



## Indoor mobile infrastructures and 5G opportunities.

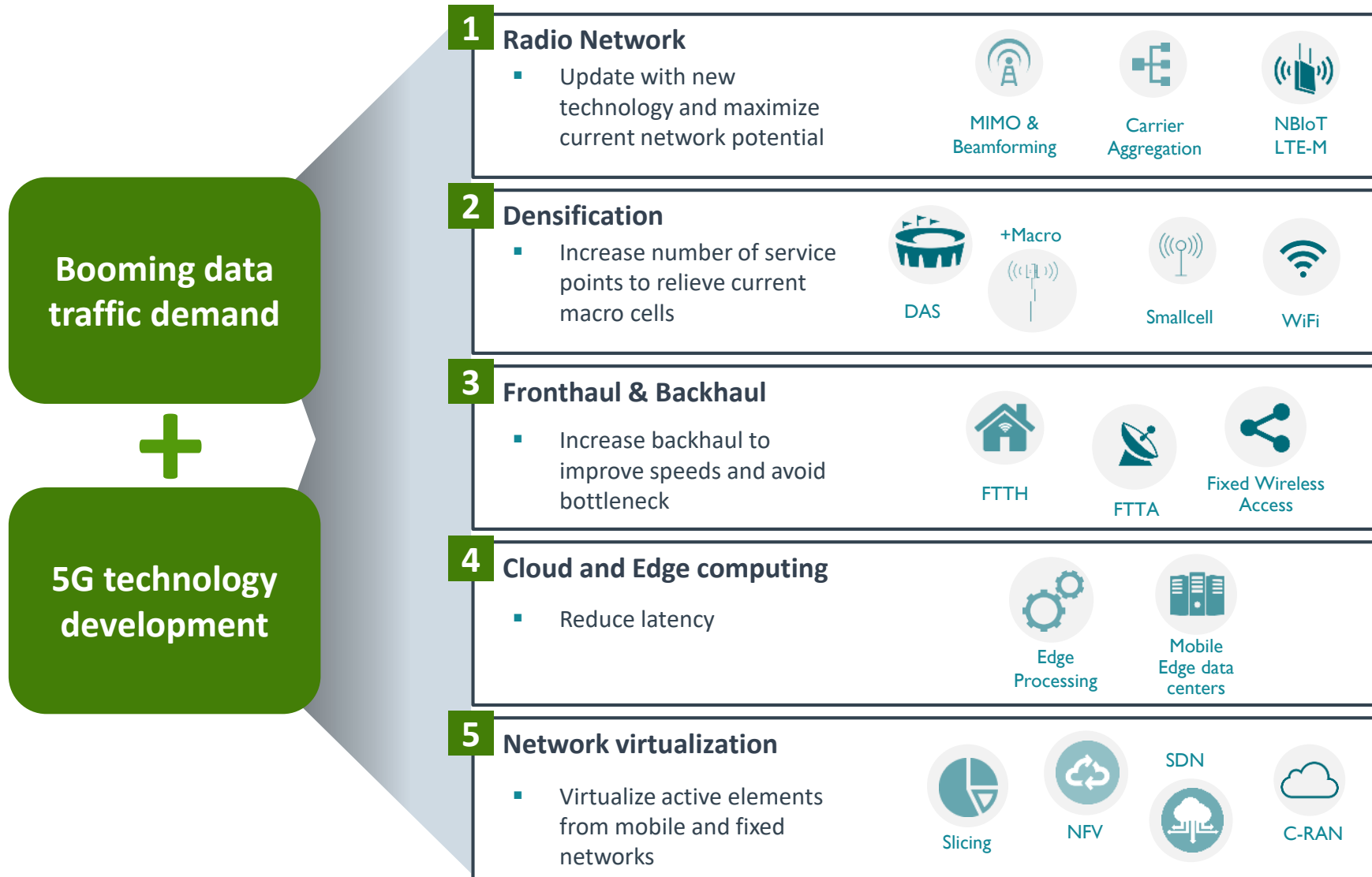
### Technology Surveillance

Product Strategy and Innovation

*Jose Antonio Aranda*

# Towards 5G

## MNO's will need to adapt their networks

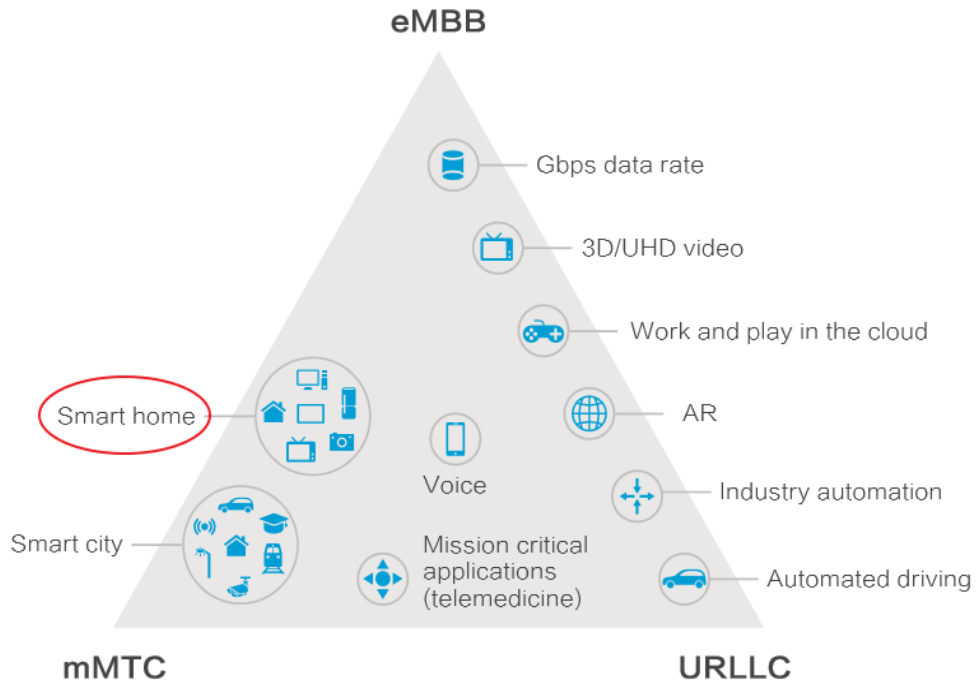


# 5G Opportunities

## In-building scenarios



### 5G Triangle



### Possible Use Cases

- Smart Buildings
- D.A.S. & Small Cells
- Facilities management
- Radio indoor Coverage
- Car Parkings
- Indoor Wifi



### Possible Use Places



# 1 Smart Building

## Key Cellnex references

Cellnex manages nearly **1,300 nodes** distributed in more than **80 locations**, with an average of **3 operators per location**.  
More than **10 years of experience** in DAS.



Stadiums



Sport Halls



Concert Halls



Shopping Centers



Skyscrapers



Hospitals



Underground



Railways



Tunnels



Airports



City Centers

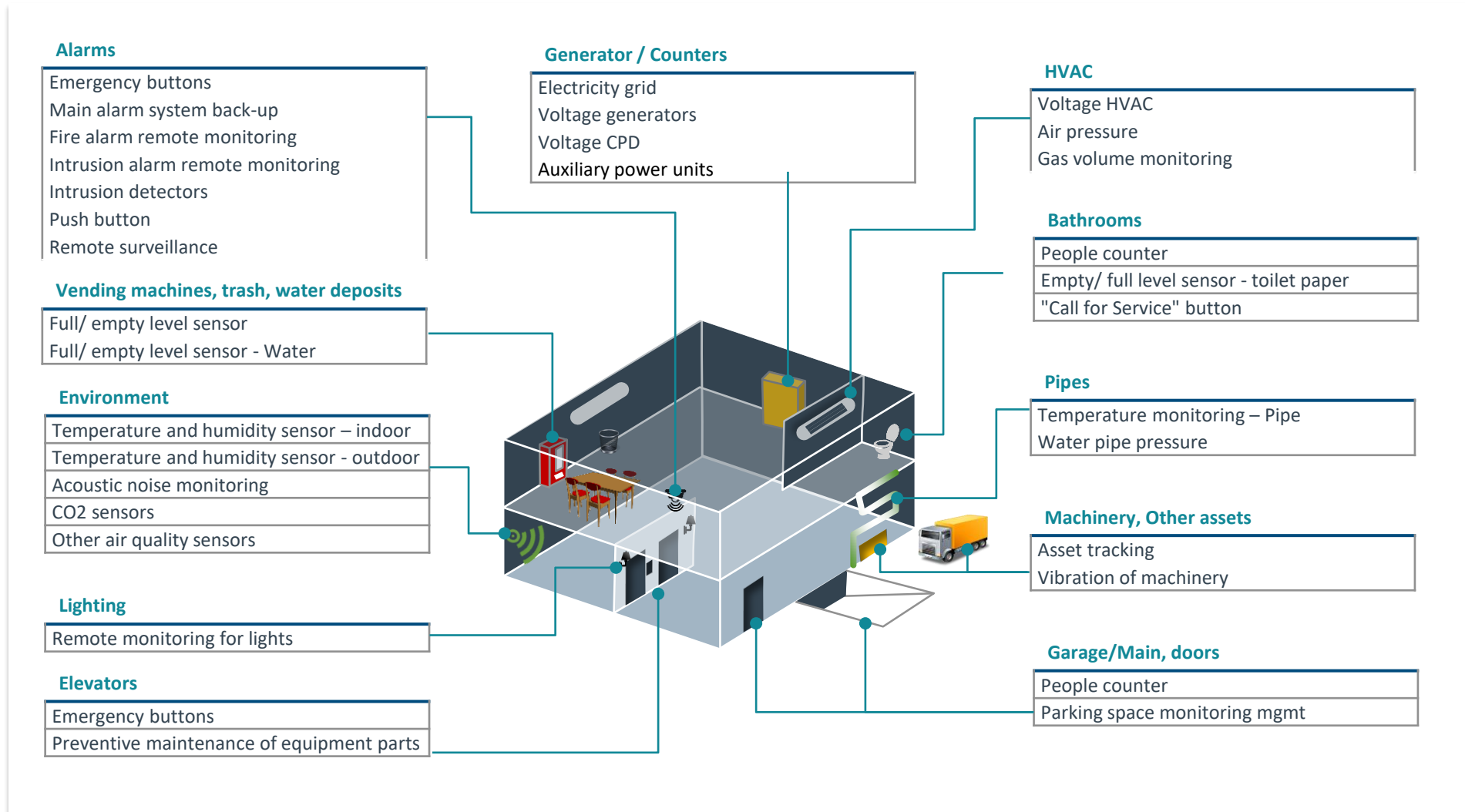


Car Parks

# 1 Smart Building

## Multiple sources of information

5G figures: x10 Connection density/Km<sup>2</sup> and 1000 X lower energy/bit



# 2 DAS and Small Cells

## An important pillar for coverage expansion

### Savings and flexibility in CAPEX and OPEX

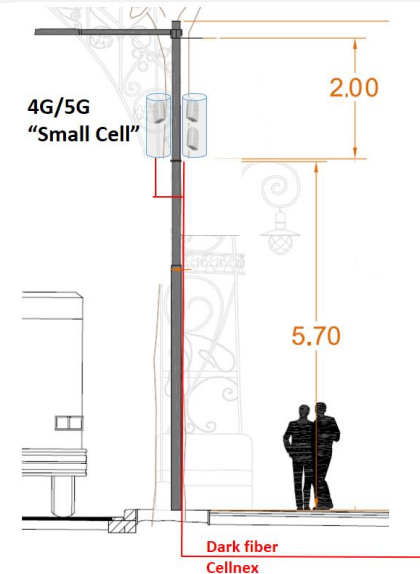
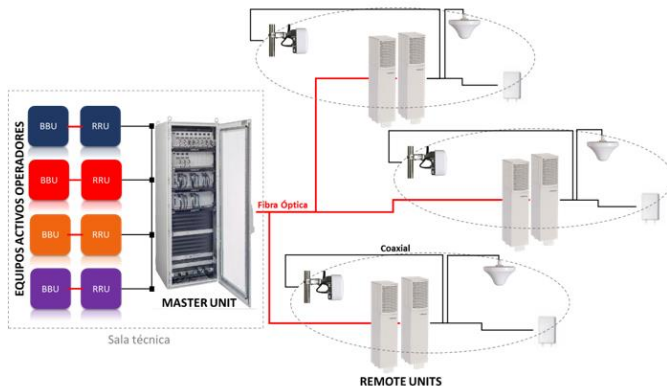
- Cellnex assumes the risk of marketing the network deployed with the other operators. It allows to desynchronize the deployment of the rest of Operators.
- CAPEX and OPEX flexible depending on the financial requirements of the operator.
- Reduction of the cost of acquisition of sites thanks to:
  - Cellnex co-investment
  - Design engineering and advanced radio planning.
  - Operational efficiency in the provision of the service.

### Time to market

- Single window of relationship with the owners / managers of the sites
- Access to a portfolio of sites of great interest to operators
- Reduction of the execution period and start-up of the solution thanks to:
  - Portfolio acquired by the acquisition team
  - SLA for the planning and deployment of the solution.

### Operational excellence

- Team of engineers dedicated to the deployment.
- Project management and installation of the end-to-end solution.
- SLAs for O & M, agreed with the operators according to their needs and independent of the rest.
- Monitoring from the Network Control Center 24/7.
- Updates of the network according to the needs of the operator or the owner of the site.



# References

Wanda Metropolitano:

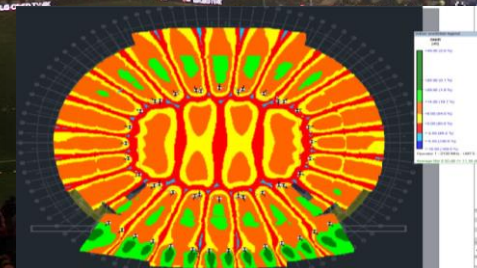
- 67,703 spectators
- Area of 155,000 m<sup>2</sup>



3D Model



Sectorization layout



Coverage Simulation



# 3 Facilities Management

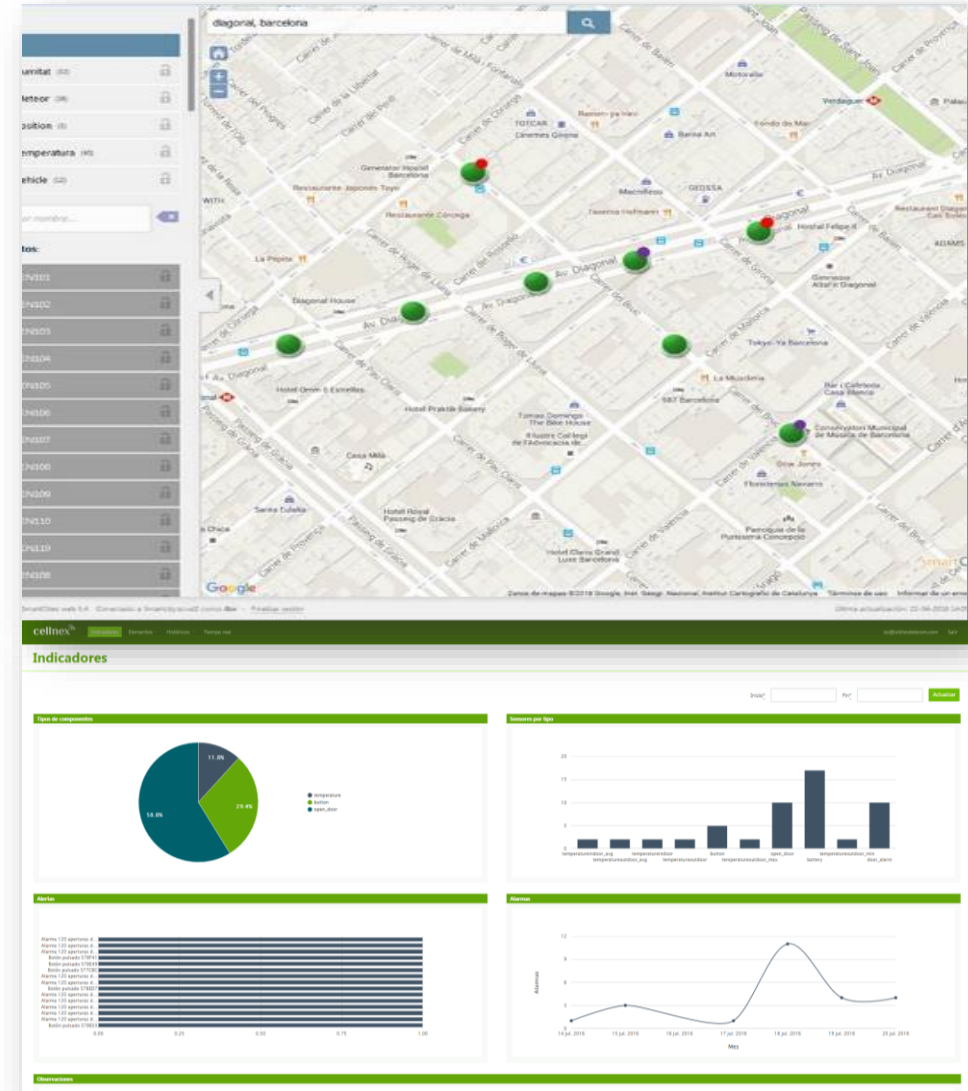
## Accessing to different ways to visualize the data

### Main Goals

- Development of a tool for the visualization of the state of the different elements.
- Efficient management of resources.
- Generation of alarms and warnings based on business rules defined by the client.
- Integration of different types of sensors (door opening, power consumption, presence control for surveillance rounds, CPD temperature, device tracking, etc.)
- Display of service indicators associated with the data obtained.

- **PROJECTS:**
  - Sensoring Pilot for ISS buildings (SMARTFACILITIES)

### Monitoring and reporting





# In-building solutions

## References: Skyscrapers

- Discreet installations
- Minimizing exposure to wireless signals



Porta Nuova



Intesa San Paolo

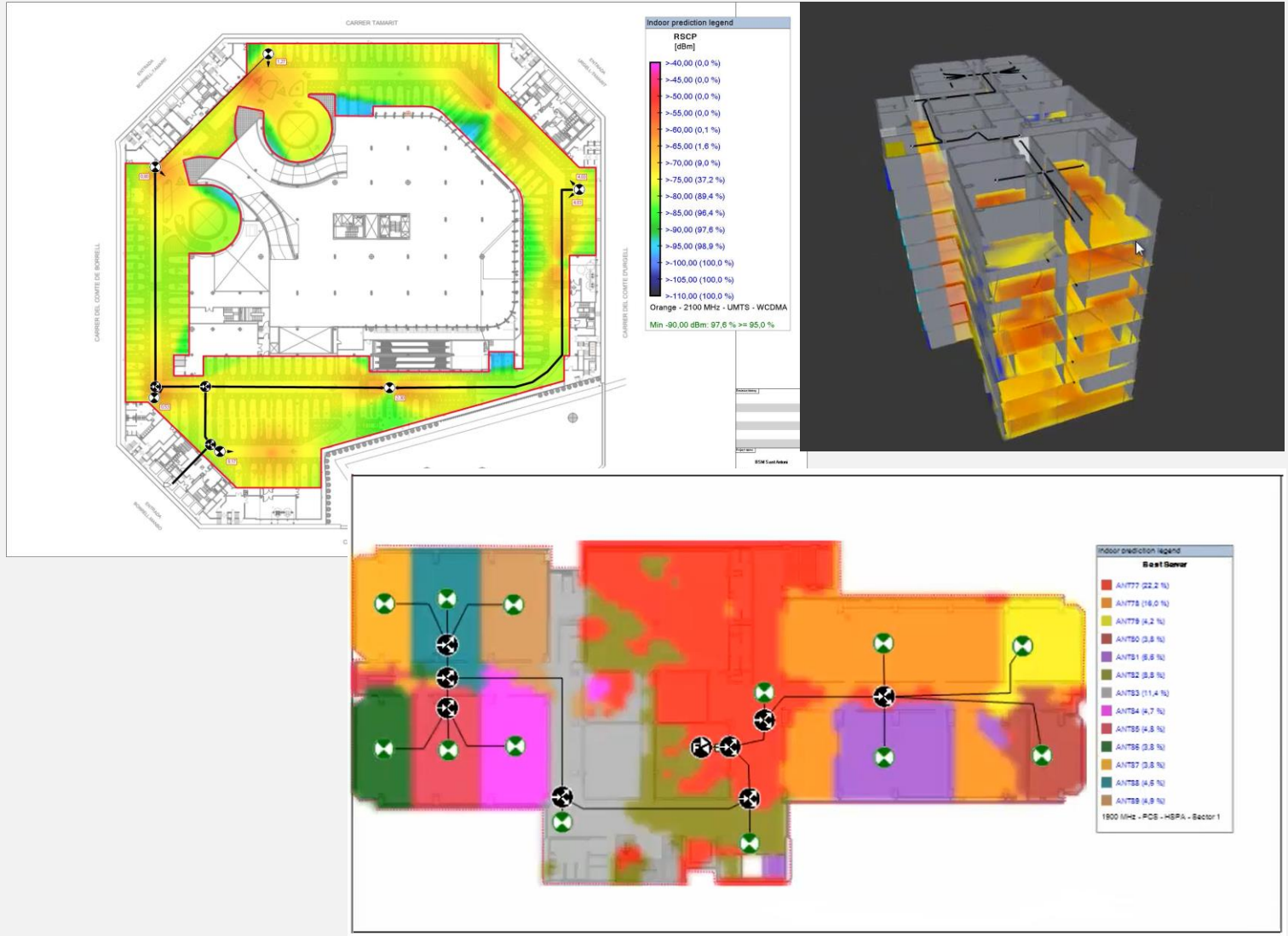


Palazzo Lombardia



Torre Hadid

# 4. Radio Indoor Coverage



## Main Goals

Cellnex is using different tools based on software models to identify the levels of the in-house radio coverage in a gradual manner in different building types:

- Big department stores
- Stadiums
- Big and small Offices
- Private houses

These tools can analyse indoor radio in 3G, 4G and 5G frequency bands.

## 4 Radio Indoor Coverage References

- Minimizing exposure to wireless radio signals
- Reduced antenna dimension and Minimization of visual impact

Multi-operator solution



Spedali Civili (Brescia)



Ospedali Riuniti (Bergamo)



Liceu

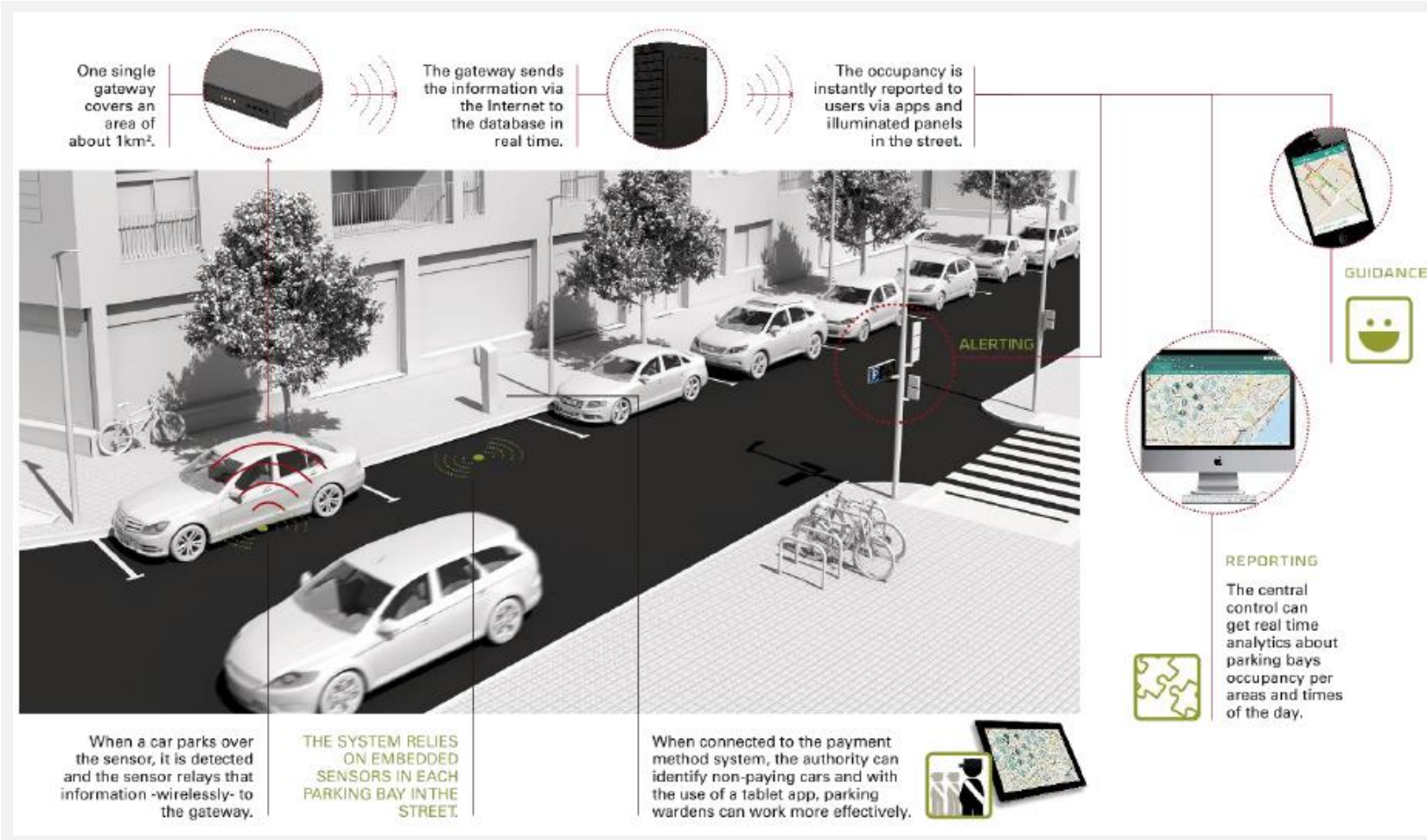


Plaza Rio 2



L'Oceanogràfic

# 5 Car Parkings



## Target

Mesh of sensors to detect and inform about empty spaces.

Leading to :

- Gain in efficiency and optimization for car users.
- Reducing time to find an empty slot.
- Thus reducing energy consumption.
- Thus reducing city pollution.

# 6 Indoor Wifi or FWA

## Target and goals

- Development of scorecards based on BI (Business Intelligence) tools to facilitate decision making.
- Integration of data from different WIFI management systems.
- Development of scorecard and analysis of business indicators associated with the use of the network and tracking.

## Projects

- Project **WIFI BARCELONA**:  
Development of a Scorecard for the visualization of resources and data analysis.

