

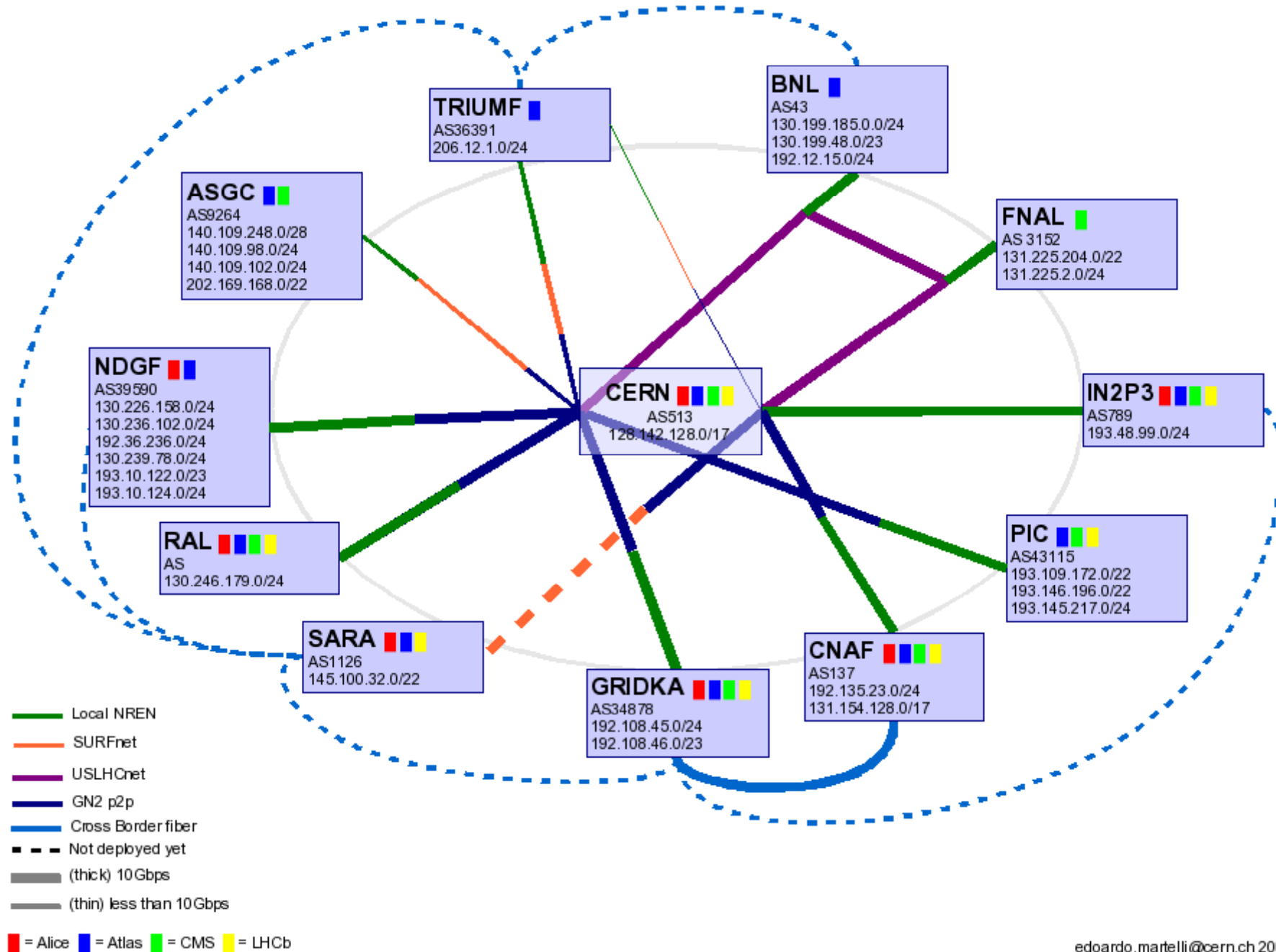


LHCOPN lambda and fibre routing – Episode 3

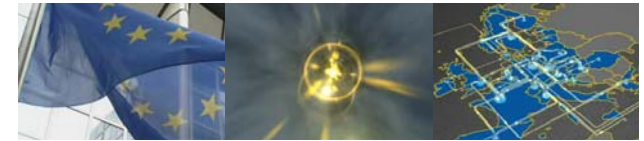
Michael Enrico
Network Engineering & Planning Manager
DANTE

LHC Meeting, Amsterdam, 27.07.2007

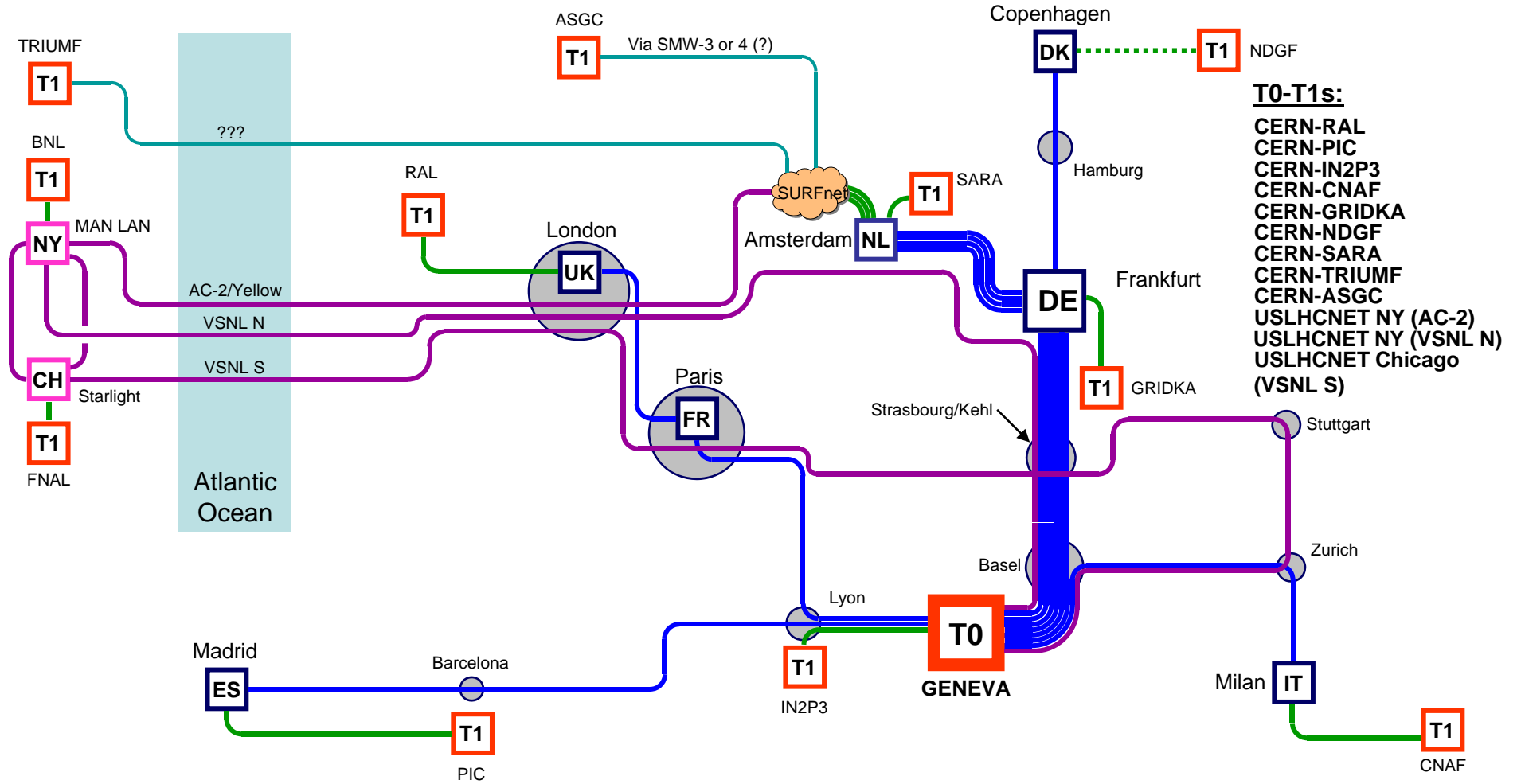
LHCOPN – current status



T0-T1 Lambda routing (schematic)



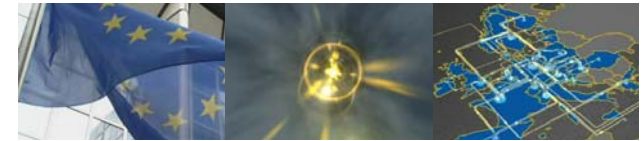
Connect. Communicate. Collaborate



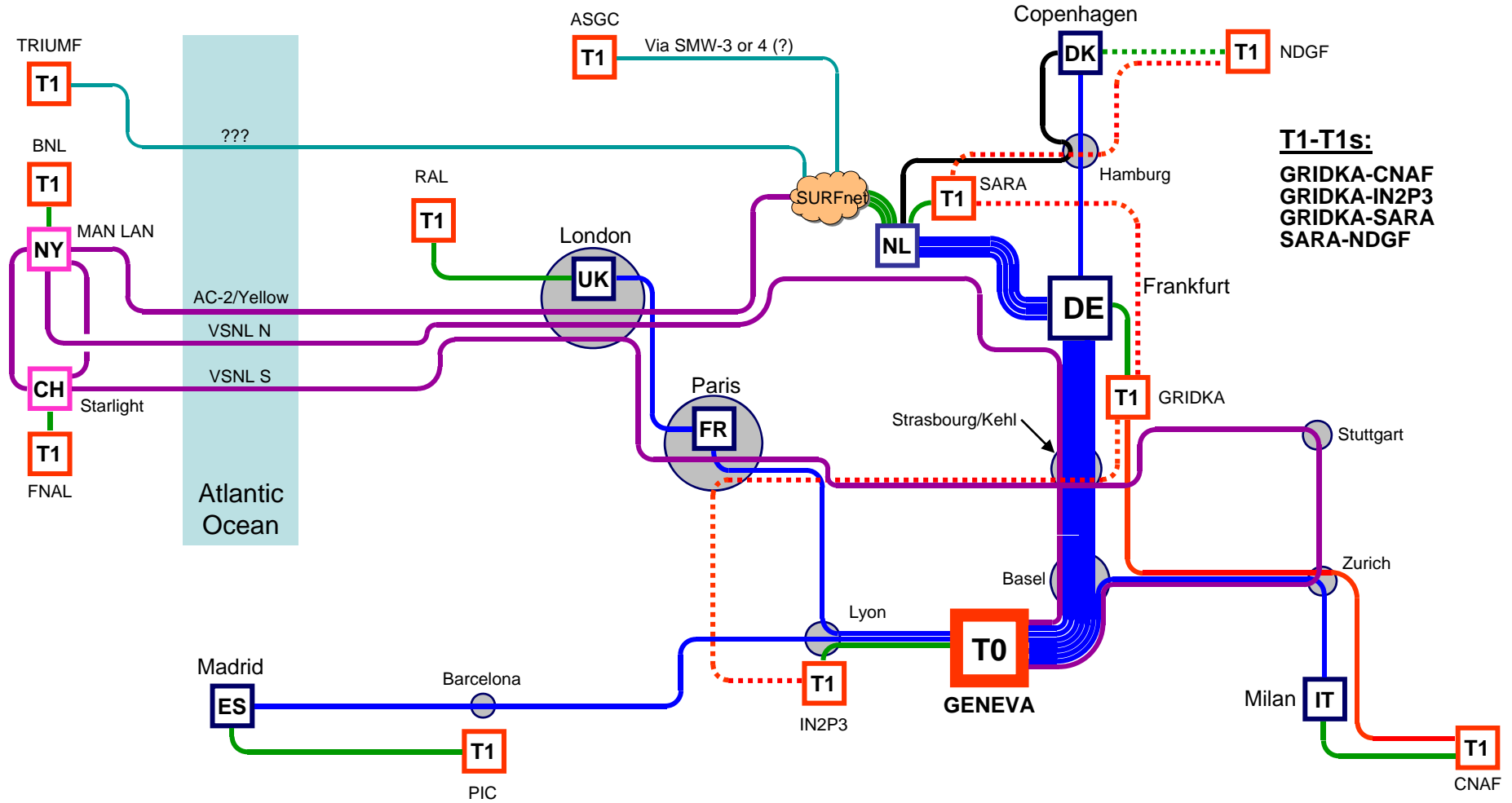
- T0-T1s:**
- CERN-RAL
 - CERN-PIC
 - CERN-IN2P3
 - CERN-CNAF
 - CERN-GRIDKA
 - CERN-NDGF
 - CERN-SARA
 - CERN-TRIUMF
 - CERN-ASGC
 - USLHCNET NY (AC-2)
 - USLHCNET NY (VSNL N)
 - USLHCNET Chicago (VSNL S)



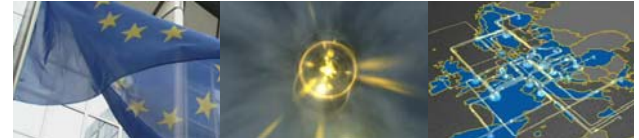
Add T1-T1 Lambda routing (schematic)



Connect. Communicate. Collaborate

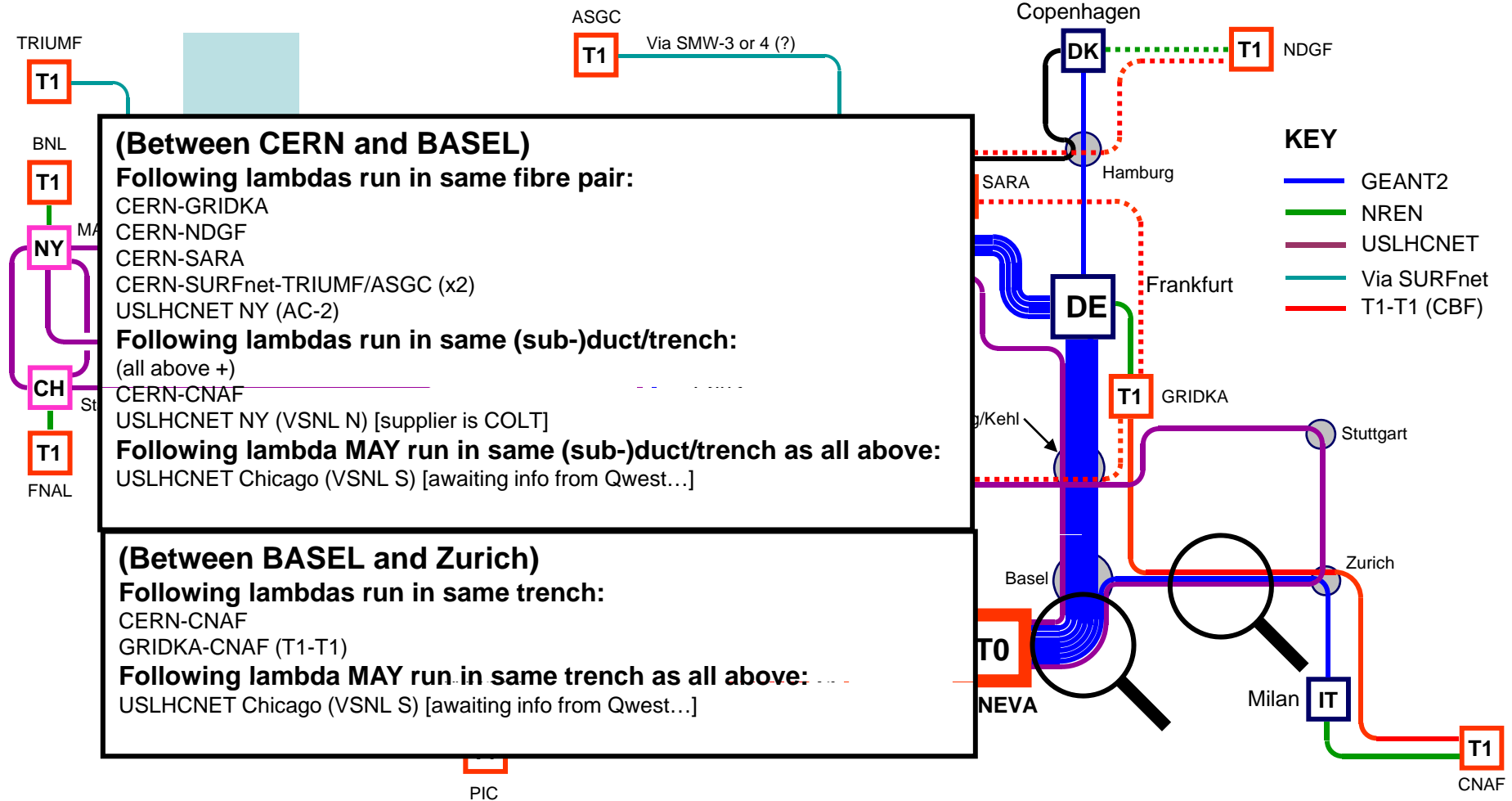


T1-T1s:
 GRIDKA-CNAF
 GRIDKA-IN2P3
 GRIDKA-SARA
 SARA-NDGF

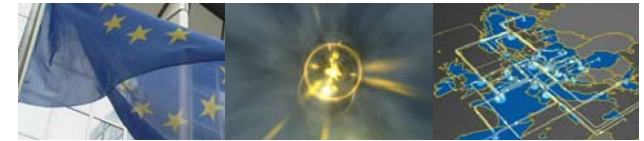


Connect. Communicate. Collaborate

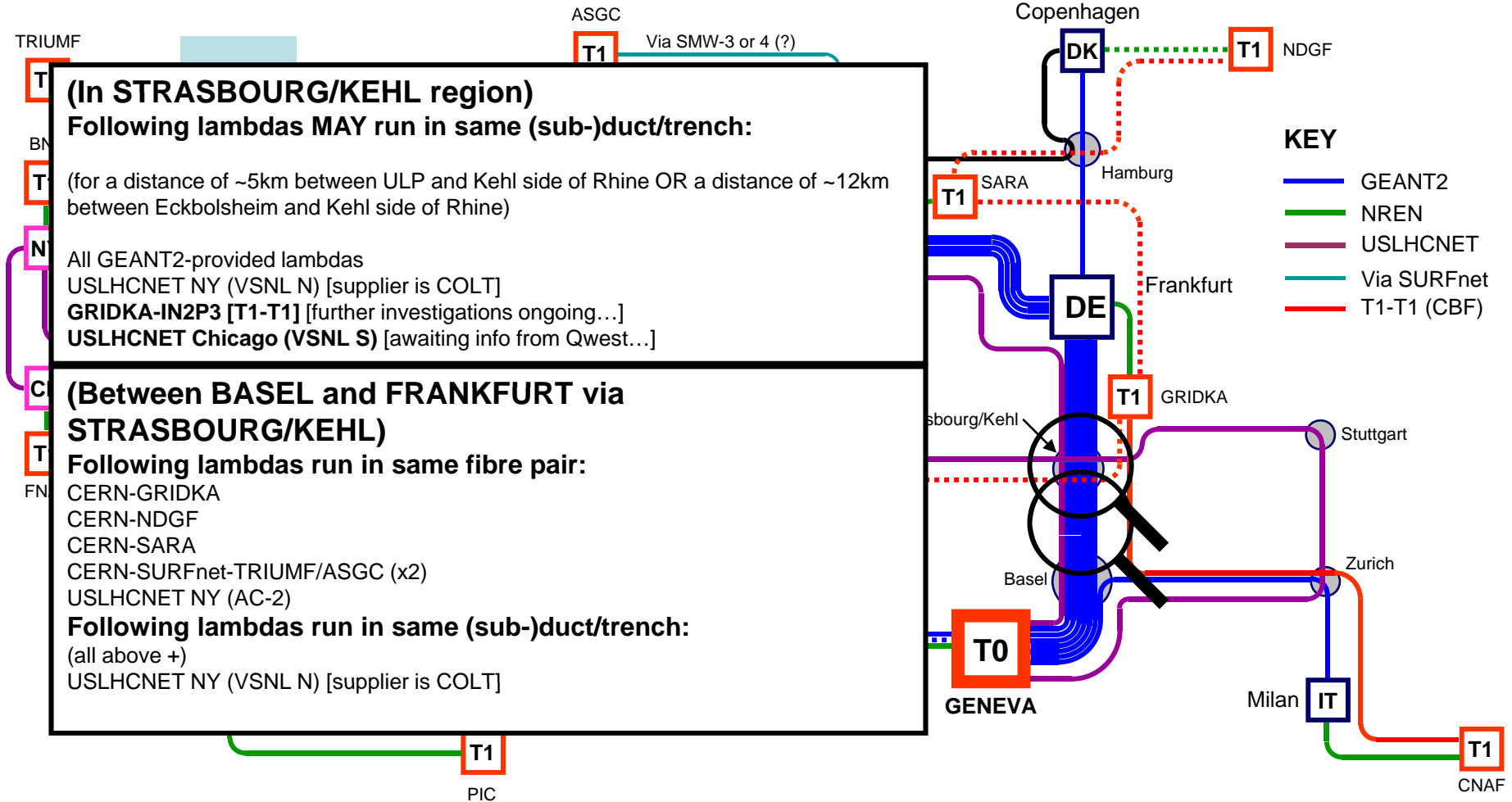
SRLG analysis - I



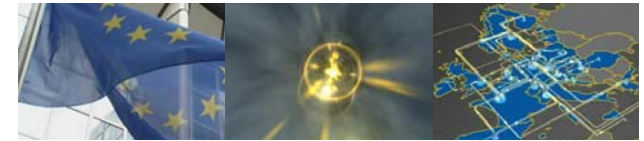
SRLG analysis (cont)



Connect. Communicate. Collaborate



SRLGs analysis (cont)



Connect. Communicate. Collaborate

ASGC

(Between STRASBOURG/KEHL and KARLSRUHE)

USLHCNET Chicago (VSNL S)

MAY be in a SRLG with EITHER

All GEANT2-provided lambdas + USLHCNET NY (VSNL N) [COLT]

OR

DFN-provided lambdas [GRIDKA-CNAF, GRIDKA-IN2P3]

or NEITHER

[awaiting info from Qwest...] [awaiting info from Interoute...]

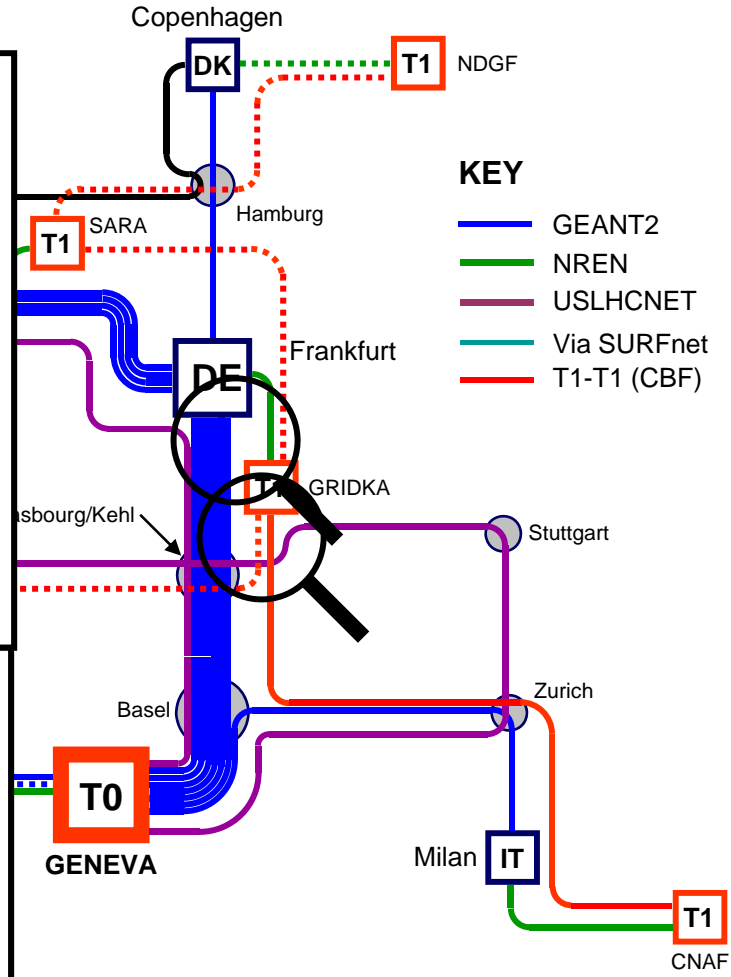
(Near Frankfurt airport)

Following lambdas MAY run in same (sub-)duct/trench:

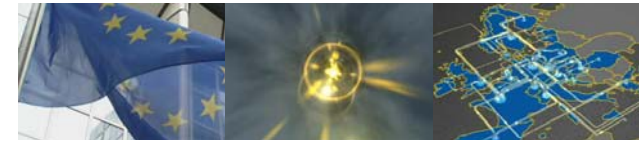
(for a distance of ~1.4km near the "Frankfurter Kreuz")

All GEANT2-provided lambdas + USLHCNET NY (VSNL N) [COLT]
 GRIDKA-SARA

[investigations ongoing...]



SRLGs analysis (cont)



Connect. Communicate. Collaborate

(Between HAMBURG and COPENHAGEN)

SARA-NDGF [T1-T1]

MAY be in a SRLG with

CERN-NDGF

[further investigations ongoing...] **[but see next slide...]**

(NOTE: Between HAMBURG and AMSTERDAM)

SARA-NDGF [T1-T1] and
GEANT2 NL-DK fibre

run in the same trench BUT

this is of no consequence to LHC OPN at the moment as no LHC OPN lambdas run over the GEANT2 fibre

(Between FRANKFURT and AMSTERDAM)

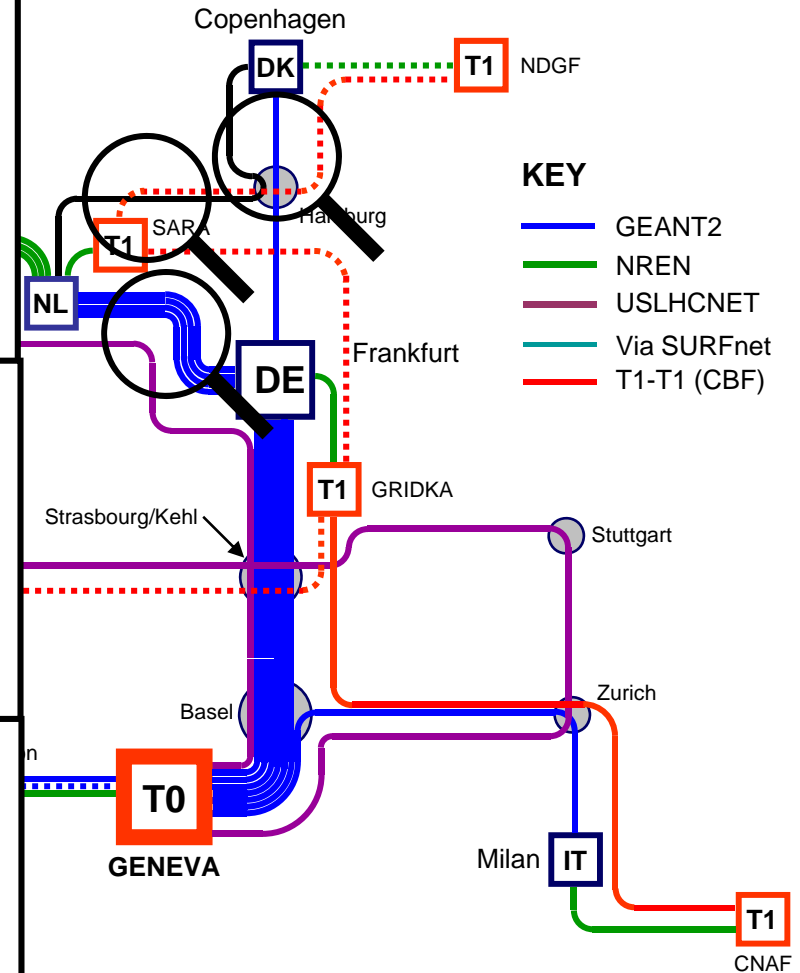
Following lambdas run in same fibre pair:

CERN-SARA
CERN-SURFnet-TRIUMF/ASGC (x2)
USLHCNET NY (AC-2)

Following lambdas MAY run in same (sub-)duct/trench:

(all above +)
USLHCNET NY (VSNL N) [supplier is VSNL along this section]

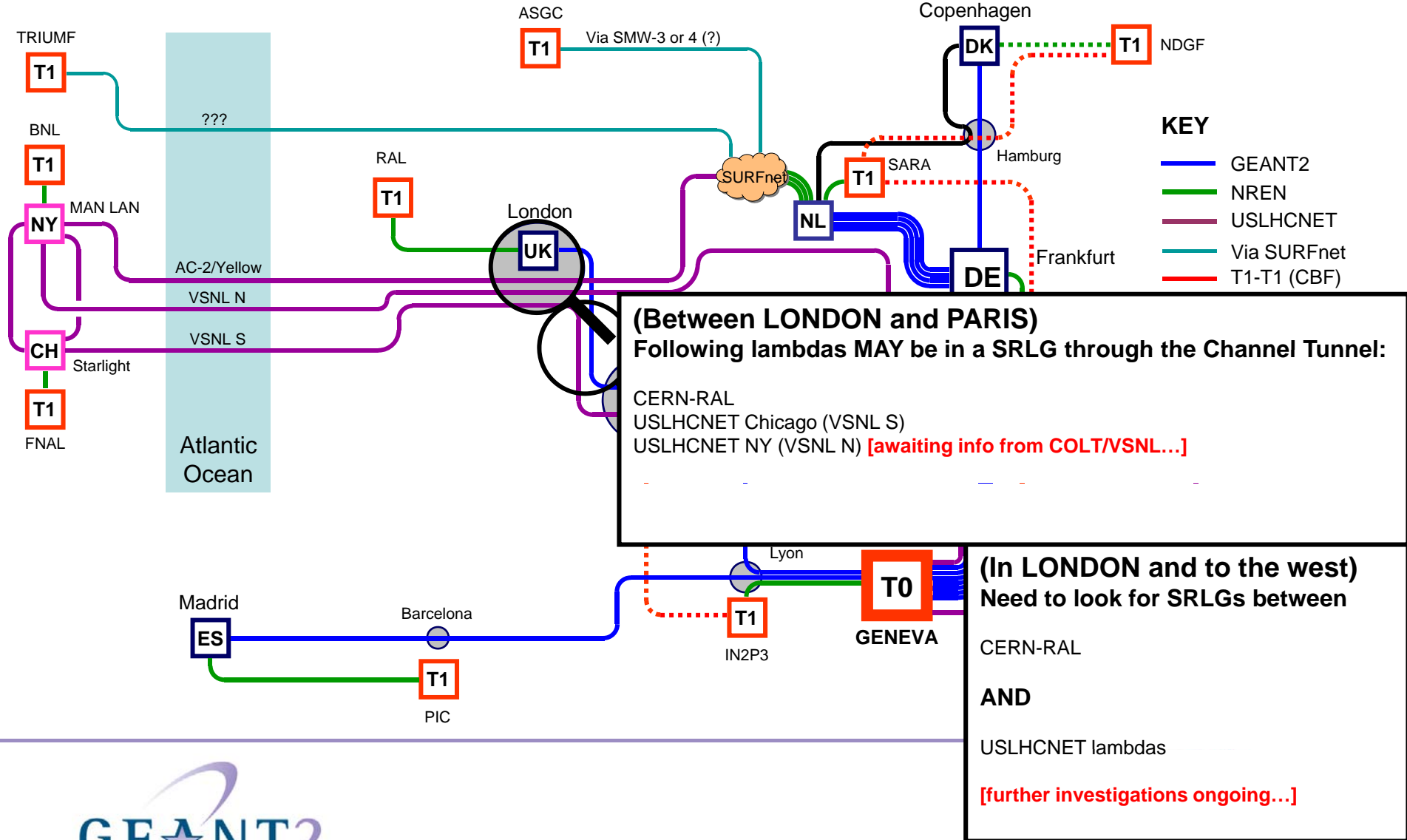
[further investigations ongoing...]



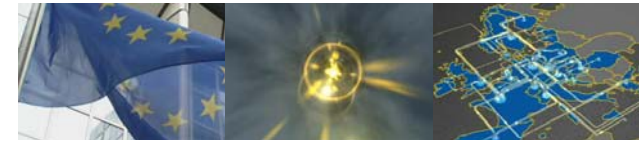
SRLGs analysis (cont , last two!)



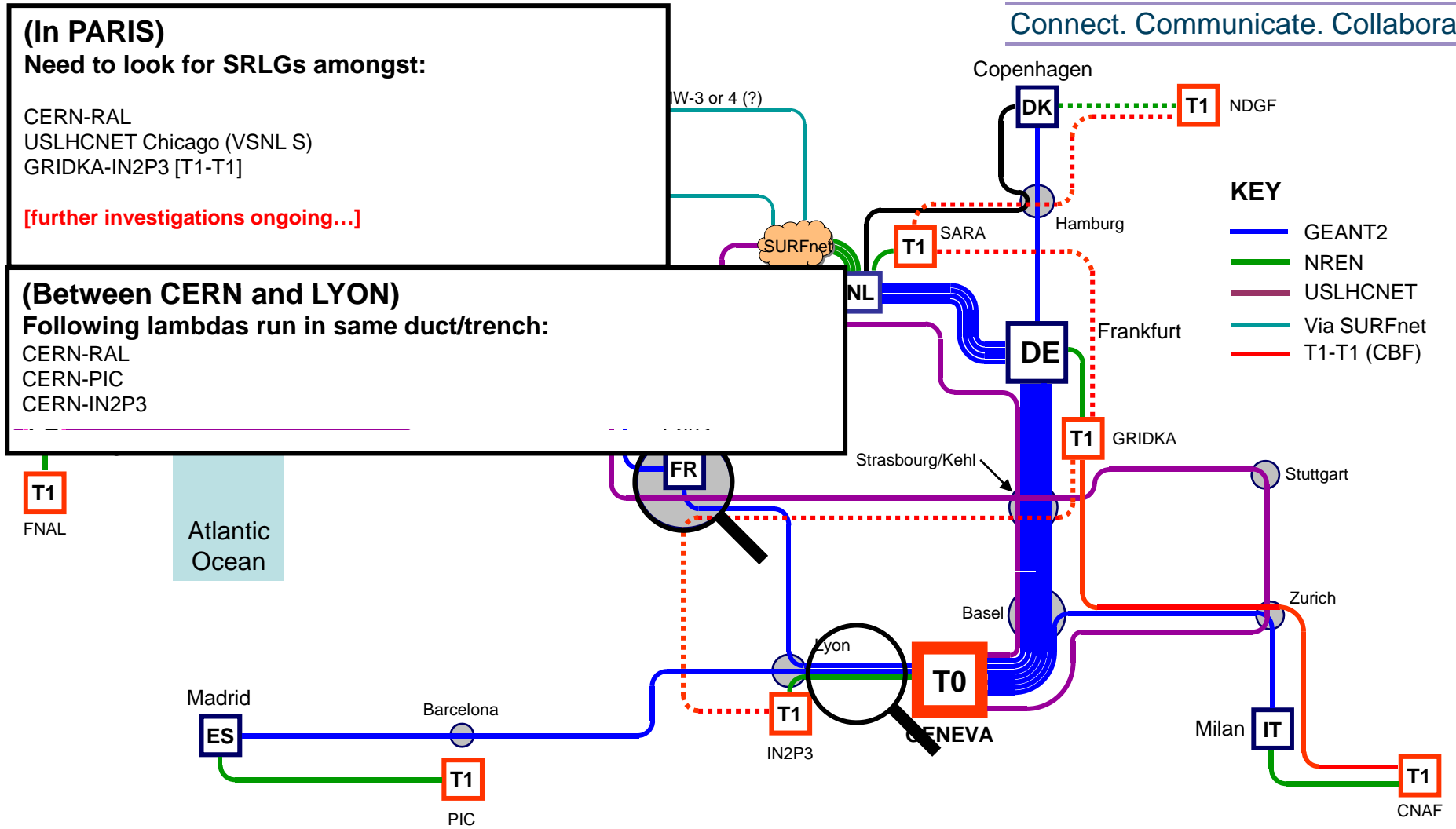
Connect. Communicate. Collaborate



SRLGs analysis (cont)



Connect. Communicate. Collaborate





Connect. Communicate. Collaborate

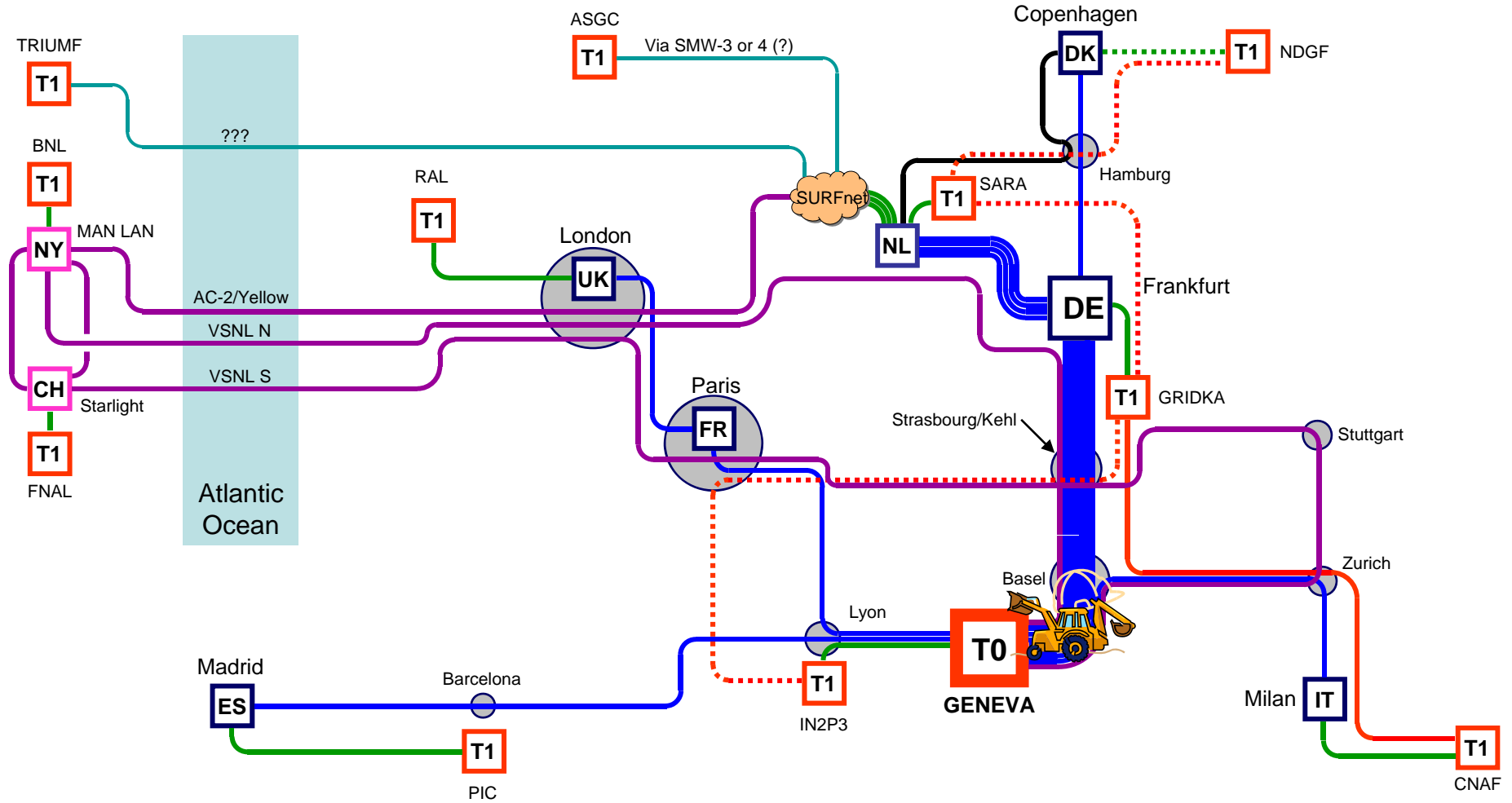
Failure scenarios



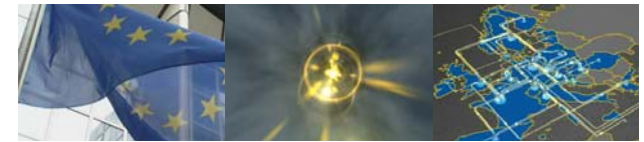


Big fibre cut Basel-CERN

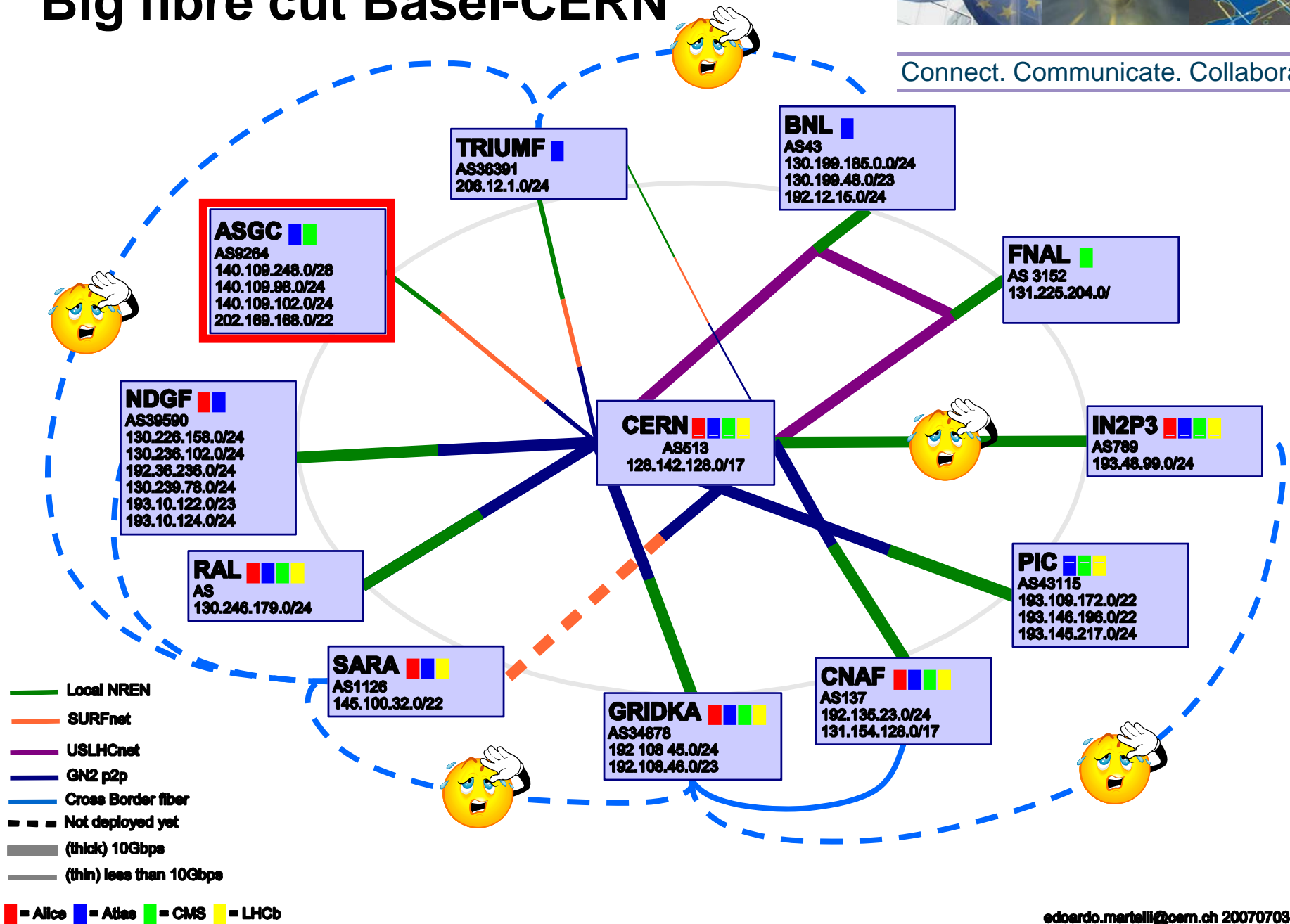
Connect. Communicate. Collaborate

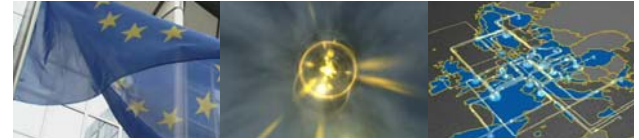


Big fibre cut Basel-CERN



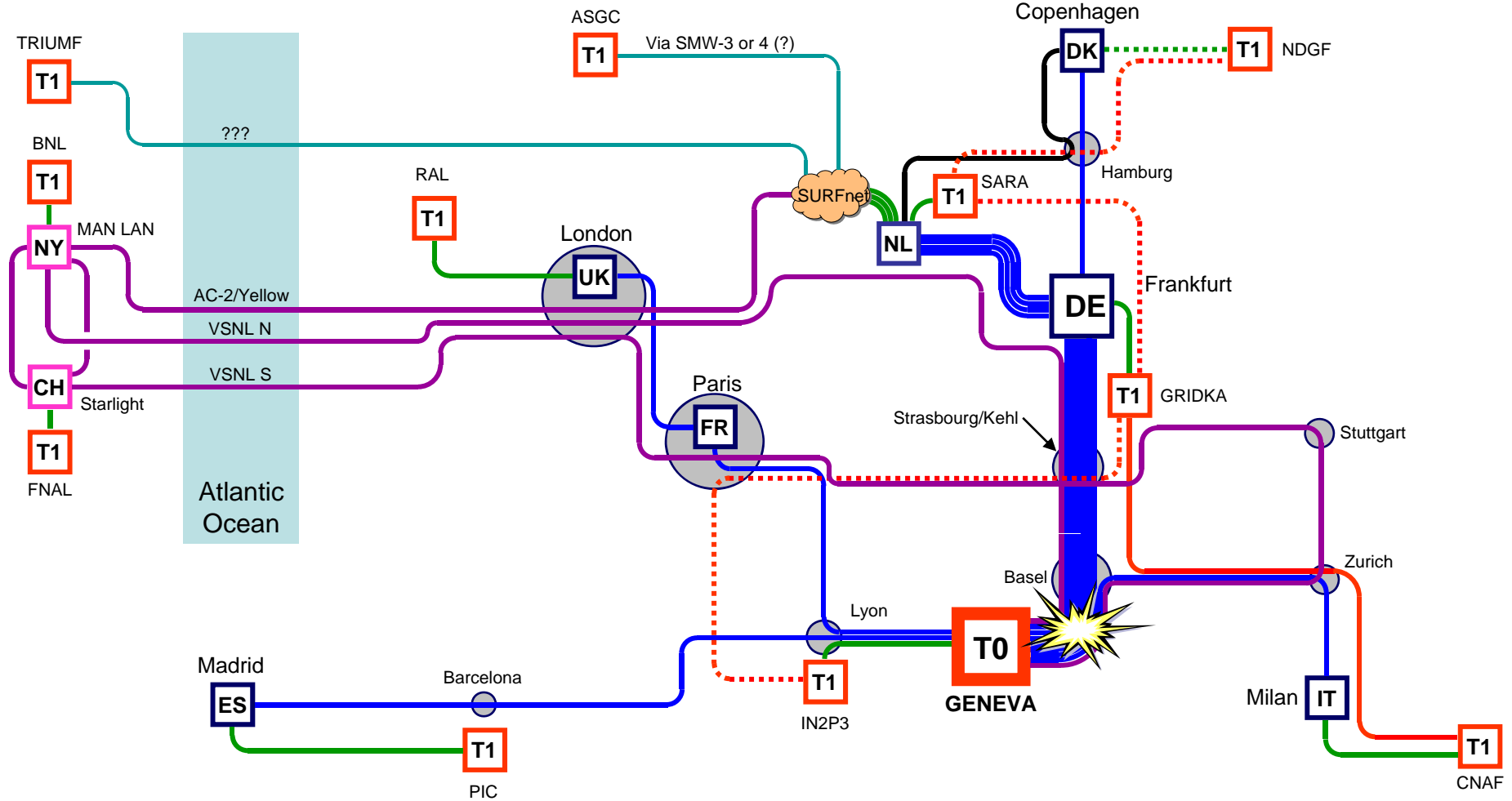
Connect. Communicate. Collaborate





GÉANT2 Fra-Gen EDFA failure

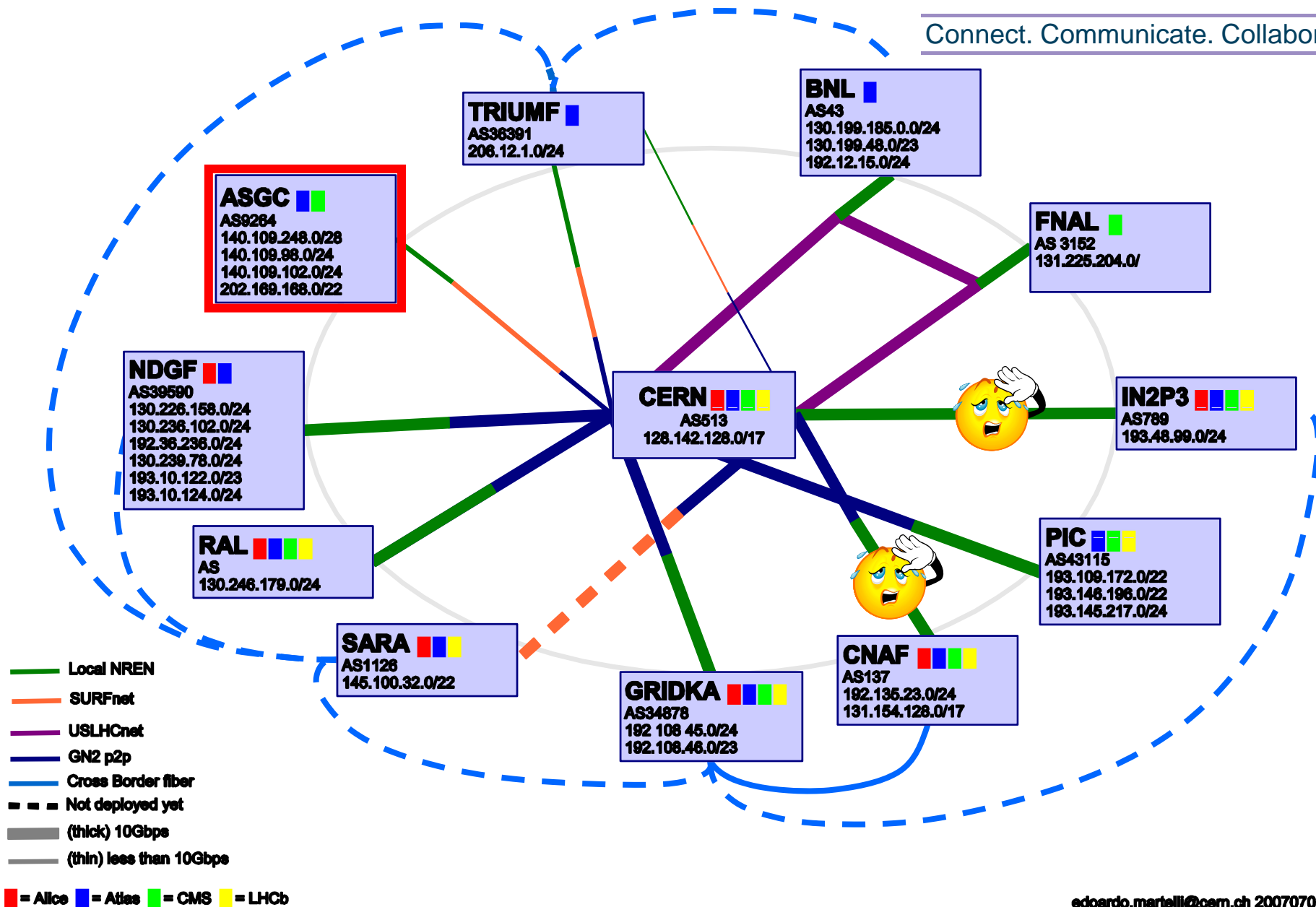
Connect. Communicate. Collaborate

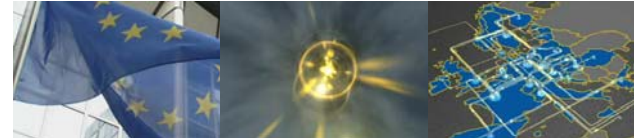


GÉANT2 Fra-Gen EDFA failure



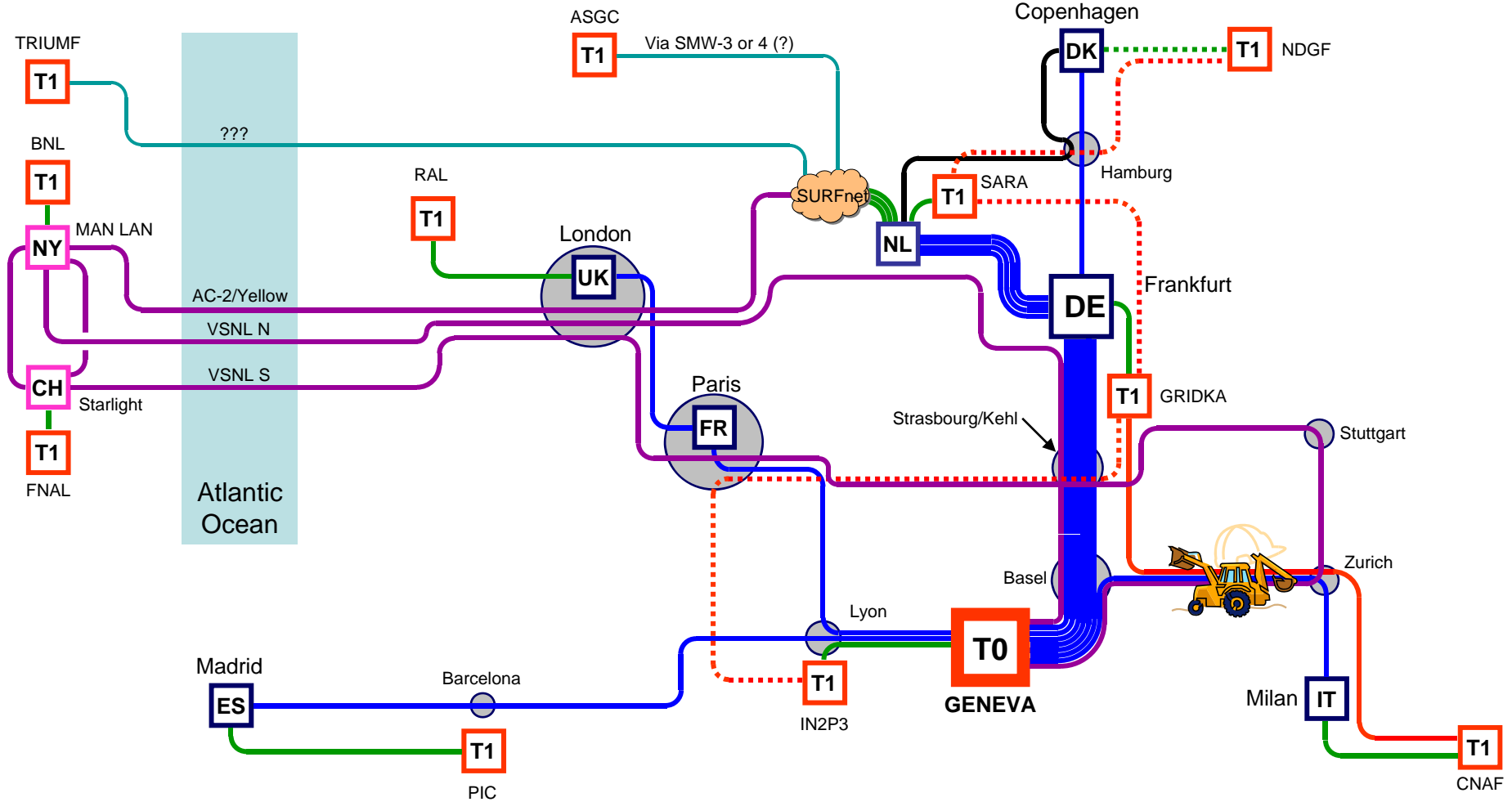
Connect. Communicate. Collaborate



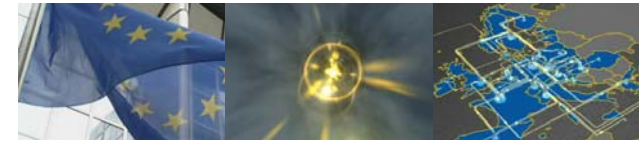


Big fibre cut Zurich-Basel

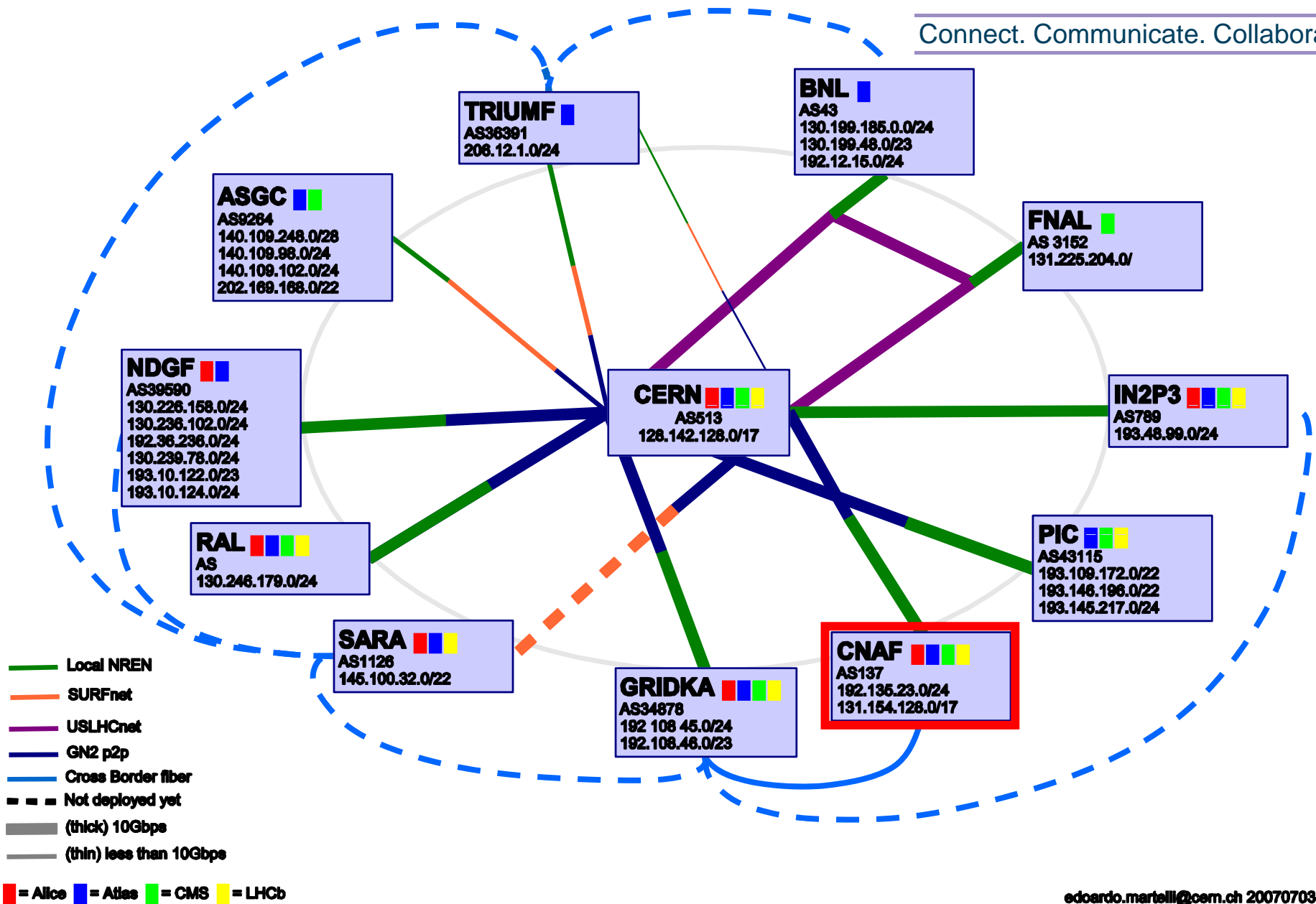
Connect. Communicate. Collaborate



Big fibre cut Zurich-Basel



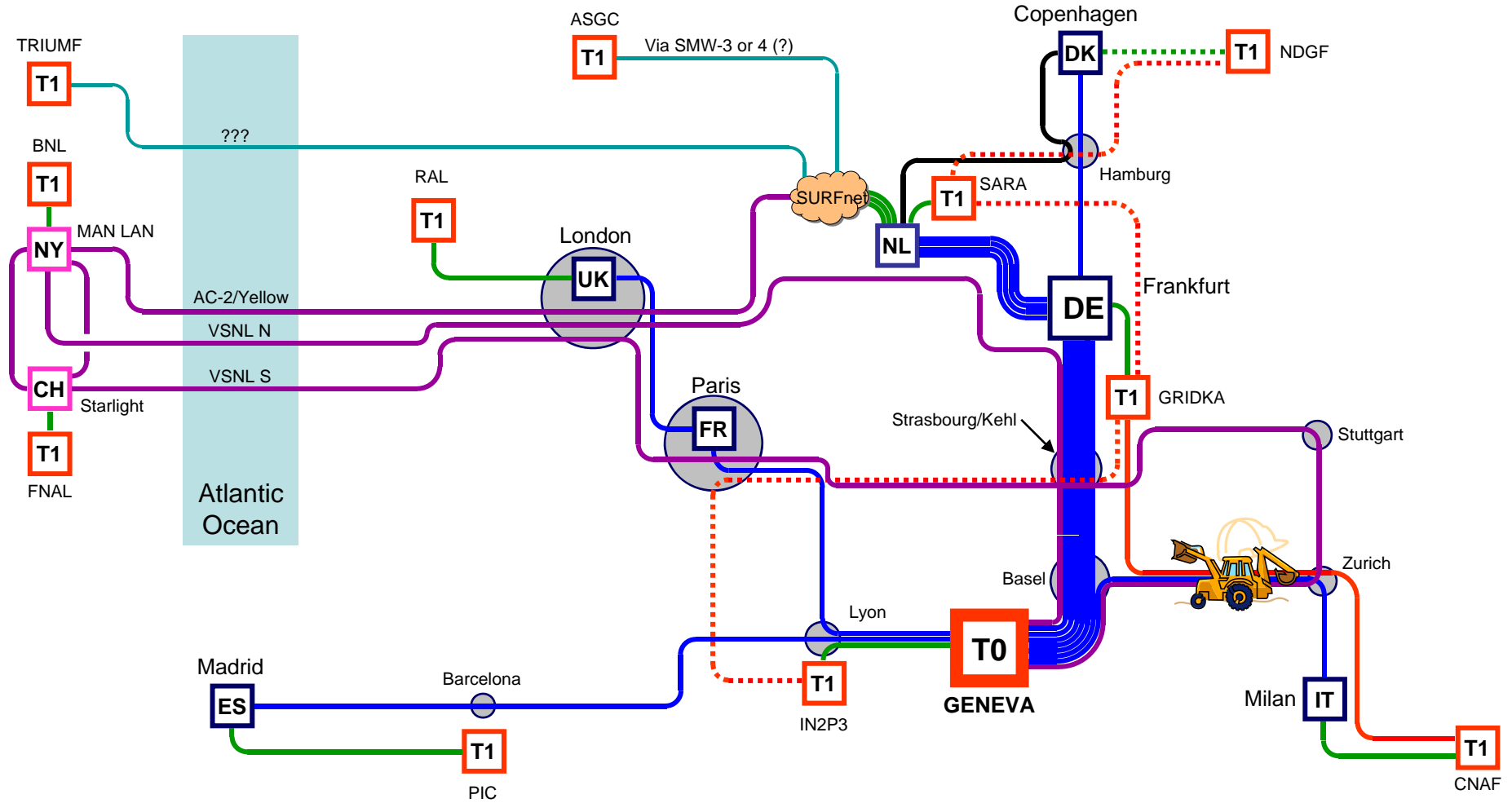
Connect. Communicate. Collaborate



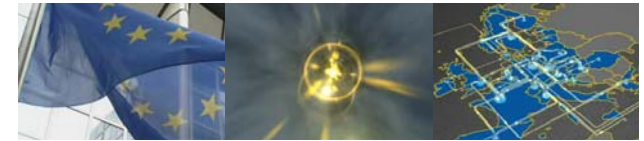


Big fibre cut Strsbrg/Kehl-Basel

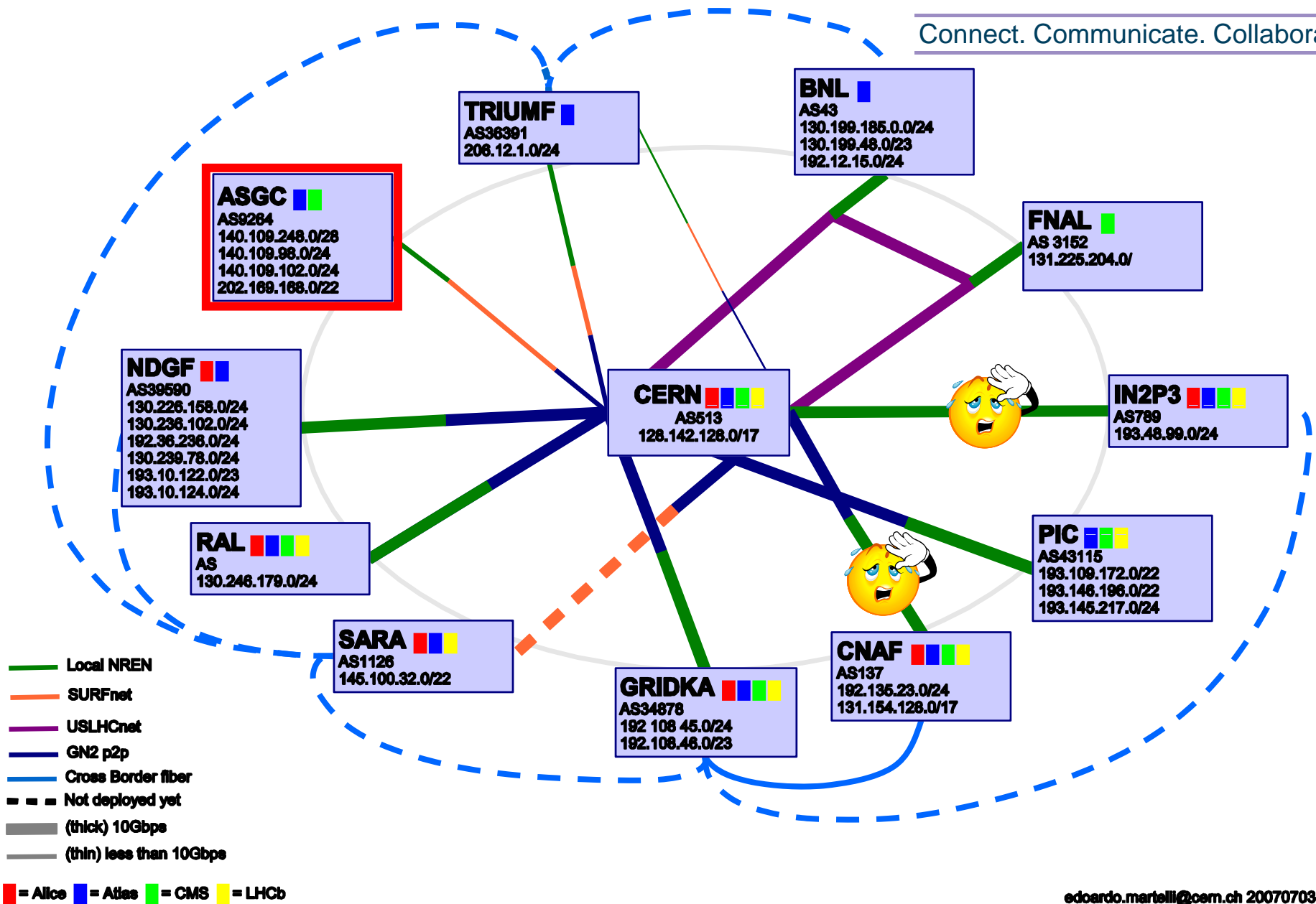
Connect. Communicate. Collaborate



Big fibre cut Strsbrg/Kehl-Base



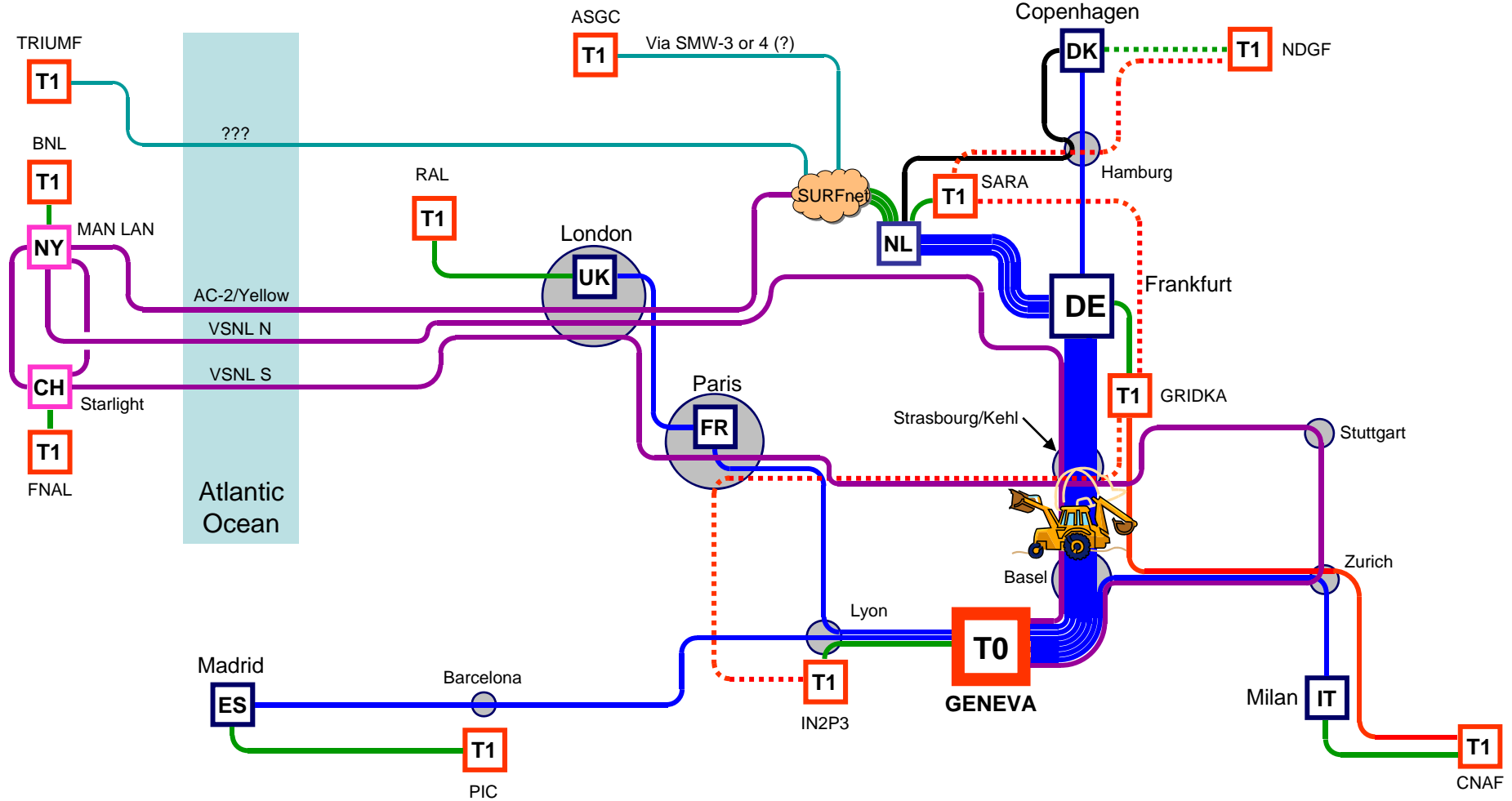
Connect. Communicate. Collaborate



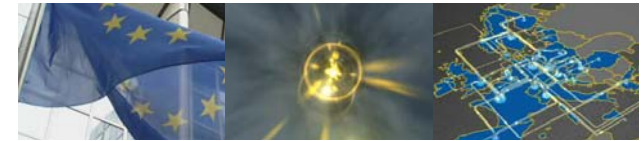


Big fibre cut in Strasbourg area

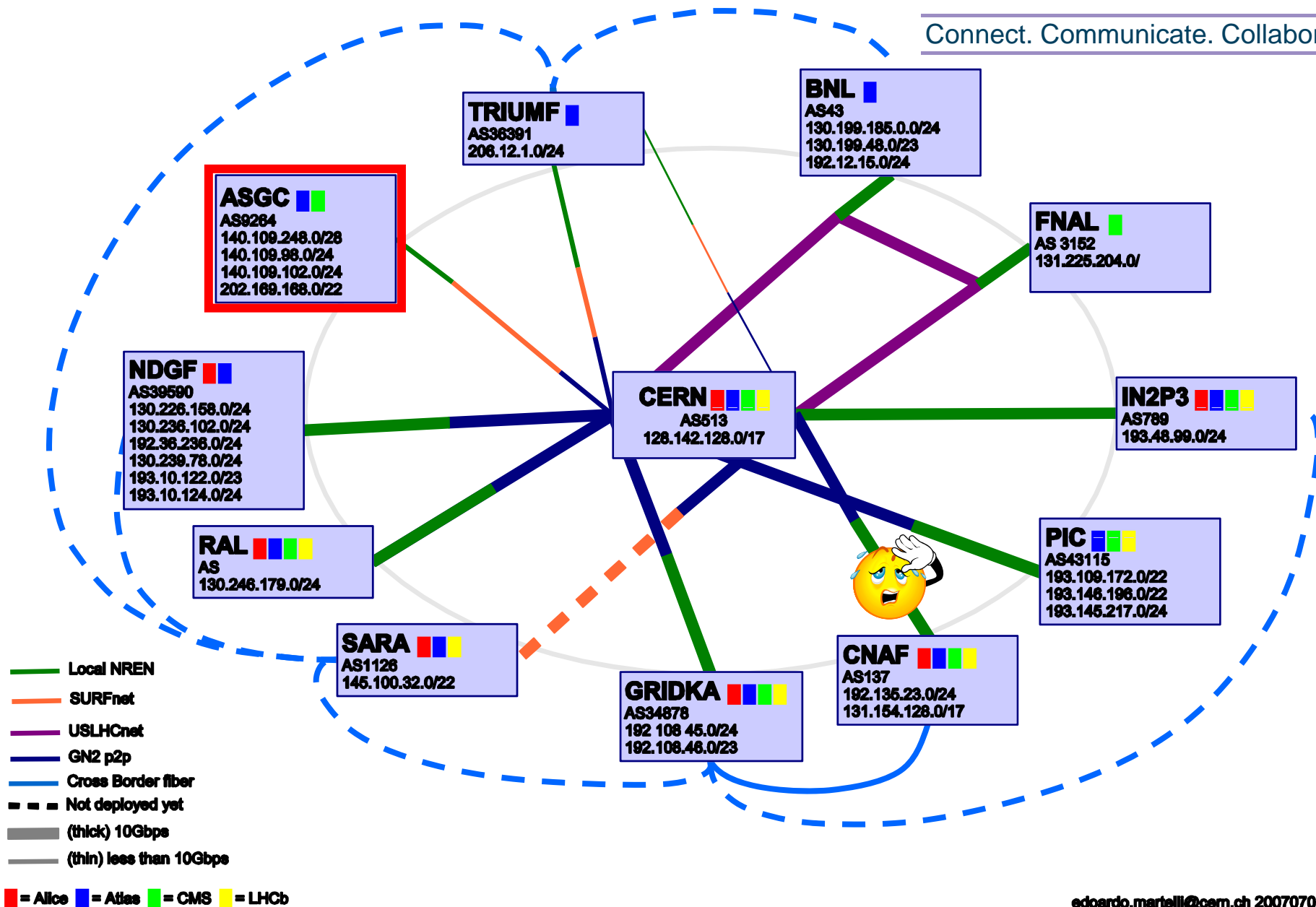
Connect. Communicate. Collaborate



Big fibre cut in Strasbourg area



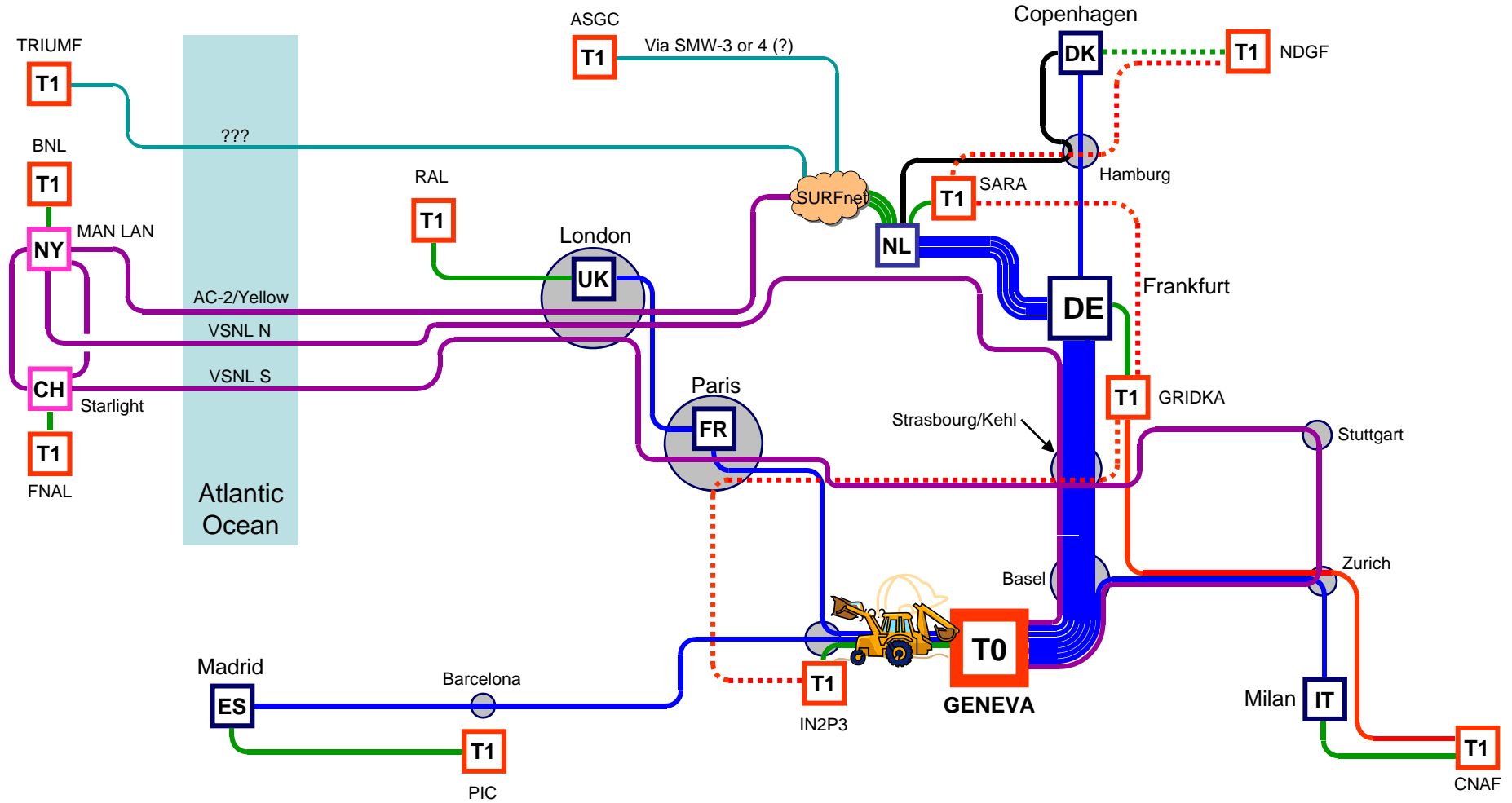
Connect. Communicate. Collaborate



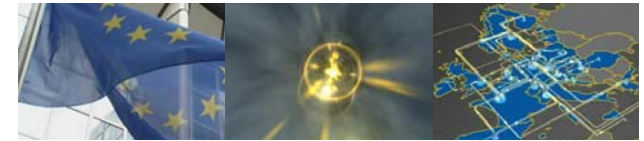


Big fibre cut Lyon-CERN

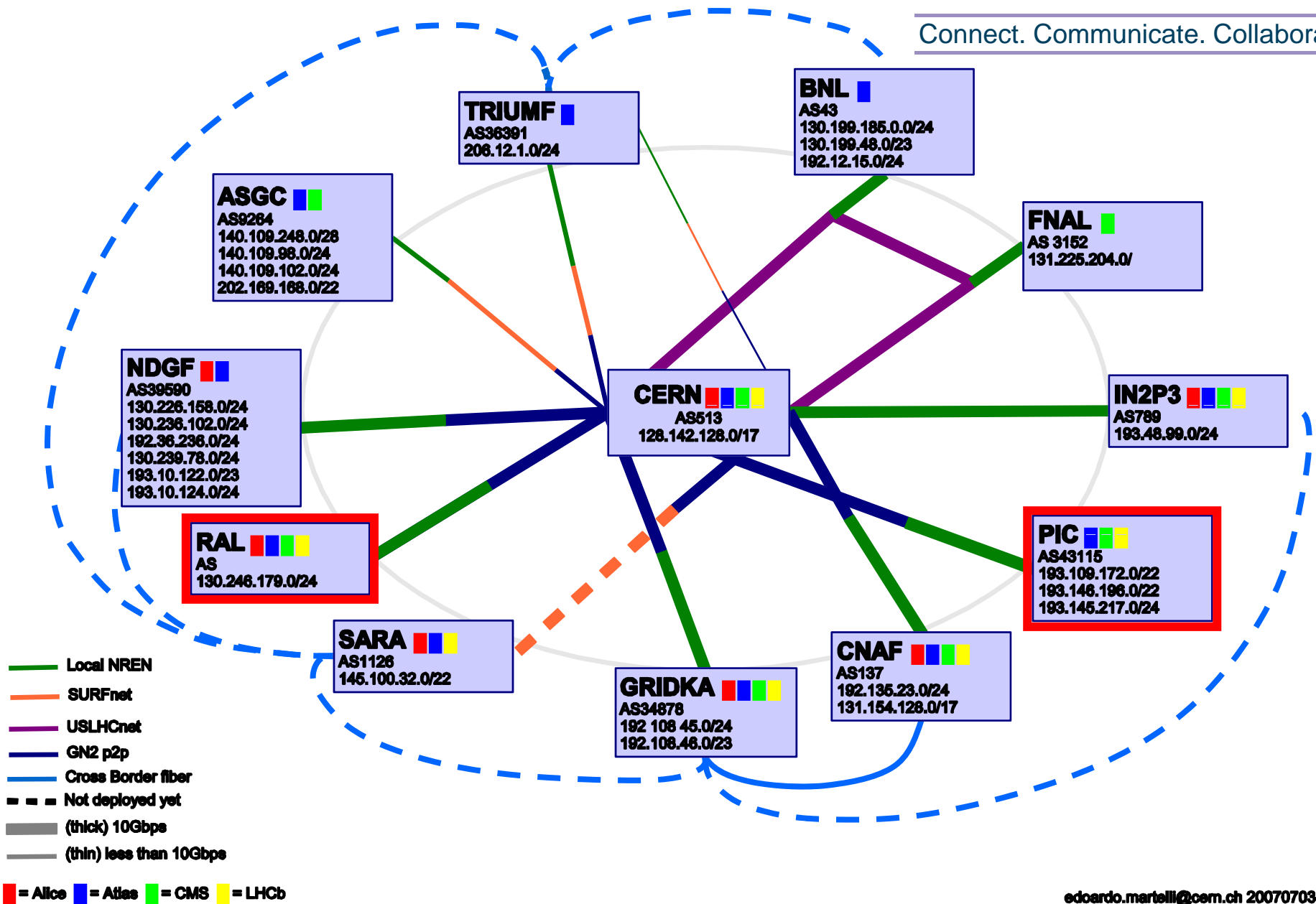
Connect. Communicate. Collaborate



Big fibre cut Lyon-CERN



Connect. Communicate. Collaborate



Mitigations...



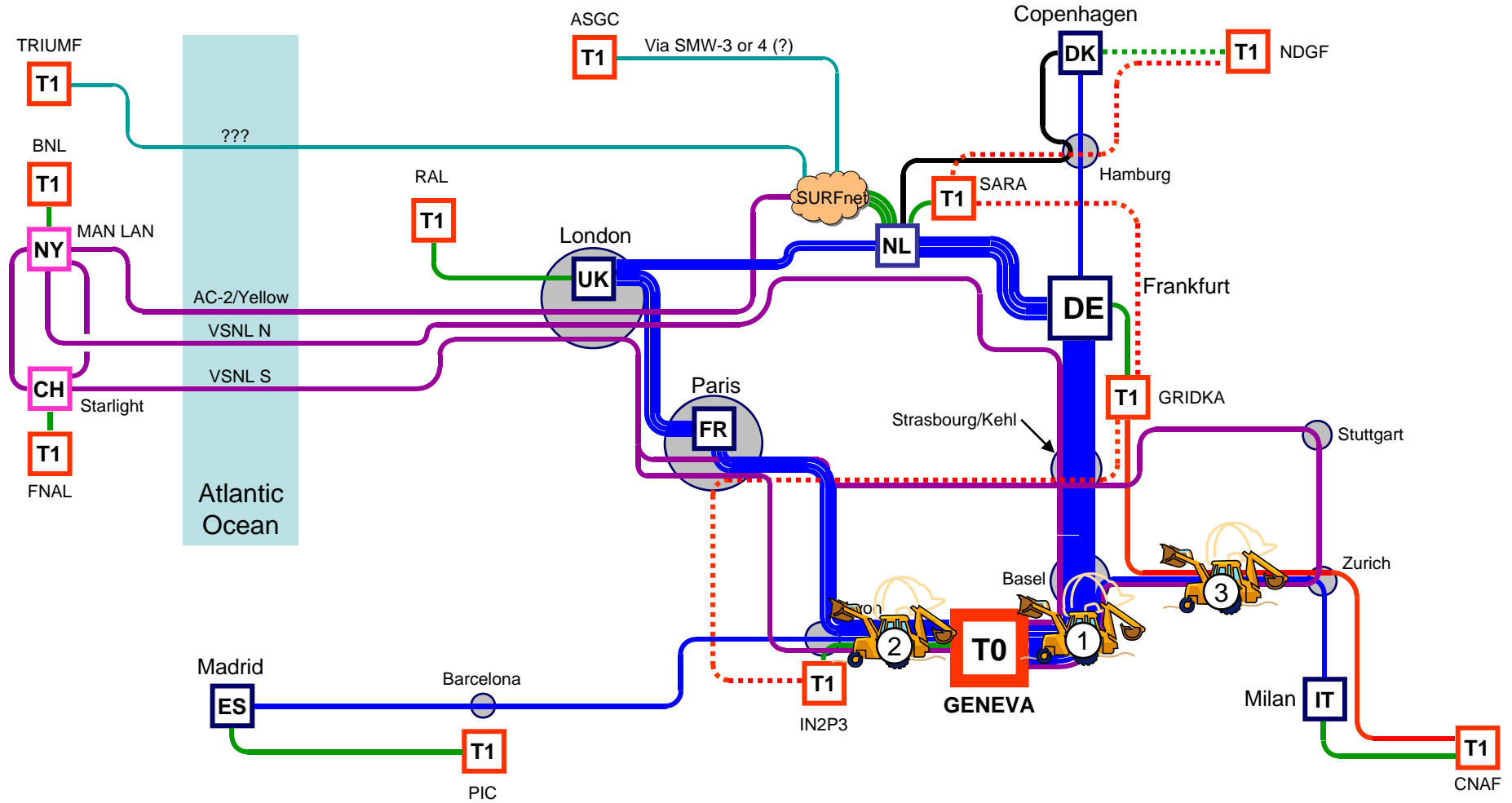
Connect. Communicate. Collaborate



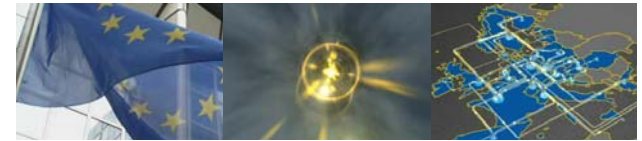


Route 3 lambdas via Lyon

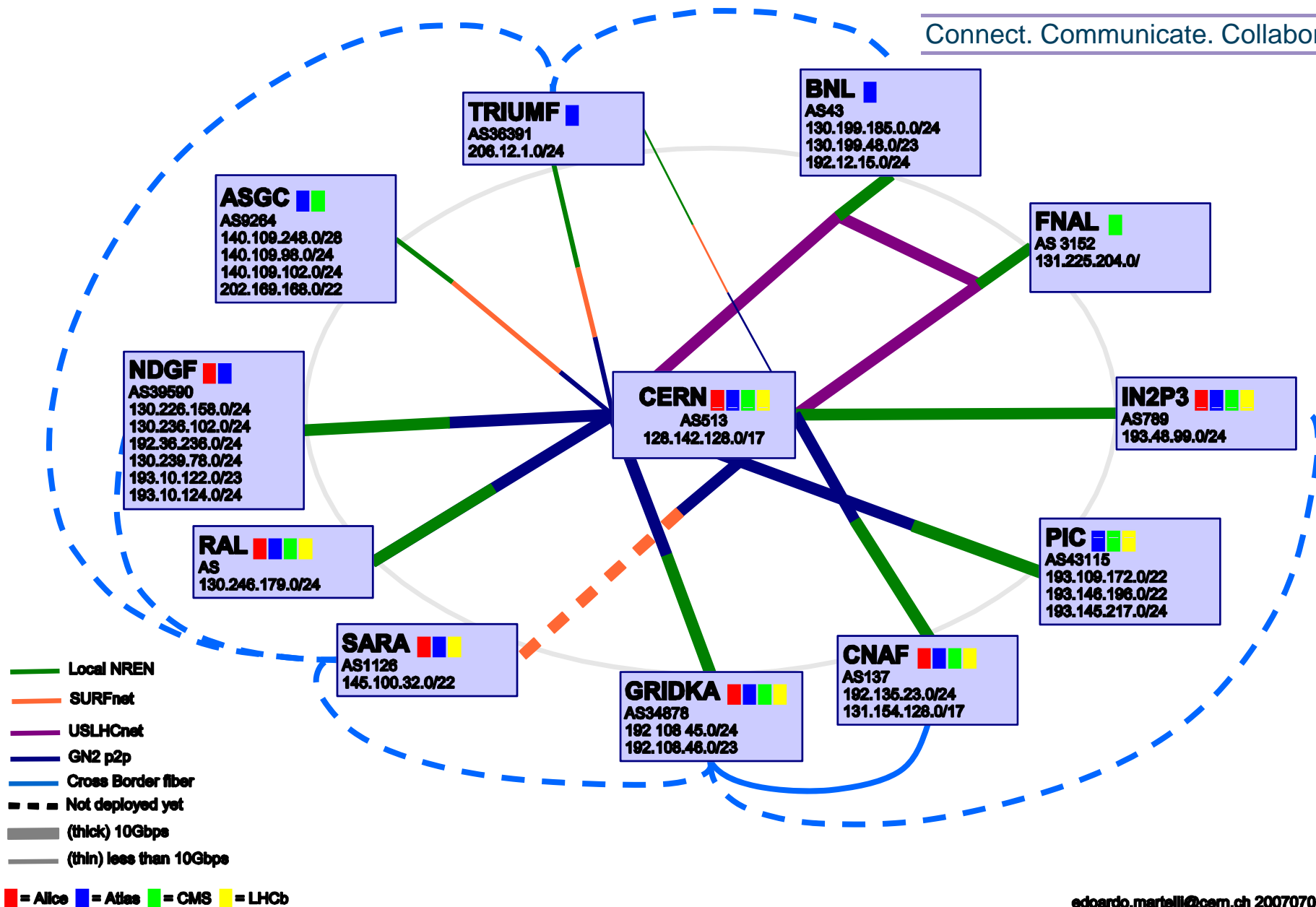
Connect. Communicate. Collaborate



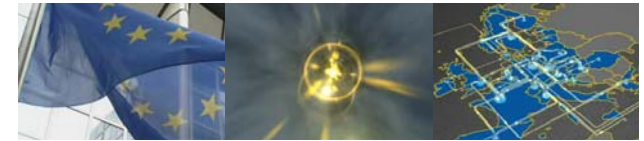
Big fibre cut Basel-CERN



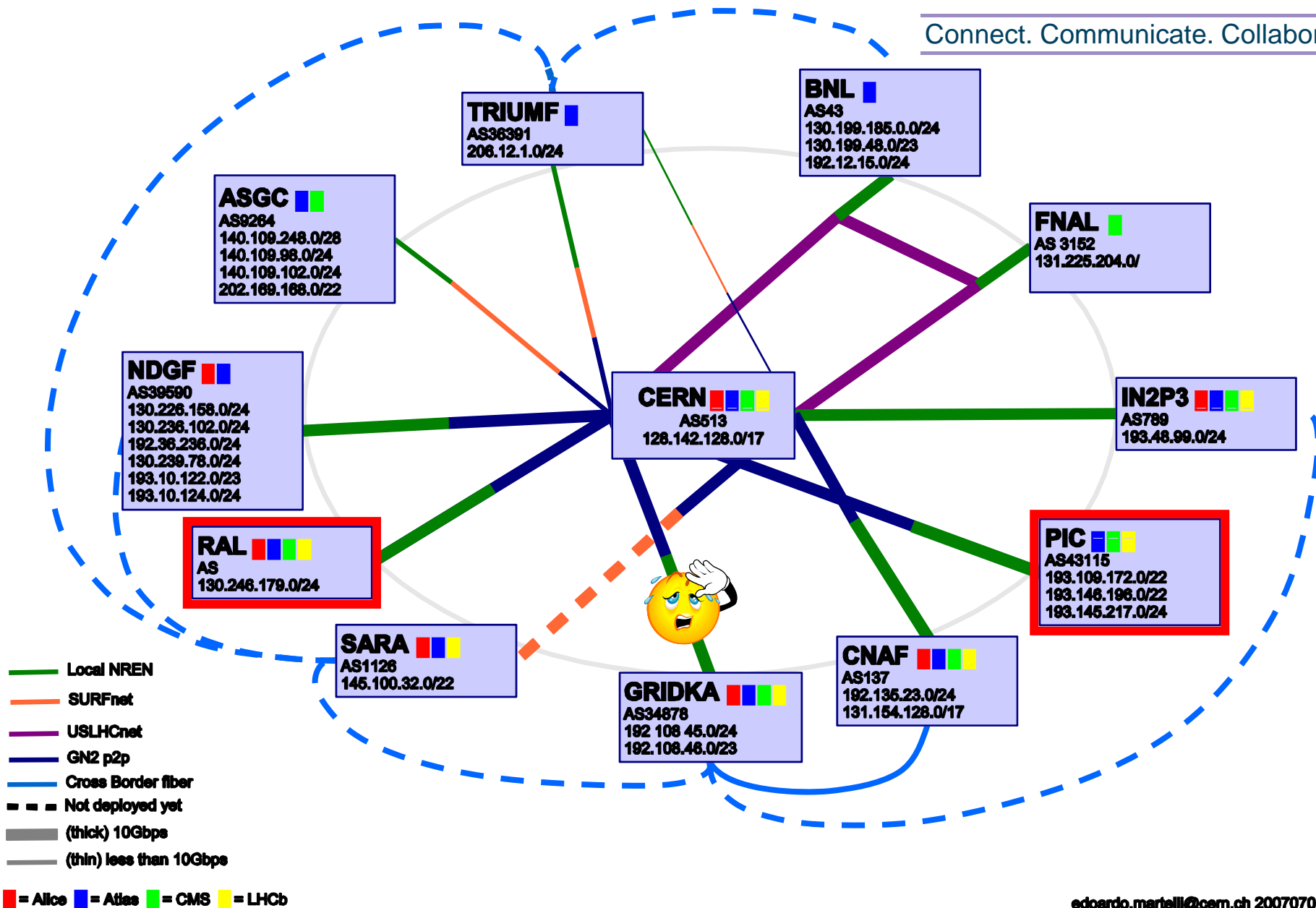
Connect. Communicate. Collaborate



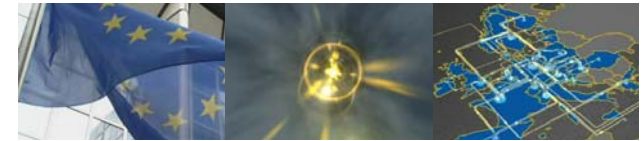
Big fibre cut Lyon-CERN



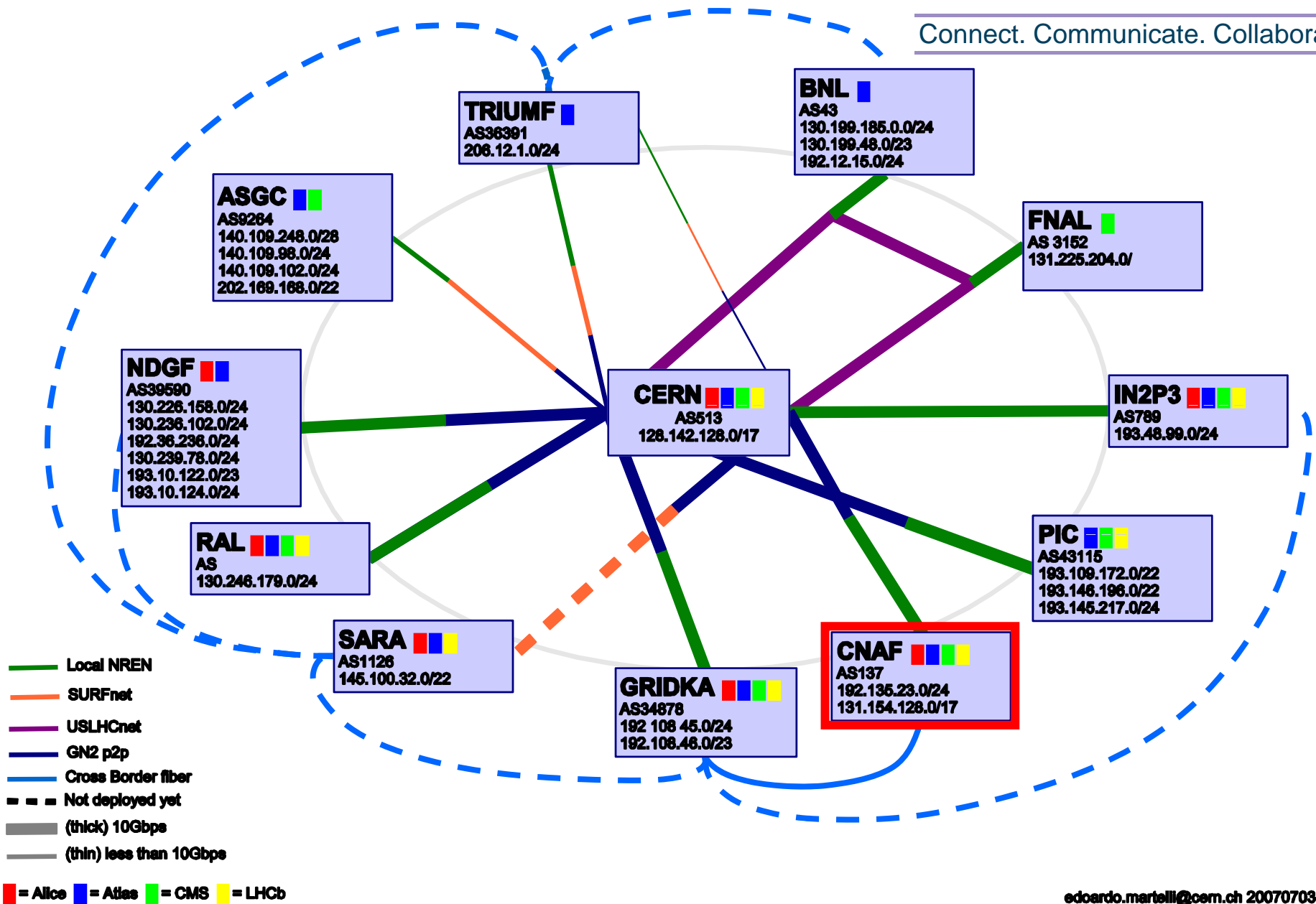
Connect. Communicate. Collaborate



Big fibre cut Zurich-Basel



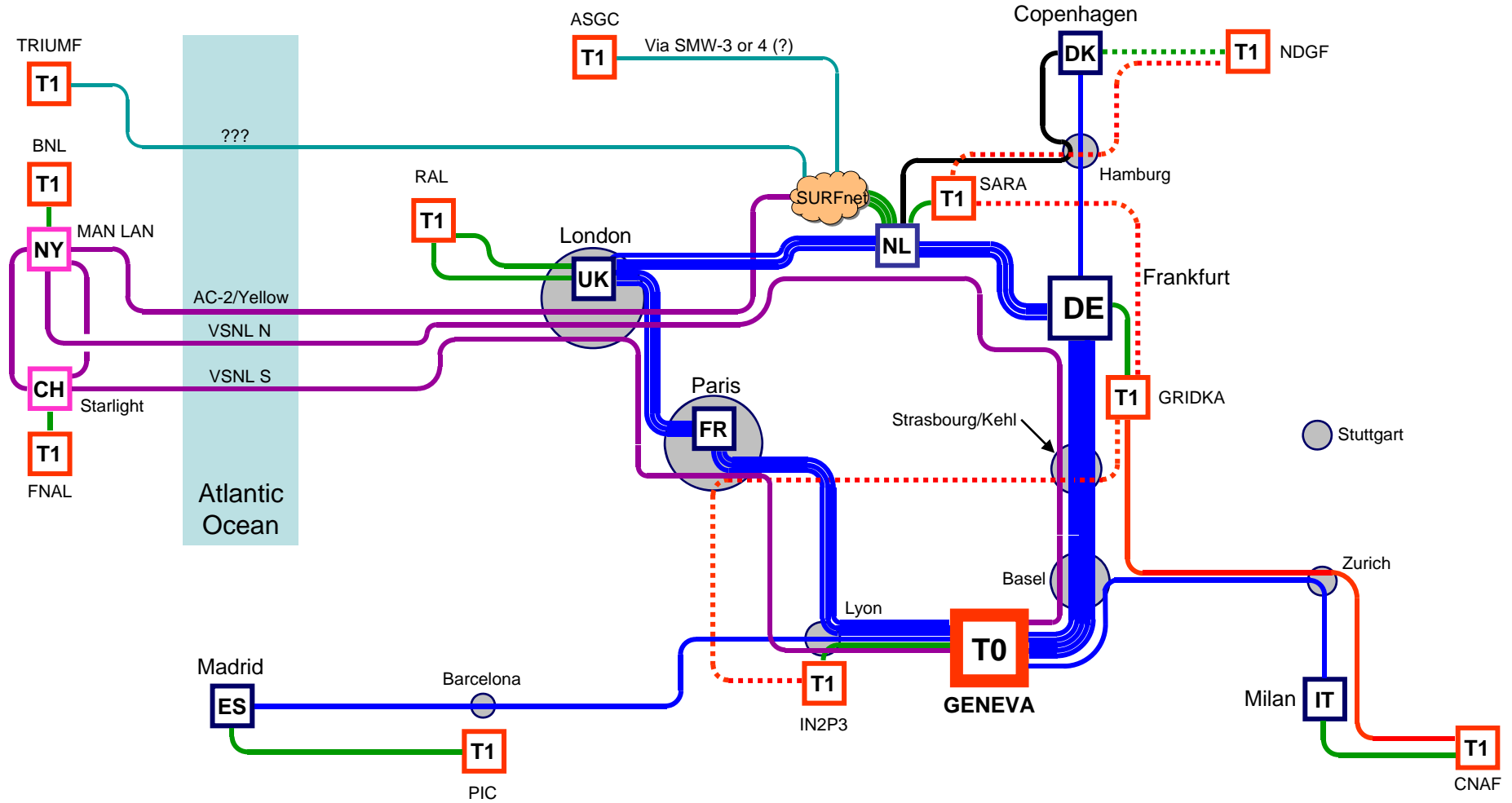
Connect. Communicate. Collaborate





Add RAL backup via Frankfurt

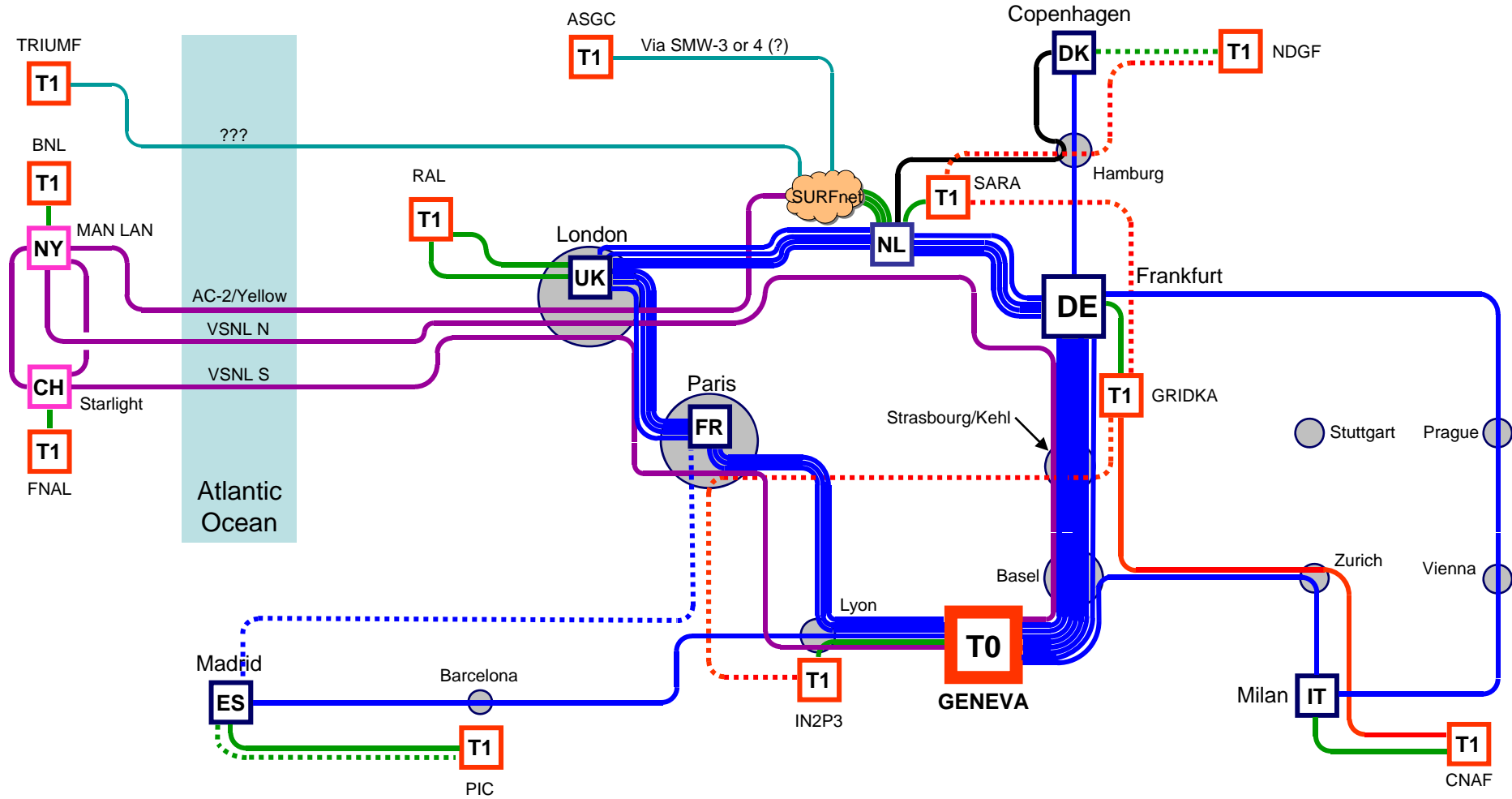
Connect. Communicate. Collaborate



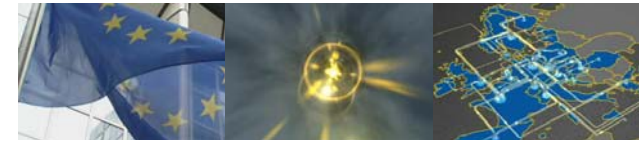


Add PIC backup via Paris

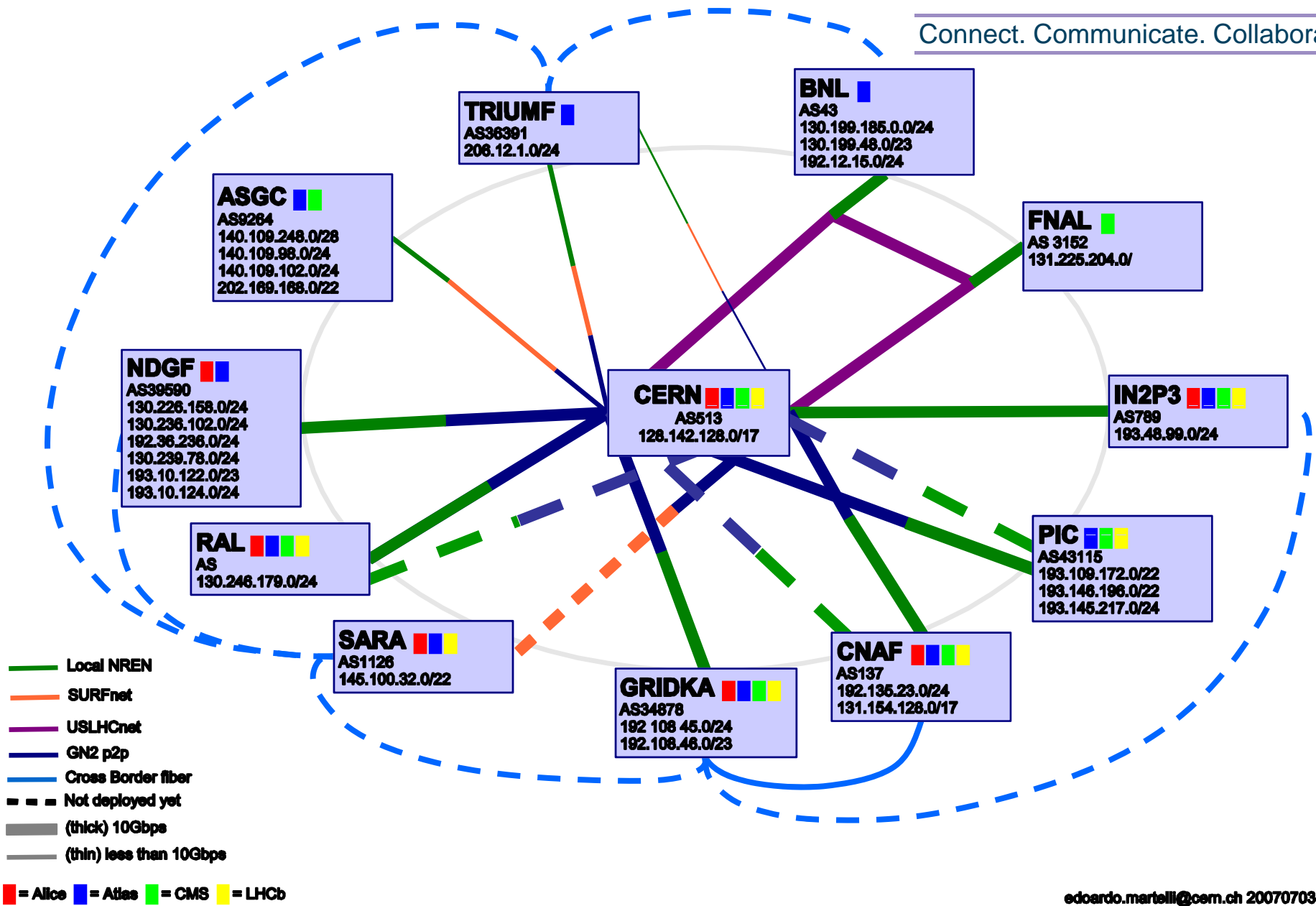
Connect. Communicate. Collaborate



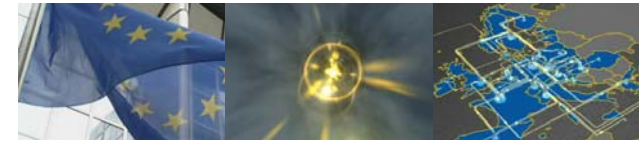
Big fibre cut Basel-CERN



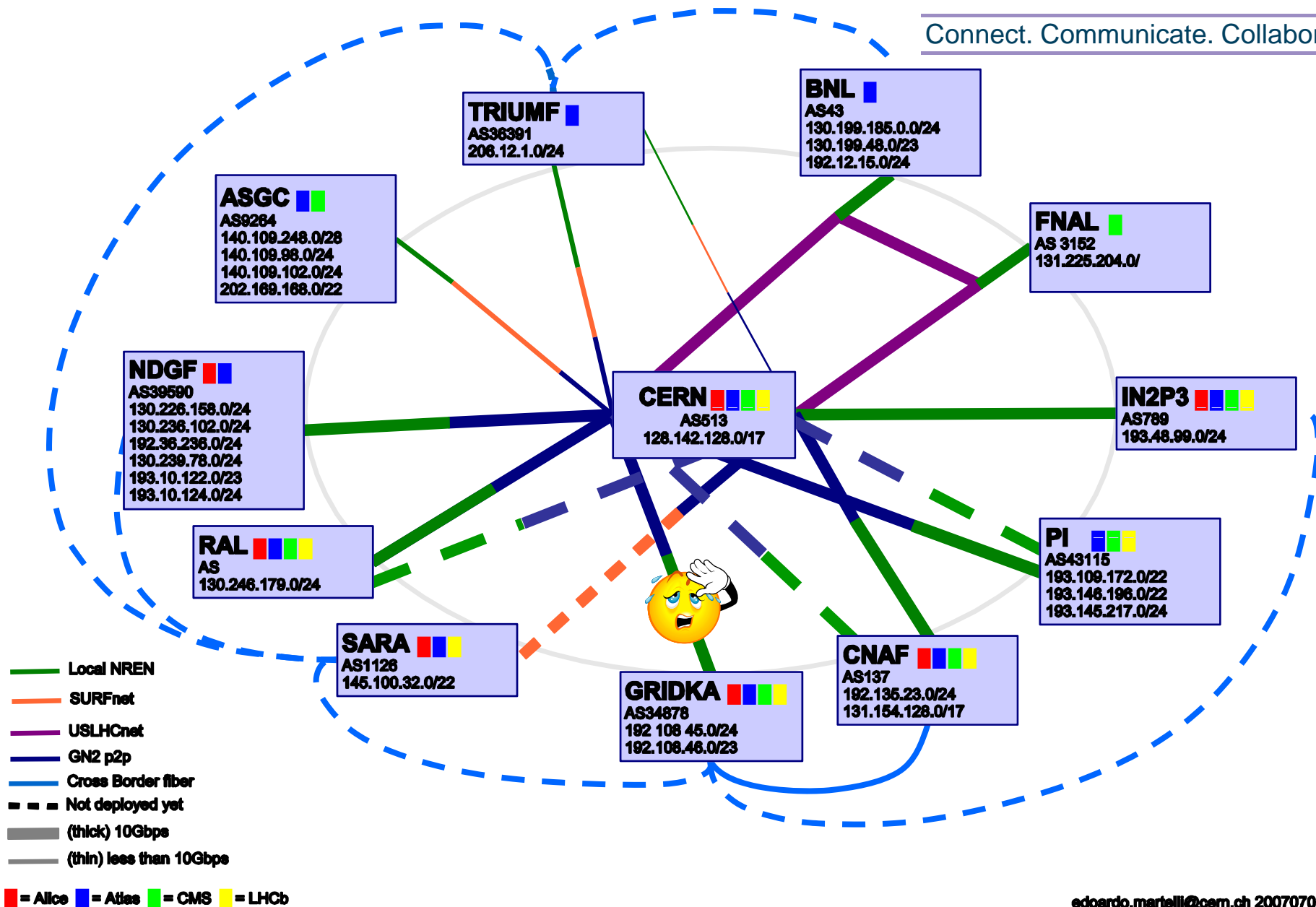
Connect. Communicate. Collaborate



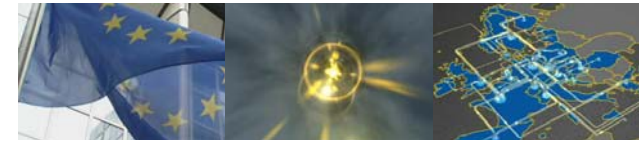
Big fibre cut Lyon-CERN



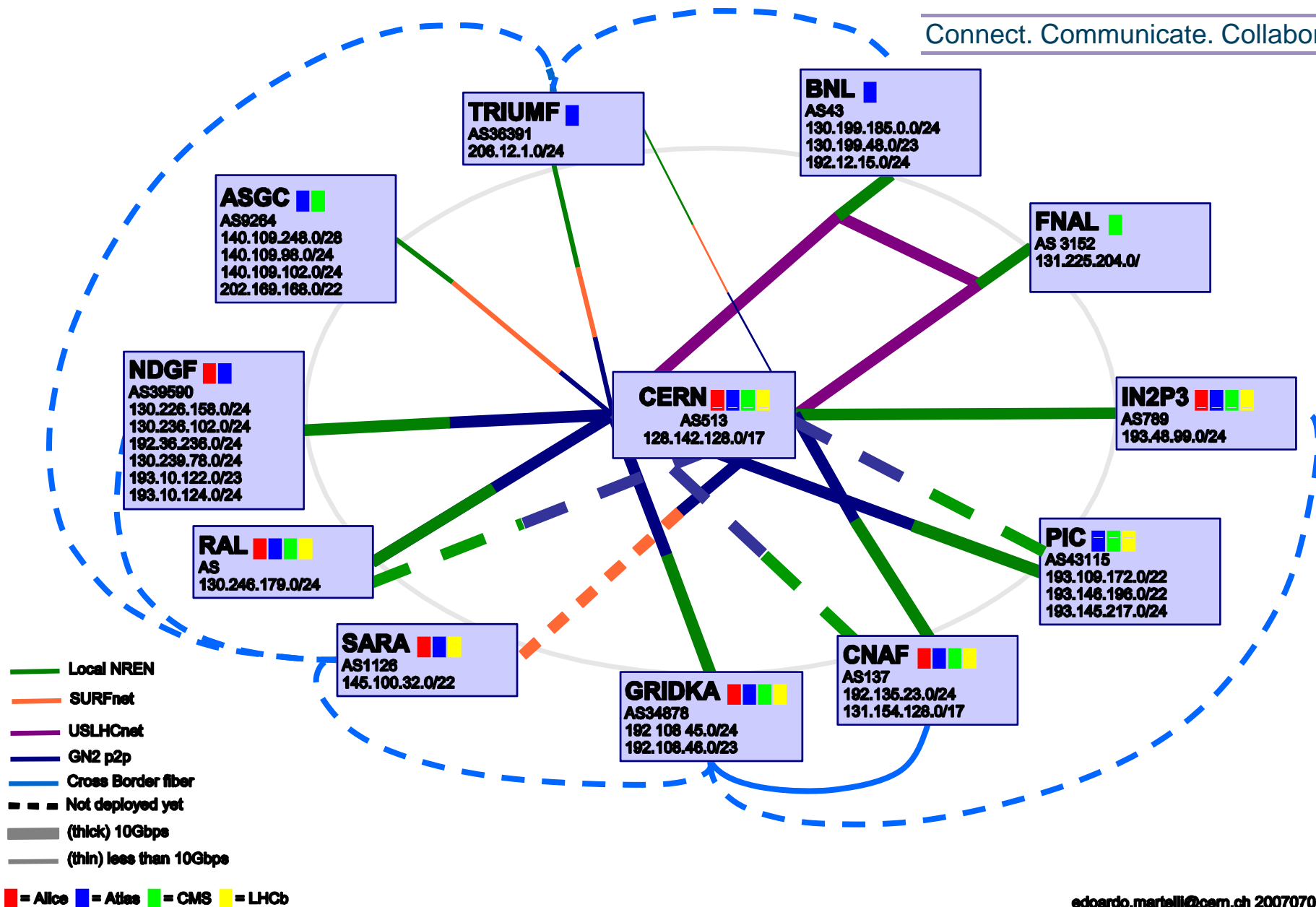
Connect. Communicate. Collaborate



Big fibre cut Zurich-Basel



Connect. Communicate. Collaborate





Connect. Communicate. Collaborate

Conclusions

- RAL & PIC need backups!!!
- CNAF needs a 3rd route into CERN
- Reroute 2 Amsterdam-CERN lambdas via Lyon
- Reroute USLHCNET (FNAL-CERN) via Lyon
- SARA-NDGF should be routed on northern leg of NORDUnet's "Southern Cross" (for Cop-Ham part)
 - via Padborg, Kolding, Odense
- Further investigations required in particular concerning:
 - Physical routing of GRIDKA-IN2P3 in Paris area
 - Leased lambdas passing through London