NAV demo

NORDUNET Operational Forum

Trondheim, April 13, 2010

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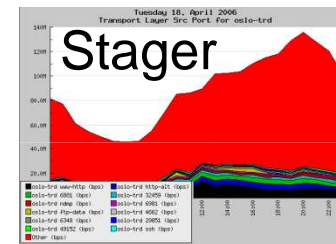
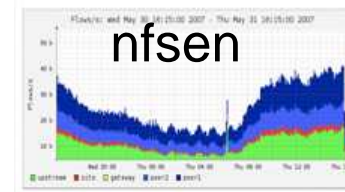# GigaCampus tool boxes
Managing 30 campus networks around Norway

- The tool boxes are servers containing a number of management tools:
  - NAV: Proactive network management
  - nfsen: Netflow traffic analysis
  - Stager: Netflow and Qflow
  - Hobbit: Service monitoring
  - tftp server, syslog server, radius server

- The tool boxes are placed on campus and used by the local IT staff.

- Management, tool enhancements, software upgrades, etc, is done by UNINETT.

- Free training in tool usage is given.

http://metanav.uninett.no

Stager

http://software.uninett.no/stager/

nfsen

http://nfsen.sourceforge.net/

Hobbit

http://hobbitmon.sourceforge.net/

NAV – Network Administration Visualized

- Network management system developed by UNINETT and NTNU since 1999.

Key features
- Inventory information with topology
  - topology autodetected
  - L3, L2, per vlan
- Status monitor with alarm system
  - sms and email alarms
- Client machine tracking
  - based on ARP and bridge table data
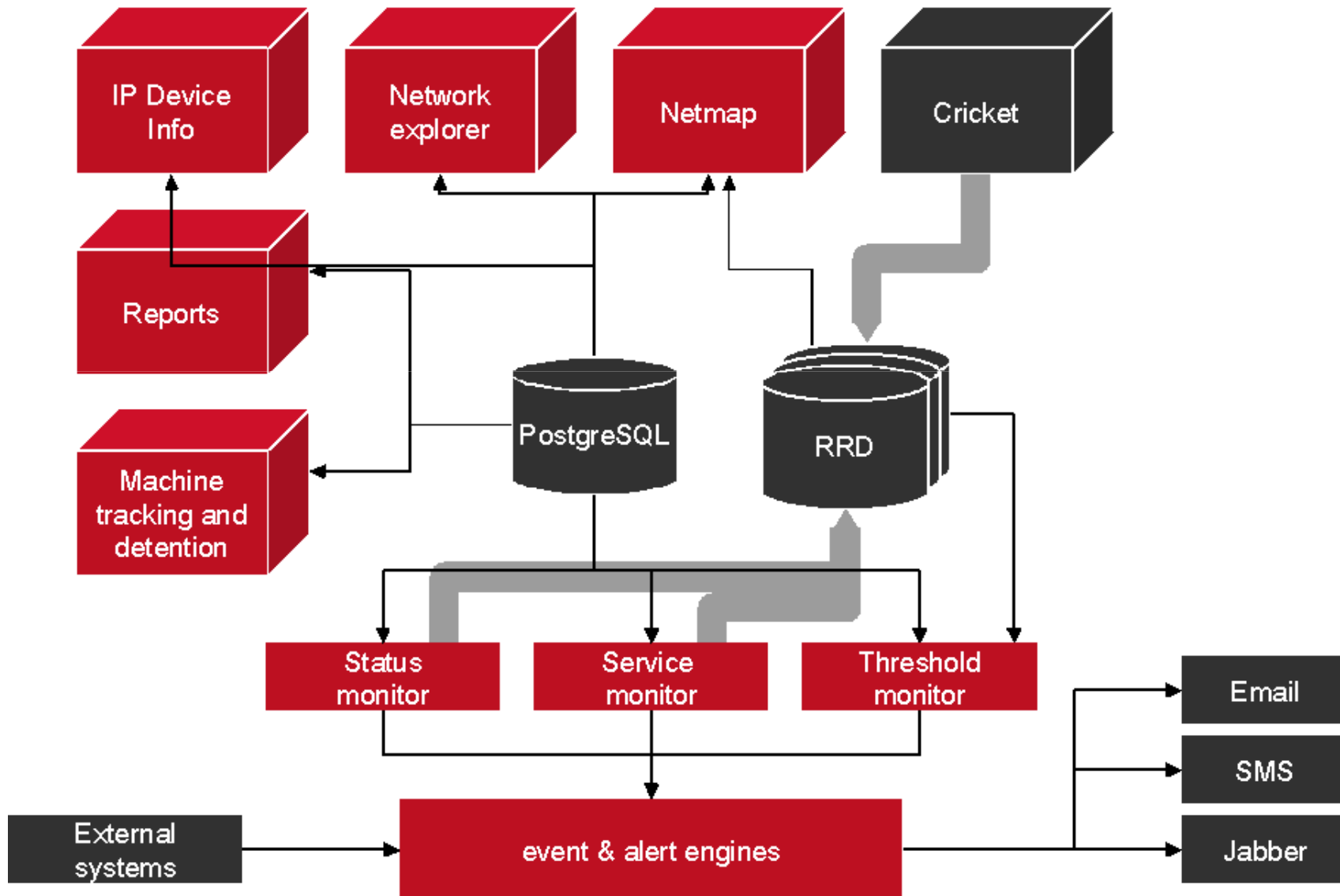- Client machine detention
- Statistics and graphing

Get NAV
- Free software – GPLv2
- Debian package ++
- Virtual appliance available
  http://metanav.uninett.no/navappliance

http://metanav.uninett.no
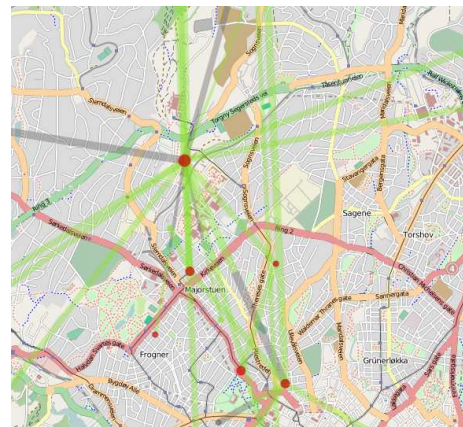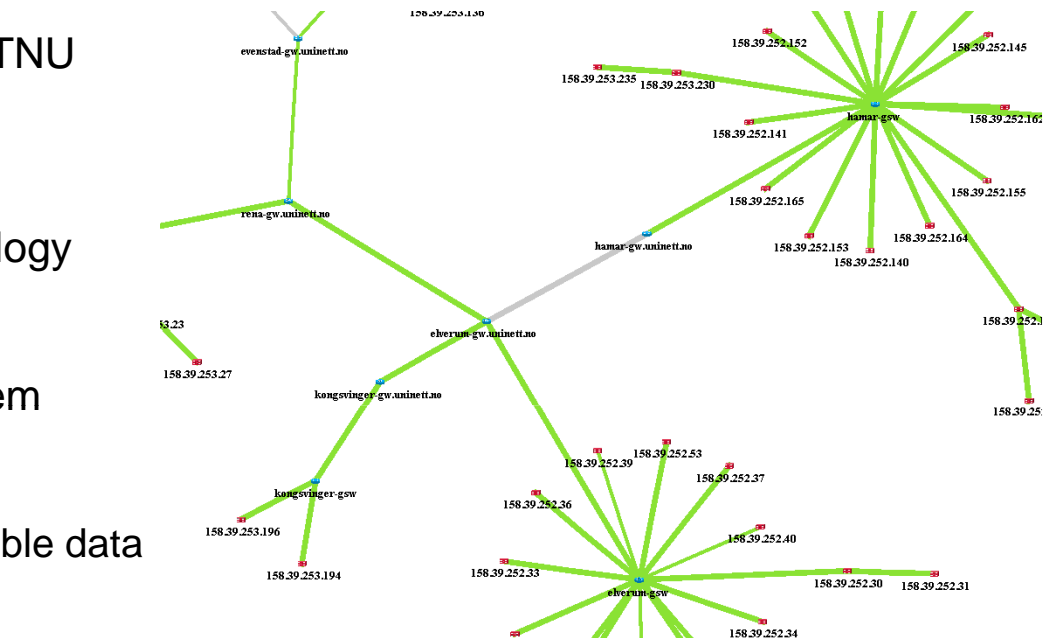
NAV users

- An estimated 35 universities and university colleges in Norway use NAV (nearly all)
  - ◆ 30 of these local installations operated centrally by UNINETT
- Reported usage from universities and businesses in Italy, Romania, Russia, Switzerland, UK, USA and Denmark
- 188 subscribers to the nav-users mailing list

- Show:
  - ◆ http://metanav.uninett.no
  - ◆ https://launchpad.net/nav/

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NAV overview

IP Device Info

Network explorer

Netmap

Cricket

Reports

Machine tracking and detention

PostgreSQL

RRD

Status monitor

Service monitor

Threshold monitor

Email

SMS

Jabber

External systems

event & alert engines

Start monitoring

Add IP device

IP or hostname *	Category *
158.38.62.182	SRV (Server)
RO community	Room *
public	teknobyen (Tr
RW community	Organisation *
no:scpublic	uninett (UNIN

Add IP device | Cancel

getDeviceData → PostgreSQL
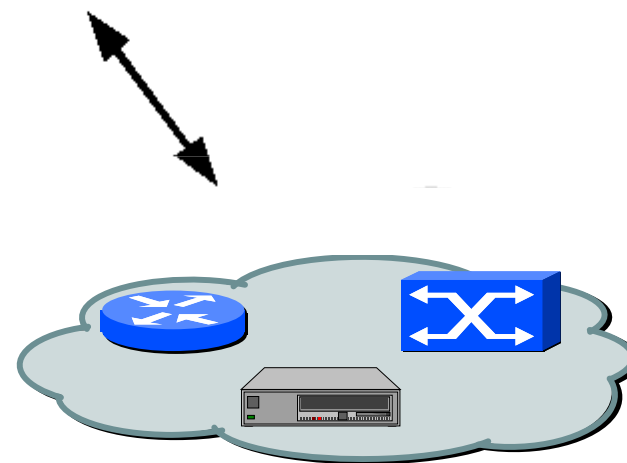
- No *device* autodiscorery
- "Seed" the database
- Inventory and topology autodiscovery

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getDeviceData

- Plugin based SNMP collector
- Data is collected from devices in parallel, using threads
- Collects full inventory every 6 hours, by default
  - Modules
  - Serial numbers
  - Softeware version
  - Interfaces with attributes
  - IP addresses and prefixes
    - IPv4 and IPv6
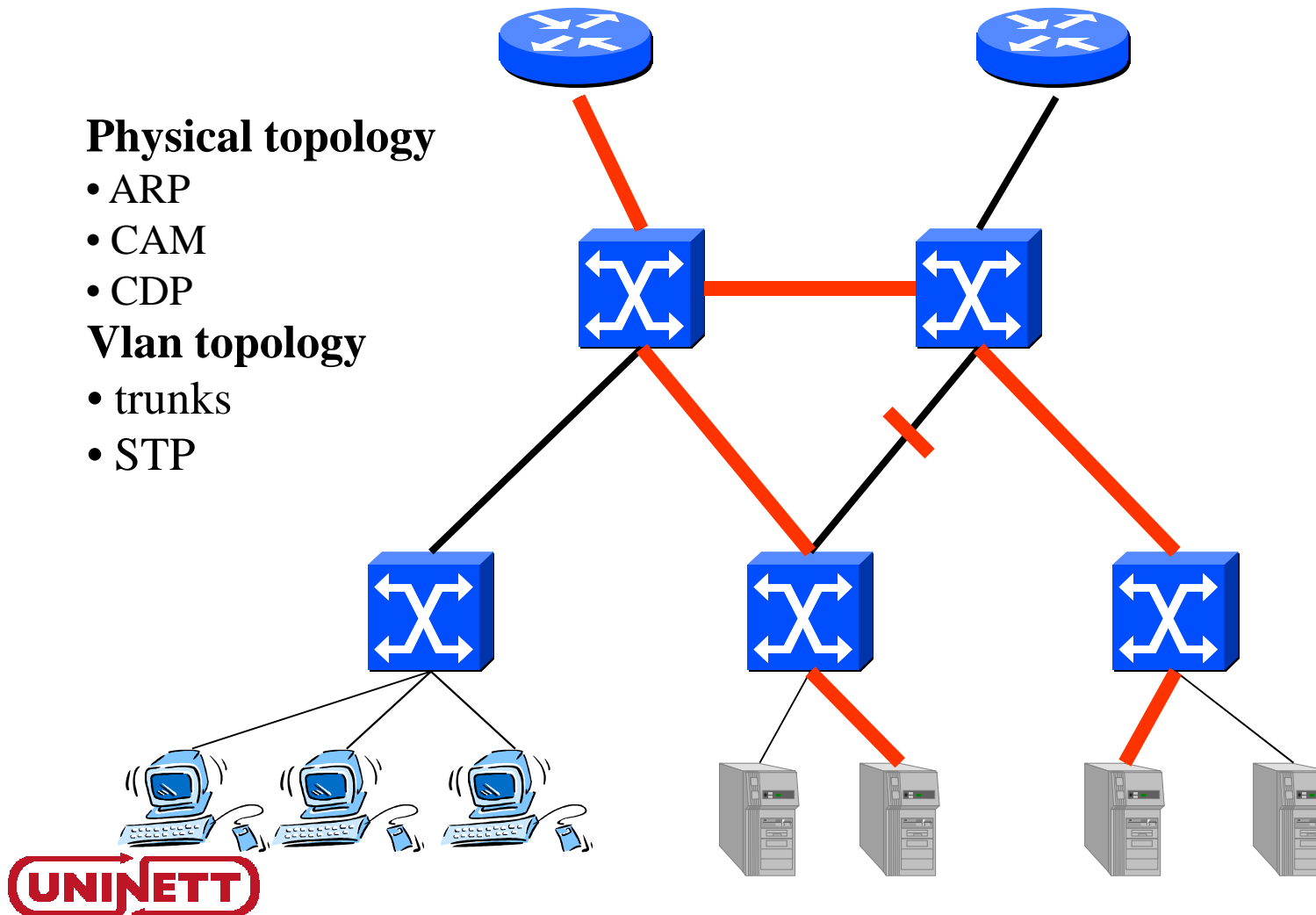- Module monitor plugin is invoked every hour, by default

Autodetecting the topology

Physical topology
- ARP
- CAM
- CDP

Vlan topology
- trunks
- STP

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Withholding alerts

- Shadow
  - ◆ Uses topology to see that a device is unreachable because of another device being down

- Scheduled maintenance
  - ◆ Purposely withhold alerts from devices on scheduled maintenance

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Demo

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Implementation

- Began as hodge-podge mix of scripts

- First use Perl and PHP

- Add some Java

- Then some more Java

- Then throw in Python for good measure

- What a mess!?

Development model

- Many summer interns (students)
- More than 30 people involved over a span of 10 years of development
  - ◆ Always a new "favorite" programming language
- Turnaround is a problem for code maintenance

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Integration and cleanup

- Since 2003, new programming languages were forbidden

- Code cleanup, rewrites and encouraging API building

- Reducing number of languages
  - PHP is out
  - Perl is almost out (1 program left)
  - Java accounts for nearly 50%, but is very slowly on its way out

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Active developers

- UNINETT
  - 1 full-time employee (me)
  - 4 part-time students
- NTNU
  - 1 person, 25% of the time
- University of Tromsø
  - 2 people, ad-hoc
- University of Oslo
  - Packaging for Debian GNU/Linux

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Development tools

- Launchpad
  - ◆ Bug and specification tracking
- Mercurial
  - ◆ Distributed version control
- Emacs, Vim, Eclipse, etc.
- Sympa
  - ◆ Mailing list software
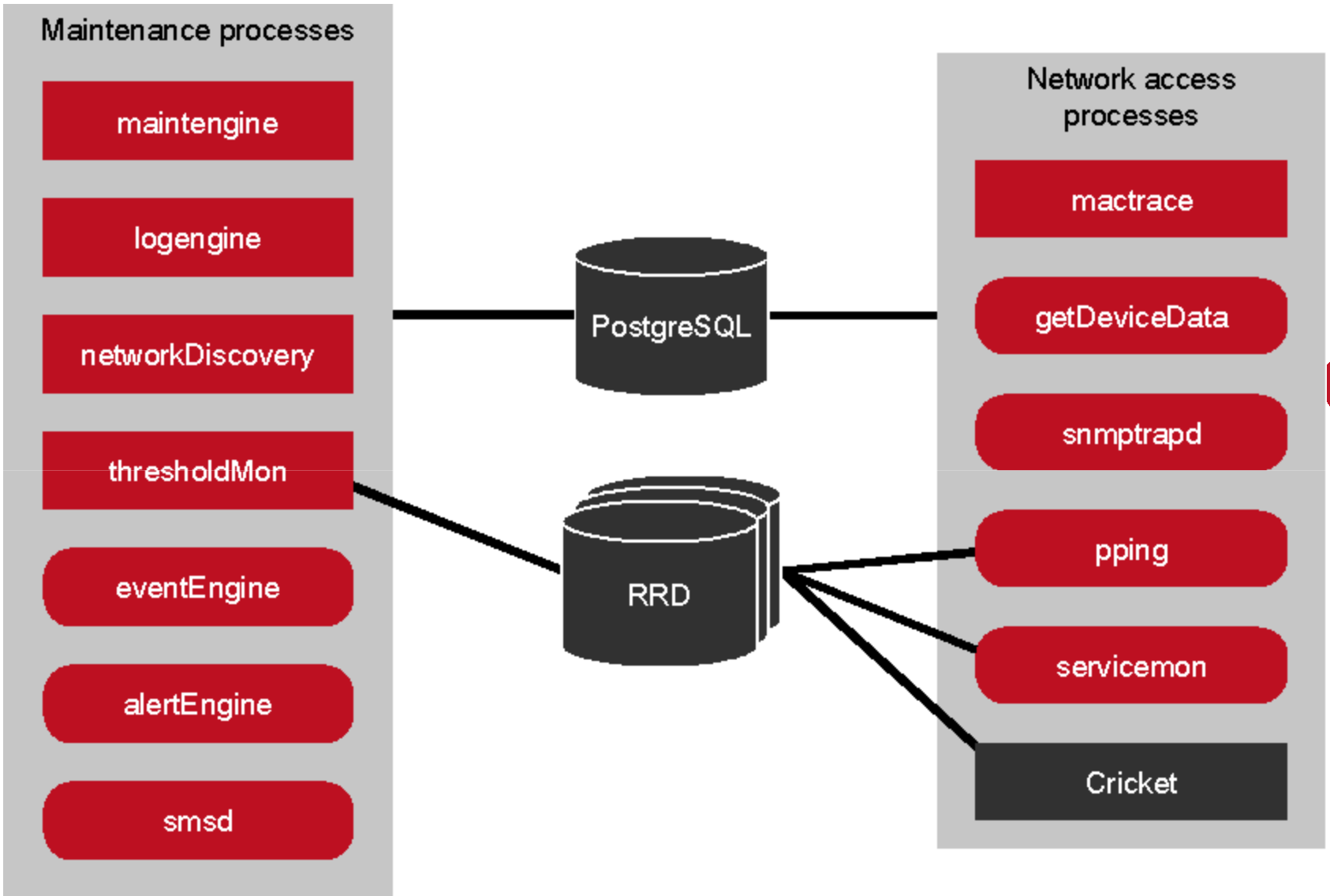- Dokuwiki
  - ◆ Wiki-based web site

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Future plans

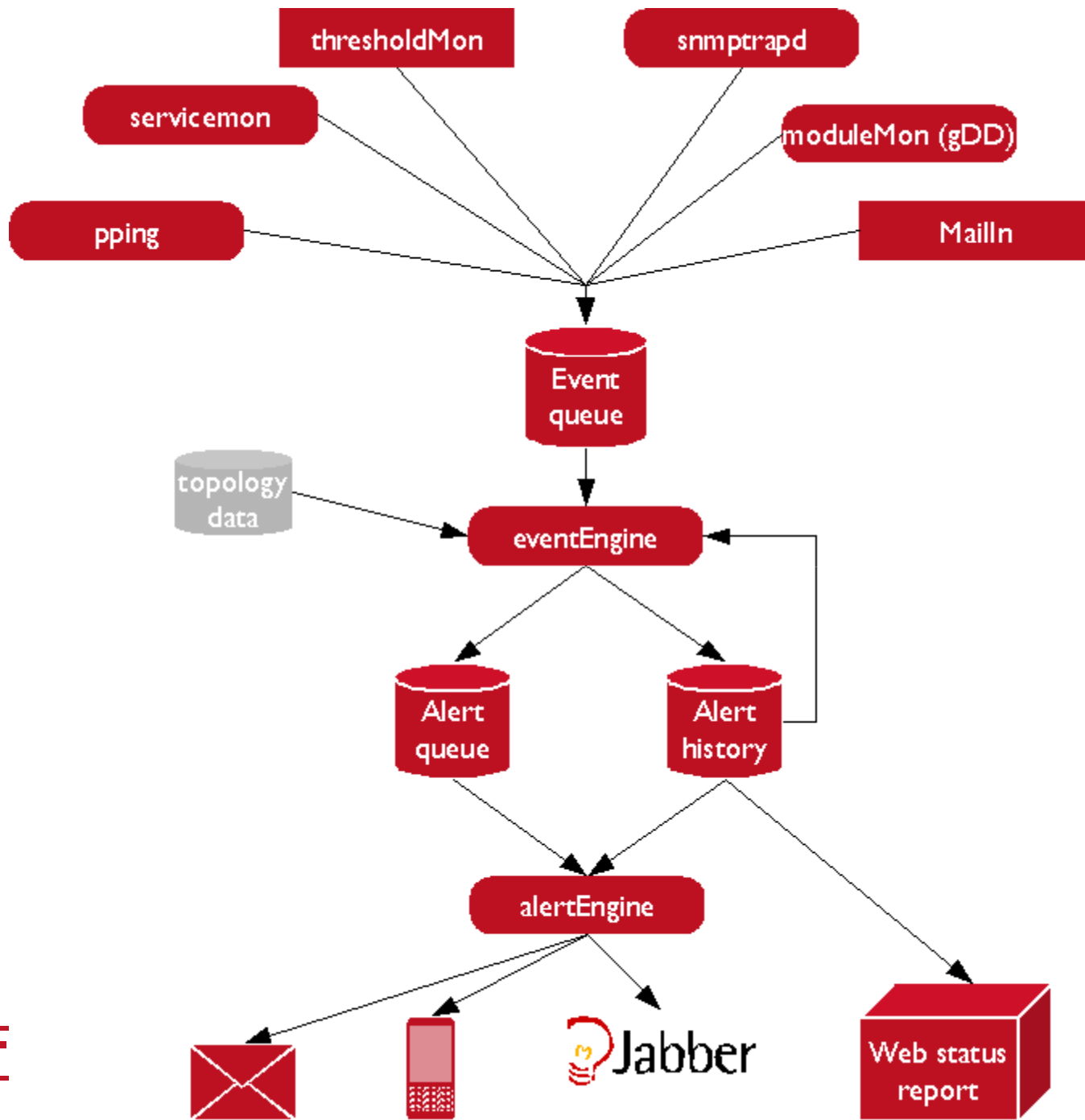- Currently working on next-generation collection framework

- Working on improved environment and UPS monitoring

- LLDP support for topology

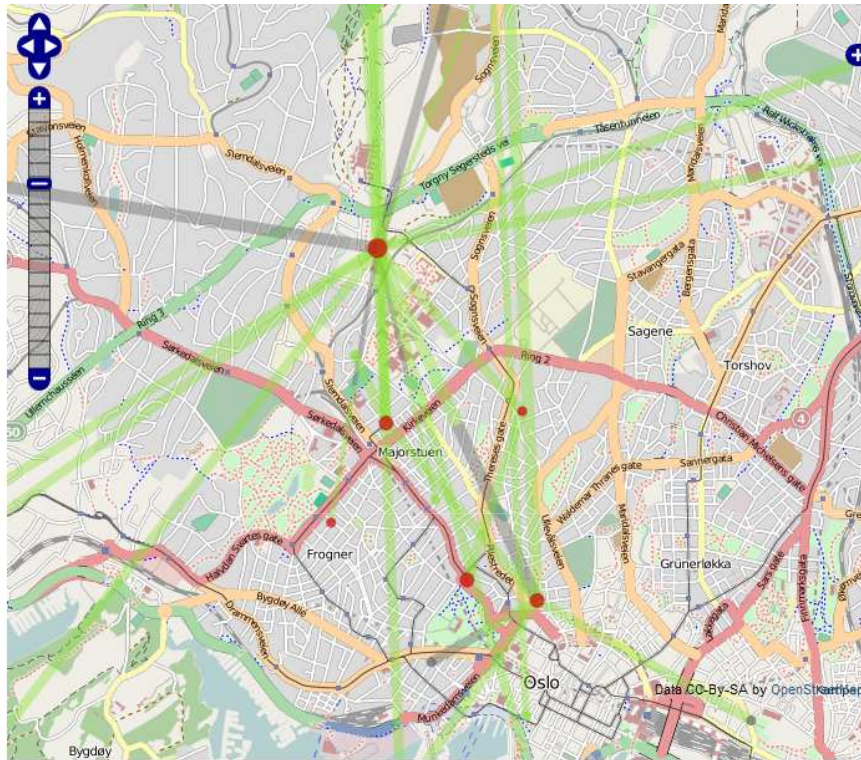- Integrate Geomap
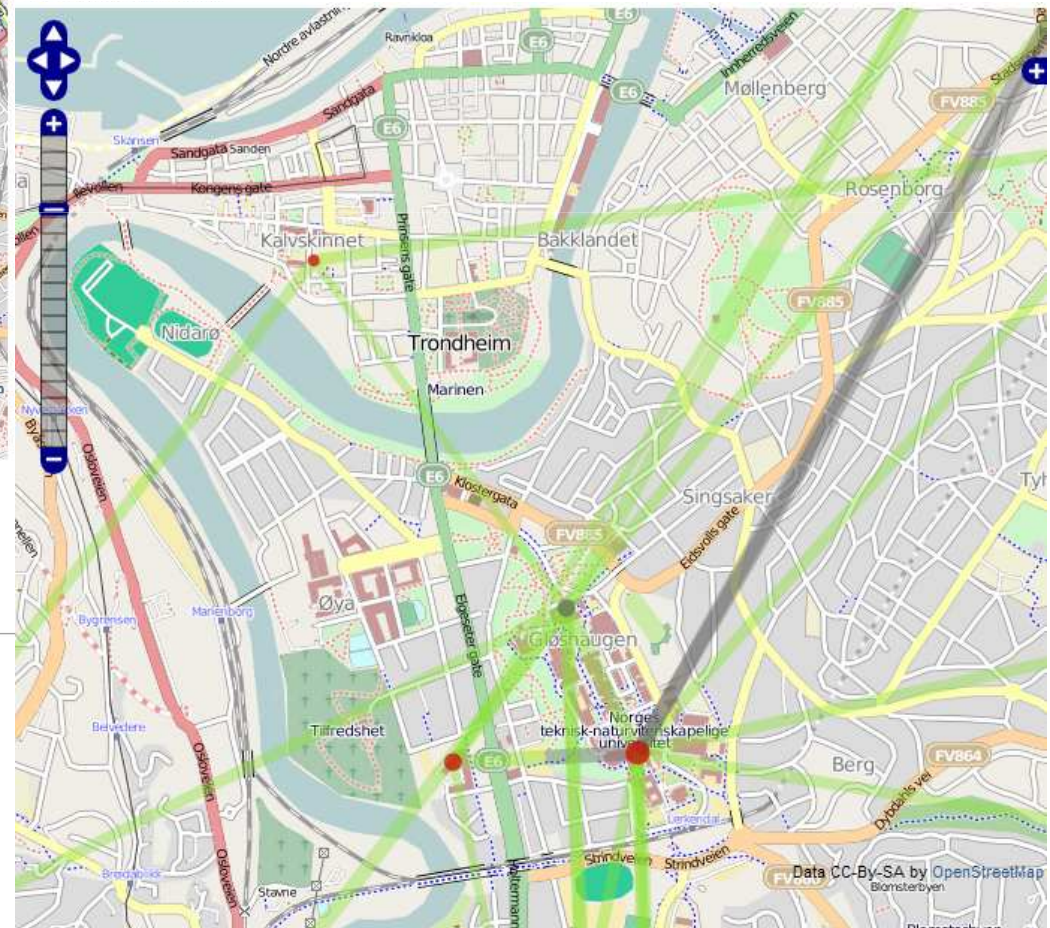
- SNMPv3 and/or Netconf

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Left overs

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thresholdMon

snmptrapd

servicemon

moduleMon (gDD)

pping

MailIn

Event queue

topology data

eventEngine

Alert queue

Alert history

alertEngine

Jabber

Web status report

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Weathermap in NAV using OpenStreetMap

http://metanav.uninett.no/   http://www.openstreetmap.org/

Trondheim

Oslo

2009-10-15 15:25–15:30

Interval size: 5 minutes

<<	<	Oct 2009		>	>>
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

CPU load:		# netboxes:		Link load:		Link capacity:	
	No statistics	·	1		No statistics		<= 2 Mbit/s
	0--0.5	▪	2--10		0--30 %		<= 155 Mbit/s
	0.5--1	▪	11--20		30--60 %		<= 2.5 Gbit/s
	> 1	▪	> 20		60--90 %		> 2.5 Gbit/s
					90--100 %		

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Measurement beacons
29 in operation, 12 more coming

Planlagte
- Harstad
- Nesna
- Levanger
- Kalvskinnet (Hist)
- Førde
- Haugesund
- Drammen
- Hønefoss
- Hamar
- Elverum
- Fredrikstad

Målepåler i drift

Ny Ålesund	Stord
Longyearbyen	Stavanger
Alta	Kristiansand
Tromsø	Grimstad
Narvik	Porsgrunn
Steinkjer	Bø
Trondheim	Notodden
Molde	Kongsberg
Ålesund	Rena
Volda	Halden
Sogndal	Oslo
Bergen	

Research network

Campus network

Packet Capturing Card

Server

Router

Measuring beacon

Router

- Throughput
- Packet delay and loss
- Multicast connectivity
- IPv6 flows
- Session intensity
- Available capacity
- Traffic behaviour

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Measurement beacons
29 in operation, 12 more coming

- End user speed tests with Network Diagnostic Tool (NDT)
- Verifies multicast connectivity
- Measures one way delay, loss and jitter
- Requires GPS time synchronization for optimal results (μsec level)

UNINETT IPv4 Multicast Beacon

Current server time is Wed Apr 19 16:30:15 2006 (Past stats, History)

Current stats for 228.26.17.81/10000

View [?] (Hide Source Info, Full, ASM, SSM, Both, SSM or ASM): TTL (hop count) Loss (percentage) Delay (ms) Jitter (ms)

↓ Sources \ Recipients →	1	2	3	4	5	6	7	8	9	10	11	12	13
grimstad-mp.hia.no 1		4.3	14.6	2.6	5.8	7.6	7.7	8.7	8.6	16.1	16.7	23.5	23.8
bergen-mp.uib.no 2	4.4		13.2	2.1	5.6	6.2	6.5	4.5	7.2	15.0	15.4	22.2	22.6
tromso-mp.uit.no 3	14.7	13.2		15.0	13.3	7.2	7.3	11.4	8.1	2.2	2.4	9.3	9.8
stavanger-mp.uis.no 4	2.5	1.8	14.8		6.9	7.8	8.1	6.1	8.8	16.3	16.9	23.6	24.2
rena-mp.hihm.no 5	5.2	4.5	12.4	6.6		5.5	6.0	8.8	6.6	14.4	14.6	21.1	21.6
trd-mp.uninett.no 6	7.3	6.2	7.0	8.1	6.3		0.3	4.3	1.1	9.0	9.2	16.1	16.4
mi6.uninett.no 7	7.5	6.3	7.3	8.1	6.3	0.3		4.4	0.8	9.8	9.3	16.3	16.5
molde-mp.himolde.no 8	9.0	4.5	11.4	6.4	9.9	4.5	4.8		5.5	12.9	13.7	20.4	20.9
storhaugen.uninett.no 9	7.8	6.1	7.2	7.9	6.2	0.2	0.1	4.4		9.6	9.4	16.1	16.5
alta-mp.hifm.no 10	16.3	14.9	2.2	16.9	15.0	9.1	9.3	13.2	10.0		4.3	11.0	11.5
narvik-mp.hin.no 11	17.2	15.6	2.7	17.5	15.7	9.5	9.7	13.8	10.6	4.7		8.4	8.8
svalbard-mp.unis.no 12	23.4	22.1	9.2	24.0	22.3	16.1	16.2	20.4	17.0	10.9	8.2		0.5
nyalesund-mp.uninett.no 13	24.3	22.8	9.9	24.6	22.9	16.8	17.1	21.0	17.8	11.9	8.7	0.5	

Matrix cell colors: Full connectivity (ASM and SSM) X ASM only X SSM only X Loss > 15% X Loss > 45% X

- Passive monitoring cards
  - Moniters traffic in/out of campus
  - Traffic quality
  - Security

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MPING

- Round trip measurements

Round-trip time for malepale
Data from March 2006 - Probes per interval: 50 - Interval per hour: 6

« ‹ › [Available statistics: ▾] [Other: ▾] [Language: ▾]

Machine name (Route)	Round-trip time (ms)			Round-trip time distribution (%)				Packet loss (%)	
	Median	Max	Std dev	<25 ms	<50 ms	<100 ms	<200 ms	Avg	Max
alta-mp.hifm.no	17.17	29.50	3.36	100.0	100.0	100.0	100.0	0.7	10.8
www.uninett.no	0.10	0.30	0.14	100.0	100.0	100.0	100.0	0.0	0.0
grimstad-mp.hia.no	15.28	28.20	4.69	100.0	100.0	100.0	100.0	0.0	0.0
molde-mp.himolde.no	9.72	11.70	0.39	100.0	100.0	100.0	100.0	0.0	0.3
stavanger-mp.uis.no	16.04	16.70	0.39	100.0	100.0	100.0	100.0	0.0	0.2
bergen-mp.uib.no	12.74	13.80	0.20	100.0	100.0	100.0	100.0	0.0	0.2
tromso-mp.uit.no	14.47	15.10	0.36	100.0	100.0	100.0	100.0	0.0	0.1
porsgrunn-mp.hit.no	11.82	13.20	0.62	100.0	100.0	100.0	100.0	0.0	0.5
narvik-mp.hin.no	18.78	59.20	7.42	100.0	100.0	100.0	100.0	0.0	0.2
notodden-mp.hit.no	11.47	12.80	0.70	100.0	100.0	100.0	100.0	0.0	0.1
localhost	0.10	0.10	0.07	100.0	100.0	100.0	100.0	0.0	0.0
rena-mp.hihm.no	7.10	7.90	0.26	100.0	100.0	100.0	100.0	0.0	0.3
bo-mp.hit.no	11.09	12.40	0.84	100.0	100.0	100.0	100.0	0.0	0.1

```
TCP/Web100 Network Diagnostic Tool v5.3.3e
click START to begin
Checking for Middleboxes . . . . . . . . . . . . . . . . . Done
running 10s outbound test (client to server) . . . . . 3.20Mb/s
running 10s inbound test (server to client) . . . . . . 3.94Mb/s
The slowest link in the end-to-end path is a 45 Mbps T3/DS3 subnet
Information: The receive buffer should be 195.22 Kbytes to maximize throughput

click START to re-test
```
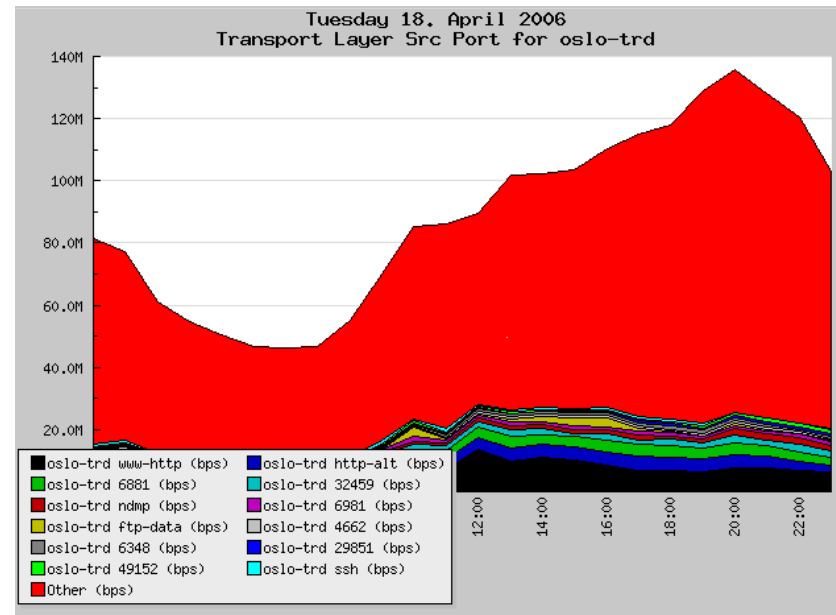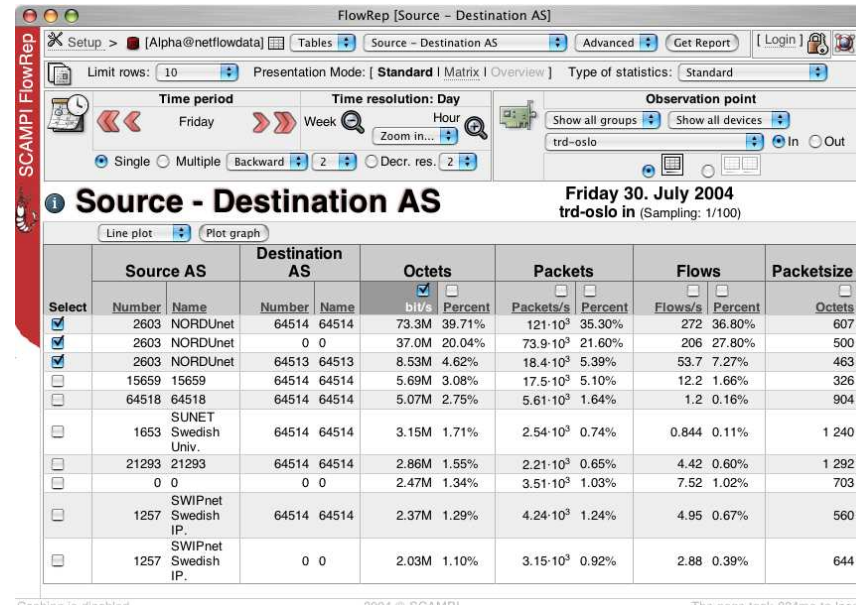
NDT

- End-user speed test

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Stager

- Developed at UNINETT since 2002.
- Generic tool for storage, aggregation and presentation of network statistics
  - Netflow analysis
  - Round trip and packet loss
  - Generic SNMP data gathering
  - Qflow analysis
- Stores data in a postgreSQL database
- High performance
  - Netflow database > 1TB in size at UNINETT…

http://software.uninett.no/stager/

The service monitor Hobbit

- Agent on servers that reports on the "local" status
- Monitors CPU load, disk usage, memory, processes running and whatever you script ☺
- Servers are organized in groups. Alarms are showed on a per group basis.
- Drill down to details of when an alarm occured and reported reason

http://hobbitmon.sourceforge.net/