CSC

ICT Solutions for Brilliant Minds

SIG-NOC: About FUNET

Juha Suhonen / 7.5.2024

CSC – IT Center for Science

CSC – IT Center for Science is a non-profit company, owned by the state of Finland and Finnish higher education institutions

CSC has 693 employees

We provide high-quality ICT services to our customers

CSC has one of the world's most eco-efficient data center environments located in Kajaani, Finland

"But first, let me tell you a bit about CSC"

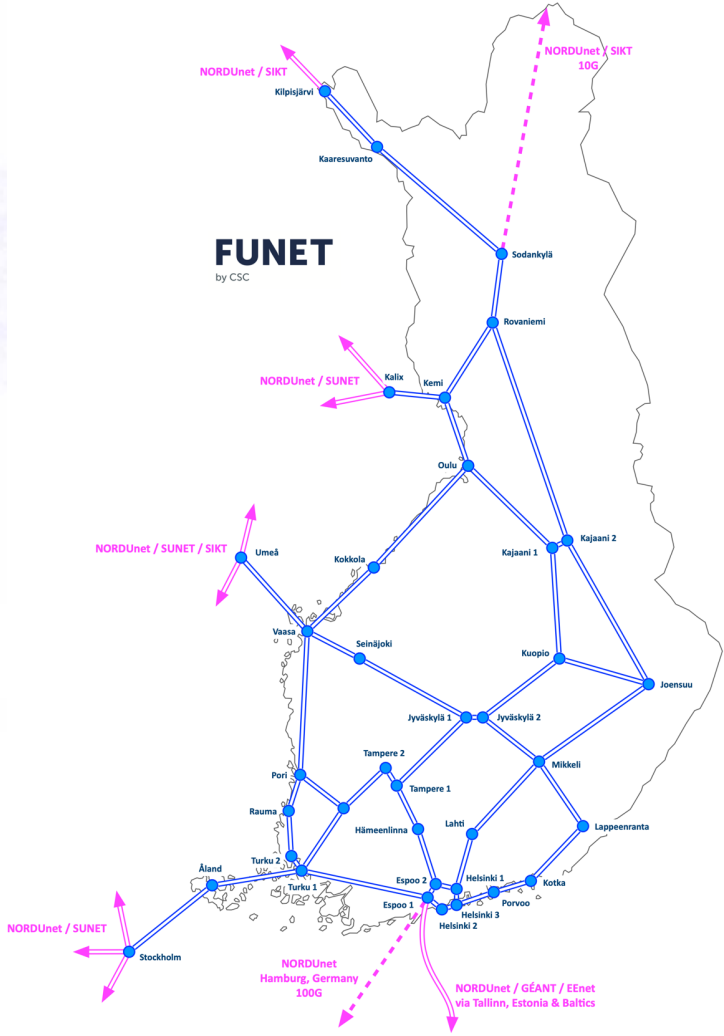
CSC operates FUNET:

Finnish University and Research Network

FUNET's 40th anniversary and 35 years of Finnish Internet connectivity were celebrated in 2023

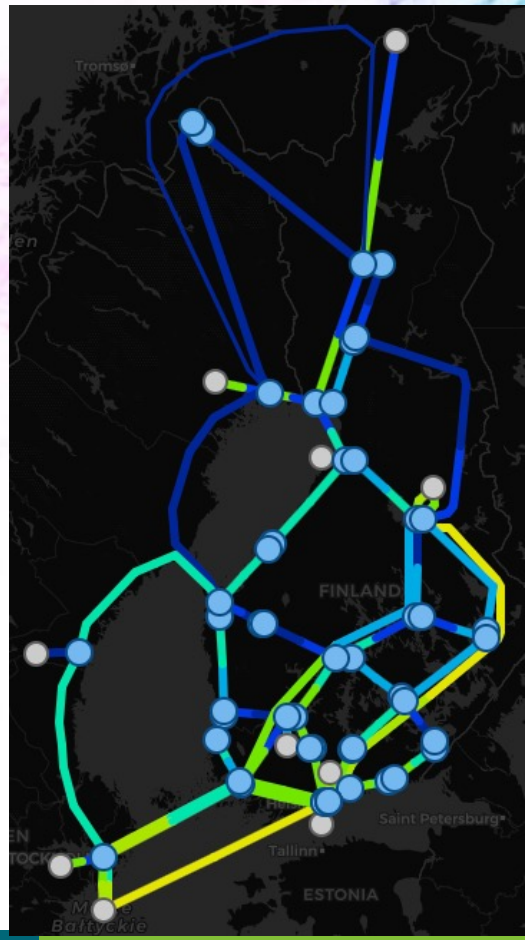
FUNET Network (1/2)

- FUNET has a high-speed nationwide IP backbone
  - Spanning 20+ cities in Finland
  - 100G links, first 400G links to production Q2 / 2024
  - Juniper routers (MX204, MX304, MX10003)
- 6000+ km of fiber network
  - Dark fibers from commercial operators
  - Own transmission equipment (ADVA)
  - All fiber links with active sensing and alerting (OTDR)
- About 80 end-user organisations
  - All of Finland's higher education institutions
  - 1G – 100G access speeds



FUNET Network (2/2)

- Redundant design
  - Every city has 2+ core routers
  - All POPs connected via 2+ different physical routes
- Peering in all Finnish IXP's (FICIX 1, FICIX 2, FICIX 3 and TREX)
- International connectivity done with NORDUnet
  - Optical level interconnection to Sweden and Norway networks
  - Multiple physically and geografically separate 100G (/ 400G) links
  - International backup links via Sweden and Norway
- Supports scientific applications
  - EISCAT_3D (4 Tbps per site)
  - Time and Frequency distribution, QKD



FUNET Services (1/2)

- IP connectivity
  - IP addresses, DNS services (authoritative + resolvers)
- Private connectivity
  - MPLS VPN
  - Azure Expressroute (via NORDUnet and Géant)
- Campus networks as a Service
- Wireless LAN services
  - eduroam, eduroam proxy, eduroam visitor access
  - eduVPN

FUNET Services (2/2)

- FUNET CERT
- FUNET CSOC (Cyber Security Operation Center as Service)
- Géant TCS (Sectigo's Certificate Service)
- In co-operation with NORDUnet
  - Different video storage / streaming services
  - Zoom (on-prem private server cluster over the Nordics)

- ftp.funet.fi ("original home of Linux kernel")
- FileSender, NTP, iperf, …

Network management & monitoring

- Monitoring with naemon + snmp + prometheus
- Statistics with InfluxDB + Telegraf + Grafana
- Network management and service provisioning done with Ansible
  - Monitoring is auto-configured based on data in Ansible
- Lots of in-house scripts and glue (mostly perl)

- DDoS & abuse monitoring / handling done by FUNET-CERT, with their own toolset

FUNET NOC (1/2)

- No dedicated NOC staff
- CSC's common Service Desk handles also NOC Level 1
  - All initial customer contacts during regular office hours (emails, phone calls)
  - Alerts from naemon / router monitoring / ADVA / servers / …
- Service Desk categorizes tickets and reaches out to right specialists
  - Normally via RC / email
  - Urgent issues: phonecall is still the best
- Outside office hours, critical alerts are delivered to 24/7 monitoring partner
  - Monitoring partner contacts on-call specialists

FUNET NOC (2/2)

- CSC has Hybrid Work model, people work flexibly from Home & Offices
- Tickets (both internal & external) are handled in RT
- Primary communication methods are RC, Zoom, email and phone
  - Inside CSC: RC (+ email / phone)
  - With customers & providers: email (usually via RT) / phone
- Meetings are usually held in Zoom
- Phone is still the best in urgent matters
  - Make a trouble ticket **and** call about it

FUNET SLA

- For all our services, baseline service level promised is “best-effort”
- For IP connectivity, if customer has redundancy, service level has been ~100 %
  - Two (or more) redundant links
  - Over separate physical routes
  - From separate FUNET routers
  - To separate CPE routers (with eBGP)
- .. Irregardless of SLA, we’re interested in faults that knock out entire customers or some critical supporting services (think: DNS)
  - Also outside regular office hours

Documentation?

- Our internal documentation is stored in Wiki(s)
- Historical documentation on a shared (read-only) storage
- Our network configuration is fully in Ansible
  - Interfaces, vlans, filter rules etc. are explained in Ansible comments
  - History is also visible .. if you know how to use git ;-)
  - Funet Kampus (Campus networks as a Service) configurations are handled in a similar way

Thank you!
Any questions?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