

Network Operations at CERN



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15.02.2011

Multi-purpose, multi-vendor network infrastructure
Internet connectivity, Experimental instruments, LCG, Internet Exchange (CIXP)

...Where the web was born

3 distinct multi-ten-gigabit backbones
150+ very high performance routers
3'700+ subnets
2200+ switches (increasing)
50'000 active user devices
80'000 sockets, 5'000 km UTP cable
400+ starpoints
5'000 km of fibers (CERN owned)
150 Gbps of WAN connectivity

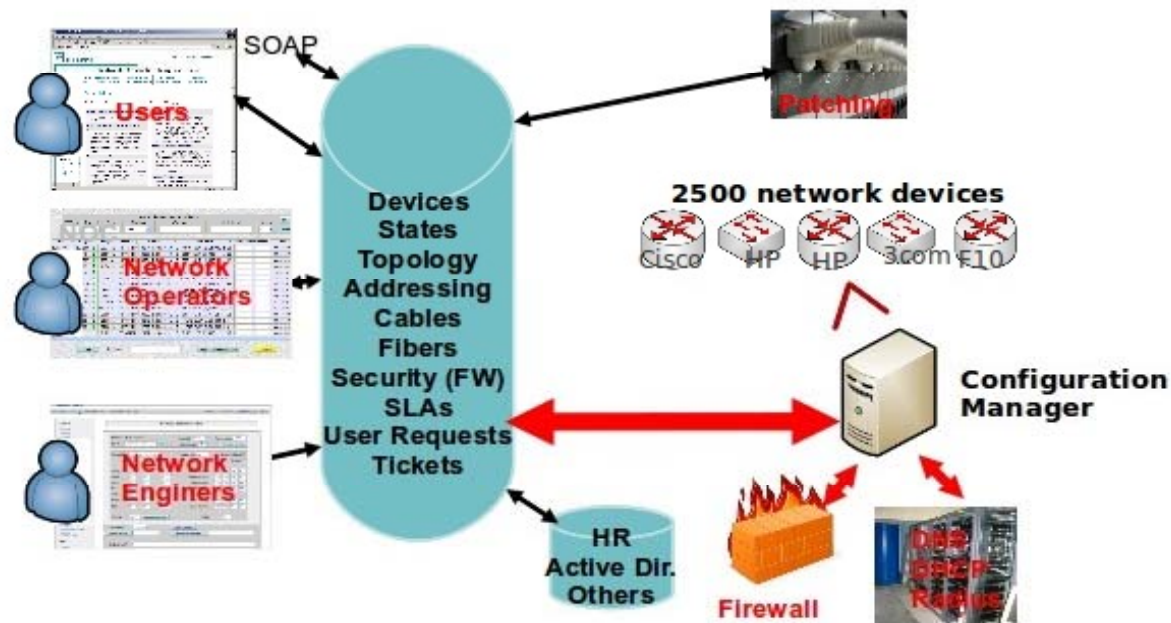


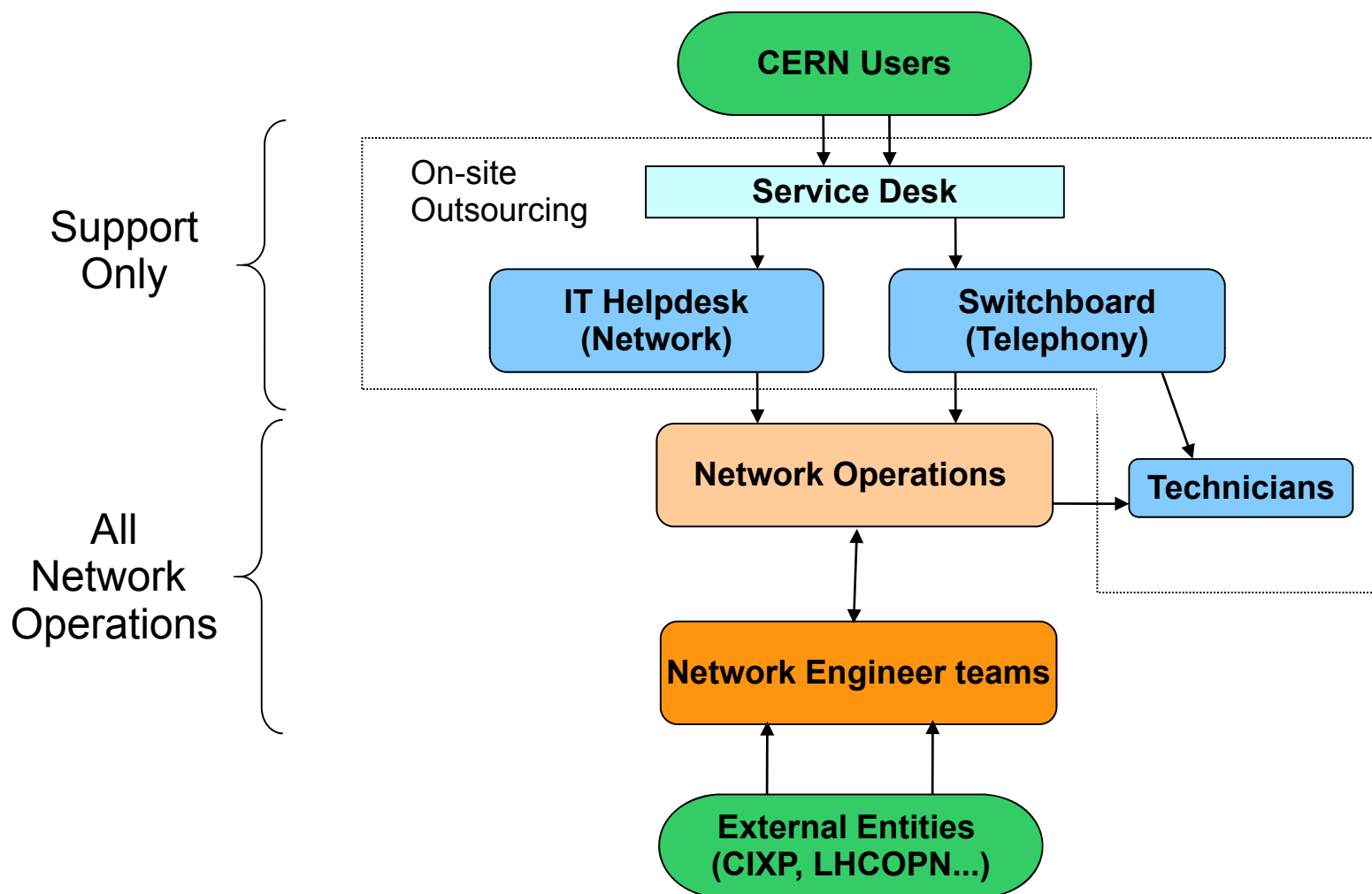
Extremely Dynamic environment → 2x more visitors than staff

1500 connection and change request / month

All centrally managed infrastructure**10+ years of development of our own NMS**

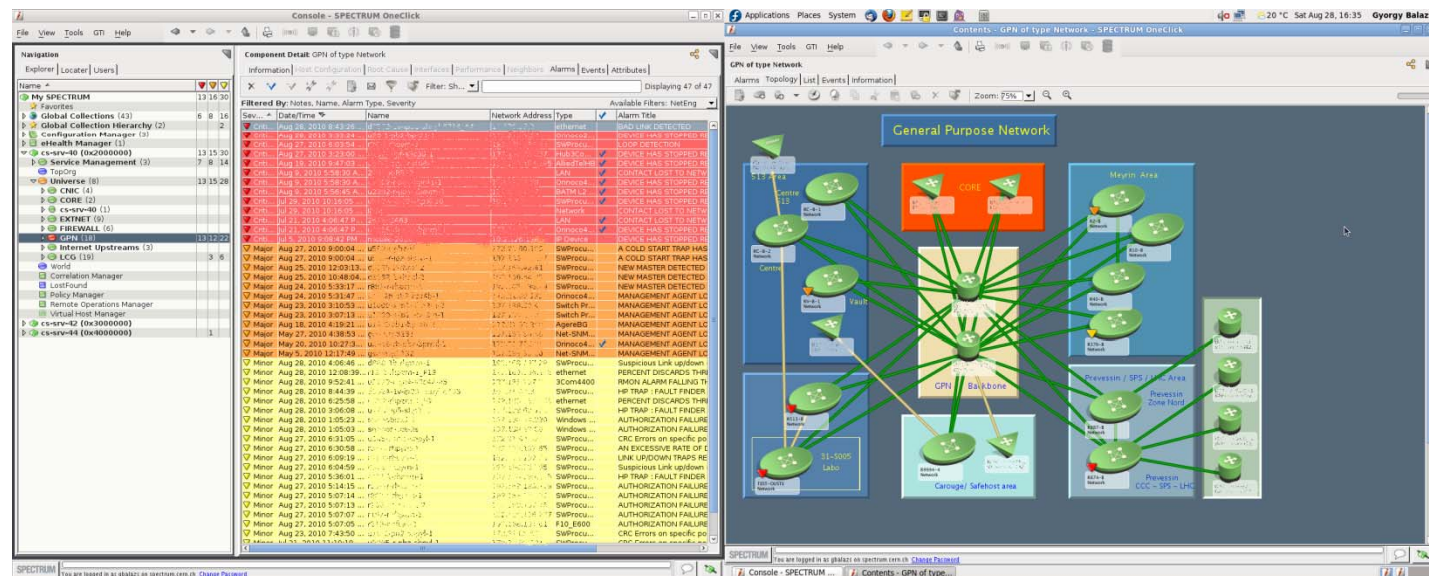
- ~5 software developers
- Extremely high level of automation
- 500'000+ lines of code/150+ DB tables

**This allows for very limited manpower dedicated to operations**



- **Operations**: 3 non-degreed specialists dedicated during office hours
 - Monitoring:
 - LAN, Telecom
 - Support:
 - LAN, Telecom
- **Engineer on duty**: 6 engineers in daily rotation, ~10% load during office hours
 - Monitoring:
 - LAN, WAN, Network services (DNS, DHCP...)
 - (Advanced) Support:
 - LAN, WAN, Network services, External entities
- **1 engineer dedicated to CIXP and Hosting services administration and support**
- **OWH by Computer Centre Operators**
 - Monitoring, triggering urgent interventions

Only commercial tool: **CA Spectrum**



Cricket
(Servers, External network)

Nagios
(Routers, Servers)

SMS
(Servers)

PerfSONAR
(LHCOPN)

+ Homegrown Statistics and Sflow based network behaviour and anomaly detection tools

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Front End

CERN IT
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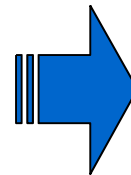
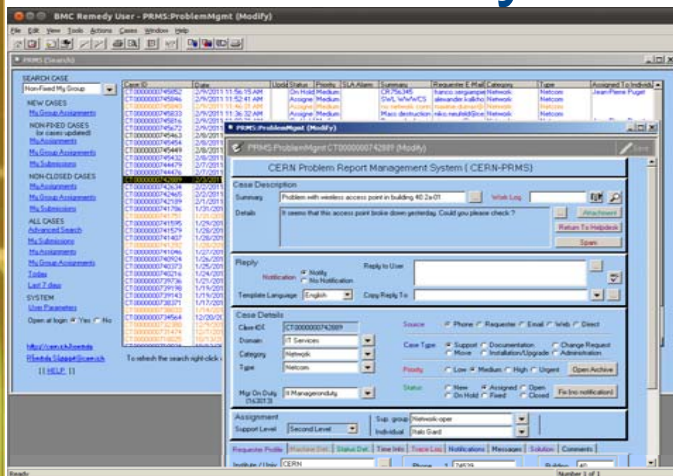
Network Support

Servicedesk → IT Helpdesk → Operations → Engineer teams

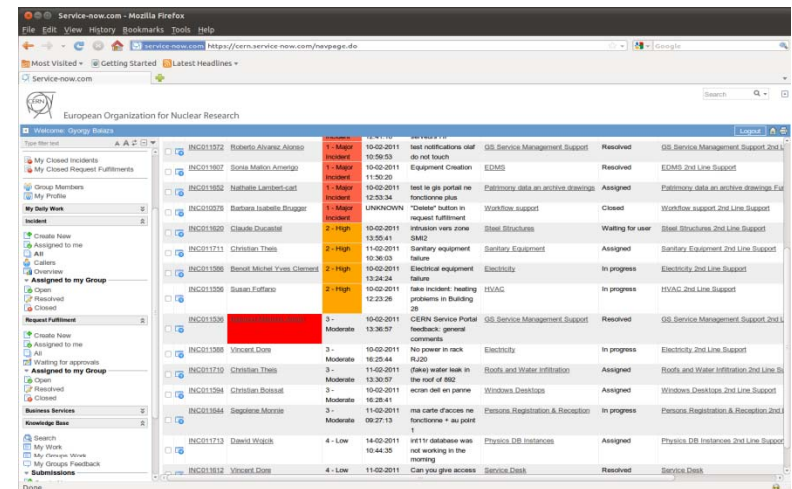
Final stage of ITIL implementation

Done on the organisation level, new ticketing tool

BMC Remedy



Service-Now



Network support tickets resolution ratio

Week (2011)	Total	IT Helpdesk	Operations	Helpdesk Ratio
1	65	36	29	55%
2	67	48	19	72%
3	94	54	40	57%
4	70	31	39	44%
5	106	68	38	64%

<6% of tickets are escalated to the engineering level

Intra-NOC

- Homegrown internal ticketing system, integrated with the NMS
- SLA tracking of the outsourced-contracts included

Inter-NOC

- GGUS for LHCOPN
- E-Mail

CSDB WEB GTI Tickets List

Version 10.5.0 | System opened by GIMBALDI at Fri Feb 11 10:58:50 MET 2011

Tools: SAVANNAH WEBDO MNOIC

ManUTP++

ManUTP++

Search
Device
Output
Print
Work Orders
Watch operations

Admin

ManSIP

GTI

GTI Ticket
GTI Problems List
GTI Tickets List
GTI Tools

Firewall

Fiber

MTP++

NetLive

Power Consumption

BLOCKING_NETOPS

Syslog

Logout

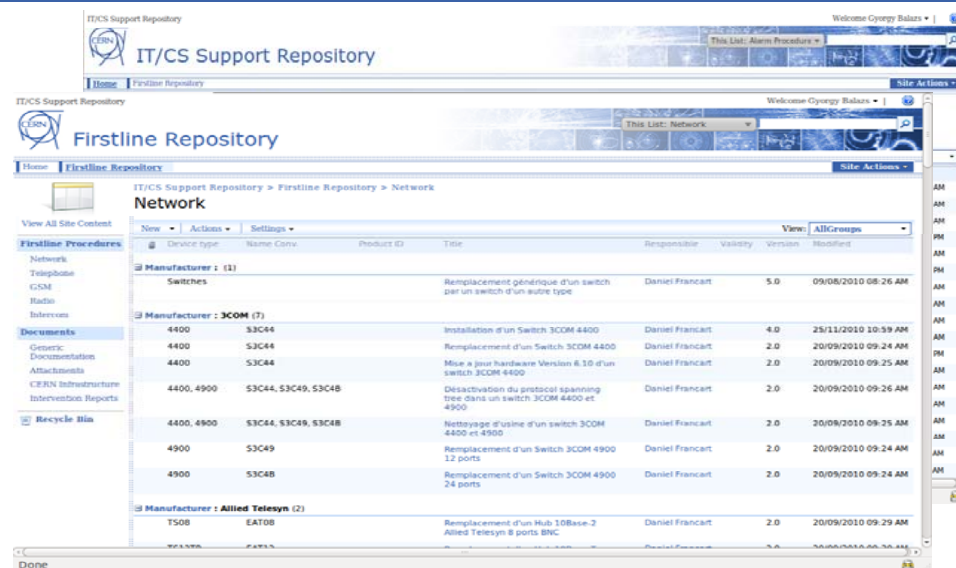
Done

Your teams: First Line, TC firstline, S141 Firstline

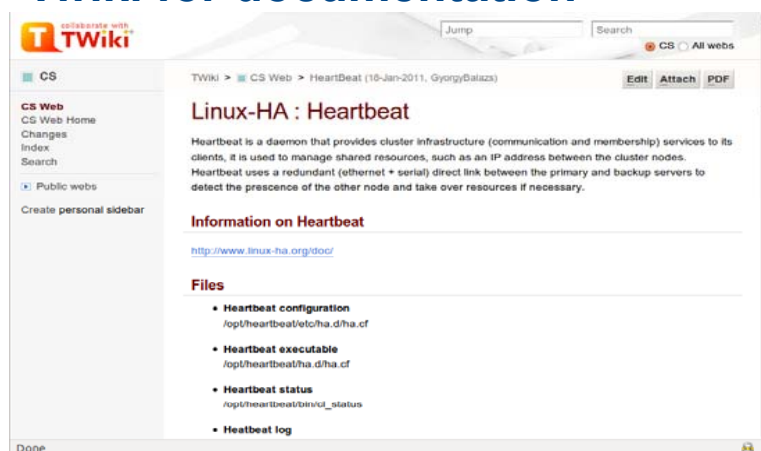
Building	Stepoint	Device	Telephone	Requested By	Assigned To	Category	Subcat	Status	Start Time	Time Left To Start	Time Left To Finish	SLA
P00371	0104	0104.R		Netops	S141	UP	Net	CLOSED	2011-02-11 08:42:43.0	56	96	■
P003671	913V	0013.V		Netops	S141	FI	Net	CLOSED	2011-02-10 15:58:54.0	12	-14	■
P00371				Netops	S141	UP	Net	CLOSED	2011-02-10 14:44:19.0	56	118	■
P004071	2179	2179.R		Netops	S141	FI	Net	DONE OK	2011-02-09 17:23:20.0			
P004071	3294	3294.R		Netops	S141	UP	Net	DONE OK	2011-02-09 15:27:08.0			
P004071	0051	0001.A		Netops	S141	UP	Net	CLOSED	2011-02-09 14:35:02.0	60	108	■
P004071	0867			Netops	S141	FI	Net	DONE OK	2011-02-09 14:22:27.0			
P004071	0867	0867.R		Netops	S141	UP	Net	CLOSED	2011-02-09 14:18:33.0	39	99	■
P004071	0019	0019.2		Netops	S141	UP	Net	DONE	2011-02-09 14:11:54.0			
P004071	0019	0019.2		Netops	S141	UP	Net	DONE	2011-02-09 14:10:53.0			
P004071			72528	Switchboard	S141	UP	Final	CLOSED	2011-02-09 10:09:04.0	39	88	■
P004071	0131			Netops	S141	FI	Net	DONE	2011-02-09 08:36:17.0			
P003971	2639			Netops	S141	UP	Net	DONE OK	2011-02-08 16:28:03.0			
P003671	0378	0378.R		Netops	S141	UP	Net	CLOSED	2011-02-08 13:56:36.0	57	87	■
P00371	0013			Netops	S141	UP	Net	DONE OK	2011-02-08 13:33:58.0			

Sharepoint collaboration workspace sites:

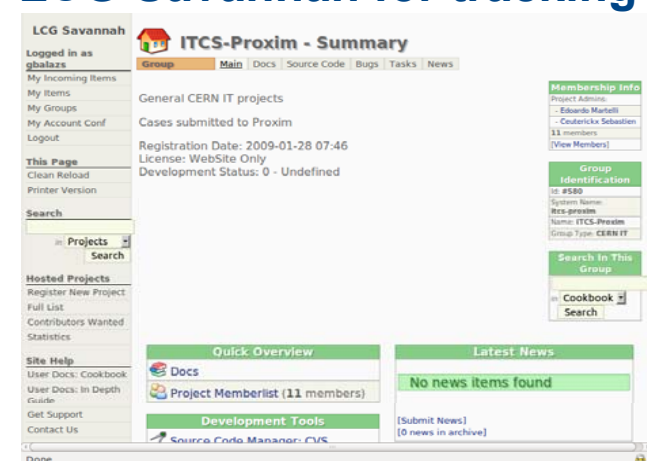
- Repository for support entities: All procedures for Operators, Technicians
- Change management logging



Twiki for documentation



LCG Savannah for tracking





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Thank You!

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Q & A