



SMALL CELLS AND HETEROGENEOUS NETWORKS

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AGENDA

1. INTRODUCTION

2. HETEROGENEOUS NETWORKS

CONCEPTS

MOTIVATIONS

CHALLENGES

3. SMALL CELLS

COMMON FEATURES

NODE TYPES

TECHNICAL ASPECTS

4. WRAP-UP

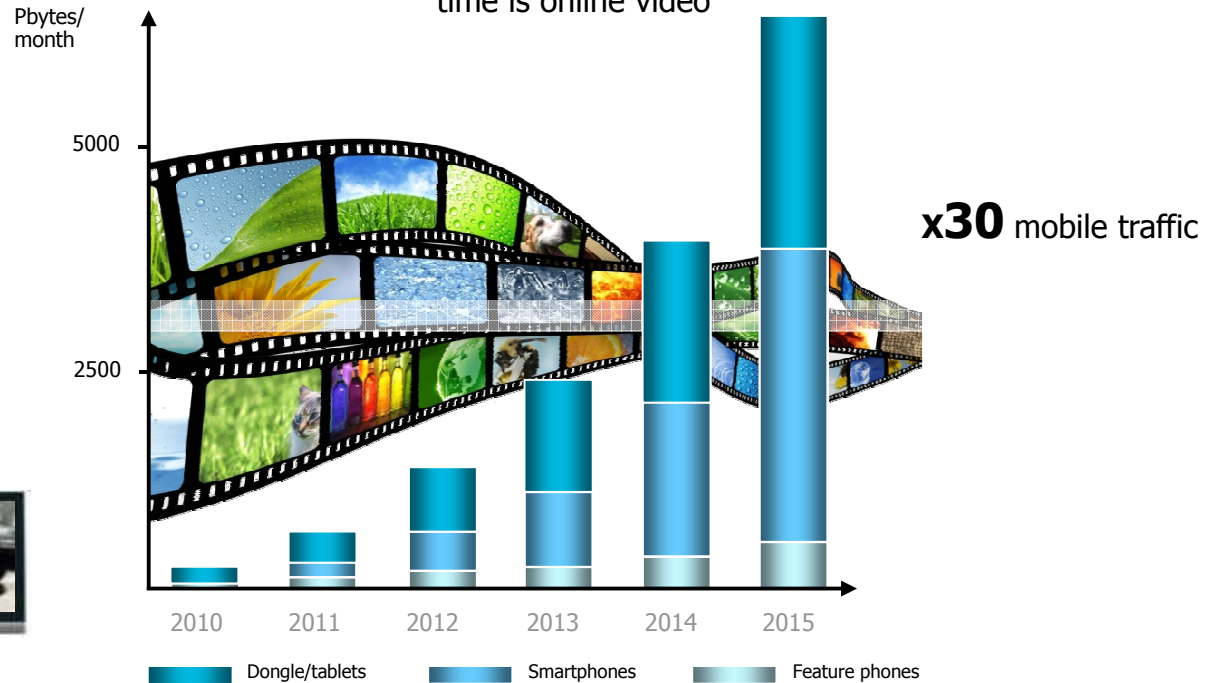
WHAT'S GOING ON WITH MOBILE NETWORKS?



THE GAME HAS CHANGED



37% of Internet traffic during prime time is online video



Connected, IP-enabled Devices

1.200 Million devices connected by 2014

Video

~ 70% of internet traffic by 2014

Smartphones

2.500 Million connections by 2015

Mobile Internet

70% of mobile traffic by 2014

Source: Bell Labs analysis

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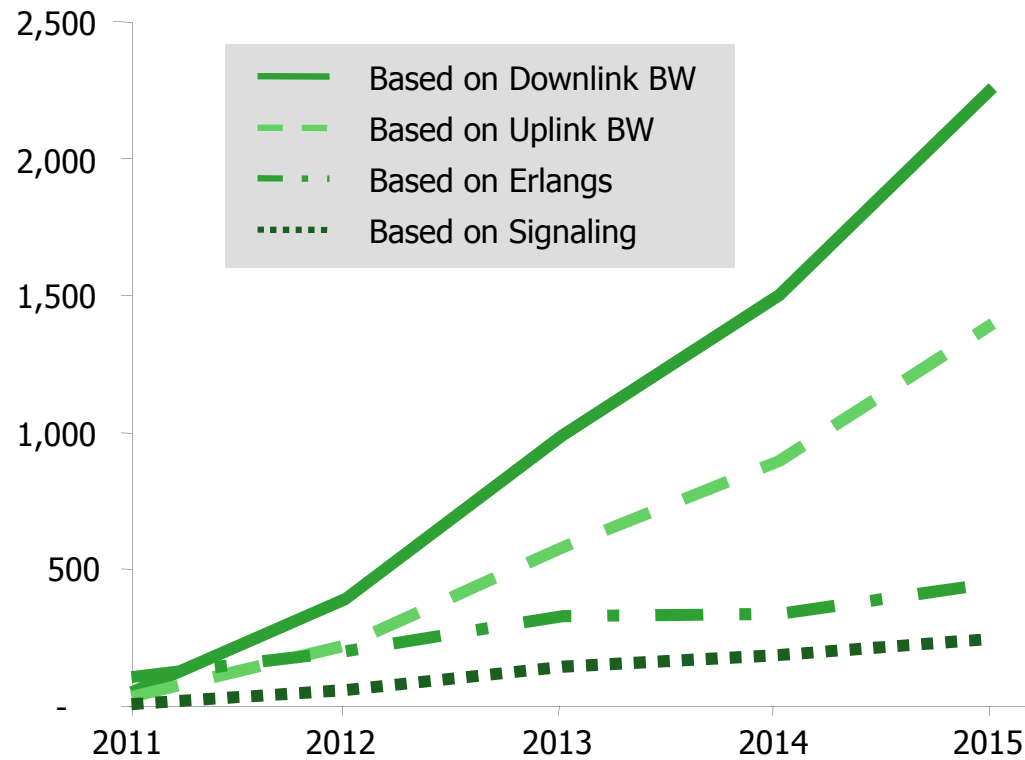
x30

Mobile Data Traffic (2011-2015)



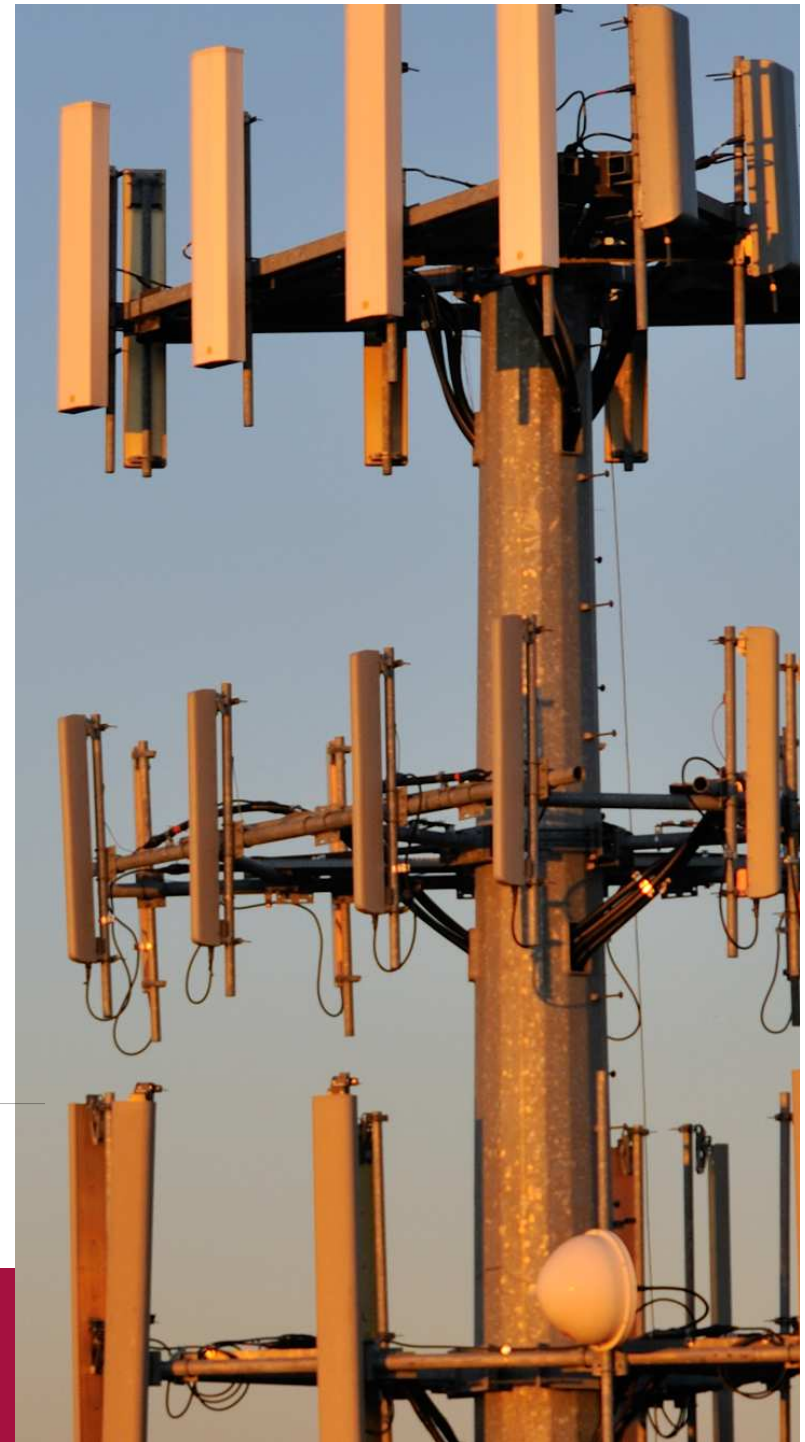
TRAFFIC GROWTH EQUALS BASE STATION GROWTH

Base Station Requirements in a Tier 1 City



Source: Bell Labs

3 Technologies, 5 spectrum bands,
What's next?



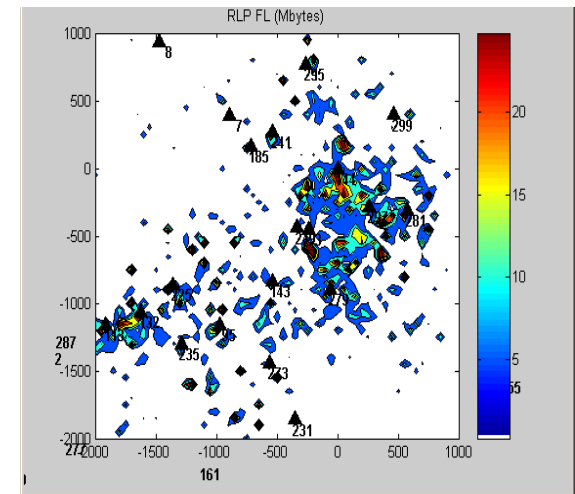
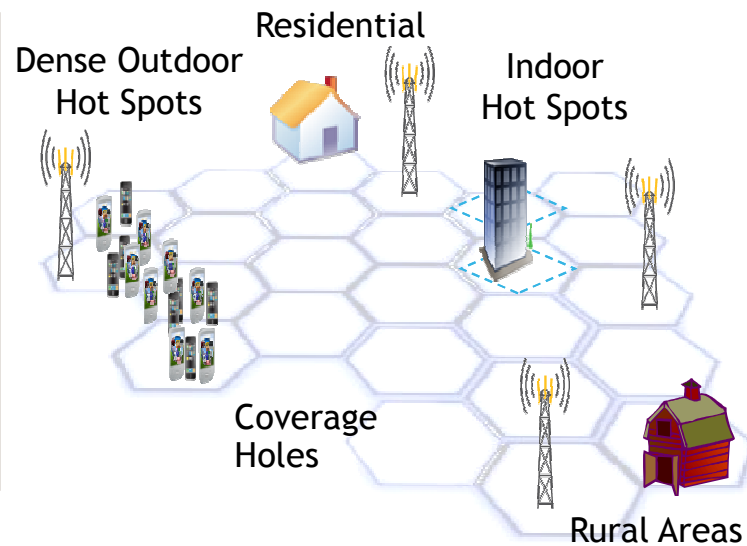
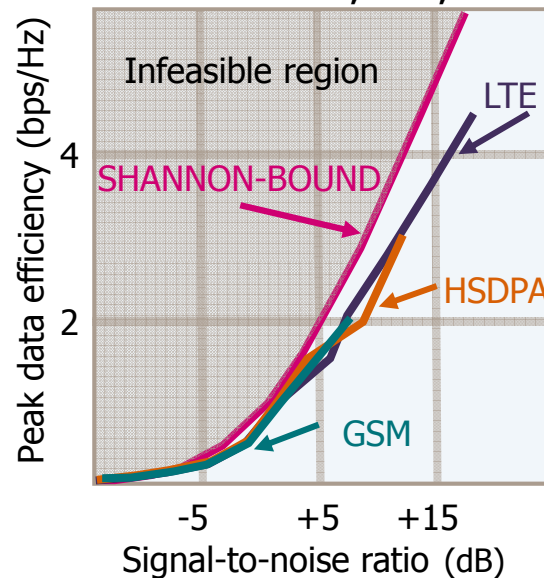
KEY CHALLENGES

SPECTRUM EXHAUST

COVERAGE/CAPACITY

COST

Limits of 2G, 3G, 4G



PCMD data captured during busy hour indicates that congestion is localized and better addressed by targeted deployments

Goal: Improving QoE and lowering cost in a non-obtrusive manner

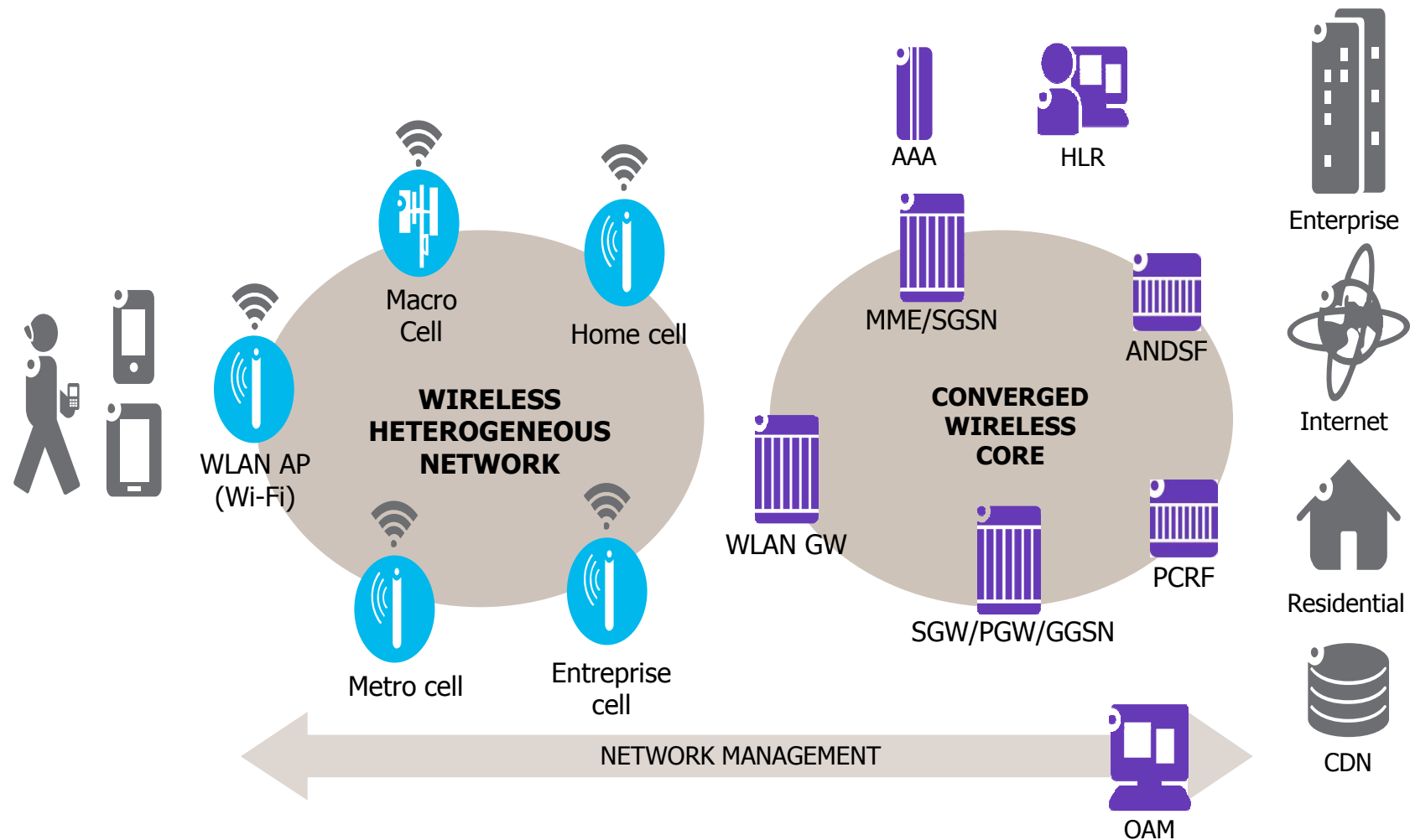
HETEROGENEOUS NETWORKS



HETEROGENEOUS NETWORK COMBINING STRENGTHS

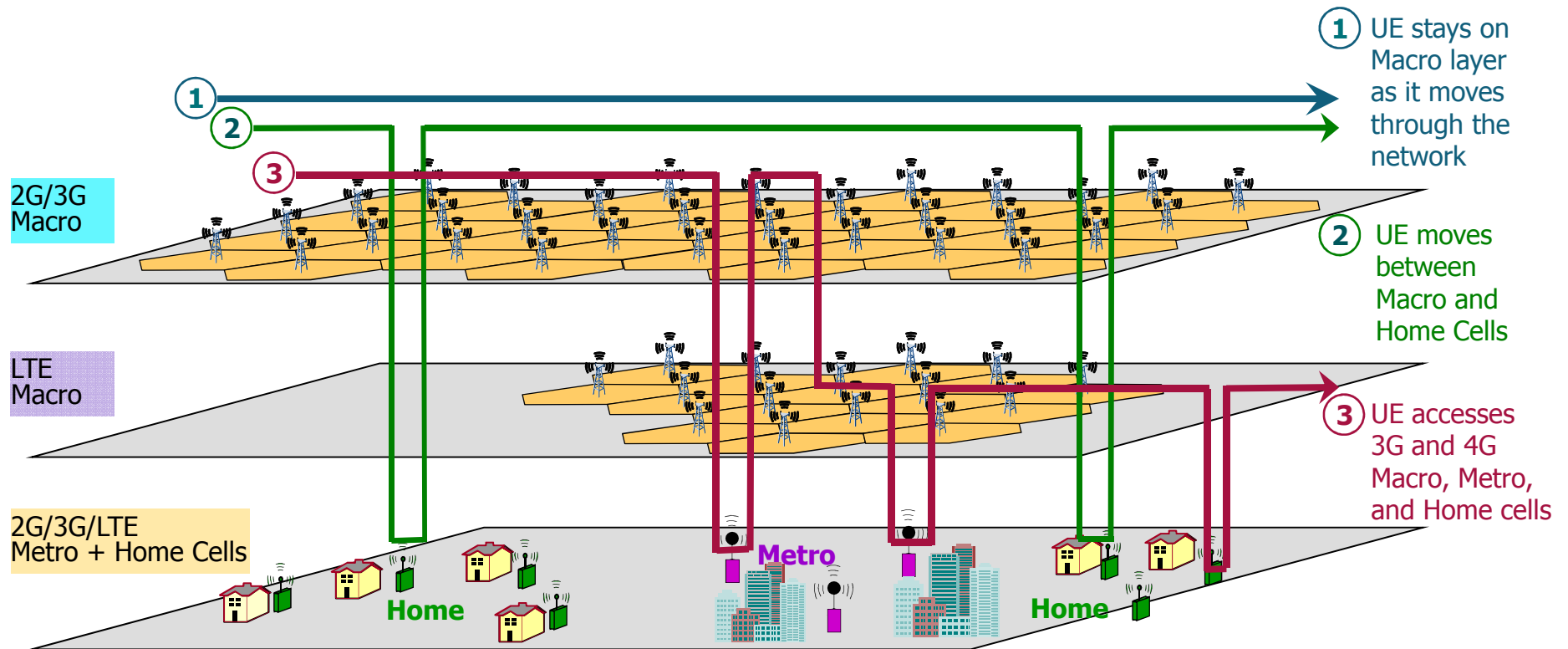


HETNET ARCHITECTURE



MORE COMPLEX

MORE EFFICIENT



Traffic is distributed intelligently across RAN technologies, frequencies, and node types

HETNET MOTIVATIONS



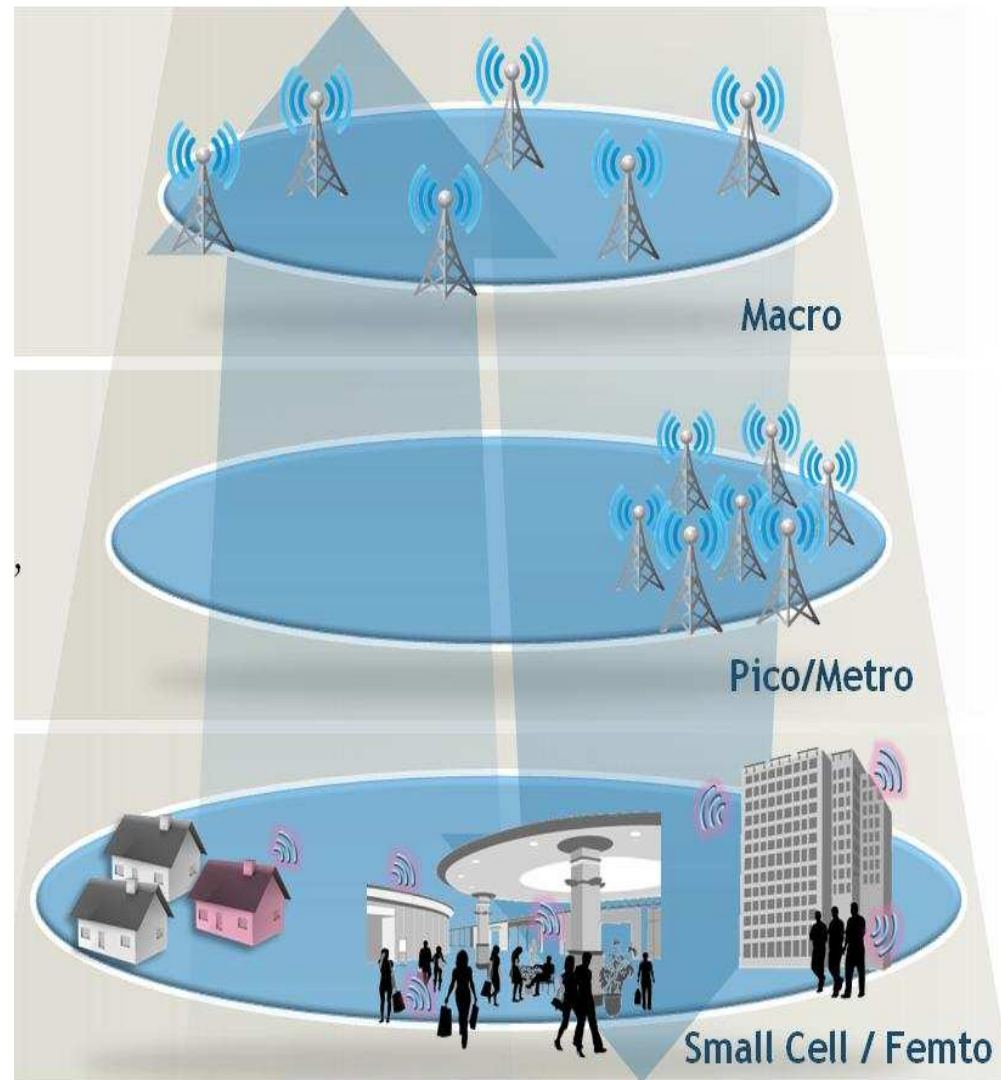
HETNET CHALLENGES

INTERFERENCE

MOBILITY

BACKHAUL

PROVISIONING

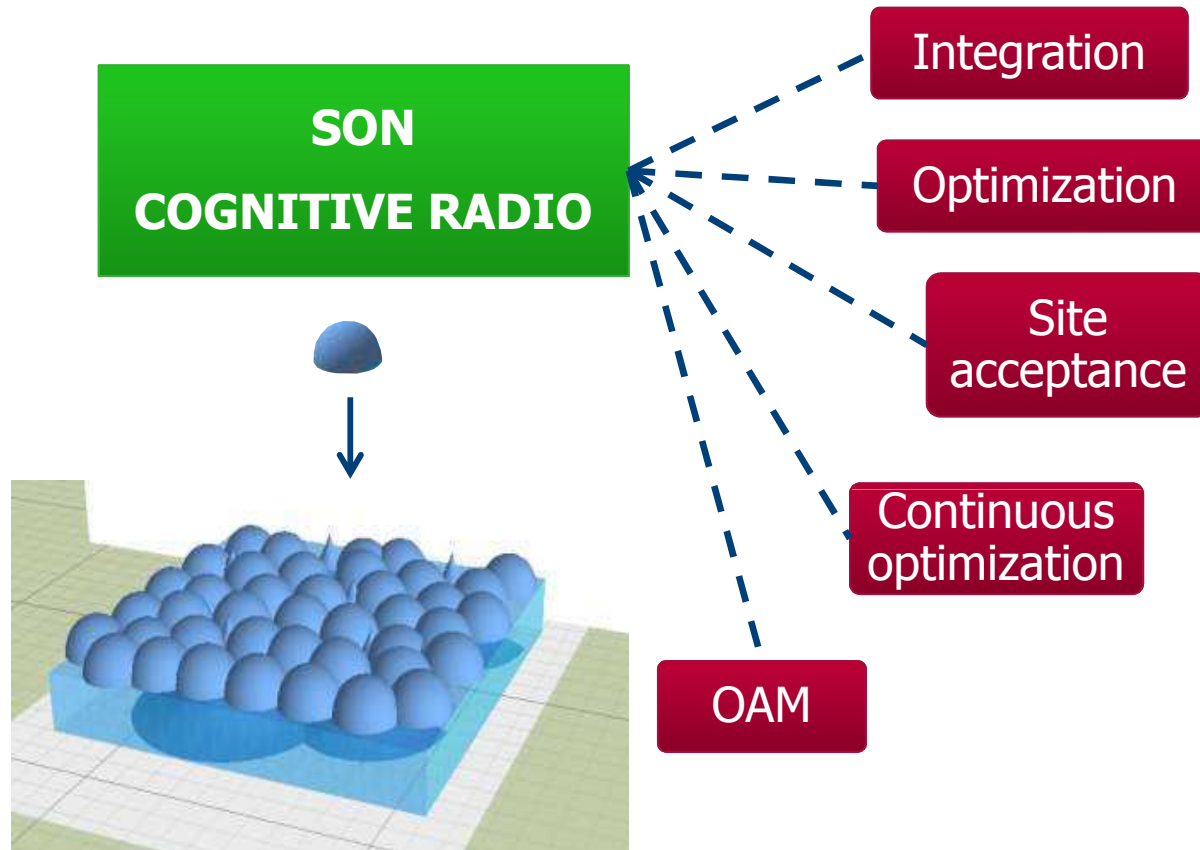


SELF-ORGANIZING NETWORKS (SON)

PROVISIONING

MOBILITY

INTERFERENCE



Self-configuration

Automatic Neighbour Relation

Interference Management

Load Balancing

Handover Optimization

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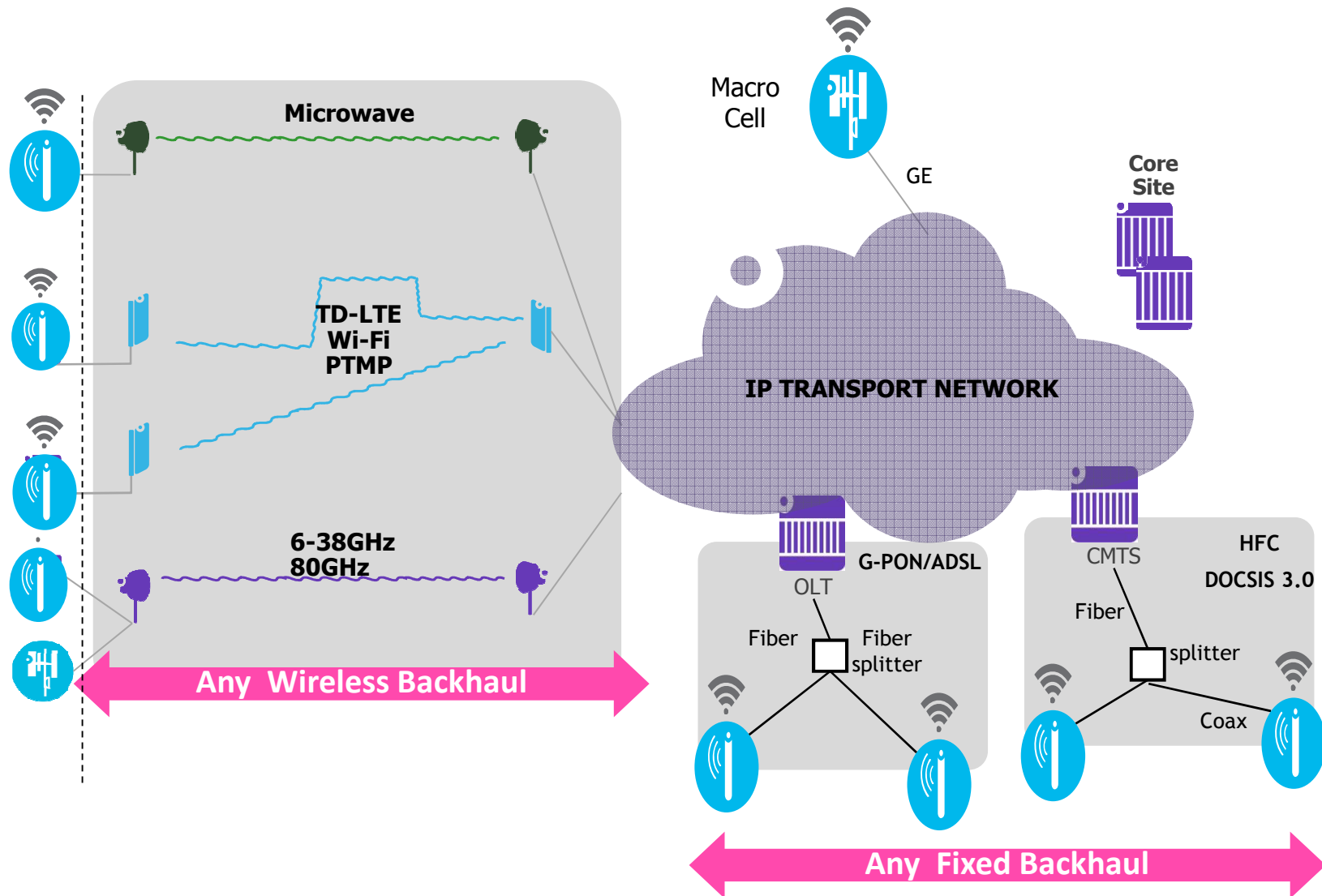
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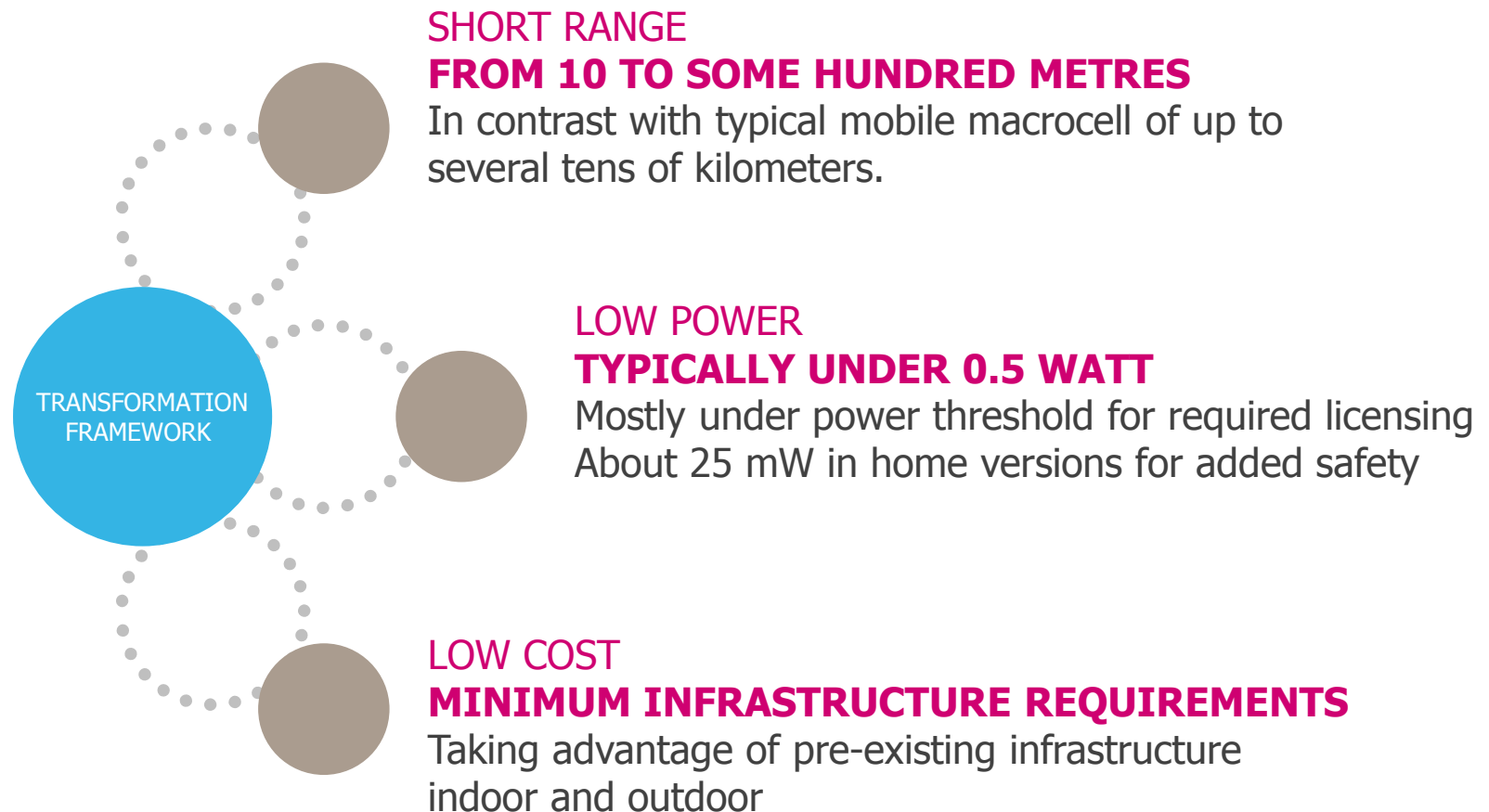
MOBILE BACKHAUL

IP ENABLES SIMPLICITY

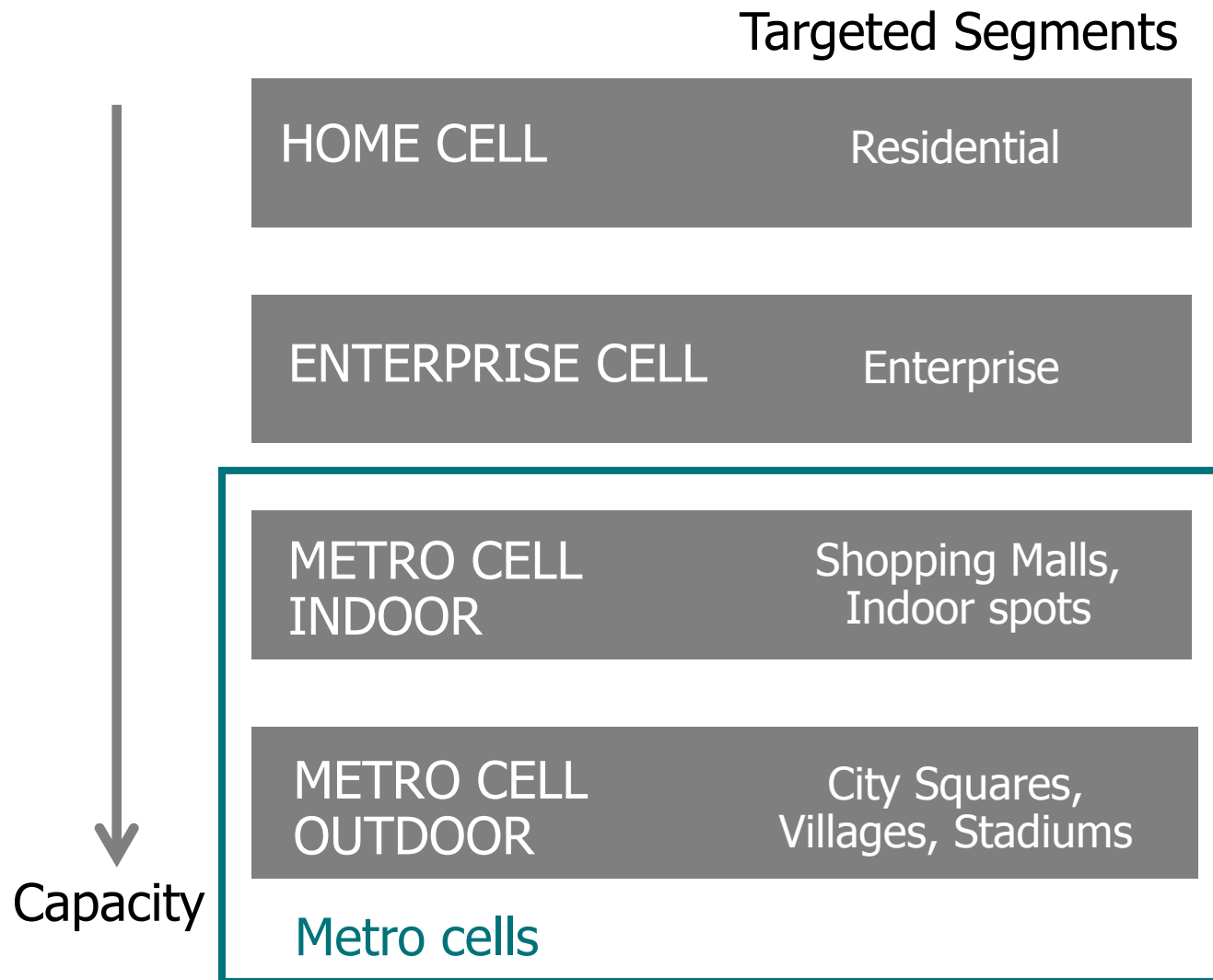


What's in a Small Cell?

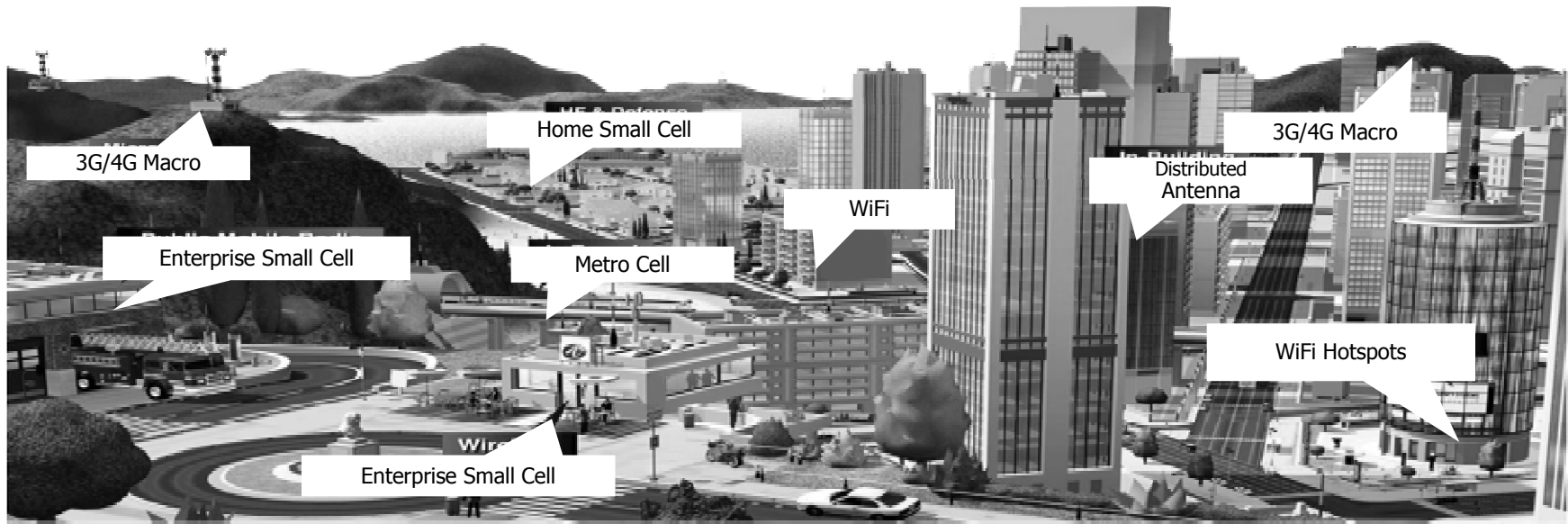
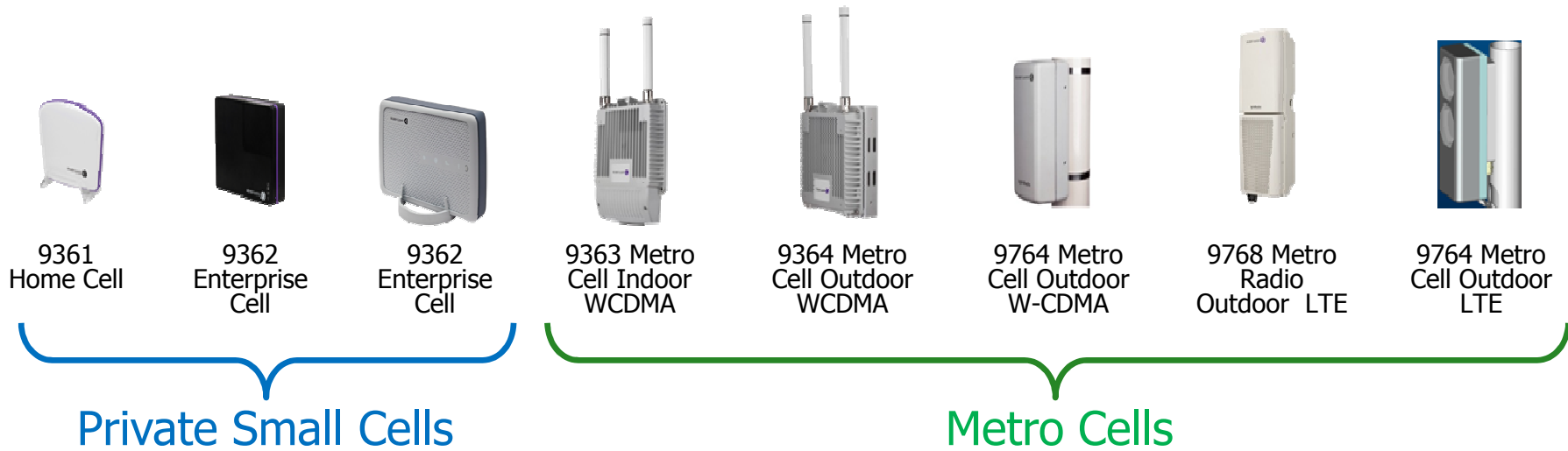
COMMON FEATURES



NODE TYPES



ALCATEL-LUCENT LIGHTRADIO™ SMALL CELLS



LIGHTRADIO™ SMALL CELLS PORTFOLIO

9361 HOME CELL

Main features

- 4 users capacity
- 20 mW output power
- 2100MHz UMTS operating band
 - 2100MHz UMTS sniffing band
 - 900/1800MHz GSM sniffing band
- Full rate HSPA
- Ethernet backhauling
- Security through crypto memory or digital certificate
- Free standing and wall mounting
- Plug and play installation, no radio planning



LIGHTRADIOtm METRO FAMILY

MAST MOUNTING WITH SEPARABLE RF FROM TRANSPORT MODULE



Passive Cooling, Designed for simple transport connectivity

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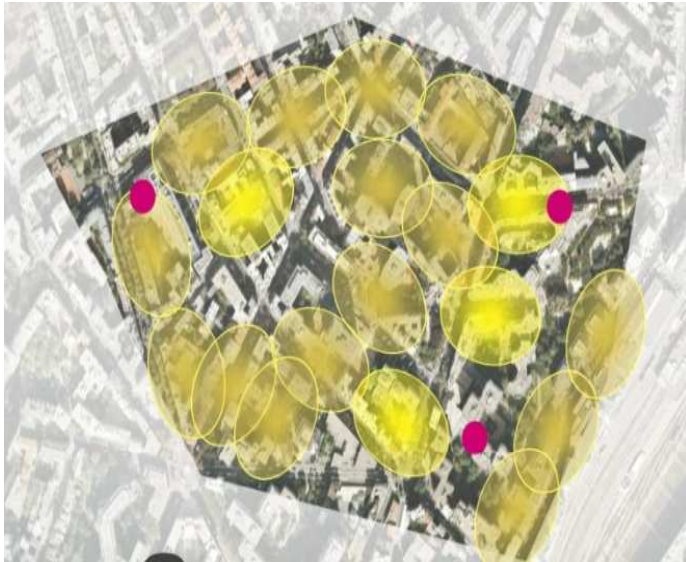
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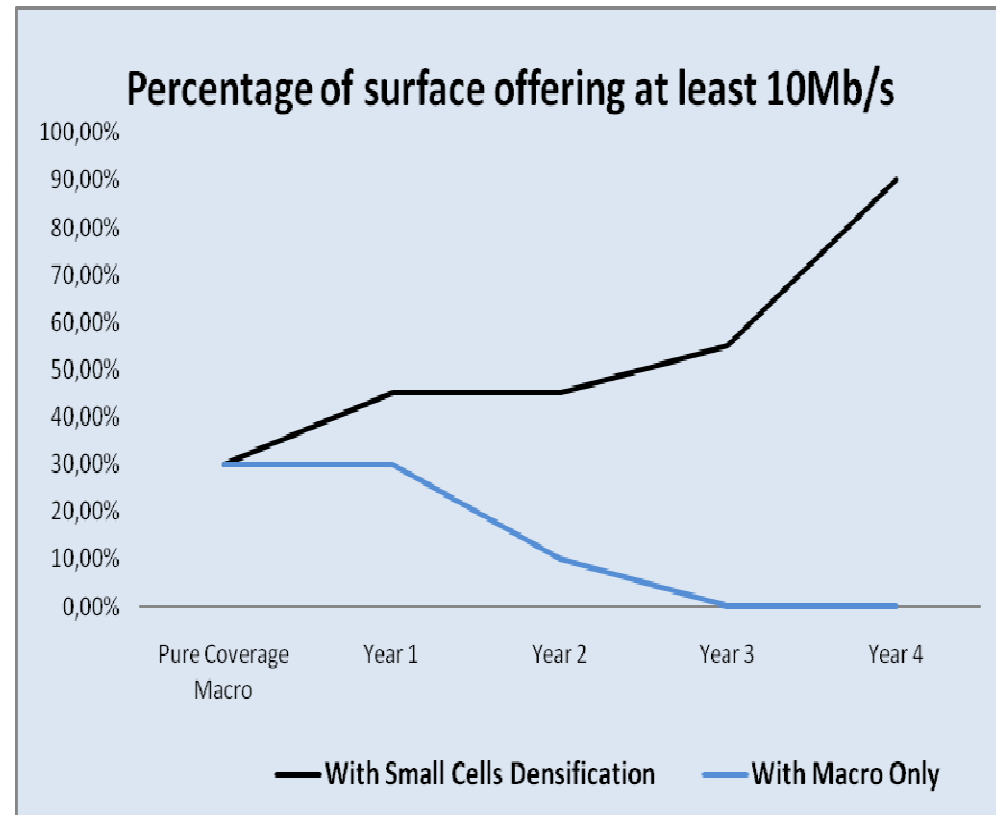


Wrap-up!

NEXT NETWORKS WILL BE HETEROGENEOUS



Reference point : 3 macro LTE BTS
Dense Paris Area
Traffic increase forecast
Metro cells densification year over year
(year 1 = 4, Year 2 = 7, Year 3 = 15, Year 4 = 19)



Capacity close to the user = best option for downlink = only option for uplink

FUTURE NETWORKS WILL BE VIRTUAL

Virtual BTS

Technology Agnostic

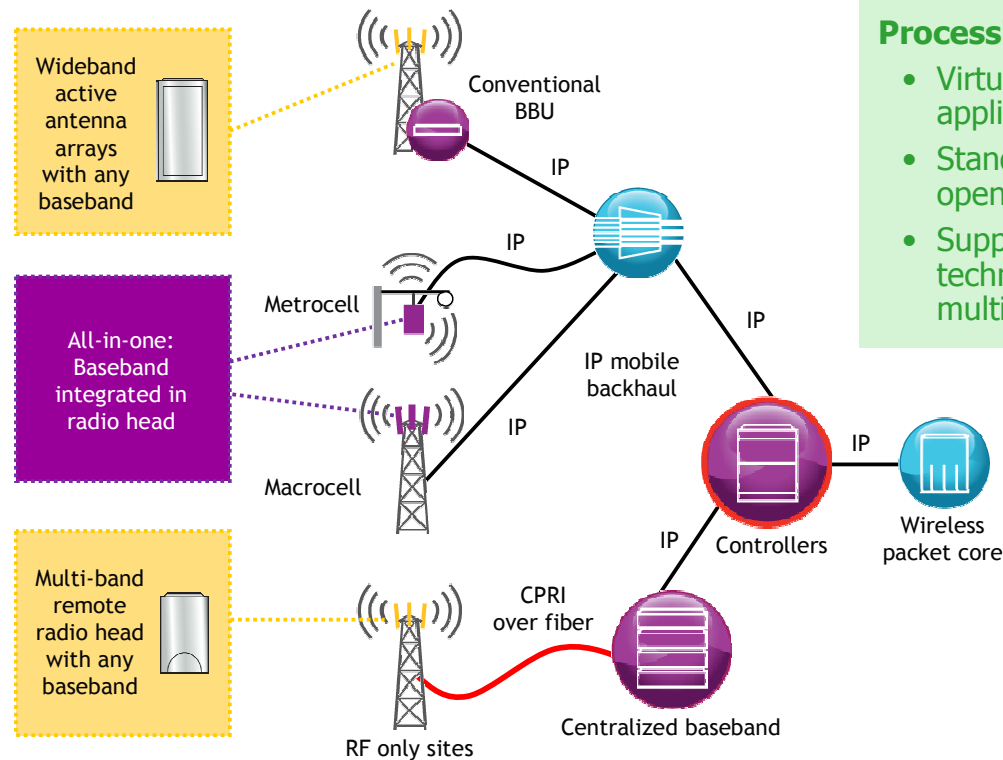
- Active Antennas and MB-RRH
- RF in all bands 700-2600 MHz
- SoC-based BBU (2G/3G/LTE)

Flexible and Scalable

- Different deployment options (conventional, clustered or pooled)
- Virtualization and processing aggregation

Ultra Compact

- Near Zero footprint BTS
- New generation cabinets



Virtual Control

Processing Optimization

- Virtualization of applications
- Standardization on open platforms
- Supporting multiple technologies and multiple topologies

Convergence

Wireline and Wireless Network Convergence

- Integration with broadband Small Cells
- Integration with Optics (WDM, PON) and xDSL

IP Convergence

- Consistent IP service quality and management between Wireless and Wireline

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