Orange national and international experience on infrastructure sharing practices

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Plan

Introduction: the coverage challenge

1. Infrastructure sharing:
- technical aspects
- Examination of some advantages

2. The French experience: the Telecommunications New Deal

3. International experience (Europe/Africa)

4. Lessons learned

Conclusion

Introduction

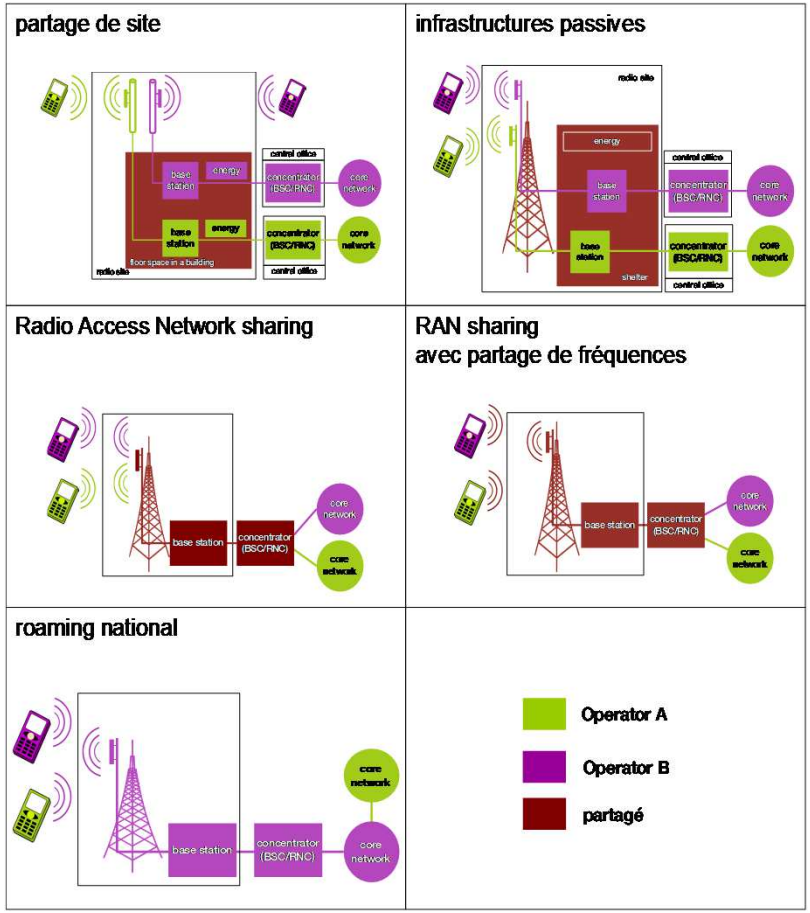
- Connectivity is a priority for many international organisations and national governments
- Strong and growing pressure on governments to find solutions to close the coverage gap
- Industry's purpose to connect everyone and everything to a better future: MNOs in particular play leading role as the primary drivers of connectivity
- Various solutions to close the coverage gap through technical solutions and various regulatory vs commercial mechanisms

In addition to operators agreements: various solutions to close the coverage gap

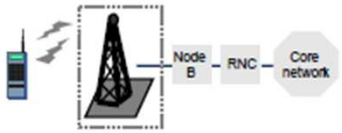
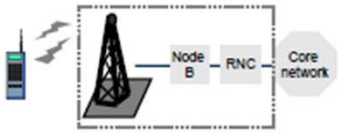
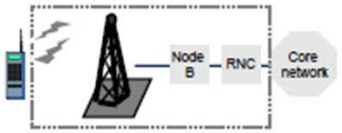
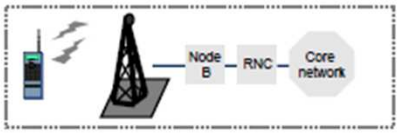
- **A wide range of technical solutions …**
- ✓ Infrastructure sharing
- ✓ innovative tech to try new model to reach the last mile such as lower-cost BTS (e.g., Rural Star), Higher BTS (e.g., drones/balloons)
- **… combined to various regulatory vs commercial mechanisms:**
- ✓ **USFs (Universal Service Funds)**
- ✓ **PPP (Public Private Partnerships):**
  - o effective mechanism to leverage public and private synergies to deploy and operate network infrastructure in areas that otherwise do not have sufficient economic potential to attract private investment
  - o Helps to provide the enabling infrastructure required to deploy commercially viable networks
- ✓ **Community networks:**

  addressing specific and local connectivity needs (often utilise WiFi technology in unlicensed spectrum for their operation)

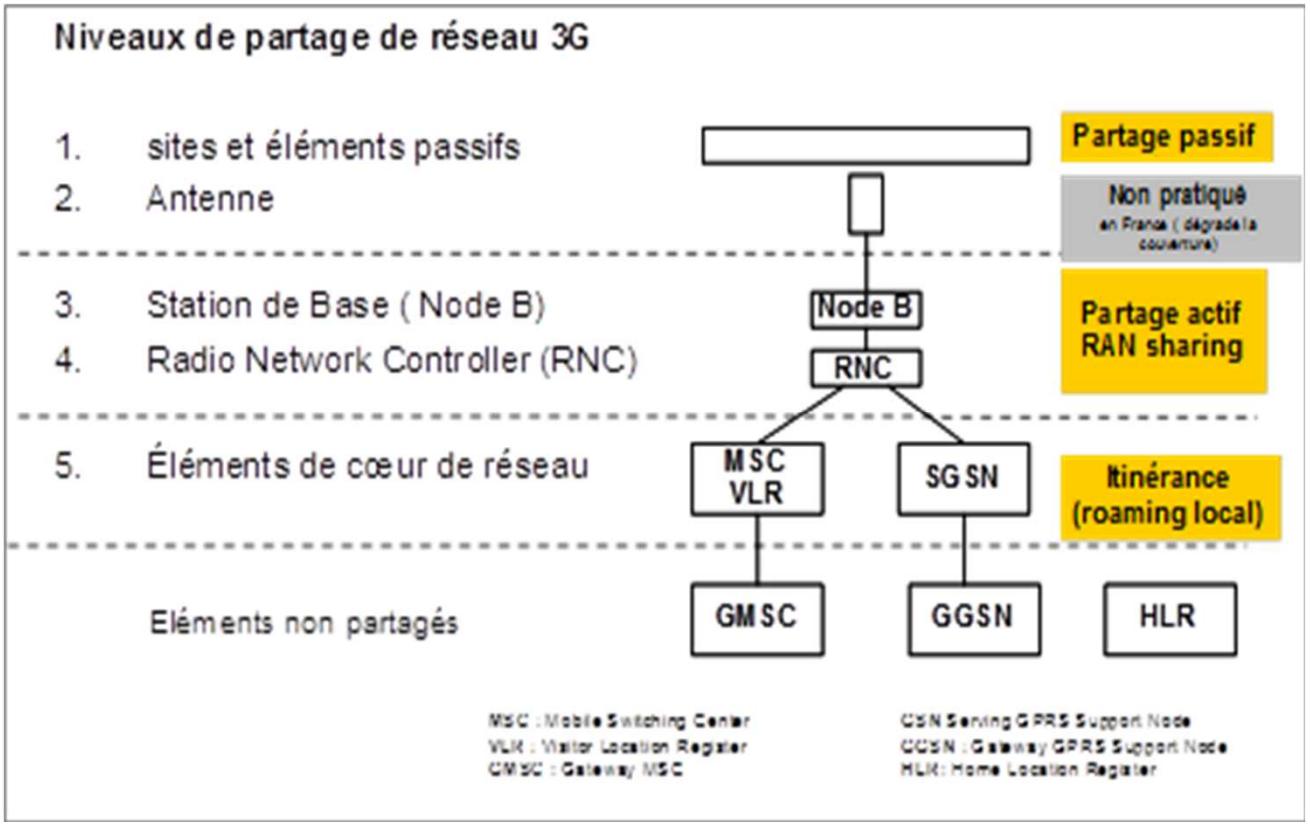
I. Infrastructure sharing: technical aspects (1)



Infrastructure sharing: technical aspects (2)

	1 Deep passive, i.e. common grid and shared transm.	2 Active sharing without spectrum (MORAN)	3 Active sharing with spectrum sharing (MOCN)	4 National roaming, ie. sharing RAN capacity and spectrum
Sharing model[1]				
Descrip-tion	▪ Operators share physical site and mast/antenna frame ▪ Can include shed, power, cooling, transmission etc.	▪ Operators share BTS/Node B, antenna, transmission and mast ▪ Operators use separate core network and spectrum	▪ Operators share BTS/Node B, antenna, transmission and mast ▪ Spectrum is pooled and shared	▪ Hosting operator provides capacity to visiting operator in specific areas ▪ Only spectrum of host is used for traffic of both

Infrastructure sharing: technical aspects (3)



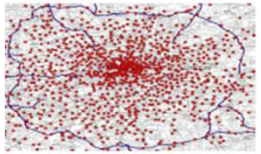
Advantages of Infrastructure sharing (1)

- Infrastructure sharing allows operators to invest more efficiently in infrastructure
- This collaboration can lead to faster expansion of mobile networks..
- …and brings better service to customers.
- Network sharing can be used to improve coverage
- Allows more efficient use of spectrum
- Quality Benefits

Network quality benefits from increased number of sites of two overlapping networks

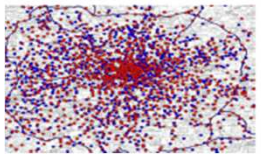
Network coverage benefits
- **Combined coverage benefits**
- **Ability to cover rural areas where standalone roll-out is not feasible**

Example



948 sites of 1 operator in metro area prior to sharing

After sharing…



1.544 sites by JV in metro area

Advantages of Infrastructure sharing (2)

- **Sharing of passive installations (sites, buildings, pylons, mats ...).**
  - This type of sharing is easy to set up and can be done site by site

- **Antenna Sharing ("antennal mutualization"):**
  - this solution has strongly negative impacts on the coverage when the antenna was not designed from the beginning for sharing.
  - Indeed, installing several base stations on the same antenna requires couplers that significantly reduce the available power per base station and therefore degrade the level of coverage of each operator.

- **Sharing active installations: "RAN-sharing".**
  - This is the shared radio access network (base station and base station controller).
  - RAN sharing allows hardware sharing, hence investment savings.
  - RAN Sharing without frequency sharing maintains operator-separated radio coverage, which makes network sharing unnoticeable by the customer.

Advantages of Infrastructure sharing (3)

- **Roaming:**

  - A single network is built, the host operator welcomes customers of other operators on its frequencies in a given area (local roaming).

  - This option has the disadvantage of limiting the services available to the customer :
    - nature of services available,
    - lack of handover,
    - the name of the operator is not always visible on the mobile.

  - In addition, the operator to whom the channel is allocated must share it, which limits the traffic flow capacity

II. The French experience: the telecommunications “New Deal”

Applying to mobile services (4G), the New Deal”is a trade-off between spectrum renewal fees and the commitment to provide coverage in rural areas, associating all operators

- o Win- win deal
- o Aim was to resolve the digital gap and the coverage issue:
- ✓ many non- covered areas, mainly due to some geographical difficulties
- ✓ economic , political and social pressure
- ✓ Involvement of all actors: operators and government
- ✓ Agreement on financial conditions: operators will no longer pay for spectrum refarming, by directly invest money in the network deployment

=> This New Deal helped to speed up the extension of the coverage incl. in rural countries

=> Operators could mutualize some parts of the network

… and competition still goes on by a differentiation on services

The French New Deal : details

- **Operators: Commitments for digital spatial planning:**

✓ Improvement of reception quality in rural countries

✓ Speed up of deployment of shared infrastructure , in non-covered areas (white zones)

✓ Enhance 4G coverage for all roads and railways at local level

✓ Enhance inside coverage (in combination with WIFI technology)

- **Public authorities/governments:**

✓ Renewal of licenses: special conditions (no auctions)

✓ Administrative simplification (e.g. building permits for antennas)

✓ Incentive taxation: stable licence fee, 5 years tax exemption (IFER- flat fee taxation on networks companies to be paid to local authorities))

The French New Deal : evaluation, assessment and control

Governmental agencies control the effectiveness of the measures taken:

- ANFR (Frequency agency) : control of number of base stations deployed
- ARCEP (NRA): observatory of mobile coverage and quality of the mobile service

Transparent information is communicated to the public and the medias

…with positive results for 4G

Taux de couverture 4G au 31 mars 2019	Orange	Bouygues	SFR	Free
Population covered	98,6%	99%	99%	93%
Territory	86,4%	83%	83%	71%

The French situation: what about fixed network

- **The New Deal does not apply to fixed networks**

✓ Competition exists,

✓ All actors started at the same time (FTTH)

- **For local areas, Public authorities have taken special measures**
- **= Public Initiatives Network (RIP, Réseaux d'Initiative Publics)**

✓ Example of PPP

✓ RIP is a shared use of a local network

✓ Exists still 2004 (Cf France Broadband Plan)

✓ Local authority allows a technical operator to deploy the local network

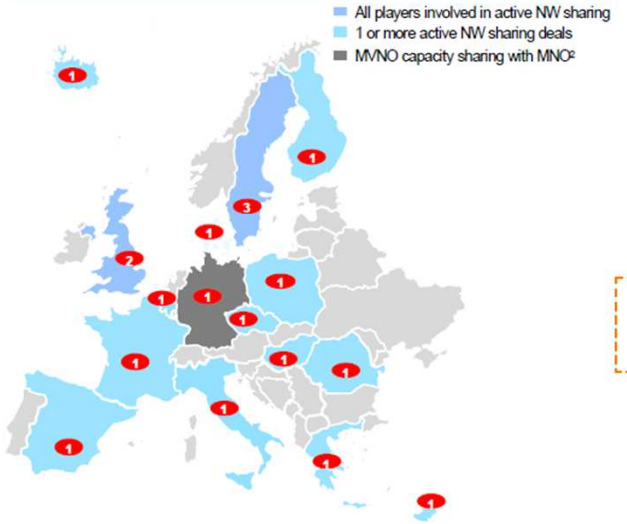
✓ This local network is used with respect of competition rules and on an equality principles by services operators

III. International experience

Europe has seen a wave of active network sharing with Orange actively represented

CONTEXT

Active NW sharing deals at scale[1] running in EU (excludes national roaming)



MNOs	# players in market	#1 & #2	Tech-nology	Scale	Financial assessmen
ČETIN	3	YES	2g/3g/4g	National, exl.top 2 cities	✓[4]
PRIMETEL	3	NO	3g/4g	National	
Telia	4	NO	2g/3g/4g	National	✓
Telia DNA	4	NO	2g/3g/4g	Regional, 50% geo, 15% pop	✓
SFR bouygues	4	NO	2g/3g/4g	Rural	✓
O2	3	NO	2g/3g/4g	National (MBA-MVNO)	
WIND	3	NO	2g/3g/4g	Rural	✓
	3	YES	4g	National, excl. Budapest	
NOVA	3	NO	2g/3g/4g	National	
	4	NO	2g/3g/4g	National	✓
	4	YES	2g/3g	Rural	✓
	4	NO	2g/3g/4g	Rural	✓
TELE2	4	NO	2g/4g/5g	National	
3	4	NO	3g	National, exl. top 3 cities	
Telia TELE2	4	YES	3g	National	
O2	4	NO	2g/3g/4g/5g	National excl. London[3]	✓
3	4	NO	3g	National	
TIM	4	YES	2g/3g/4g/5g	National	
proximus	4	NO	2g/3g/4g/5g	National	
proximus	3	YES	5g	National	

International experience (2)

In Europe, numerous « RAN sharing » agreement have been signed:

- Orange and Vodafone in Spain (3G, 2G, 4G)
- Orange and T-Mobile in Poland (Joint venture, NetWorks!), for 10 000 sites
- Vodafone and Orange in Rumania (2G, 3G, possibly 4G)
- Orange and Proximus in Belgium

Others agreements:

- Rumania: roaming agreement between Orange and Telkom (Deutsche Telekom) covering 4G
- Poland: frequency sharing (mutualization)

+ Some first agreements in Europe on 5G (UK, Italy)

International experience (3)

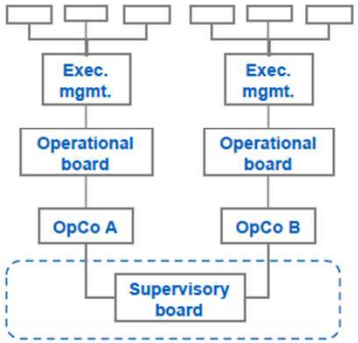
Main sharing initiatives in Europe						
France	Belgium	UK		Spain	Germany & Irland	Poland
Orange, SFR et Bouygues + Free mobile	Orange et Base	EE et H3G	Vodafone et O2 (Telefonica)	Orange et Vodafone	Vodafone et O2 (Telefonica)	Orange et DT
Local roaming (2250 sites). RAN sharing 3G (2550 sites) Cf New deal	passive Infrastructure sharing	roaming 2G pour H3G. 3G RAN sharing EE/ H3G (JV MBNL)	passive Infrastructure sharing	RAN sharing 3G (cities < 25 000 h) extension to cover 2G et 4G ad cities up to 175 000 habitants	passive Infrastructure sharing	RAN sharing 2G/3G/4G national.

International experience (4)

Experience in Europe highlights different outcomes and operating models

1. No JV – Geographical split

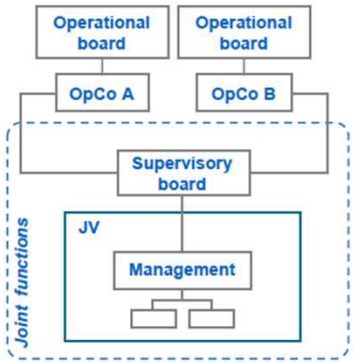
Pure geographical split with jointly agreed governance but no JV entity



Only recommended for small scope deals (rural only, single technology

2. Geographical split – "Light" JV

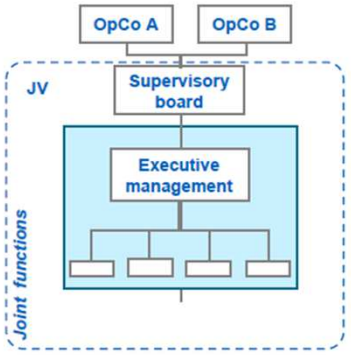
Joint Planning entity takes over planning, coordination and monitoring and control functions but not operations



Combination of geographical split and JV setup to ensure

3. Full JV / Netco

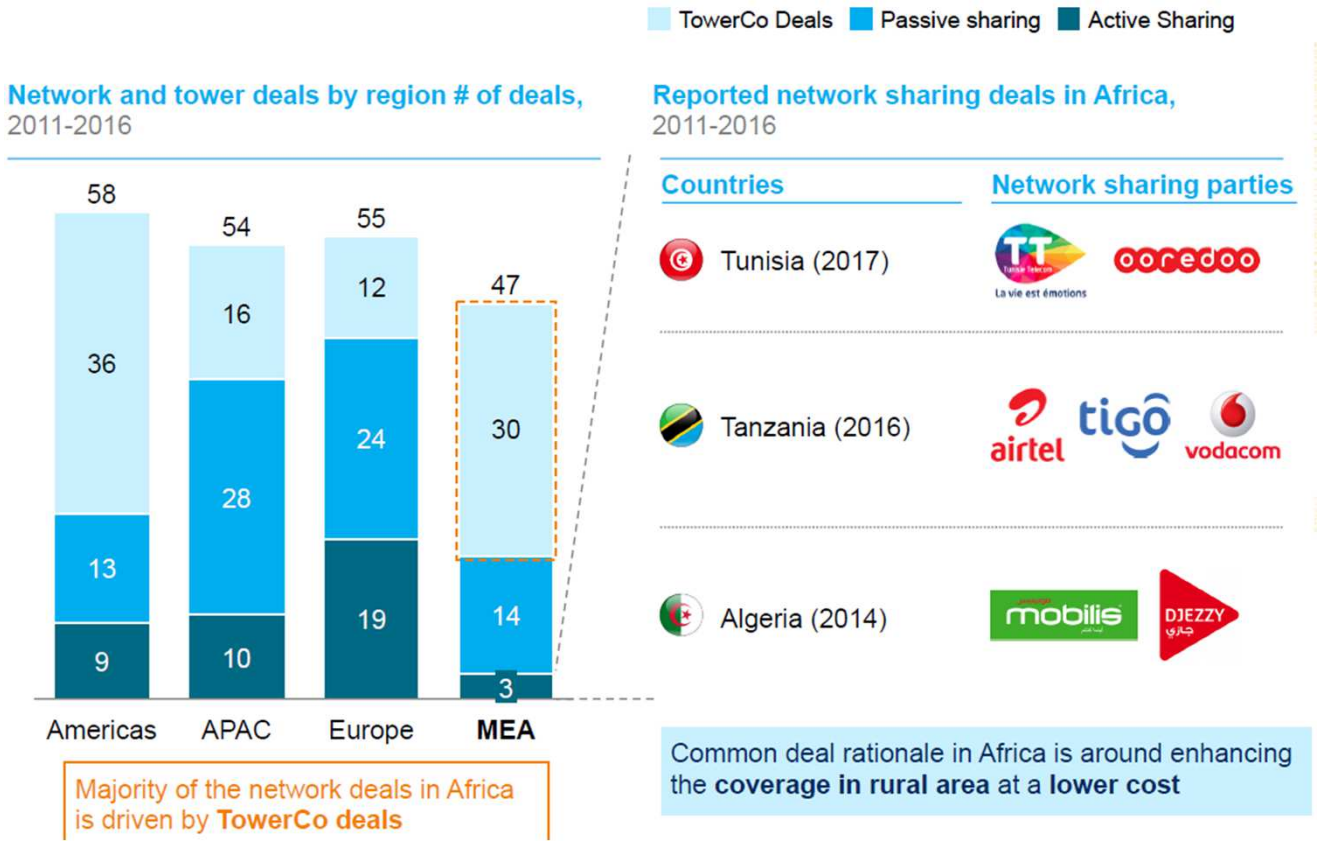
JV that takes over all plan, build and run responsibilities (and assets)



Enabling cost synergies maximization, transparency and

International experience (4)

In contrast Africa has had disproportionally fewer active sharing deals



International experience (5): Regulators in Africa are now more open to network sharing

Recent Infrastructure sharing regulation updates in Africa

Tanzania	Electronic and Postal Communications Act (Access, Co-location and Infrastructure sharing) published in 2018, requires licensee who owns, leases or manages infrastructure to **share their infrastructure upon request**
Namibia	'Regulations Prescribing Sharing of Infrastructure' stated that all carriers **make infrastructure available to a qualifying carrier** on reasonable conditions, including **active sharing**
Zimbabwe	**Mandated sharing of infrastructure** among telco operators to eliminate overlap of infrastructure in 2017, and **EcoNet eventually agreed to share its infrastructure in 2019**
Nigeria	In May 2018, the regulator announced it will introduce a more **active infrastructure sharing** and **co-location framework** to help the **small telecom operators provide service** to all Nigerians
Mozambique	Telecom Law (Law no. 4/2016) and **new regulations** introduced in **November 2018** (Decreto 65/2018) require that operators must be able to facilitate **infrastructure sharing within their networks (including passive and active)**

International experience (6):

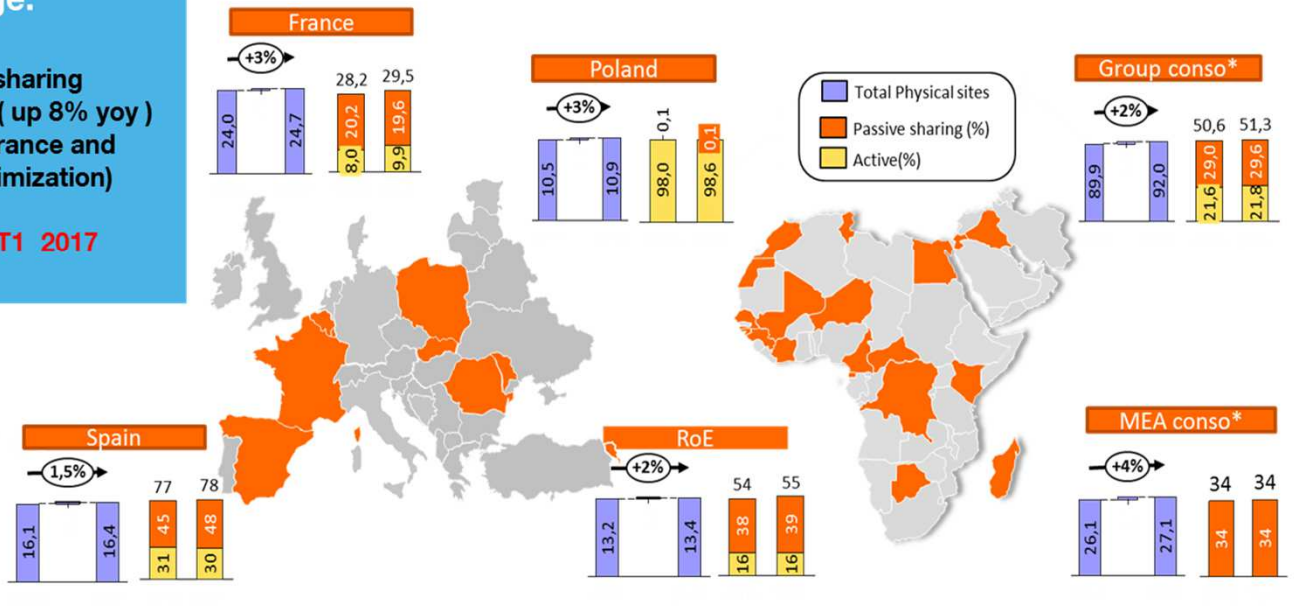
Radio sharing

Key message:

Radio network sharing reached 51,4% (up 8% yoy) mainly due to France and Spain (sites optimization)

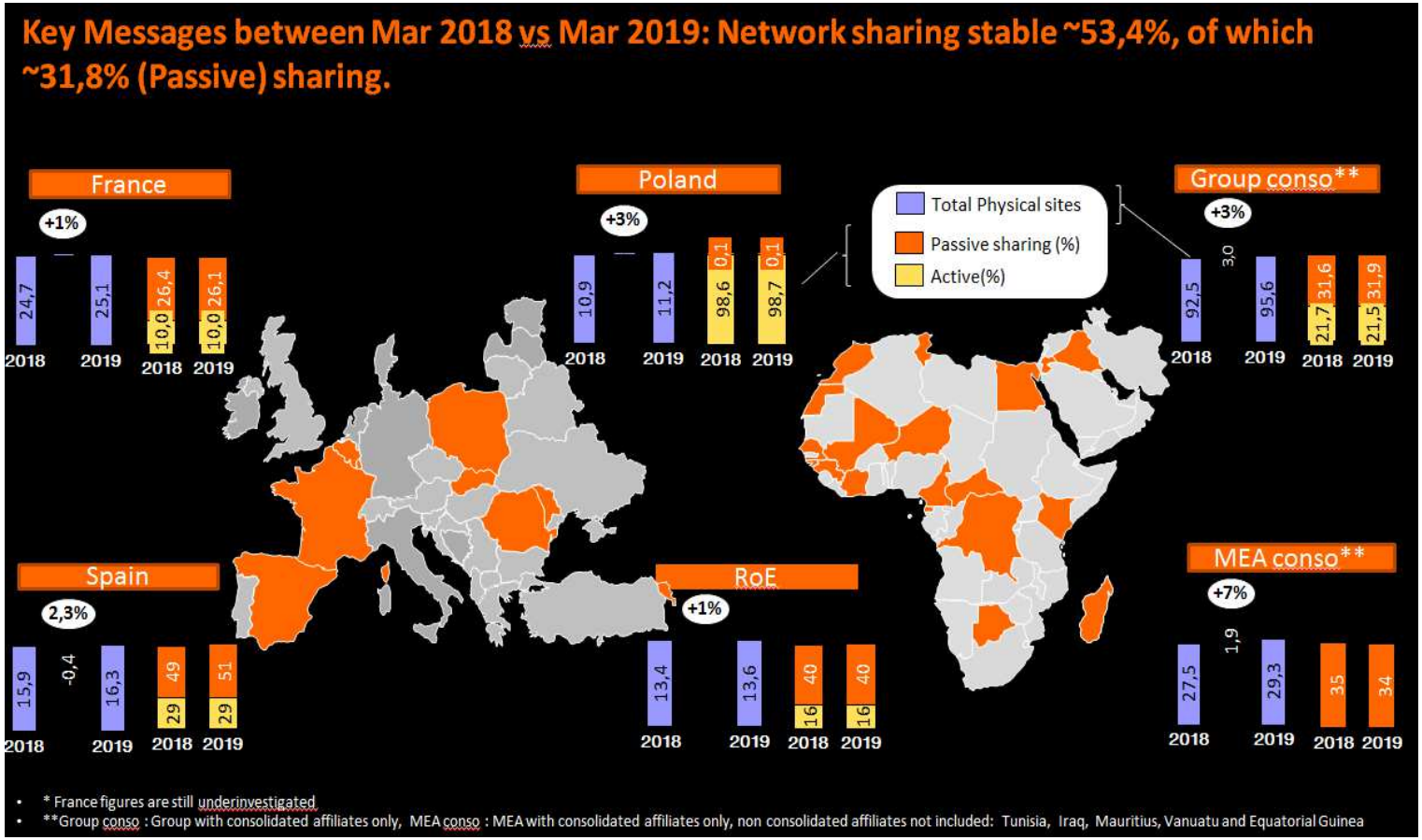
T1 2016 versus T1 2017

Good status



• *Group conso : Group with consolidated affiliates only, MEA conso : MEA with consolidated affiliates only, non consolidated affiliates not included: Tunisia, Iraq, Mauritius, Vanuatu and Equatorial Guinea

International experience (7):



- * France figures are still underinvestigated
- **Group conso : Group with consolidated affiliates only, MEA conso : MEA with consolidated affiliates only, non consolidated affiliates not included: Tunisia, Iraq, Mauritius, Vanuatu and Equatorial Guinea

International experience (8):

- The most common agreements are related to the sharing of passive facilities.
- Antenna sharing, when not designed from the outset, is difficult to implement because it can degrade the level of coverage of each operator.
- RAN-sharing is particularly suitable for new deployments (typically LTE) and for coverage of small cities or areas with low density.
- Mainly use of network sharing: each operators deploys a network on a specific part of a country, and give access to the others for the use of its own frequencies
- Win situation:
  - faster speed of deployment
  - cost advantage: avoid the risk of two networks
  - for customers: competition exists, is based on services

IV. Lessons learned (1)

Technologies are evolving very fast..

..and operators have to adapt and anticipate these evolution in order to provide to their customers the best network and services everywhere

1. Competition is the first driver for deployment of infrastructure and ensure a good coverage
2. **With some anticipation, Public authorities can encourage deployment of infrastructure sharing in an agreed way to resolve some specific situation (geographical difficulties, speed of deployment)**
3. Appropriate policies can help the market go further into areas that may be non-economical or are of high-risk for MNOs, starting with the most remote uncovered areas
4. **Various mechanisms can be used to achieve e this goal: discounted spectrum or trade-off (cf Sweden, France, etc.) , PPPs, community networks, USF, government subsidies**
5. Shared infrastructure , mutualised networks continue to be basis for competition ,as differentiation could be made on core networks and on proposed services
6. **One single network for all operators is not an ideal solution (cf some issues: responsibilities in case of technical failure)**

IV. Lessons learned (2): some other messages

- To speed the process, remove all regulatory or legal unnecessary barriers
- Encourage supportive policy and regulatory environments:
- Apply good taxation, spectrum and infrastructure policy, e.g. infrastructure sharing,
- Define planning rules,
- Encourage investment-friendly policies;
- Have clear policy goals: competitive environment, tech neutrality, proportionality, license conditions, and prices.
- Apply same rules to all: for example consider giving MNOs the same preferential conditions that PPPs often enjoy, such as subsidies, no-cost , access to public infrastructure, or alleviated QoS obligations. Consider PPPs for the most remote areas
- At local level: Community Networks can play a useful role and complement mobile network operators' efforts to expand coverage in areas that are not commercially viable.
- More generally: develop a global environment to lower the main barriers to usage, i.e. accessibility, affordability, lack of literacy and digital skills, lack of relevant content, concerns around safety and security.

Conclusion:

Network operators (and in particular mobile network operators) are recognised as the primary drivers of connectivity

The efforts to achieve greater mobile internet connectivity have to be effectively supported by regulators, policymakers and the international community.

Thanks

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