



## TF-NOC flash presentation

# ARNES

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# Network Infrastructure - Backbone

- Optical backbone
  - leased dark fibre
  - 53 PoPs in 30 towns
- L3 equipment (IPv4/IPv6)
  - Cisco
  - Juniper
- Optical transport
  - active DWDM: Adva
  - passive CWDM



# Network Infrastructure - Backbone



# Network Infrastructure - Access

- 1300 customer's LANs with L3 connections
  - Cisco routers
  - uplinks hired by customers
- Technology
  - dark or lit fiber to PoPs
  - VPN over FTTH, xDSL and CATV, via service provider's networks to main PoP in Ljubljana



# Network Services

- L3 connectivity (IPv4, IPv6)
  - QoS and IP SLA
  - IP filtering (Access Control Lists - ACL)
- Point-to-Point circuits
  - L2
    - MPLS pseudo wire
    - EPL (Ethernet Private Line)
  - L1
    - DWDM/CWDM lambdas



# Management/Monitoring tools

- Cacti – graphing
- Smokeping – active monitoring
- Icinga – passive monitoring
- Syslog – passive monitoring
- Rancid – configuration repository
- NDT, iperf – on-demand active monitoring
- in-house scripts:
  - routing control
  - multiple equal path detection
  - default route monitoring
- Observium – passive monitoring, in test phase



# NOC structure

- Three level NOC
  - 1<sup>st</sup> level – helpdesk
  - 2<sup>nd</sup> level – network consultants
  - 3<sup>rd</sup> level – backbone experts
- non dedicated personnel
  - NOC hats are on when needed



# NOC structure - Backbone NOC

- One expert available 24/7
- 3<sup>rd</sup> level support mainly for backbone and big customers (Uni-LJ, Uni-MB, IJS, GOV)
- Expertise:
  - intra and inter domain IP routing
  - switching
  - MPLS
  - optical transmission systems
  - QoS
  - performance issues (PERT)



# NOC structure – Access NOC

- 1<sup>st</sup> level NOC – helpdesk
  - 5 operators – weekdays 8:00 – 20:00
- 2<sup>nd</sup> level NOC
  - 3 operators – weekdays 8:00 – 16:00
- Expertise:
  - intra-domain IP routing
  - switching
  - IPsec VPN
  - access technologies
    - xDSL, cable, FTTH, wireless



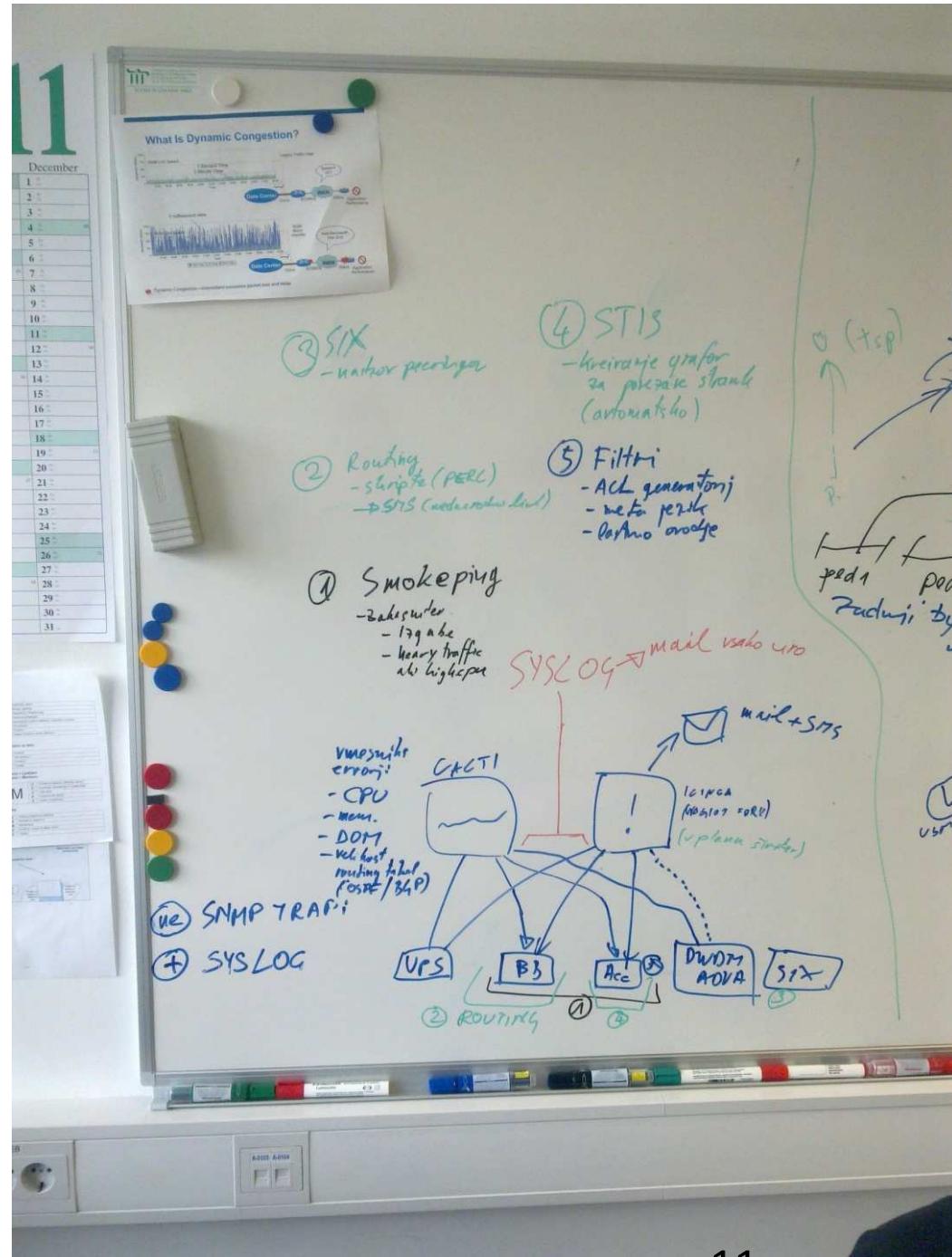
# NOC structure – Joint activities

- PERT
  - Performance Enhancement and Response Team
- Backbone and Access NOC involved in:
  - operational procedures
  - net-admin procedures
  - maintenance
  - provisioning



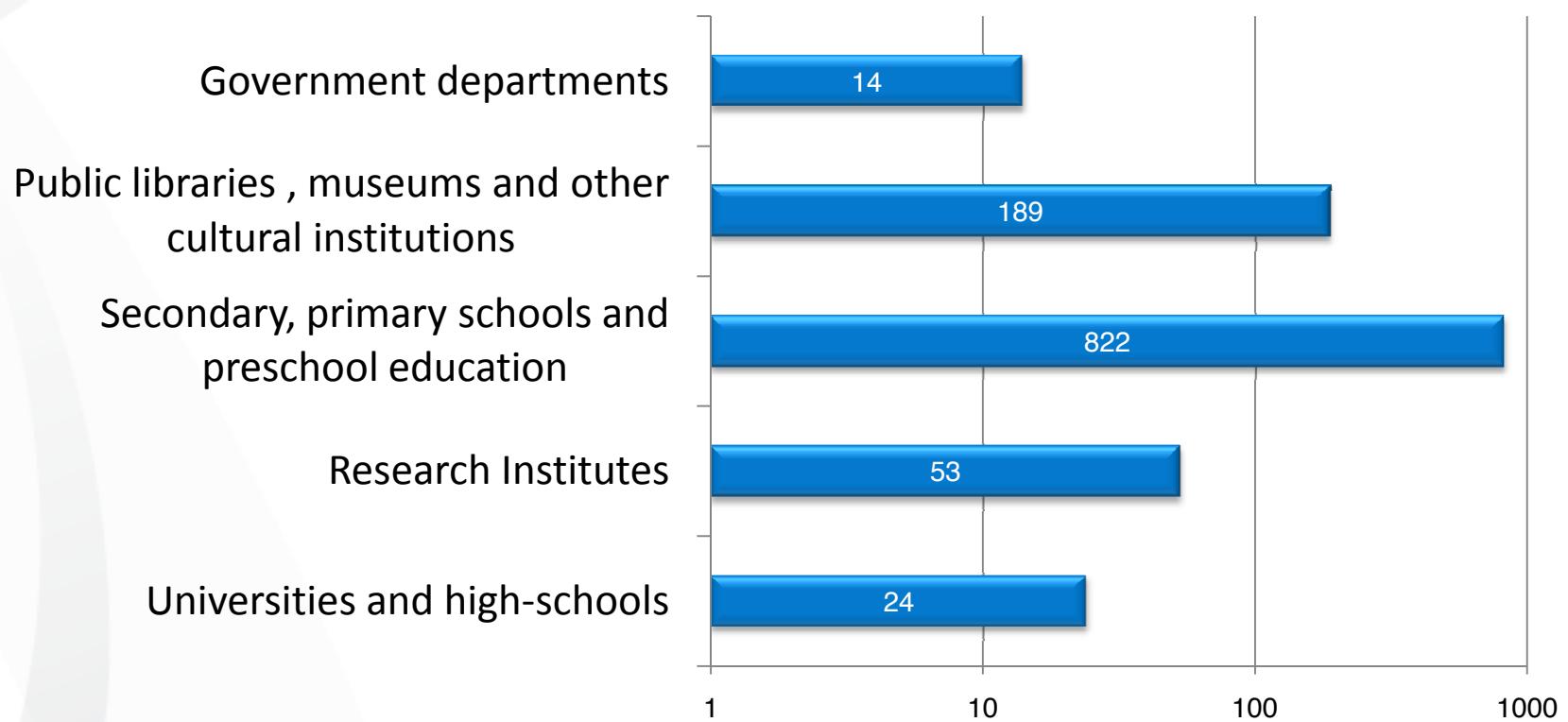
# NOC tools

- All the monitoring tools
- Vi
- Big question:
  - tool integration
- Goal:
  - creating a common network information base and API for management and monitoring applications



# Front End – Users

**Number of connected customers – log scale**



- estimated 200.000 end users



# Front End – SLAs and agreements

- No SLA agreements
  - monitoring IP SLA parameters on some links
- We are very much interested in what is the role of other NOCs between access providers and organizations in term of SLA



# Front End – Communication

- Communication:
  - e-mail
  - phone
- Keeping track:
  - Trouble Ticket – proprietary tool
  - OTRS
- Question:
  - skilled contact person on customer's side?
  - education, workshops?



# Inter-NOC Communication

- Inside
  - OTRS, email, IM chat, phone
  - shouting to the nearest colleague ☺
- Outside
  - email, phone
- Inter-NOC
  - email, OTRS



# Documentation – What, Tools

- Network documentation
  - organization's data (address, contacts, equipment, network information)
  - equipment configuration files
  - access provider's contact information
- Tools:
  - Proprietary information system (ARIS)
  - Wiki



# Documentation – Best practice

- Mostly checklists
  - some were done for transfer of activities to 1<sup>st</sup> level support helpdesk
- Bunch of documents, but not structured (yet!).
- Short answer
  - Not enough
  - Difficult to keep up-to-date



# NREN – NOC questions

- How to integrate NOC into an NREN?
- Dilemma
  - designated operators for NOC or not?

