



Enabling Grids for E-science

Network Performance Monitoring

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- **Introduction**
 - Why NPM?
 - For EGEE
 - By EGEE
- **NPM Architecture**
- **What's available**
 - Software
 - Information
- **Demonstration**
- **Deployment plans**
- **Development plans**
- **Requirements**

- **Network Performance Monitoring (NPM), formerly part of JRA4, is now part of SA1**
- **We want to integrate closely with Operations to ensure that we are addressing your requirements**
- **We are not network experts**
 - We aim to provide easy, standardised access to NPM data, rather than defining what that data should be

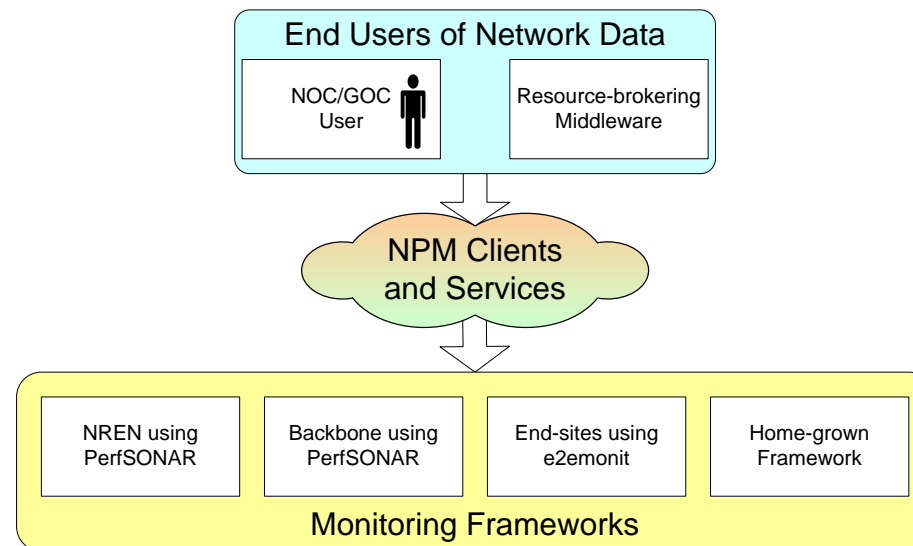
- **For Grid operations**

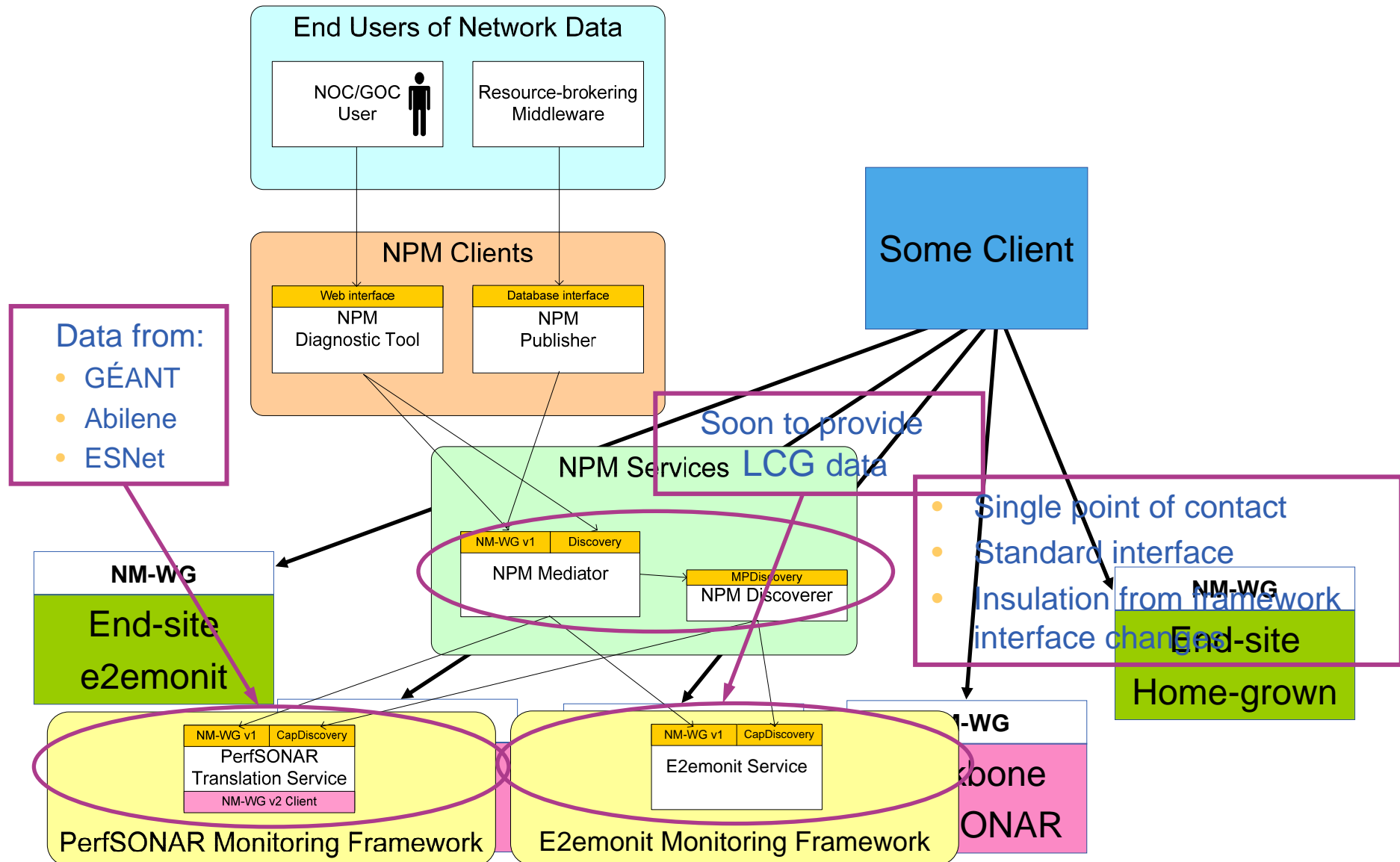
- Help diagnose performance problems between sites
 - This transfer is slow, what's broken? – the network, the server, the middleware...
 - I can't see site X, has the network gone down or the cluster head-node?
 - My application's performance varies with time of day – is there a network bottleneck?

- **For Grid middleware**

- I want to increase the performance of file transfers between sites
- I want to know which compute site is “closest” to my data to submit a job to it

- **Network performance data can be obtained in various ways**
 - Different measurement types
 - end-to-end
 - Appropriate to what a user or application experiences, eg TCP achievable bandwidth
 - Backbone
 - Lower level measurements, used to pin-point source of problems
 - Different measurement tools
 - Different data formats
- **EGEE NPM (as developed in JRA4) provides world’s first single-point, single interface access to heterogeneous data from heterogeneous frameworks**
- **Note – we are not building measurement tools, but standardising access to NPM data across multiple domains, and providing mechanisms to use that data**





- **Clients**

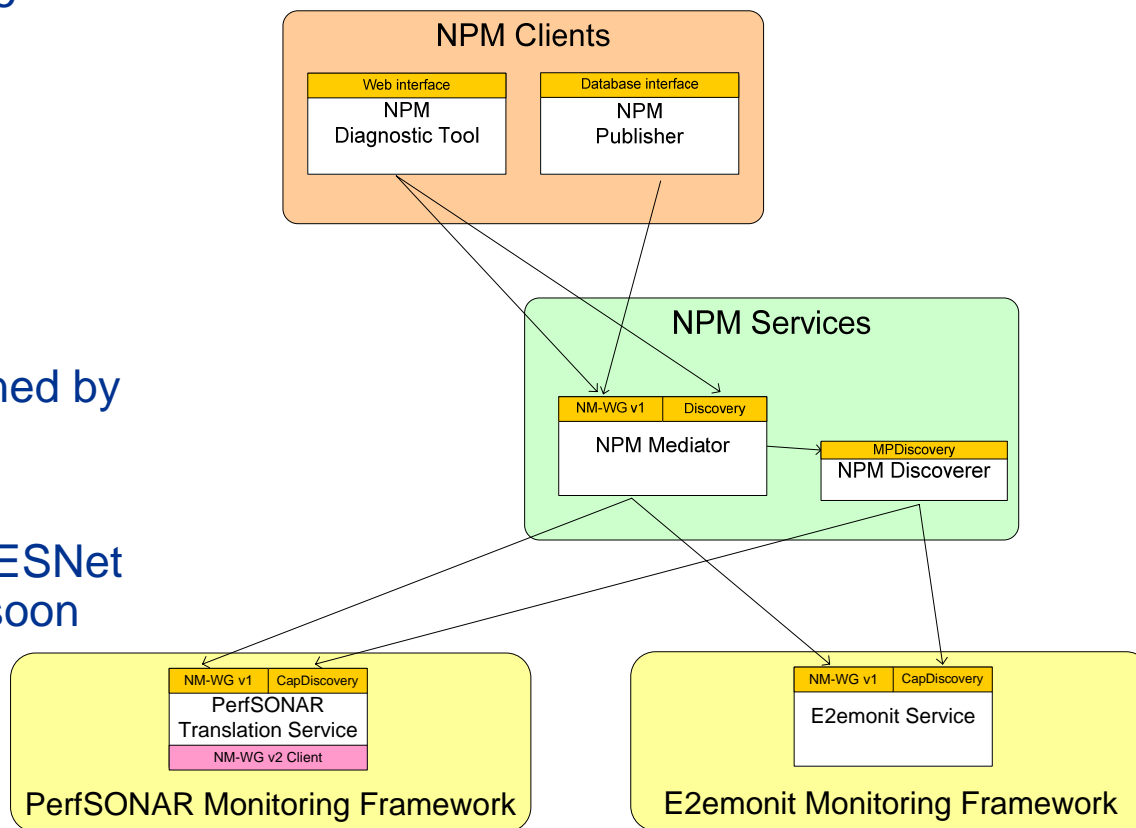
- The **Diagnostic Tool** (DT)
 - For use by people
- The Publisher
 - For use by middleware

- **Middleware**

- Mediator/Discoverer

- **Monitoring Frameworks**

- **e2emonit**
 - Formerly EDG::WP7
 - Provided and maintained by NPM team
- PerfSONAR
 - GÉANT, Abilene and ESNet data, more networks soon
- LHC-OPN
 - In future?



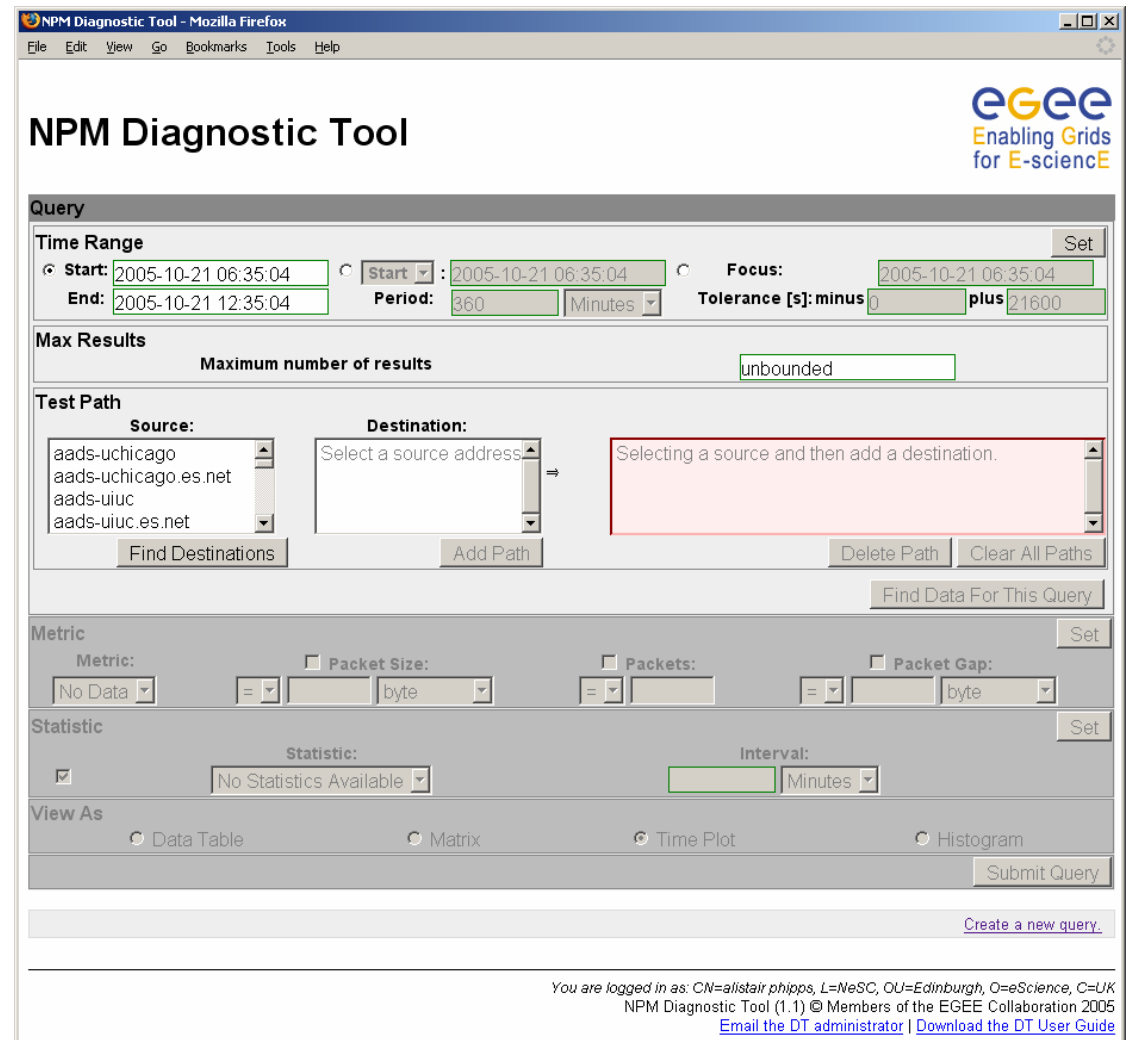
- **Data depends on which tools you use!**
 - We will allow access to any relevant data, provided it is available using a GGF NM-WG compliant interface
- **e2emonit**
 - ping
 - Round trip time, packet loss
 - iperf
 - TCP achievable bandwidth
 - udpmon
 - UDP achievable bandwidth, one-way delay, UDP packet loss
 - Traceroute (Coming soon)
 - Hop lists, RTT, etc...
- **PerfSONAR**
 - Developed by GÉANT, Internet2 and ESNet

- 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/GOC/ROC operator

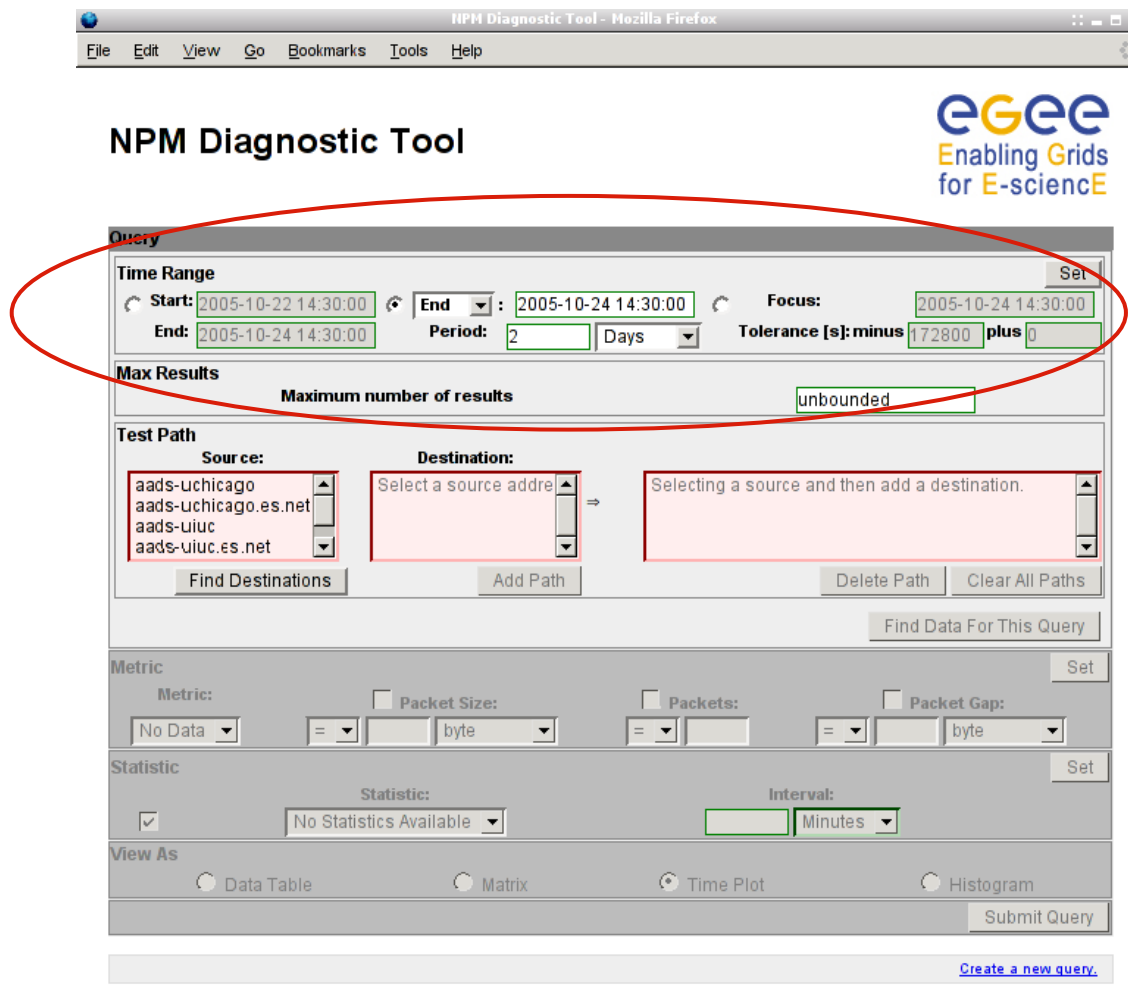


The screenshot shows the NPM Diagnostic Tool interface in a Mozilla Firefox browser window. The interface is titled "NPM Diagnostic Tool" and includes the EGEE logo. The main sections are:

- Query:**
 - Time Range:** Start: 2005-10-21 06:35:04, End: 2005-10-21 12:35:04, Period: 360 Minutes, Focus: 2005-10-21 06:35:04, Tolerance [s]: minus 0 plus 21600.
 - Max Results:** Maximum number of results: unbounded.
- Test Path:**
 - Source:** aads-uchicago, aads-uchicago.es.net, aads-uiuc, aads-uiuc.es.net.
 - Destination:** Select a source address.
 - Action:** Find Destinations, Add Path, Delete Path, Clear All Paths.
- Metric:**
 - Metric:** No Data.
 - Packet Size:** byte.
 - Packets:** (empty).
 - Packet Gap:** byte.
- Statistic:**
 - Statistic:** No Statistics Available.
 - Interval:** (empty) Minutes.
- View As:** Data Table, Matrix, Time Plot, Histogram.
- Buttons:** Submit Query, Create a new query.

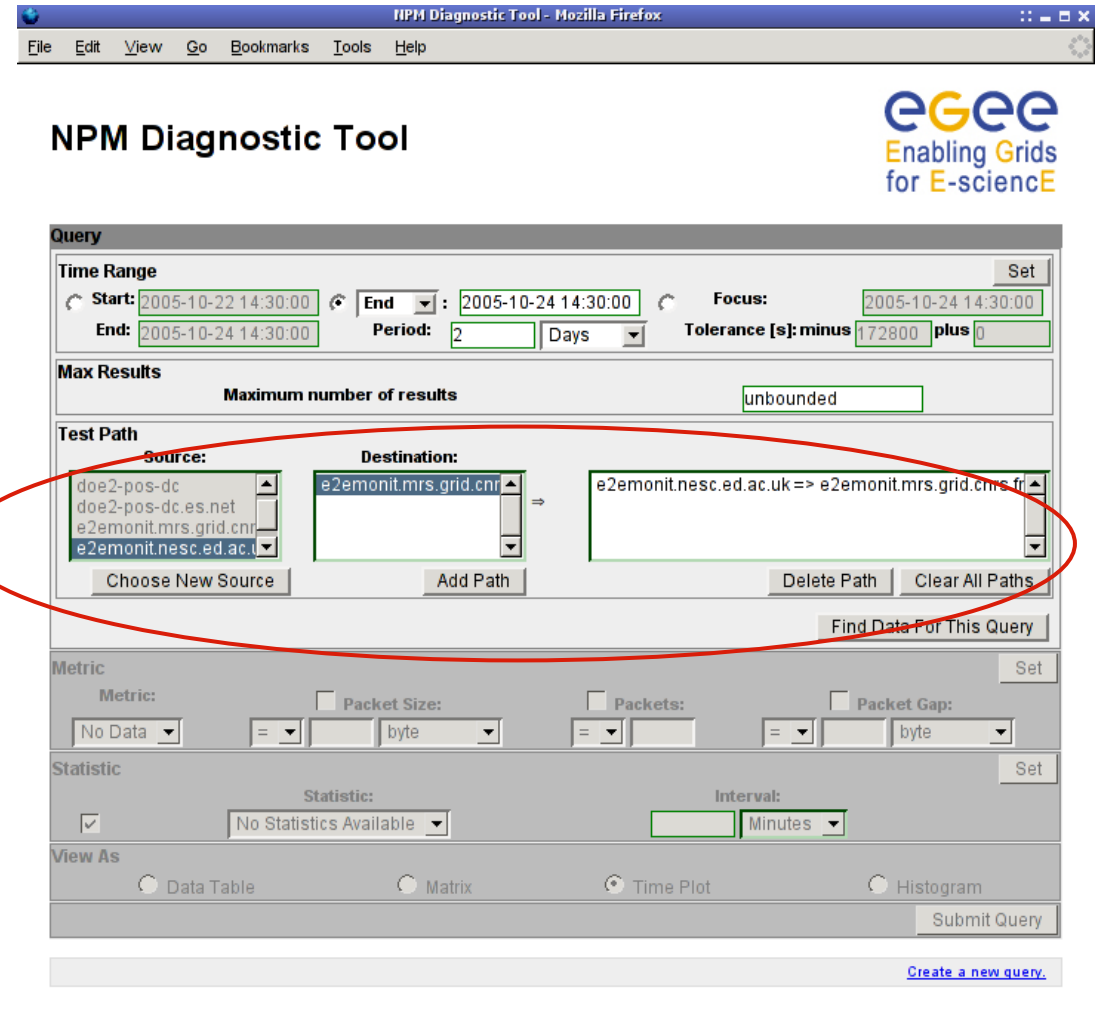
At the bottom, the user is logged in as: CN=alstair.phipps, L=NeSC, OU=Edinburgh, O=eScience, C=UK. The interface is version 1.1, © Members of the EGEE Collaboration 2005. Links for "Email the DT administrator" and "Download the DT User Guide" are provided.

- 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 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 user presses the Set button to confirm and the alternate time range representations update.



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- Step 3: Select a Path.
 - The end-user experienced the problem between UEDIN and CNRS.
 - The user selects e2emonit sites at UEDIN and CNRS, adds the path and then selects “Find Data For This Query”

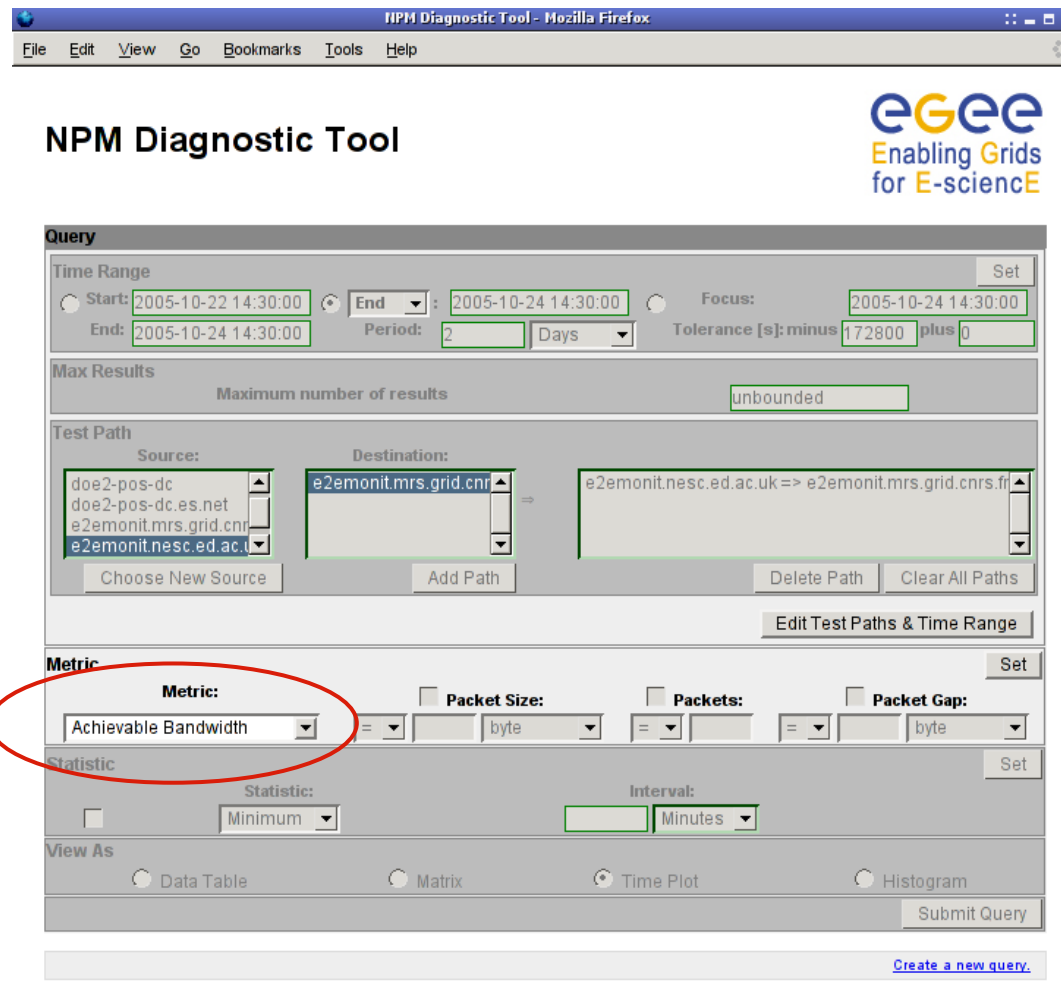


The screenshot shows the NPM Diagnostic Tool interface. The 'Test Path' section is highlighted with a red oval, showing a path configuration from 'e2emonit.nesc.ed.ac.uk' to 'e2emonit.mrs.grid.cnrs.fr'. Other sections include 'Time Range', 'Max Results', 'Metric', 'Statistic', and 'View As'.

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- 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 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.



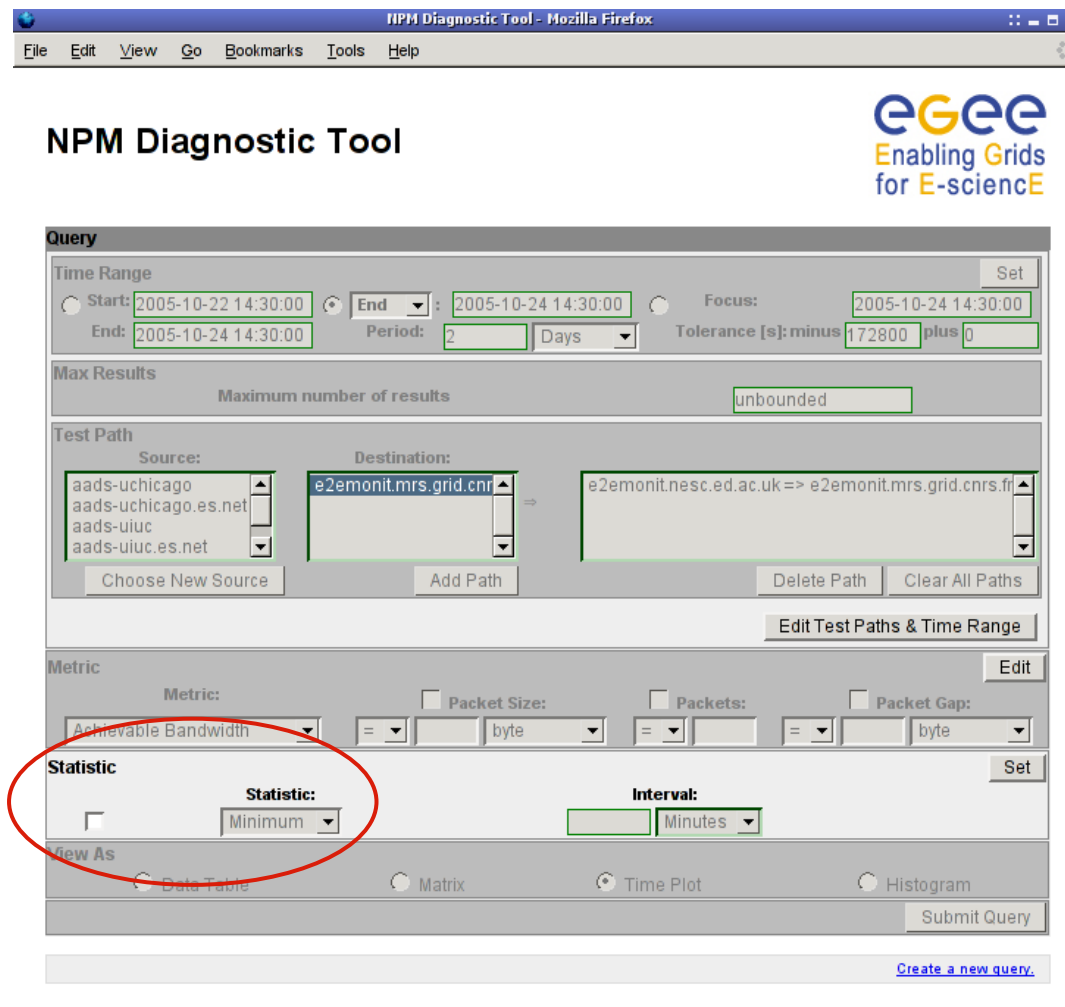
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- Step 5: Select a Statistic.

- Several types of statistical data are available, such as Minimum, Maximum, Mean.

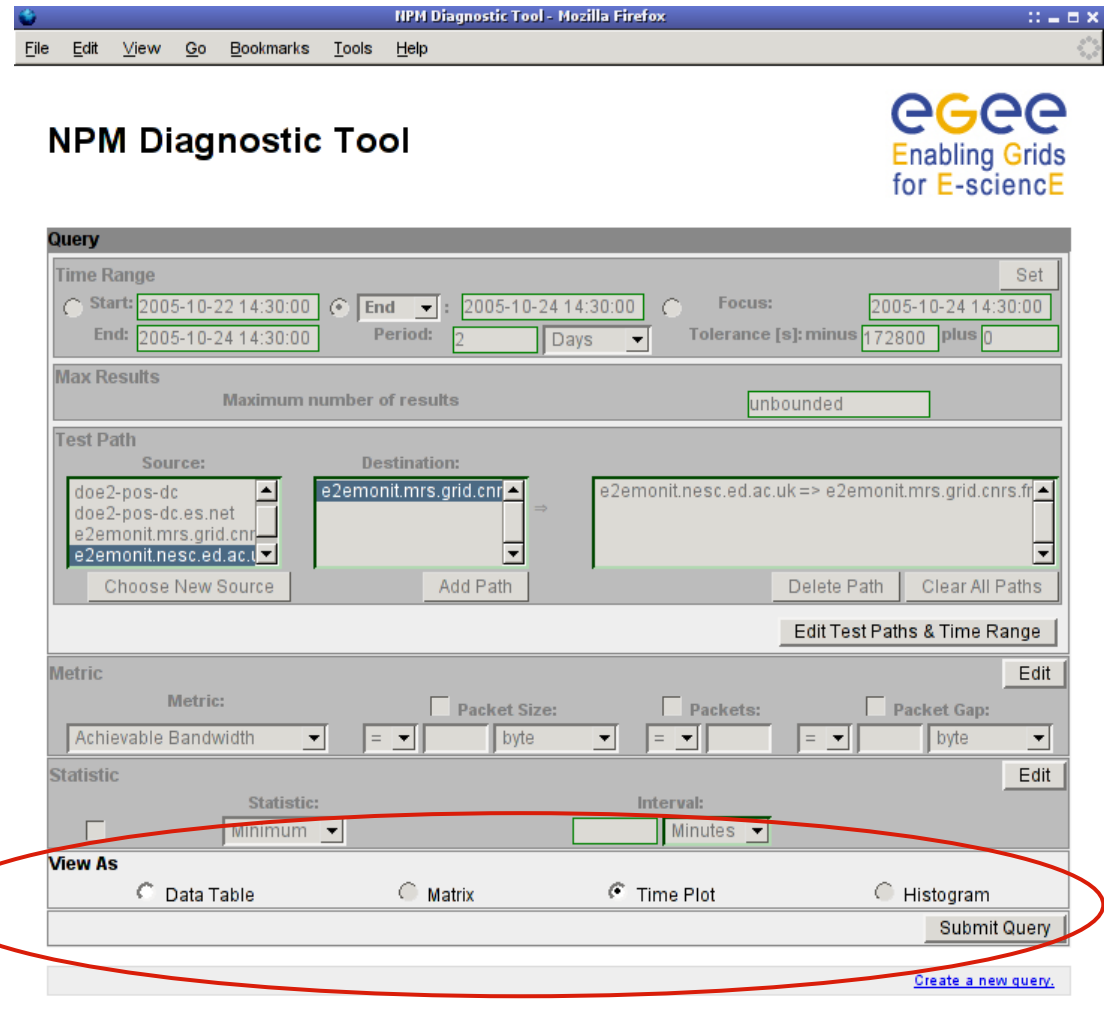
- A particular interval can be applied to each, to provide, for example, an hourly mean over the past two days.

- The user just wants a general overview of measurements and elects to retrieve raw data (Statistic check-box not checked).



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- Step 6: Select a View.
 - Currently Data Table and Time Plot views are available.
 - The 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 user selects Submit Query.



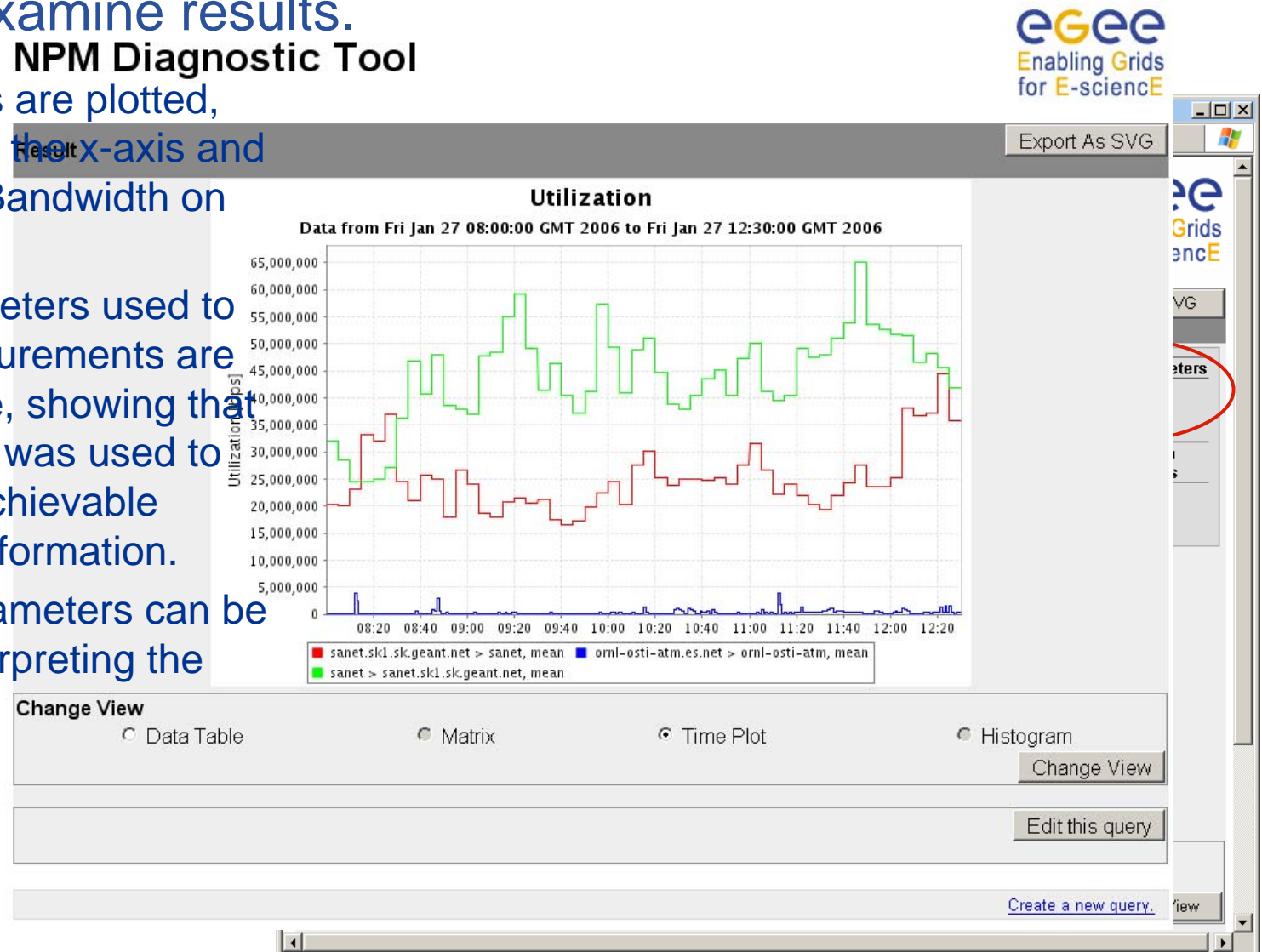
- Step 7: Examine results.

NPM Diagnostic Tool

- 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.



- **Ongoing work from EGEE-I is to deploy e2emonit on the Tier0/Tier1 sites**
 - Currently star topology
- **As other tools are installed, eg by LHC-OPN group hope to use those instead**
- **Further deployment has to be led by *requirements***
 - From DT users – ROCs, CICs etc
 - Which network paths are important for operations
 - From middleware users
 - WMS
 - FTS
 - From applications
 - Perhaps an application uses a particular subset of sites that they want to monitor
- **In parallel putting NPM components through gLite testing/certification process**

- **As with deployment, any further development must be *requirements led***
- **DT enhancements or potentially other clients to make full use of data**
- **Support for other network measurement tools and frameworks**
 - Traceroute being added to e2emonit
 - GridFTP transfer monitoring
- **Use of new version of GGF NM-WG schema**
- **Security**
- **General testing, hardening, performance improvements**

- **We need your input!**
 - Please use the DT and give us your opinions
 - For full details and access see DT user guide at <https://edms.cern.ch/document/653967>
 - (Need to add x.509 DN to for authorisation)
 - What sites and network paths do you want to monitor?
 - What tools would you like to be able to use?
 - How else might you want to use monitoring data?
- **I'll be around for the rest of today and tomorrow morning if you want to talk or explore the DT in more detail**
- **More details available from JRA4 website**
 - <http://cern.ch/EGEE-JRA4/>
 - Link to NPM Savannah for submitting issues