How to ensure full wireless service in your venue

This presentation addresses the challenges in providing full indoor Mobile services in your venue. Seamless wireless services are essential to assuring Smart-Venue functionality to enhance efficiency and functionality of your venue. JMA Wireless is showcasing how to implement “open systems” that allows a single infrastructure to provide wireless services for all mobile operators.

Morten Tolstrup & Erik Nilsson

JMA Wireless

Agenda

Who is who in shared Distributed Antenna Systems? *(Erik Nilsson)*

Centralized DAS - Showcasing an open system

- Open shared infrastructure 3G/4G
- The business model
- The upgrade path

Case Study: The Aarhus City-DAS

Smart Venues *(Morten Tolstrup)*

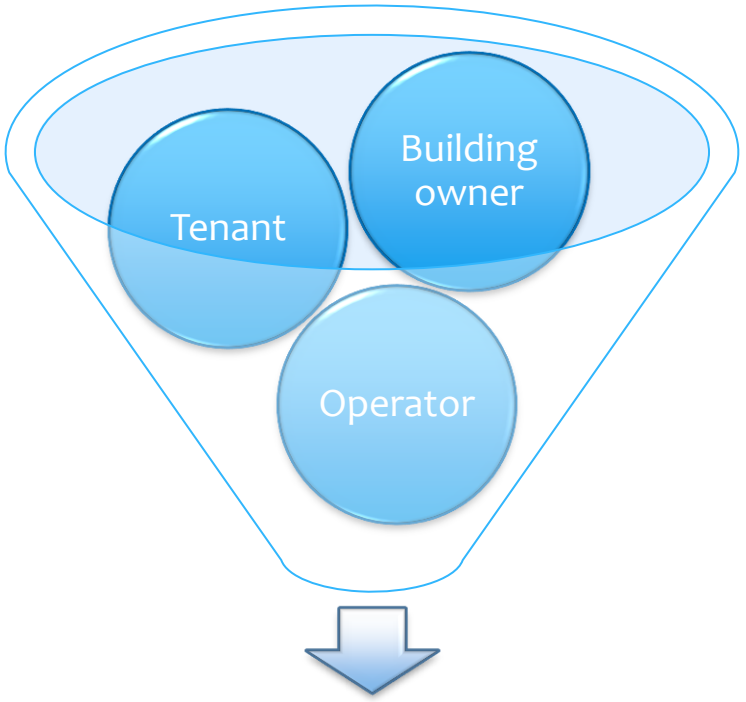
- Highlights of Smart Venue Functionality
- Showcase “Smart Stadium”
- “5G” and the future…

Who is who?

Who are the players and why should they invest?

Erik Nilsson

Who cares about wireless coverage?



Operators

- Offload the macro network
- Customer satisfaction
- Provides technical approval

Tenants

- Seamless voice and data traffic

Building owners

- Pleased tenants and guests
- Increased revenues

What is the problem?

There is increased demand for in-building coverage, because…

- New building techniques and materials lead to very poor in-building coverage from the macro networks

The business is not there, because…

- Providing in-building coverage does not increase operators revenues as no new subscribers are gained.
- This is especially critical for residential and small/medium office buildings.

What are the solutions?

In many cases, it is difficult for the parties to agree on how to share the investment…

Financial solution

- A third party can take the investment, charging instead the other parties a subscription fee

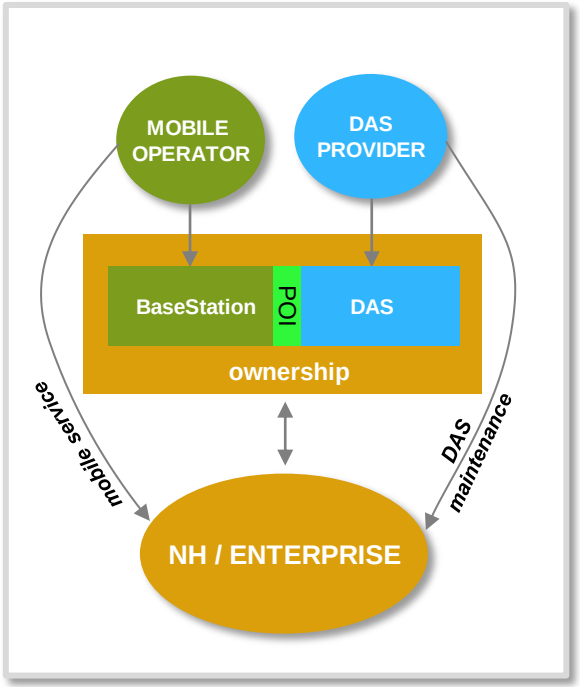
Technical solution

- A more efficient technical solution can help drive down the investment
- This is done by looking at several buildings at a time, sharing the BTS resources
- We call this Centralized DAS, or C-DAS

The business model

Characteristics

- Operating DAS in mobile bands can only be done with the approval of the local mobile operators
- In most regions it is allowed for a third party to own a “distribution system”
- In-building systems are installed and sold by a third party – DAS provider, referred by the operator independently
- Operator typically provides RF source (base station or repeater)
- System is designed to operators’ specifications
- Performance is guaranteed by DAS supplier - no risk for the operator
- Maintenance is provided by the enterprise or the DAS provider
- Local, regional differences and challenges



Centralized DAS

Driving down cost and simplifying the business model

for in-building wireless

The Centralized DAS

The Solution

In order to unlock the situation, the BTS cost issue needs to be taken out of the equation.

This is done by introducing a new partner, that centralizes BTSs and aggregates the business between operators and building owners.

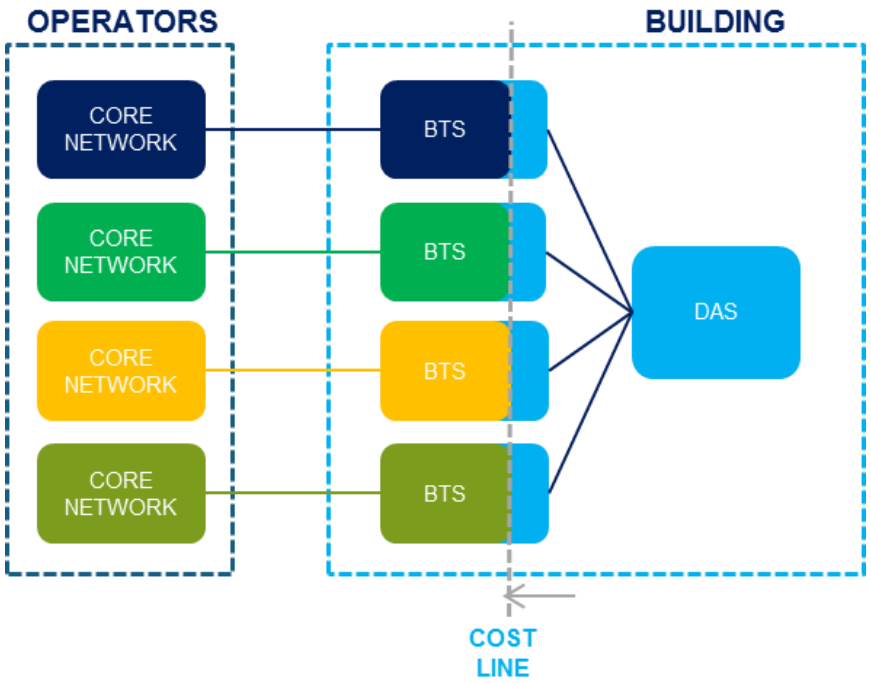
In Aarhus Denmark, JMA has deployed a Centralized DAS that covers buildings all over the city - a **City DAS**

The solution used by JMA in Denmark shows that:

- DAS deployments can be **cost neutral**, or profitable for the operators
- The number of partners for the operators is **dramatically reduced**, allowing a massive rollout of in-building coverage

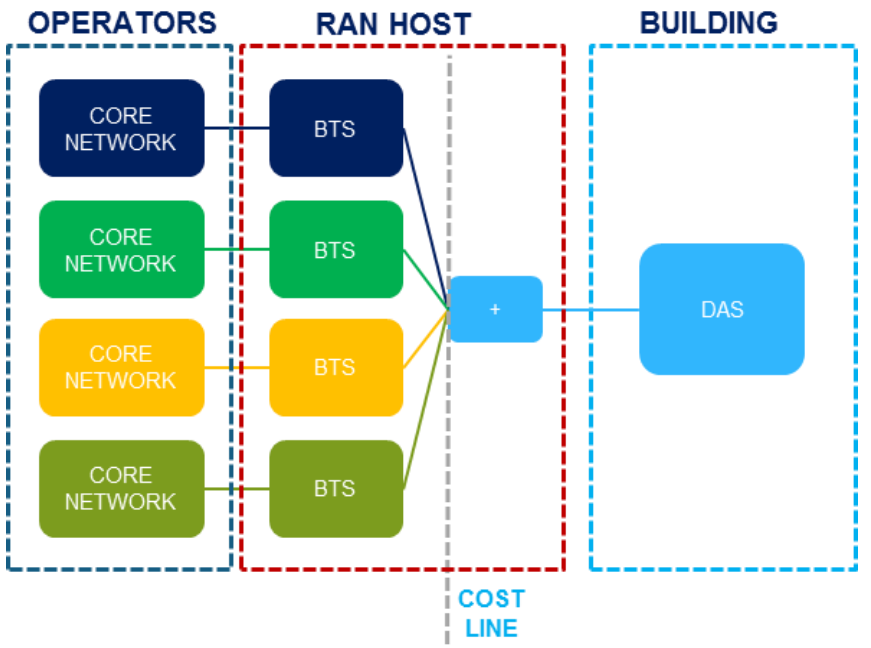
Changing the business model

The past



- The building owner installs a multi-operator passive DAS
- The operators may or may not choose to connect to the system using BTS, and may request the building owners to pay for the BTS
- The responsibility for the solution is complex - shared by 4 operators and the building owner

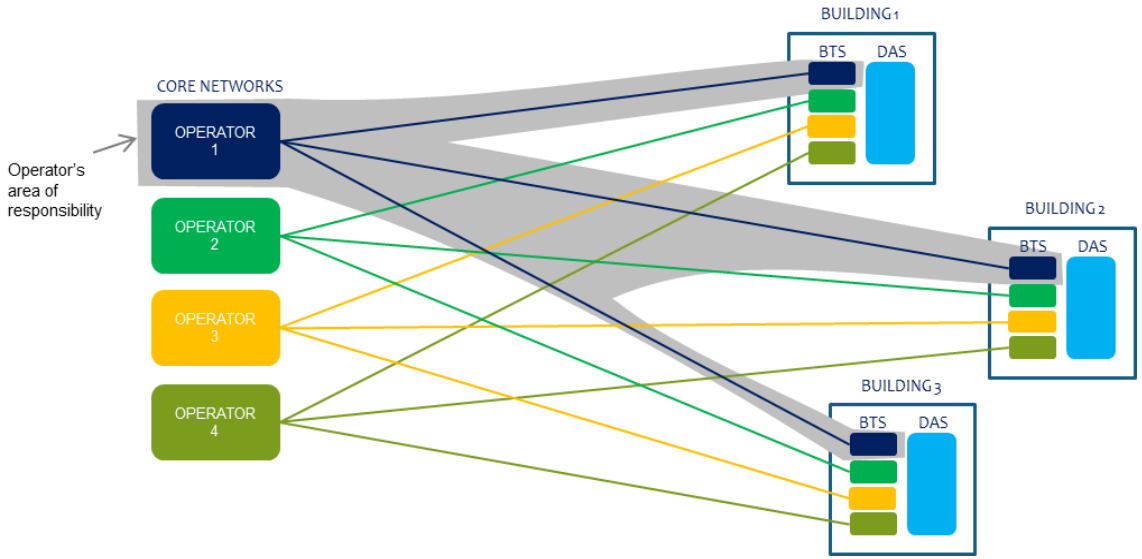
The future



- The building owner installs a multi-operator DAS and interconnects to the BTS hotel operated by the RAN Host
- The operator ensures that enough capacity is available at the BTS hotel
- The responsibility for the solution is clear – the operators have no equipment in the building

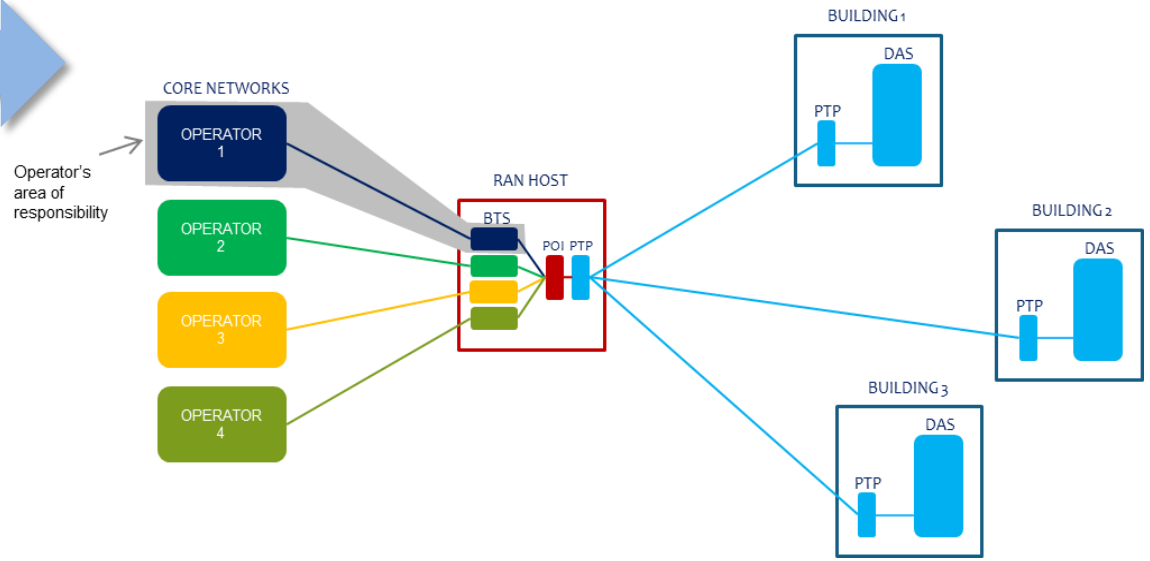
Operator benefits

The past



- Many BTS installations in remote locations which leads to big investments and high maintenance costs
- Many legal agreements
- Unclear responsibilities

The future

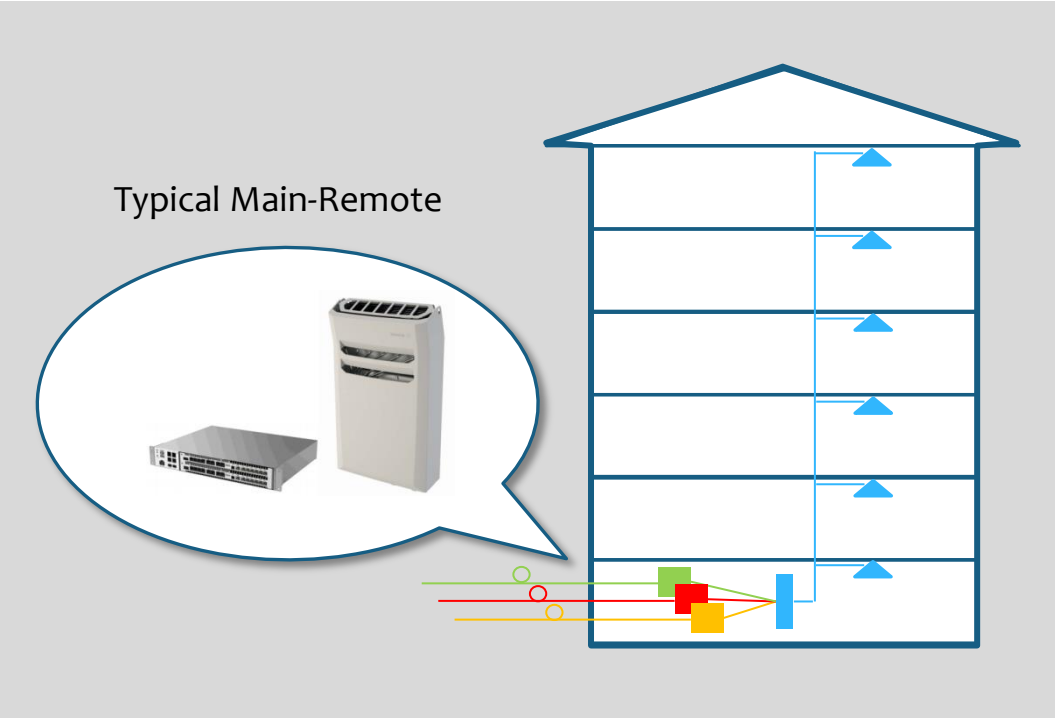


- Fewer BTS locations which reduces CAPEX and maintenance costs
- Dramatical reduction in legal agreements
- Clearly defined responsibilities

Traditional vs JMA´s approach

Main-Remote BTS solution for access to the operators signals

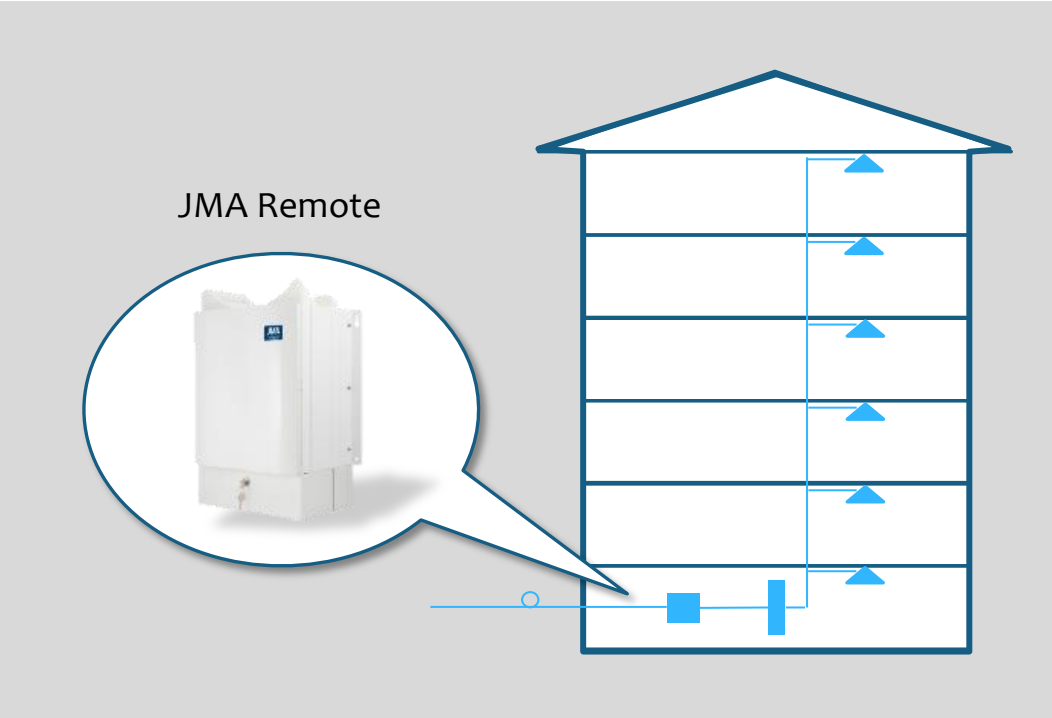
- One system per operator
- One remote per band
- One fiber per building per operator



Centralized BTS

Multi-band, multi-operator remote

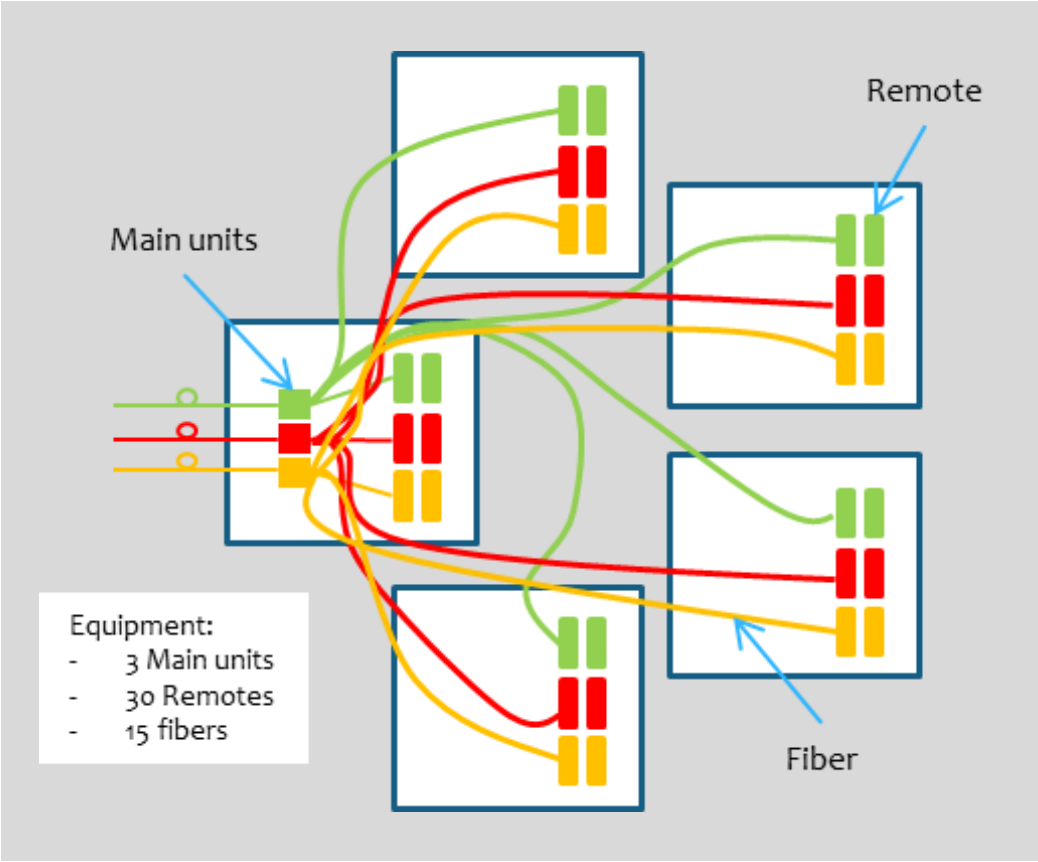
- One shared system for all operators
- One shared remote for all bands
- One fiber per building



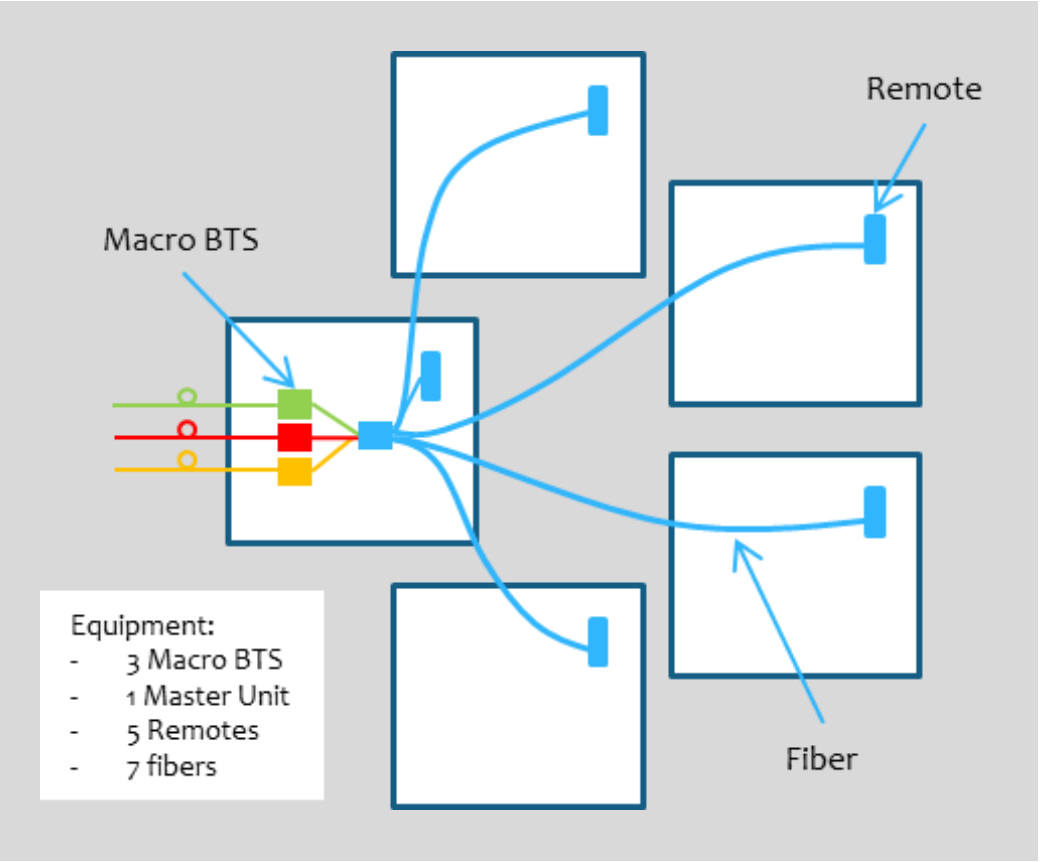
Comparison example (5 buildings)

Comparing the conventional approach with the JMA solution for 5 buildings, coverage for 3 operators and 2 bands.

Conventional solution

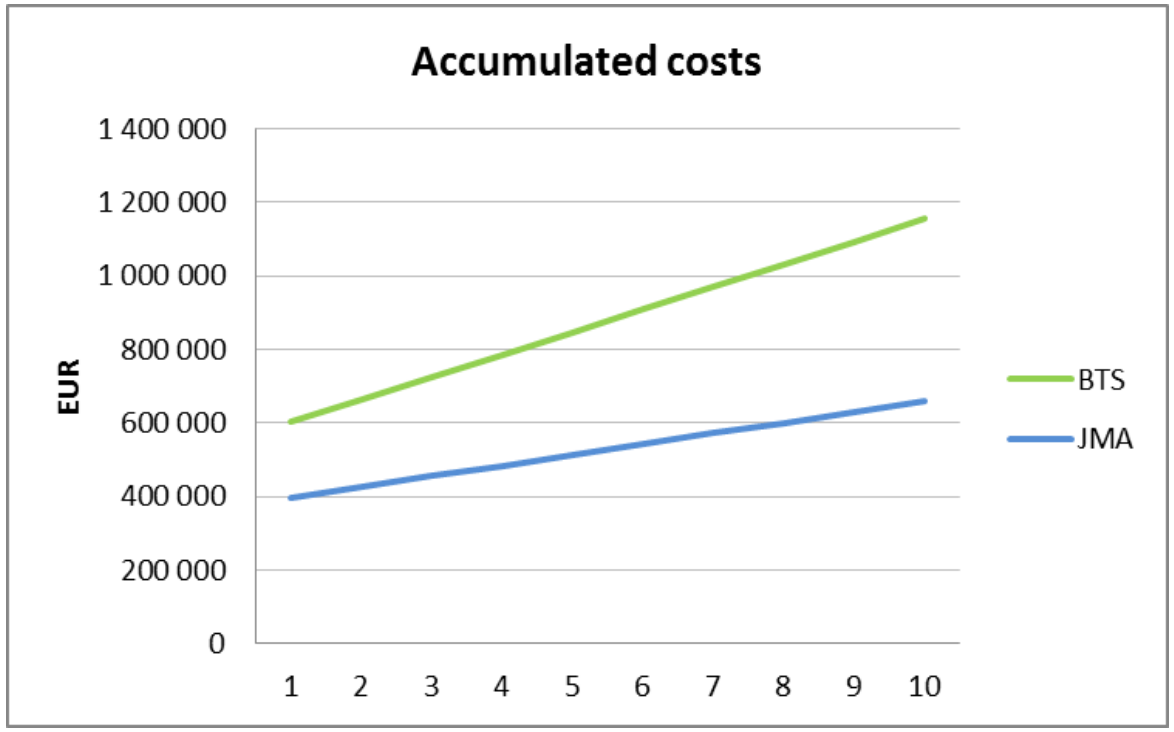


JMA's solution

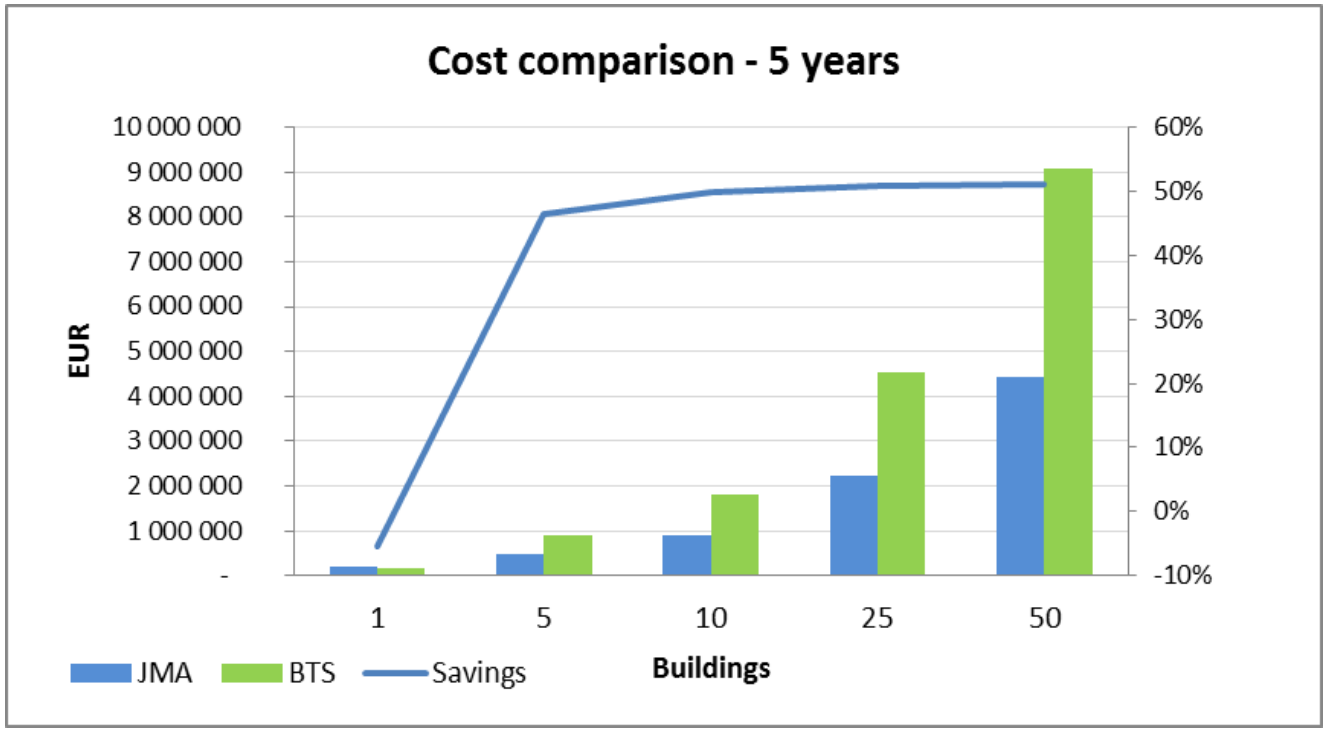


TCO analysis

Cost development– 5 buildings



Cost comparison depending on project size



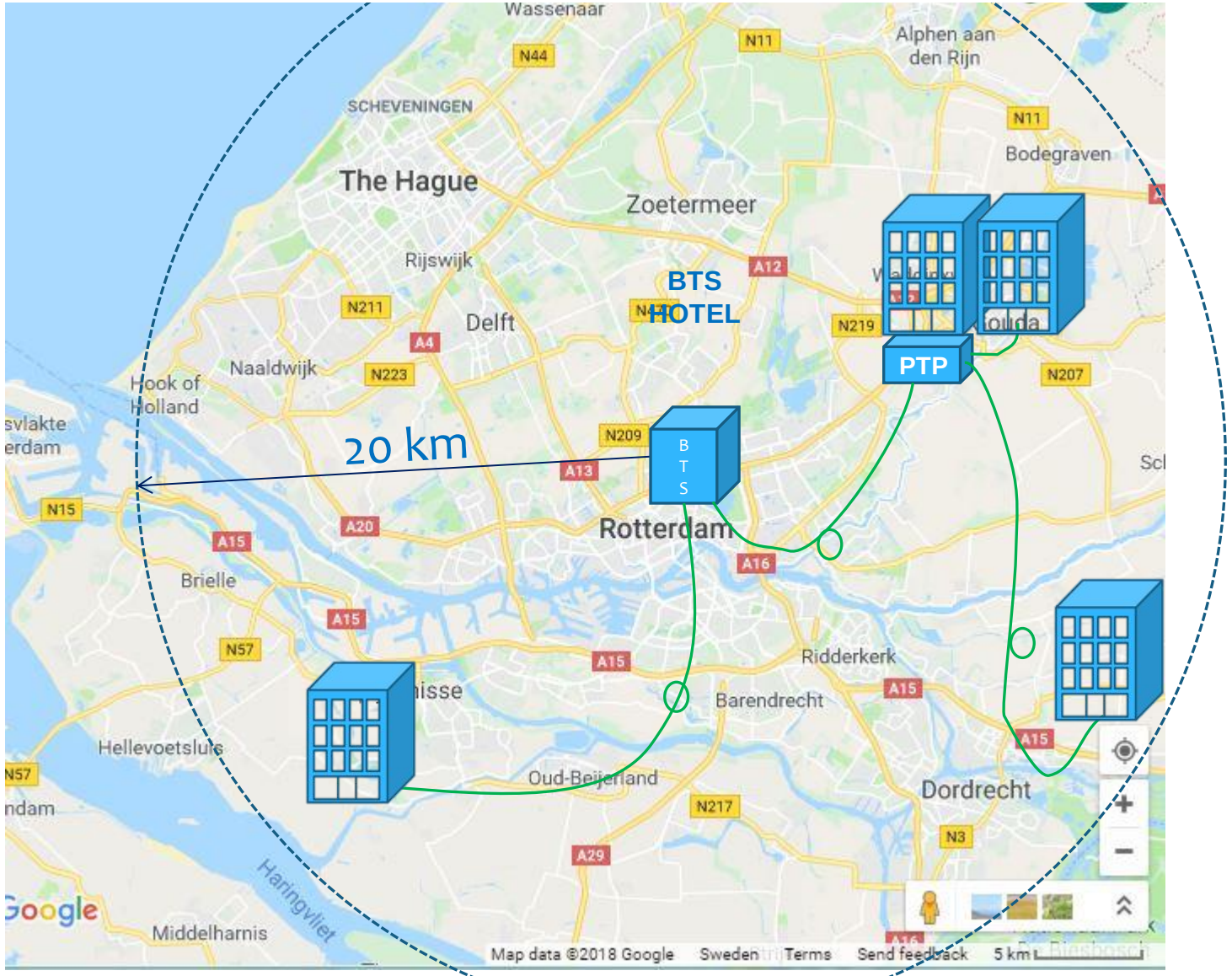
Assumptions:
- 3 operators
- 2 bands

The C-DAS model saves in equipment, power and fiber cost!

Case study – City DAS

Covering Aarhus residential buildings from a single location

Technical solution – The City DAS



Advantages:

- With a centralized BTS Hotel, buildings in the entire city can be covered without the need for on-site BTSs
- Dark fiber is used to connect BTS Hotel and buildings within a 20km radius (>1200 sqkm)
- With the use of Point to Point equipment, this range can be further increased
- Simplifies the upgrade to 5G in lower bands (0.7-3.5 GHz)

Aarhus City DAS, Denmark

Stofa owns fiber in Aarhus and has established BTS Hotel in central Aarhus. They offer 3G In-building coverage in 14 new buildings in Aarhus, without on-site BTS equipment.

The system covers 4 residential zones, each driven by 1 fiber from the BTS Hotel, where each of the 4 operators have a macro BTS.

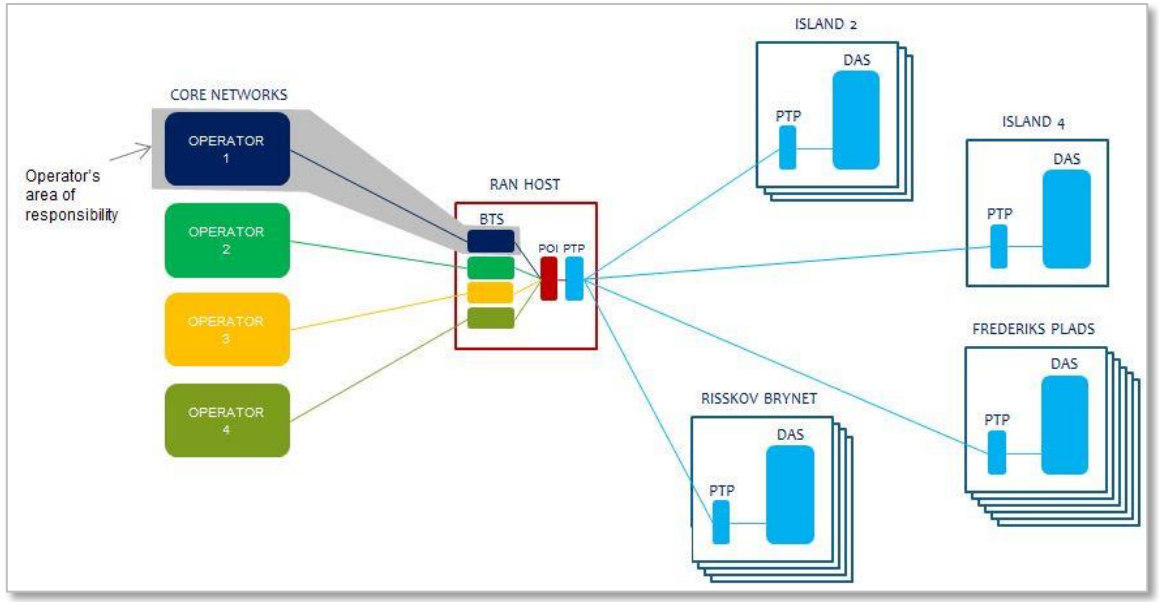
The solution allows coverage to be provided at a much lower investment and running cost, compared to on-site BTS solutions.

Design and installation is done by KM Telecom and the JMA Teko system is used to feed passive DAS systems in each building.

KM TELECOM

Building locations in Aarhus

- Stofa hosts a BTS Hotel in Central Aarhus
- In the initial stage, 14 buildings in four new apartment zones are being connected:
  - Risskov Brynet (4 buildings)
  - Frederiks Plads (6 buildings)
  - Island 2 - Pakhusene (3 buildings)
  - Island 4 (1 building)



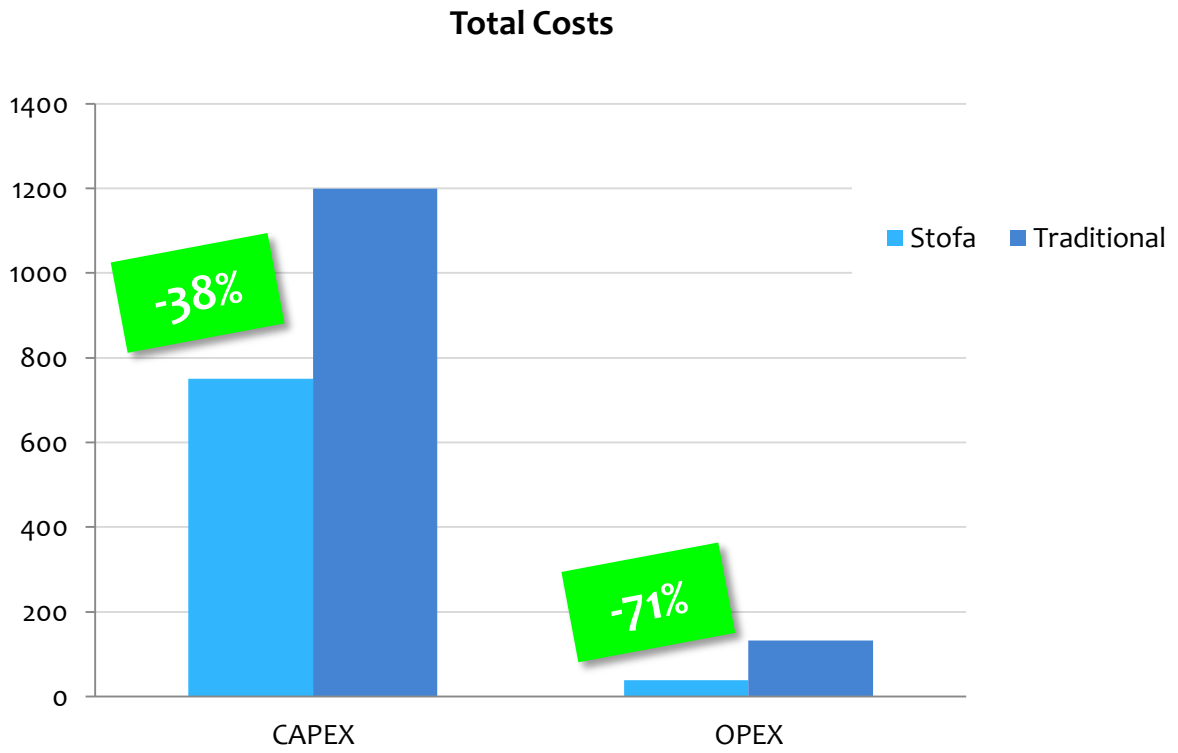
Benefits to Operators and Building owners

Operators

- Reduced CAPEX
- Reduced OPEX
- Fewer legal interfaces
- Simplified maintenance

Building owners

- Less equipment on site
- Fewer legal interfaces
- Clearer line of responsibility
- Quicker decisions



Morten Tolstrup

Our Vision for Smart Venues

TELECOM INFRA EVENT 2018

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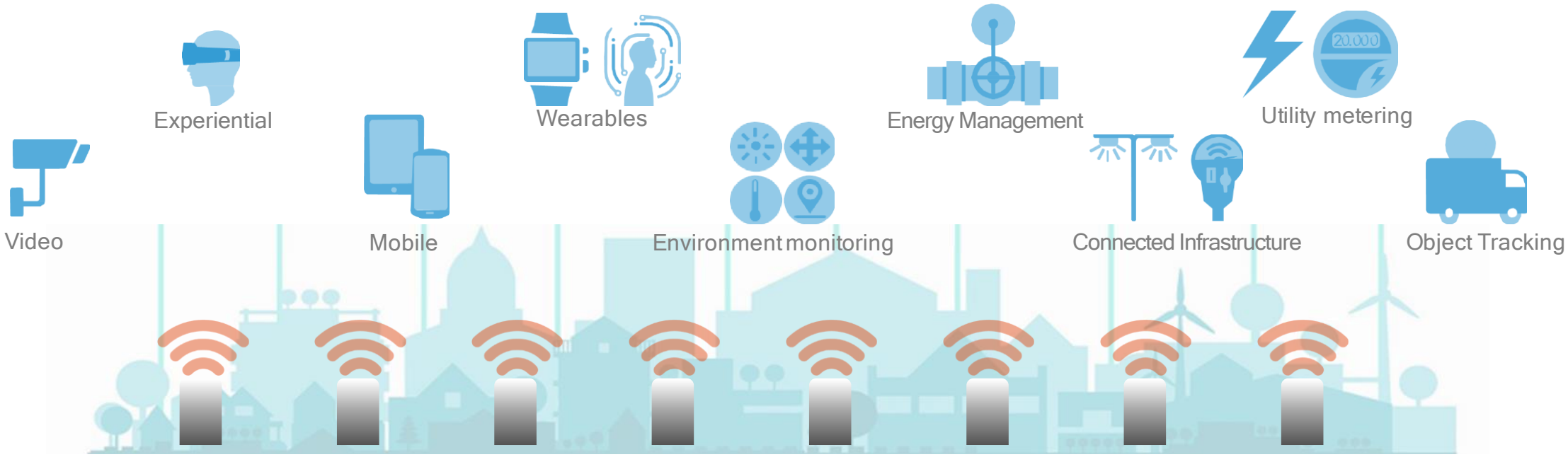
Smart Venues will be Connected Venues

Flexible, Multi-Technology, Future-ready

Flexibility to empower the city with key technologies consistently across the city

Multi-technology to ensure support for current and forthcoming capabilities.

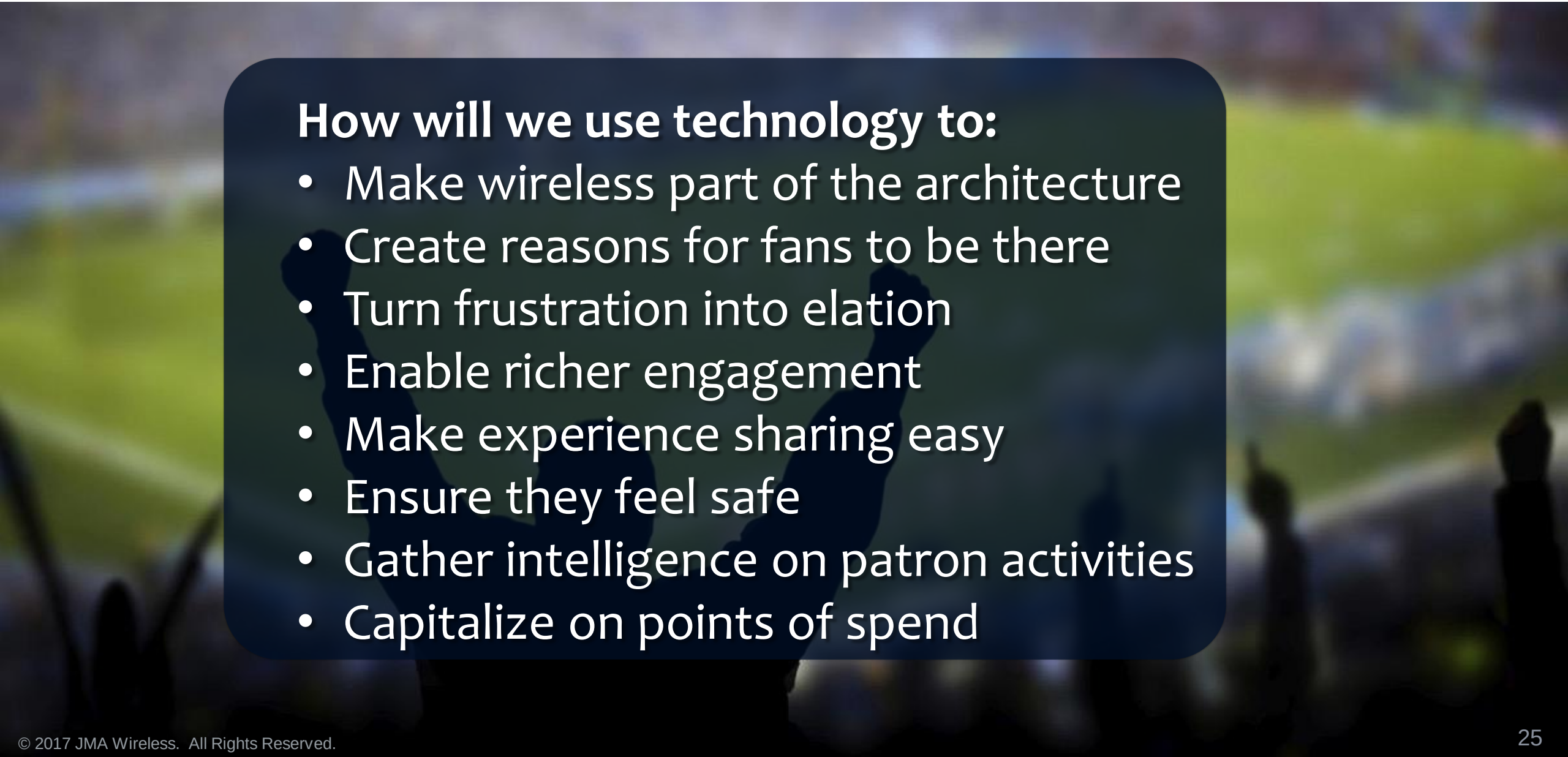
A platform that is non-cluttering, non-intrusive, and stealthy.



Over 40 Sports & Entertainment Venues

Enabling Powerful Mobile Interaction

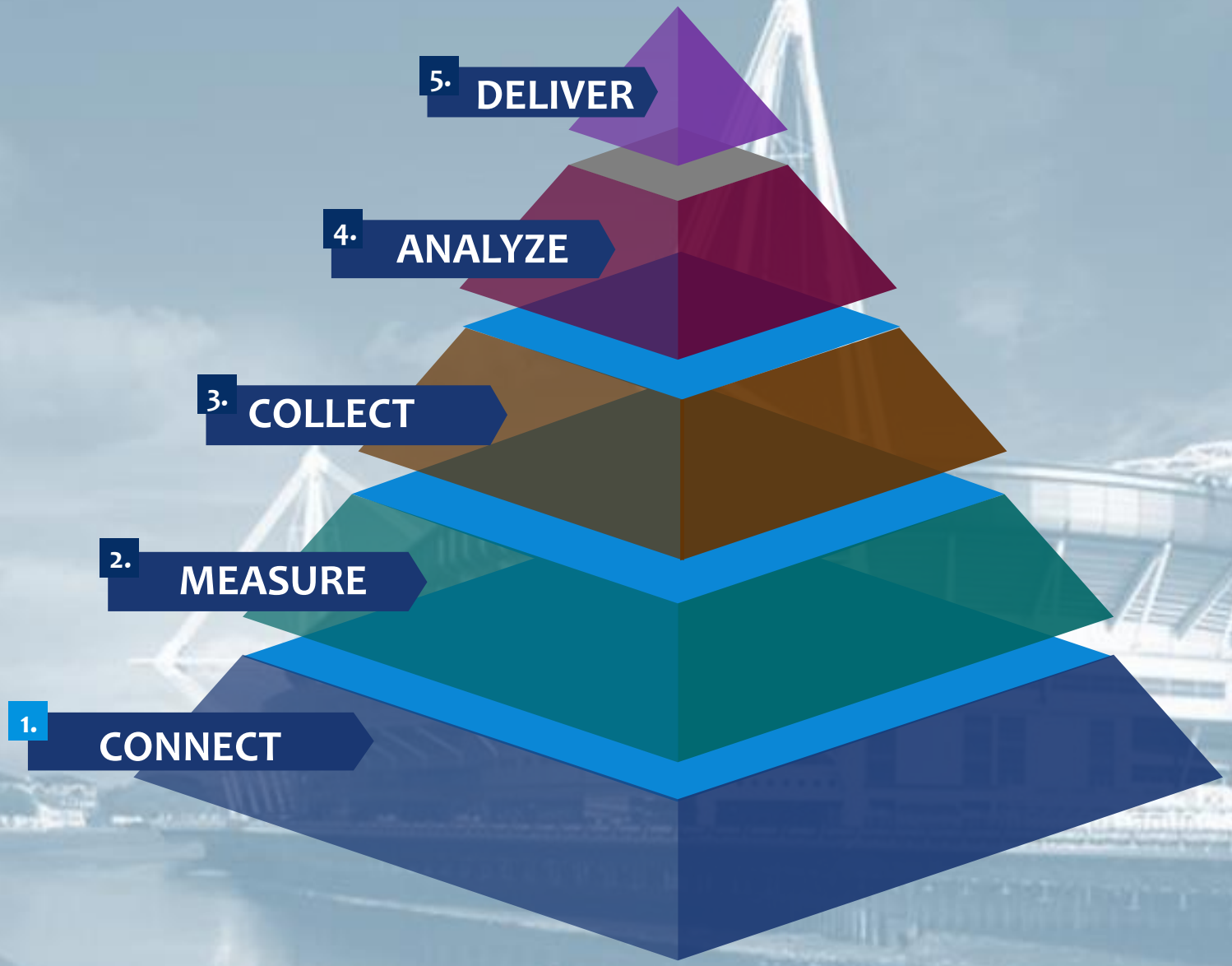
Envisioning Technology for Smart Venues



How will we use technology to:

- Make wireless part of the architecture
- Create reasons for fans to be there
- Turn frustration into elation
- Enable richer engagement
- Make experience sharing easy
- Ensure they feel safe
- Gather intelligence on patron activities
- Capitalize on points of spend

The Steps To Building A Smart Venue



USERS & CONSUMERS

Transform user and customer experience with engaging, enhanced and autonomous services

ANALYTICS & INTELLIGENCE

Transform data into insight, action and knowledge. Integrate into business and operational processes.

DATA FLOW & DEVICE CONTROL

Collect data and manage devices on our network. Use edge computing and gateways prior to sending to the cloud.

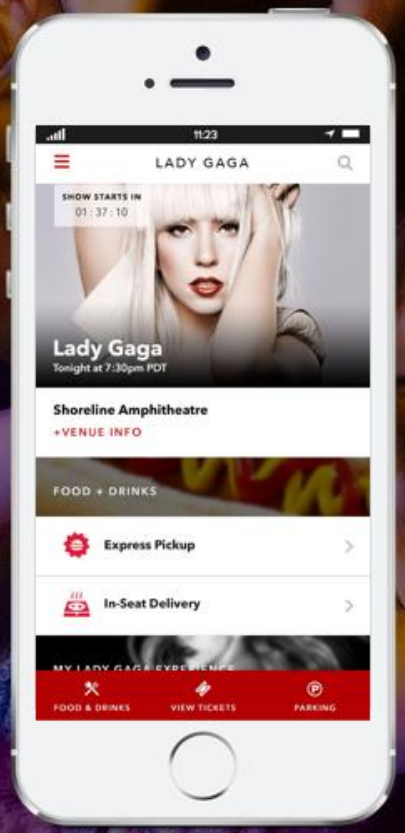
DEVICES & SENSORS

Deploy devices and sensors to measure existing and new data sets. Inventory assets that are not measured today.

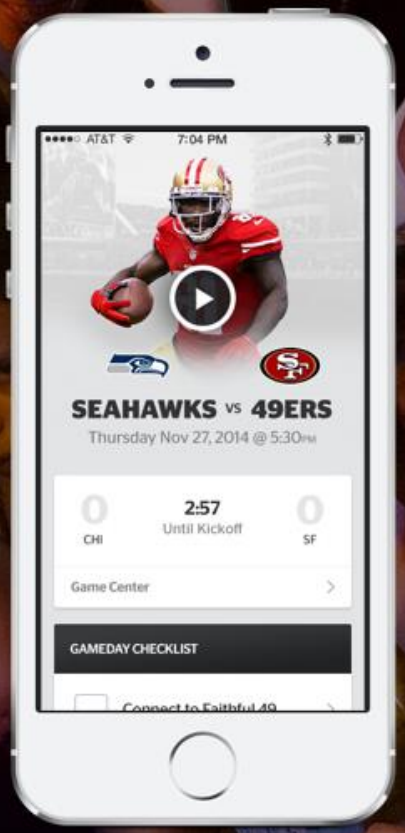
CONNECTIVITY & ACCESS

Build a network foundation for connectivity and access for more bandwidth, device types & mobility.

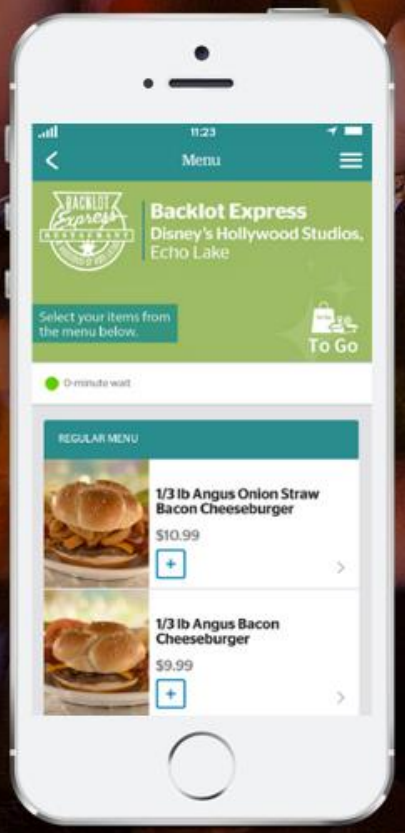
JMA WIRELESS



Tickets
& Parking

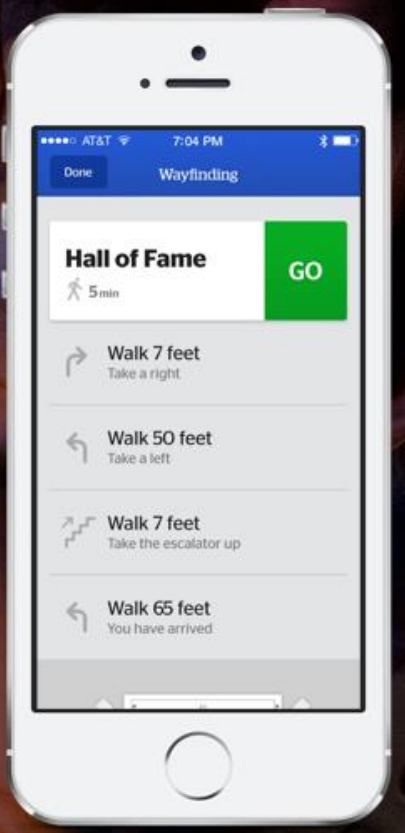


Game/Concert/
Event Center



Food, Beverage &
Merchandise

Loyalty &
Experience

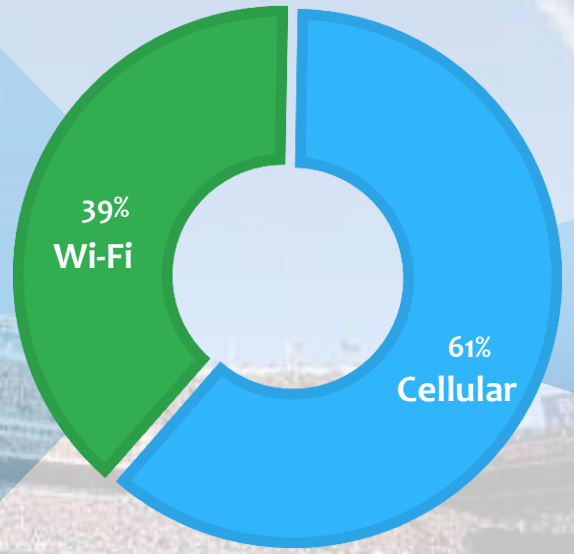


Wayfinding

Getting the Full Picture of Data & Intelligence

Application	Data Volume
iCloud	3.9 TB
IOS Updates	1.3 TB
Amazon Web Services	732 GB
Google Web Content	564 GB
Apple Web Content	507 GB
Facebook	370 GB
Snapchat	346 GB
Twitter	235 GB
Instagram	150 GB
iTunes Streaming	117 GB
YouTube	73 GB
iMessage	72 GB

- Only see Wi-Fi based Information
- Cannot extrapolate to Cellular Data
- Unlimited plans driving usage to Cellular



No Cellular Visibility

*Data from Super Bowl 50

JMA WIRELESS

Preparing for 5G

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Delivering on 5G Infrastructure and Solutions

5G

Enhanced mobile broadband

- Multi-Gbps data rates
- Highwe capacity
- Uniformity
- Deep awareness

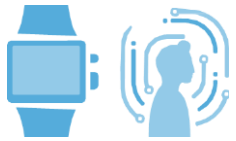
Experiential

Video

Mobile

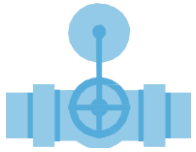
Higher reliability services

- Lower latency
- Higher reliability
- Higher availability
- Stronger security



Wearables

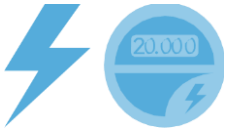
Environment monitoring



Energy Management

Massive Internet of Things

- Lower cost
- Lower energy
- Deeper coverage
- Higher density

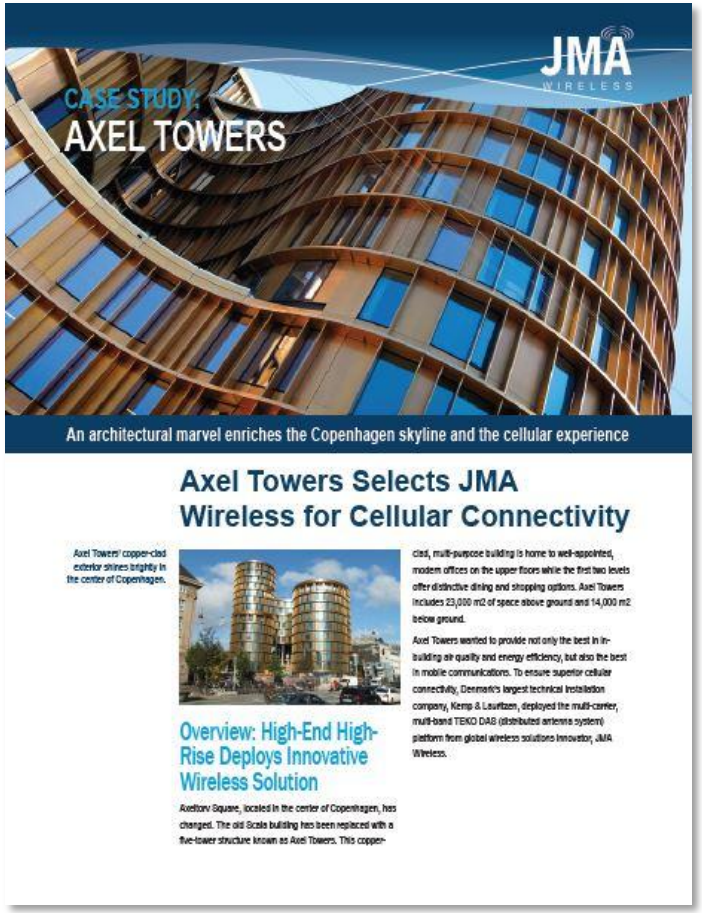


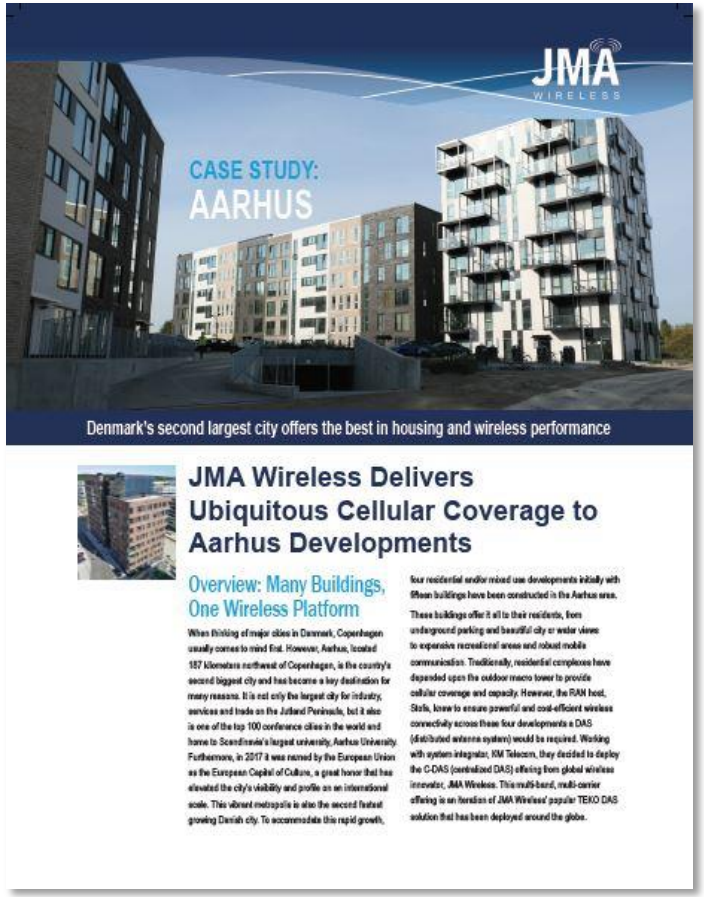
Utility metering

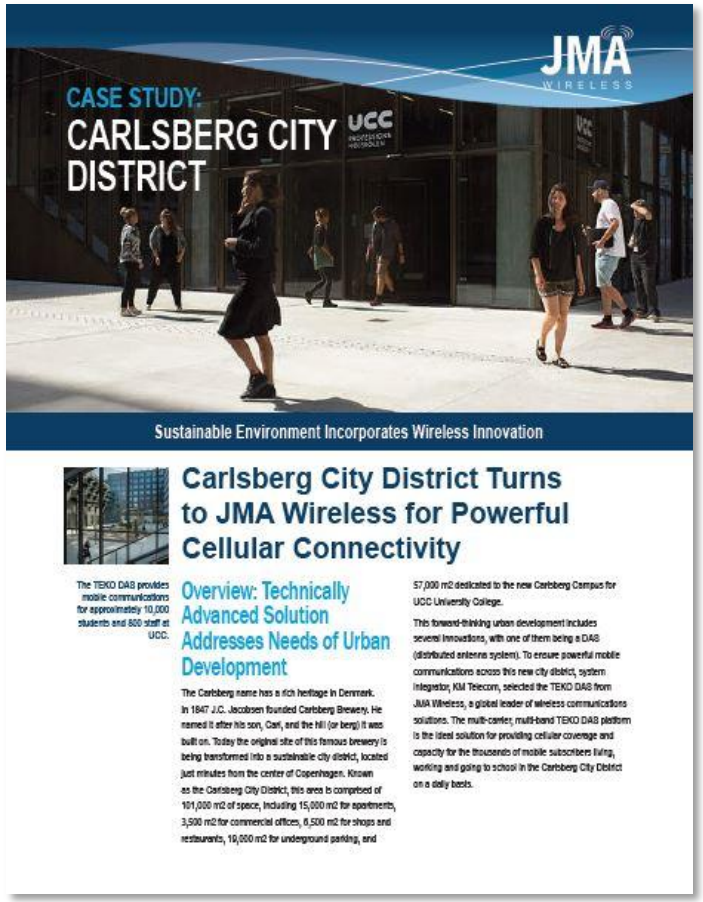
Connected Infrastructure

Object Tracking

More reading at jmawireless.com







Come and talk with us!