# SA2 and JRA4: Network Services

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# Activities

- **SA2**
  - Operational Interface EGEE ⇔ Network (GÉANT + NRENs)
  - SLAs EGEE ⇔ Network (GÉANT + NRENs)
  - Technical Network Liaison Committee

- **JRA4**
  - Network Performance Monitoring
  - Bandwidth Allocation and Reservation
  - IPv6

**These activities are by design building an important working relation between EGEE and the network providers (GÉANT + NRENs)**

# Issues and Achievements

## *Issues*

- **GÉANT2 NSAP not available until PM21**
  - Updating our webservice interfaces to fully match it
- **No effort on TA to harden EDG NPM tools**
  - Improved version released to SA1
- **Heterogeneity of the NREN ticketing systems**
  - Working with NREN NOCs to address this issue.

## *Achievements*

- **On-time, quality-driven deliverables**
- **Forged unique working relationship with GÉANT2**
- **ENOC the implementation of the EGEE-GÉANT Network Operational Interface**
- **EGEE-NPM a prominent demo for NM-WG and GÉANT2-NPM**

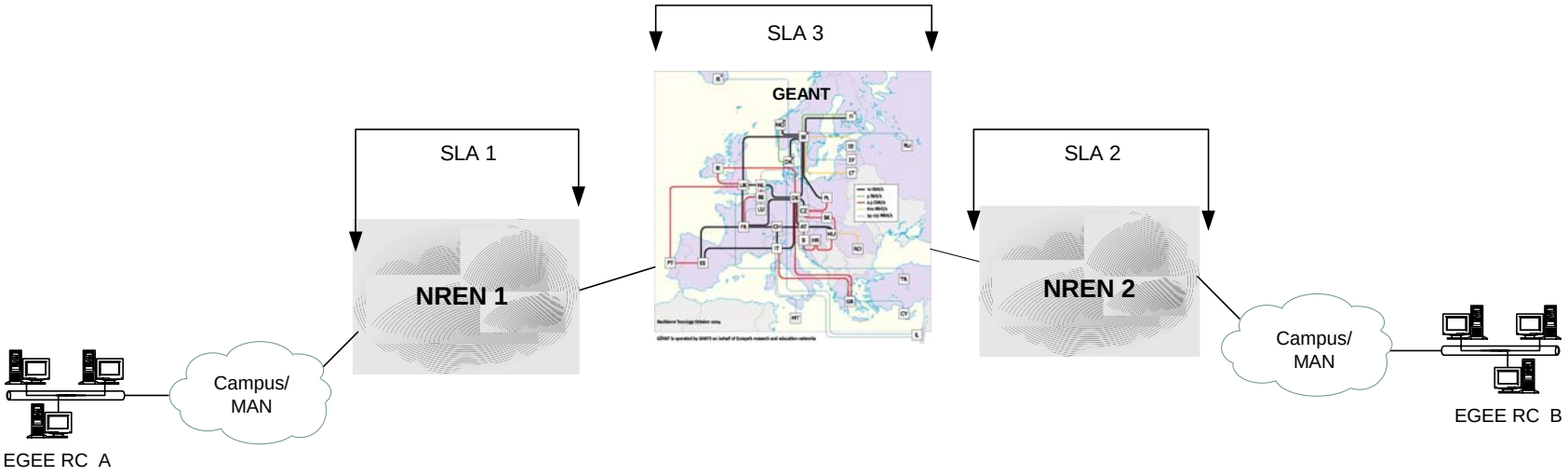
# SA2: Network Resource Provision

# SA2 Activity

- **End-to-End Service Level Agreement**
  - After the definition of service classes (DSA2.1) and specification of network services as SLS (MSA2.2)
  - DSA2.2 in March 2005 (https://edms.cern.ch/document/565447)
- **Network Operational Interface**
  - Between EGEE and GÉANT/NRENs
  - MSA2.3 in March 2005 (https://edms.cern.ch/document/565449)
- **Network service provisioning model**
  - Interactions between the reservation architecture of EGEE and NRENs
  - SA2 and JRA4 joint work (https://edms.cern.ch/document/570622)
- **Validation and implementation of the above work**
  - QoS experiment
  - EGEE Network Operation centre (ENOC) trial
  - Grid sites connectivity informational schema

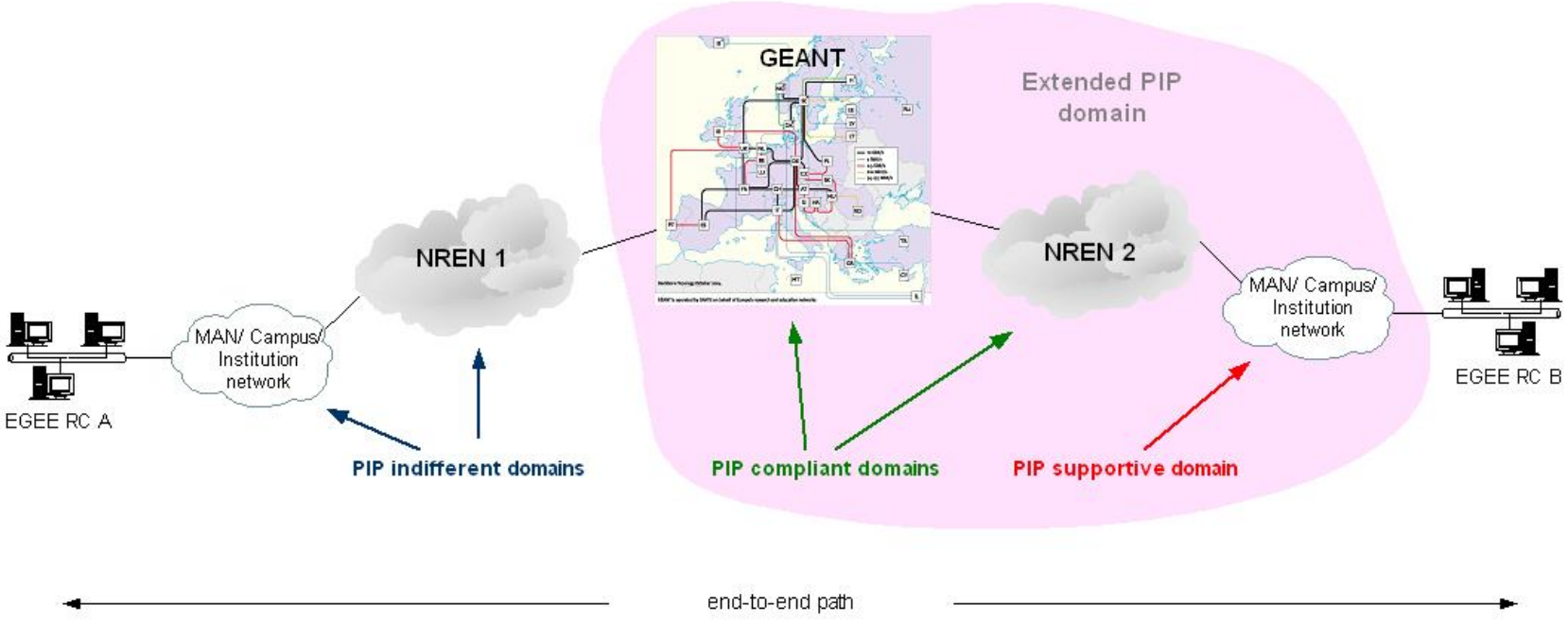
# SLA model

- **SLA definition:**
  - Based on previous work inside EGEE and answers from GÉANT2 to some open issues (procedures, demarcation point…)
  - Definition in cooperation with GÉANT2
- **EGEE end-to-end SLA template**
  - This SLA is formed using the individual SLAs provided by all domains along the end-to-end path
    - SLA between the border of the NRENs cloud (border-to-border SLA)
    - Difficulty to accommodate and take into account the “last mile”



# SLA institution

- **All domains involved in network services provisioning to EGEE as part of the existing network infrastructure hierarchy have to be categorized as:**
  - Compliant with the Premium IP service
  - Supportive of the Premium IP service
  - Indifferent to the Premium IP service



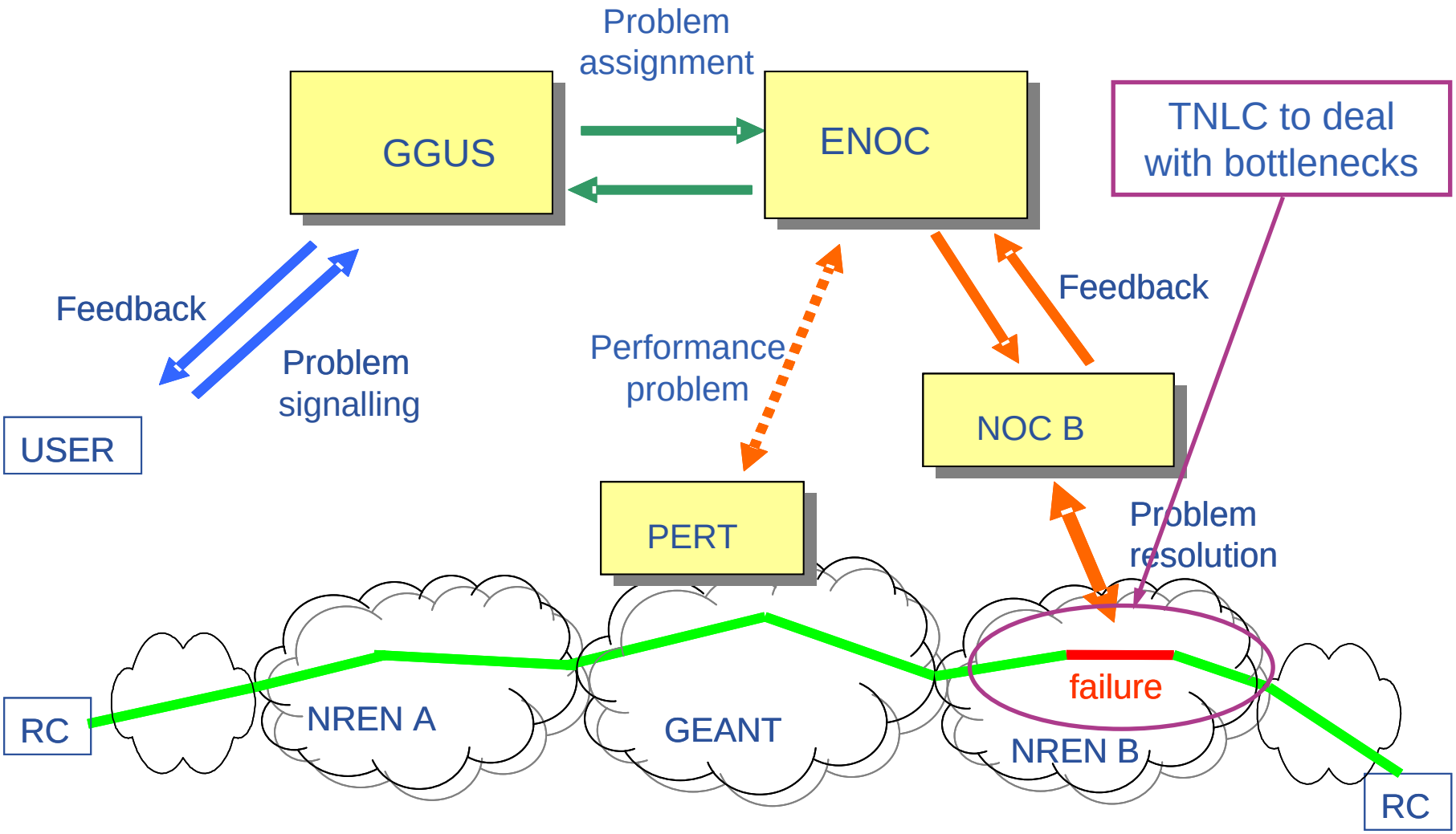
# SLA roadmap

- **QoS experiment helps to validate the proposed model and process**
  - Tests between pairs of EGEE sites:
    - Four EGEE sites involved: Lyon, Athens, Moscow, Paris
    - Five networks involved: GÉANT, GRnet, RbNet, Renater, RAP (Paris MAN)
    - Tackle the network heterogeneity in the Grid world
  - We tried to follow the whole process from configuring the testbed to establishing SLAs:
    - Contact with EGEE sites and NRENs (NOCs)
    - Gather information and issues before a possible introduction into production
- **End-to-end SLA processing definition is underway**
  - Based on the DSA2.2 model
  - Compliant with the provisioning model defined by SA2 and JRA4
  - To be used in the BAR context
- **Revised SLAs in the 2nd year of EGEE (DSA2.3 for M22)**
  - Improvement with the inputs from the experiment

# Network operational interface

- **Defines the interactions between the Global Grid User Support (GGUS) and the NREN NOCs:**
  - SLA management (processing, installation, monitoring)
  - Trouble management (reporting, interactions)
  - Definition of procedures and information flows between NOCs and EGEE so as to:
    - Provide a consistent view of the EGEE network
    - Be able to evaluate network reliability and the quality of the services
- **Creation of the "EGEE Network Operation Centre" (ENOC)**
  - Support unit for all network-related issues in EGEE
  - Interface between EGEE and NREN NOCs
  - Progressive integration into GGUS
    - Single entry point for the support to the Grid users
  - Difficulties remain (trouble tickets normalization, languages…)
    - Cooperation with the NREN NOCs to address these

# Troubleshooting workflow



# ENOC trial

- **A trial took place during the summer:**
  - Two NRENs involved: GÉANT and Renater
- **Aim:**
  - Work with GGUS to integrate the ENOC in their workflow
  - Test the ENOC procedures defined in MSA2.3
  - Implement software to parse and filter Trouble-Ticket (TT) emails
- **Early statistics from 5 July to 13 September:**
  - About 1500 mails received (more than 600 per NREN, the rest from GGUS). This corresponds to about 450 unique TT (~200 per NREN)
- **Next steps:**
  - Test if “grid user” workflow scales with more NRENs (workload on the filter tool and on the ENOC people)
    - GARR is involved since the mid of November
  - Extend workflow tests to encompass the whole procedure
  - Move to be really operational in March 2006
- **Inputs for the extension of MSA2.3 (M22)**

# Grid sites connectivity information

- **To get an informational schema representing network infrastructure through the EGEE resource centres connectivity:**
  - For network operational tasks (MSA2.3)
  - For end-to-end SLAs (DSA2.2)
- **The schema accommodates:**
  - Site information
  - Network connectivity
  - Network service information
- **The aim is to implement this informational schema in the Grid Operation Centre Database (GOCDB)**

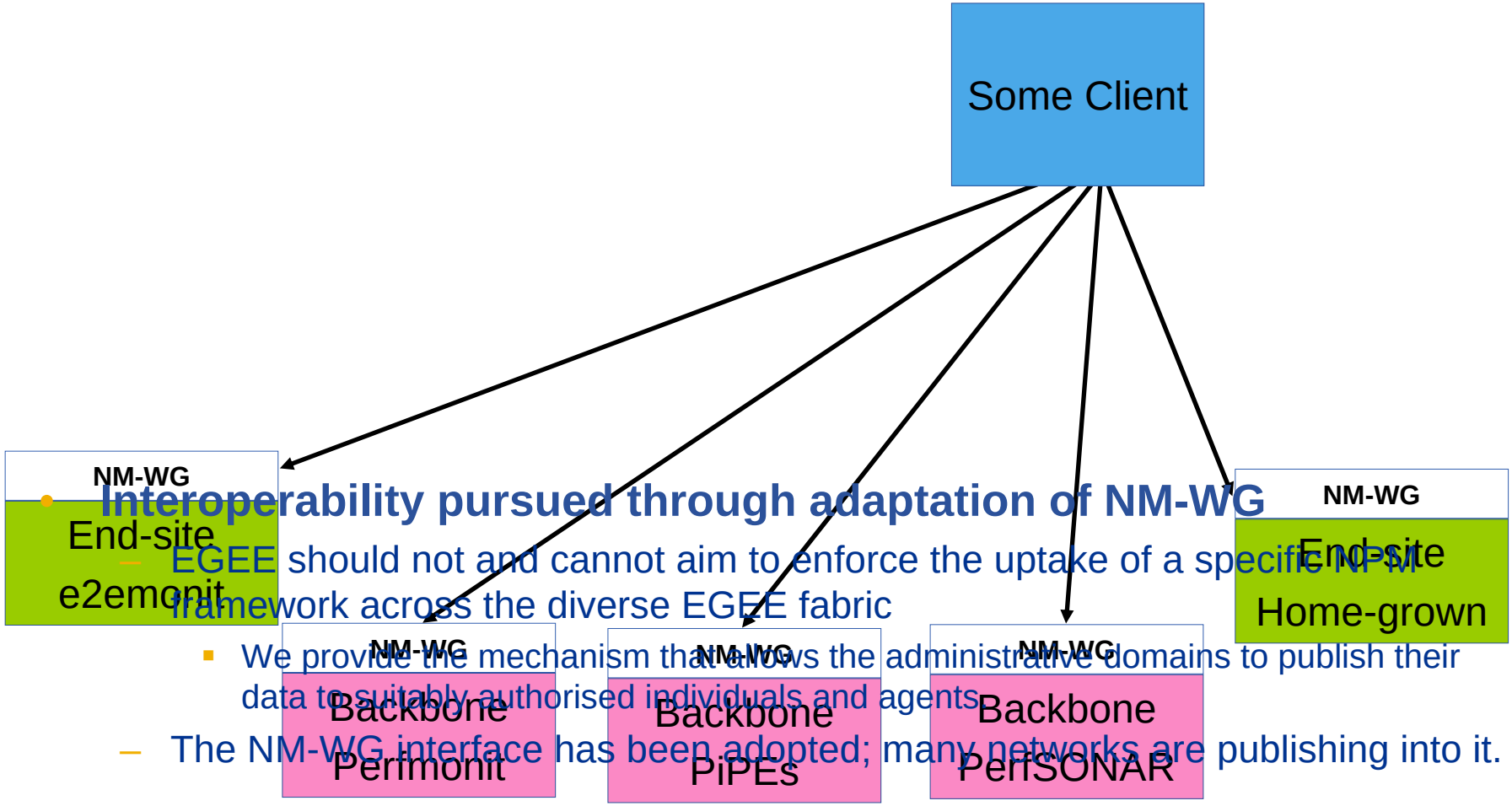
# Network service provisioning model

- **Definition of this model is key to promote the "Network" as a Grid resource**
  - Convergence between the gLite reservation and allocation architecture (JRA1) and the GÉANT2/NRENs resource management architecture
  - JRA1, JRA4, SA2 are bringing their competences in this task
- **Status:**
  - GÉANT2 is currently defining the architecture of the reservation mechanisms:
    - Based on inter-domains SLAs
    - Prototype (with software signalling but manual configuration) due beginning of next year
  - Ongoing work inside EGEE between involved activities:
    - To discuss integration in the whole gLite architecture
    - To glue GÉANT2 and gLite architectures in order to meet the application requirements.

# JRA4: Network Services Development

# Network Performance Monitoring

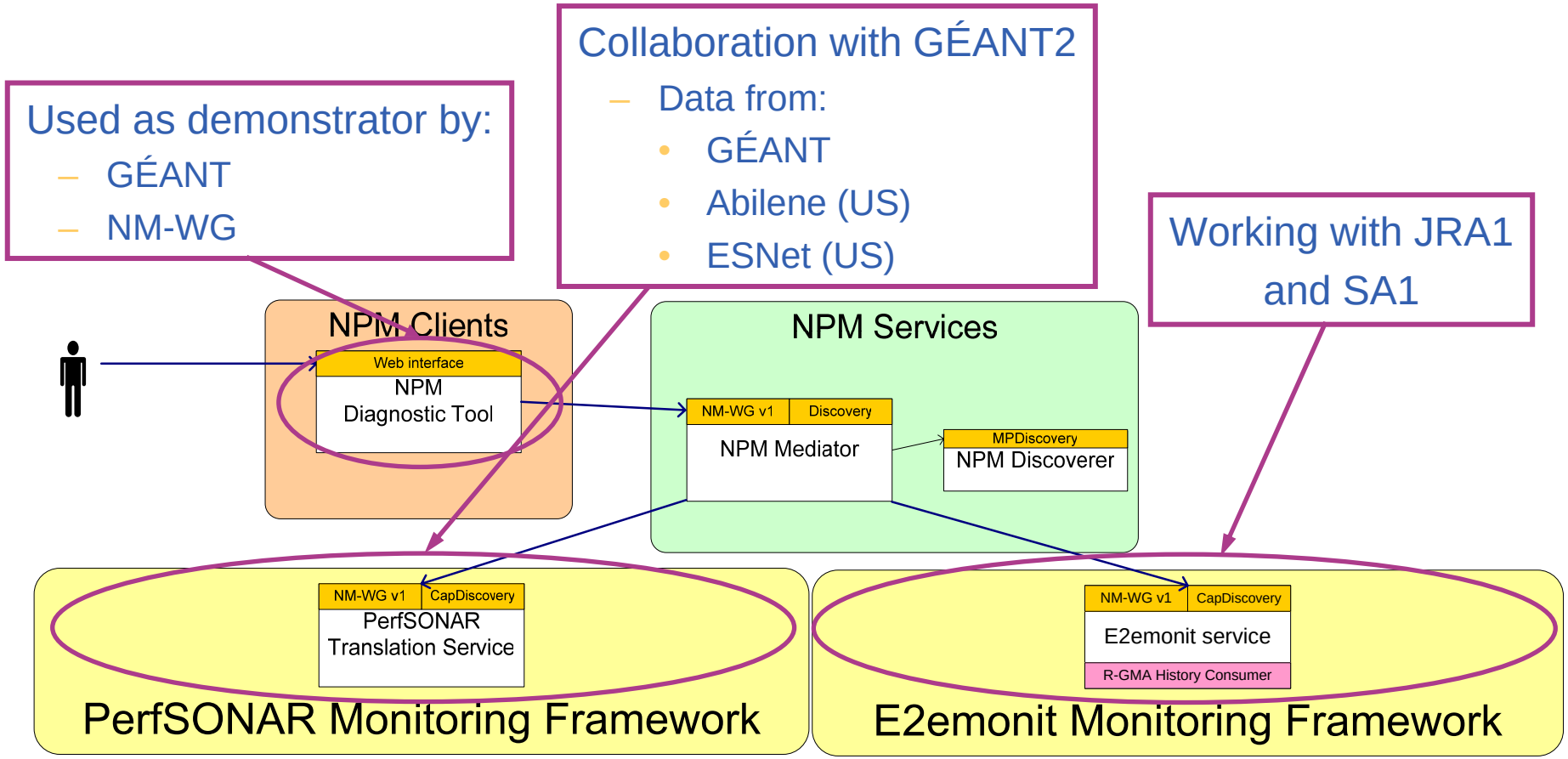
- **Standardising access to NPM across different domains.**
  - GGF NM-WG recommendation is the selected basis for standardisation




- **Interoperability pursued through adaptation of NM-WG**
  - EGEE should not and cannot aim to enforce the uptake of a specific NPM framework across the diverse EGEE fabric
    - We provide the mechanism that allows the administrative domains to publish their data to suitably authorised individuals and agents
  - The NM-WG interface has been adopted; many networks are publishing into it.

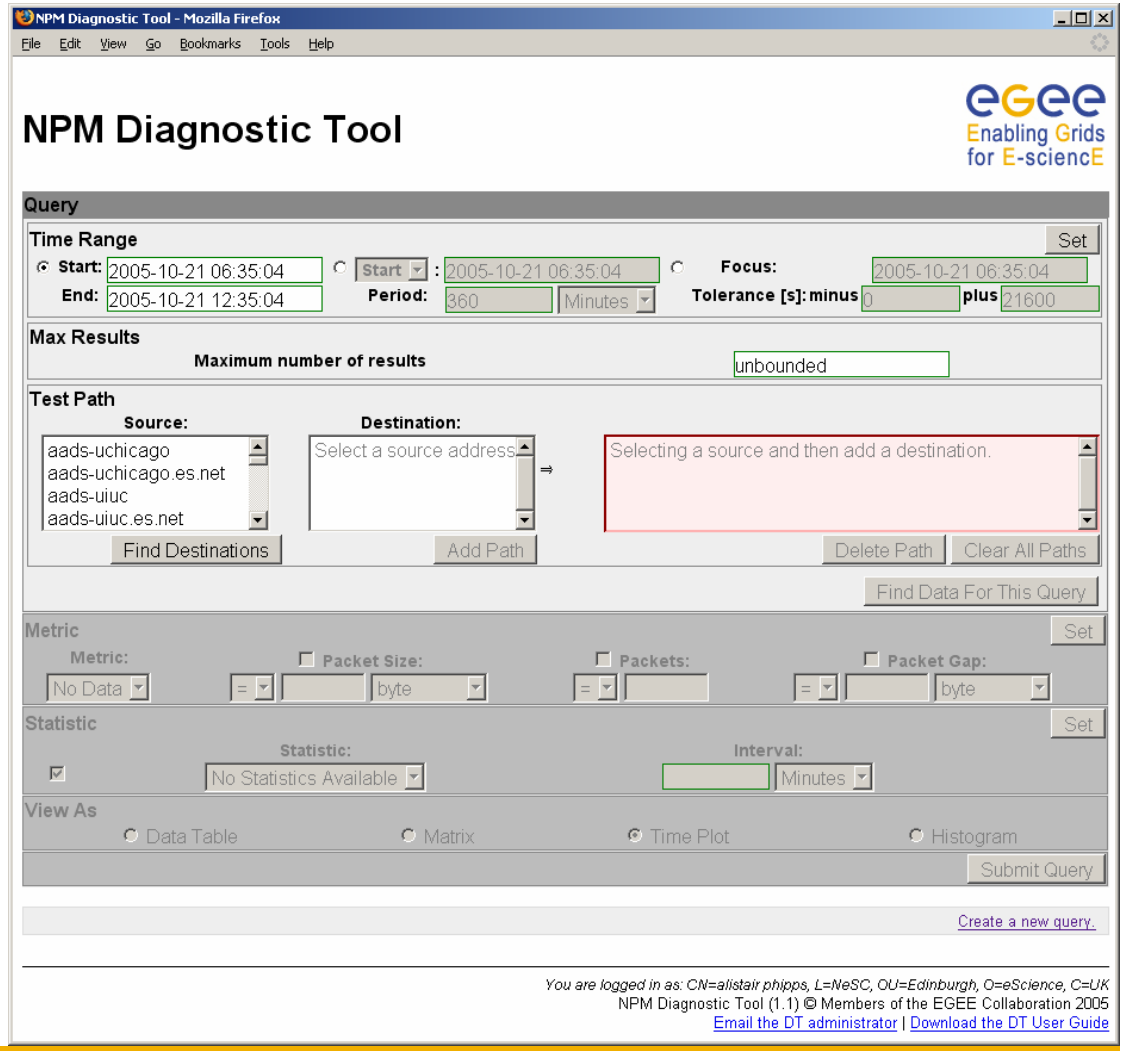
# NPM Architecture

- The currently deployed NPM client, services, and accessible frameworks (MJRA4.6)



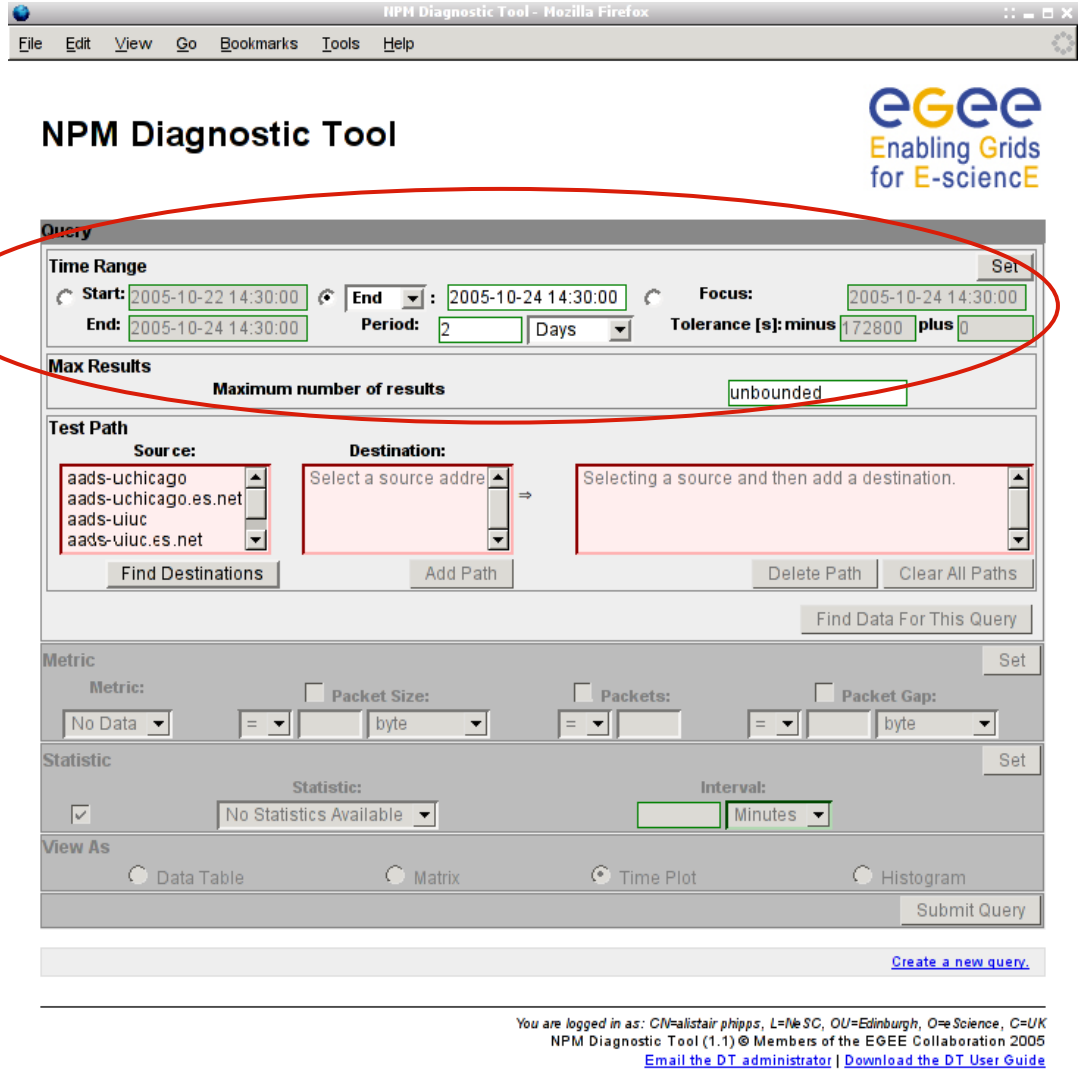
# NPM DT Scenario (1)

- Step 1: Access the NPM Diagnostic Tool.
  - The Diagnostic Tool can be accessed using a standard web browser, which users are individually authorised to use.
    - In the future, we plan to use VOMS for authorisation.
    - Please mail us for access!
  - The intended user is a NOC or CIC operator



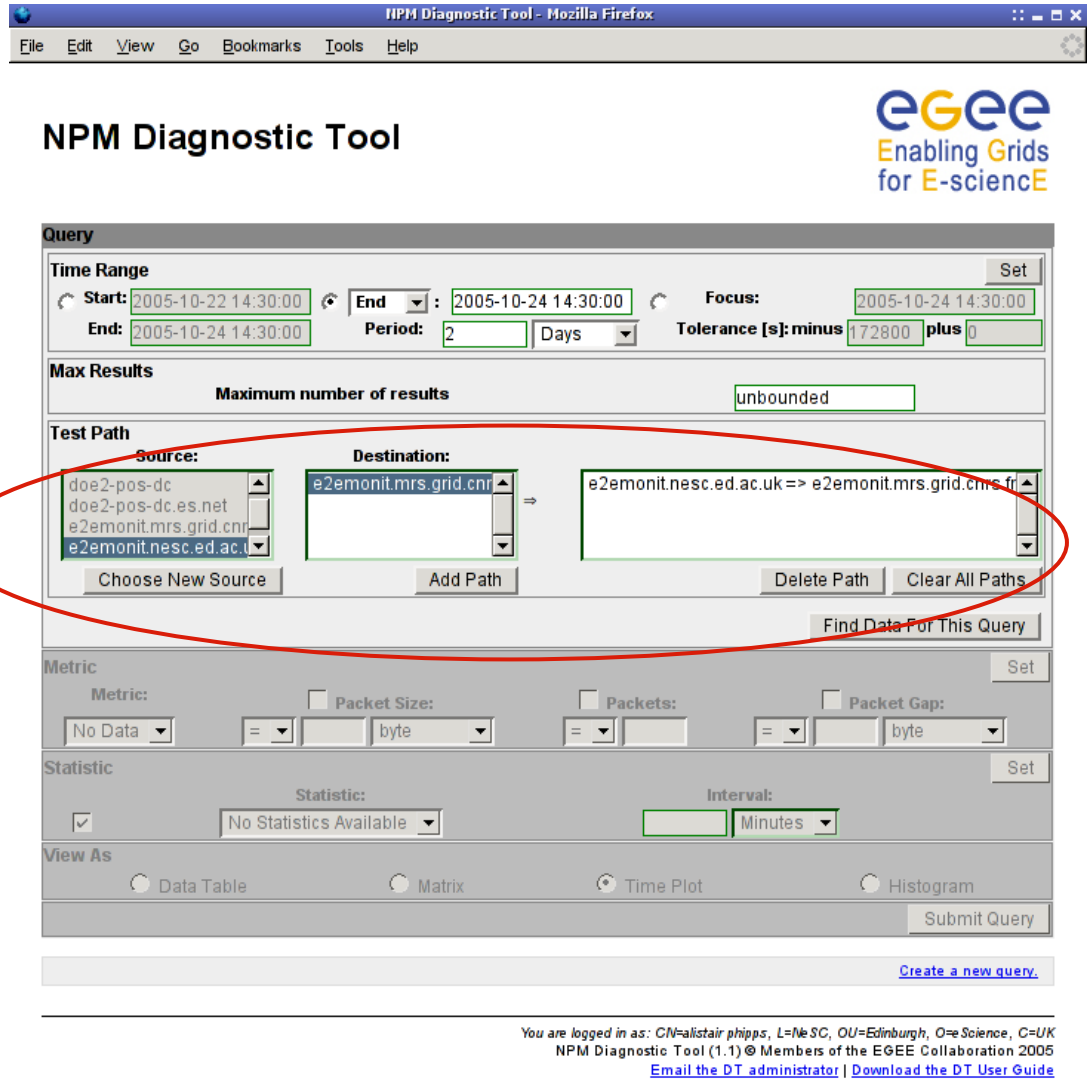
# NPM DT Scenario (2)

- Step 2: Select a Time.
  - The end-user does not have a specific time, but knows the problem occurred within the past two days.
  - The CIC-user enters the appropriate time range, specifying an End date/time of 2005-10-24 14:30:00 (the current time), and a period of 2 days.
  - The CIC-user presses the Set button to confirm and the alternate time range representations update.



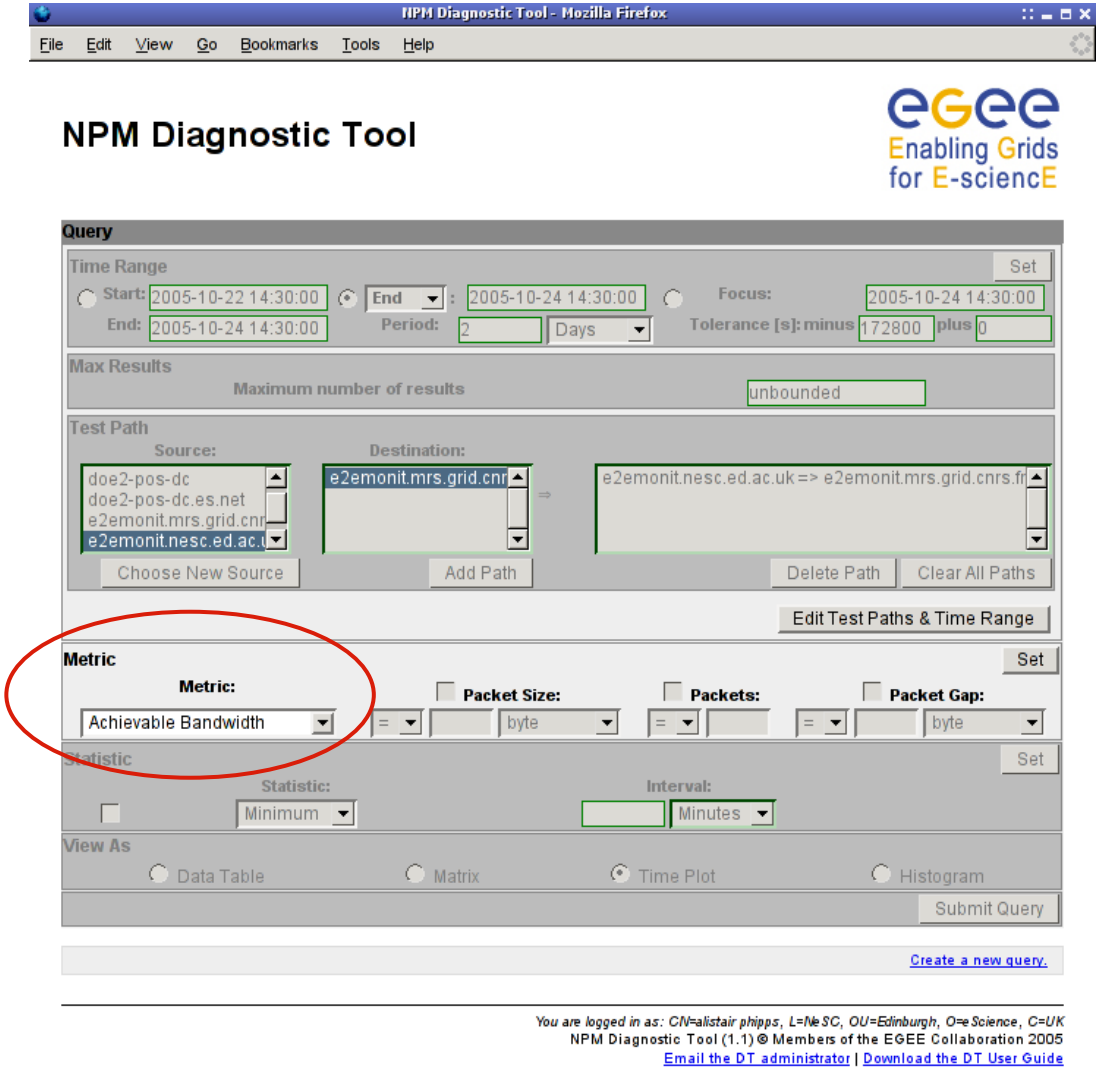
# NPM DT Scenario (3)

- Step 3: Select a Path.
  - The end-user experienced the problem between UEDIN and CNRS.
  - The CIC-user selects e2emonit sites at UEDIN and CNRS, adds the path and then selects "Find Data For This Query“
    - E2emonit, formerly known as EDG/WP7, is an end site-to-end site monitoring framework



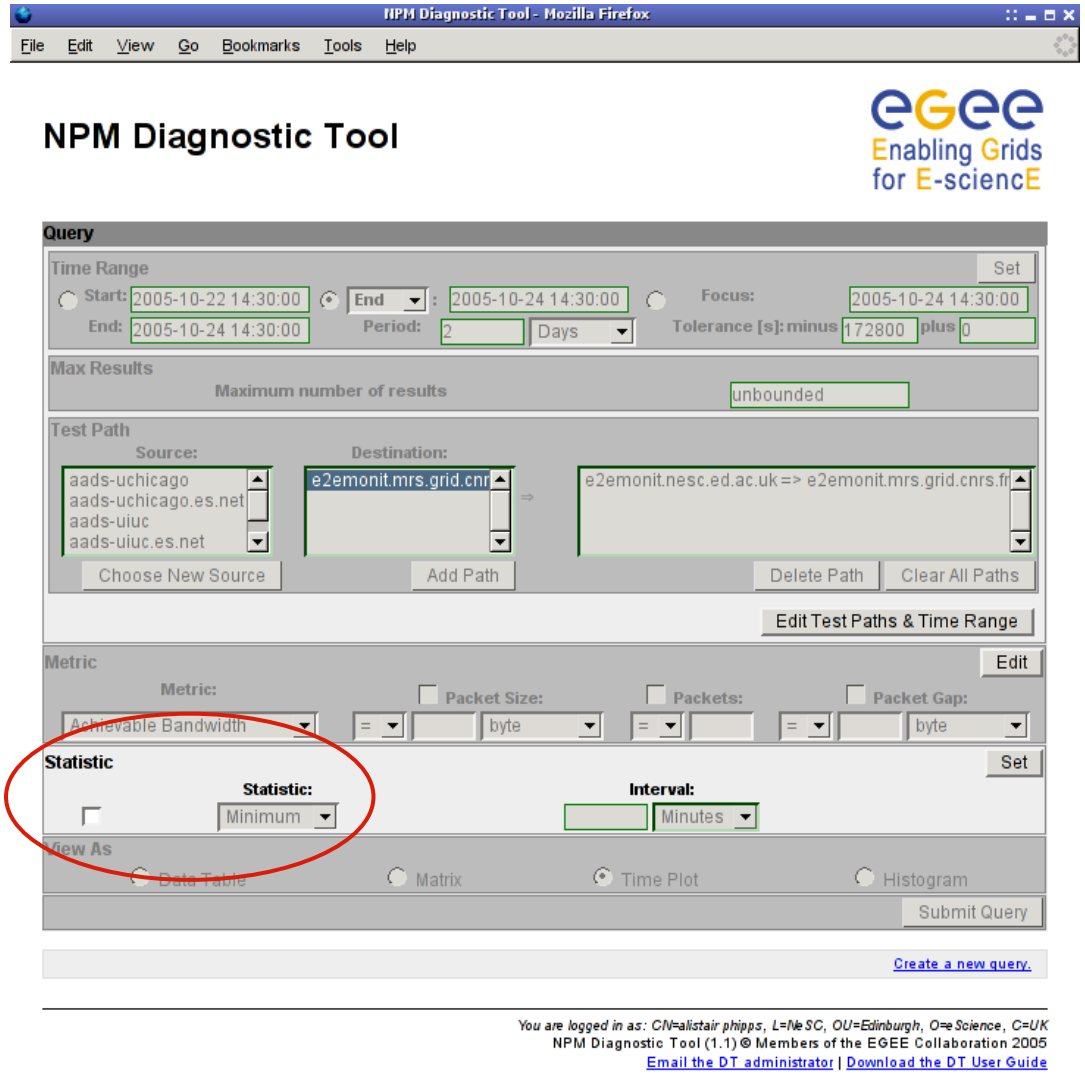
# NPM DT Scenario (4)

- Step 4: Select a Metric.
  - The end-user experienced throughput problems.
  - Although there are several possibly relevant metrics to choose from (and only those measured are available to select from), the CIC-user decides to look at the Achievable Bandwidth on the path.
  - Achievable Bandwidth is selected from the Metrics box and the Set button pressed to confirm.



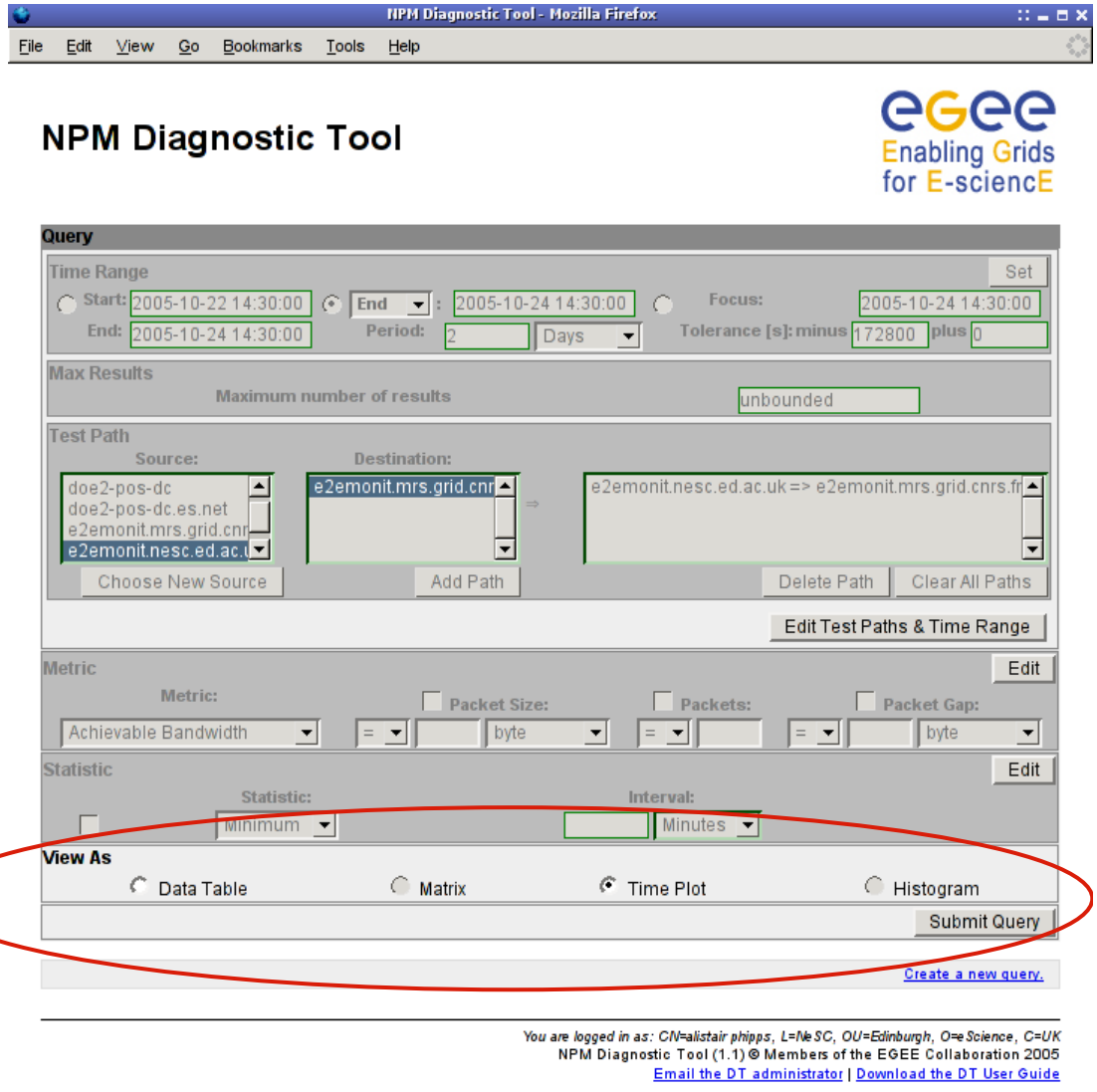
# NPM DT Scenario (5)

- Step 5: Select a Statistic.
  - Several types of statistical data are available, such as Minimum, Maximum, Mean.
  - A particular interval can be applied to each, to provide, for example, an hourly mean over the past two days.
  - The CIC-user just wants a general overview of measurements and elects to retrieve raw data (Statistic check-box not checked).



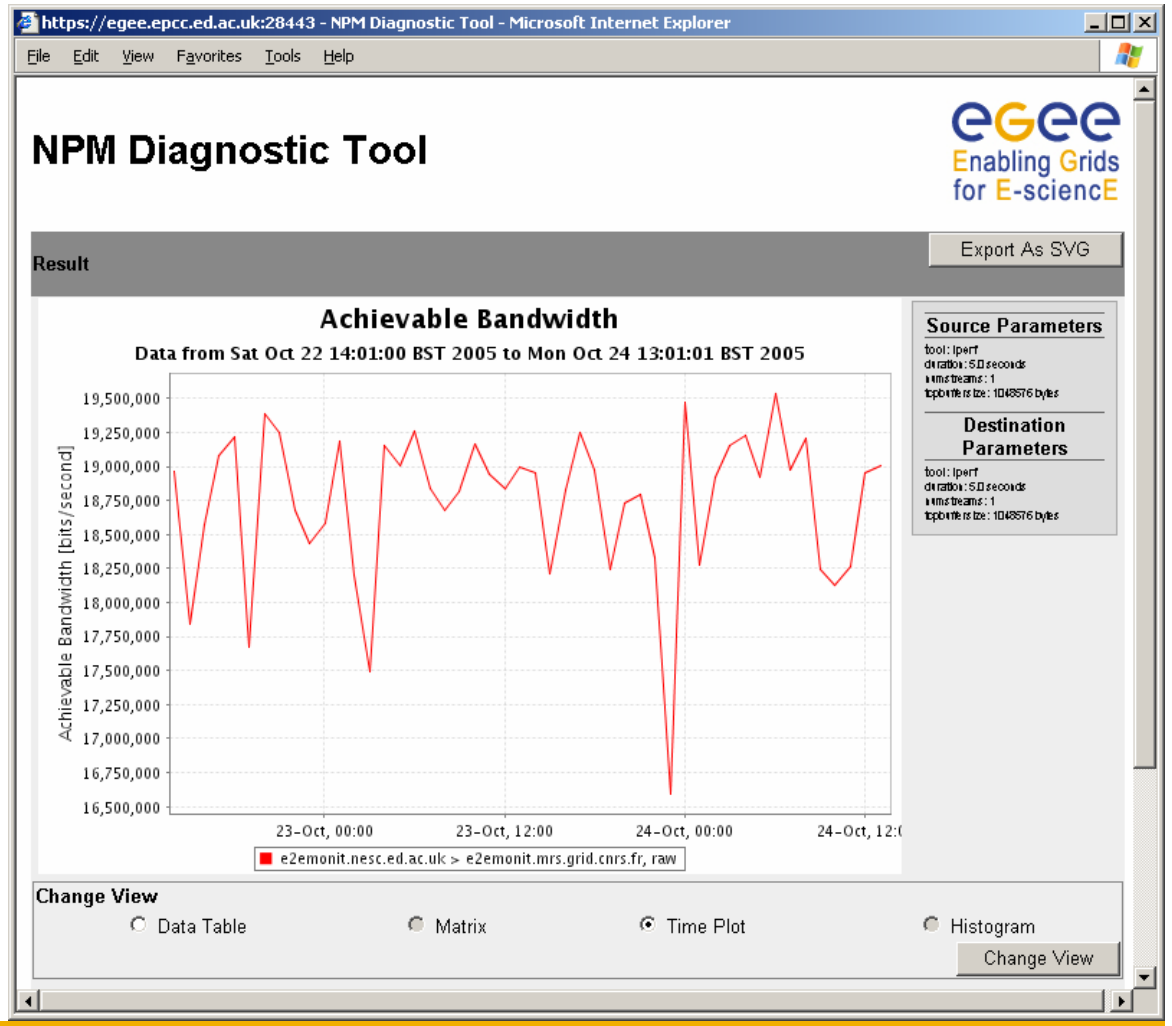
# NPM DT Scenario (6)

- Step 6: Select a View.
  - Currently Data Table and Time Plot views are available.
  - The CIC-user wants an overview of how the Achievable Bandwidth has changed over time, so selects the Time Plot.
  - The Query entry is complete, and the CIC-user selects Submit Query.



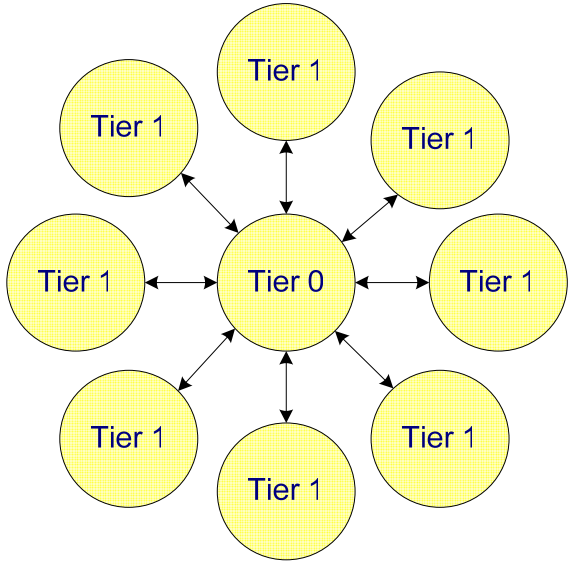
# NPM DT Scenario (7)

- Step 7: Examine results.
  - The results are plotted, with Time on the x-axis and Achievable Bandwidth on the y-axis.
  - The parameters used to gather measurements are shown - here, showing that the iperf tool was used to gather the achievable bandwidth information.
  - These parameters can be useful in interpreting the results.



# NPM Current developments

- JRA4 is currently working on a solution for resource-brokering middleware (JRA1)
  - The proposed *NPM Publisher:*
    - pre-caches measurement data and allows requests to be answered almost instantly
    - provides a mapping from Compute Element/Storage Element address to Network Monitoring Point address.
- EGEE SA1 to deploy e2emonit between CERN and the LCG Tier 1 sites.



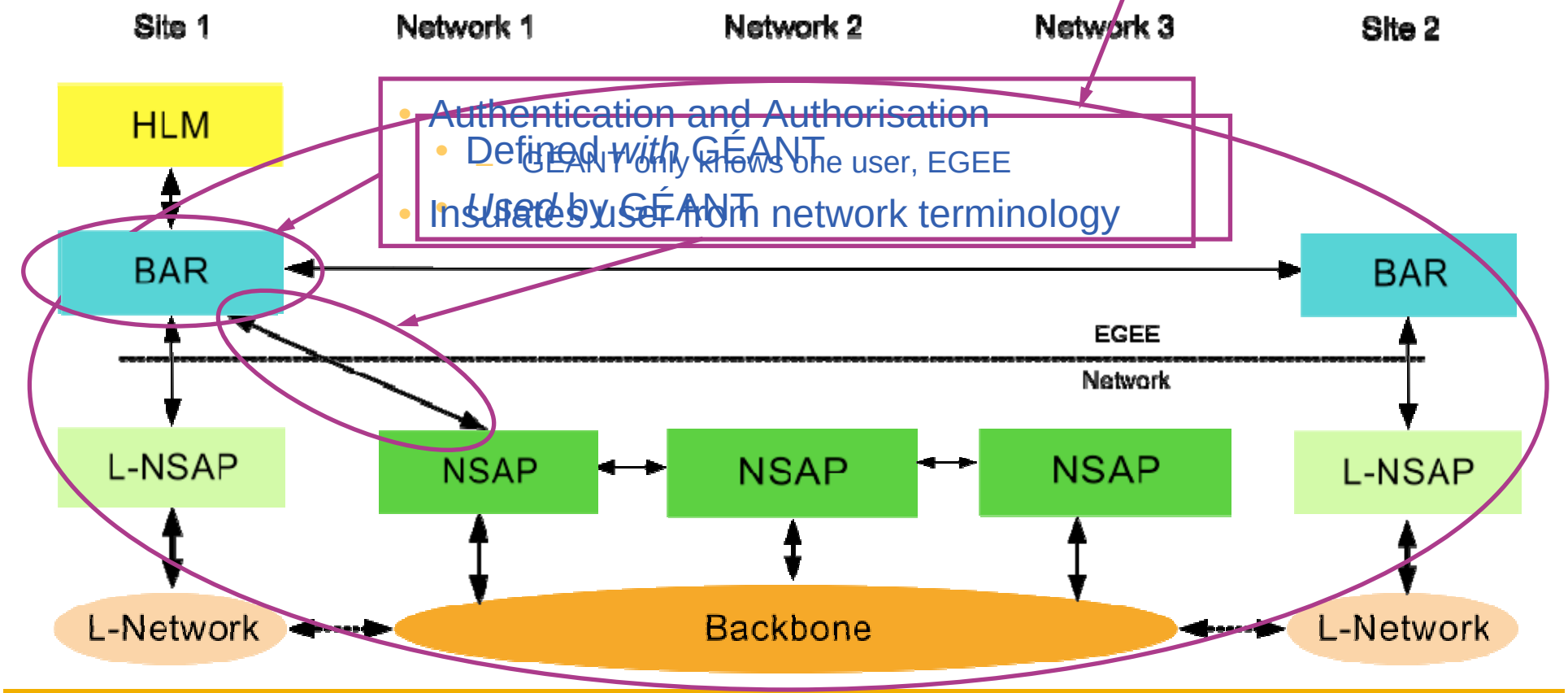
# Bandwidth Allocation and Reservation (BAR)

- **To allow reservation of a network service between two end-points**
  - Assuming underlying functionality from the network providers
- **For EGEE-I the network service is “IP-Premium”**
- **Goal is to show first programmatic interface between EGEE and GÉANT**

# BAR End-to-End Architecture

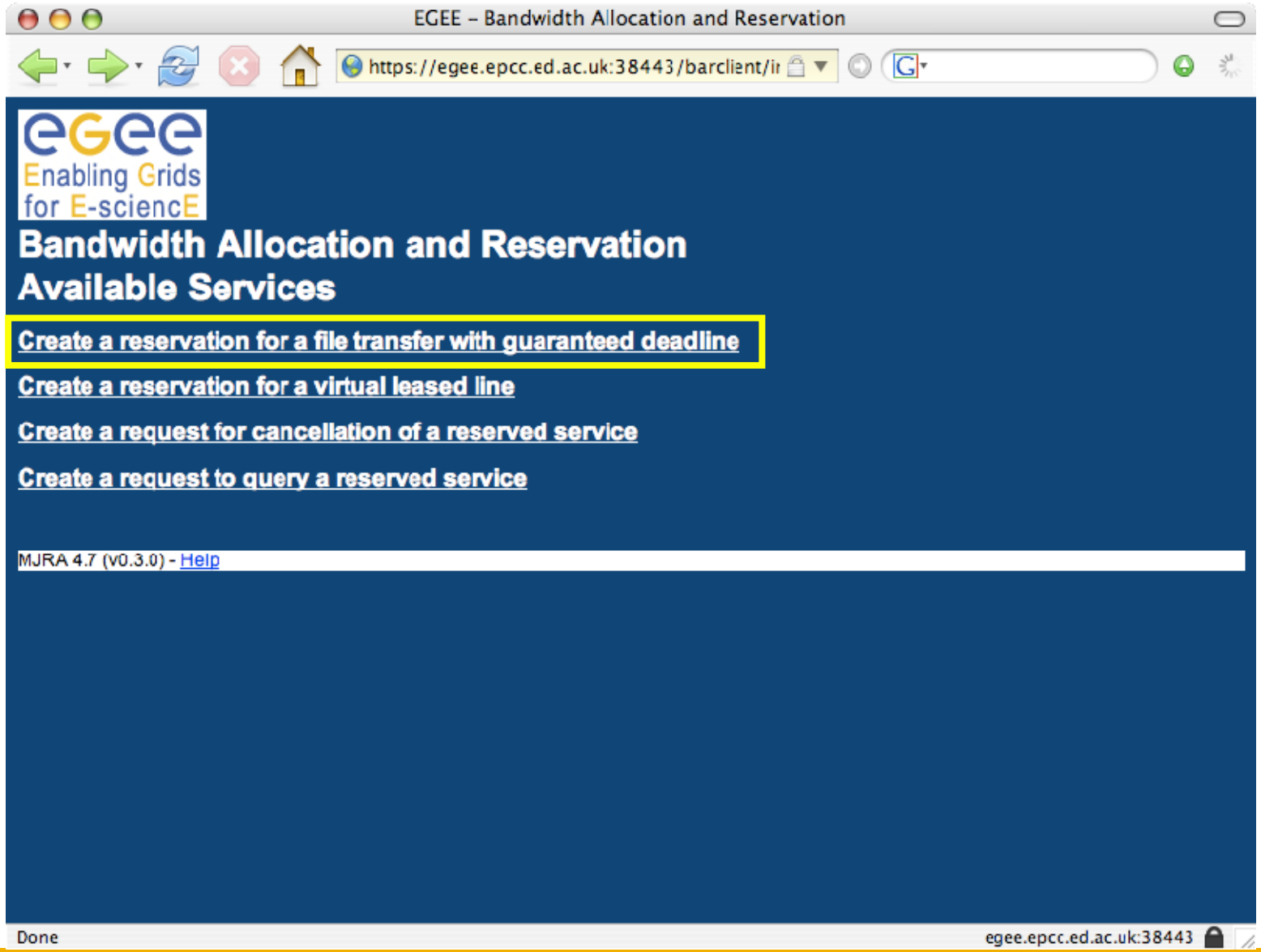
- **Two-stage process (MJRA4.5):**
  - Service Reservation
  - Service Activation

- Input from SA2, JRA1 and GÉANT2
- Published in IEEE Gridnets Conference

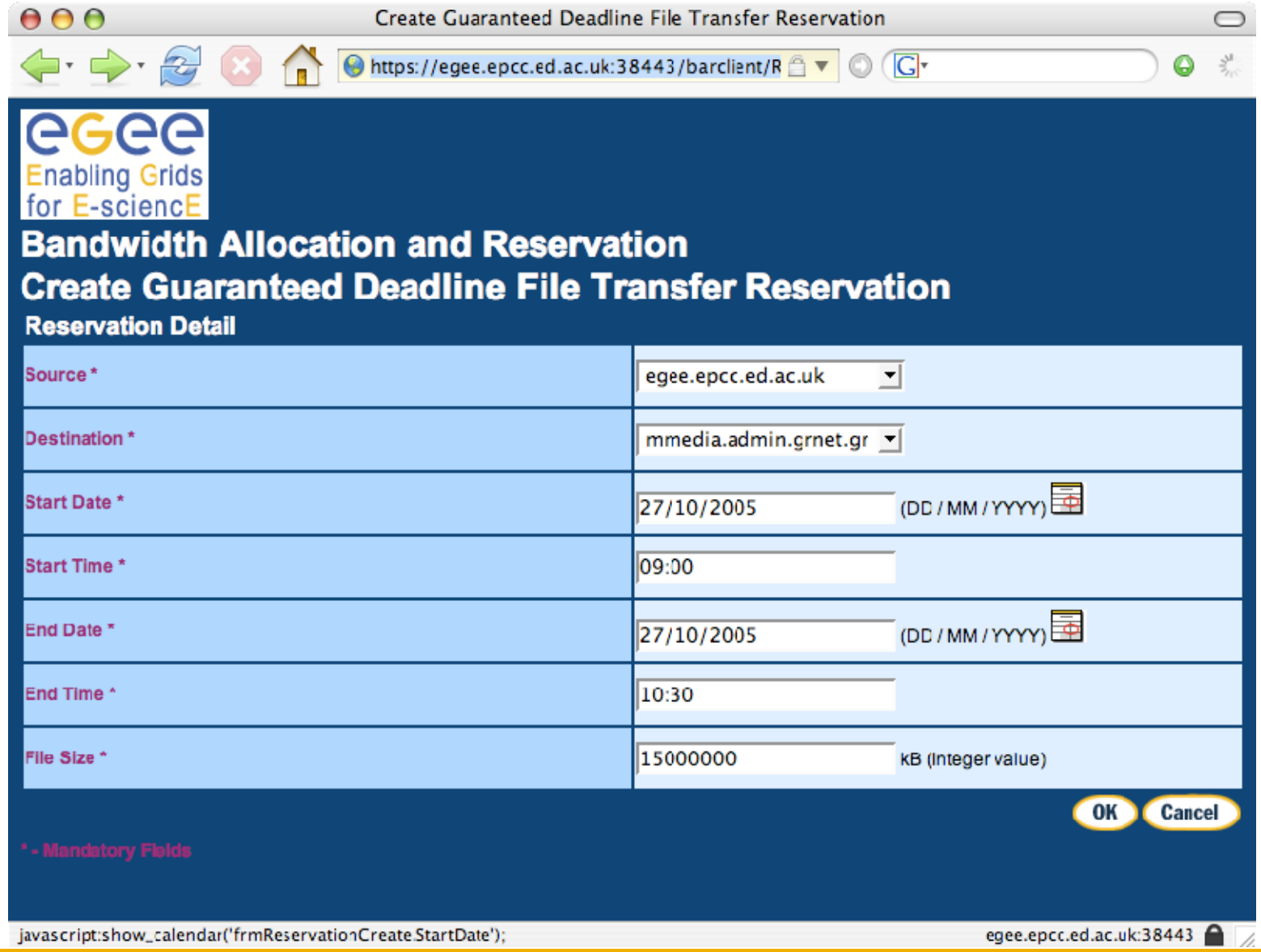



- Authentication and Authorisation
  - Defined *with* GÉANT
    - GÉANT only knows one user, EGEE
  - *Used* by GÉANT
- Insulates user from network terminology

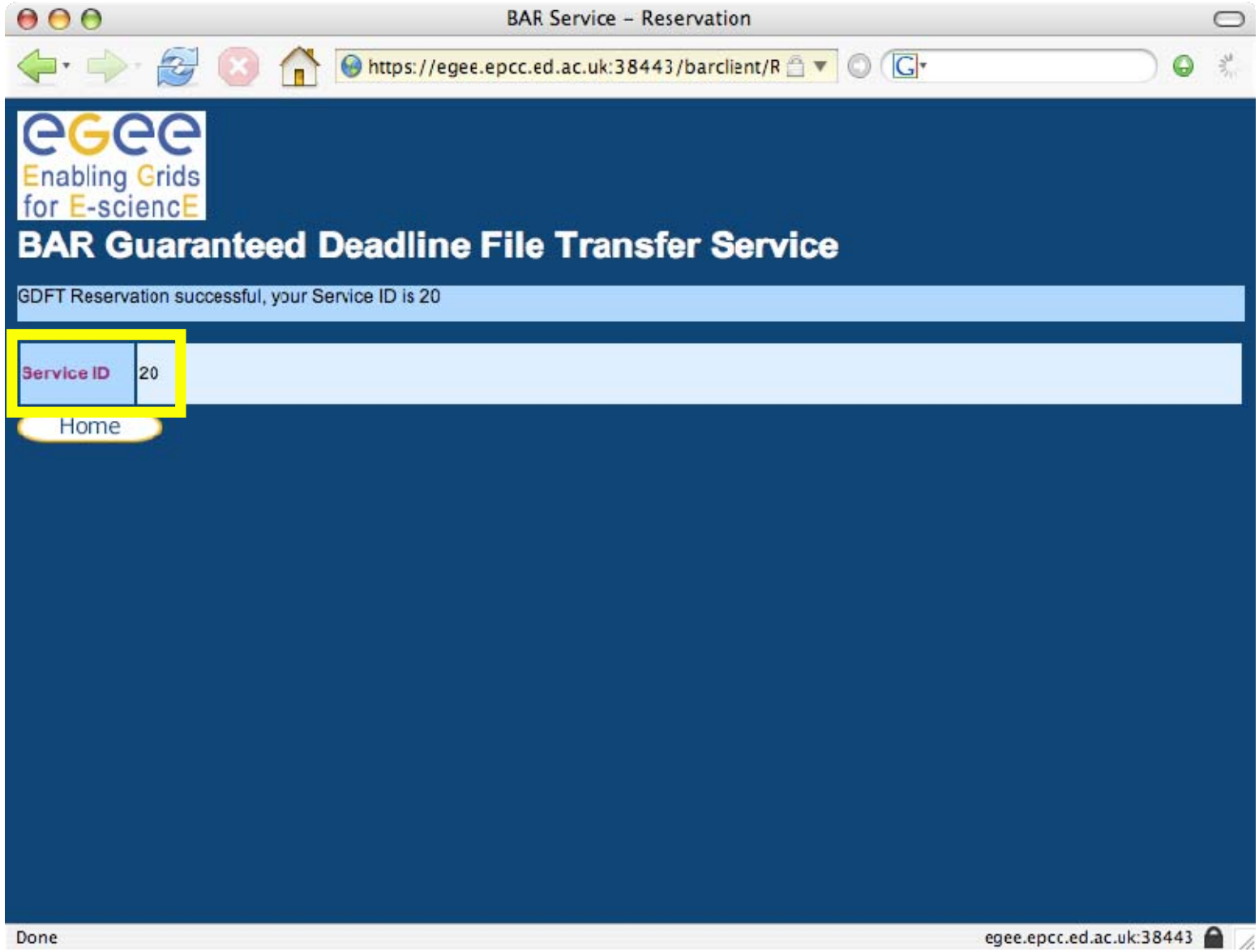
# BAR Client Interface



# Fill in Reservation Data



# File Transfer got Reserved



# Queried Reservation Data

# BAR Current Developments

- Work on the interfaces for Service Activation
- Update the NSAP interfaces to reflect GÉANT2 changes
- Integrate with GÉANT2 NSAP!

# IPv6 uptake

- **Report on implications of IPv6 usage for EGEE Grid**
  - Both IP protocols will coexist for many years
    - Applications and middleware will have to live in the resulting “Dual stack” worldwide network
    - The emergence of new countries (India, China and Latin American) may accelerate IPv6 arrival
      - *They are interested in Grid computing and perhaps gLite.*
  - gLite is not IPv6-enabled yet
    - Not a high priority to address
    - Future integration of IPv6 in EGEE should be the aim of a related project
  - From a network point of view, including infrastructure deployment, services and programming, there is no obstacle to tackle integration of IPv6 in EGEE
    - Existing recommendations from international bodies (IETF, GGF) must be followed
    - Resources and experience from various activities need to team up
      - *Development, integration, testing, operations*

# Network Activities Summary

- **Both activities running according to plan**
- **Set up roadmap to pursue SLAs with Network**
- **ENOC progressing towards integration with GGUS**
- **World-first NPM work:**
  - Adopted and deployed by various networks
  - Interfacing with CICs and Middleware
- **Gaining from and feeding back to GGF NM-WG**
- **BAR Architecture a practical solution, compatible with GÉANT2**
- **Established working relationship with GÉANT and the NRENs**