



Enabling Grids for E-science

The End-to-End Coordination Unit (E2ECU) and EGEE Network Operations Centre (ENOC)

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www.eu-egee.org



- **ENOC and E2ECU Responsibilities**
- **ENOC Organization & Tools**
- **ENOC Work Flow**
- **E2ECU Overview**
- **E2ECU Work Flow**
- **E2E Monitoring Systems**

- **Purpose**

- Administer the EGEE “overlay” network

- **Responsibilities**

- Act as EGEE’s single point of contact with European networks
- Receive notifications about network faults and planned maintenance, and inform EGEE users about the resulting impact
- Troubleshoot suspected network problems reported by EGEE users
- As appropriate, establish Service Level Agreements (SLAs) with individual networks
- Monitor SLA compliance

- **Purpose**

- To communicate the state of international end-to-end circuits (transiting GN2) to all appropriate entities (transit domains, end-sites)

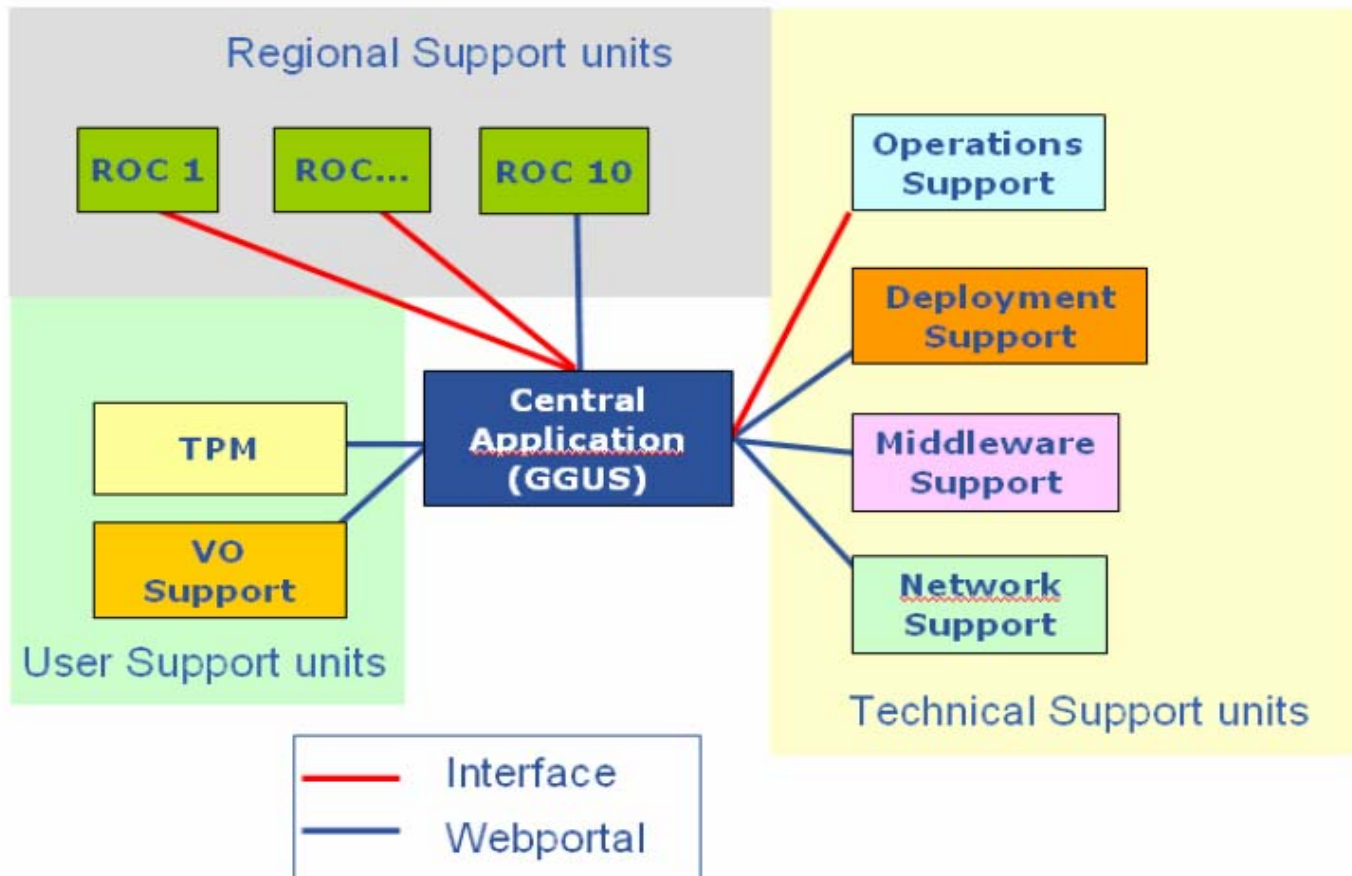
- **Responsibilities**

- Monitor (indirectly) the state of all end-to-end circuits
- Receive reports from all involved entities of changes to circuits (faults, planned maintenance)
- Advise all entities of known changes to circuits (learned from direct reports and E2ECU monitoring)
- Escalate (and receive escalations about) unresolved issues

- **ENOC**
 - All EGEE end-user networking requirements
- **E2ECU**
 - Only concerned with end-to-end circuits in optical private networks (currently only LHC-OPN)
 - Only concerned with circuit outages (identifying and reporting)
- ***Some overlap***
 - E.g. Campus net admins will be mailed E2E circuit outage info by E2ECU, and will also see this info in the GGUS ticket system

ENOC

EGEE Network Operations Centre



- **ENOC Organization**
 - Based in CC-IN2P3 (Lyon, France)
 - 2FTE Staff (1 + 0.25 x 4 people)
- **ENOC Operations**
 - Analyse network planned maintenance for possible impact on EGEE users
 - Investigate fault reports reported by EGEE users
 - Notify EGEE users of actual and expected network degradation

- **Filter Tool**
 - Creates GGUS tickets based on information in tickets received from NRENs
 - Integrated with network operational database in order to determine applicability of event
- **Network Operational Database**
 - High-level (domain) view of the network infrastructure between EGEE sites
 - Records relevant technical properties of the network
 - Schema has been defined and implemented
 - Database and interface currently being prepared
- **ENOC Dashboard (future work)**
 - Presenting the status of the problems and metrics for internal use and public assessment of ENOC

- **ENOC requested copies of all NREN Trouble Tickets**
 - 11 NRENs sending tickets to ENOC: DFN, GARR, GRNET, HEAnet, HUNGARNET, JANET, NORDUnet, RBNET/RUNET, RedIRIS, RENATER, SWITCH + GÉANT2
 - Waiting on response from CESnet and SURFnet
- **ENOC filter tool attempts to parse tickets**
 - If ticket seen not to affect EGEE, no further action
 - If ticket seen to affect EGEE, information added to GGUS and advisory message sent to ENOC
 - Info in Operational Database used to determine applicability of ticket
 - If ticket cannot be parsed then ticket forwarded to ENOC staff
- **Filter tool receives new *GGUS* ticket,**
 - ID matched with ID of original NREN ticket, and relationship logged in local database.

- **Experience to date**

- In approximately one year of operation, ENOC received 18,000 mails, relating to 5,500 separate events
- Diverse formats in use
 - 8 languages
 - Different date/time formats (and time-zones)
 - Different character sets
 - Variation even in 'common' fields e.g. 'open' vs 'opened'

- **Future plans**

- EGEE SA2 researching and promoting a basic, common format for TT exchange
 - Standards based where possible e.g. date/times as per RFC 3339
 - Mark-up language based (XML)
 - Easy to use with existing systems i.e. only requiring simple program to re-format existing TTs in common format

E2ECU

End-to-End Coordination Unit

- **E2ECU concerned only with operational status of end-to-end circuits**
 - a.k.a ‘point-point circuits’, ‘optical circuits’, ‘wavelengths’, ‘lambdas’
- **By extension, E2ECU is *not* concerned with**
 - IP status of E2E circuits (ENOC)
 - End-site IP network connectivity (ENOC/NRENs)
 - Provisioning new E2E circuits (GN2/NRENs)

- **An end-to-end circuit is considered to exist between the CPE (“Customer Premises Equipment”) at one end-site and the corresponding CPE at the other end-site.**
 - For LCG this means between the CERN access router and the corresponding Tier 1 CPE (router)
- **The transit NRENs deploy appropriate monitoring tools (e.g. those developed by perfSONAR)**

- **The E2ECU will be able to co-ordinate all trans-GÉANT2 circuits, but is currently organized with the LHC Optical Private Network (OPN) in mind**
- **The E2ECU is not contactable by end-users – only campus network admins and transit domain NOCs**
- **The E2ECU is responsible for facilitating communications about end-to-end circuits – it is *not* responsible for the circuits themselves**
 - Responsibility for the constituent circuits of an end-to-end circuit remains with the owners (NRENs, DANTE)

- **Appoint organization to undertake E2ECU role**
- **Deploy Tools**
 - Monitoring Tools
 - Trouble Ticket System
 - Database
- **Develop Policies and Procedures**
 - Fault Reporting and Service restoration
 - Hours of Coverage
 - Escalation Procedures
 - Periodic Reports

- **Communication et Systemes [CS] located in Paris**
- **Currently providing services as GÉANT2 NOC**
- **Organized and supervised by DANTE**

- **Involved NRENs must deploy either ‘E2E MP’ or ‘E2E MA’ application**
- **Both work in a similar way (‘MP’ more basic version of ‘MA’)**
 - E2ECU monitoring software queries MP/MA for state of one or all circuits
 - MP/MA checks data repository (XML file for MP, database for MA)
- **MP only reports current state - MA makes historical queries possible (in future)**

- **The circuit information held by the MP/MA includes the following:**
 - Operational status *Up, Down, Degraded, Unknown*
 - Admin status *Normal operations, Maintenance, Troubleshooting, UnderRepair, Unknown*

Note: the GN2 project does not mandate *how* to populate the XML file (in MP) or database (in MA)

- **E2E Monitoring system sends SNMP traps to E2ECU NAGIOS system**
 - In future, SNMP polling (or SNMP v3 traps) may be used in order to avoid risk of missing traps

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E2ECU view

[All E2E Links](#)

[Problem Links](#)

Domain/NREN view

[CERN](#)

[DFN](#)

[GARR](#)

[GEANT2](#)

[SURFNET](#)

[SWITCH](#)

Project view

[LHCOPN](#)

Monitored Links for Domain GEANT2

E2E Link ID	Topology Point A	Role	Topology Point B	Role	(Domain) Local Name	Link Type	Oper. Status	Admin. Status	Time Stamp
CERN-GRIDKA-LHCOPN-001	DFN-FRA82	D	GEANT2-FRA	D	GEANT2-DE-CERN-GRIDKA	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-GRIDKA-LHCOPN-001	GEANT2-FRA	D	GEANT2-GEN	D	GEANT2-CH-DE-CERN-GRIDKA	Domain Link	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-GRIDKA-LHCOPN-001	CERN-T0	E	GEANT2-GEN	D	GEANT2-CH-CERN-GRIDKA	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-CNAF-LHCOPN-001	GARR-MIL	E	GEANT2-MIL	D	GEANT2-IT-CERN-CNAF	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-CNAF-LHCOPN-001	GEANT2-MIL	D	GEANT2-GEN	D	GEANT2-CH-IT-CERN-CNAF	Domain Link	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-CNAF-LHCOPN-001	CERN-T0	E	GEANT2-GEN	D	GEANT2-CH-CERN-CNAF	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-RAL-LHCOPN-001	GEANT2-LON	D	UKERNA-LON	E	GEANT2-UK-CERN-RAL	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-RAL-LHCOPN-001	GEANT2-LON	D	GEANT2-GEN	D	GEANT2-CH-UK-CERN-RAL	Domain Link	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-RAL-LHCOPN-001	CERN-T0	E	GEANT2-GEN	D	GEANT2-CH-CERN-RAL	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-SARA-LHCOPN-001	GEANT2-AMS	D	SURFNET-SARA	E	GEANT2-NL-CERN-SARA	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-SARA-LHCOPN-001	GEANT2-AMS	D	GEANT2-GEN	D	GEANT2-CH-NL-CERN-SARA	Domain Link	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
CERN-SARA-LHCOPN-001	CERN-T0	E	GEANT2-GEN	D	GEANT2-CH-CERN-SARA	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000

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E2ECU view

[All E2E Links](#)
[Problem Links](#)

Domain/NREN view

[CERN](#)
[DFN](#)
[GARR](#)
[GEANT2](#)
[SURFNET](#)
[SWITCH](#)

Project view

[LHCOPN](#)

Monitored Links for Domain GEANT2

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CERN-GRIDKA-LHCOPN-001	DFN-FRA82	D	GEANT2-FRA	D
CERN-GRIDKA-LHCOPN-001	GEANT2-FRA	D	GEANT2-GEN	D
CERN-GRIDKA-LHCOPN-001	CERN-T0	E	GEANT2-GEN	D
CERN-CNAF-LHCOPN-001	GARR-MIL	E	GEANT2-MIL	D
CERN-CNAF-LHCOPN-001	GEANT2-MIL	D	GEANT2-GEN	D
CERN-CNAF-LHCOPN-001	CERN-T0	E	GEANT2-GEN	D
CERN-RAL-LHCOPN-001	GEANT2-LON	D	UKERNA-LON	E
CERN-RAL-LHCOPN-001	GEANT2-LON	D	GEANT2-GEN	D
CERN-RAL-LHCOPN-001	CERN-T0	E	GEANT2-GEN	D
CERN-SARA-LHCOPN-001	GEANT2-AMS	D	SURFNET-SARA	E
CERN-SARA-LHCOPN-001	GEANT2-AMS	D	GEANT2-GEN	D
CERN-SARA-LHCOPN-001	CERN-T0	E	GEANT2-GEN	D

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(Domain) Local Name	Link Type	Oper. Status	Admin. Status	Time Stamp
GEANT2-DE-CERN-GRIDKA	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-CH-DE-CERN-GRIDKA	Domain Link	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-CH-CERN-GRIDKA	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-IT-CERN-CNAF	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-CH-IT-CERN-CNAF	Domain Link	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-CH-CERN-CNAF	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-UK-CERN-RAL	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-CH-UK-CERN-RAL	Domain Link	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-CH-CERN-RAL	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-NL-CERN-SARA	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-CH-NL-CERN-SARA	Domain Link	Up	Normal Oper.	2006-12-04T16:43:38.0+0000
GEANT2-CH-CERN-SARA	ID Part.Info	Up	Normal Oper.	2006-12-04T16:43:38.0+0000

Status of E2E Link CERN-GRIDKA-LHCOPN-001

Oper. State: **Up**
 Admin. State: **Normal Oper.**

Warning: Administrative state is known not for all involved links

Domain	DFN				GEANT2				CERN		
Link Structure	EP	←————→	DP	←.....→	DP	←————→	DP	←.....→	EP
Type	EndPoint	Domain Link	Demarc	ID Part.Info	ID Part.Info	Demarc	Domain Link	Demarc	ID Part.Info	ID Part.Info	EndPoint
Local Name	DFN-FZK23	DFN-DOMAIN_Link-53805	DFN-FRA82	DFN-ID_LinkPartialInfo_53805	GEANT2-DE-CERN-GRIDKA	GEANT2-FRA	GEANT2-CH-DE-CERN-GRIDKA	GEANT2-GEN	GEANT2-CH-CERN-GRIDKA	CERN-GEN	CERN-TO
State Oper.	-	Up	-	Up	Up	-	Up	-	Up	Up	-
State Admin.	-	Normal Oper.	-	Normal Oper.	Normal Oper.	-	Normal Oper.	-	Normal Oper.	Unknown	-
Timestamp	-	2006-12-05 T16:40:00+01:00	-	2006-12-05 T16:40:00+01:00	2006-12-04 T16:43:38.0+0000	-	2006-12-04 T16:43:38.0+0000	-	2006-12-04 T16:43:38.0+0000	2006-12-05 T16:40:12+1:00	-

- **Extension to existing system used by GÉANT2 NOC**
- **Possible to send e-mails to specific community of users depending on the fault's impact**
- **Periodic updates**
 - Updates to the E2ECU from the domains where the fault first occurred => Then TT with latest updates forwarded to the remaining partners

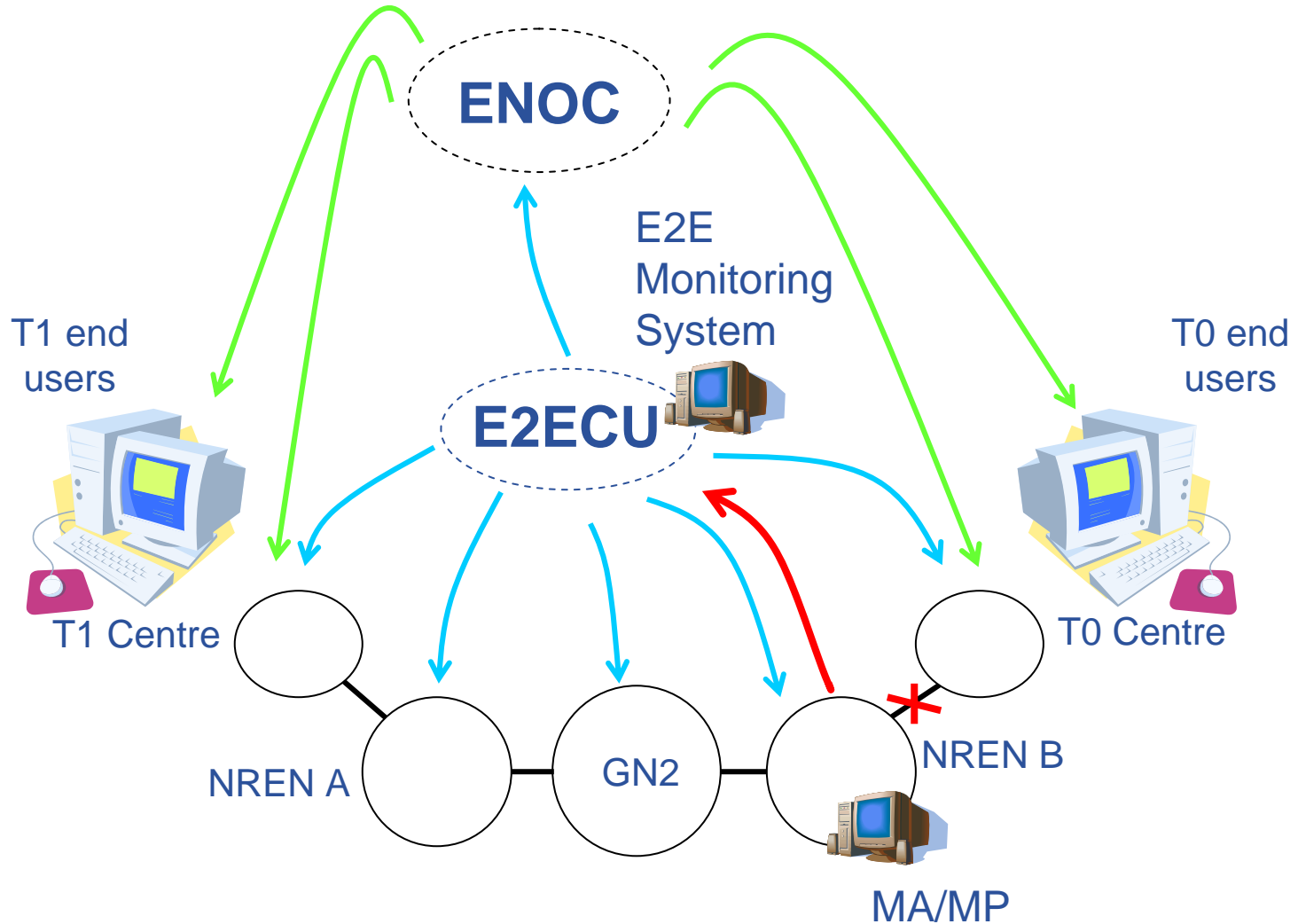
Note: Unlike ENOC, E2ECU will not extract information from other domain TTs (all communication via phone, direct e-mail or web interface)

- Reason for communication: [Open, Update, Close]
- Problem type: maintenance or fault
- Project affected:
- End-to-end link name:
- Domain affected:
- Domain reference (for future communication please specify the reference given to the problem above described):
- Problem description (when open) / Problem update (when update) / Summary (when close)
- Impact:
- Expected duration:
- Problem start:
- Problem end:

- **Extension to existing GÉANT2 database**
- **Will contain information on**
 - Links
 - Projects
 - Contact information of the network administrators
- **Accessible by the E2ECU**
- **Developed and operated by DANTE**

- **Operational procedures are being drafted**
- **Communication back to the entities involved**
 - Via phone or e-mail in case of queries
 - E-mailed Trouble Tickets for relaying updated information
- **Fault Reports or Maintenance specifications**
 - Via a dedicated phone number (TBC)
 - Via e-mail address (e2ecu@noc.geant2.net)
 - Via a web interface on the GEANT2 site

- **Coverage**
 - From 8.00 – 22.00 (CET) Monday to Friday
 - From 9.00 – 18.00 (CET) Saturday to Sunday
- **Escalation Procedures: From the entities involved in a project to the E2ECU (and vice versa)**
- **Monthly Reports to be provided describing the E2E links availability and tickets opened related to each specific project**



- **MAs/MPs deployed in most LHC-OPN participating networks:**
 - GERN, DFN, GARR, GÉANT2, SURFNET, SWITCH
- **Pilot E2ECU service planned for mid November**
 - Slight delay; expected to begin this month
 - Focused on LHC support
- **Full service planned for January 2007**

- European academic grid computing, in the form of EGEE, uses both the European academic IP network and now also private circuits made possible by new NREN optical networks
- ENOC is the network technical support for EGEE, concerned with all aspects of end-users' network connectivity
- The ENOC receives trouble tickets from NREN NOCs and adds appropriate information to the GGUS ticket system
- The E2ECU is the new GN2 end-to-end (circuit) coordination unit
- The E2ECU will monitor the state of all end-to-end circuits in the LHC-OPN and reports any identified issues to all participating domains plus the ENOC
- E2ECU will start a pilot service before the end of the year, and a full service is expected to begin in January 2007

QUESTIONS?