The GARR – ARNES collaboration and future projects

Claudio Allocchio, Marco Marletta, GARR

Mreža znanja 2019, 4. in 5. december

EVROPSKA UNIJA
EVROPSKI SKLAD ZA REGIONALNI RAZVOJ
NALOŽBA V VAŠO PRIHODNOST

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE, ZNANOST IN ŠPORT

Naložbo sofinancirata Republika Slovenija in Evropska unija iz Evropskega sklada za regionalni razvoj

ARNES, GARR …

We Are NRENs!

A very long and very special history to know about!

NRENs, the origins…

- Back in the ‘80s, for the need of users in research and education
  - NRENs were born before formal computer networking science!
  - The communities created them, bottom up
  - Everyone was collaborating and in helping each other to setup.
  - All had to be invented!

- The first “NRENs associations”
  - EARN
  - RARE
  - …

RARE 89

Bled, Grand Hotel Toplice, October 1988

In front of the restaurant, used as meeting room:

"RARE meeting"

Bled, Grand Hotel Toplice, October 1988

In front of the restaurant, used as meeting room:

"RARE meeting"
Medium meeting
Well done meeting

GARR in a nutshell

GARR in a nutshell

GARR is the network and the services built by the Italian Research and Education community to satisfy the needs of its own users and to help them in doing their own activities!

… of course we have a Vision, a Mission, a Strategy & Value

The Vision: GARR aims at being the reference infrastructure, application driven, that fulfils the requirements of the Research, Education and Cultural community in Italy.

The Mission: Connect Universities, Research organisations and provide services to the community of Education and Research

The Strategy: Project, Build, Manage, Maintain and Evolve an inclusive infrastructure that provides unique and high quality services to the reference community optimising it in terms of costs, efficiency and value.

The Value:
- Inclusiveness in terms of community served and services provided
- Solidarity with a cost properly shared in the community
- European value as part of a larger community
- Trustiness that allows to provide Digital Identities and Security
- Community driven applications: what the users need
- Innovation to dynamically follow the needs of the community
- Neutral in respect to Technology and Market

GARR: The Research and Education Community

FOUNDERS

Consiglio Nazionale delle Ricerche

ENEA

INFN Istituto Nazionale di Fisica Nucleare

Fondazione CRUI

INAF Istituto Nazionale di Astrofisica National Institute for Astrophysics

INGV

agenzia spaziale italiana

INRiM Istituto Nazionale di Ricerca Metrologica

Istat Istituto Nazionale di Statistica

Elettra Sincrotrone Trieste

Stazione Zoologica Anton Dohrn Napoli

iit Istituto Italiano di Tecnologia

CINECA

MIUR - AFAM

AREA Science Park

OGS Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

EMBL European Molecular Biology Laboratory

JRC - Ispra

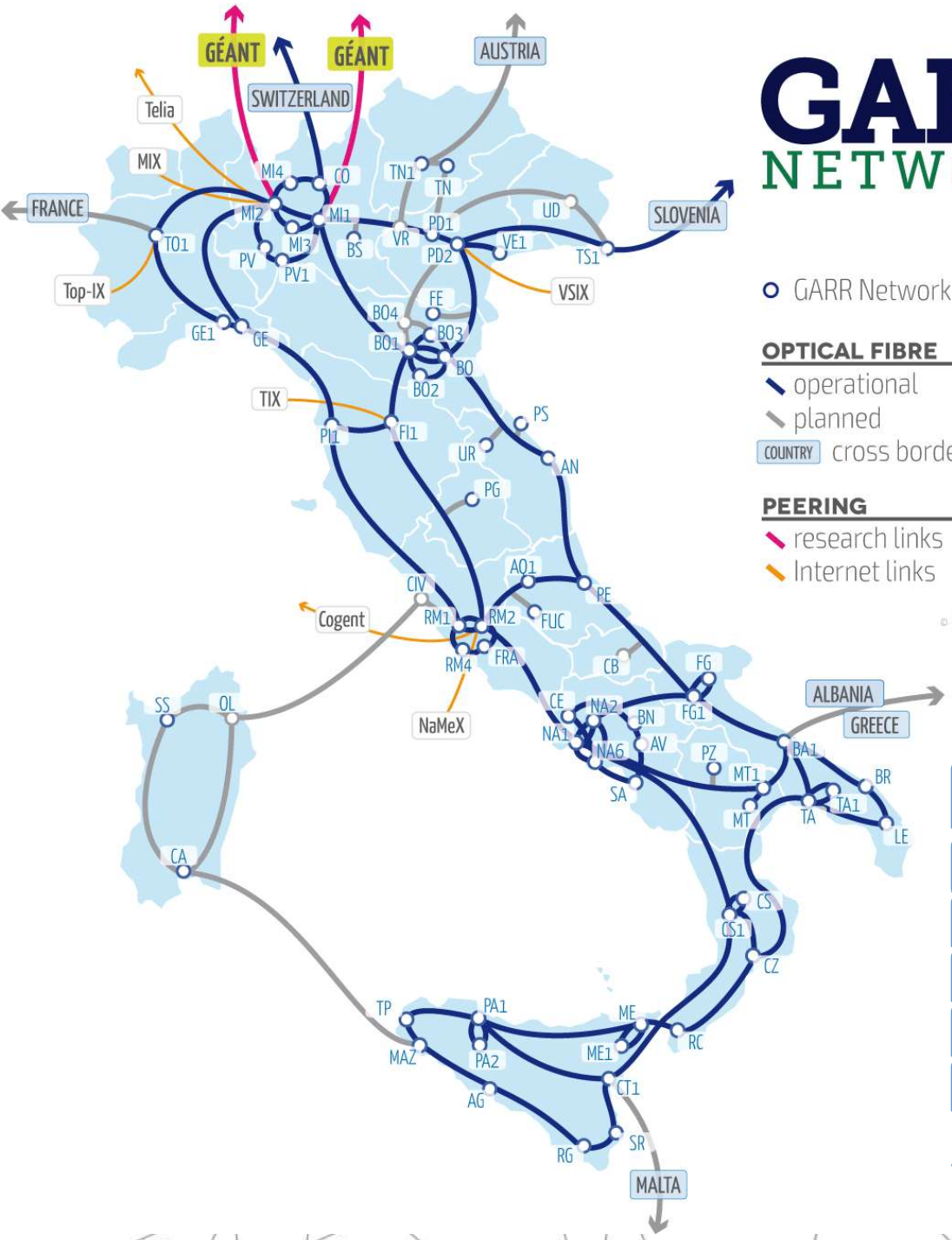
European Commission

Fondazione Bruno Kessler Ricerca Scientifica e Tecnologica

CIRA Italian Aerospace Research Centre

FUB Fondazione Ugo Bordoni Ricerca e Innovazione

crea Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria



GARR NETWORK

GARR Network PoP

OPTICAL FIBRE
- operational
- planned
- COUNTRY cross borders fibre

PEERING
- research links
- Internet links

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- More that **16.000** km of GARR owned fibers
  - **~9.500** Km of backbone
  - **~6.500** Km of access links
- More than **1000 user sites** interconnected
- **> 1,8 Tbps** aggregated access capacity
- > **3,5 Tbps** total backbone capacity
- **2x200 Gbps** IP capacity to GÉANT
- Cross border fibers with ARNES (Slovenia), SWITCH (Switzerland), and other are coming
- > **100 Gbps** to General Internet and Internet Exchanges in Italy
- **NOC and engineering** are in-house, in Rome.

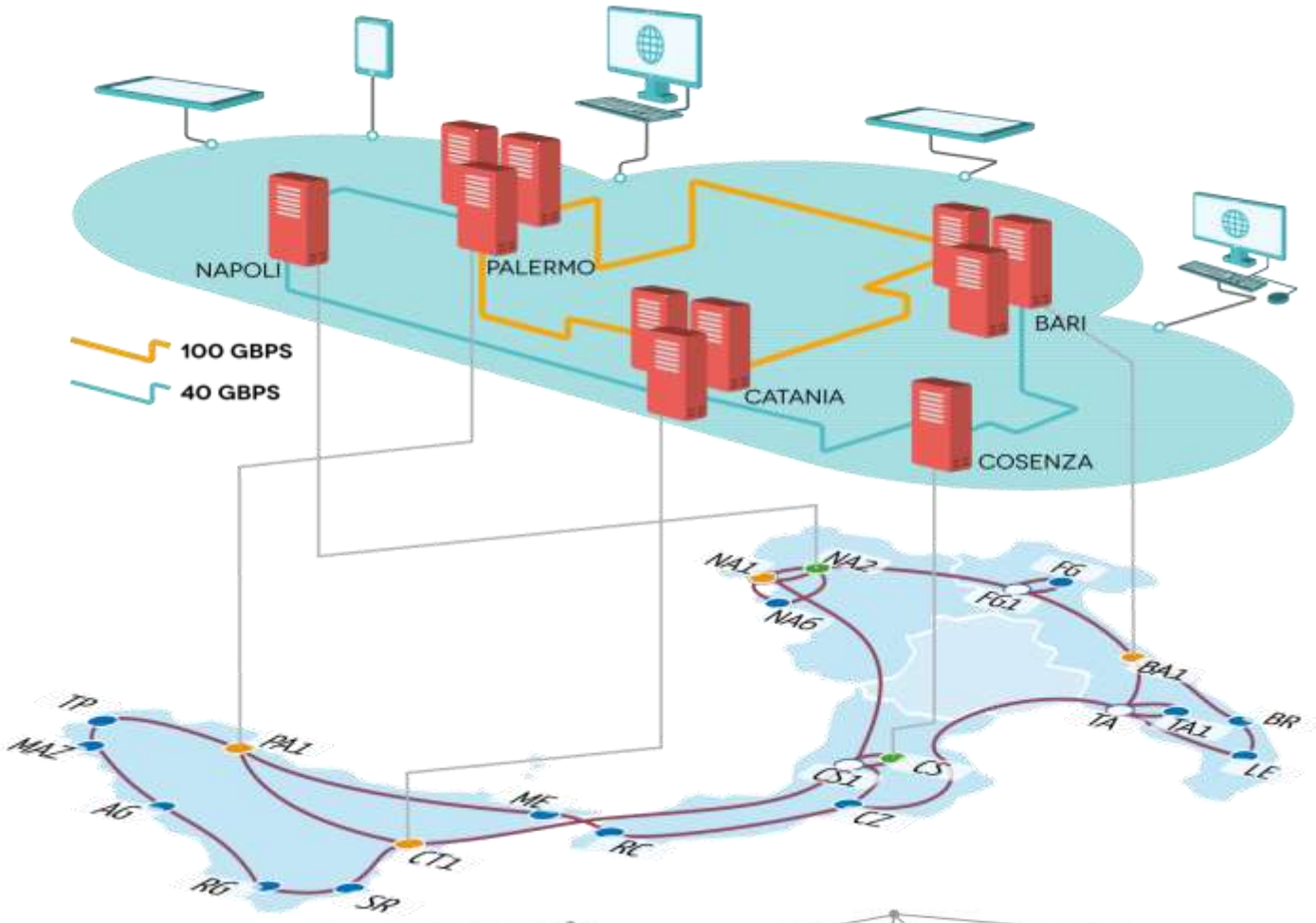
Interconnects Data Centres of:

INFN	HTC - 1 Tier1 (CNAF-Bologna) + 9 Tier2 (Bari, Catania, Frascati, Legnaro, Milano, Napoli, Pisa, Roma, Torino)
ENEA	HTC & HPC - Portici (NA), Brindisi
CNR	Roma, Pisa
CINECA	HPC - Marconi (Bologna)
GARR	Bari, Catania, Cosenza, Napoli, Palermo
CRS4	Cagliari
RECAS	Bari, Catania, Cosenza, Napoli

Consortium GARR THE ITALIAN EDUCATION & RESEARCH NETWORK

we also run ICT Infrastructure and a GARR Cloud

5 Sites for a total of 8448 virtual CPU and 10 PB di STORAGE
Built in the GARR-X Progress Project co-funded by MIUR



Federated Cloud
OpenStack based + Kubernetes cluster

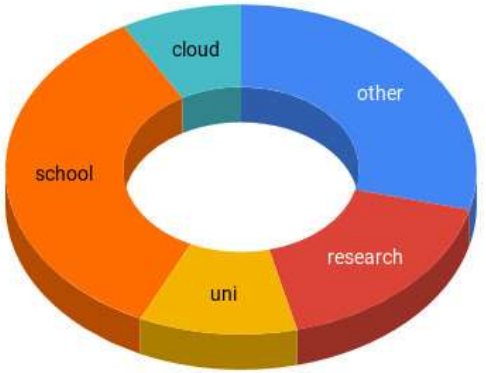
Services:

- IaaS – Infrastructure as a Service with Virtual Data Centre
- DaaS – Deployment as a Service a type of PaaS (Platform as a Service)

New GARR services

DDoS detection and mitigation in GARR

- In-house developed tools for detection and analisys
  - Distributed synflood detection using netflow
- Industrial tools for mitigation: Corero (Juniper spin-off)
  - Detection (splunk based)
    - Using Mirrored sampled traffic
  - Mitigation using Juniper MX
    - NETCONF
    - Ephemeral filters
    - Filters matching traffic payload
  - Telemetry for reporting
  - Totally automated solution
  - Very fast (seconds) detection and mitigation of recurring attacks

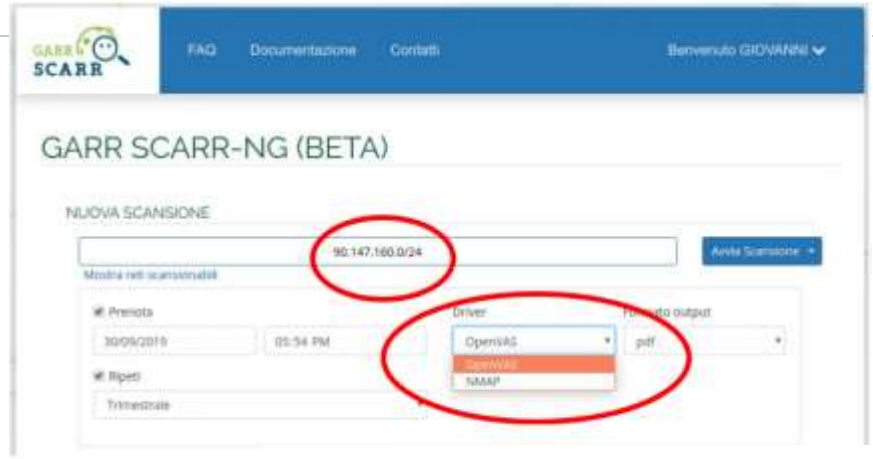


DDoS Targets Nov 18 - Sep 19

Security services: SCARR

Vulnerability scan on demand:

- Based on Greenbone (ex OpenVAS) and NMAP
- Each GARR APM can request a scan to its network
- Self-service via web portal
- AAI authentication only
- All tasks are splitted in sub-tasks and executed on different backends to speed execution



Result Overview

Host	High	Medium	Low	Log	False Positive
90.147.90.177	0	3	0	16	0
Total: 1	0	3	0	16	0

Medium (CVSS: 4.3)
NVT: SSL/TLS: Report Weak Cipher Suites

Summary
This routine reports all Weak SSL/TLS cipher suites accepted by a service.
NOTE: No severity for SMTP services with 'Opportunistic TLS' and weak cipher suites on port 25/tcp is reported. If too strong cipher suites are configured for this service the alternative would be to fall back to an even more insecure cleartext communication.

Vulnerability Detection Result
'Weak' cipher suites accepted by this service via the TLSv1.0 protocol:
TLS_RSA_WITH_RC4_128_MD5
TLS_RSA_WITH_RC4_128_SHA

Solution
Solution type: Mitigation
The configuration of this services should be changed so that it does not accept the listed weak cipher suites anymore.
...continues on next page ...

Info: https://scarr.garr.it

Mail: scarr-service@garr.it

Eduroam Self Service

Eduroam Self Service helps eduroam institution operator to

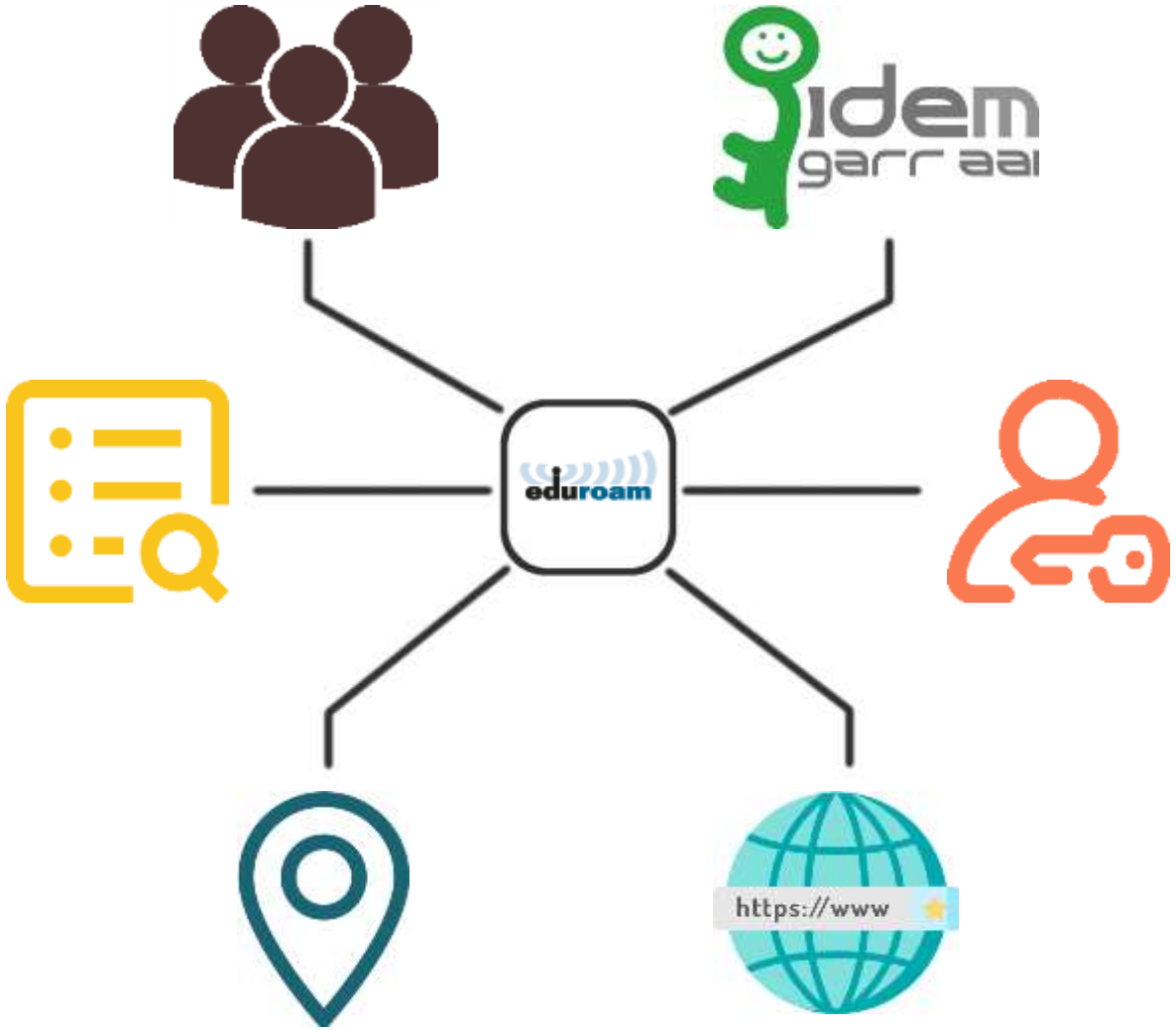
- manage and configure radius server
- troubleshoot failed authentications
- modify hotspot location
- roaming test

Fully integrated in the activation workflow of Italian eduroam Federated institutions.

Local and AAI authentication supported.

Info: https://docs.eduroam.it

Mail: eduroam@garr.it



The GARR-ARNES collaboration

Last january, it was a quiet day

- Then, suddenly a bunch of many optical cables was ripped off
- The whole Trieste PoP (but also FVG region) was totally cut off from the world Internet.
- Both fiber carriers serving the PoP were impacted (and all those of other providers)
- The area was between Portogruaro and Trieste
- After a few minutes our NOC realised that repair wouldn't have been so fast
- «Houston Ljublijana!, we have a problem»

«Miha can you give us a layer2 path to GEANT?»

«sure, give me a few minutes to configure it»

DIARIO DI UDINE

CRONACA

LATISANA

Blackout di internet nella Bassa friulana: tranciati i dorsali in fibra

Molti i disagi segnalati nella giornata di mercoledì 9 gennaio. Le cause sono legate a un realizzazione della terza corsia

Redazione Udine

LATISANA - Sono stati risolti durante la notte i disservizi causati dal danneggiamento delle dorsali in fibra posate nei cavidotti che corrono lung la A4. Mercoledì pomeriggio, come rende noto Autovie Venete, durante un intervento riguardante la costruzione della terza corsia, in prossimità dell'uscita di Latisana (in comune di Ronchis), una macchina fresatrice ha scardinato un tratto di cavidotti danneggiando pesantemente i cavi in fibra

il FRIULI.it

telefriuli | UDINESEBLOG

CULTURA

Risolti nella notte i disservizi alla linea fibra nella Bassa

Ieri pomeriggio, durante il cantiere della terza corsia, in prossimità dell'uscita di Latisana, una macchina fresatrice aveva scardinato un tratto di cavi

ECONOMIA

Messaggero Veneto

Cavo tranciato in A4, mezza Bassa senza internet

LATISANA. Tranciato un cavo della fibra ottica. Connessione internet a macchia di leopardo nella Bassa Friulana. A subire il danno la linea per la trasmissione dati dagli addetti ai lavori denominata "business" che corre sotterranea a ridosso dell'autostrada A4.

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A short timeframe

13:57 the Telecom Italia fiber and the Irideos lambda go down at the same time

14.05 Claudio realizes that he can only reach ARNES but nothing else, and calls NOC

15:20 Miha Dimec receives a call from a panicking Marco

15:34 Marco writes a request email to GEANT for a backhaul

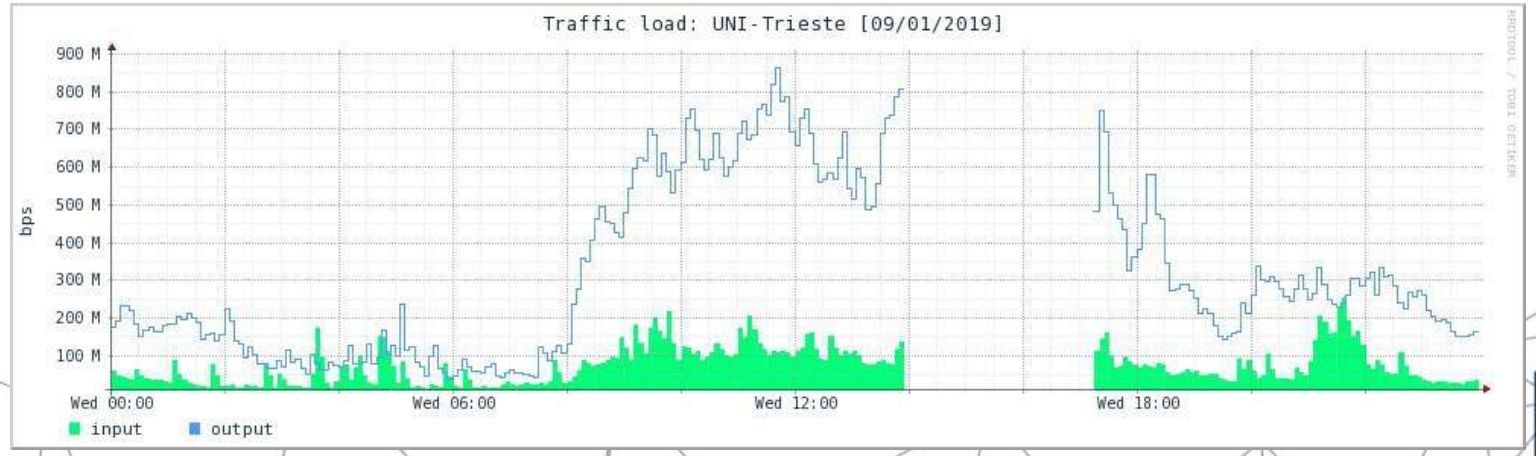
16:45 GEANT configures the L2VPN Ljubljana-Milan

17:24 OSPF adjacency up, traffic starts (yay!)

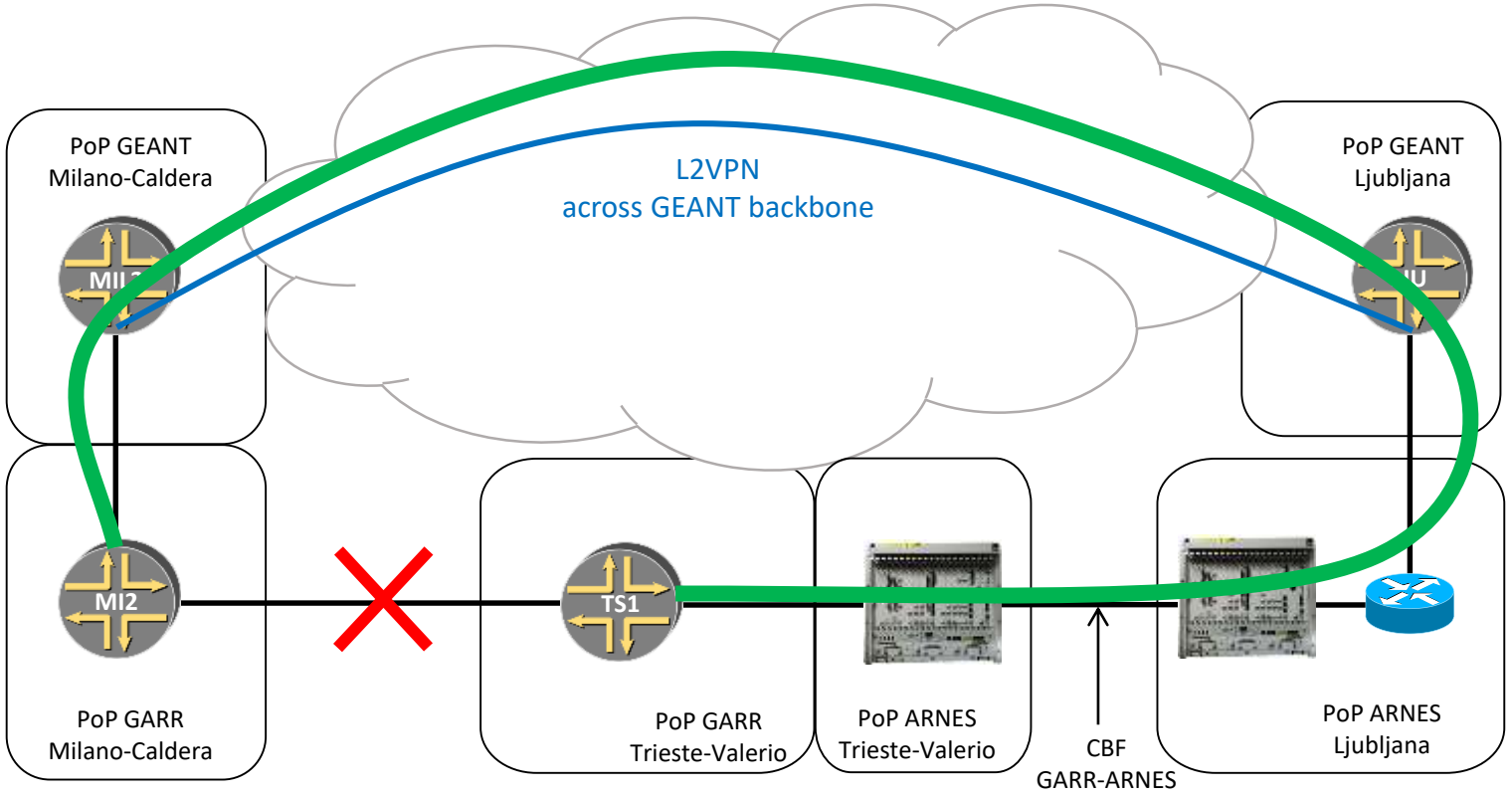
00:39 the Irideos lambda comes back up

02:00 the Telecom Italia fiber is spliced

Alarm cleared, traffic goes back to the original path



TRIESTE-MILAN emergency link



Post-mortem analysis

The Telecom Italia and Irideos fibers use different cables, but have a common path along the A4 highway between Portogruaro and Latisana

There are ongoing highway works for the construction of the 3rd lane, and will last at least until end 2020

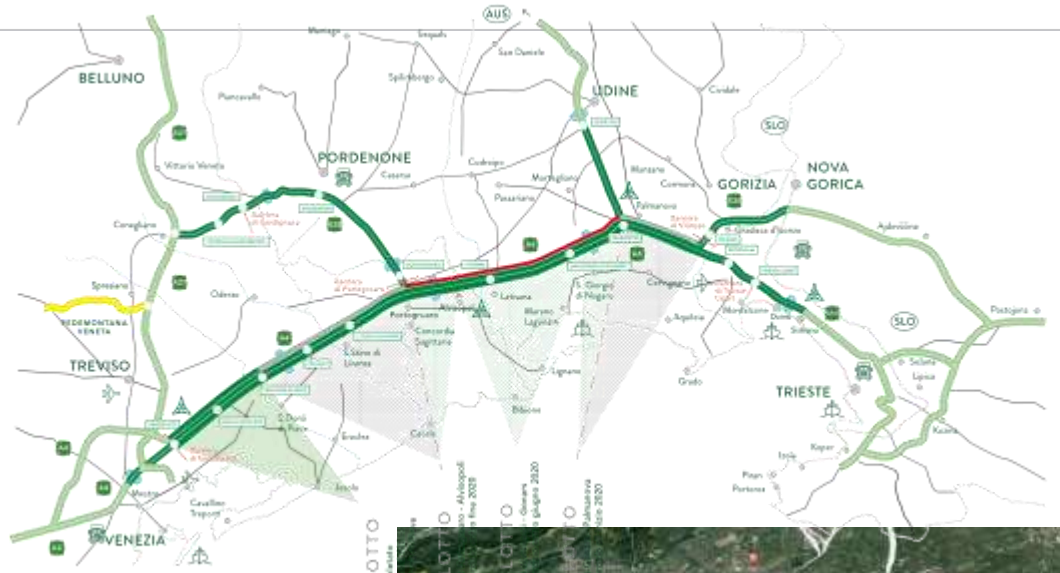
We had identified and solved other infrastructure weaknesses, but this one was not known

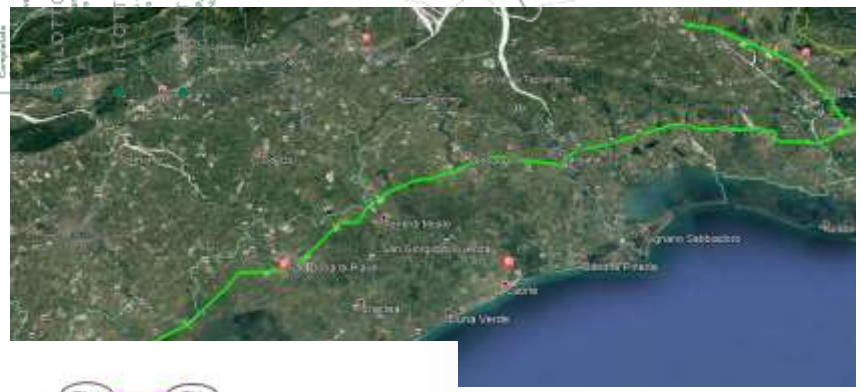
The GEANT fiber provided by Interoute goes via the SS14, not the A4 and was not affected by the cut

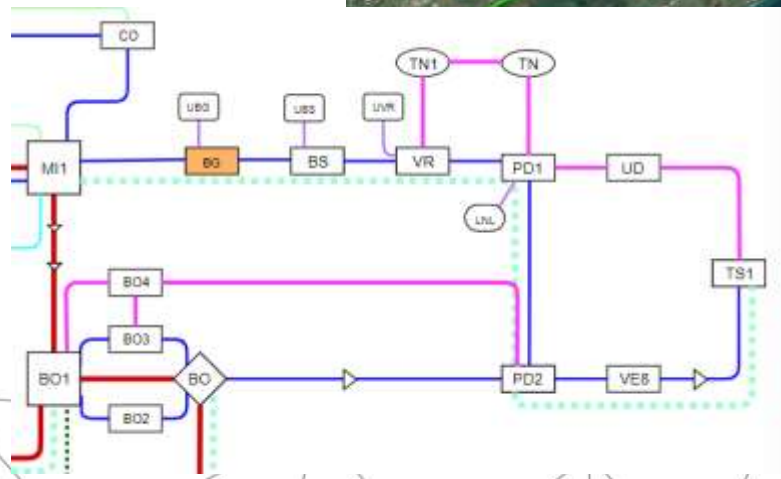
There was ANOTHER double fiber cut later in Spring, but this time nobody, apart GARR NOC, realized this. ☺

We have a plan for a new fiber path to Trieste that will be implemented together with the new transmissive platform, operational in 2021

Therefore we will need ARNES support for quite some time!







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Lessons learnt

- It took 2 (two) hours to design and implement a solution crossing 3 domains and many devices
- Thanks to :
  - people knowing each other
  - people knowing each other's setup and procedures
  - long standing cooperation relationships
  - there was no paperwork needed, no meeting, no kick-off, no plan.
- Just two phone calls, an email, a skype chat
- And a well deserved snack and a beer afterwards

We are NRENs !

This result would have never been possible in the commercial world

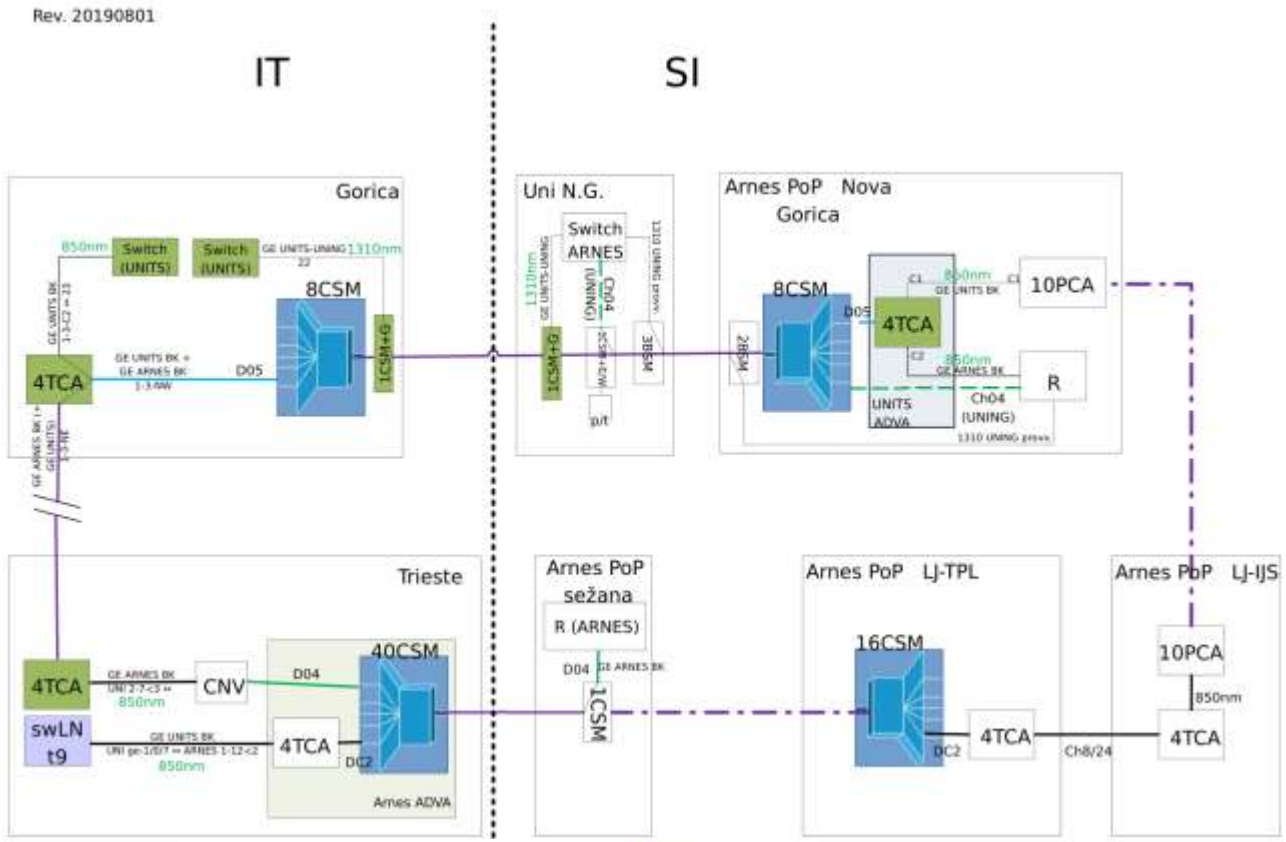
The GARR-ARNES-LightNet collaboration

Two cross border fiber links

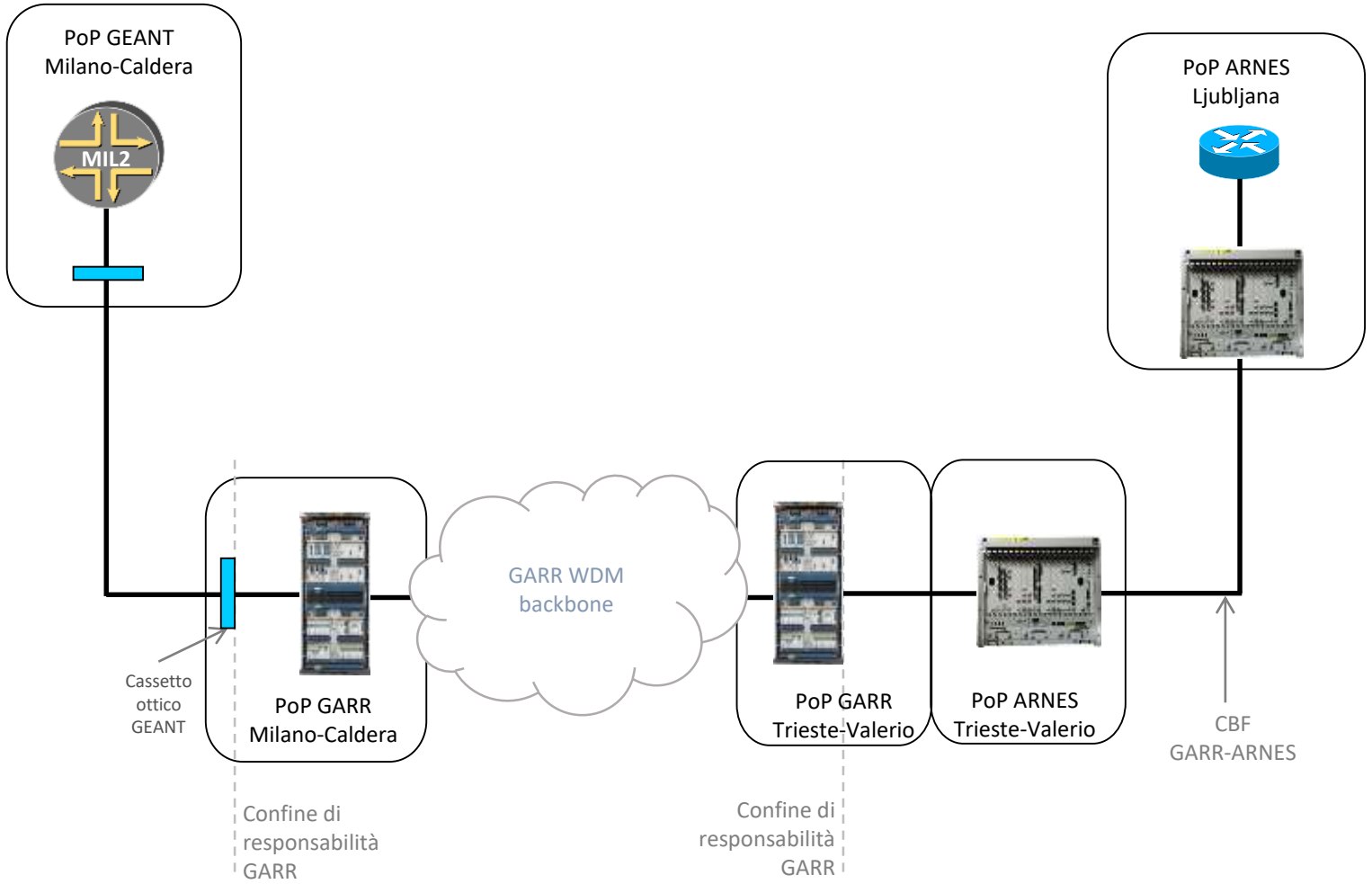
- The main one between Trieste and Sežana
- A second one between Gorizia and Nova Gorica

Services on these links:

- 10G Trieste-Ljubljana for peering, LHCONE, Trieste GARR PoP backup
- 10G Milan-Ljubliana for ARNES backup to GEANT PoP in Milan
- 1G backup for Nova Gorica ARNES PoP via Lightnet, the Trieste MAN
- 1G backup for Gorizia Lightnet PoP via ARNES
- 1G e2e between Conservatorio Tartini e Akademija za Glasbo in Ljublijana



ARNES backup to GEANT PoP in Milano



The HPC scenario

The new HPC datacentre in Bologna

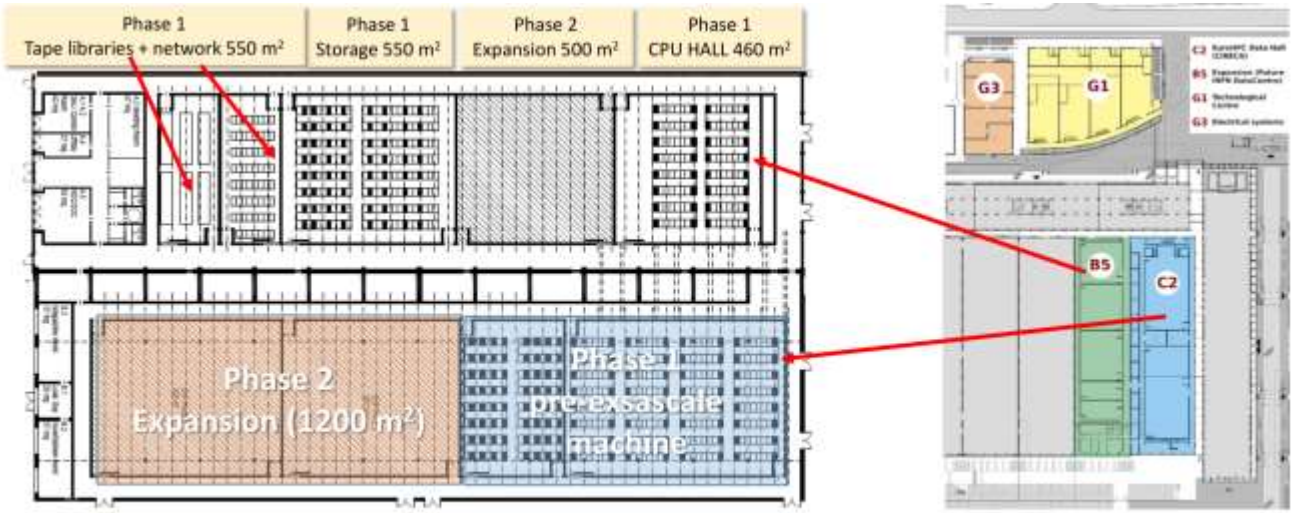
- One of the biggest data centers in Europe (100.000 m²) is being built at Bologna Tecnopolo
- Old tobacco factory, buildings protected by the law as an architectural heritage
- Many R&E and government agencies will settle there
- ECMWF new, huge datacenter will enter into service in 2020
- There will be another 20MW datacenter used for HPC (pre-Exascale) & HTC (new LHC Tier1)

The Leonardo Consortium

The new pre-Exascale machine will be built by the Leonardo Consortium with Slovenia:

- Cineca (consortium leader)
- the Italian Ministry of Education, Universities and Research (MIUR)
- the National Institute of Nuclear Physics (INFN)
- International School of Advanced Studies (SISSA)
- with the support of the Emilia-Romagna Region

- The system will have a peak perfomance of 270 Petaflop/s and cost 240 million euro
- The new datacenter is designed to be extremely energy efficient (PUE ~1.1)
- Technological plants and infrastructures are sized for 20 MW, cooling for 5MW



The GARR network at the Tecnopolo

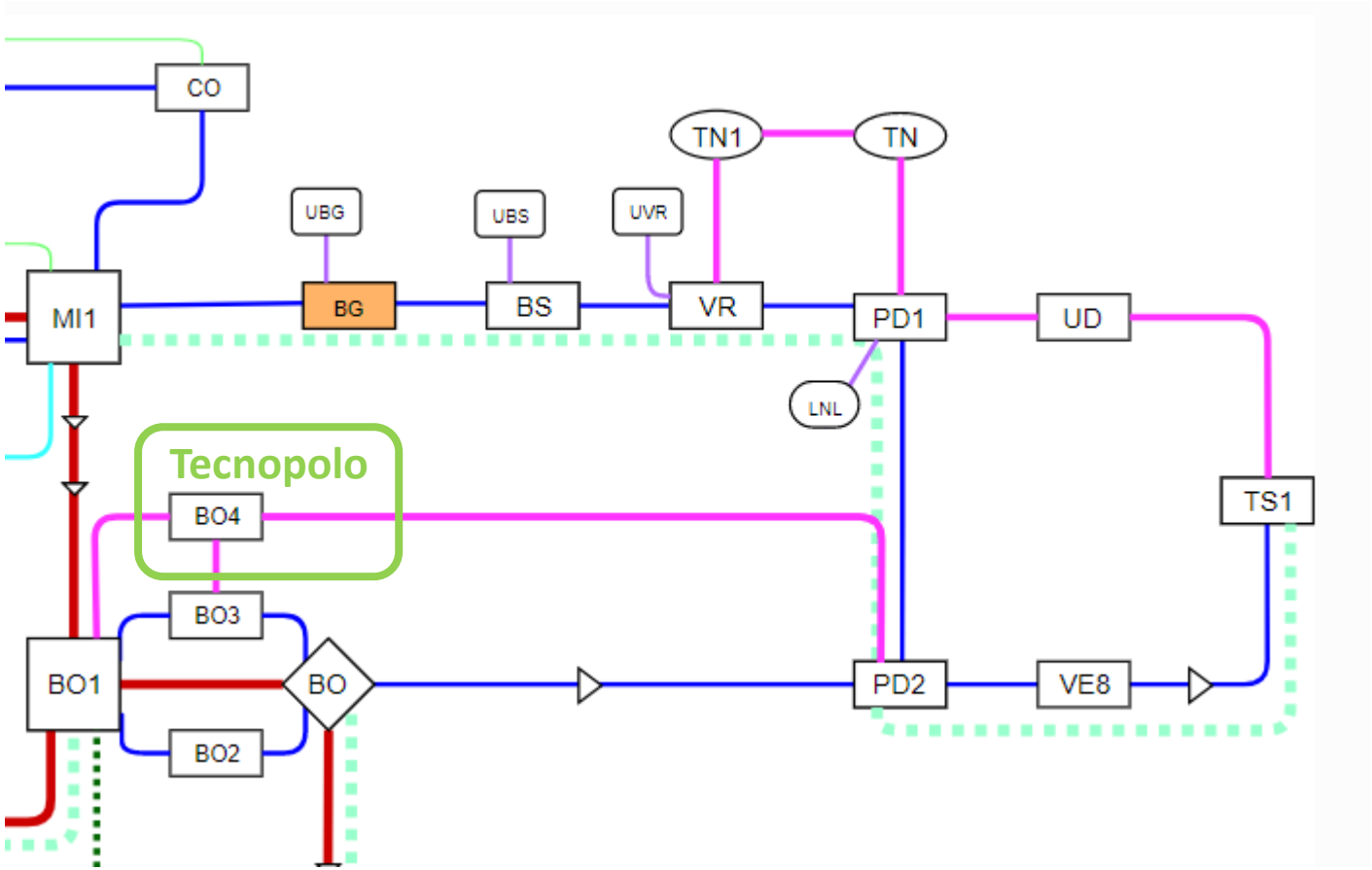
In 2021 a new GARR PoP will be operational at the Tecnopolo

New fibers and equipment are being procured

Several 100G links will be available from the beginning

A big leap will be required after 2025 (New Exascale machine, HL-LHC)

Connectivity to GÉANT and to ARNES will not be an issue



THE END

claudio.allocchio@garr.it

marco.marletta@garr.it