

# Essentials 2020

## Indoor coverage

**Arnaud Vamparys**

**Orange Labs Networks**

**SVP Radio Networks**

**October 2017**

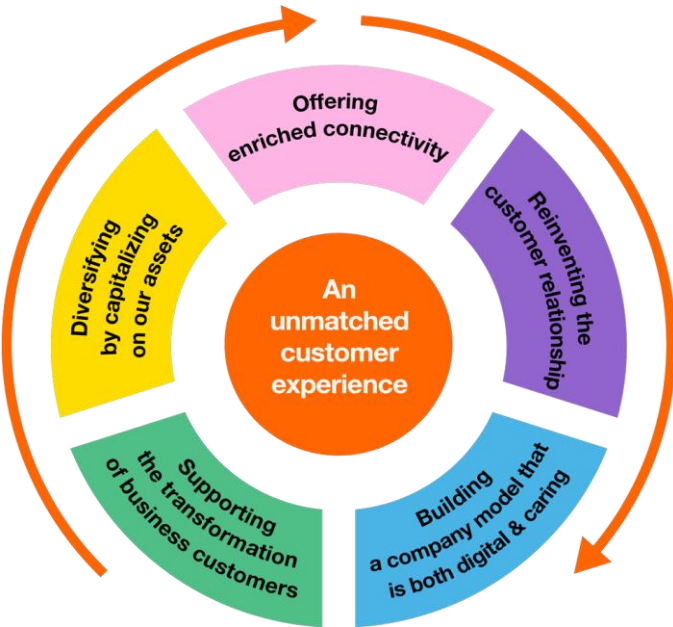


# a growing connectivity expectation

<b>Coverage</b>		the customer's expectation is increasing : a <b>high quality</b> connection <b>everywhere</b> (home, transports, rural,...)
		our customers, specially in Africa, ask for a <b>more affordable</b> basic internet access
<b>Speed</b>		new usages, like virtual reality or augmented reality, requires <b>faster speed</b>
<b>Connected Objects</b>		some objects, like driverless vehicles, drones or robots, call for <b>higher performance</b>
		low-end, low energy consumption sensors will be <b>massive</b> and should be handled properly

# Essentials 2020 – an unmatched customer experience

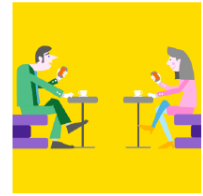
requiring network quality and high throughput : fiber and 4G investments




Powerful and reliable networks



World class quality of service



customer experience



and on the move  
Towards zero drop call



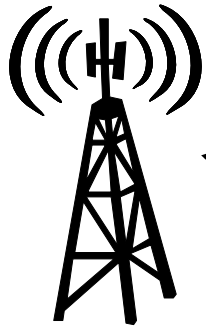
x3 the average data throughput on all our networks  
by 2018



Indoor coverage  
Voice over WiFi

## How to offer the best indoor coverage ?

# from radio link budget to network design



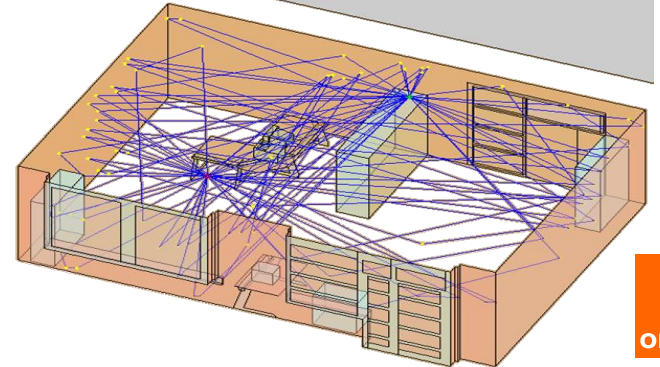
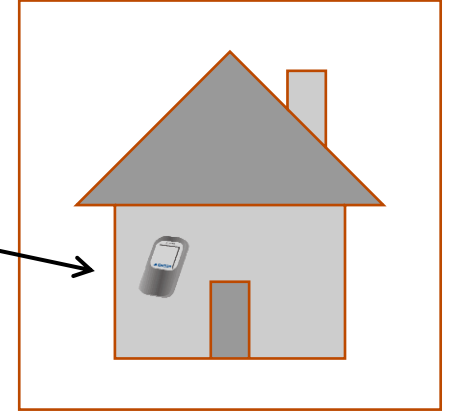
Macro sites

Received power level =  
 $P_{em} + \text{antenna gain} - \text{propag loss} - \text{penetration loss} -$   
 $\text{additional attenuation (human mask)} + G_{rec}$

Wireless link budget in  
dB or dBm

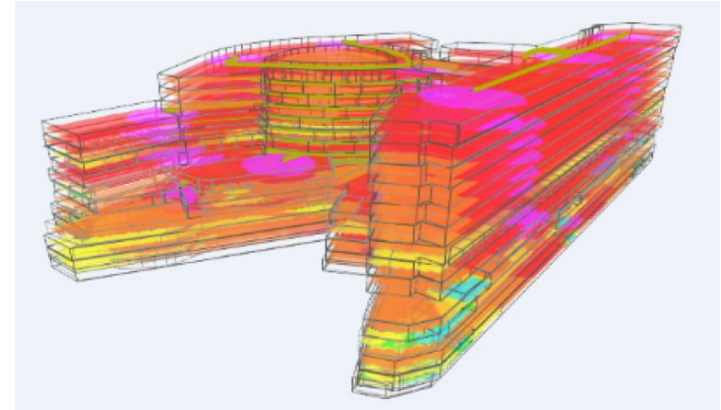
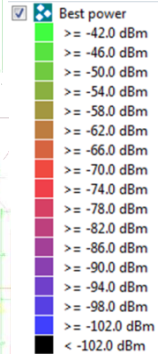
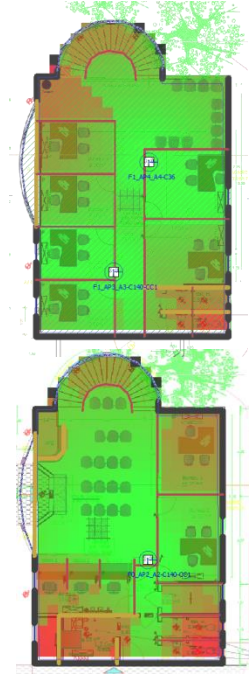
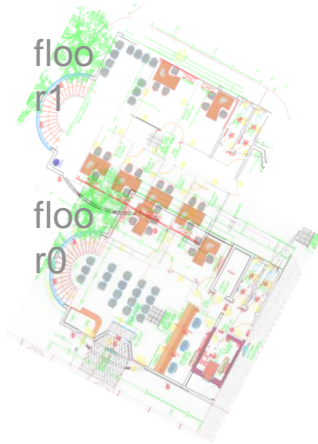
SINR

Electromagnetic interferences  
and thermal noises



# indoor coverage tools

- Wall
  - Mur porteur 13.00 dB
  - Cloison épaisse 8.00 dB
  - Cloison moyenne 7.00 dB
  - Cloison fine 6.00 dB
- Door
  - Porte 5.00 dB



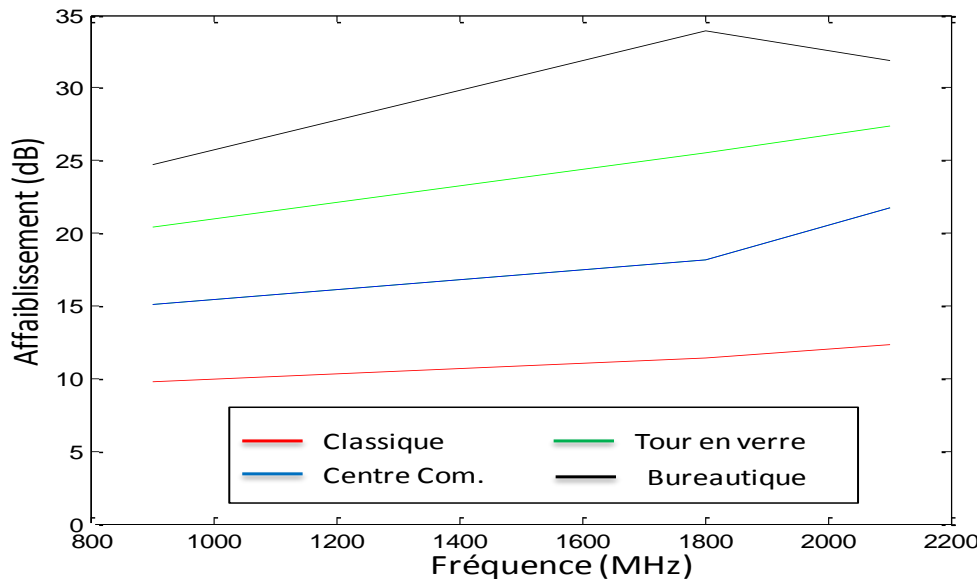
# new HQE building : a growing challenge

Results for **HQE** glasses :

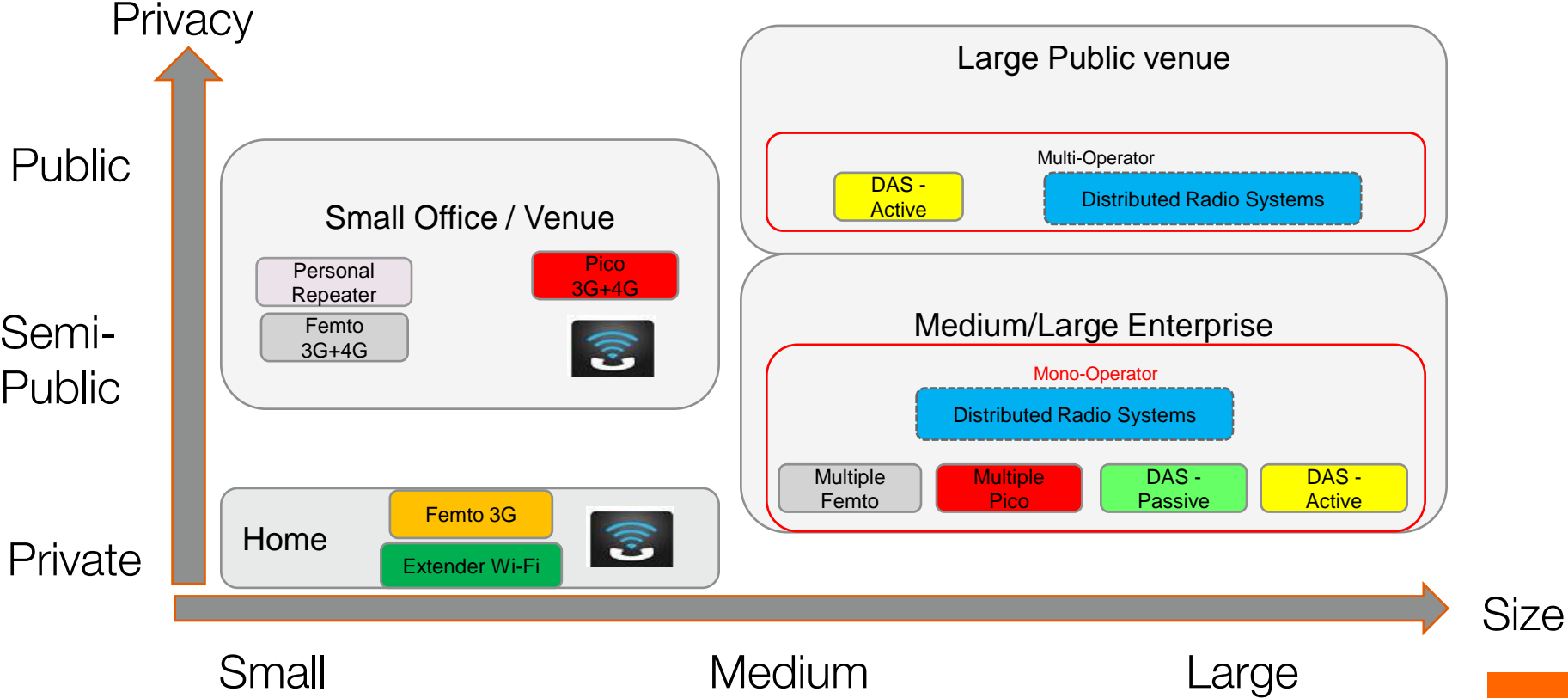
=> high impact on penetration: **10 to 14 dB** instead of 2 or 3 dB

=> propagation and attenuations in the building are usually not impacted

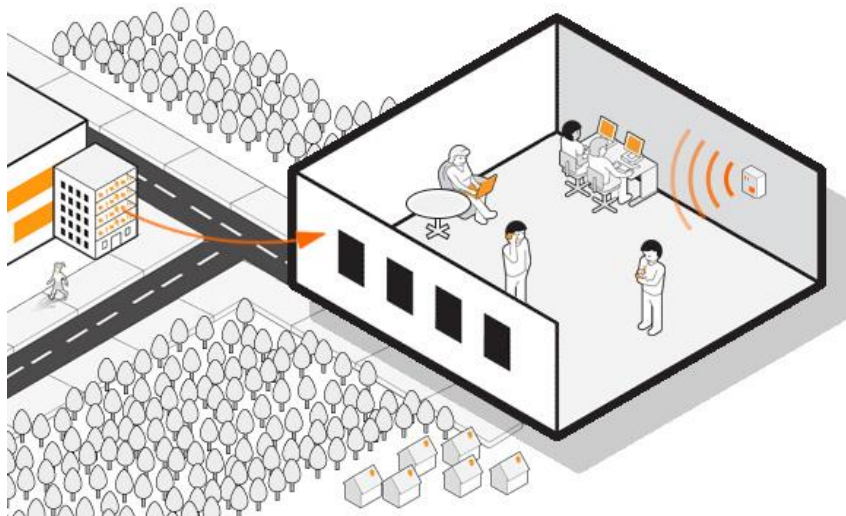
=> but penetration is highly degraded when metal grid is present in glasses



# a range of dedicated indoor solutions



# a range of dedicated indoor solutions



<http://www.orange-business.com/fr/produits>



<https://boutique.orange.fr/mobile/options/femtocell-orange>



# Résultats l'ARCEP 2017 : Orange n° 1 pour la 7ème fois consécutive



Le réseau mobile d'Orange arrive en pole position sur les critères essentiels pour nos clients :

- N° 1 sur la qualité des appels avec 94,3% d'appels parfaits toutes zones d'habitation confondues
- N° 1 sur le débit moyen de téléchargement de fichiers au global avec notamment 45,5Mbit/s en zone dense
- N° 1 sur la navigation web mobile au global dans les transports