The DANTE NOC Network Monitoring System

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TNC 2010, Vilnius, 2nd June 2010

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The brief for the DANTE Network Operations Centre Network Monitoring System

- ***The requirement***

Network Monitoring Tools to support the Network Operations Centre business model

- ***The solution***

An integrated monitoring system correlating and interpreting alarms from multi-layer, multi-vendor network systems

The Requirement

Tasked with developing a suite of monitoring tools -

- Tailored to the Network Operations requirement for the DANTE NOC
- Create a central dashboard of network problems accessible by multiple teams, to help organise workflow
- Correlating multiple alarms to provide more straightforward problem descriptions
- Provide network information as the basis for the creation of further tools and reports

Tailored Monitoring Tools at the Centre of the NOC

DANTE

- *Tier 1*

Basic Skill, 24x7

- *Tier 2*

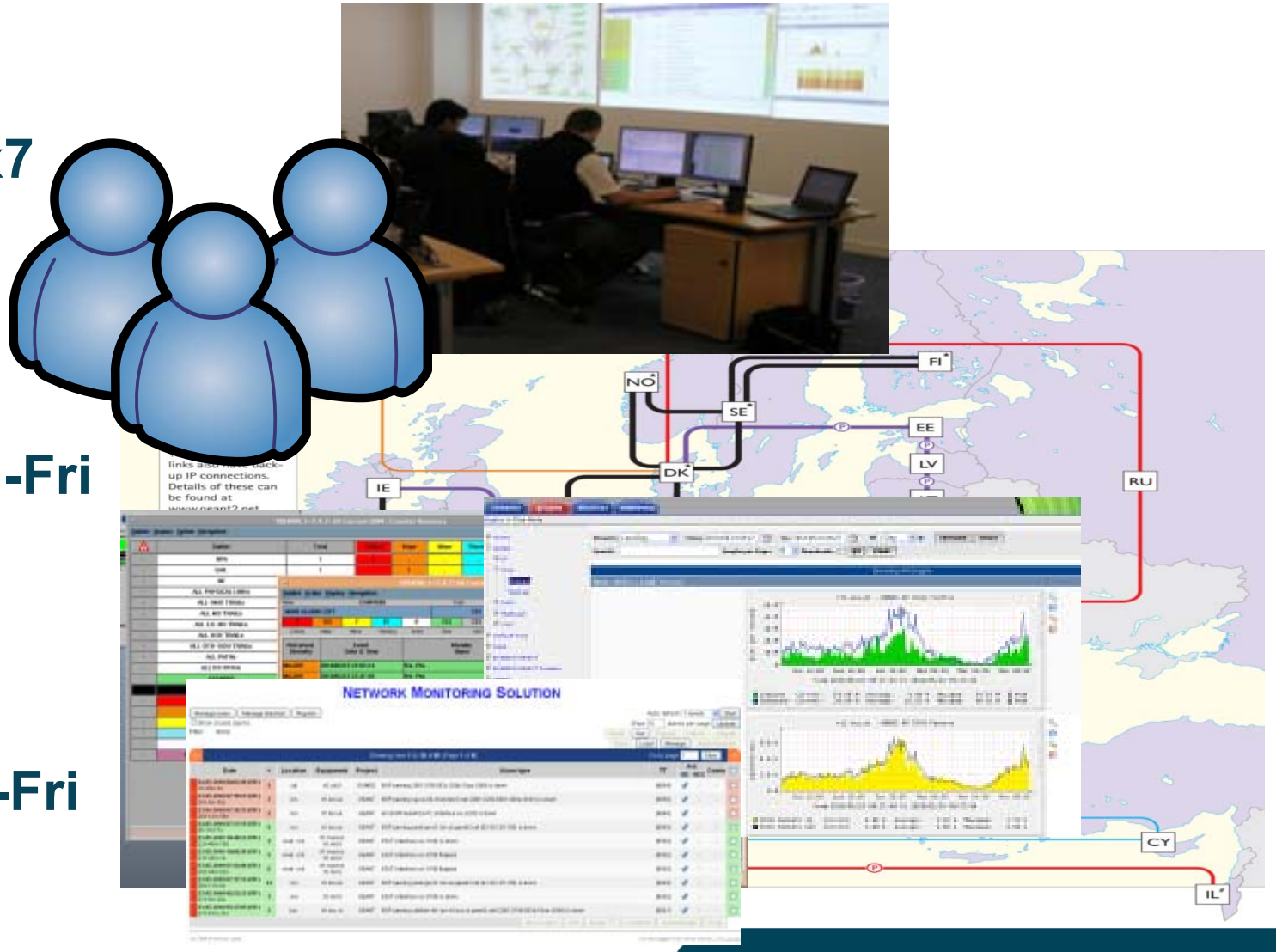
Higher skill,

5am–9pm, Mon-Fri

- *Tier 3*

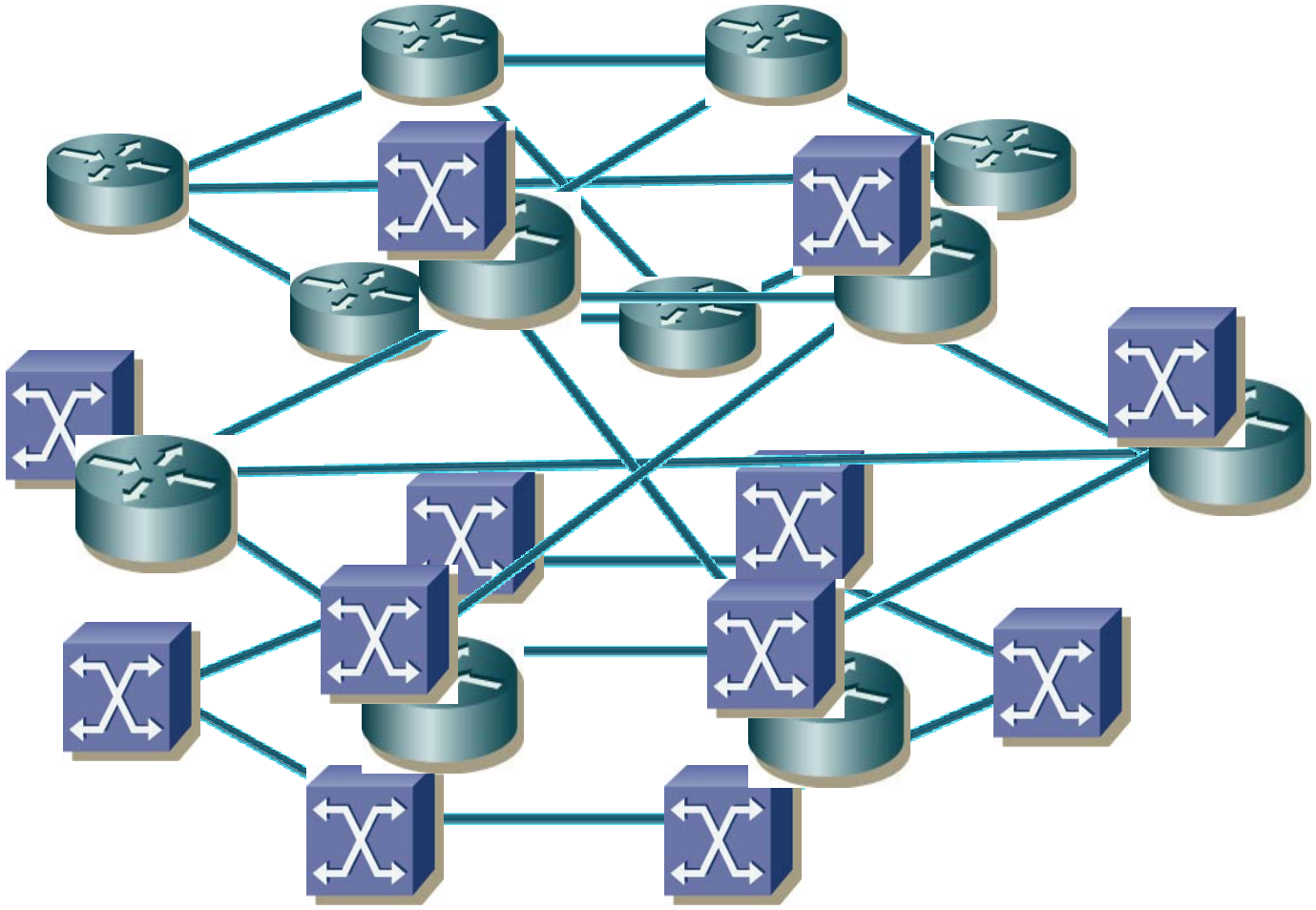
Specialists

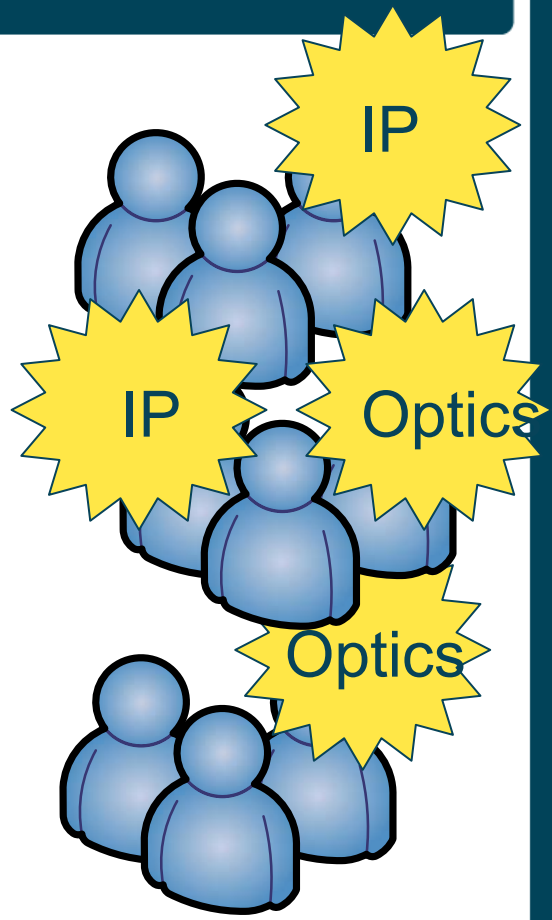
9am-5pm, Mon-Fri



GÉANT

Enabling Multi-skilled Operations

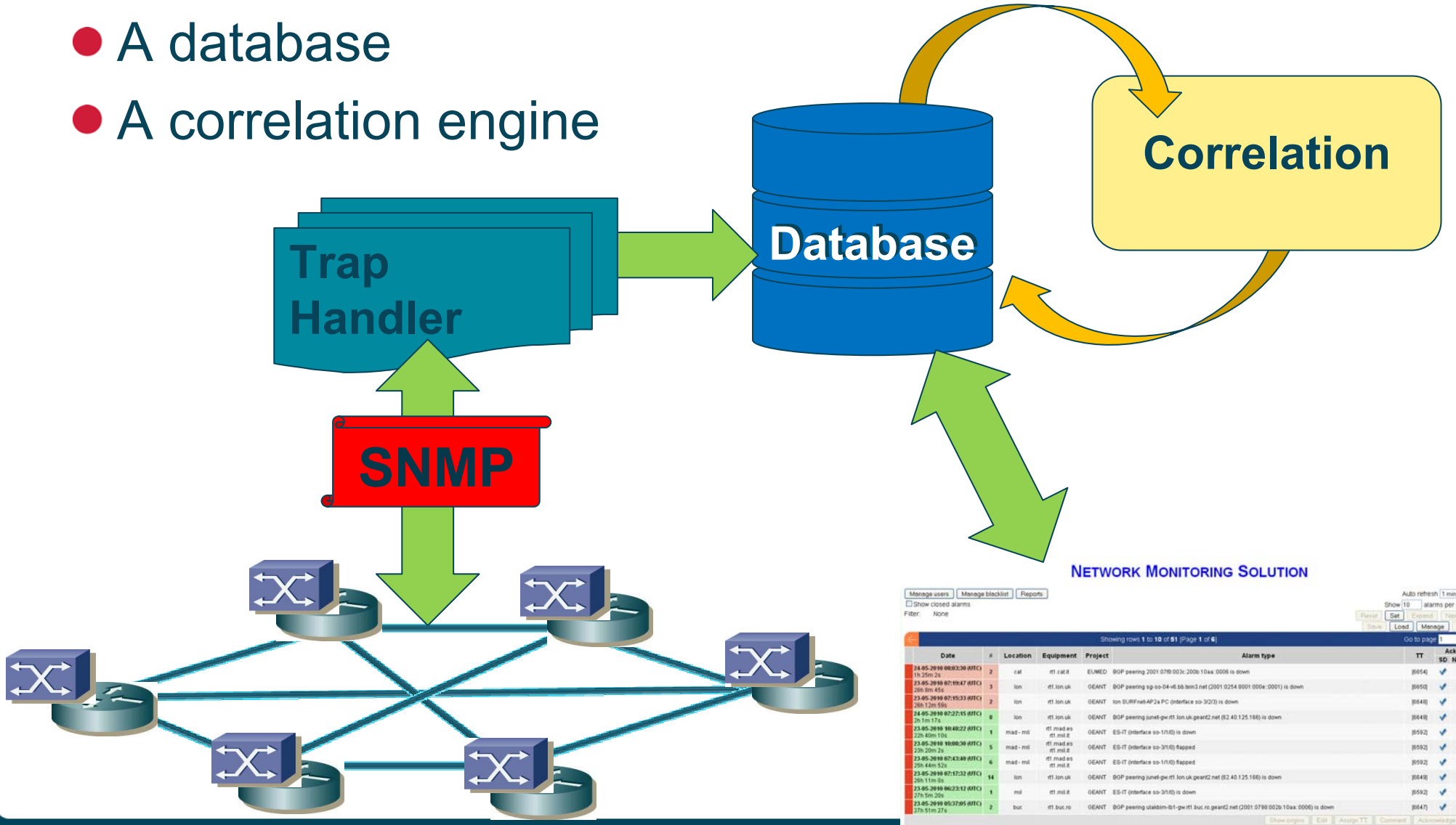




IP and Optical Support in the same NOC team, which requires integrated monitoring solutions.

The Solution

- A trap handling mechanism
- A database
- A correlation engine



An Example of the Correlation Requirement

- Fibre Cut
  - *Regular non-preventable problem*
  - *Priority to respond quickly*
  - *Important to simplify alarms generated at multiple layers*

- The Challenge:
  - *Multiple vendors / hardware*
  - *Different layers see the problem differently*
  - *A lot of alarms are generated, confusing operators*

Correlation

- Responding to the challenge
  - *Logical analysis by product specialists within DANTE*
  - *'Trigger Points' identified*
  - *Related/unrelated alarms separable using logic and 'time buckets'*
  - *Correlation output translated to coded logic*

Correlation

- End product –
  - “Possible Fibre Cut” alarm
  - One alarm with clear time and location
  - Containing detail of underlying alarms, and related higher layer alarms
  - Definitive call-out trigger for out of hours response

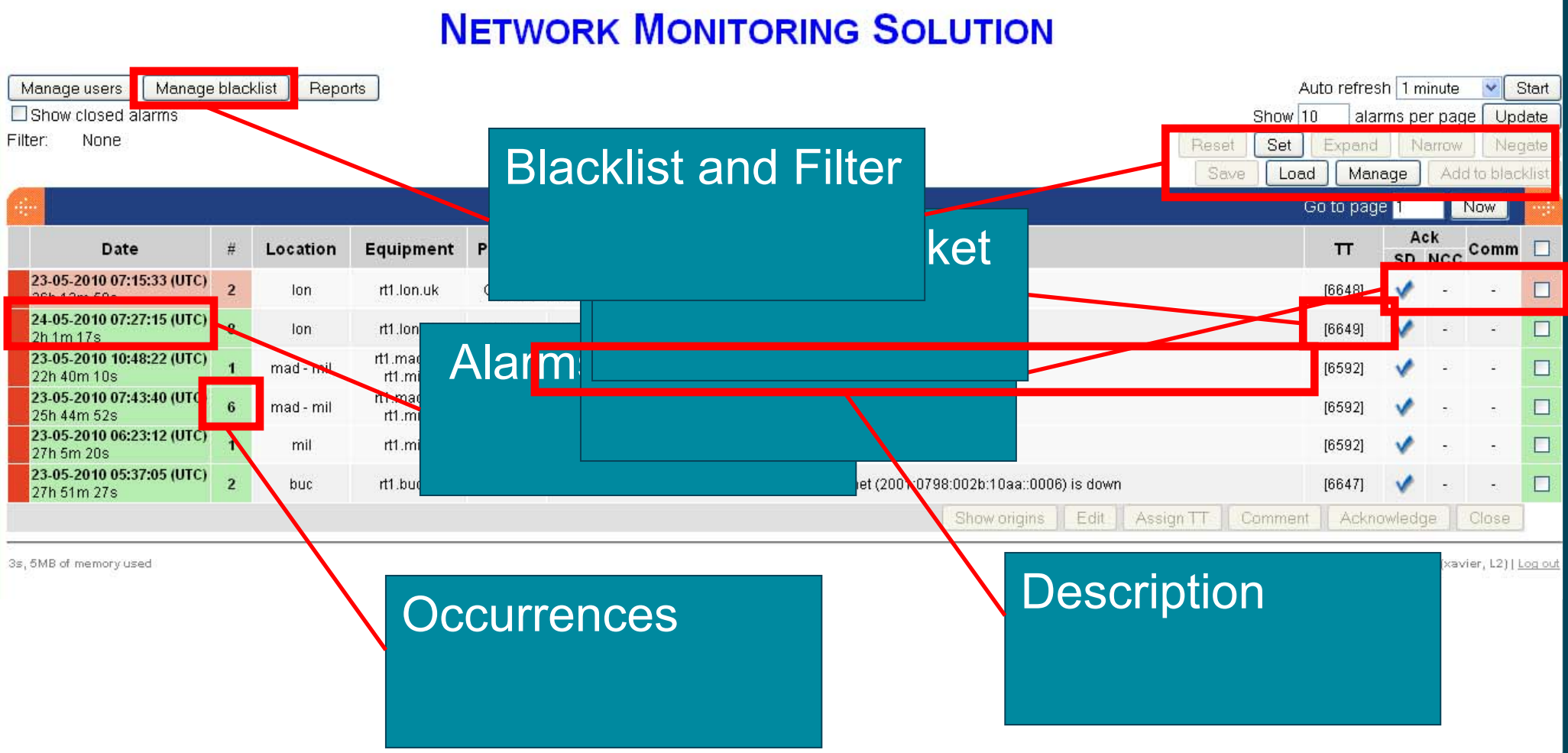
2009-01-29 11:23:14 [22h 49m 27s	1	ams - bru	ila01.ams-bru.nl	GEANT	Possible Fibre Cut

The GUI

‘The Dashboard’

- Needed to be an interactive database by all three support
- Containing all required information for response and resolution
- Configurable to a basic level by operators

The Dashboard



Dashboard – Alarm detail

NETWORK MONITORING SOLUTION ION

NETWORK MONITORING SOLUTION

Manage users | Manage blacklist | Reports

Show closed alarms

Filter: None

Auto refresh 1 minute Start

Show 10 alarms per page Update

Reset | Set | Expand | Narrow | Negate

Save | Load | Manage | Add to blacklist

Showing rows **1** to **10** of **51** [Page **1** of **6**] Go to page 1 Now

Date	#	Location	Equipment	Project	Alarm type	TT	Ack SD	Ack NCC	Comm	
23-05-2010 07:15:33 (UTC) 26h 12m 59s	2	lon	rt1.lon.uk	GEANT	lon SURFnet-AP2a PC (interface so-3/2/3) is down	[6648]	✓	-	-	☐
24-05-2010 07:27:15 (UTC) 2h 1m 17s	8	lon	rt1.lon.uk	GEANT	BGP peering junet-gw.rt1.lon.uk.geant2.net (62.40.125.166) is down	[6649]	✓	-	-	☐
23-05-2010 10:48:22 (UTC) 22h 40m 10s	1	mad - mil	rt1.mad.es rt1.mil.it	GEANT	ES-IT (interface so-1/1/0) is down	[6592]	✓	-	-	☐
23-05-2010 07:43:40 (UTC) 25h 44m 52s	6	mad - mil	rt1.mad.es rt1.mil.it	GEANT	ES-IT (inter so-1/1/0) flapped	[6592]	✓	-	-	☐
23-05-2010 06:23:12 (UTC) 27h 5m 20s	1	mil	rt1.mil.it	GEANT	ES-IT (interface s 3/1/0) is down	[6592]	✓	-	-	☐
23-05-2010 05:37:05 (UTC) 27h 51m 27s	2	buc	rt1.buc.ro	GEANT	BGP peering ulakbim-l gw.rt1.buc.ro. eant2.net (2001:0798:002b:10aa::0006) is down	[6647]	✓	-	-	☐

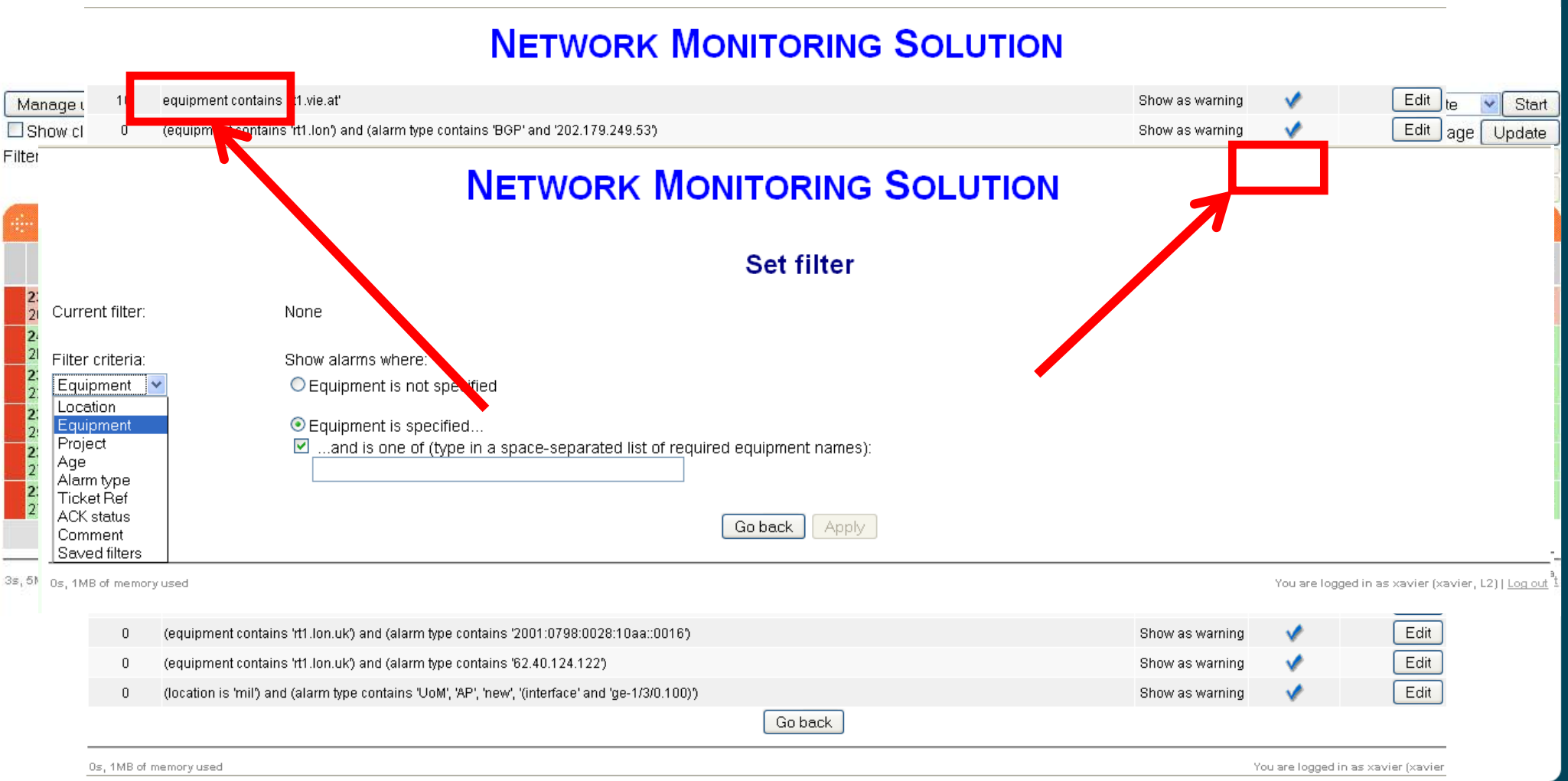
Show origins | Edit | Assign TT | Comment | Acknowledge | Close

3s, 5MB of memory used

You are logged in as xavier (xavier, L2) | Log out

Link interface:	so-3/1/0
Admin status:	up since 010-05-23 10:48:22
Oper status:	up since
Alarm properties:	
DISMAN-EVENT-MIB::sysUpTimeInstance:	116:16:53:17.85
IF-MIB::ifAdminStatus.171:	up
IF-MIB::ifIndex.171:	171
IF-MIB::ifName.171:	so-3/1/0
IF-MIB::ifOperStatus.171:	up
SNMPv2-MIB::snmpTrapOID.0:	IF-MIB::linkUp

The Dashboard - Blacklist



Integrating existing tools

- **DANTE Operations Circuit Database**

Segments

Name	Circuit-Id	OK	A-End PoP	A-End Equipment	A-End Shelf	A-End Card	A-End Port	A-End LU	B-End PoP	B-End Equipment	B-End Shelf	B-End Card	B-End Port	B-End LU
LON-PAR-IP		✔	London	rt1.lon.uk.geant2.net		POS3/0	0		Paris	rt1.par.fr.geant2.net		POS2/1	0	
lon-par-IP DL		✔	London	rt1.lon.uk.geant2.net		POS3/0	0		Paris	rt1.par.fr.geant2.net		POS2/1	0	
lon-par-IP lon PC		✔	London	rt1.lon.uk.geant2.net		POS3/0	0		London	ter1.lon-par.lon.uk.geant2.net	1	Transponder-16	1	
smf-22515		-	London	rt1.lon.uk.geant2.net		POS3/0	0		London	pp-uk-e20		Tray 2	1	
smf-22115		-	London	pp-uk-e20		Tray 2	1		London	pp-uk-e10		Tray 1	3	
smf-22108		-	London	ter1.lon-par.lon.uk.geant2.net	1	Transponder-16	1		London	pp-uk-e10		Tray 1	3	
lon-par-IP OCH		✔	Paris	ter1.lon-par.par.fr.geant2.net	1	Transponder-16	1		London	ter1.lon-par.lon.uk.geant2.net	1	Transponder-16	1	
lon-par-band-7 OMS		✔	London	ter1.lon-par.lon.uk.geant2.net	1	Channel Mux-19	1		Paris	ter1.lon-par.par.fr.geant2.net	1	Channel Mux-19	1	
lon-par-dfroute	refer to span ID	✔	London	ter1.lon-par.lon.uk.geant2.net	1	Amplifier-7,	1		Paris	ter1.lon-par.par.fr.geant2.net	1	Amplifier-7,	1	
tmp-ph2-207		-	London	ter1.lon-par.lon.uk.geant2.net	1	Amplifier-7	1		London	pp-uk-e14a		Tray 1	1	
smf-2168		-	London	pp-uk-e14a										
ter01-spl01.lon-par.uk	Glass Through	-	London	Telecity-ODF.lon.uk.ge										
spl01-ila01.lon-par.uk	LONDENEH-PDWDENAA-00001 & 02	-	spl01.lon-par.uk	spl01.lon-par.uk										
ila01-ila02.lon-par.uk	LONDENEH-PDWDENAA-00001 & 02	-	hut01.lon-par.uk	ila01.lon-par.uk										
ila02-ila03.lon-par.uk	PDWDENAA-FKSTENAB-00003 & 04	-	hut02.lon-par.uk	ila02.lon-par.uk										
ila03-ila04.lon-par.uk	FKSTENAB-GRVLFRAA-00004 & 05	-	hut03.lon-par.uk	ila03.lon-par.uk										
ila04-ila05.lon-par.fr	GRVLFRAA-BSGRFRAA-00007 & 08	-	hut04.lon-par.fr	ila04.lon-par.fr										
ila05-ila06.lon-par.fr	BSGRFRAA-ARRSFRAA-00007 & 08	-	hut05.lon-par.fr	ila05.lon-par.fr										
ila06-ila07.lon-par.fr	ARRSFRAA-ALBRFRAA-00007 & 08	-	hut06.lon-par.fr	ila06.lon-par.fr										
ila07-ila08.lon-par.fr	ALBRFRAA-BEVSFRAA-00007 & 08	-	hut07.lon-par.fr	ila07.lon-par.fr										
ila08-ila09.lon-par.fr	BEVSFRAA-PARSFRAW-00005 & 06	-	hut08.lon-par.fr	ila08.lon-par.fr										
ila09-ter1.lon-par.fr	PARSFRAW-PARSFRDO-00011 & 12	-	hut09.lon-par.fr	ila09.lon-par.fr										
smf-22230		-	Paris	pp-fr-e13b										
lon-par-IP par PC		✔	Paris	rt1.par.fr.geant2.net										
smf-22505		-	Paris	rt1.par.fr.geant2.net										
smf-22165		-	Paris	pp-fr-e10										
smf-21381		-	Paris	ter1.lon-par.par.fr.gea										

Housing Info | PoP Layout | Floor Layout | Circuits | Routing Equipment | SDH Equipment | WDM Equipment | Project Equipment | OOB Equipment | Workstations | Cabling | Spares

Name	Model	Serial No.	DANTE PCN	Rack	State	RFS Date	Total Cards	Built-in Port	State	Connected to	Trace
rt1.lon.uk.geant2.net	T1600	JN1090935AHA	002153	RACK-UK-12	Operational		34	Console-0	In use	ts1.lon.uk.geant2.net Serial/1	Trace
								Console-1	In use	ts1.lon.uk.geant2.net Serial/2	Trace
								Eth-0	In use	sw1.lon.uk.geant2.net Built-in-ETH/41	Trace
								Eth-1	In use	sw1.lon.uk.geant2.net Built-in-ETH/42	Trace

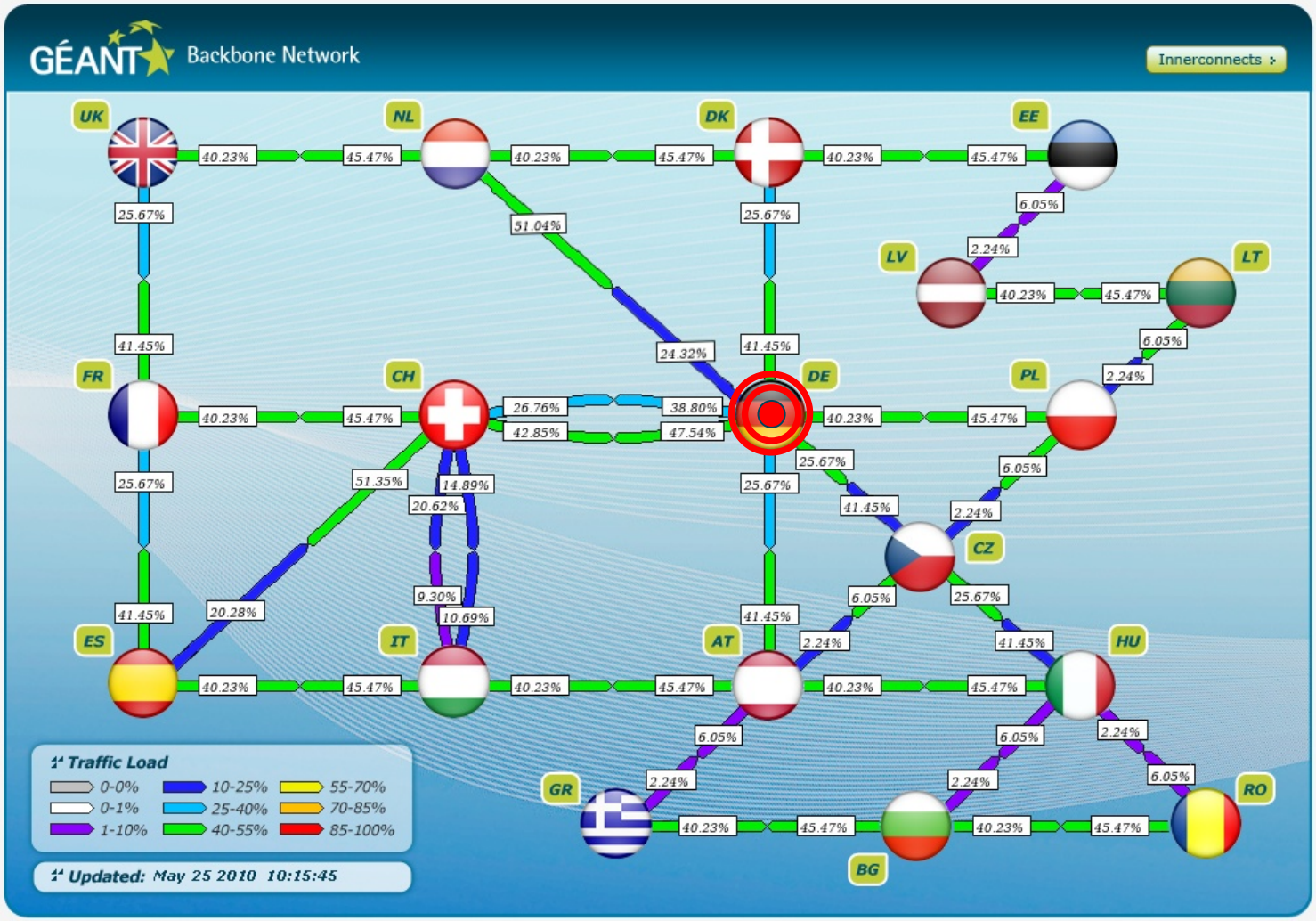
Card Type	Designation	Slot	Status	Speed	Serial No.	No. of Ports
CB	CB (**)				DK4384 CB0 Orig	
CB	CB (**)				DK4391 CB1 Orig	
CIP	CIP				DH8437	
Fan Tray	Fan Tray (**)				LON - Fan Tray 0 Original	
Fan Tray	Fan Tray (**)				LON - Fan Tray 1 Original	
Fan Tray	Fan Tray (**)				LON - Fan Tray 2 Original	
FPM Display	FPM Display				DK4875	
PEM	PEM (**)				TL26631 PEM 1 Orig	
Routing Engine	Routing Engine (**)				1000737465 RE 0 Orig	
Routing Engine	Routing Engine (**)				1000737704 RE 1 Orig	
SCG	SCG (**)				DH8504 SCG 0 Orig	
SCG	SCG (**)				DJ3738 SCG 1 Orig	
SIB	SIB (**)				DL0245 SIB 0 Orig	
SIB	SIB (**)				DL0250 SIB 1 Orig	
SIB	SIB (**)				DL0171 SIB 2 Orig	
SIB	SIB (**)				DL0202 SIB 3 Orig	
SIB	SIB (**)				DL0183 SIB 4 Orig	
FPC1	FPC1-0	0			DH9068	
Line Card	SERIAL0/0	0		T3	DK4258	4

Port No.	State	Connected to	Trace
SERIAL0/0/0	Free		
SERIAL0/0/1	In use	JORDAN NREN Access Router	Trace
Inter-domain Link	In use	JORDAN NREN Access Router	Segments
PC Trail	In use	JORDAN NREN Access Router	Segments

- Asset Database
- Configuration items
- Contact information

Performance and Reporting

Backbone view



IP Services - Detailed IP Access Availability (1 of 3)

IP Access	Total Number of Failures	Total Outage Time	Total Outage Time During Maintenances	Total Availability	Mean Time Between Failures	Mean Time To Repair
ACOnet AP	1	0:07:27	0:07:27	99.983%	719:52:32	0:07:27
ACOnet AP2	6	6:54:51	1:07:11	99.040%	118:50:51	1:09:09
ARNES AP	1	0:55:25	0:00:00	99.872%	719:04:34	0:55:25
ARNES AP2	0	0:00:00	0:00:00	100.000%	0:00:00	0:00:00
BELNET AP	4	1:46:17	0:16:30	99.754%	179:33:25	0:26:34
BELNET AP2	3	0:00:40	0:00:00	99.998%	239:59:46	0:00:13
CARNet AP	1	0:55:26	0:00:00	99.872%	719:04:33	0:55:26
CARNet AP2	0	0:00:00	0:00:00	100.000%	0:00:00	0:00:00
CESNET AP	0	0:00:00	0:00:00	100.000%	0:00:00	0:00:00
CESNET AP2	0	0:00:00	0:00:00	100.000%	0:00:00	0:00:00
CyNet AP LB1	1	0:00:05	0:00:00	100.000%	719:59:54	0:00:05
CyNet AP LB2	17	3:18:53	0:00:19	99.540%	42:09:29	0:11:42
DFN AP	0	0:00:00	0:00:00	100.000%	0:00:00	0:00:00
EENet AP	0	0:00:00	0:00:00	100.000%	0:00:00	0:00:00
EENet AP2	0	0:00:00	0:00:00	100.000%	0:00:00	0:00:00
FCCN AP	13	10:35:56	2:16:24	98.528%	54:34:09	0:48:56
FCCN AP2	2	0:00:16	0:00:00	99.999%	359:59:51	0:00:08
GARR AP	0	0:00:00	0:00:00	100.000%	0:00:00	0:00:00
GARR AP2	2	0:21:50	0:21:39	99.949%	359:49:04	0:10:55
GRNET AP	2	0:01:24	0:00:00	99.997%	359:59:17	0:00:42
GRNET AP2	6	8:16:34	1:34:49	98.851%	118:37:14	1:22:46

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Legend

AP Primary Access Point
AP2 Backup Access Point
LB1 Load Balance Access

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Evaluation of the Process

A lot of work was invested in delivering this solution

- Initially –
  - *1 developer coding for 6 Weeks*
  - *The time of many experts within the company (Engineering and Planning, Systems, NOC, Operations)*
- Now
  - *0.5 FTE of a developer; on-going support*

Evaluation of the Process

- ... A unique result delivering great results for the network
  - A tool that fits our need
  - With a very high level of flexibility and integration
  - A natural way to control the work flow

An important basis for the development of further tools to add to the network management portfolio

Conclusion

- The Dashboard is available for Download

http://downloads.geant.net