

Fixed and Mobile Convergence (FMC) (and FWA in a 5G Covid environment)

- major factors for future networks

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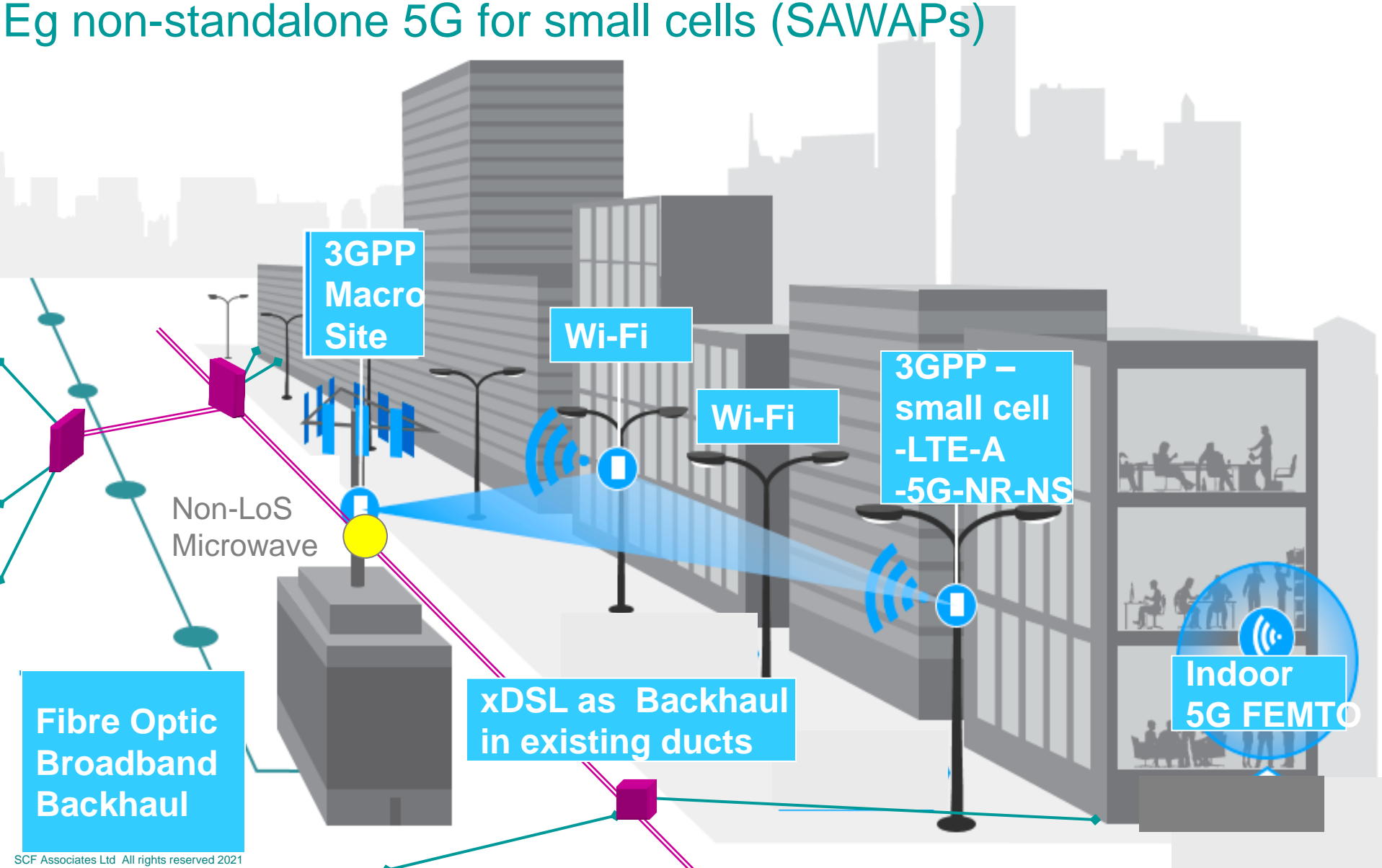
FMC Questions and Answers

- Convergence between fixed and mobile ('5G in the time of the pandemic')?
- Minimum benefits and limits of FMC?
- Has the pandemic impacted public and private plans?

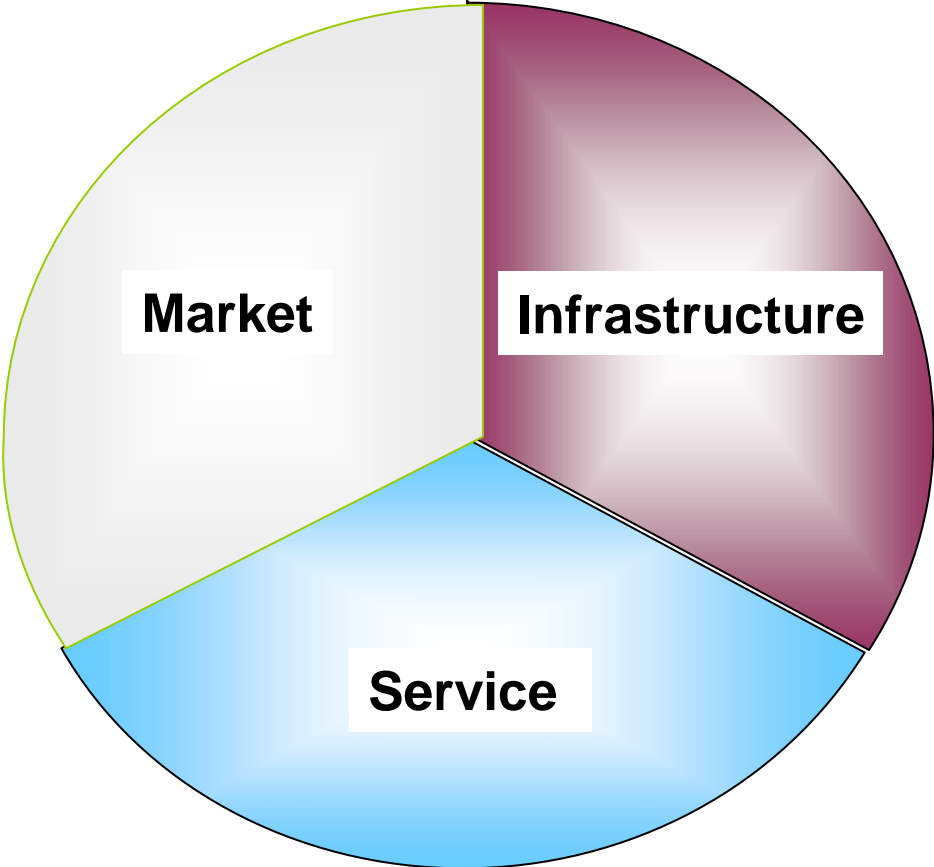
Key points to consider:-

1. **REAL 5G business case** for FMC - cost of infrastructure and density of deployment vs demand for services drives FMC for **infrastructure cost cutting** as Backhaul is main cost - need to re-use existing infrastructure (NS 5G model) – integrate F & M
2. **REAL 5G business model** – mobile broadband for consumers – especially SVOD entertainment drives FMC via fixed wireless access (**FWA**) for consumer demand
3. Scenarios of deployment of FMC infrastructures – **will FWA exceed mobile?**
4. **Quality measures for future FMC networks : KQIs**
5. Choice of Services for fixed (including FWA), and services for mobile, evolution of fixed line with FWA (mobile as fixed) – and optimisation
6. COVID effects – drives FWA but problems of indoor penetration with higher GHz (above 3Ghz – up to 28 GHz)
7. Mix n' Match FMC enables SME Open RAN suppliers to provide more equipment.

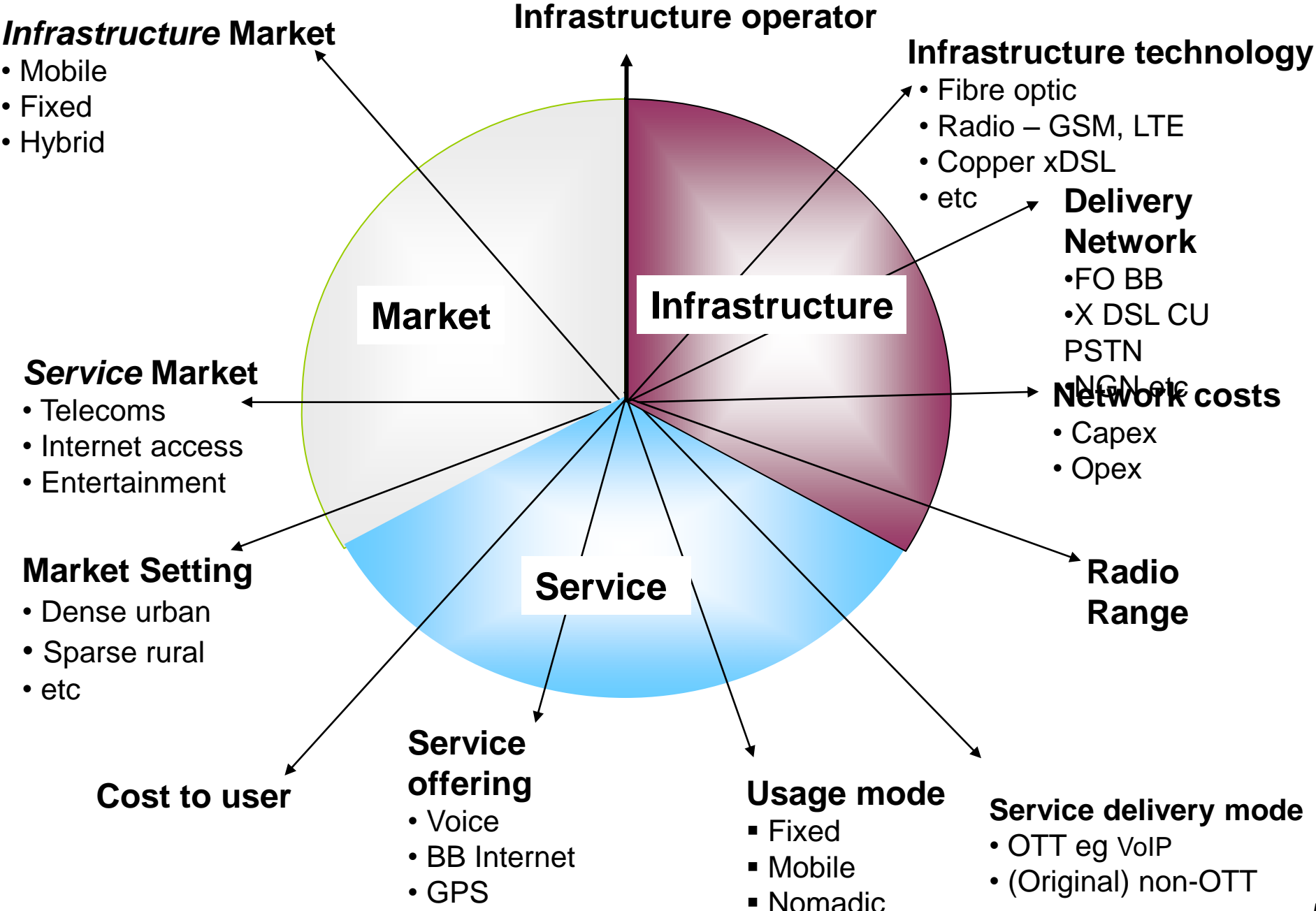
For densification expect more complex street furniture for outside plant to serve multiple small cell technologies - both indoors and outdoors - using heterogeneous backhaul technologies
Eg non-standalone 5G for small cells (SAWAPs)



Dimensions of FMC - Fixed Mobile Convergence and FMS – Fixed Mobile Substitution



Dimensions of FMC/FMS



Suggested taxonomy of Telecommunications QoS & QoE parameters

Reliability

(consistency/ availability/repeatability/ resilience/ interconnection)

MTBF, MTTR - Physical Coverage

Time variation in QoS during session, day, Week, year

Basic transport

Signal Strength

Indoors & Outdoors
Local loop extremity
Rain/ foliage
Ferro concrete
& insulation
Coverage

Data

Channel Capability

Bandwidth
Bit rate (D/L-U/L)
Volume capacity
Parallel sessions
Latency
Side channels
& interference

Communications Session

Packets

Packet drop rate
Rate, Delay, Jitter
False packets
acceptance

Internet

Access

Web

Performance

Calls

Success rate of set up
Drop rate/retention rate
Set-up Delay
Blocking probability

Media Conditions

Audio Quality

Sound bandwidth
Voice quality
Noise level
Distortion
Consistency

Video Quality

Channel bandwidth
Picture and colour quality
Resolution, luminescence
Image Distortion
Pixellation/aliasing

Real world Constraints

Security & Privacy

Risk level
ID Protection

Accessibility

Handicap
Ageing

Health

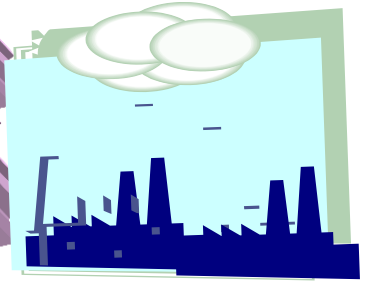
RF radiated signal
limits (Centi/
Millimetric)

Energy

Footprint
Consumption
GHG level

Scenario 1 : Popular entertainment rules the web - and the networks - thru convergence of media and communications industry, dominant media players and services – for broadband media delivery anywhere

Scenario 2: Industrial IoT platform drives FMC/FMS via n/w slicing



Scenario 3: Internet Radio World - Simple ultra low cost lightweight radio networks using small cells, mesh networks, long distance Wi-Fi/WiMAX, LEO satellite/stratellite and existing NGA all for OTT services only

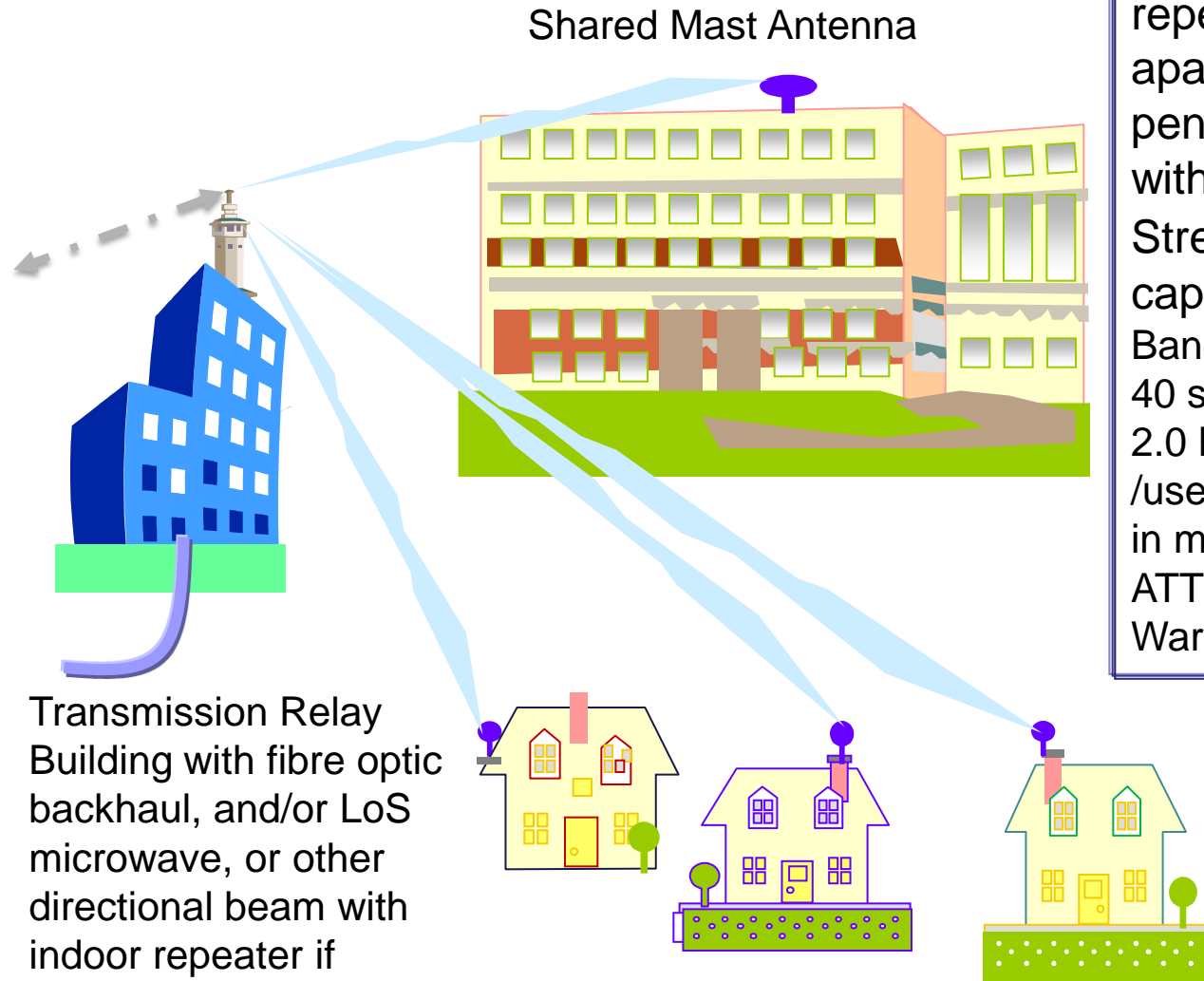
Scenario 4: smart cities with a mixed Home life and Urban living space - based on small cell densification reaching equally into rural areas for BB everywhere



Scenario 5: Linked local communities are the telecoms infrastructure – Telecomia



Real business case for the short term? - '5G' for wireless broadband to buildings as **Fixed Wireless Access (FWA)**: Gigabit speeds to multiple users in the local loop (urban and suburban)



Early 5G FWA example:
 repeater point on dwelling or apartment houses for indoor penetration – pilot model without full MIMO, or Multi-Stream Aggregation so shared capacity:-
 Bandwidth 2GHz
 40 simultaneous users
 $2.0 \text{ bps/Hz} (2000 \times 2) / 50 = 100 \text{ Mbps/user}$ in AT&T field Trials, H2, 2016 in millimetric band
 ATT acquires DirecTV and Time Warner /Turner as media portfolio

Thank You

Fixed/Mobile Convergence in Europe

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