RENATER
CONNECTEUR DE SAVOIRS

Updates of RENATER 6 network and REFIMEVE monitoring tools

REFIMEVE 2020 General Assembly

Outlines

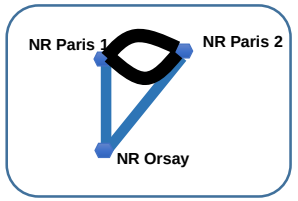
- RENATER-6 DWDM network
  - Evolutions since 2018 and work in progress
- Ongoing REFIMEVE+ link implementation
- Monitoring REFIMEVE equipment
  - NOC monitoring
  - Internal procedures
- Interactions with NOC RENATER

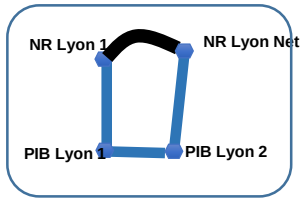
RENATER-6 DWDM network
Evolutions since 2018 (1/5)

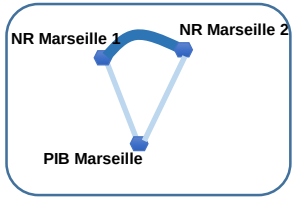
- Infinera closes acquisition of Coriant end of 2018
  - One of the largest fully vertically integrated optical network equipment providers in the world Infinera Corporation (NASDAQ:INFN)
  - Ex-Coriant portfolio still upgraded
  - ODUc2 deployed between Paris 1 ⇔ Lyon 1 (16QAM)
- Routing
  - Cisco ASR9000
- Network strategies
  - Connectivity between each site will be increased up to 2x100Gbps (improved resilience)
  - Internet traffic between sites aims for 60 Gbps

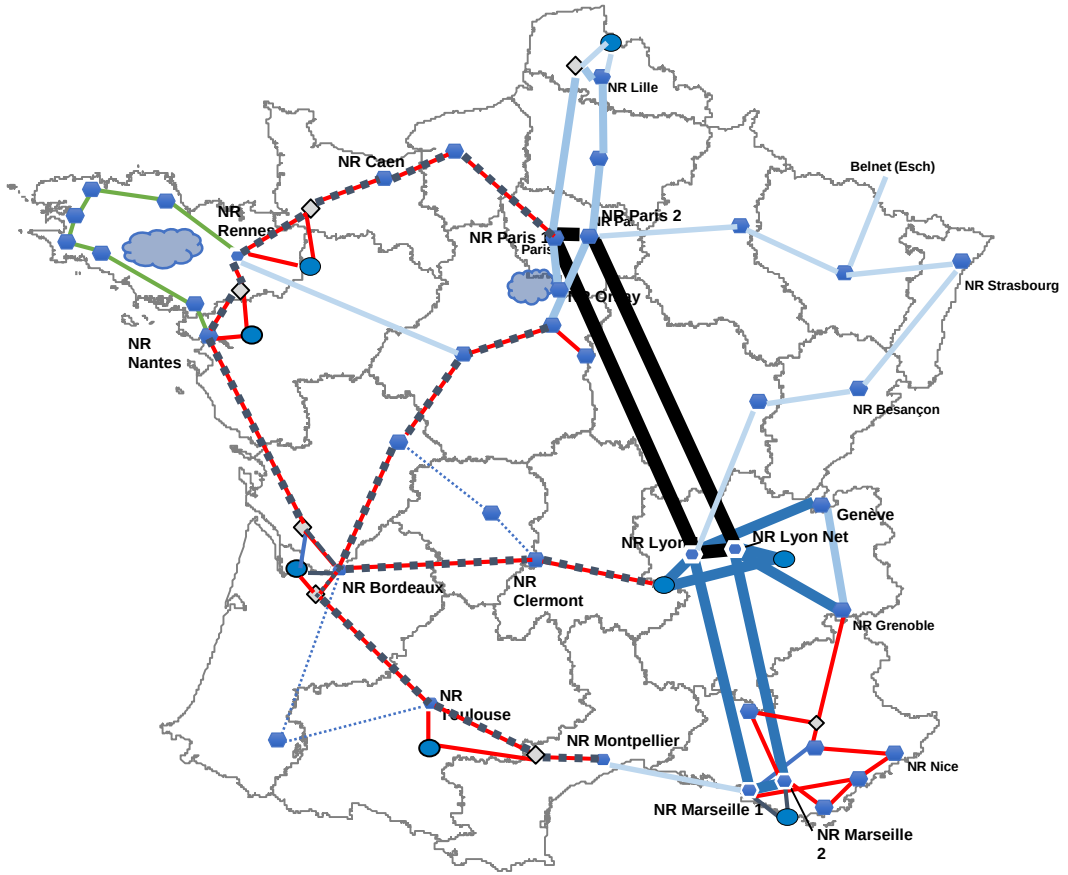
RENATER-6 DWDM network

Evolutions since 2018 (2/5)









DWDM/OTN optical coherent network

- 1 x 100G Infinera mTera/Hit7300
- 2 x 100G Infinera mTera/Hit7300
- 3 x 100G Infinera mTera/Hit7300
- 4 or more 100G Infinera mTera/Hit7300

Alien wavelengths

- 100G Infinera AW on Ciena layer

Access Network

- G.8032 Infinera (Ring architecture)

RENATER 5 DCM/DWDM transmission network

- Alcatel Lucent 1830 PSS : 2 x 10G
- Ciena CN4200 : n x 10G

Other

- Bandwidth

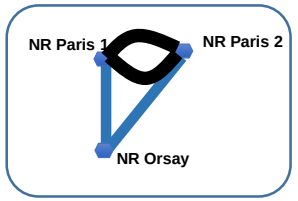
Point of Presence RENATER

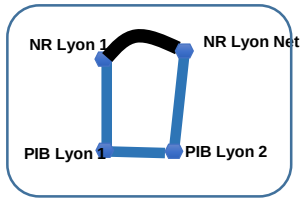
- NR
- PIB

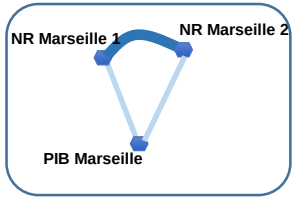
RENATER-6 DWDM network

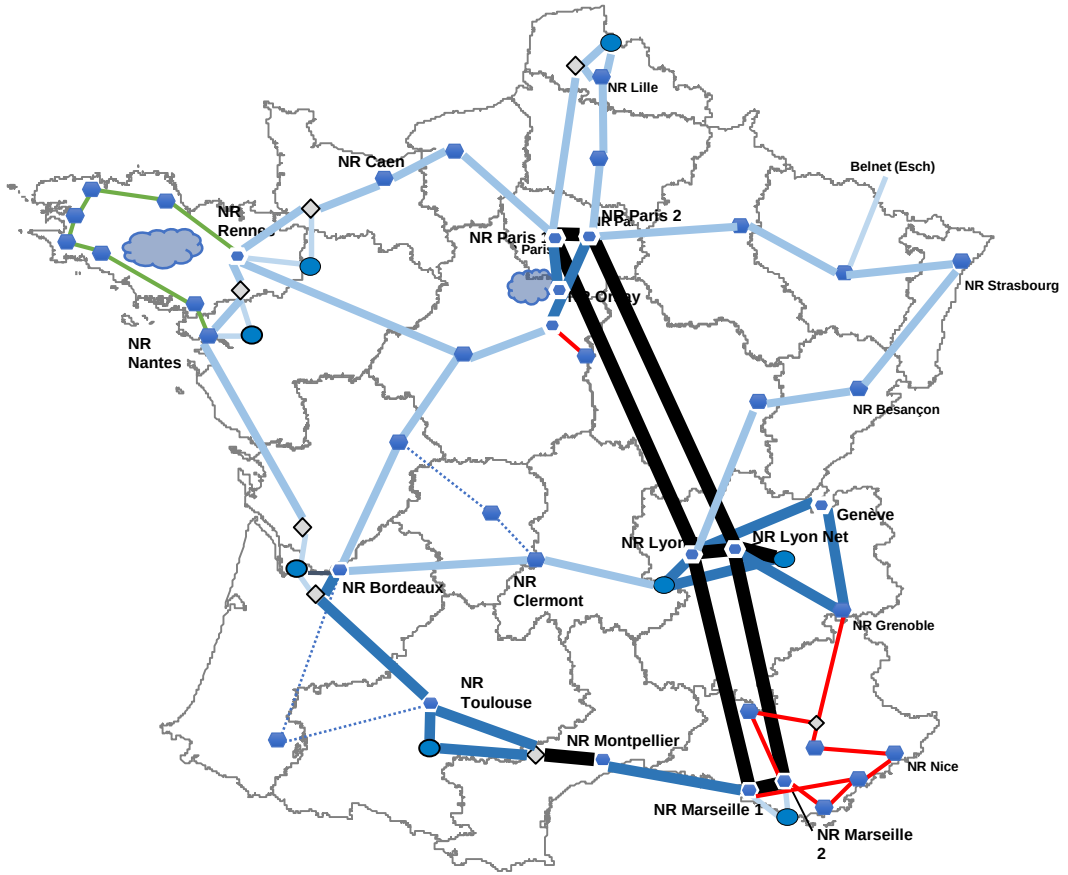
Evolutions since 2018 (3/5)

By end of 2021









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Point of Presence RENATER

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RENATER-6 DWDM network
Evolutions since 2018 (4/5)

- Fibres
  - Step 1 (12 000/ 15 000km till 2030)
    Migrations of Nancy ⇔ Strasbourg + Marseille ⇔ Montpellier
    New fibres path Tours – Rennes + Tours – Orléans + Tours – Poitiers
  - Step 2 (3 000 km in 2020 till 2030)
    Renew rest of the backbone
- Sites
  - PoP in Strasbourg, moved to new DC (same campus)
  - PoP in Nantes, is moving to new DC (same campus)
  - Geneva racks moved in an other room
  - Netcenter (new site)
  - Tours (new site)

RENATER-6 DWDM network
Evolutions since 2018 (5/5)

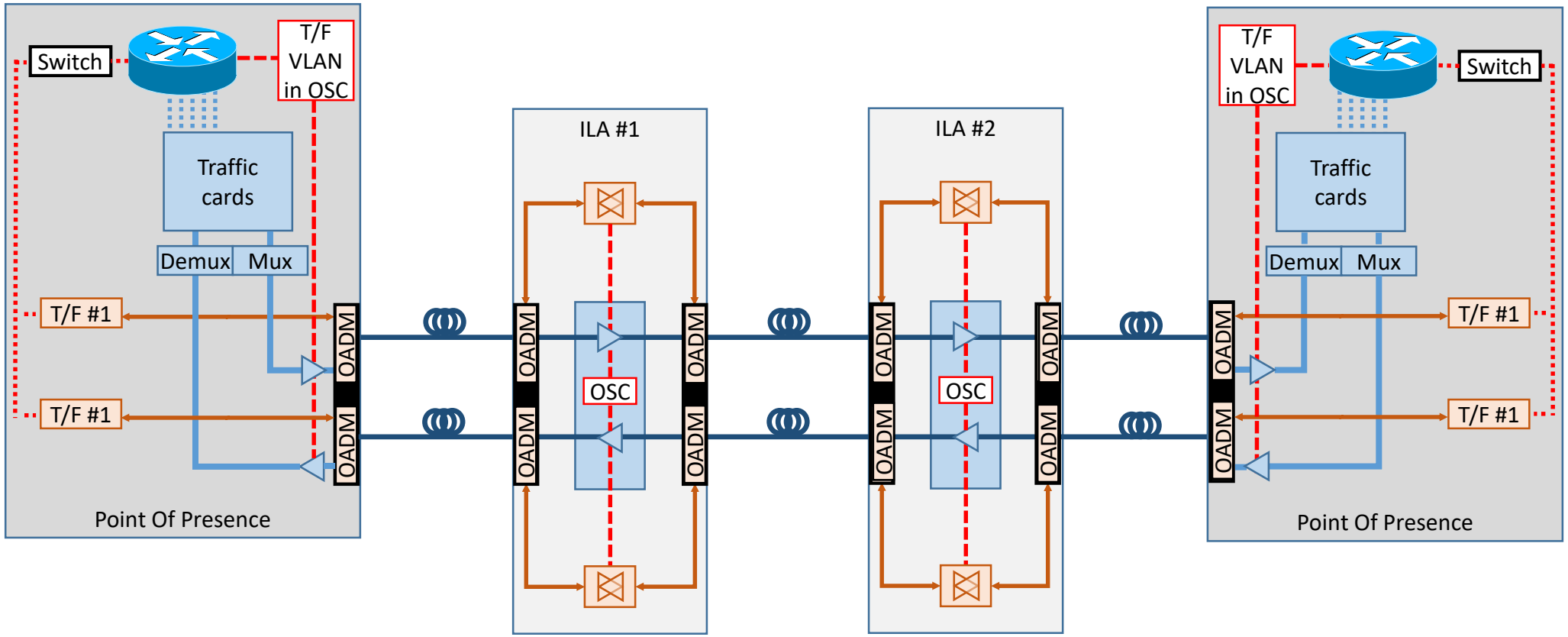
- New NSOC IMS/Thales => BT (now Computacenter)
  - Public procurement (5 years)
  - Impacts all RENATER services
  - BT had been RENATER NSOC previously (till 2015)
    - was in charge of RENATER 6 DWDM Proof of Concept
  - New NOC officially since 01/10/2020

Ongoing REFIMEVE+ link implementations

- Lyon 2 to Lyon Netcenter migration

- Remaining REFIMEVE links
  - Grenoble - Lyon Netcenter
  - Montpellier - Marseille 1 - Marseille 2 - Lyon 2
  - Montpellier - Toulouse - Bordeaux
  - Bordeaux - Poitiers - Tours - Orléans – Orsay
  - PACA

Ongoing REFIMEVE+ link implementations



T/F signal

T/F #1 T/F RLS

Bidirectional amplifier for T/F signal

In-Band T/F monitoring added in OSC

Out-Of-Band T/F monitoring

Data traffic equipment

Routeurs

Client side data traffic (10Gbps, 100Gbps…)

Line side data traffic (10Gbps, 100Gbps…)

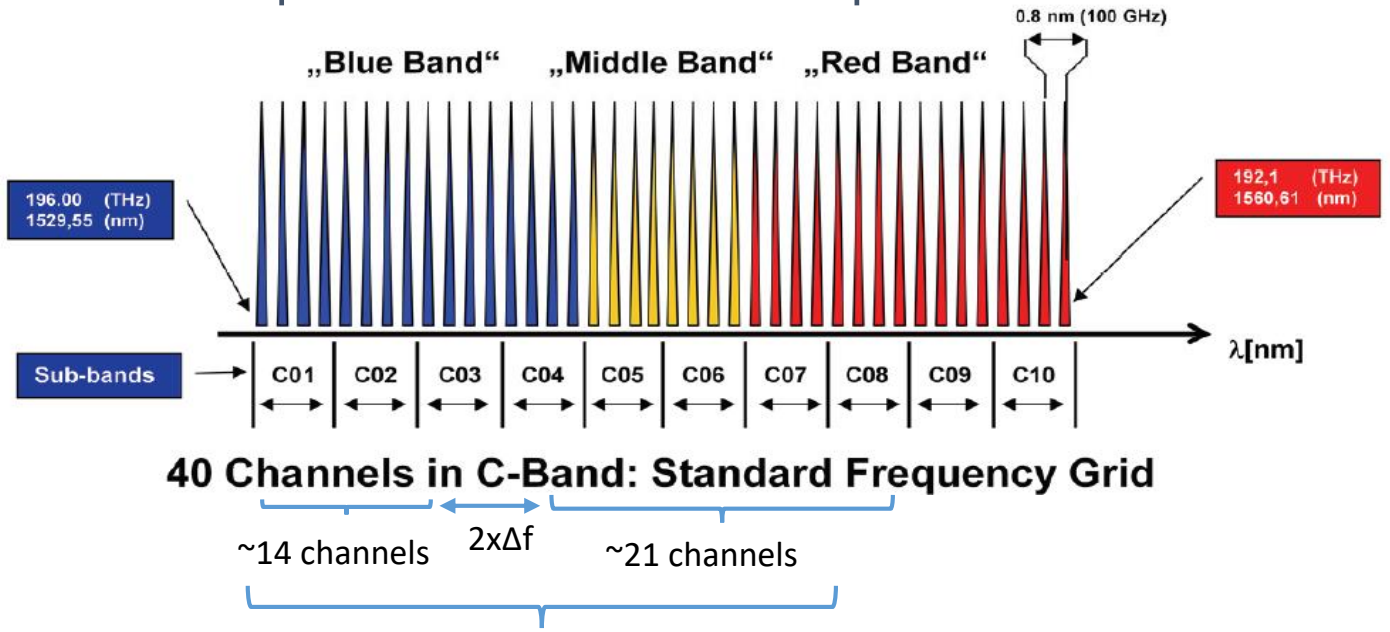
OMS (Optical Multiplexed Section)

OADM / OADM

Pair of fixed Optical Add-Drop Multiplexer (44th channel)

Ongoing REFIMEVE+ link implementations

- Spectrum upgradeable up to 40 wavelengths @ 100 GHz central frequency spacing,
- Each wavelength running @ QPSK or 16-QAM modulation scheme (more in the future)
- So far, no worries on the spectrum utilization in respect to the transmission capacity !



Δf = guard band

~35 channels <> between 3,5Tbps (@QPSK) and 7,0 Tbps (@16-QAM) of traffic capacity

Option : To double the capacity by using 50 GHz spacing grid and more with gridless system

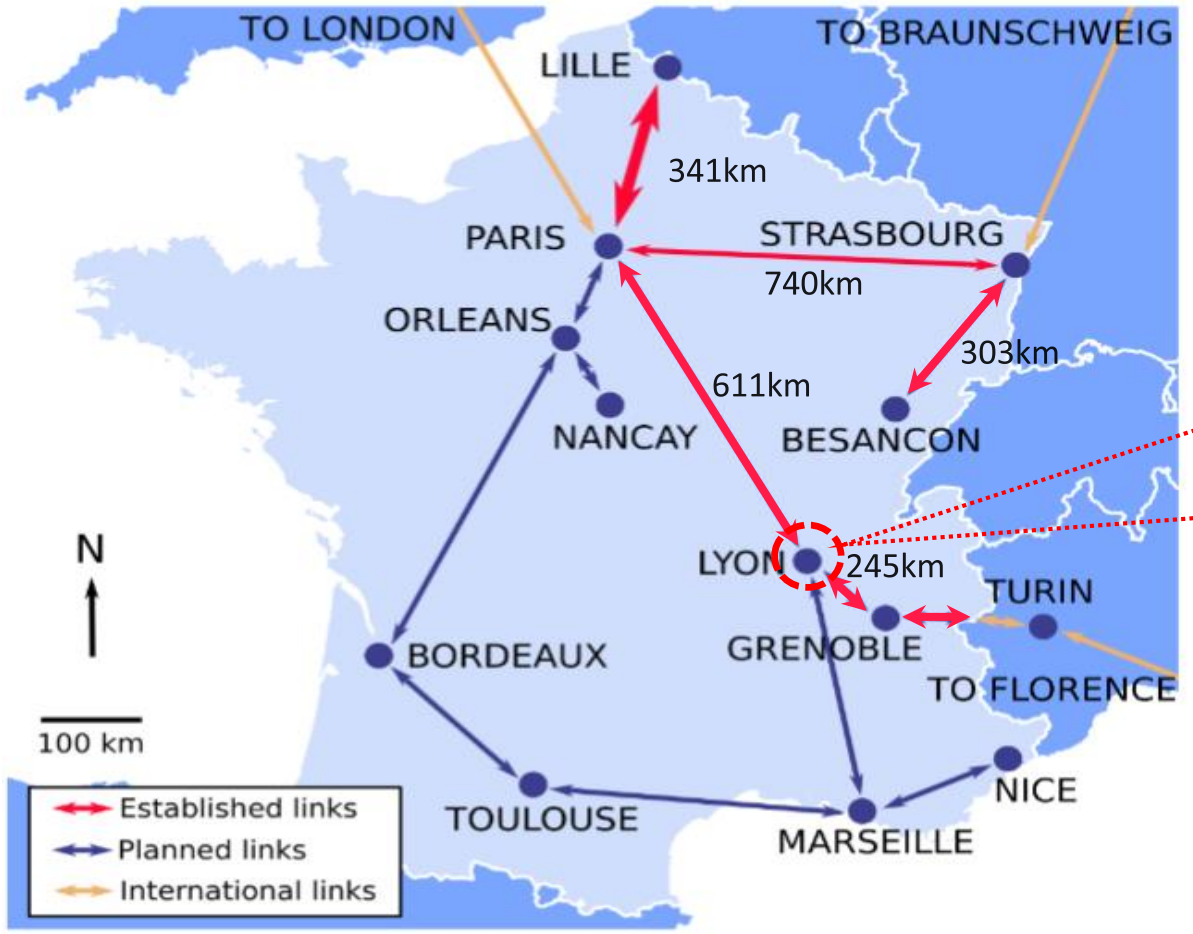
Ongoing REFIMEVE+ link implementations

Since 2008:

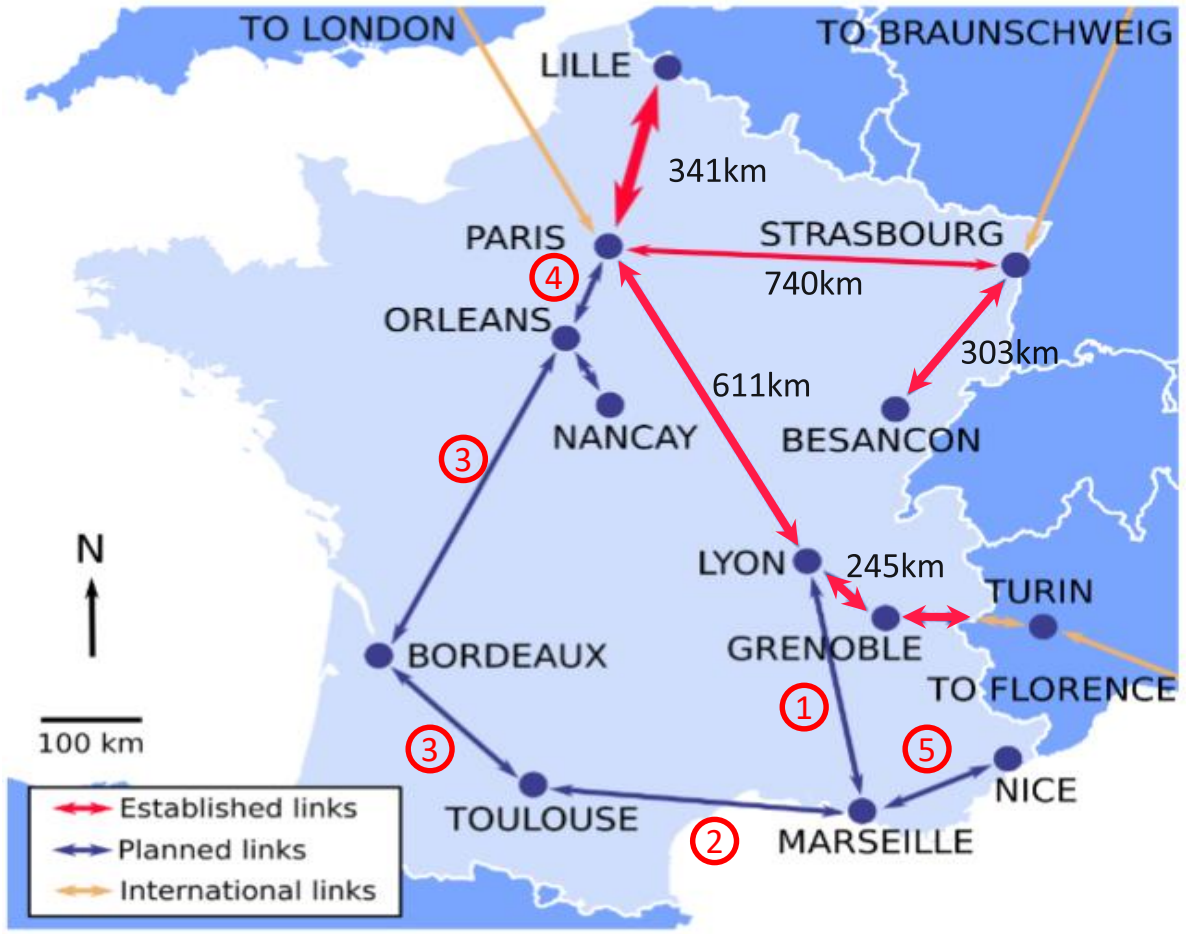
- **12 years** of cohabitation between data traffic and T/F services
- **3 years without guard band** (42nd and 43rd channels used for data traffic)
- 1 incident in 2015 when first Coriant Raman cards were deployed

  => Impact on the neighbouring channel lasted 72 hours
- **Never impacted** end-users

Ongoing REFIMEVE+ link implementation



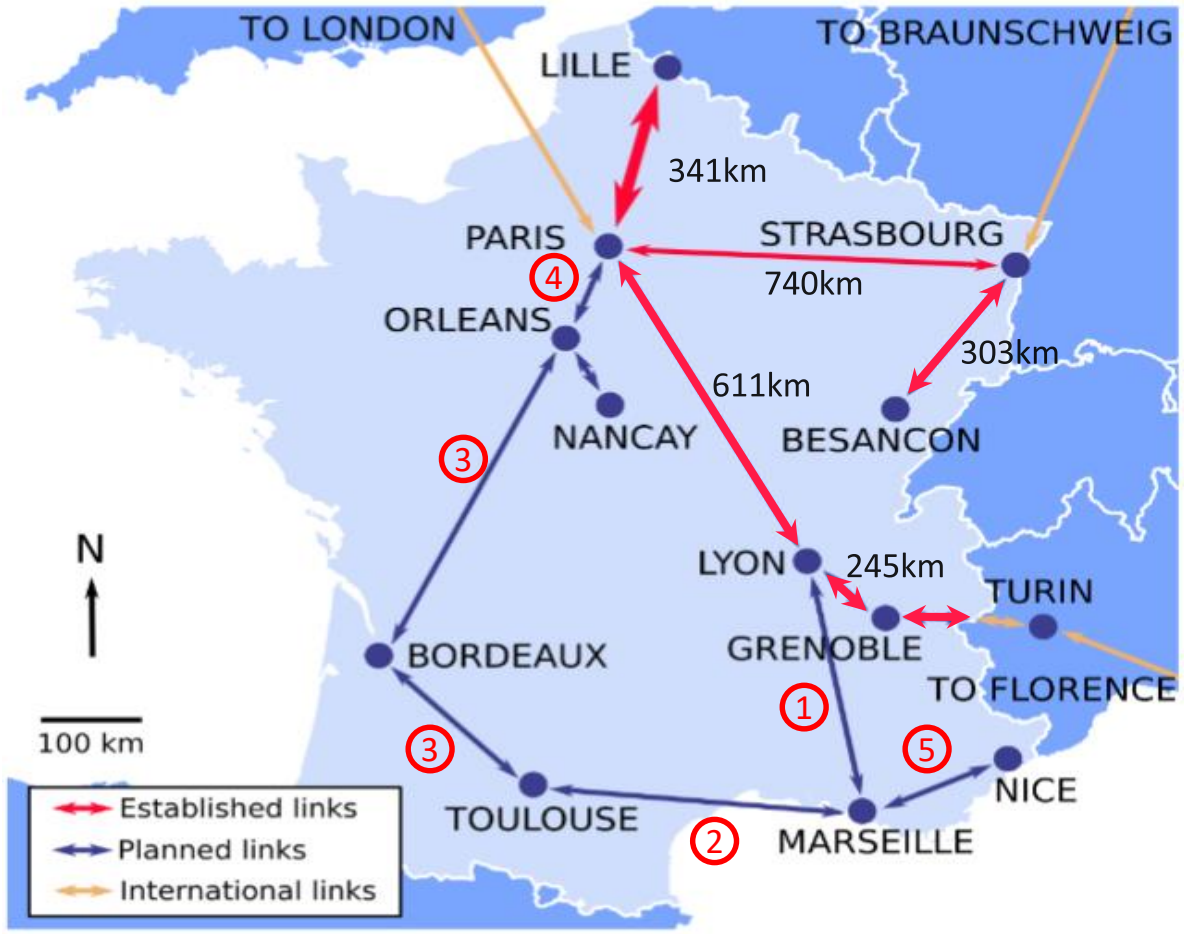
Ongoing REFIMEVE+ link implementation



Implementing new REFIMEVE links	*Step1: RENATER 6* *Step2: OADM* *Step3: EMOP* *Step4: Amplifiers and RLS* *Step5: End-user*

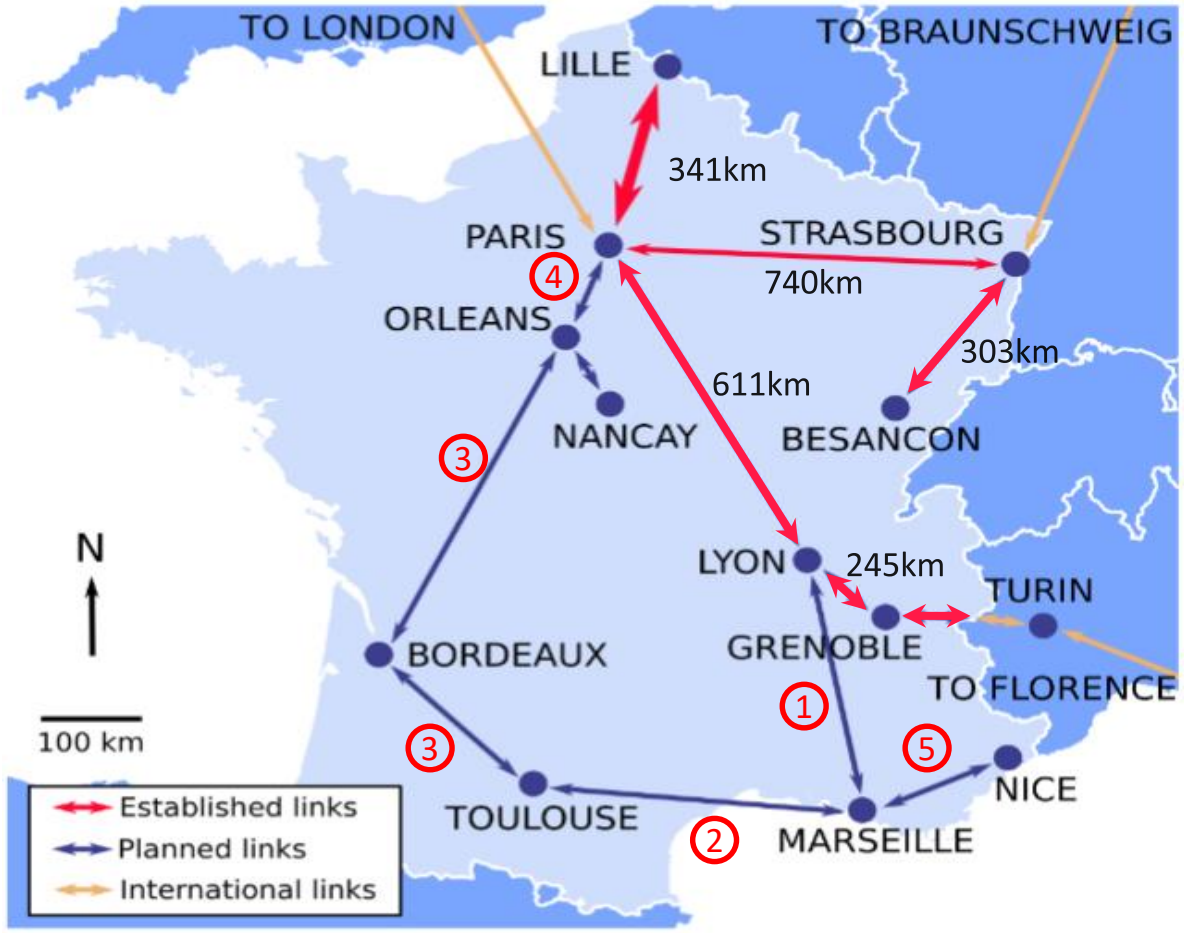
Implementation area 1	
Current status	RENATER 6 ✓ OADM ✓ REFIMEVE EMOP ✗
Planning	Post Lyon Netcenter migration

Ongoing REFIMEVE+ link deployments



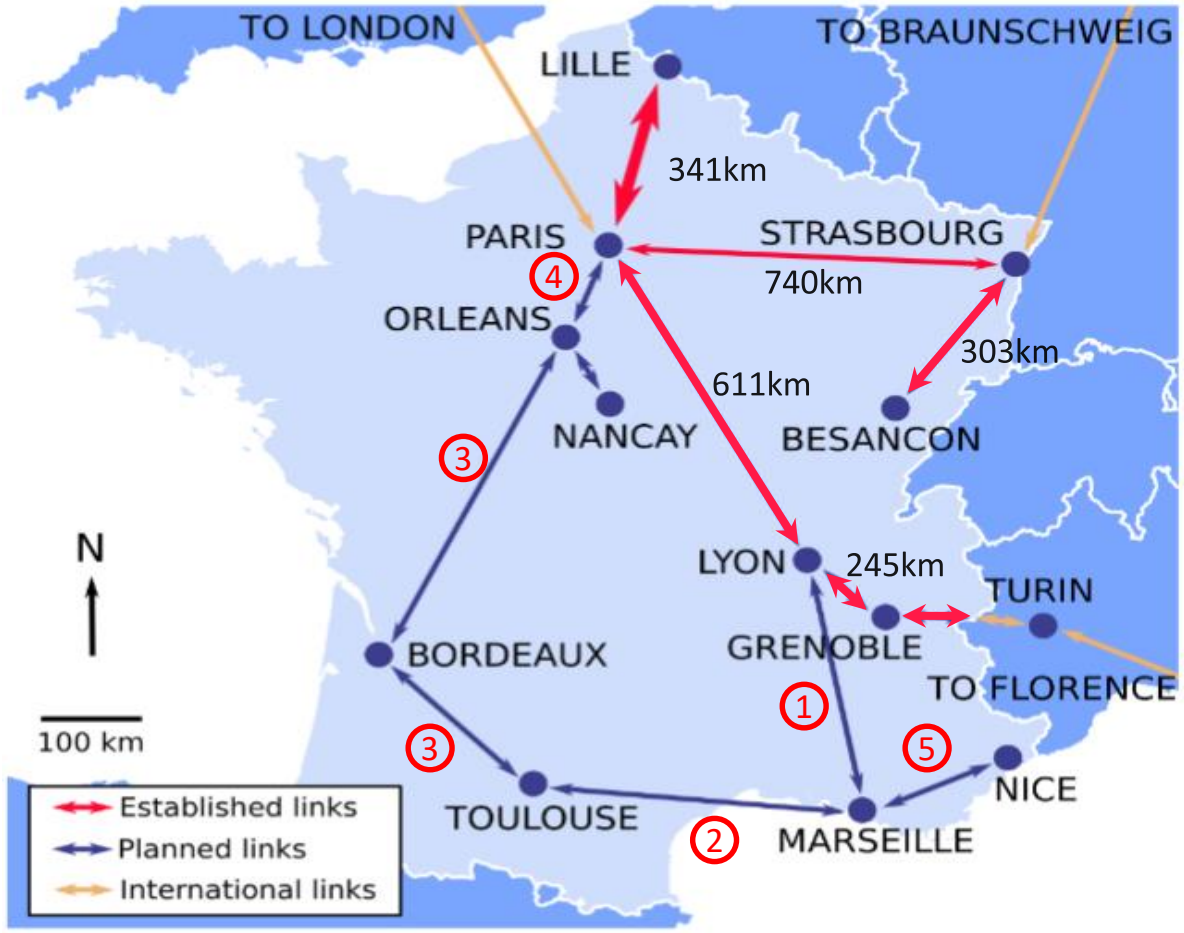
Implementation area 2	
Current status	RENATER 6 ✓ OADM ✓ REFIMEVE EMOP ✗
Planning	Post Lyon Netcenter migration Signal has to arrive to Marseille first

Ongoing REFIMEVE+ link deployments



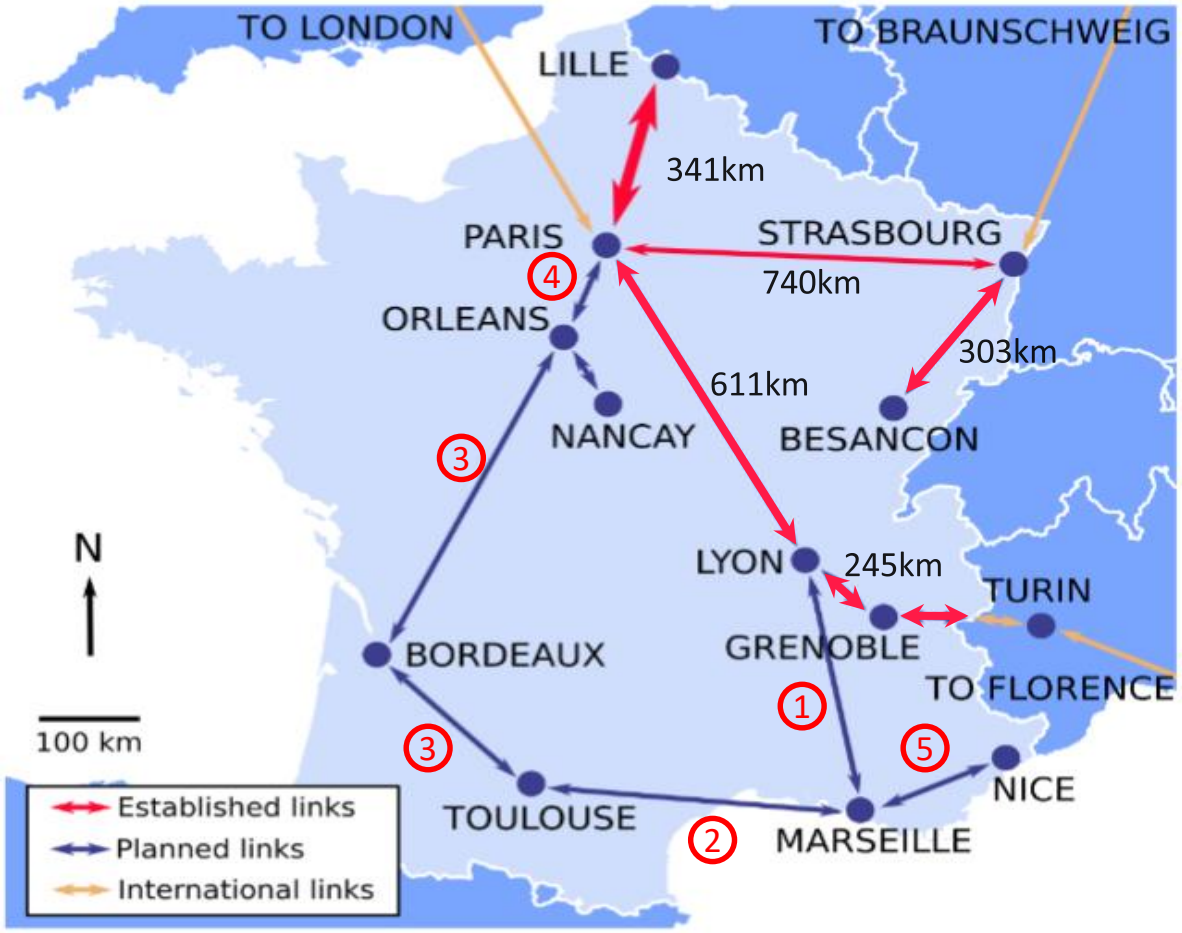
Implementation area 3	
Current status	RENATER 6 ✕ OADM ✕ REFIMEVE EMOP ✕
Planning	Post Lyon Netcenter migration RENATER 6 and OADM first quarter 2021

Ongoing REFIMEVE+ link deployments



Implementation area 4	
Current status	RENATER 6 ✓ OADM ✗ REFIMEVE EMOP ✗
Planning	Post Lyon Netcenter migration Fibre provider has deploy new fibres Dedicated rack in Orsay for REFIMEVE equipement

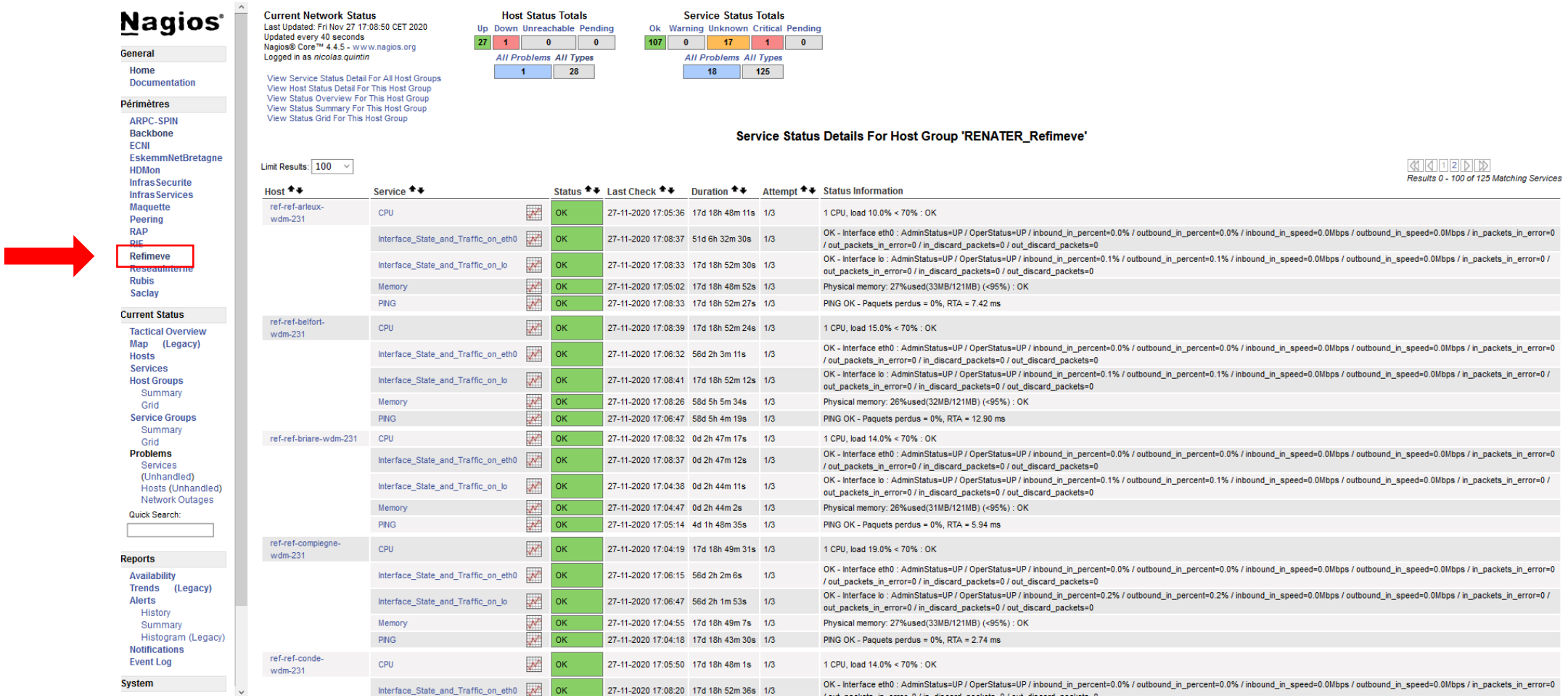
Ongoing REFIMEVE+ link deployments



Implementation area 5	
Current status	RENATER 6 ✕ OADM ✕ REFIMEVE EMOP ✕
Planning	OADM will be implemented in RENATER 5 network

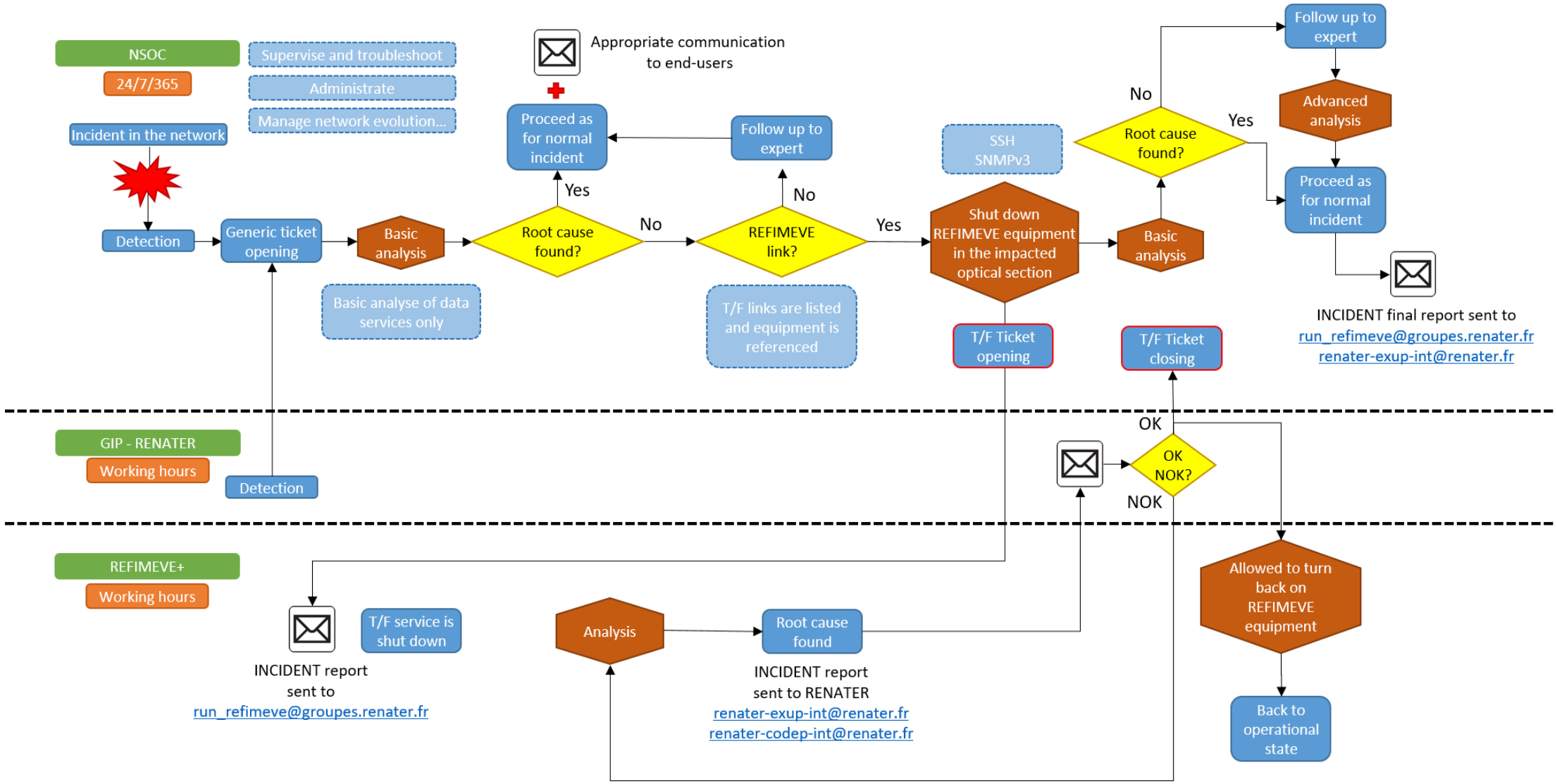
Monitoring REFIMEVE equipment

Monitoring REFIMEVE equipment



Monitoring REFIMEVE equipment

Internal network procedures

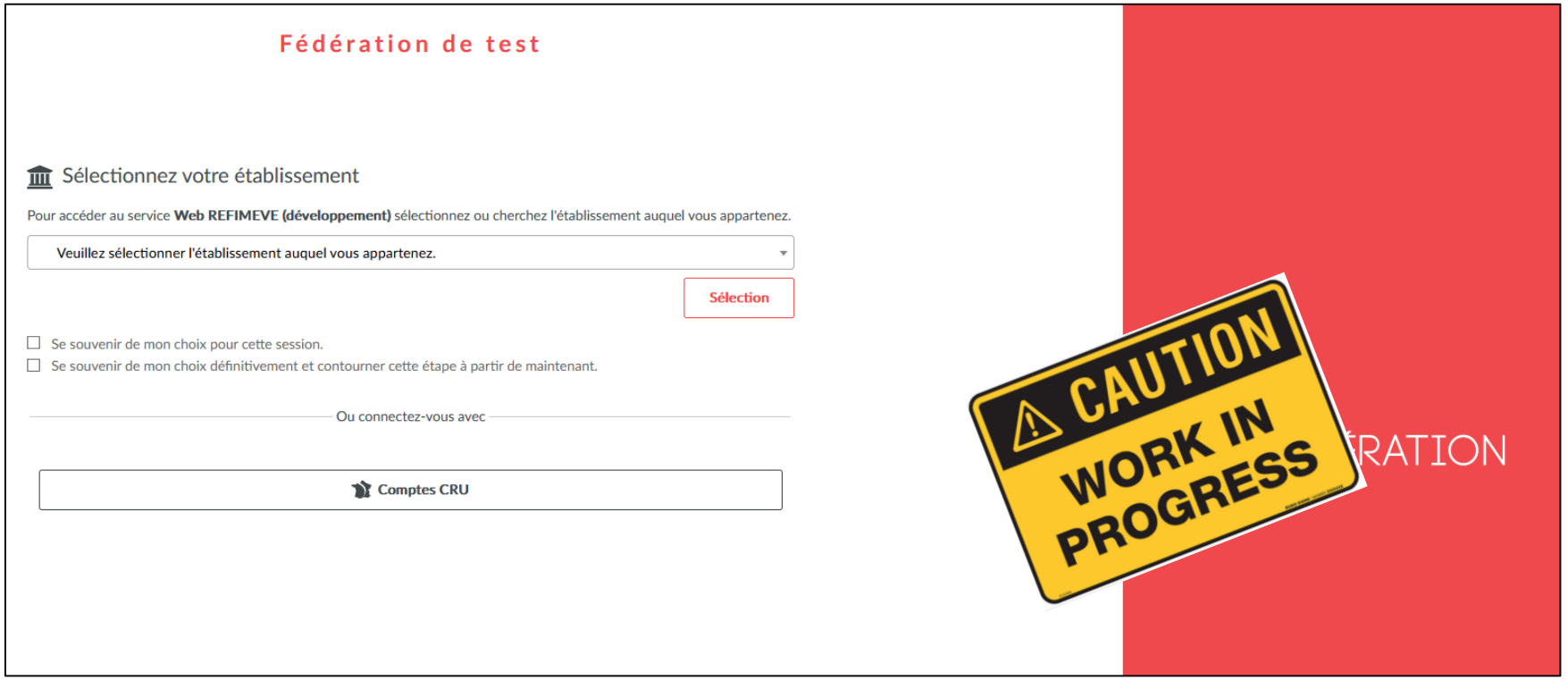


Monitoring REFIMEVE equipment

Refimeve weathermap

Direct URL

Provide your identity to access REFIMEVE private zone



Interactions with NOC RENATER

- Mailing lists
  - run_refimeve@groupes.renater.fr
    Core REFIMEVE Team + Muquans
    - In case equipment failure
    - Incident or maintenance occuring in a T/F link
  - refimeve@noc.renater.fr
    Members of REFIMEVE consortium (draft version with list of people attending REFIMEVE AG 2018)
    - Incident or maintenance occuring in a T/F link
- Feel free to report to nicolas.quintin@renater.fr any undesirable communication

Conclusion

- 2019 and 2020 faced very slow implementation processes
- Ongoing work to provide a simple way to overview the status of REFIMEVE network and monitore REFIMEVE equipment
- Remaining REFIMEVE links
  - Grenoble - Lyon Netcenter early 2021
  - Montpellier - Marseille 1 - Marseille 2 - Lyon 2 early 2021
  - Montpellier - Toulouse - Bordeaux 2021
  - Bordeaux - Poitiers - Tours - Orléans – Orsay 2021
  - PACA 2021

Thanks for your attention

Questions time!