



# Airport 4.0: How private 5G is a key enabler

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Punta Cana, April 29th, 2022



# Airport 4.0: How private 5G is a key enabler

Connectivity is no longer a commodity but a strategic asset

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# 2021 was a transformational year for Nokia

Net sales

€22.2bn

2020: €21.9bn

Gross margin  
(comparable)

40.4%

2020: 38.9%

Operating margin  
(comparable)

12.5%

2020: 9.5%

EPS, diluted  
(comparable)

€0.37

2020: €0.25

Net cash and current  
financial investments

€4.6bn

2020: €2.5bn

Total cash and current  
financial investments

€9.3bn

2020: €8.1bn

# We are investing across the globe



~130

Countries

~€130bn

R&D investment  
(since 2000)

17

Innovation centers



# 150+ years of successful reinvention

From  
mobile phones



to  
telecommunications  
networking



to  
industrial wireless, machine-  
learning and software



# 2200+ customers trust our innovation and performance for their mission critical networks

2200+  
Customers

250+

Transportation and  
Logistics

400+

Energy

200+

Manufacturing and  
Large Enterprise

500+

Government  
and Cities



# Airport maturity

## The journey towards airport 4.0

### AIRPORT 1.0



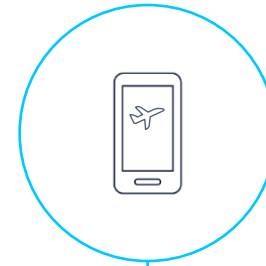
Operations mostly analogue and manual  
Long response times towards passengers and operations

### AIRPORT 2.0



First implementation of self service  
Optimizing flow processing tasks  
Focus on passenger experience

### AIRPORT 3.0



First initiatives on digitalization  
Further optimizing flow processing  
Increased business culture  
Enhancing passenger experience

### AIRPORT 4.0



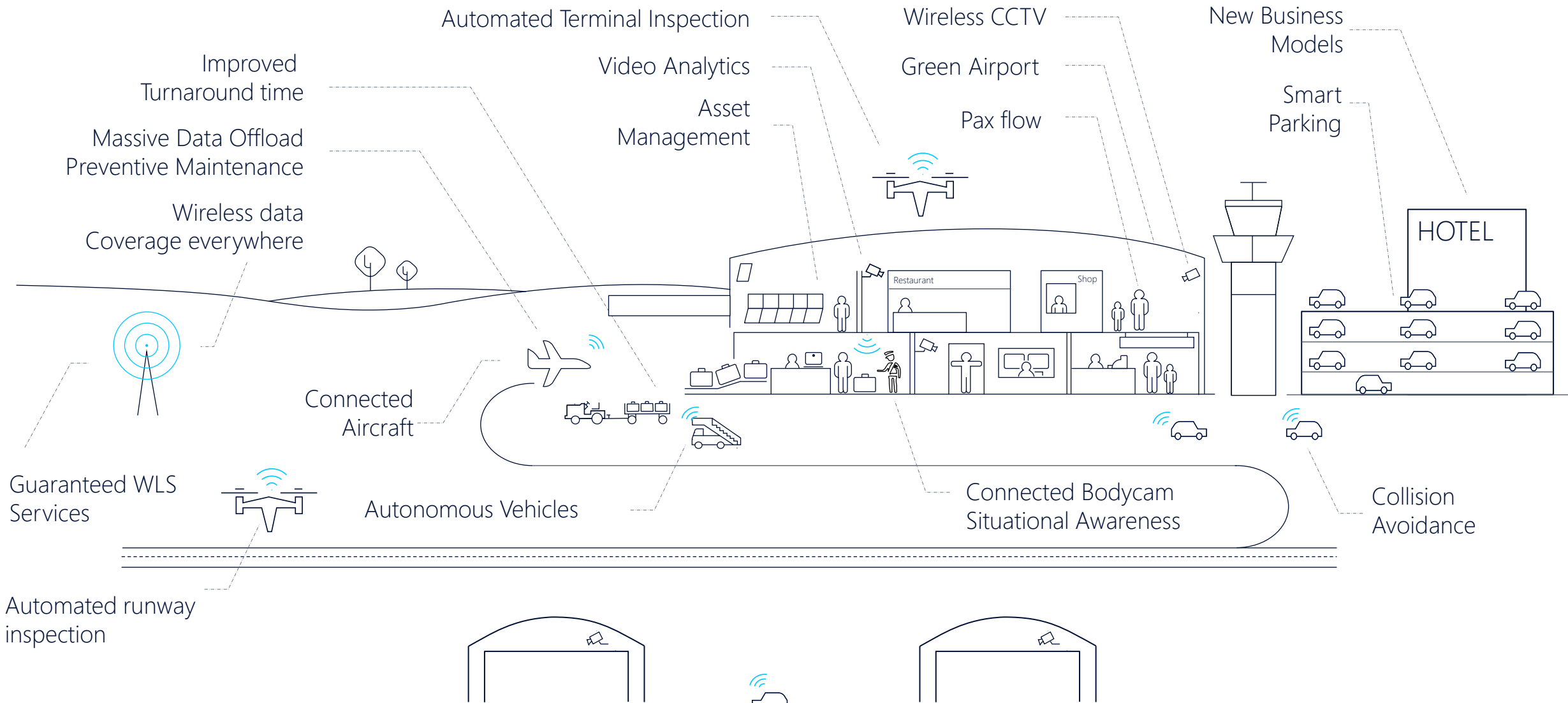
Full process digitalization with all stakeholders  
Operational excellence  
Excellent Passenger Experience  
Further emphasis on monetization  
Strong green culture

THE IMPORTANCE OF CONNECTIVITY GROWS

CONNECTIVITY IS A STRATEGIC AIRPORT 4.0 PRODUCTION ASSET  
CONNECTIVITY BECOMES AS IMPORTANT AS YOUR RUNWAY



# Airport 4.0: The value of data and real time interaction





# 1<sup>st</sup> Step of industry 4.0

Digitalization by connecting  
all assets

74% of today's data  
not yet collected!

# Wireless strategy for Airport 4.0

## Building the airport wireless foundation

### Fragmentation of existing systems

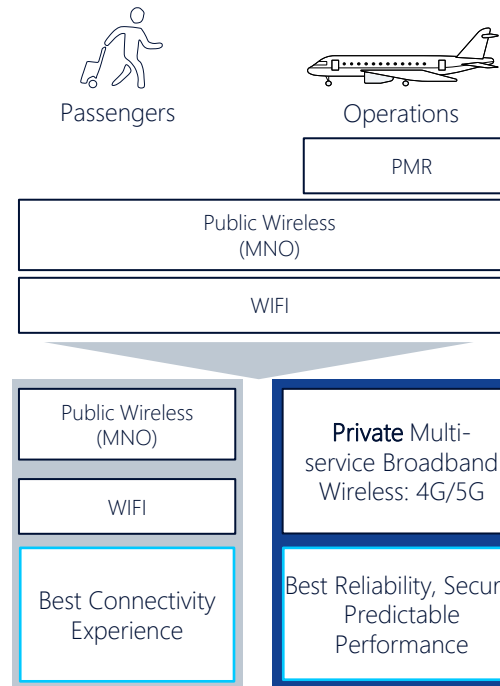
- Multiple networks and systems = high TCO
- Multi-devices for operations = inconvenient and unsafe
- Multi-silo's for operations = less efficient decision making

| Voice                   | Data          | Voice / Data  | Localization | M2M                 | ... |
|-------------------------|---------------|---------------|--------------|---------------------|-----|
| Private PMR (TETRA/P25) | Private Wi-Fi | Public 3G/LTE | Private LPWA | Private Proprietary | ... |

| Voice          | Data | Voice / Data | Localization | M2M | ... |
|----------------|------|--------------|--------------|-----|-----|
| Private LTE/5G |      |              |              |     |     |

Converged wireless infrastructure

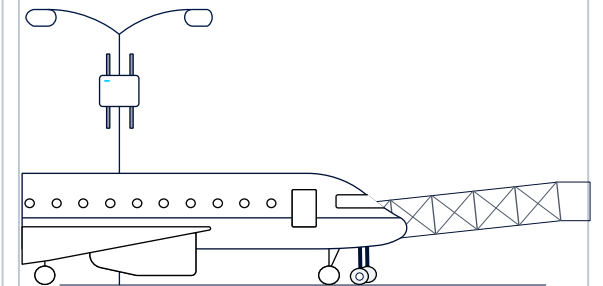
### Shared, unreliable connectivity



PAX: Enhanced experience  
OPS: Best reliable solution

### High network expansion and maintenance cost

- Wi-Fi with low output power requires many cells at airside with unpredictable performance = high TCO
- Public Wireless was never build for airport operations = unreliable performance



Fewer cell sites  
(factor 5-10x)

# Private wireless technology – 4G/LTE and 5G – ...

## ...provides required reliability, availability, security and performance

### Business driven communication with WiFi

Day2day business and office communication for non-business-critical applications

**Coverage:** 50-100m AP radius

**Capacity:** ~30-100 connections/AP

**QoS:** best effort, lack of prioritization

**Performance:** high peak rates

**Mobility:** 15s connect. loss @ roaming

**Latency:** 1ms-2sec, fluctuating

**Security:** Key/password-based

### Business critical communication with 4G/LTE

Reliable, secure communication for operational & business-critical applications

**Coverage:** 50m-30km AP radius

**Capacity:** up to 800 connections/AP

**QoS:** managed, with prioritization

**Performance:** predictable, 3-4x "9's"

**Mobility:** up to 350 km/h

**Latency:** 8-20ms, stable

**Security:** APN/SIM authentication

### Industrial-grade communication with 5G

Industrial-grade communication for mission-critical applications with safety features

**Coverage:** 50m-30km AP radius

**Capacity:** up to 1M devices/AP

**QoS:** managed, prioritized, NW slicing

**Performance:** predictable, 4-5x "9's"

**Mobility:** up to 350 km/h

**Latency:** 1-5ms, stable

**Security:** APN/SIM authentication

**Increasing levels of guaranteed reliability, availability, security and performance**



# Airport use cases

## Enabling digitization of operations

### Stand Automation

- Below wing
- Scanning
- Push to Talk
- Push to Video
- Analytics

### Collision Avoidance

### Telemetry Offload

- ### Terminal side
- Security body cam
  - Kiosk
  - Biometric Scanner
  - Gate reader
  - WiFi AP
  - BLE GW's

- ### Remote sensor connectivity
- CCTV
  - Noise

### Asset Tracking

- ### PAX Bus
- Direction
  - PAX connectivity

- ### Follow me / Marshal car
- Real time runway view

- ### First Responders
- Push to Talk
  - Push To Video
  - Situational Awareness
  - Mobile Command Center connectivity

- ### Common use
- Enhanced situational awareness

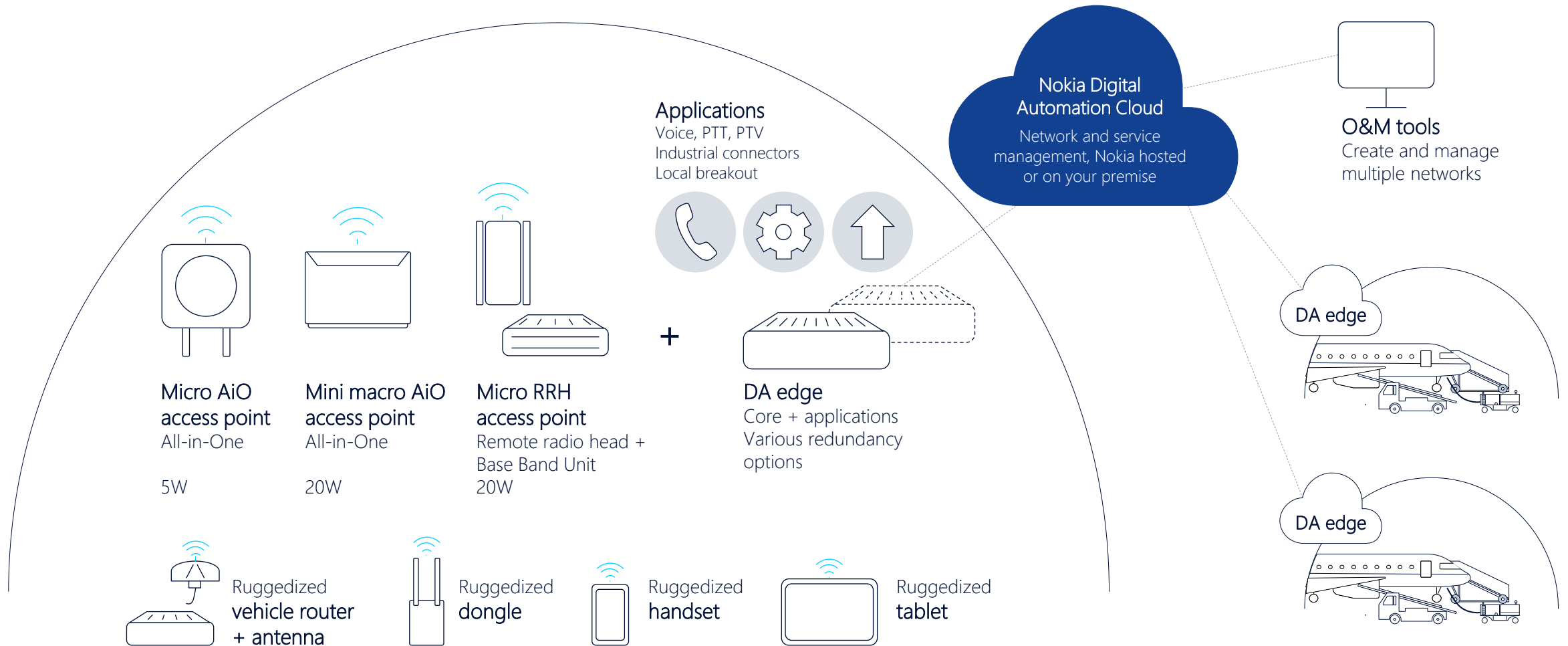
Multiservice Wireless Network

- Push to Talk
- Push to Video
- Data
- Video
- IoT
- Unified Communication
- Secure



# Nokia Digital Automation Cloud for airports

## Removing complexity

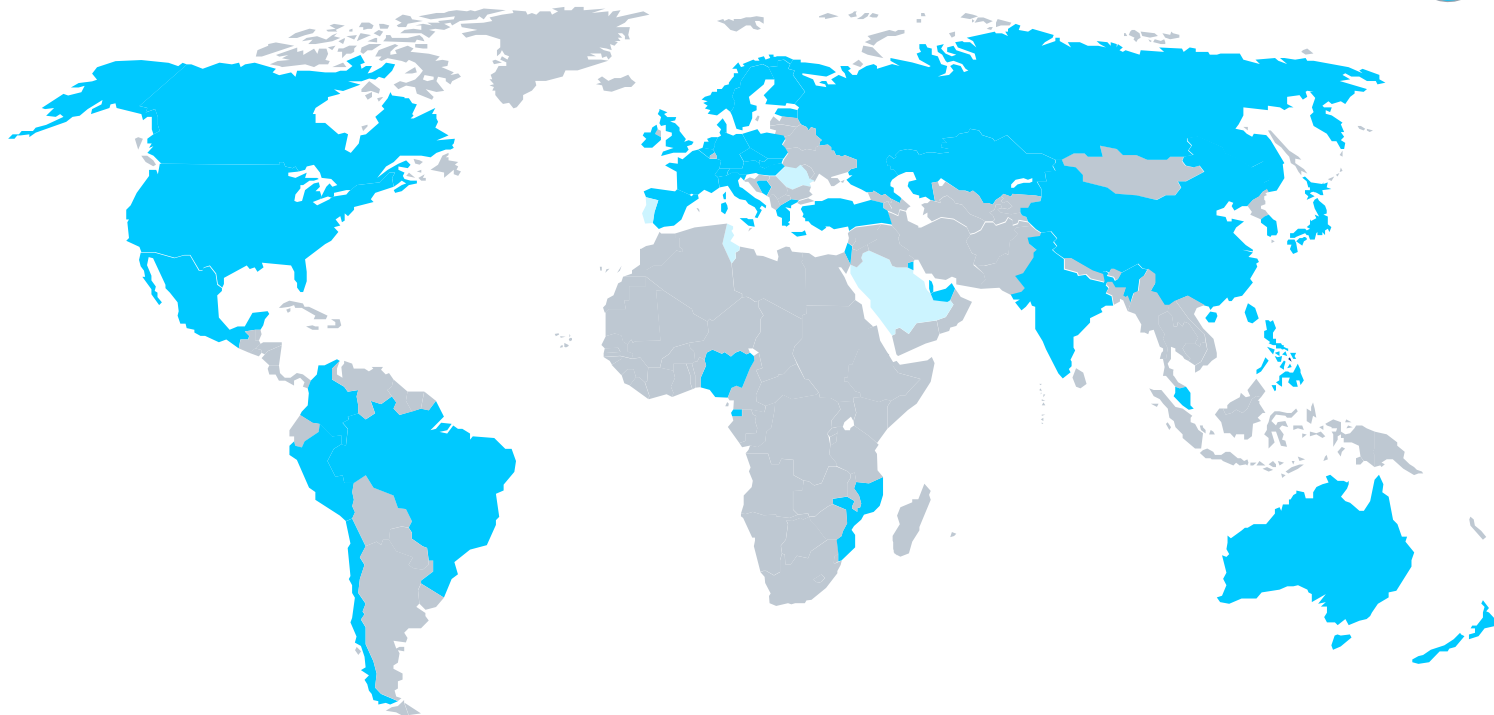






# 420+ private wireless customers (2021)

Uncontested market leader in private wireless\*



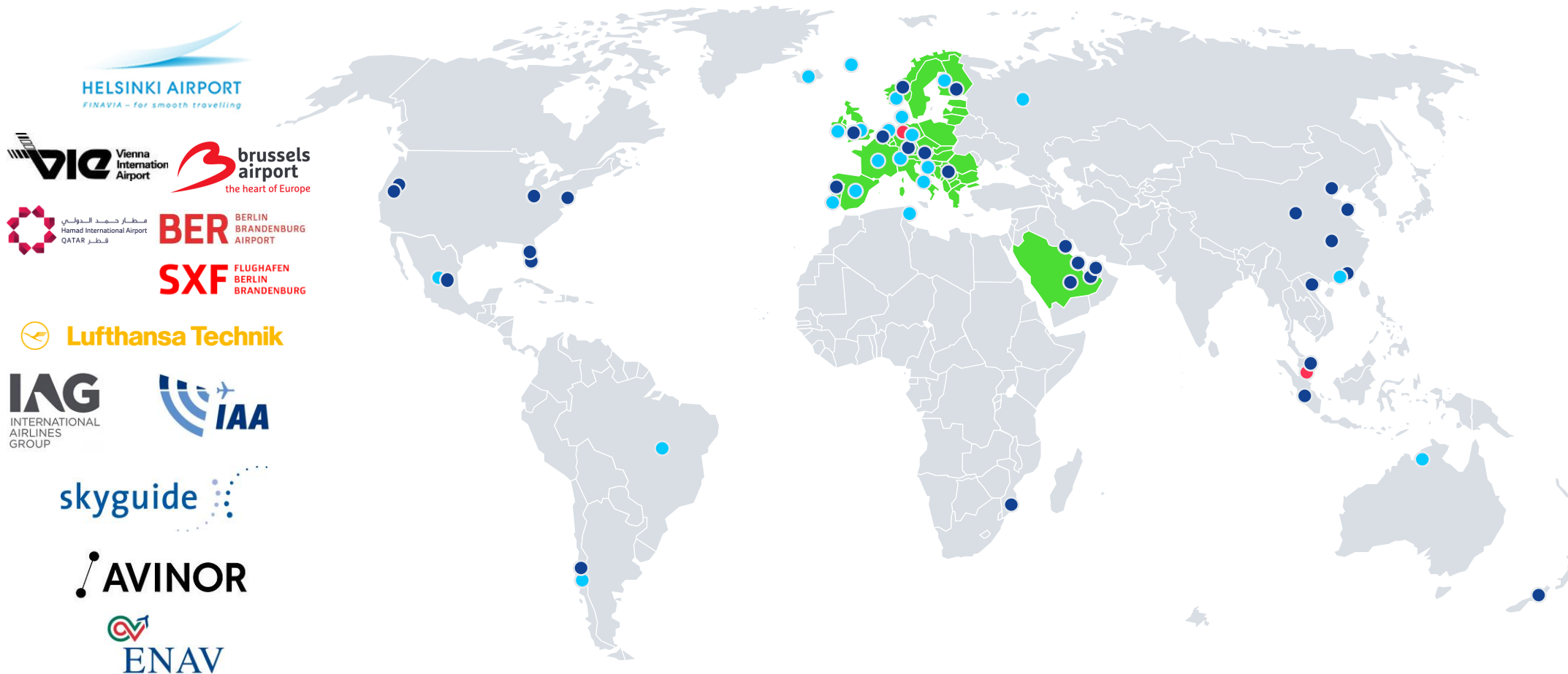
## Public references

Recent new logos



\*Supported by latest publicly released data from key analysts' firms

# Nokia in aviation



## MEMBERSHIPS



ANSP 

AIRPORT 

AIRLINE 

# Helsinki Airport

## Case study

Airport Operator: Finavia  
 Airport Size: 21M PAX annually  
 Deployment start: 4Q 2017  
 Technology: Private LTE  
 Spectrum: 2.6GHz TDD (B38)  
 Bandwidth: 20 MHz  
 Core: Georedundant, on site  
 Wireless Operator: Ukkoverkot  
 Public Link: [pre 5G Helsinki](#)



PTZ camera on first Responder car



Real time runway Activity follow me car



pLTE Antenna Follow me car



### Use Case 1:

#### Follow me car / Marshall

*Need:* reliable connectivity for in-car real time runway activity update + incoming flights. MNO service was not reliable

*Solution:* private LTE over full airfield + vehicle routers

### Use Case 2:

#### Increased Situational Awareness

*Need:* reliable connectivity to support enhanced visual awareness outside CCTV perimeter, specifically for airport incidents.

*Solution:* private LTE for full airfield + remotely controlled PTZ cameras (1080p, 30x opt. zoom), VMS and vehicle routers.

### Use Case 3:

#### De-Icing

*Need:* reliable connectivity supporting de-icing process

*Solution:* Finavia offered reliable pLTE connectivity to de-icing company

### Use Case 4:

#### Critical Communication – voice

*Need:* reliable connectivity for critical voice communication. Current TETRA provider service is not reliable

*Solution:* private LTE supporting group com: PTT, PTV and redundant core



# Vienna Airport

## Case study

Airport Operator: Flughafen Wien AG  
Airport size: 27M PAX annually  
Deployment start: 1Q 2018  
Technology: Private LTE  
Spectrum: 2.6GHz FDD (B7)  
Bandwidth: 20 MHz, sliced  
Core: Geo-redundant, on site  
Wireless Operator: A1  
Public Link: [pre-5G Vienna](#)

Antenna installation on rooftop



Radio installation on poles



Small cell radio placement at apron: 1 per 2 gates



### Use Case 1: Operational Continuity

*Need:* Below wing process suffered from unreliable WiFi performance as well as cellular best effort capacity issues

*Solution:* Dedicated gate capacity and coverage using private LTE network  
Private LTE network slice with priority combined with best effort LTE service

*Status:* (Almost) Commercialized

### Use Case 2: Improve Passenger Experience

*Need:* Vienna airport targets to provide the passenger with the best digital experience. Existing WiFi and MNO Cellular services shared PAX and OPS services not fully benefiting the passengers.

*Solution:* Dedicated private wireless network for operations, offloading WiFi and Cellular from these services and full dedicate WiFi and best effort Cellular to PAX. Additional benefit to have small cells next to airplane for PAX to enjoy excellent cabin connectivity while parked.

*Status:* (partially) Commercialized

\* Local Break Out

# Brussels Airport

## Case study



Airport Operator: Brussels airport company  
 Airport size: 26M PAX annually  
 Deployment start: 4Q 2019  
 Technology: Private LTE  
 Spectrum: 3.5GHz TDD (B42)  
 Bandwidth:  
 Core: Geo-redundant, on site  
 Wireless Operator: Citymesh  
 Public Link: [pre-5G Brussel](#)

Remote controlled Drone



Use Case 1:

### Follow me car / Marshall

*Need:* reliable connectivity for in-car real time runway activity update + incoming flights. MNO service was not reliable

*Solution:* private LTE over full airfield + vehicle routers

Use Case 2:

### Situational awareness - visuals

*Need:* APOC to receive visual insights into incidents

*Solution 1:* 30x optical PTZ camera, connected through private LTE to APOC. Camera installed on general purpose vehicle / fire fighter car.

*Solution 2:* Remotely controlled drone to improve safety for first responders, surveillance, wildlife

Use Case 3:

### Situational awareness – IoT

*Need:* APOC to receive environmental data as well as vehicle speed data

*Solution:* sensors connected through ruggedized mobile 4G router installed on a car

Use Case 4:

### COVID-19 Test Center

*Need:* Quick connectivity to new build COVID-19 test center

*Solution:* "Cut the wire" private Wireless provide quick access to remote locations such as a test center

Use Case 5:

### Critical voice/video communication – PTT, PTV

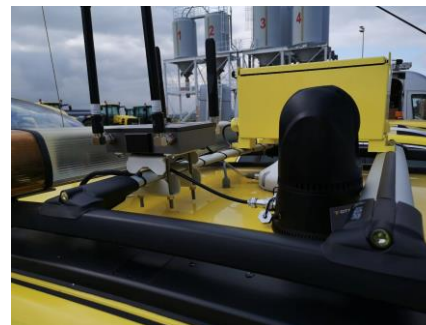
*Need:* reliable voice communications enhanced with video com's

*Solution:* group communications (voice and video) over a private LTE network for a selected group of users

COVID-19 Test Center



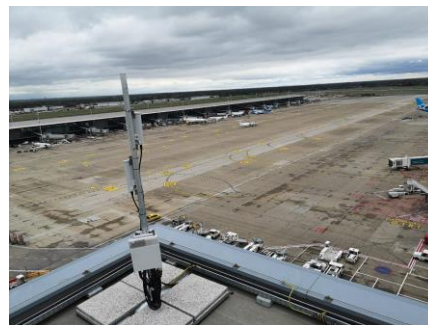
CPE + 30x PTZ camera on Marshall car



APOC view



Radio & antenna installation on rooftop



\* Local Break Out



# Executive summary

- LTE/5G technology lets you benefit from technical advantages over other wireless solutions. A standalone, fully private solution is technically superior, but it requires dedicated spectrum
- Nokia DAC combines the benefits of a standalone, fully private LTE/5G solution with easiness in operations (IT centric) in a first of its kind plug and play solution for private LTE networks
- Any Nokia solution implemented today could evolve to a more compelling implementation alternative in the future paving the way to 5G operational use cases
- Nokia can provide an end-to-end private LTE or 5G solution, including user equipment and application to build out use cases
- Nokia has a global track record of references and partnerships with leading players of aviation industry





**NOKIA**

# Thanks!

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