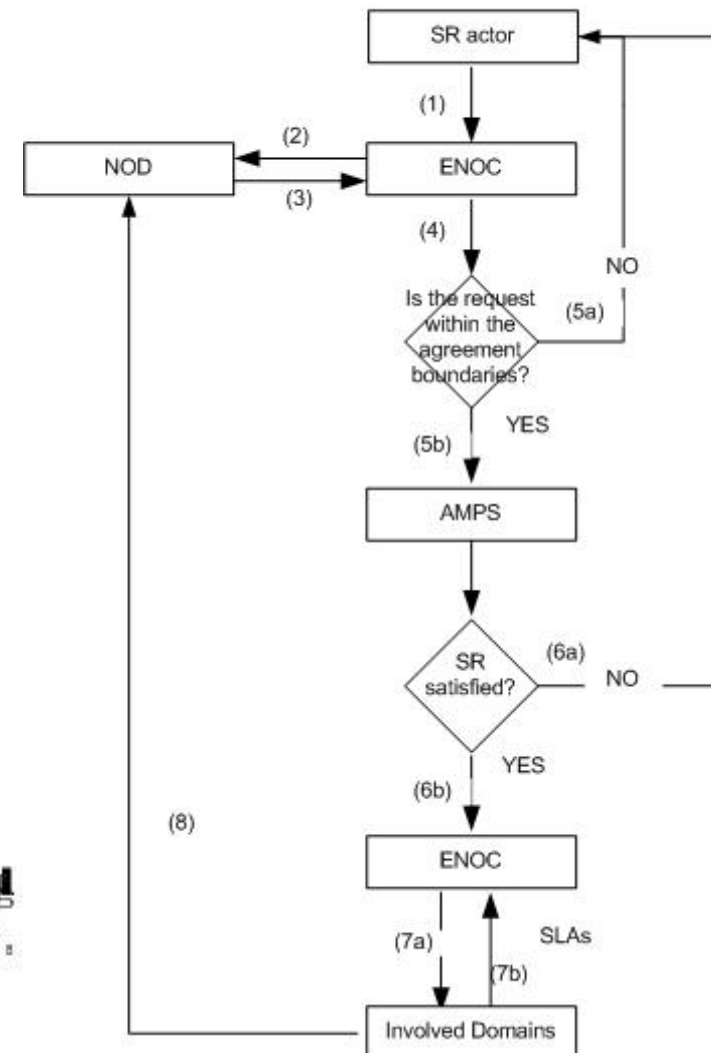
- **In the Service Reservation (SR) stage**
 - PIP reservation in extended QoS network
 - border-to-border SLA (GEANT/NRENs SLAs)
- **In the Service Activation (SA) stage :**
 - Configuration of the routers in the last mile network
 - end-to-end SLA (b2b SLA + NREN client domains' SLAs)



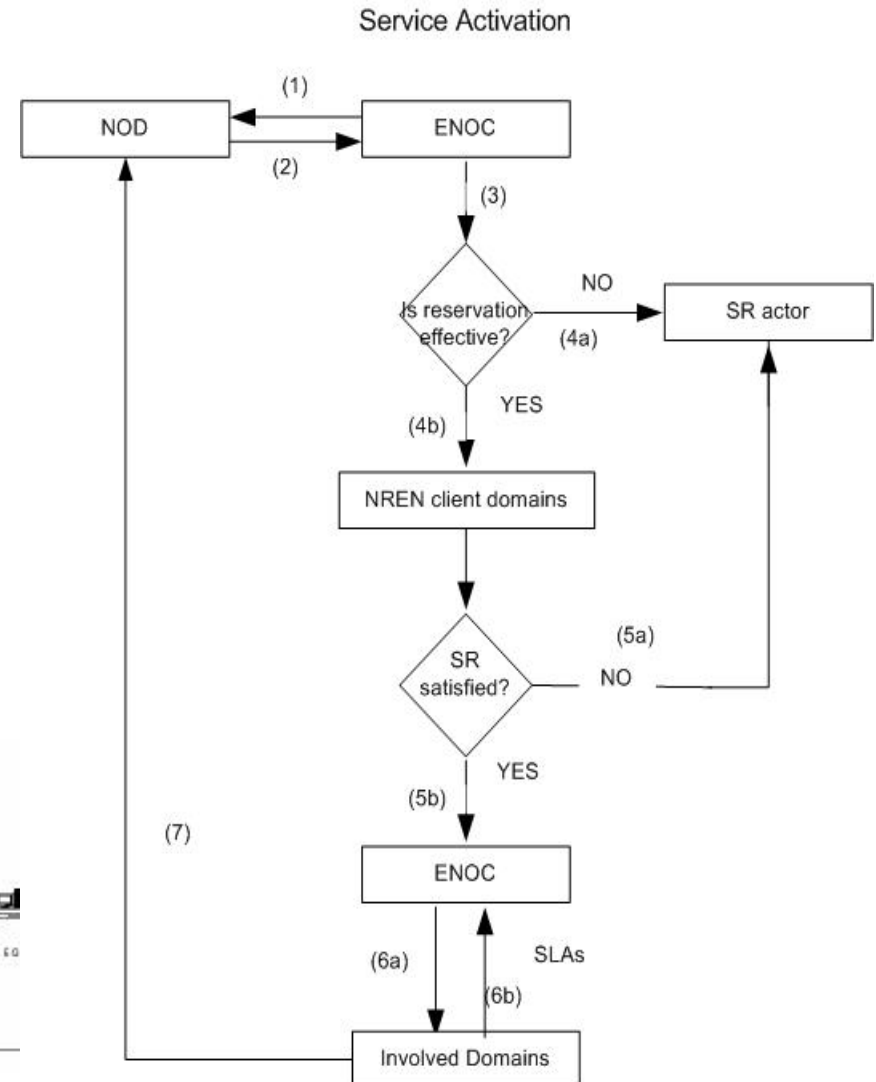
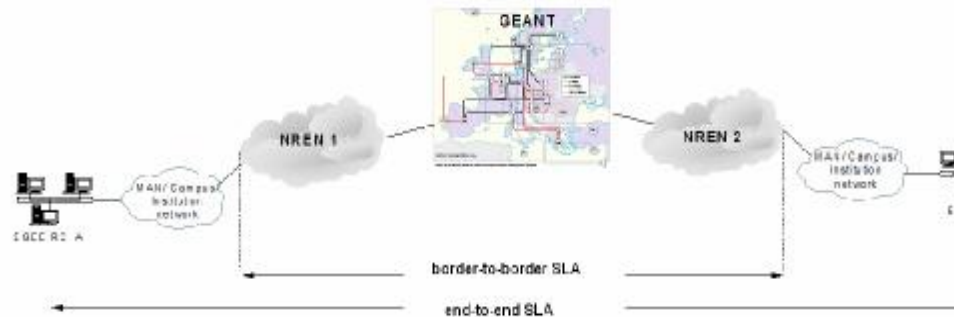
- Reservation via AMPS (Advanced Multi-domain Provisioning System) servers of hosting NRENs and GEANT
- AMPS system:
 - In testing stage by the GEANT project
 - Management of the whole PIP provisioning process from user request through to the configuration of the appropriate network elements
- ENOC identifies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



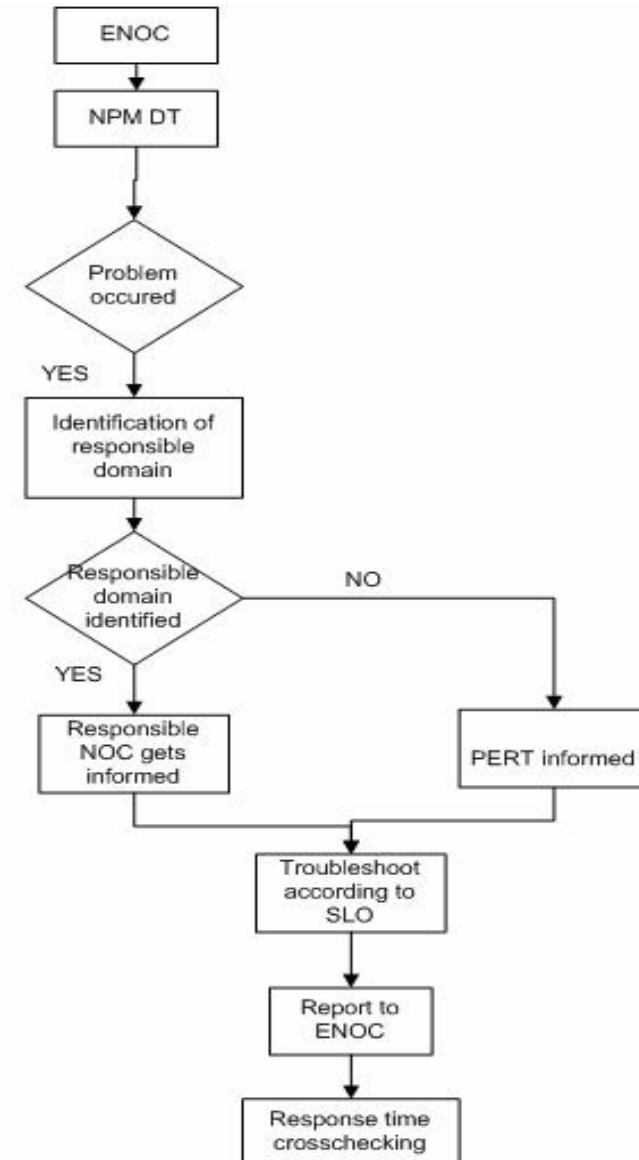
Automatic Service Reservation



- ENOC retrieves from NOD (Network Operational Database) the reservation information in the extended QoS domain
- ENOC verifies the reservation is still effective
- Checks if NREN client domains (MAN/campus/institution) 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 2 (including AMPS): ENOC (not able to isolate the problem) informs GEANT PERT (Performance Enhancement Response Team)
- Reaction-Repair according to SLAs
- ENOC checks SLA compliance



- **e2e Metrics:**

- OWD (One Way Delay)
- RTT (Round Trip Time)
- Available bandwidth
- Achievable bandwidth
- TTR (Time To Repair)

From trouble ticket issue to recovery, per violation

Performance metrics

- MDT (Maximum DownTime)

Maximum total TTRs for all violations in a given period

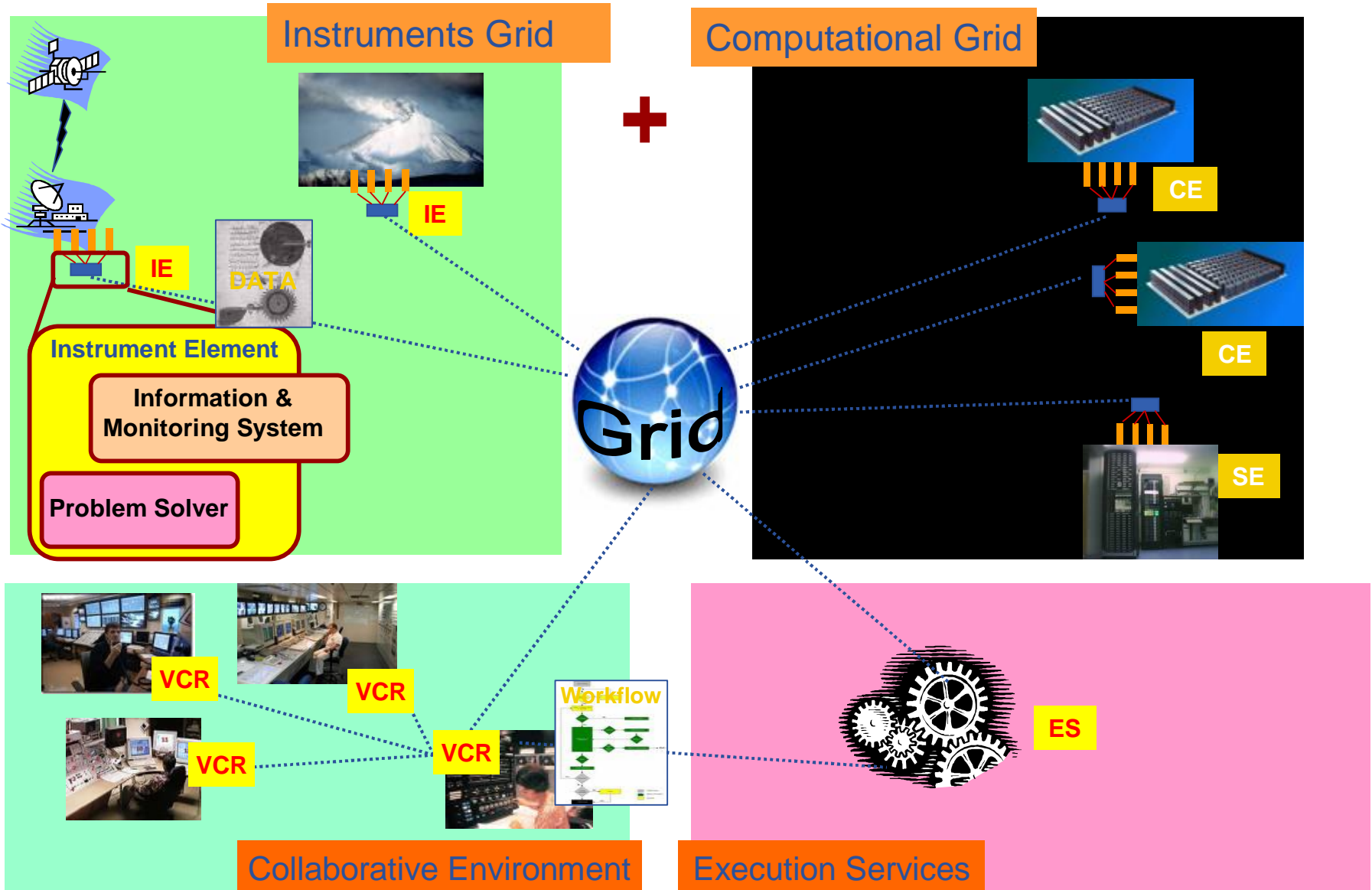
Reliability metrics

- Installed the latest version of AMPS
- Populated NIS (at least routers & links in the path)
- Policies for the request (a default policy that allows everything is preinstalled)
- AMPS firewalls should allow EGEE ENOC

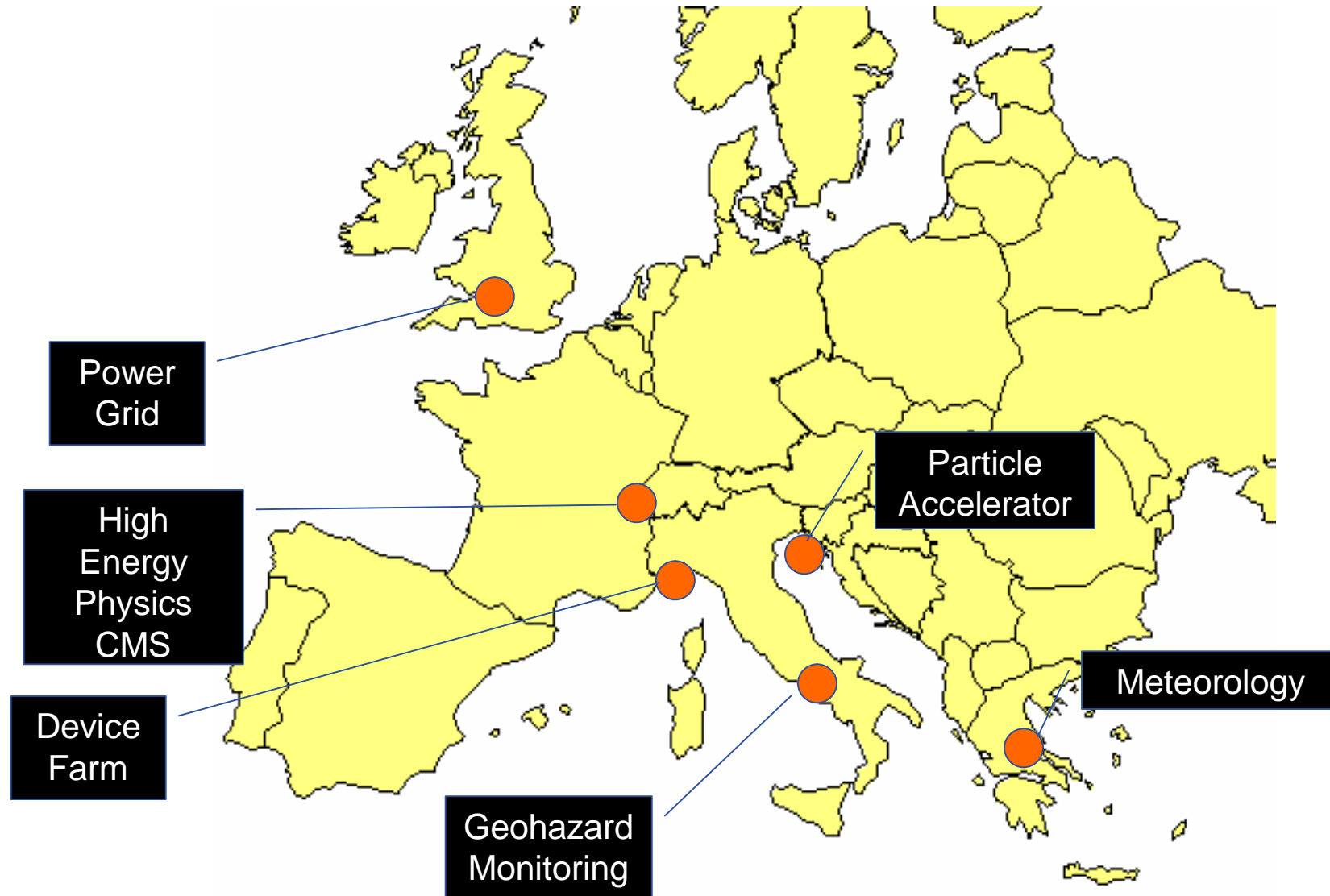
- **GRIDCC is a FP6 project ending August 2007**
- **It is showing how Instruments and Sensors can be not only remotely controlled and monitored, but even fully integrated in the European GRID, enabling in this way a perfect integration between control, data acquisition and grid based data storage and data processing**
- **Human interaction with Grids via Virtual Control Room (collaborative environment)**
- **Enactment of complex workflows**
- **GRIDCC Pilot Applications have been deployed in test bed environments, and even in production ones**
- **GRIDCC middleware is ready to be deployed in real and production infrastructure**

Participant name	Country
Istituto Nazionale di Fisica Nucleare	Italy
Institute Of Accelerating Systems and Applications/ IASA/NTUA	Greece
Brunel University	UK
Consorzio Interuniversitario per Telecomunicazioni	Italy
Sincrotrone Trieste S.C.P.A	Italy
IBM (Haifa Research Lab)	Israel
Imperial College of Science, Technology & Medicine	UK
Istituto di Metodologie per l'Analisi ambientale – Consiglio Nazionale delle Ricerche	Italy
Universita degli Studi di Udine	Italy
Greek Research and Technology Network S.A.	Greece

Component Name	Description
Instrument Element (IE)	This is a unique concept to GRIDCC. It consists of a coherent collection of services which provide all the functionalities to configure, partition and control the physical instruments
Information & Monitor Service (IMS)	It gathers from GRIDCC resources information and monitor data to be disseminated through a publish / subscribe systems or to be stored in persistent repositories.
Problem Solver (PS)	It offers automated problem solving in a Grid environment at two levels. A local PS, within a given Instrument Element, allows to solve local problems related to functionalities of a given instrument. A global PS, allows to solve system-wide problems.
Virtual Control Room (VCR)	It provides a common set of collaboration tools and allows users to build complex workflows, which are then submitted to the Execution Services, and to directly monitor and control remote instruments in real-time.
Execution Services (ES)	They control the execution of the workflows defined by the user in the VCR, maintaining the status of the tasks that make up the workflow. They also support the advance reservation of resources.
Security Services (SS)	GRIDCC uses a split security system. When interacting with components of other Grids the GSI security will be used and the users identified by their X.509 proxy certificate. When interacting with the IE the user will be identified by a Kerberos ticket.



- **The main objectives from the applications are: (1) to offer good ground for stress-testing the GridCC middleware and (2) to offer different “use cases” or “user requirements” to the real time grid and used as “proof-of-principle” of the applicability and completeness of the GridCC middleware. The applications are:**
 - “Run Control” (high number of instruments and users, high-rate of incoming data)
 - “*Far remote operation of an accelerator facility*” (high number of instruments/sensors , smaller-rate of incoming data)
 - “Power Grid” (tests the benefit of computing Grid)
 - “Intrusion Detection System” (an anomaly-based IDS)
 - “Meteorology” (the need for high performance computing and the continuous update of output result)



- **GridCC and SA2 activity from EGEE II have started communication**
- **GridCC has been informed about the EGEE SLA implementation and agreed on testing one or two of their main applications**
 - They can examine the performance metrics (where AMPS is installed)
 - § OWD (One Way Delay)
 - § RTT (Round Trip Time)
 - § Available bandwidth
 - § Achievable bandwidth
 - § TTR (Time To Repair)
 - § From trouble ticket issue to recovery, per violation
- **They discussed during their last software integration meeting the possible scenarios for these tests**
- **EGEE provides the SLA forms and AMPS preparation is needed for the full tests of the SLA**
- **AMPS preparation has been started in two (DANTE, GRNET) of the three main domains**

- **Transfer data from the Instrument Element INFN (ITALY) to Storage Element - IASA (GREECE)**
- **Remote Control to these data**
- **Examine the performance parameters for this transfer to the specific path**
- **Examine the SLA through the parameters given for the test (capacity, delay)**
- **Using Monitoring Tools (if needed)**
- **The request starts from the ENOC (Italy) and after that AMPS cooperating GARR à GARR à DANTE à GRNET (GREECE)**
- **The SLA is providing from ENOC (Italy) to end user which in this case is GRIDCC (Italy), so ENOC (ITALY)**