



# 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

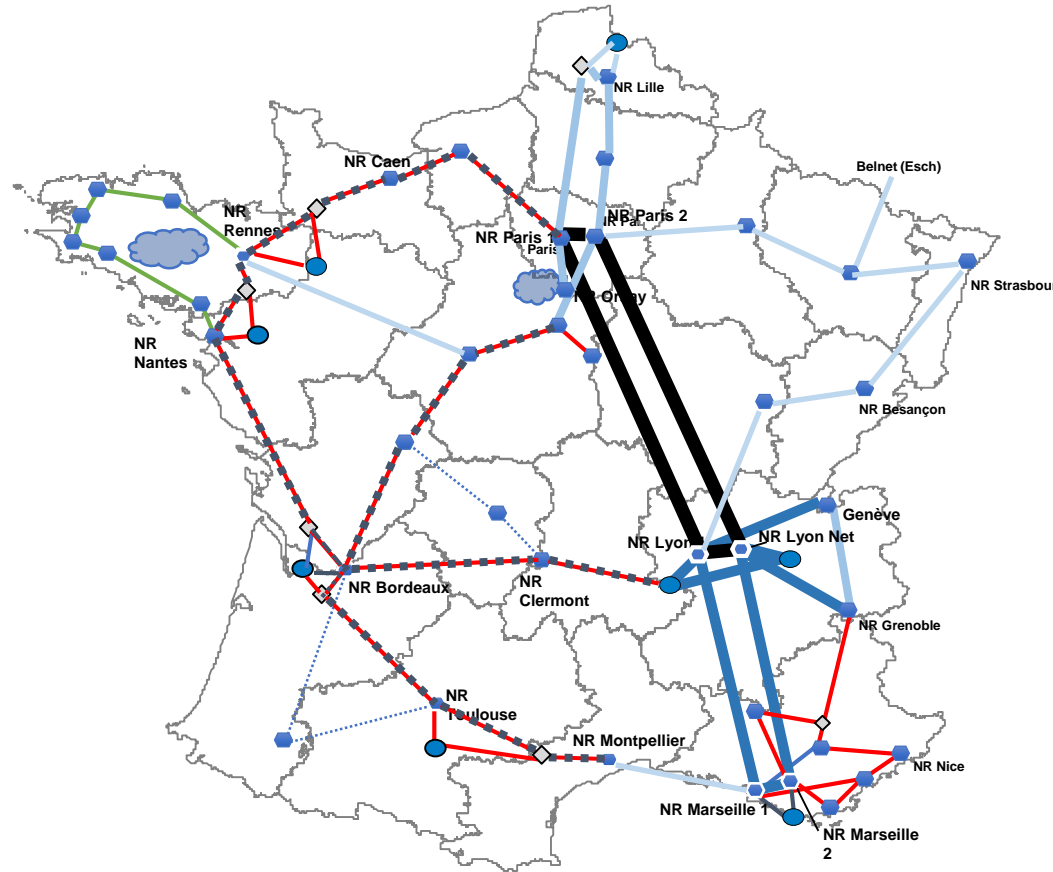
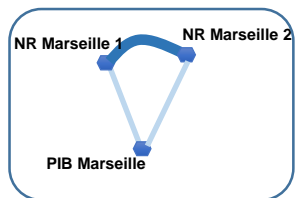
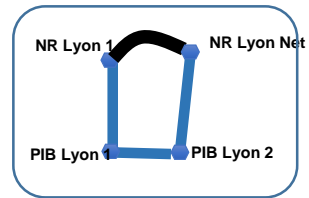
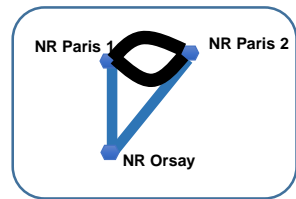
# RENATER-6 DWDM network

## 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

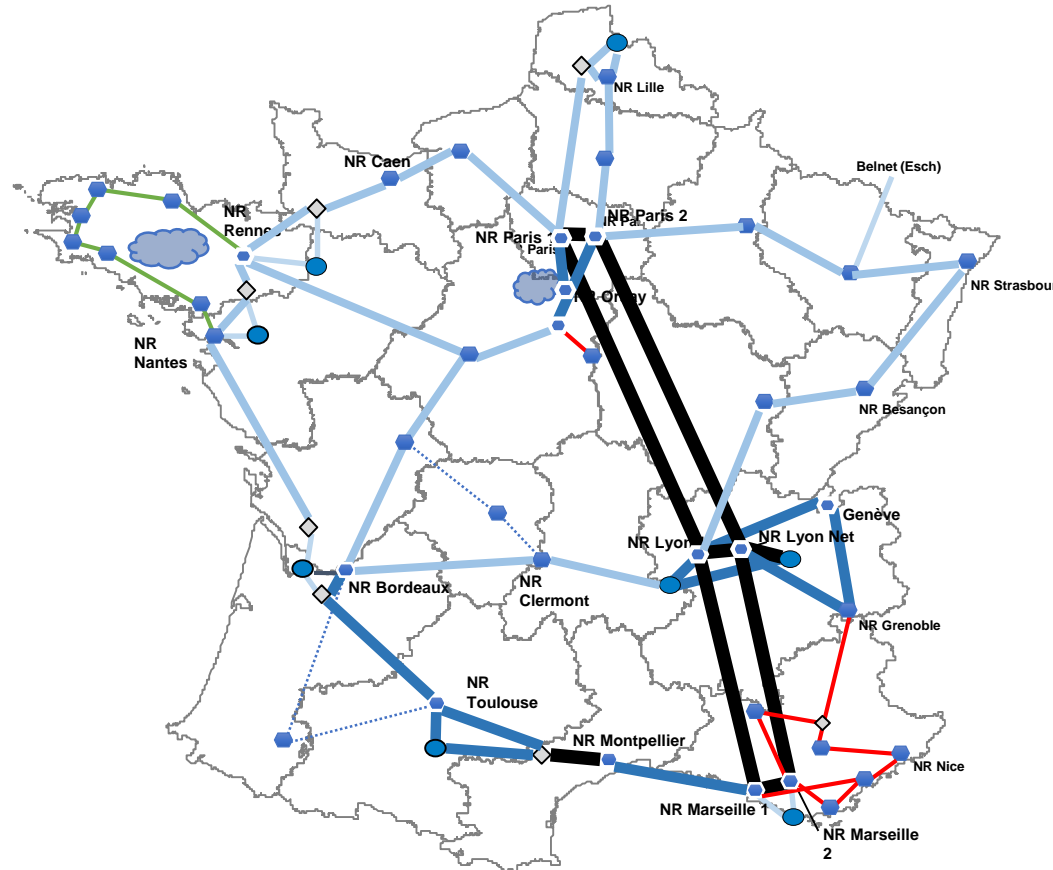
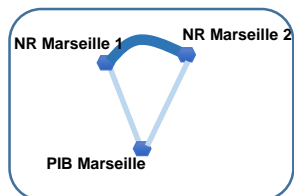
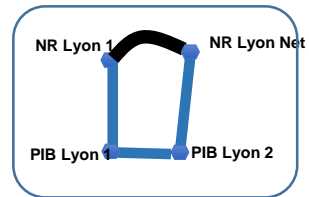
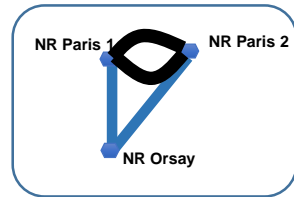
### Point of Presence RENATER

- NR
- PIB

# RENATER-6 DWDM network

## Evolutions since 2018 (3/5)

By end of 2021



### DWDM/OTN optical network

- 1 x 100G Infinera mTera/Hit7300
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### Point of Presence RENATER

- NR
- PIB

# 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

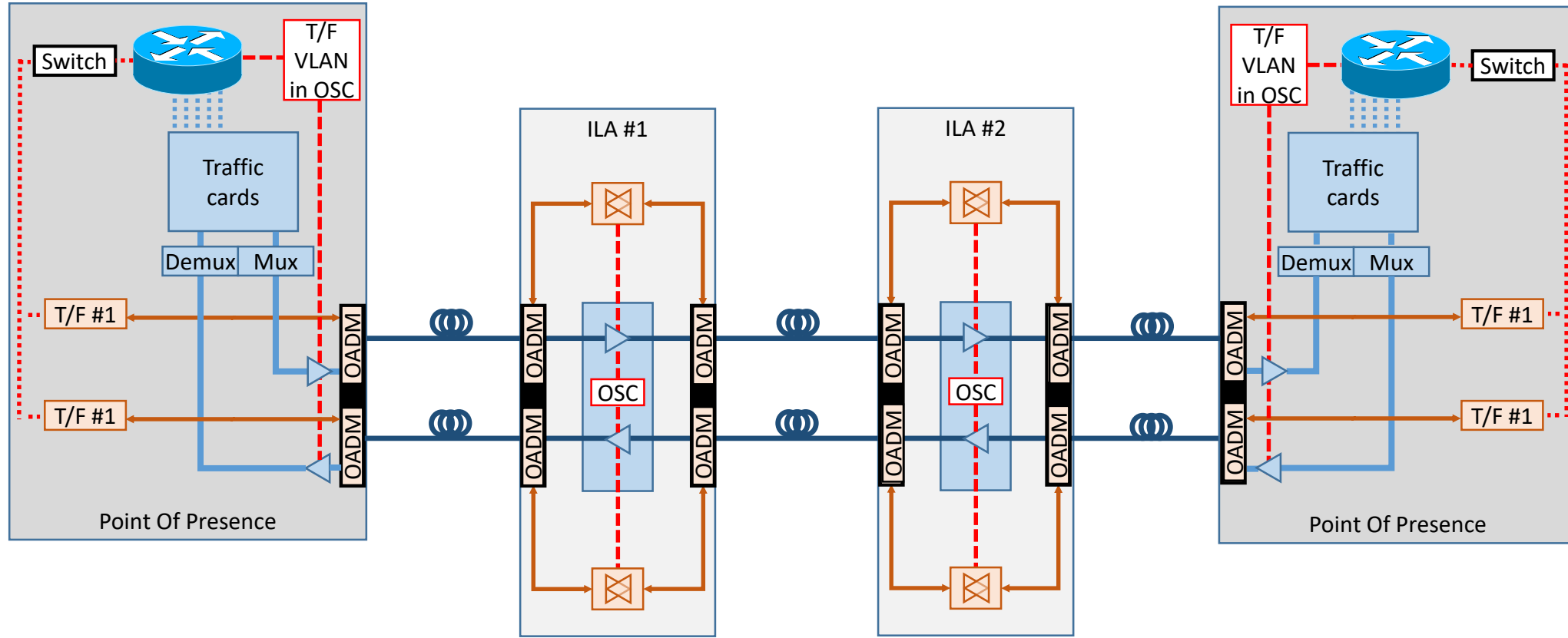


# Ongoing REFIMEVE+ link implementations

- 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

🌐 Routers

⋯ Client side data traffic (10Gbps, 100Gbps...)

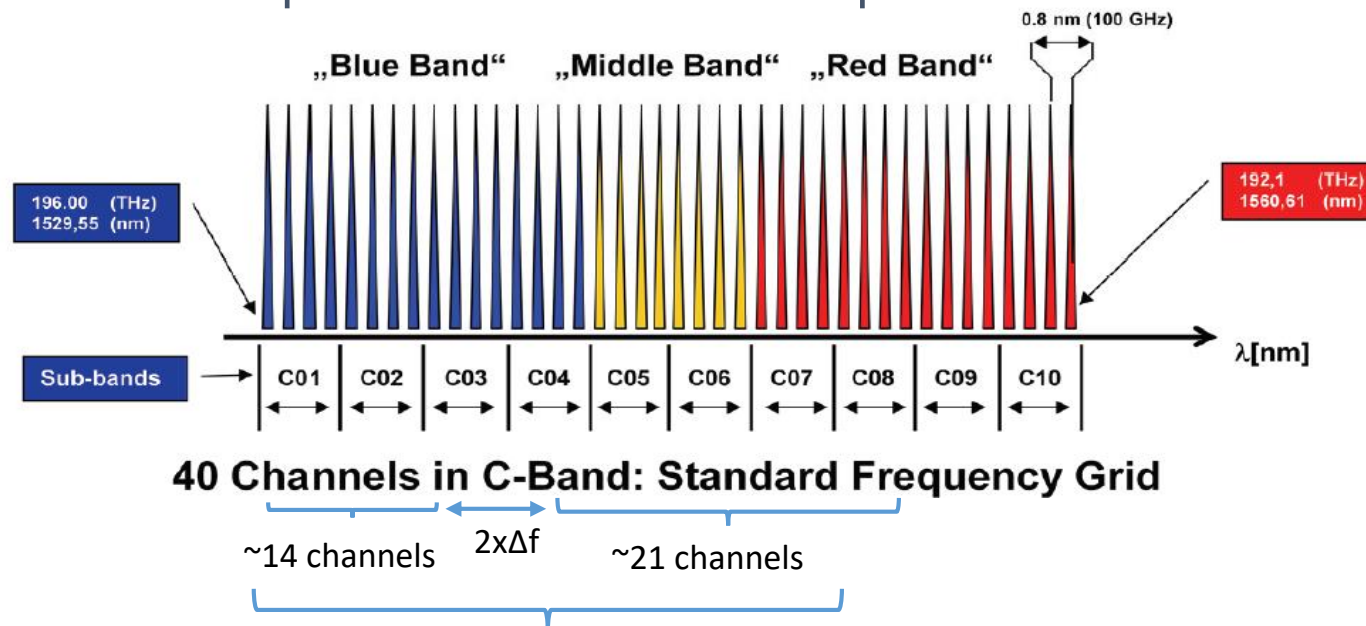
— Line side data traffic (10Gbps, 100Gbps...)

— OMS (Optical Multiplexed Section)

⊠ Pair of fixed Optical Add-Drop Multiplexer (44<sup>th</sup> 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 !



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

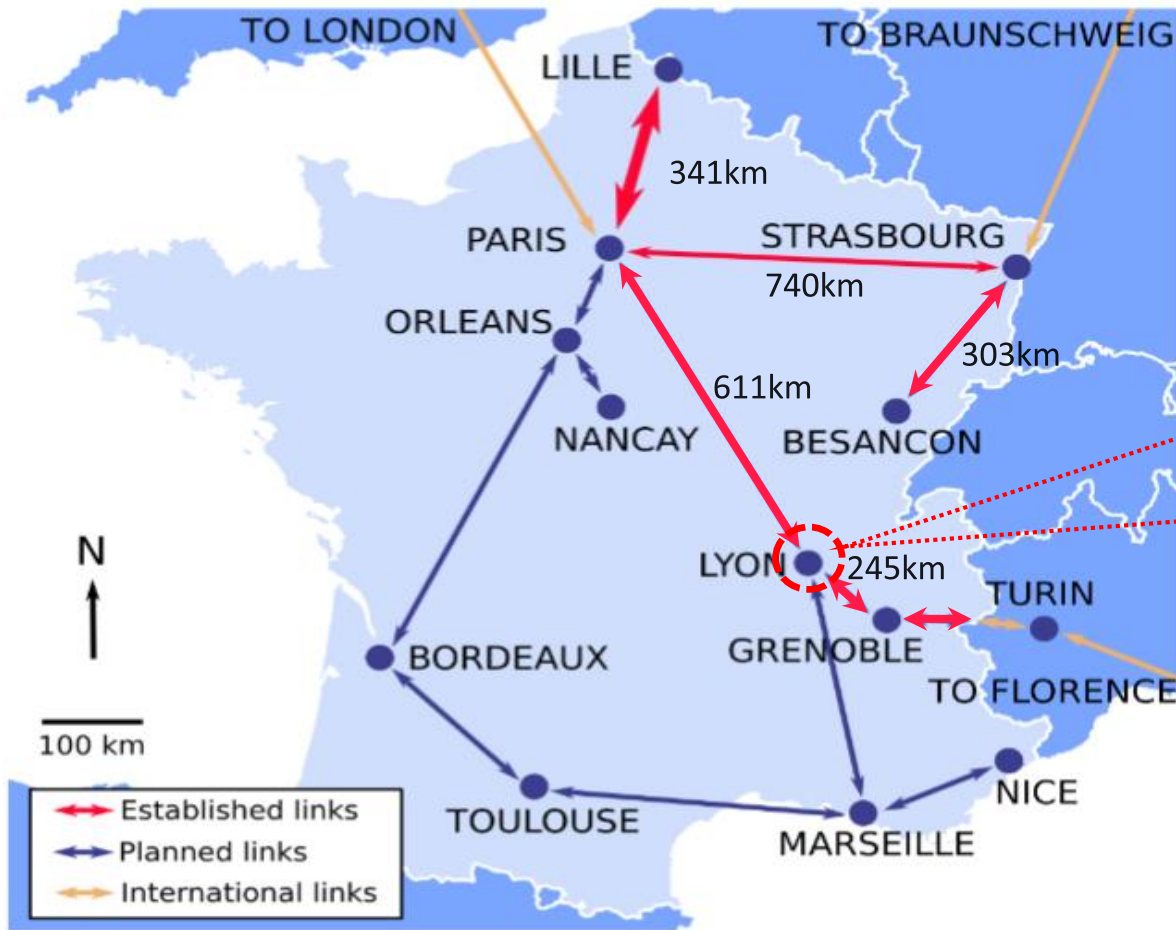
Option : To double the capacity by using 50 GHz spacing grid and more with gridless system

# Ongoing REFIMEVE+ link implementations

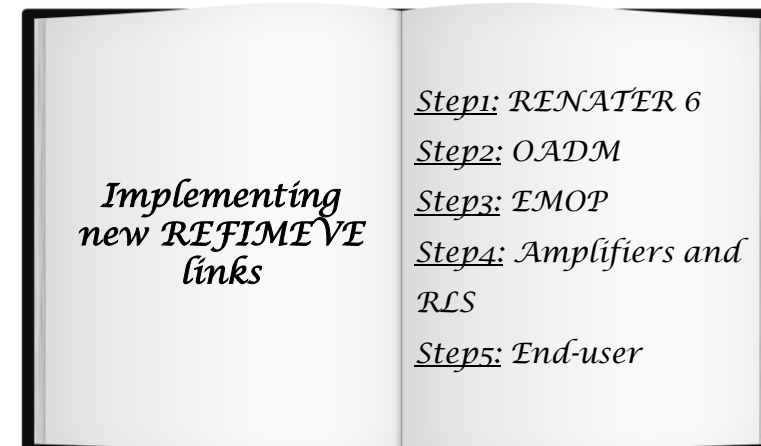
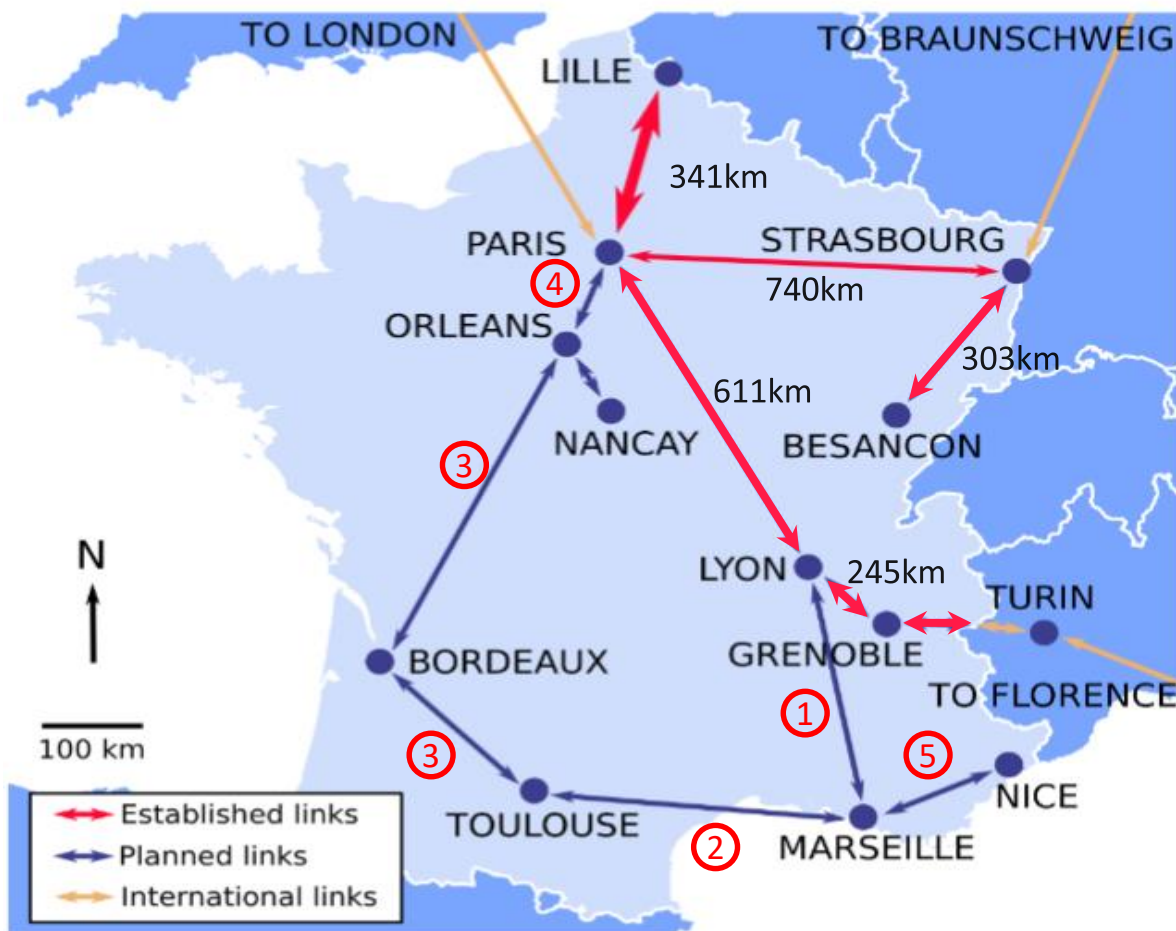
Since 2008:

- **12 years** of cohabitation between data traffic and T/F services
- **3 years without guard band** (42<sup>nd</sup> and 43<sup>rd</sup> 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

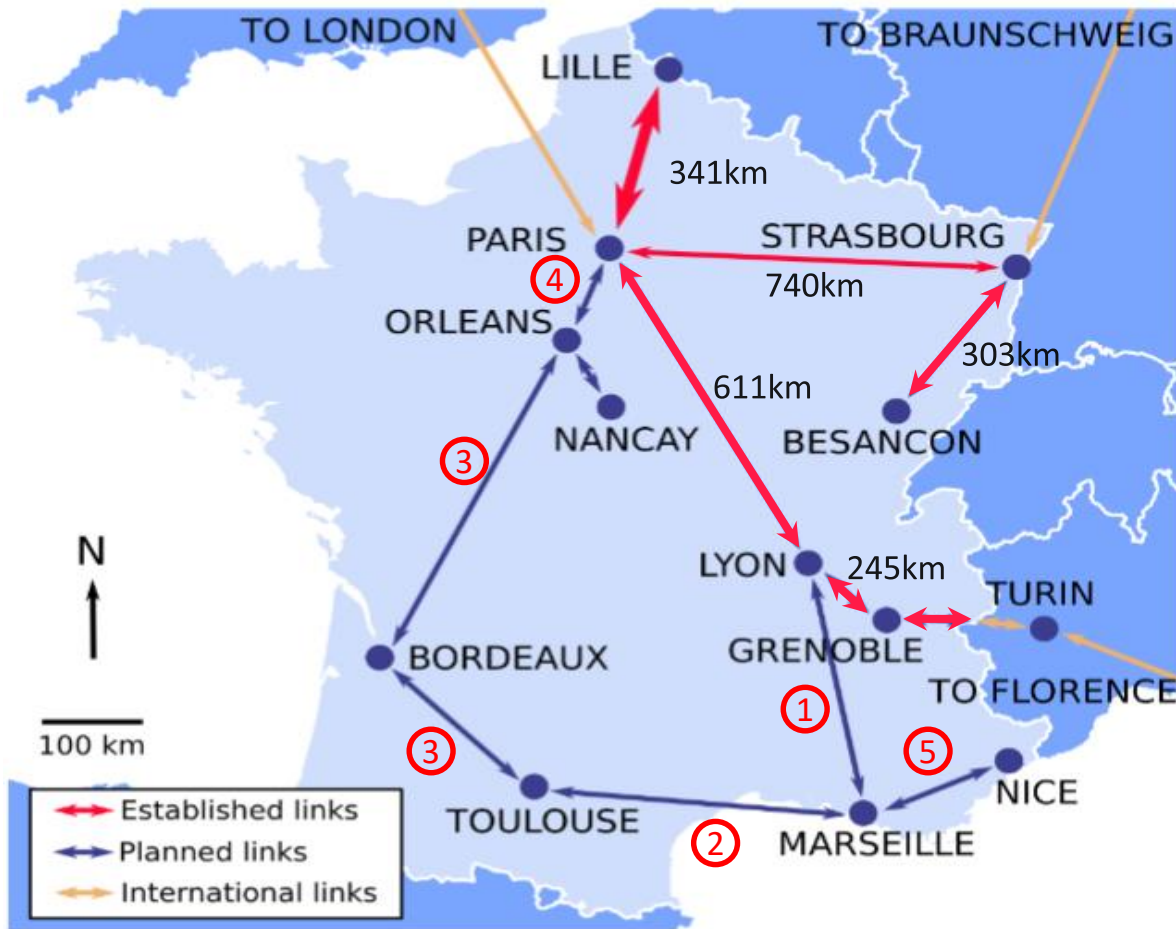


# Ongoing REFIMEVE+ link implementation



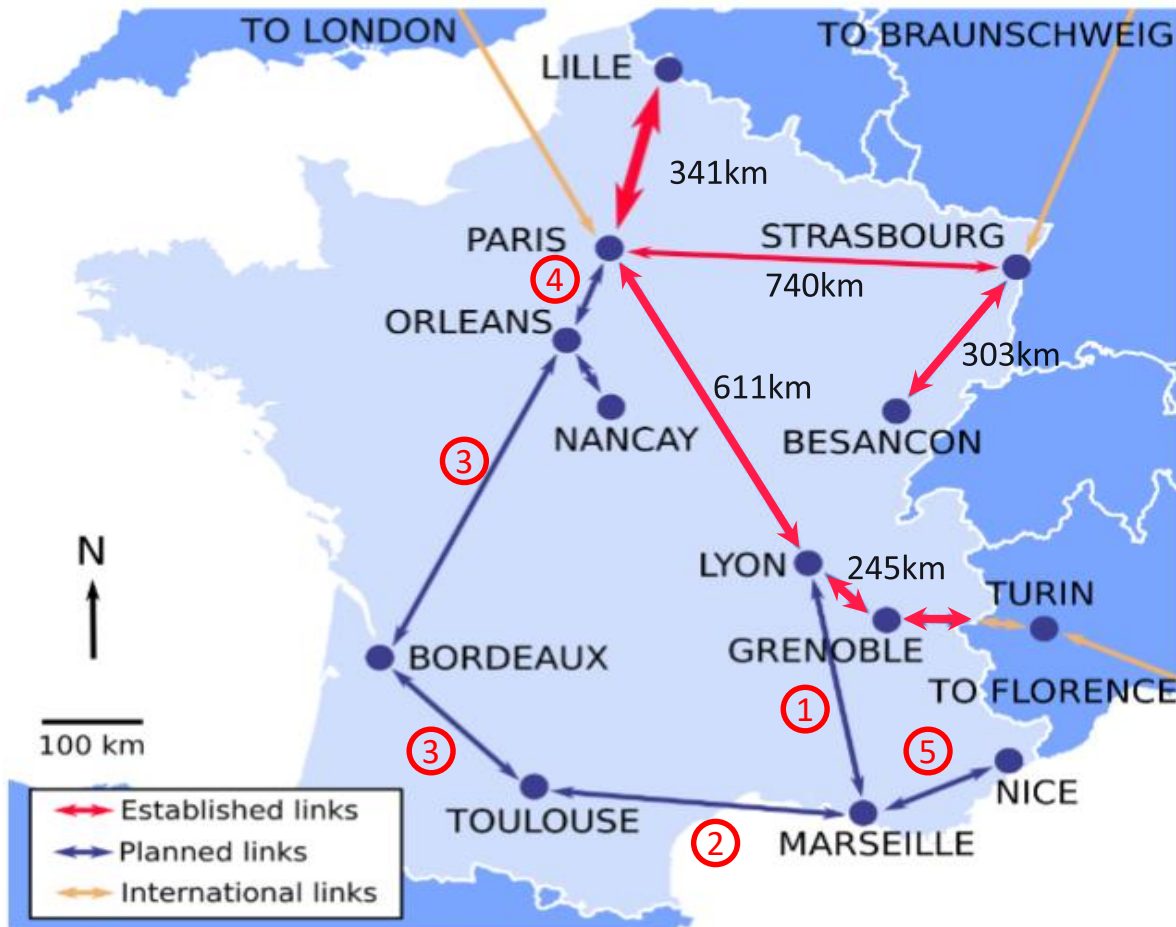
Implementation area 1	
Current status	RENATER 6 ✓ OADM ✓ REFIMEVE EMOP ✗
Planning	Post Lyon Netcenter migration

# Ongoing REFIMEVE+ link deployments



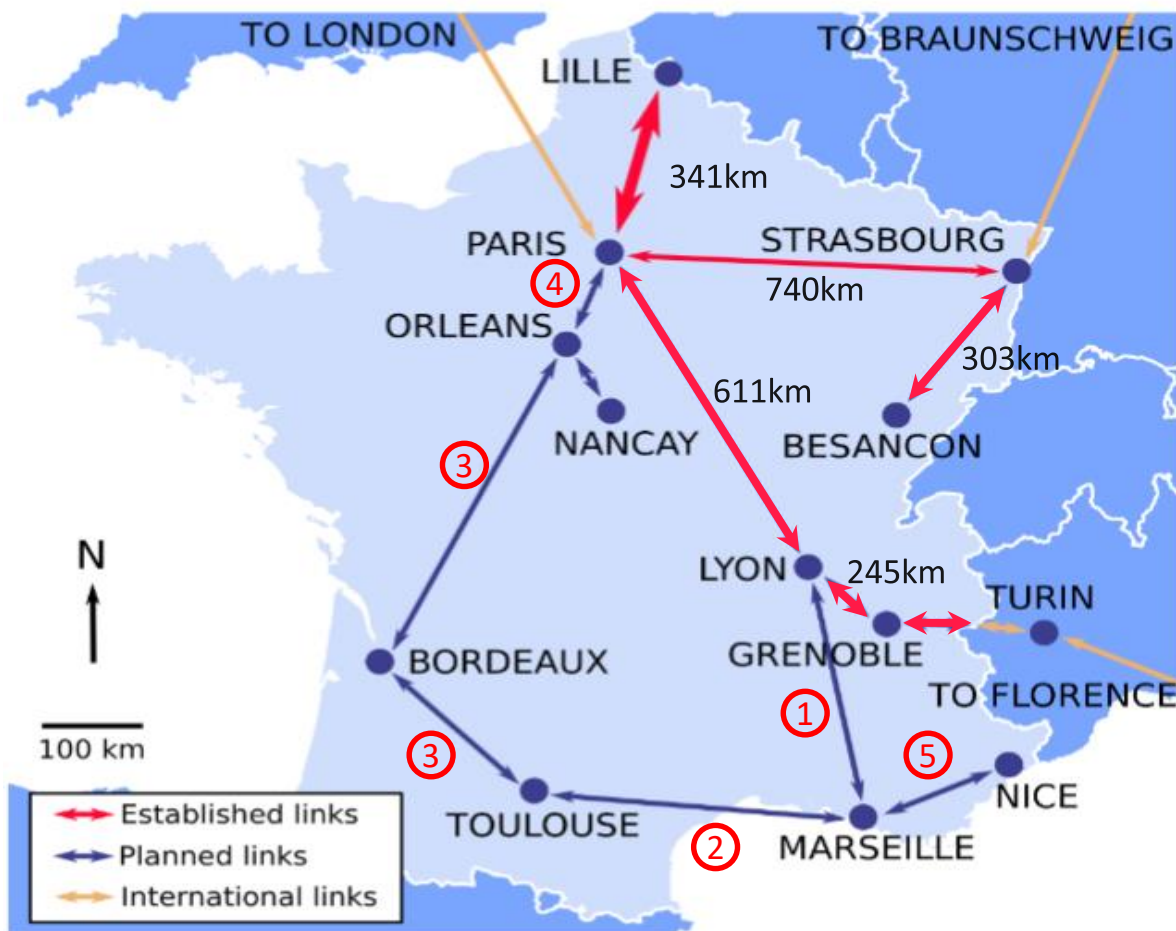
Implementation area 2	
Current status	RENATER 6 ✓ OADM ✓ REFIMEVE EMOP ✗
Planning	Post Lyon Netcenter migration Signal has to arrive to Marseille first

# 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

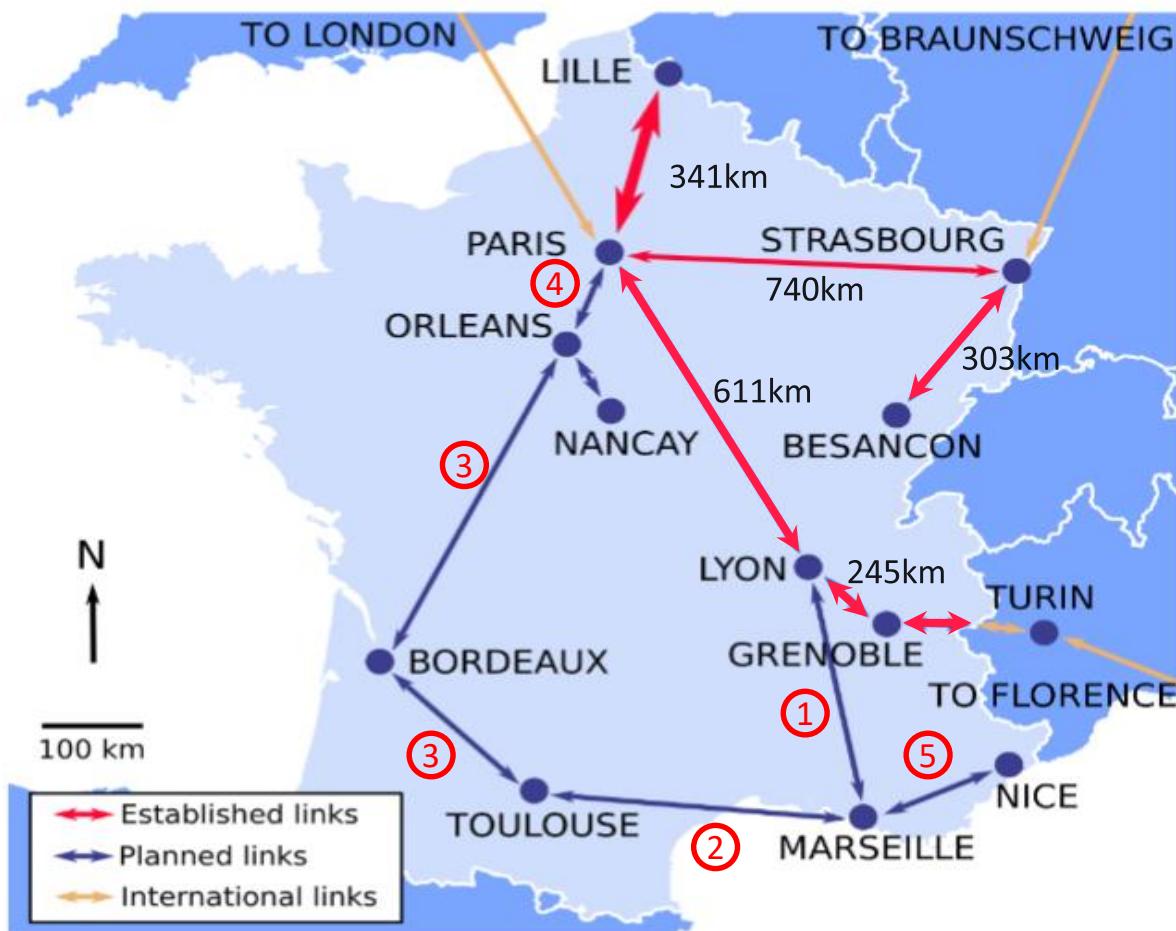


## Implementation area 4

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



# 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



### Nagios®

- General
  - Home
  - Documentation
- Périmètres
  - ARPC-SPIN
  - Backbone
  - ECNI
  - EskemmNetBretagne
  - HDMon
  - InfrasSecurite
  - InfrasServices
  - Maquette
  - Peering
  - RAP
  - RIE
  - Refimeve**
  - RessauInterne
  - Rubis
  - Saclay
- Current Status
  - Tactical Overview
  - Map (Legacy)
  - Hosts
  - Services
  - Host Groups
    - Summary
    - Grid
  - Service Groups
    - Summary
    - Grid
- Problems
  - Services (Unhandled)
  - Hosts (Unhandled)
  - Network Outages
- Quick Search:
- Reports
  - Availability
  - Trends (Legacy)
  - Alerts
    - History
    - Summary
    - Histogram (Legacy)
  - Notifications
  - Event Log
- System

**Current Network Status**  
 Last Updated: Fri Nov 27 17:08:50 CET 2020  
 Updated every 40 seconds  
 Nagios® Core™ 4.4.5 - www.nagios.org  
 Logged in as nicolas.quintin

**Host Status Totals**

Up	Down	Unreachable	Pending
27	1	0	0

All Problems All Types

1	28
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**Service Status Totals**

Ok	Warning	Unknown	Critical	Pending
107	0	17	1	0

All Problems All Types

10	125
----	-----

View Service Status Detail For All Host Groups  
 View Host Status Detail For This Host Group  
 View Status Overview For This Host Group  
 View Status Summary For This Host Group  
 View Status Grid For This Host Group

### Service Status Details For Host Group 'RENATER\_Refimeve'

Limit Results:

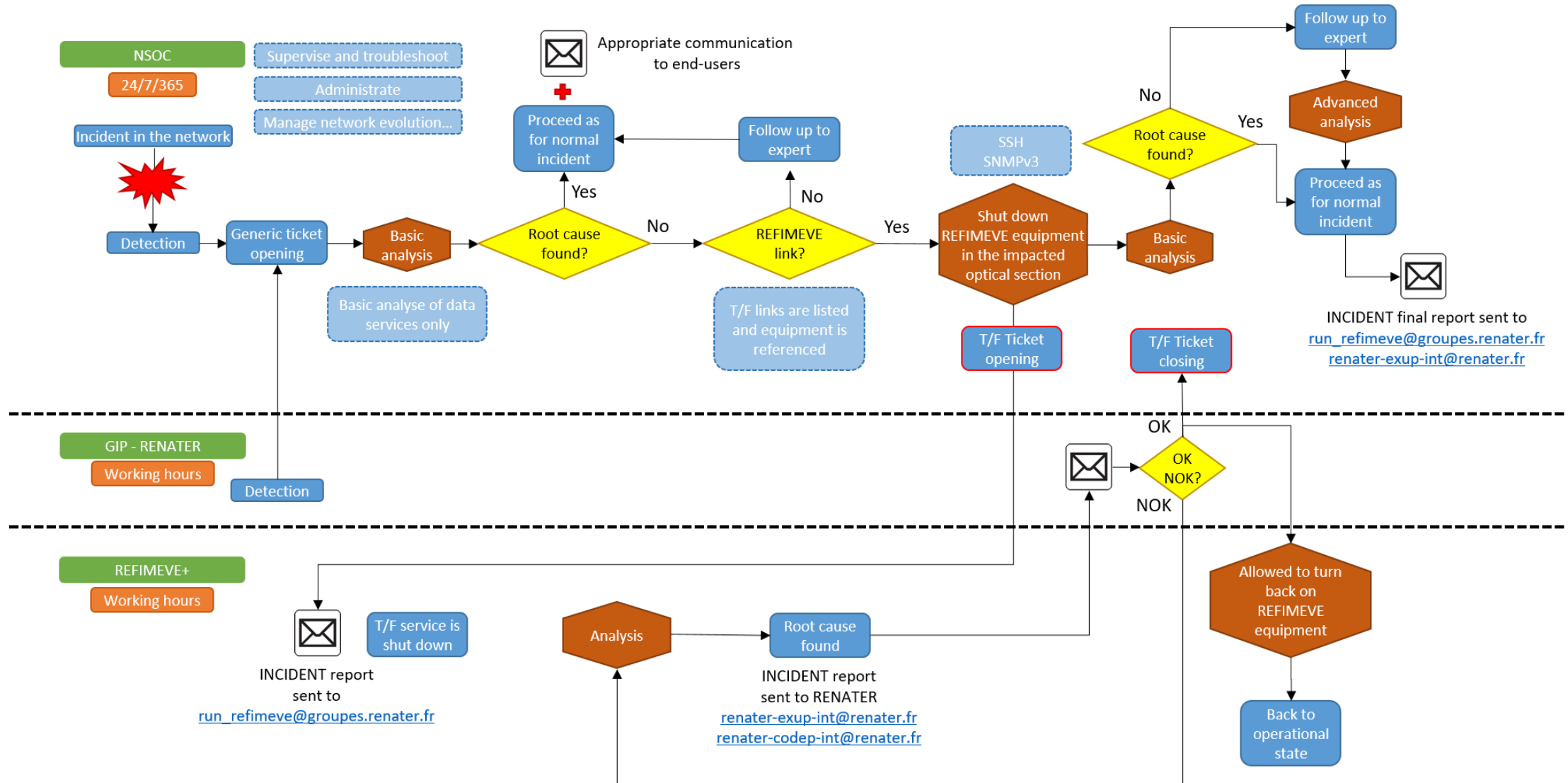


Results 0 - 100 of 125 Matching Services

Host	Service	Status	Last Check	Duration	Attempt	Status Information
ref-ref-arleux-wdm-231	CPU	OK	27-11-2020 17:05:36	17d 18h 48m 11s	1/3	1 CPU, load 10.0% < 70% : OK
	Interface_State_and_Traffic_on_eth0	OK	27-11-2020 17:08:37	51d 6h 32m 30s	1/3	OK - Interface eth0 : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.0% / outbound_in_percent=0.0% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0
	Interface_State_and_Traffic_on_lo	OK	27-11-2020 17:08:33	17d 18h 52m 30s	1/3	OK - Interface lo : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.1% / outbound_in_percent=0.1% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0
	Memory	OK	27-11-2020 17:05:02	17d 18h 48m 52s	1/3	Physical memory: 27%used(33MB/121MB) (<95%) : OK
	PING	OK	27-11-2020 17:08:33	17d 18h 52m 27s	1/3	PING OK - Paquets perdus = 0%, RTA = 7.42 ms
ref-ref-belfort-wdm-231	CPU	OK	27-11-2020 17:08:39	17d 18h 52m 24s	1/3	1 CPU, load 15.0% < 70% : OK
	Interface_State_and_Traffic_on_eth0	OK	27-11-2020 17:06:32	56d 2h 3m 11s	1/3	OK - Interface eth0 : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.0% / outbound_in_percent=0.0% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0
	Interface_State_and_Traffic_on_lo	OK	27-11-2020 17:08:41	17d 18h 52m 12s	1/3	OK - Interface lo : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.1% / outbound_in_percent=0.1% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0
	Memory	OK	27-11-2020 17:08:26	58d 5h 5m 34s	1/3	Physical memory: 26%used(32MB/121MB) (<95%) : OK
	PING	OK	27-11-2020 17:06:47	58d 5h 4m 19s	1/3	PING OK - Paquets perdus = 0%, RTA = 12.90 ms
ref-ref-briare-wdm-231	CPU	OK	27-11-2020 17:08:32	0d 2h 47m 17s	1/3	1 CPU, load 14.0% < 70% : OK
	Interface_State_and_Traffic_on_eth0	OK	27-11-2020 17:08:37	0d 2h 47m 12s	1/3	OK - Interface eth0 : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.0% / outbound_in_percent=0.0% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0
	Interface_State_and_Traffic_on_lo	OK	27-11-2020 17:04:38	0d 2h 44m 11s	1/3	OK - Interface lo : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.1% / outbound_in_percent=0.1% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0
	Memory	OK	27-11-2020 17:04:47	0d 2h 44m 2s	1/3	Physical memory: 26%used(31MB/121MB) (<95%) : OK
	PING	OK	27-11-2020 17:05:14	4d 1h 48m 35s	1/3	PING OK - Paquets perdus = 0%, RTA = 5.94 ms
ref-ref-compiegne-wdm-231	CPU	OK	27-11-2020 17:04:19	17d 18h 49m 31s	1/3	1 CPU, load 19.0% < 70% : OK
	Interface_State_and_Traffic_on_eth0	OK	27-11-2020 17:06:15	56d 2h 2m 6s	1/3	OK - Interface eth0 : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.0% / outbound_in_percent=0.0% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0
	Interface_State_and_Traffic_on_lo	OK	27-11-2020 17:06:47	56d 2h 1m 53s	1/3	OK - Interface lo : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.2% / outbound_in_percent=0.2% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0
	Memory	OK	27-11-2020 17:04:55	17d 18h 49m 7s	1/3	Physical memory: 27%used(33MB/121MB) (<95%) : OK
	PING	OK	27-11-2020 17:04:18	17d 18h 43m 30s	1/3	PING OK - Paquets perdus = 0%, RTA = 2.74 ms
ref-ref-conde-wdm-231	CPU	OK	27-11-2020 17:05:50	17d 18h 48m 1s	1/3	1 CPU, load 14.0% < 70% : OK
	Interface_State_and_Traffic_on_eth0	OK	27-11-2020 17:08:20	17d 18h 52m 36s	1/3	OK - Interface eth0 : AdminStatus=UP / OperStatus=UP / inbound_in_percent=0.0% / outbound_in_percent=0.0% / inbound_in_speed=0.0Mbps / outbound_in_speed=0.0Mbps / in_packets_in_error=0 / out_packets_in_error=0 / in_discard_packets=0 / out_discard_packets=0

# Monitoring REFIMEVE equipment

## Internal network procedures



# Monitoring REFIMEVE equipment


## Refimeve weathermap

Direct URL

Provide your identity  
to access REFIMEVE  
private zone




**Fédération de test**

 Sélectionnez votre établissement

Pour accéder au service **Web REFIMEVE (développement)** sélectionnez ou cherchez l'établissement auquel vous appartenez.

Se souvenir de mon choix pour cette session.  
 Se souvenir de mon choix définitivement et contourner cette étape à partir de maintenant.

Ou connectez-vous avec



ÉTRATION

# Interactions with NOC RENATER

- Mailing lists
  - [run\\_refimeve@groupe.renater.fr](mailto:run_refimeve@groupe.renater.fr)  
Core REFIMEVE Team + Muquans
    - In case equipment failure
    - Incident or maintenance occurring in a T/F link
  - [refimeve@noc.renater.fr](mailto:refimeve@noc.renater.fr)  
Members of REFIMEVE consortium (draft version with list of people attending REFIMEVE AG 2018)
    - Incident or maintenance occurring in a T/F link
- Feel free to report to [nicolas.quintin@renater.fr](mailto: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 monitor 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!