Tier1 Networking cost and optimizations

NeIC NT1 Manager
Mattias Wadenstein
<maswan@ndgf.org>

2017-10-16
HEPiX Fall 2017
KEK, Japan
Overview

- NDGF – The Nordic Distributed Tier-1 site for ALICE and ATLAS
- NDGF networking
- Networking costs
- Unnecessary costs
- Future directions
The LHCOPN according to NDGF

- Our network supplier is NORDUnet, a collaboration of the Nordic NRENs
- Most of the heavy lifting is in an overlay network on NORDUnet’s 100G backbone that extends to CERN
- NDGF → NORDUnet
Networking costs

• NORDUnet’s owners (the national NRENs) have asked for “external” projects to pay the full cost of networking
  • External here means not inside a university or otherwise covered organization within one of the Nordic NREN – NORDUnet only has 5 normal customers/owners
  • For now only us, but EISCAT_3D is foreseen to be the second external project
  • This includes manpower to participate in the LHCOPN and LHCONE projects

• Networking costs are a significant part of the Tier-1 cost
  • 550 k€/year, or 18-20% of the total Tier-1 cost (as found by Josep Flix, 2015)
  • Out of this, 350k€/year (~12%) is NORDUnet’s wide-area network cost paid by NeIC, the rest is internal costs to particular countries covered by national funding
  • Unit costs go down, but usage goes up
Networking costs

• The LHCOPN part is fairly straightforward, where we pay our fair share (~200k€/year, static) for:
  • MPLS backbone overlay network
  • Virtual routers
  • Operations and monitoring
  • Project participation

• Predictable, and technical development seems to keep ahead of usage needs
  • Cost goes up a bit for adding a second router in the new network building at CERN
  • But by the time we outgrow being an overlay on the NORDUnet 100G backbone for the LHCOPN, we’re likely on an overlay on the NORDUnet 1T backbone
Networking costs

• LHCONE and transit though (~150k€/year, rising)
  • Roughly equal parts in volume of:
    • Private Network Interconnect (PNI) traffic
    • Commercial IP transit
    • GEANT IP transit
• Transit unit costs
  • Including NORDUnet-internal transport to exit/entry points
  • Unit is M as in Mbit/s 95th percentile, monthly
    • PNI: 0.35 €/M
    • Commercial transit: 0.55 €/M
    • GEANT IP transit: 1.05 €/M
• Especially the GEANT IP transit unit cost is decreasing much more slowly than usage increases with higher LHC data volumes
Unnecessary costs

• Unit costs * volume and we end up paying:
  • PNI traffic: 30k€/Y
  • Commercial IP transit: 40k€/y
  • GEANT IP transit: 75k€/y

• More than half of the GEANT IP transit traffic is to close networks
  • Where NORDUnet has a presence, like Geneva (SWITCH), Hamburg/Frankfurt (DFN), London (JANET), etc
  • Adding direct connections here would end up saving us at least 25k€/year
  • And make us much less sensitive to future traffic increases

• We’re tasked with providing cost effective solutions, and especially unmotivated increases in networking costs is not welcome from my funding sources
Future directions

• Given that data volumes are ever increasing (more LHC data, more P2P traffic), we’ll need one of these solutions:
  (a) GEANT IP transit cost reform (ongoing GEANT debate for many years, not much hope)
  (b) Changed minds in the funding agencies, so they are happy to have an ever increasing bill for networking (small hope)
  (c) More PNI between NRENs, especially when they happen to be in the same place
  (d) Withdraw the NDGF LHCOPN network from GEANT IP – if you want to reach it you add a direct connection or go through commercial transit
Lively debate?