RENATER's White Box CPE in Normandy Regional network

WP6 T1 monitoring and management activity

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GÉANT 4-3 WP6 Task1: Network Technology Evolution

- LoLa
- Optical Time & Frequency Network
- Quantum Key Distribution
- White-Box for research and education
- Router for Academia, Research and Education
- Data Plane Programming

- Several topics of WP6 T1 are related to monitoring and management

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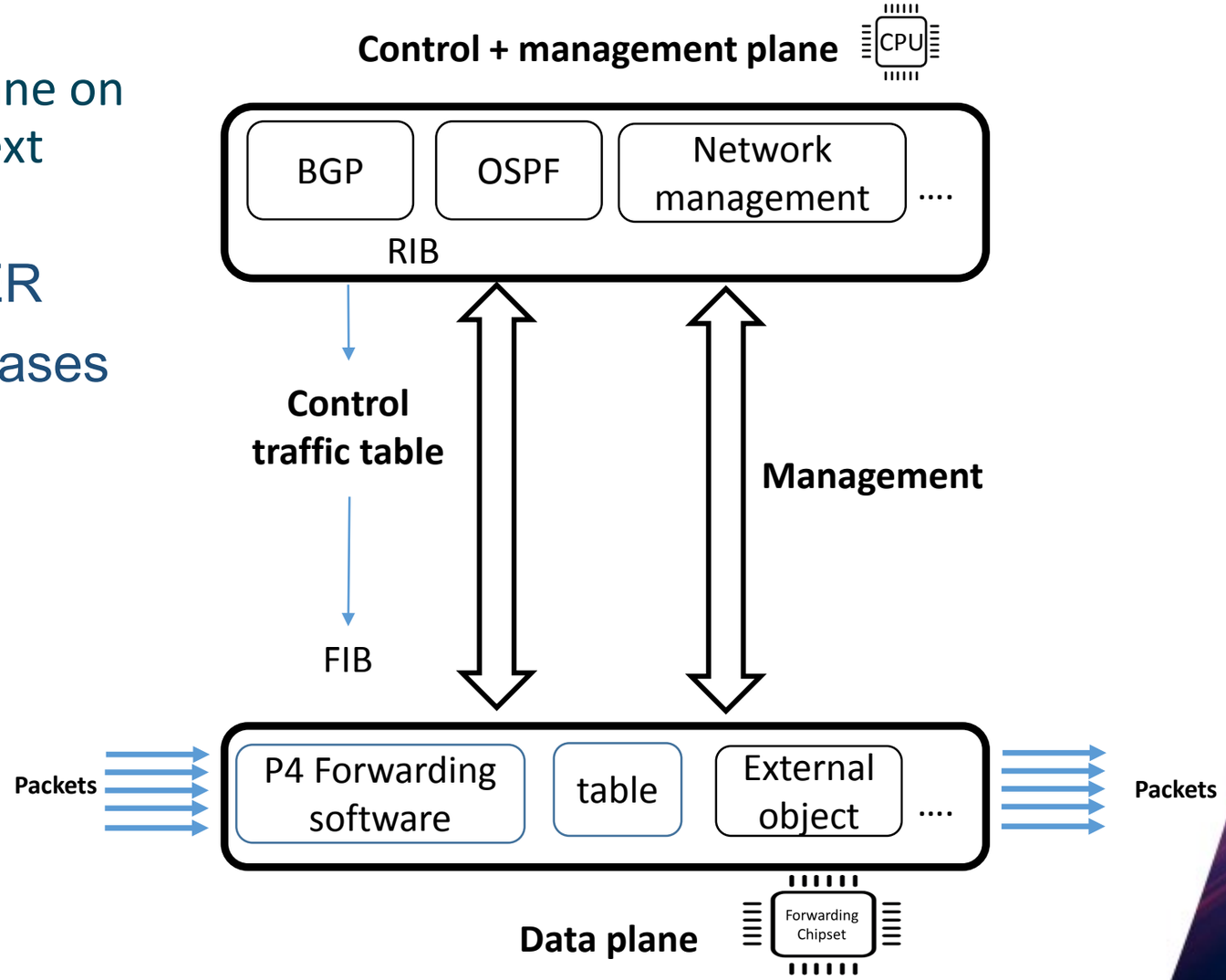
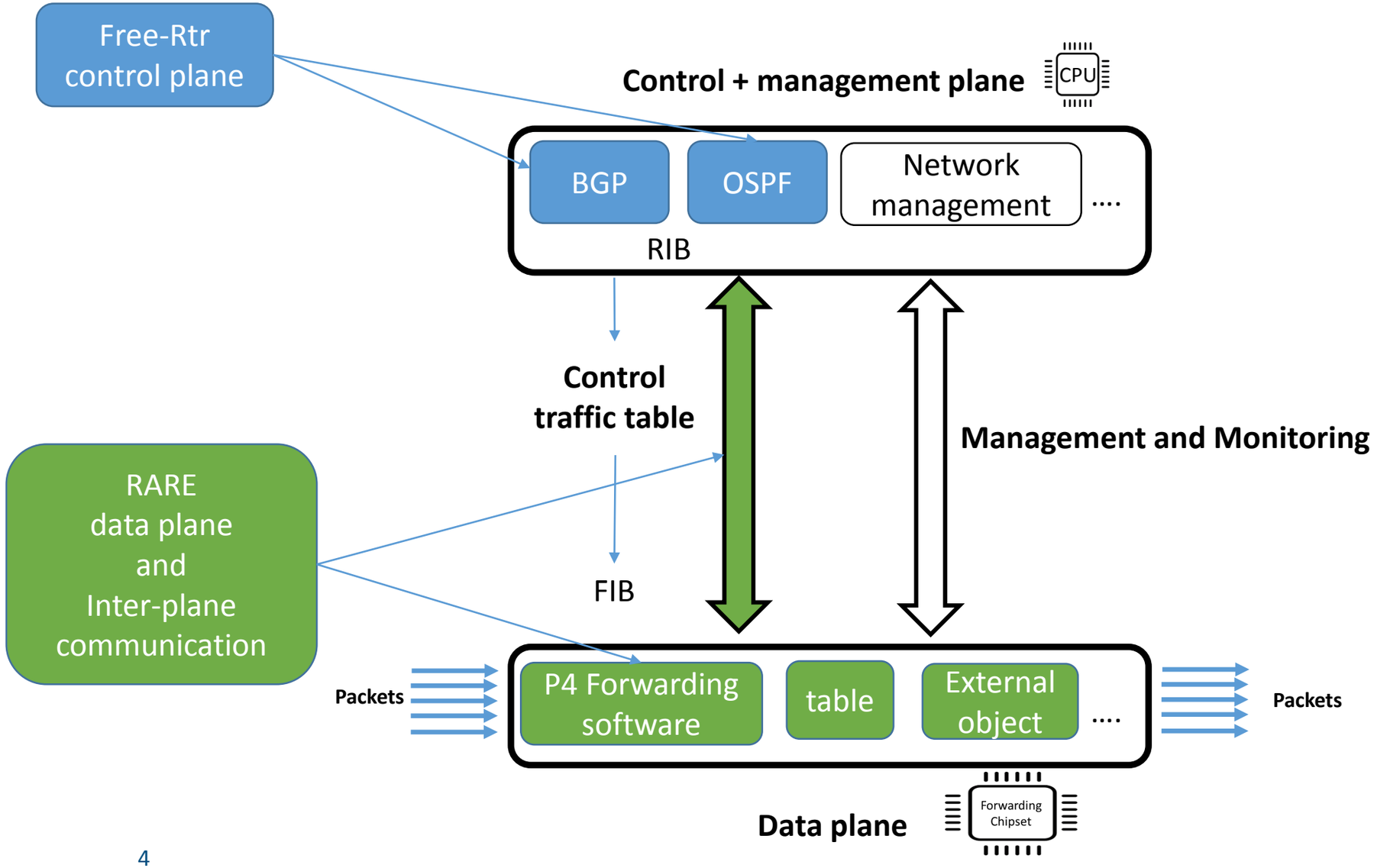
RARE Router for Academia Research and Education

- Validate an open source control plane on top of P4 data-plane in NREN context
- Use cases:
  - GIX, DC, CPE, P/LSR, PE/LER
- - Global research project use cases



Open Source control plane driving a P4 data plane



RARE Router for Academia Research and Education

- **Features developed:**
  - IPv4, IPv6, MPLS, SR-MPLS, L3VPN, XConnect, VPLS, EVPN, 6VPE
  - New features under development

- Demonstration of Segment Routing with ISIS at https://youtu.be/5dD18sJ6pS8

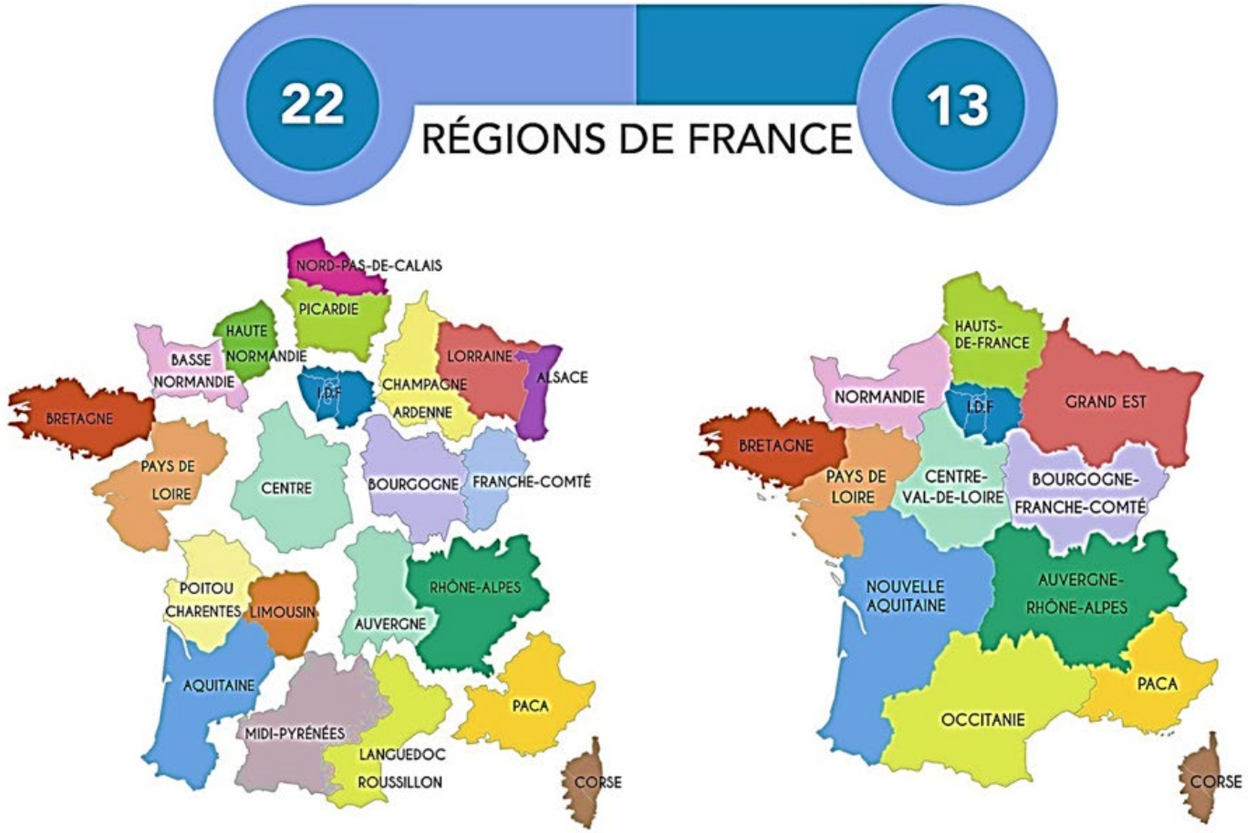
- Regarding manpower allocated, management and monitoring will be developed after
  - SNMP not envisaged, **streaming telemetry instead**

- What would be an appropriate collector?
  - RARE envisage ELK (Elasticsearch Logstash Kibana)?
- What variable/view should be sent to the collector? Format?

- Contact: gn4-3-wp6-t1-wb-rare@lists.geant.org

CPE Normandy – French context

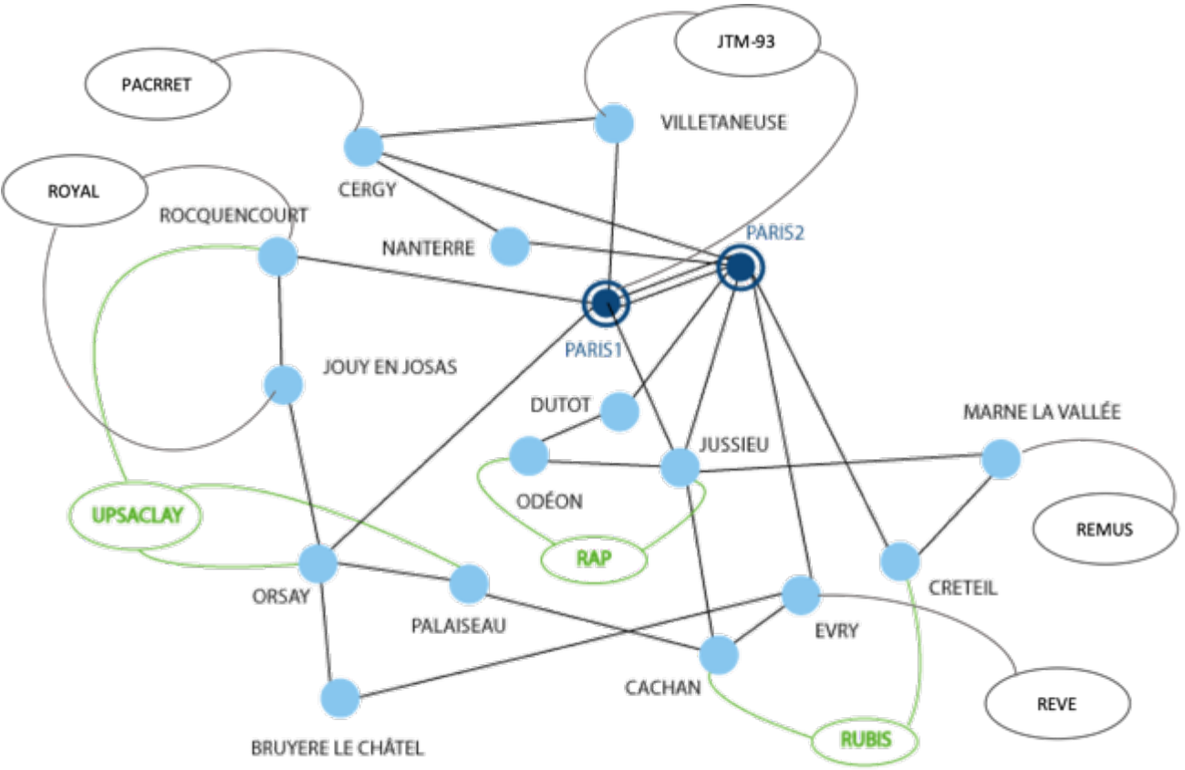
- **Regional Network (Réseau d'accès)**
  - Network that help connecting user sites. Some of them are « members » of RENATER, the regional network connect them to RENATER PoP for the others (site that are not members of RENATER) the regional network connect them to a commercial Internet provider.



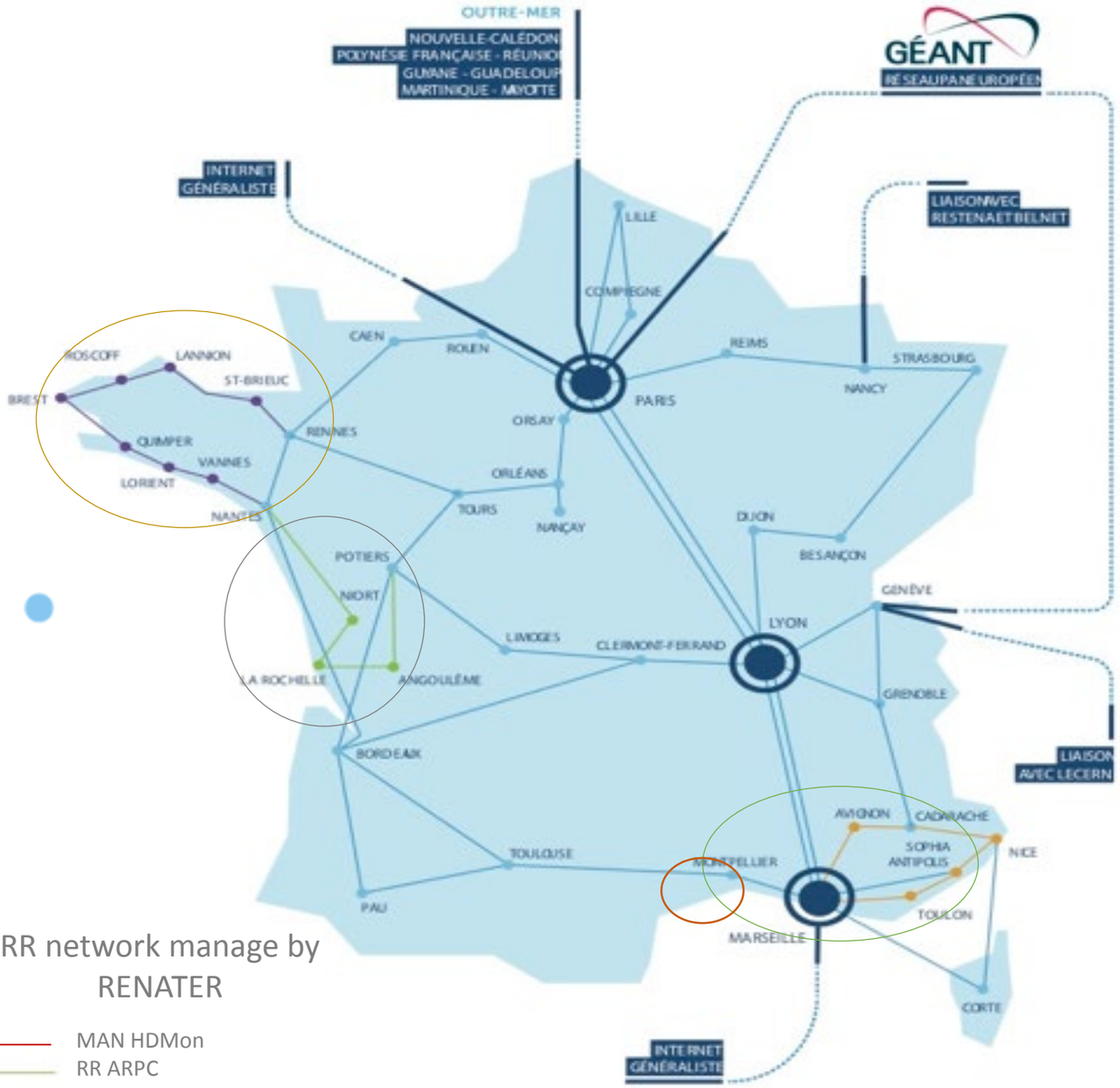
Regional networks

REGION	RA régional ER	Réseaux anciennes régions	Réseau EN	MAN
AUVERGNE-RHONE-ALPES	AMPLIVIA	ARAMIS, AUVERDATA, RRHD	AMPLIVIA	TIGRE (ex GRENET), RMESS (St. Etienne), LyRes (Lyon), CRATERE (Clermont Ferrand)
BOURGOGNE-FRANCHE-COMTE		RESUBIE, SEQUANET		
BRETAGNE	**RUHD Bretagne**	**Bretagne Très Haut Data**	Collecte Cotes d'Amor, Finistère,Morbihan	
CENTRE-VAL DE LOIRE	RRTHD		RECIA	SIRRUS (Tours), MAN (Orléans), OSIRIS (Strasbourg)
CORSE	RETECOR			
GRAND EST	RAREST	RAMSES, LOTHAIRE, TELEMUS	e-Lorraine	JUPITER (Reims), OSIRIS (Strasbourg), STANNET (Nancy), AMPERNET (Metz),EPINET (Epinal)
HAUTS-DE-FRANCE	RRT2 NOROPALE	RRTP	RRTP	RAOUL (Lille)
ILE-DE-FRANCE	**IdF RENATER**			PACRRET (Val d'Oise), ROYAL (Yvelines), **RAP** (Paris), JTM93, REVE (Evry), **RUBIS** (Hauts de Seine-Essone-Val de Marne), REMUS (Marne la Vallée), **UPSaclay** (Plateau de Saclay**)**
NORMANDIE	SYVIK	SYRHANO, VIKMAN		
NOUVELLE-AQUITAINE	**RNA**	GREPA, **SPIN**	**SPIN**, RAIHV	REAUMUR (Bordeaux), RELIER (Limoges)
OCCITANIE	THD'Oc	ASTER, R3LR6	THD'Oc., SYNAPSE	REMIP (Toulouse), **HDMon** (Montpellier)
PAYS DE LA LOIRE	GIGALIS		COLLECTE - LEMANS	OR-ANGERS, Le Mans, Omega
PROVENCE-ALPES-COTE D'AZUR	**Extension RENATER**	R2THD	REALYCE	RARE (Avignon), RMES (Toulon), RAIMU (Marseille)
GUADELOUPE				
GUYANE	**RENATER 3 points**			
LA REUNION	GAZELLE			
MARTINIQUE	RIME			
MAYOTTE (TOM)				
Polynesie Française COM)	**POLYREN**			

Operational activity regarding regional network (RR)



RR managed by RENATER
in Paris region
Backbone RENATER node



RR network manage by
RENATER

MAN HDMon
RR ARPC
RR THD Bretagne
RR PACA

RENATER and regional networks

- Active collaboration with regional network
  - Work on regional network backup access

- Project management assistance and consulting
  - Network architecture design
  - Tender/Request For Information mangement support

- Collaboration with regional network around innovation and technical
  - MD-VPN
  - White box project: CPE-Normandy
  - In the future → Network Management as a Service

What is white box?

- A white box is a switch/router manufactured from commodity components that allows different Network Operating Systems (NOS) to be run on the same piece of commodity hardware

- Decoupling the software (NOS) from the hardware→ 2 levels of independence :

  independence from the hardware

  you can change the hardware vendor and keep the software

  independence from the NOS

  you change the NOS and keep the hardware

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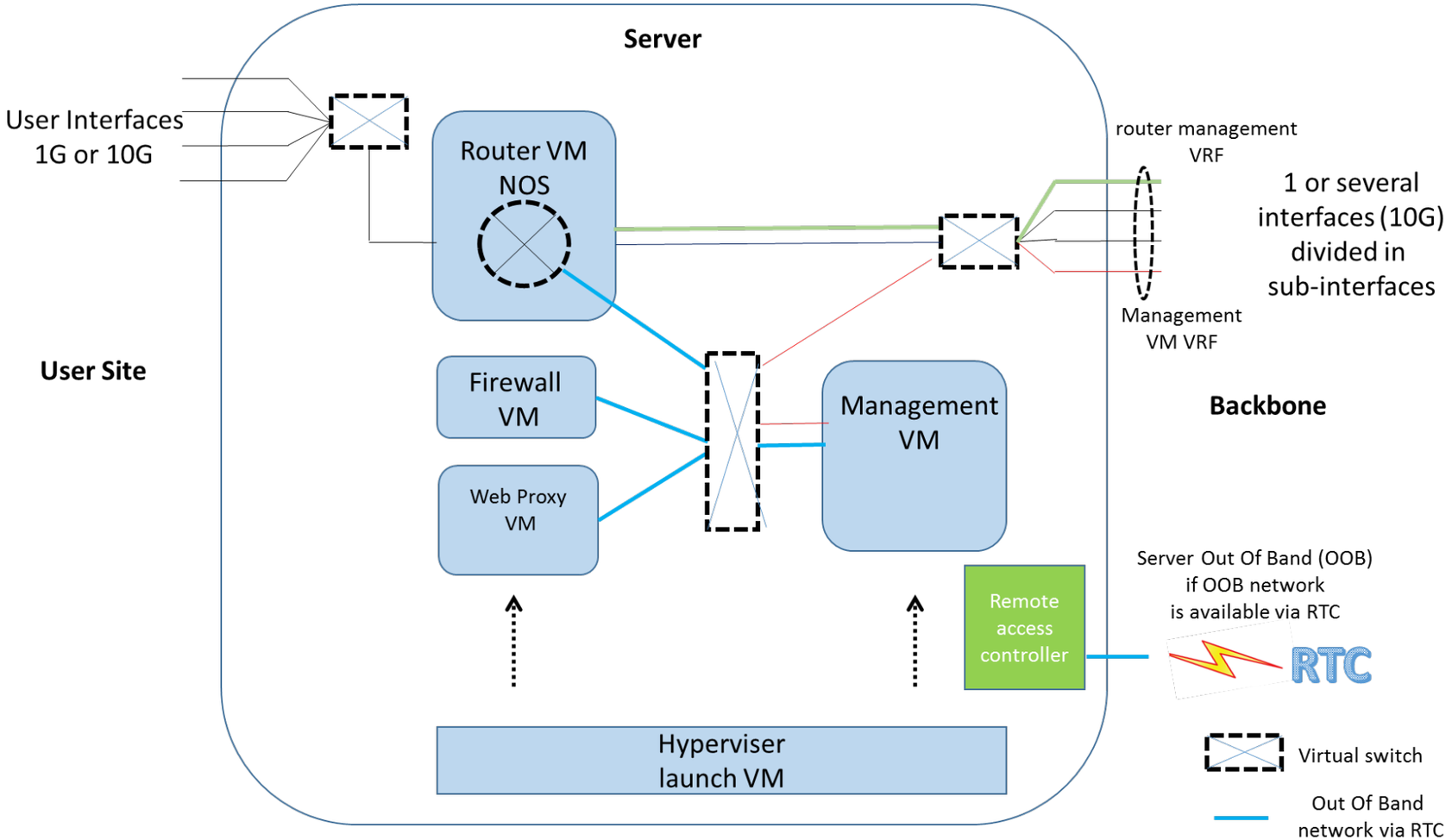
CPE for Normandy Region

- Upgrade the high schools CPE routers (Normandy region manage 140 high schools)
- Requirement
  - At least 1Gb/s throughput
  - BGP peering, IGP, VLAN, Logical interface, VRF lite), management (SSH, Syslog, SNMPv2) and security (line-rate IPv4/IPv6 L3 ACLs, Broadcast storm protection)
  - Automation.
  - The cost must not exceed the cost of the existing solution.

CPE for Normandy Region

- White boxes were originally designed for data centre use
- Not cost effective in comparison to a very small router
- A solution based on x86 servers with a switch-style form factor (Dell VEP 4600)
  - 1 socket 8 cores Intel Xeon D-2145NT @1.9GHz
  - 1x 32 GB of RAM (7 of 8 slots free)
  - 1 TB M.2 SSD
  - 2x10G ports + 4x 1Gbps RJ45 ports + some other RJ45 for management (console, ...)
- Router implemented as network virtualized function
  - Capacity to activate additional network virtualized function(s)
  - More cost efficient if other NFVs are implemented (Firewall, …)
  - CUMULUS and FRR solution tested – FRR chosen
  - No dedicated forwarder chipset so the forwarding capacity decrease according to the number of NFV implemented

X86 server CPE design



Same automation type as in a data center

1. Hypervisor provisioned on the server by the NOC
   - First, configured (IP address, ...) using an USB stick
   - In future via PXE
     - by adding the MAC and IP address in Ansible inventory and launching a playbook
2. Using a set of Ansible playbooks, the stack is set up:
   1. hypervisor configuration (bridges, VLANs, ...)
   2. CPE virtual machine provisioning on the hypervisor
   3. CPE installation (Operating System, IP addresses and additional packages)
   4. CPE configuration (routing daemon configuration: VRF, BGP, management ACL, …)

Deployment and validation

- Deployment during last week of October (foreseen October 22nd) in 2 first high schools

Thank you

Any questions?

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