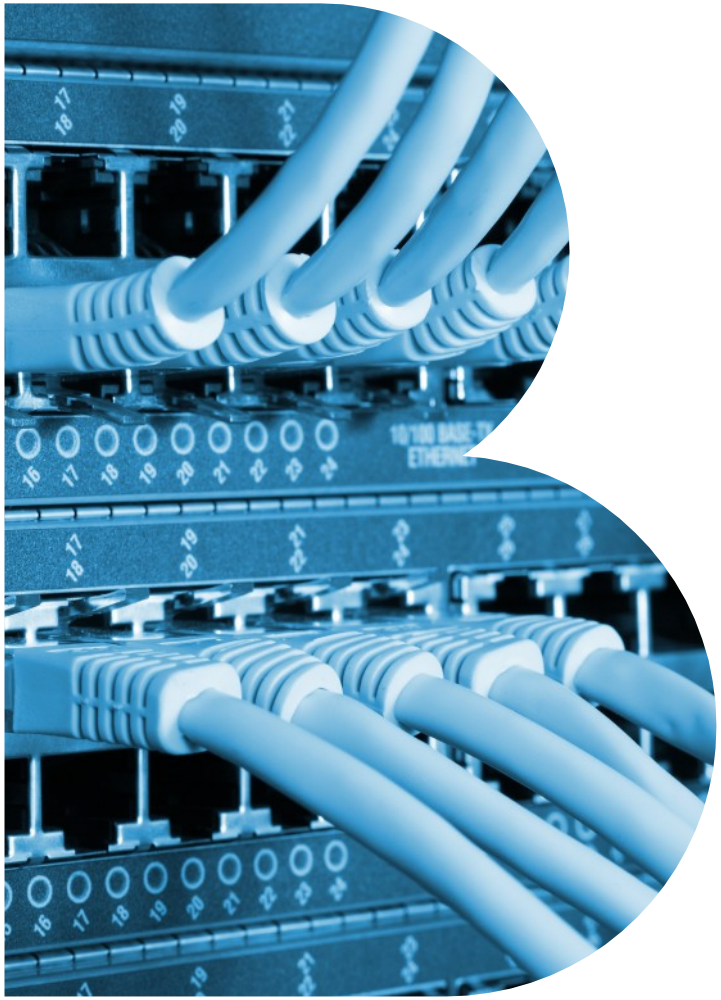
France's Path to PPDR Broadband



SNIR Day

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Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTERE DE L'INTERIEUR

DRAFT DOCUMENT

Paris, June 2018

Police officers, **gendarmes** and **fire-fighters** today use **radio equipment** that was designed for 2G, which is not entirely up-to-date and does not allow, for instance, the transmission of large amounts of data or pictures in real time from the field. Therefore one of the **major sovereign projects** will be the **common high-speed** radio network of the future ("**Réseau Radio du Futur**") for the police, gendarmerie and civil security which will benefit from a **high level of resilience** in case of crisis and the best available digital technologies. It will be a **prominent French and European industrial project** whose **deployment** must be achieved **as soon as possible** and is also subject to a clear financial commitment as part of the **major French investment plan** ("Grand Plan d'Investissement") for the coming years.

Emmanuel Macron, 18/10/2017

The objective of the RRF Project is to move from a 2G network (Tetrapol) to a LTE/4G network shared by all operational groups

Presentation of the Réseau Radio du Futur (RRF) project

Current network (Tetrapol)

- **Multiple networks:** RUBIS/ INPT
- **Dedicated network**
- **Technology:** Tetrapol (equivalent to 2G)
- **Supplier:** Airbus (proprietary technology)
- **Coverage:** 45% of territory (pedestrian coverage only)
- **Frequencies:** 80 MHz & 380-400 MHz
- **Bandwidth:** ~0,01 Mbits/s
- **Number of users:** 180 000
- **Functions:** Text and voice messages
- **Investment:** CAPEX oriented strategy

TETRAPOL

RRF[1)] project

RRF Network

- **Unified network**
- **Hybrid network:** Dedicated + commercial components
- **Technology:** LTE/4G
- **Suppliers:** The whole 4G/LTE ecosystem
- **Coverage:** 95% of territory
- **Frequencies:** 700 MHz (for the dedicated part)
- **Bandwidth:** ~10 Mbits/s
- **Number of users:** +300 000
- **Investment:** OPEX (services) oriented strategy, minimizing CAPEX related to dedicated radio networks
- **Functions:** Text and voice messages ; Video broadcasting and recording ; Instant messaging ; Geo-tracking ; Access to information systems…

1) Réseau Radio du Futur

Source: RRF prefiguration mission, Wavestone, Roland Berger

Several key principles serve as a basis in the French PPDR Broadband request for information procedure

Key principles of the RFF request for information

> The **respect of the 3GPP standard** remains a **mandatory basis** to build the RFI document.

> Objective for the Ministry of Interior (MoI) to **minimize** the **CAPEX related to dedicated radio networks** in order to use only radio network **services** (excluding terminals and tactical networks). **Resilience** is ensured by the multiplicity of networks used.

> The **recommended market period after winning the tender offer** is **4 years**. Therefore, the idea is to make all efforts to minimize the investments in infrastructure. Every potential demand of market extension will have to be justified by real amortization difficulties, **which will have to be supported by figures**, as a national security issue isn't considered as an acceptable justification. It will be possible to give this justification within the request for information procedure.

> Considering schedule by 2021-2022, it is important for the RRF to **include as of now prospective topics** in the request for information (e.g. 5G and IoT developments).

> The **securing of spectrum resources** should lead to a **fair business** for all parties involved. For this reason, the request for information procedure will ask about the economic model suggested.

> **Separation of professional services from current telephony services:** the RRF is a supplier of **prioritized critical communications**, based notably on group communications. It doesn't supply standard telephone services which is the exclusive competency area of MNOs[1)].

1) As a consequence, it is not planned that critical communications systems supply IMS functions. Concerning the access to telephone services via RFF resources, a gateway system is now preferred

Source: RRF prefiguration mission, Wavestone, Roland Berger

The use of tactical devices enhancing the network's resilience varies according to the coverage level in the area

Complementary levels of resilience

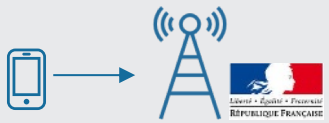
Coverage from operated networks

1. National roaming and priority/ pre-emption

2. Deployment of vehicular or individual tactical networks[1)]

3. Deployment of an infrastructure tactical network[1)]

4. Support from a regalian infrastructure network



Lack of coverage from operated networks

1. National roaming and priority/ pre-emption

N/A

2. Deployment of vehicular or individual tactical networks[1)]

3. Deployment of an infrastructure tactical network[1)]

4. Support from a regalian infrastructure network

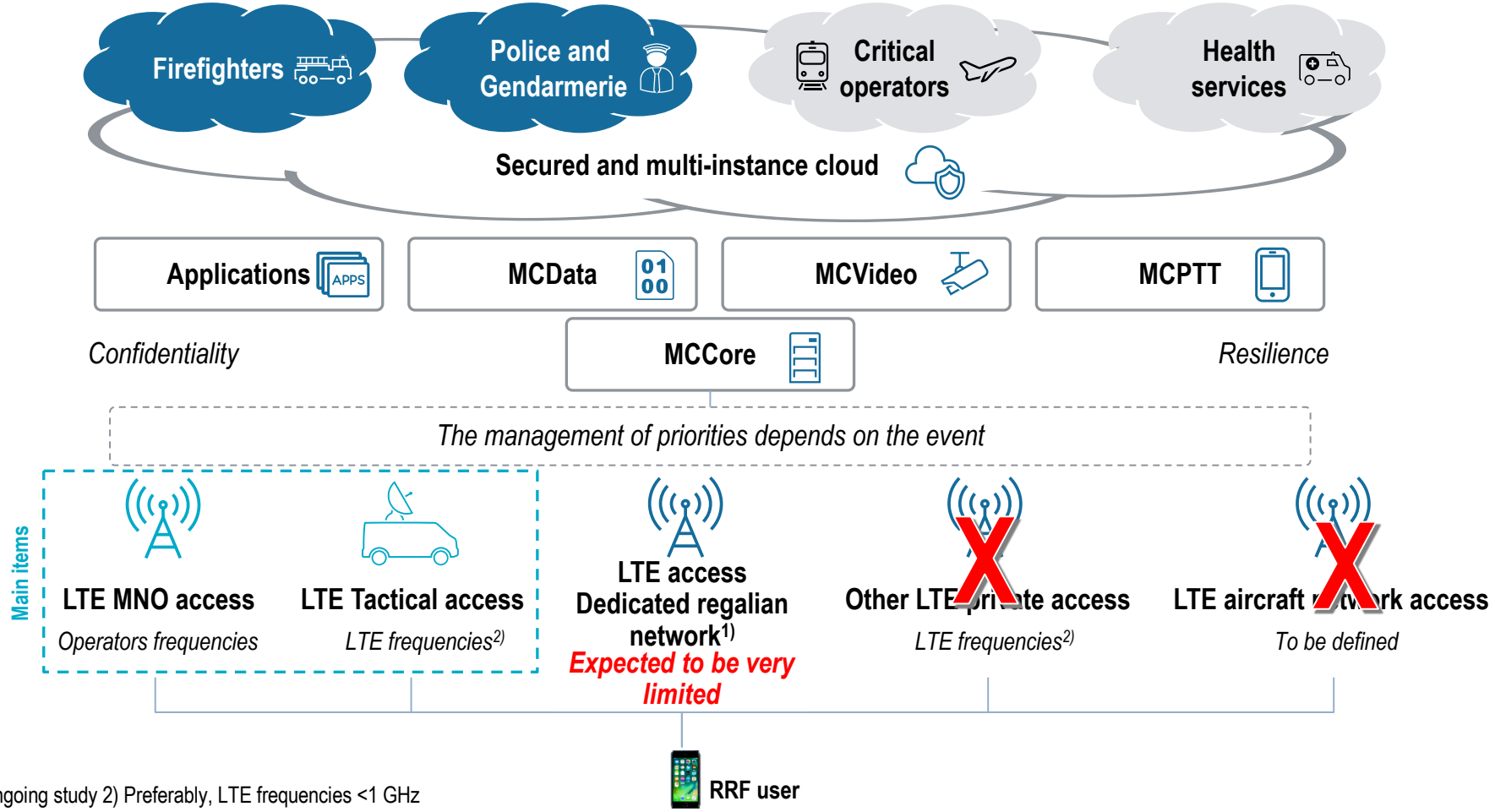
Expected to be very very limited

1) See appendix regarding PC STORM project

Source: RRF prefiguration mission, Wavestone, Roland Berger

The hybrid architecture is supported by a private network of telecom operators as well as mobile tactical networks

Presentation of the network architecture

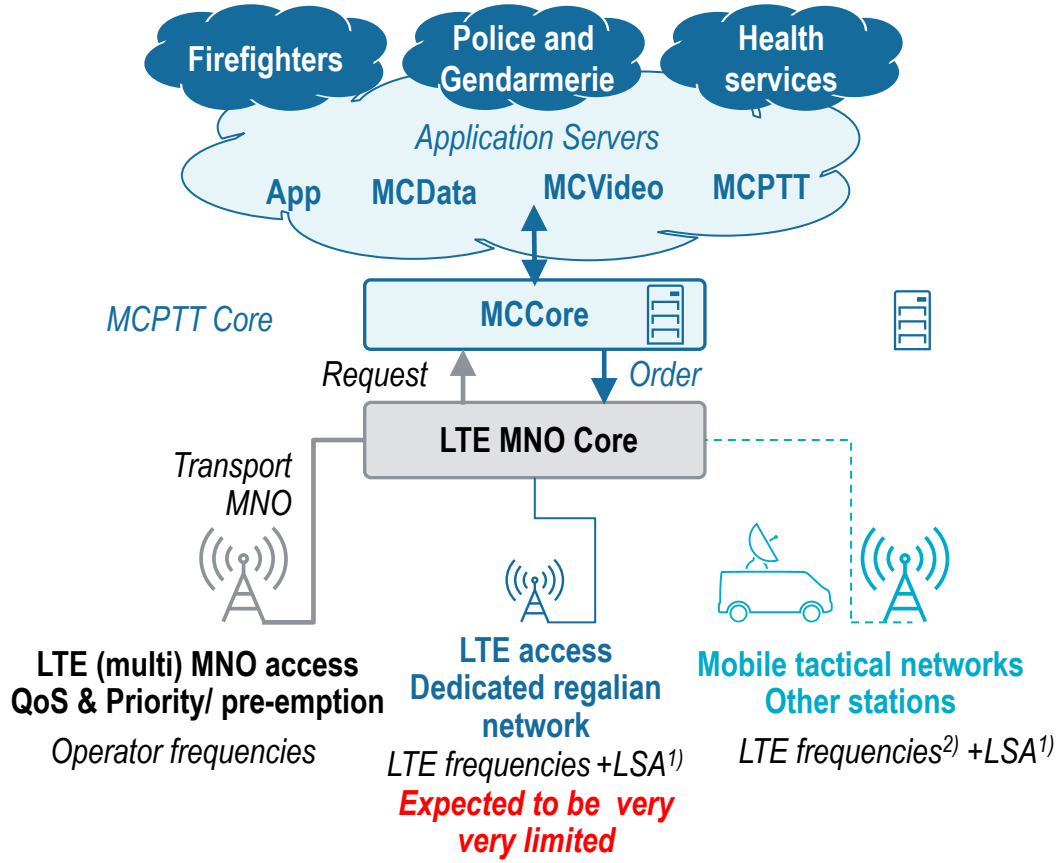


1) Ongoing study 2) Preferably, LTE frequencies <1 GHz

Source: RRF prefiguration mission, Wavestone, Roland Berger

The RRF uses both mobile tactical networks and the multi-MNO to maximize the network resilience (+ potential dedicated network)

Hybrid architecture of the reference scenario



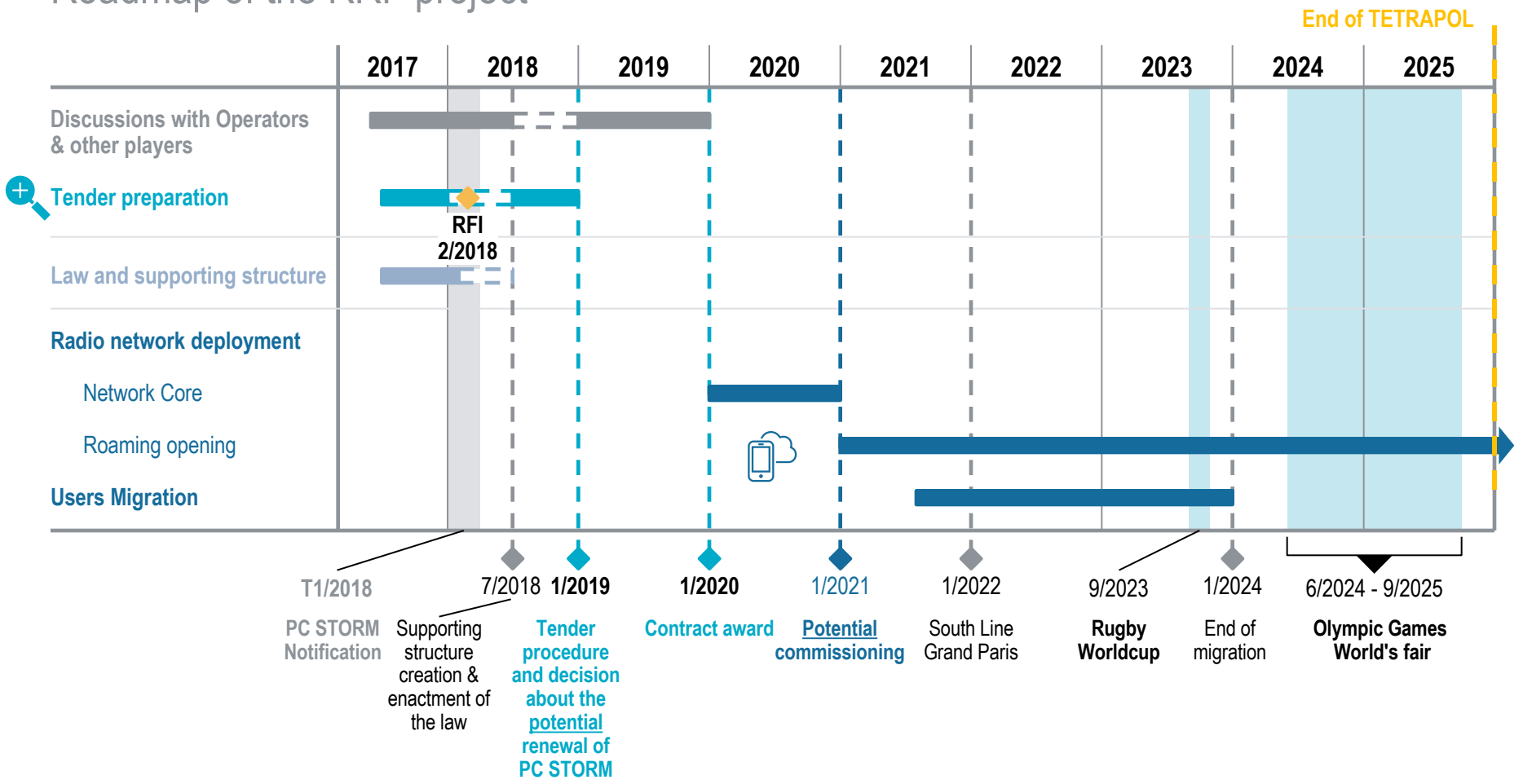
1) Licensed Shared Access : MNO spectrum rental but on RRF tactical network 2) Preferably, LTE frequencies <1 GHz

Source: RRF prefiguration mission, Wavestone, Roland Berger

The global schedule of the RRF project plans a launch of tender offer procedure in early 2019 and an implementation in 2021

Roadmap of the RRF project

Preliminary roadmap



Note : RRF will be cautious not to interfere with the PC STORM notification scheduled for Q1 2018 with the launch of its RFI procedure (planned afterwards)

Source : Mission de préfiguration RRF, Wavestone, Roland Berger

Identified risks of a long-term transition

Financial risks

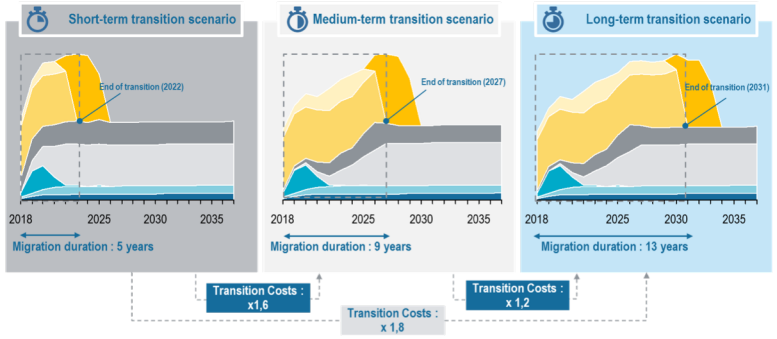
The study emphasizes a huge financial impact of running a Tetra Network and an LTE network at the same time for an extended period of time :

- > *Multiplying the transition length by 2.5 could double the transition cost ;*
- > *Some functionalities are paid for twice during the transition period, which doubles some functioning costs.*

***NB :** A financial risk about obsolescence management still exists. Such risk is avoided and minimized in the study because of the internalization of maintenance activities.*

Illustration of migration costs according to 3 scenarios

Transition costs are highly dependent on the duration of the migration



Operational risks

Keeping PPDR users on the TETRA network doesn't allow them to access the multimedia environment provided by a standard LTE network. A long term transition policy could breed :

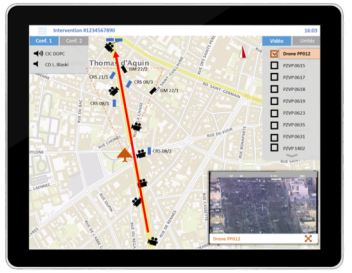
- > *Interoperability issues at border areas;*
- > *A lack of access to necessary functionalities (video, photos, etc.);*
- > *System breakdowns (a drop in reliable access);*
- > *Potential sizing issue (in case of re-designing TDM interface card is needed).*

Illustration of functionalities provided by a multimedia environment

Document access

Geolocation

Video access in real time
(public camera, drone, etc.)



A spectrum sharing case study could answer different players' needs in a context of LTE spectrum shortage (2/2)

Illustrative – for discussion

Type of user and specific needs	Geographic coverage limit	Time limit	Infrastructure	Spectrum type	When?	Business contract	Contract features
User #1 (e.g. PPDR units)	✗ Anywhere	✓ (e.g. 4 hours)	**Proprietary infrastructure** : mobile tactical network	**MNO Spectrum** (e.g. 2X2 MHz)	At anytime every month	*Spectrum rental from MNO*	*Additional spectrum can be purchased on demand with setup < 5 min.*
User #2 (e.g. Airport staff)	✓ Buildings in an area of 10 km²	✗	**Infrastructure sharing** between U2, U3 and U4 by tagging operational priorities	Spectrum from **licensee** (e.g. Ministry of Defense, **MNO**)	Permanently	*Spectrum sharing with U3 and U4*	*In case of serious incident the MNO reallocates additional spectrum to U2, U3 and U4 with a setup time of 10 min. (pre-defined settings)*
User #3 et User #4 (e.g. Airline staff, airport transport staff)	✓ Buildings in an area of 10 km²	✗	**Infrastructure sharing** between U2, U3 and U4 by tagging operational priorities	Spectrum from **licensee** (e.g. Ministry of Defense, **MNO**)	Permanently	*U2, U3 and U4 freely reuse unused MNO spectrum in the pre-identified confined environment*	*In case of serious incident the MNO reallocates additional spectrum to U2, U3 and U4 with a setup time of 10 min. (pre-defined settings)*
User #5 (e.g. Road Operator/ Manager)	✓ Buildings in an area of 10 km²	✗	**MNO infrastructure**	**MNO Spectrum**	When needed	*U5 negotiates priority preemption with MNOs with improved availability for low-speed voice and video services*	*U5 uses mobile tactical networks in case of failure of the MNO network with spectrum rental on demand*
User #6 (e.g. Bus operator)	✓ Outdoor coverage in top cities	✗	**MNO infrastructure**	**MNO Spectrum**	When needed	*Negotiates priority preemption with MNOs A national roaming solution without any SPOF[2] is implemented without any spectrum purchase*	*An MNO network or central equipment failure is not acceptable*

> **Spectrum utilization** is **limited for each user** either by **geographic coverage** or by **time limit**

> **MNOs play** a **key role** in this case study, and **can be included in all situations**, through the usage of their **infrastructure** or/ and **spectrum**.

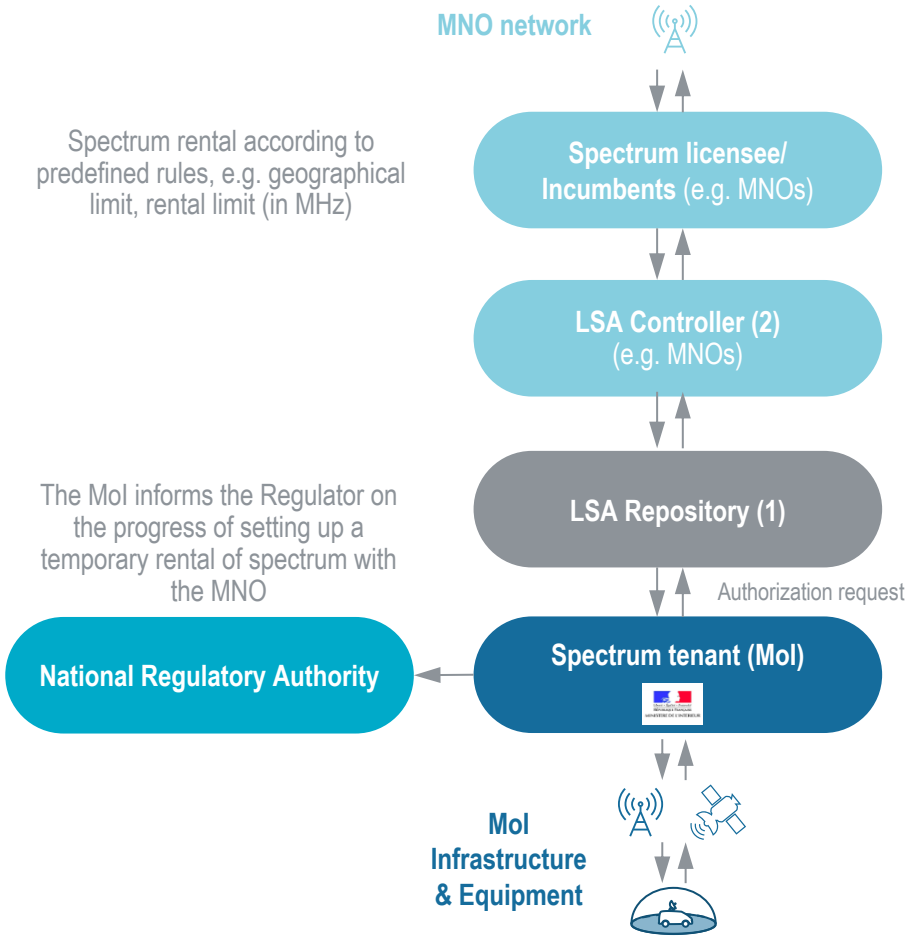
1) MNO : Mobile Network Operator 2) SPOF : Single Point of Failure

Source: Mission de préfiguration RRF, Wavestone, Roland Berger

The architecture would include different types of actors, including a LSA Repository and a LSA Controller

General Architecture of Spectrum rental for the use of the MoI

Illustrative – Architecture proposal



1 LSA Repository

> **Role :** provides information on **spectrum availability** and **associated conditions** (e.g. evolution over time ...)

> The LSA Repository can be managed by :
- the licensee / Incumbent (e.g. MNO)
- the National Regulatory Authority
- be delegated to a trusted third party

2 LSA Controller

> **Role :**
- ***manages access of "Spectrum Tenant" to available spectrum*** *according to the* ***predefined sharing rules*** *and* ***licensee usage*** *information provided by the LSA Repository*
- retrieves the LSA Repository spectrum information through **secure** and **reliable communication**
- may interact with one or more LSA Repositories as well as one or more spectrum applicants / tenants

> The *LSA Controller* can be managed by :
- the licensee / Incumbent (e.g. MNO)
- be delegated to a trusted third party

Source: Based on LSA documentation from ECC Report 205, Mission de préfiguration RRF, Wavestone, Roland Berger

Spectrum rental for the use of the French MoI comprises multiple benefits for spectrum license incumbents such as MNOs

Spectrum rental benefits for Spectrum license incumbents/ MNOs

Preliminary – for discussion

1	**Cover themselves from legal risks/ actions in case of failure on their network**	> In the event of a **failure on the MNO[1] network**, **MNOs can cover themselves** from **legal risks/ actions** since it is the **Ministry of Interior** which takes the **full responsibility** at the same time as it **uses the spectrum**. > Thus, it **enables MNOs to avoid potential legal actions** in case of breakdown/ failure of their network.
2	**Fair business approach**	> **Securing resources** should give rise to a **fair business for the MNO**, the idea being to solicit each ecosystem for what its expertise and know-how, so that the **bidder can make a return of its investment over a standard market period** (4 to 7 years).
3	**Receive more spectrum from the Regulator and answer all vertical markets needs for spectrum**	> In the long run, if spectrum rental from the MNO is proven efficient from both sides, the **Telco Regulator could push for increasing spectrum sharing** with management potentially given to the MNO, therefore obtaining **more business** on this **spectrum secondary market** > **In addition, Spectrum rental from MNOs** can be **of interest for all vertical market players**, and appears as the **only solution to answer all vertical market needs for spectrum, building an argument in favor of greater spectrum allocation towards MNOs**

1) Mobile Network Operators

Source: Mission de préfiguration RRF, Wavestone, Roland Berger

Fixed or moving networks could either be the property of the MoI[1] or partly rent through a contract with MNO

Spectrum rental implementation possibilities

Model	**Owned dedicated networks with LSA[3]**	**Rental dedicated network with network slicing**
Ownership of the dedicated network	Ministry of Interior	MNO[2] (ownership of a "box")
Technical network access	Direct access to a specific spectrum band rent to the MNO through LSA	Network slicing managed by MNO
Prerequisite	**Guaranteed immediate access** to the network in any situation, at any time	
Underlying interrogations	> Will users be able to go from one MNO to the other ? > Necessity of additional standardization ? > Necessity of frequency harmonization ?	> How to ensure the reversibility of slicing: – for small tactical networks ? – for bigger fixed dedicated networks ? > Is it sustainable (for these same networks) ?

1) MoI : Ministry of Interior 2) MNO : Mobile Network Operator 3) LSA : Licensed Shared Access

Opening discussions

1 Indoor coverage

> Working with contracts? **No regulation approach!**
> Repeating commercial networks in buildings
> People senure security will be available in deep indoor environment
> **Are SNIR members able to address this market?**
> **Under which conditions?**

2 5G

> **How will SNIR members address 5G globally?**
> How can we mutualize more between vertical markets
> High frequencies issues?
> Which markets: eHealth? Factories?

3 How do we work together?

> Access to RRF extranet
> Send email at emmanuelle.villebrun@interieur.gouv.fr
> Further meetings?
> Joint action towards regulators?

Appendix

The concept of tactical networks emerged recently, through the PC STORM project

Origin of the PC STORM project

Events

2015

7th January 2015 :
> Charlie Hebdo terrorist attack

9th January 2015 (at the same time) :
> Kouachi brothers took hostages in a printing plant about 30 km from Paris (DAMMARTIN)
> Coulibaly took hostages in a grocery store in eastern Paris

PC STORM Project

Encountered issues

Interoperability

Three different forces were deployed during those attacks, using different PPDR networks :
> **RAID** *(INPT network)*
> **BRI** *(INPT network)*
> **GIGN** *(Motorola network)*

Function

Lack of functions :
> *Absence of video sharing from the field with authorities*
> *Difficulties were encountered to coordinate two operations at the same time (due to limited information transmission)*

Output

1. **Every force should use the same interoperable networks**
2. **PPDR networks should allow the use of broadband data and video services**
3. **PPDR networks must use standard technologies**

Source: RRF prefiguration mission, Wavestone, Roland Berger

PC Storm was created in the wake of these events to provide a tactical PPDR network

Presentation of the PC STORM project

Target

> PC STROM project was set up to respond to the lack and difficulties faced during the terrorist attack of 2015

> The aim of PC STORM project is to develop a tactical ("projectable") PPDR network which uses standard LTE/4G technology

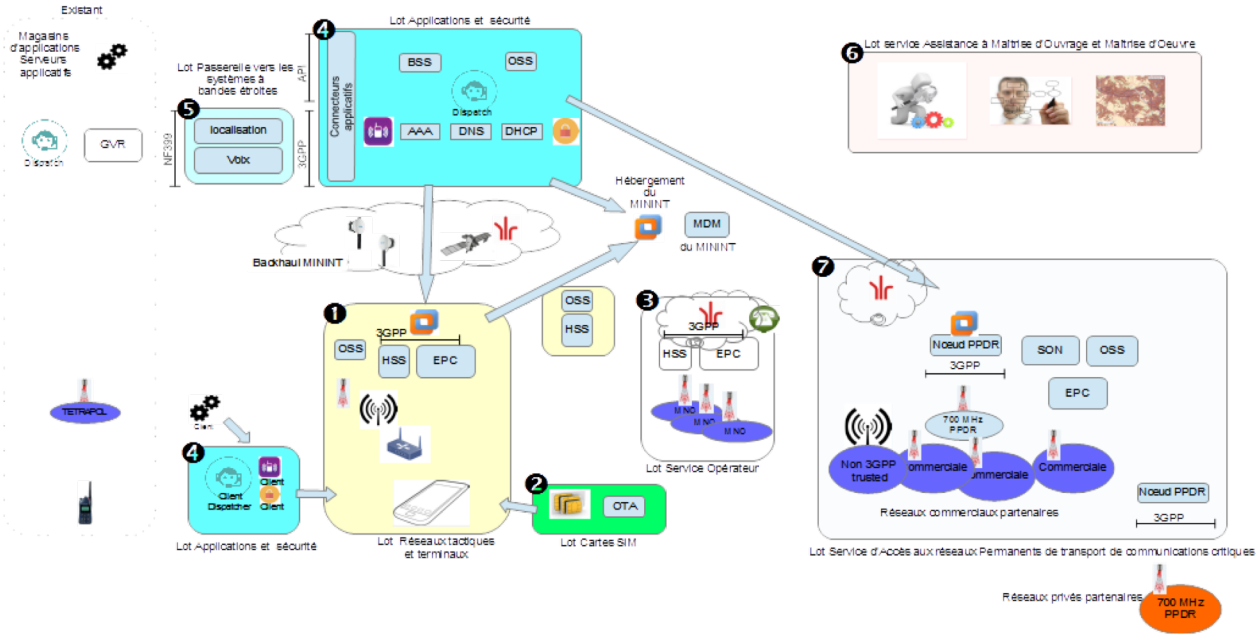
Composition of the project

PC STORM project is divided into 7 lots:

> Deployable networks
> SIM cards
> Operator services
> Applications and security
> Gateways
> Infrastructures
> Technical support

Notification expected:
1st quarter 2018

PC STROM project refers to the second and third levels of resilience



Source: RRF prefiguration mission, Wavestone, Roland Berger