

A Case Study for Private Wireless: Connectivity at DFW Airport



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Presentation Overview

- I. DFW @ a Glance
- II. Architecting Proof of Concepts
- III. What We Learned
- IV. Transforming the Airport with Private Wireless

DFW Airport – At a Glance



#10 in the world for passengers

#3 in the world for operations

AIRPORTS COUNCIL INTERNATIONAL



FIRST
Carbon Neutral
Airport in North America, largest in the world

DFW COVERS MORE THAN

26.9
SQ. MILES



Larger than Manhattan

47 INTERNATIONAL DESTINATIONS

177 DOMESTIC DESTINATIONS

7 TOTAL RUNWAYS



Owner Cities
of Dallas & Fort Worth



+ 3 Interconnected Cities

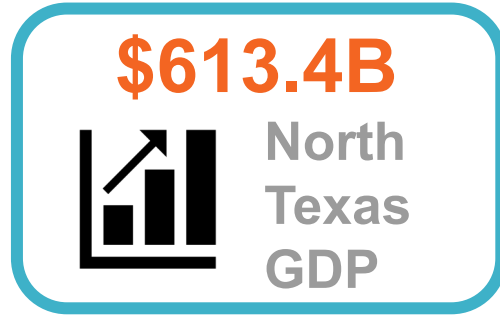


APPROXIMATELY
2,000

DFW AIRPORT BOARD EMPLOYEES

ON-AIRPORT EMPLOYEES APPROXIMATELY
60,000

North Texas – Primed for Growth



DAILY NEWS

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10.10.2021

MP 7674177203

Amazon Has Invested \$15B in North Texas—
And a Total of \$29B Across the State—since 2010

Mark Cuban Cost Plus Drug Co. Opens Deep Ellum
Facility - 22,000-square-foot facility is expected to produce
low-cost generic versions of traditionally overpriced drugs

Dallas-Fort Worth companies' bold deal making
creates business frenetic start to 2022

Our Focus is on Travel Transformed



So how do we get there?



To build for the future... We need connectivity

Landside Infrastructure Master Plan



Traffic and Roadway Improvements



Predictive Traffic Modeling



Electric, Autonomous Mobility



Aircraft Ramp & Landside Improvements



Exterior Improvements



Architecting Proof of Concepts: Design, Test, Learn

Out with the Old to Envision the New

The telecom industry transformation; Move from proprietary hardware and utility deployments to full-service technology solution companies. The new model is “as a service” with flexible architectures and hybrid solutions.



Airport Challenges Create Future Opportunities



Efficient mobility
& automation



Safety & security



Frictionless
passenger
journey



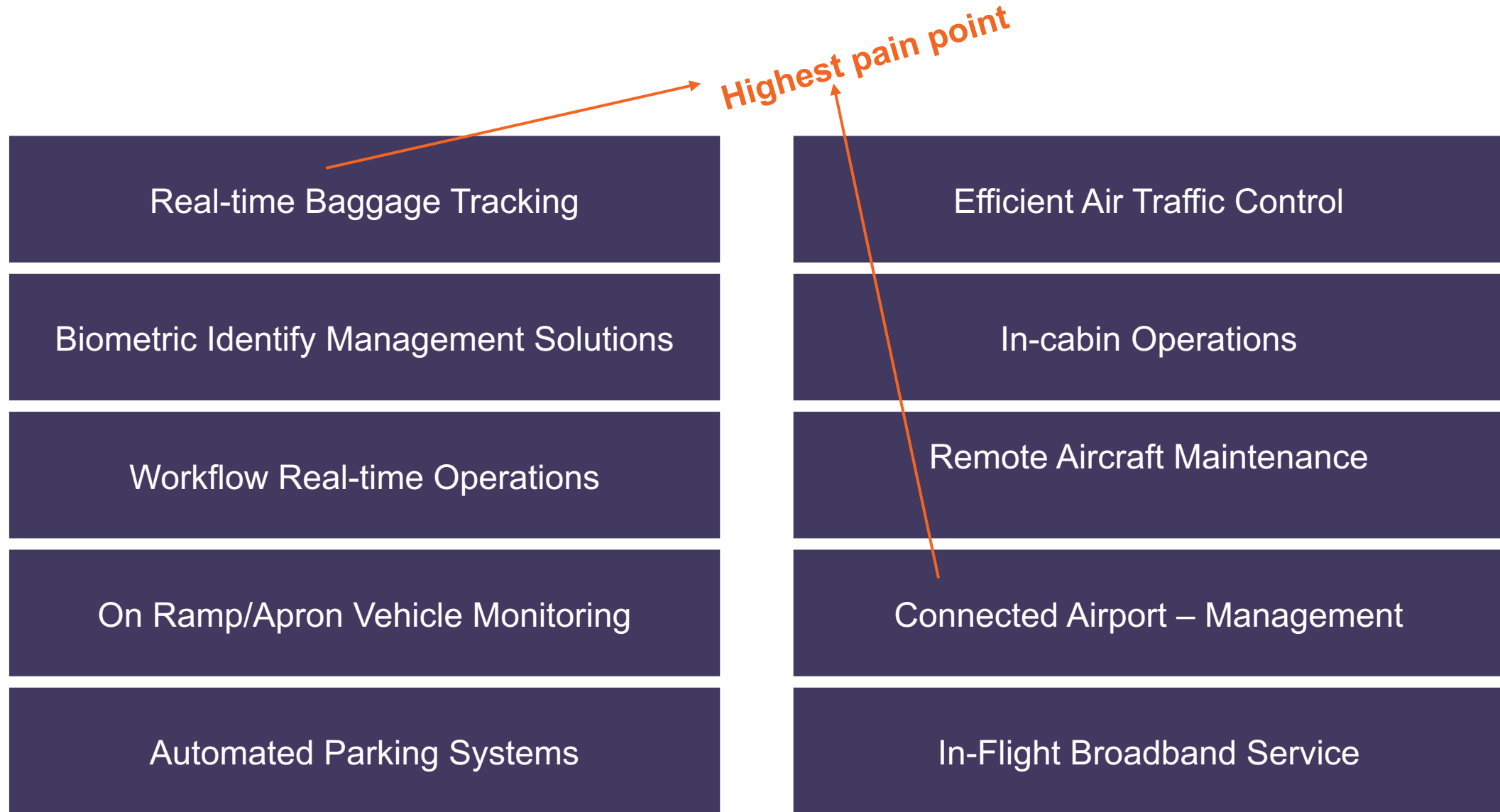
Data-driven
decision making



Connected
Journey

- Deploying needed applications and solutions requires more connectivity
- Passengers compete with stakeholders for Wi-Fi bandwidth
- Interoperable systems create inefficiency and security concerns
- Where is data?

Use Cases Address Passenger and Airport Needs



What if?

We solve for the lack of connectivity on the ramp by offering a dedicated network to capture data real time and solve for network handoff?



Could Private Wireless be a Solution for our Airport?

Dedicated networks will provide bandwidth and reliability, alleviating excess load on Public Wi-Fi.

Let's try...

- ✓ Ubiquitous connectivity to support the next generation of intelligent applications and services
- ✓ Deploy a convergence of multiple technologies: Private-LTE, Wi-Fi, CBRS, IoT, LoRaWAN, LPWAN, Bluetooth, 5G NRU
- ✓ Solidify an ecosystem partnership model for competitiveness and autonomy

No single wireless solution can solve all the airport's challenges. Proof-of-Concept tests technology in *our* environment.



Our Strategy

What we did...

- ✓ Two POCs with two different vendors for two different use cases
- ✓ Design and test a private wireless CBRS enabled network
- ✓ Identified a network management services business model with opportunities for solution integration, control, and revenue
- ✓ Identified gaps in solution deployment that need to be addressed in a full scale deployment

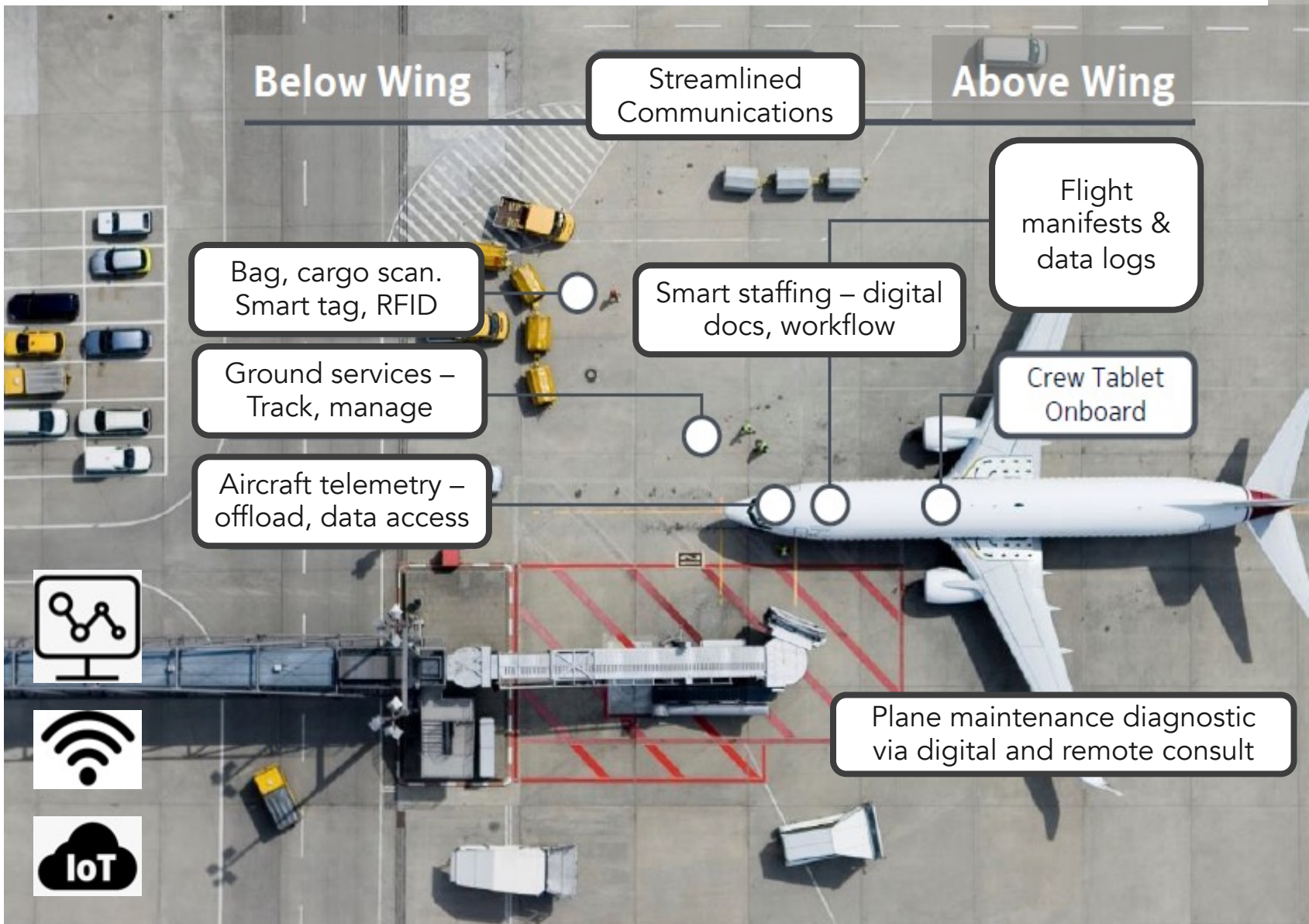
Vendor solutions should solve for:

- Network hand-off from indoor to outdoor, outdoor to indoor
- Ability to test a *secure* CBRS network with *dedicated* bandwidth and reliable connectivity for our stakeholders (separate from our Public Wi-Fi)
- Create a network design that shows the convergence of technologies that will be sustainable and scalable as our business needs change



The Connected Smart Ramp

Embedding connectivity into the ramp for reliability and productivity



Offer a network that hosts business applications around a smart, connected ramp, streamlining operations and improving productivity.

Why?

The ramp embodies the journey of all people and things. The opportunity is to improve productivity, digitalize workflow and processes, and connect things to provide insights and data.

Solve for:

- Network handoff performance from indoor to outdoor, outdoor to indoor
- Reduce time to turn planes around
- Track equipment and assets for availability
- Connected devices for data sharing between parties

Timeline: 3 months

The Connected Cargo Environment

Creating intelligent supply chains for all stakeholders

Communications:
Site management, tasks,
workflows, staffing

IoT: Connected
devices, data,
sharing, reporting

Flight
manifests &
data logs -
Blockchain

Plane maintenance diagnostic
via digital and remote consult

Location services:
RFID, GPS, BLE
(Bluetooth)

Cargo scanning: Tag,
track, time stamp

Smart vehicles,
autonomous tugs



Offer “Cargo as a Service” that supports all aspects of the supply chain through reliable connectivity and data services.

Why?

With the pandemic, more consumers are demanding goods “now” through robust e-commerce platforms. Supply chain ecosystems are being challenged in terms of resources, volume of goods in transit and how to share data that tracks and manages that journey.

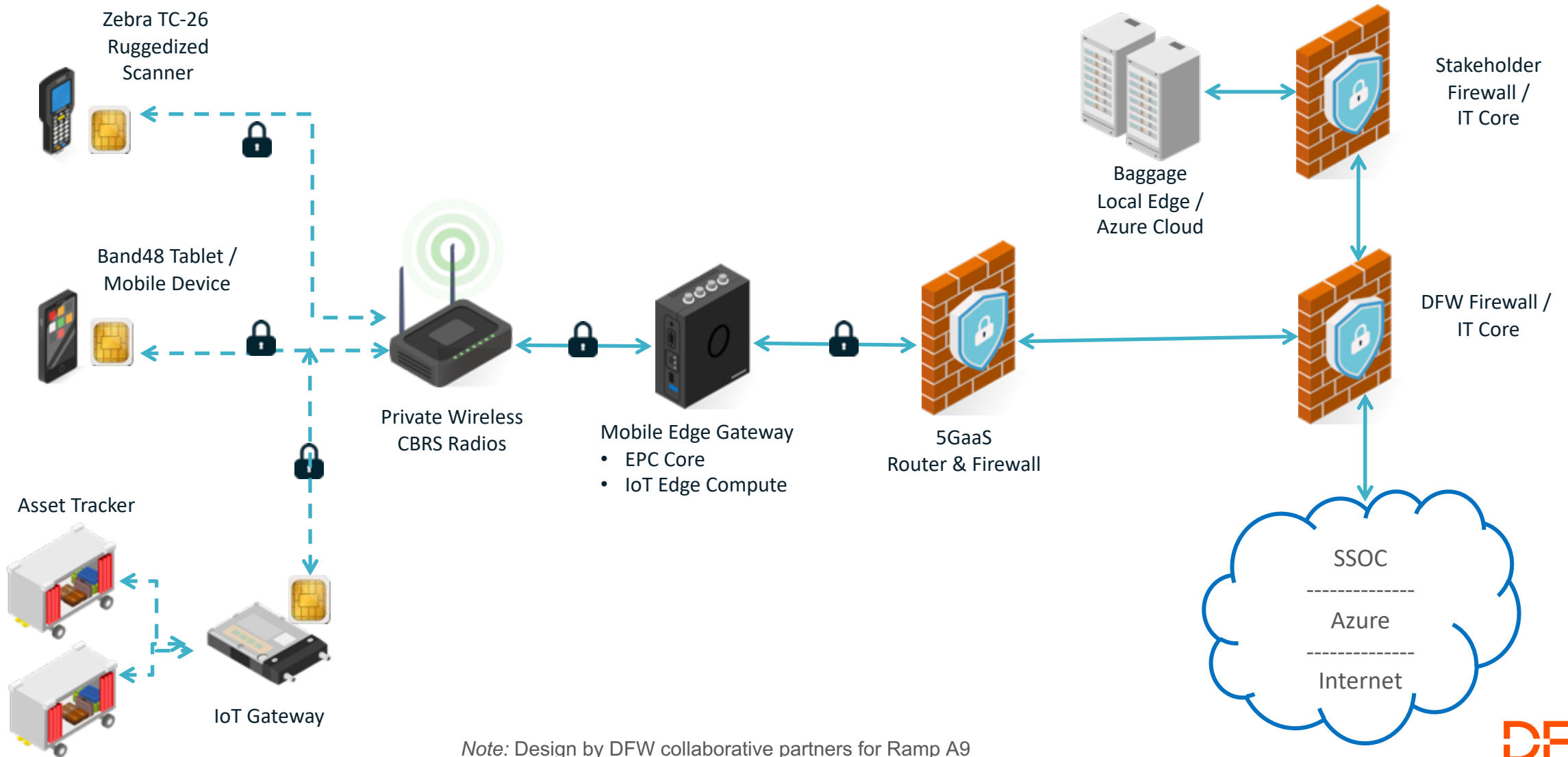
Solve for:

- Network handoff performance from indoor to outdoor, outdoor to indoor
- Visibility into % of lost, damaged cargo
- Track equipment and assets to manage journey and time
- Reliance on public Wi-Fi during cargo journey

Timeline: 3 months

Architecture for CBRS Network: Bag Handling on Ramp

Design focused on coverage for ramp, testing of CBRS network and network reliability.



Note: Design by DFW collaborative partners for Ramp A9

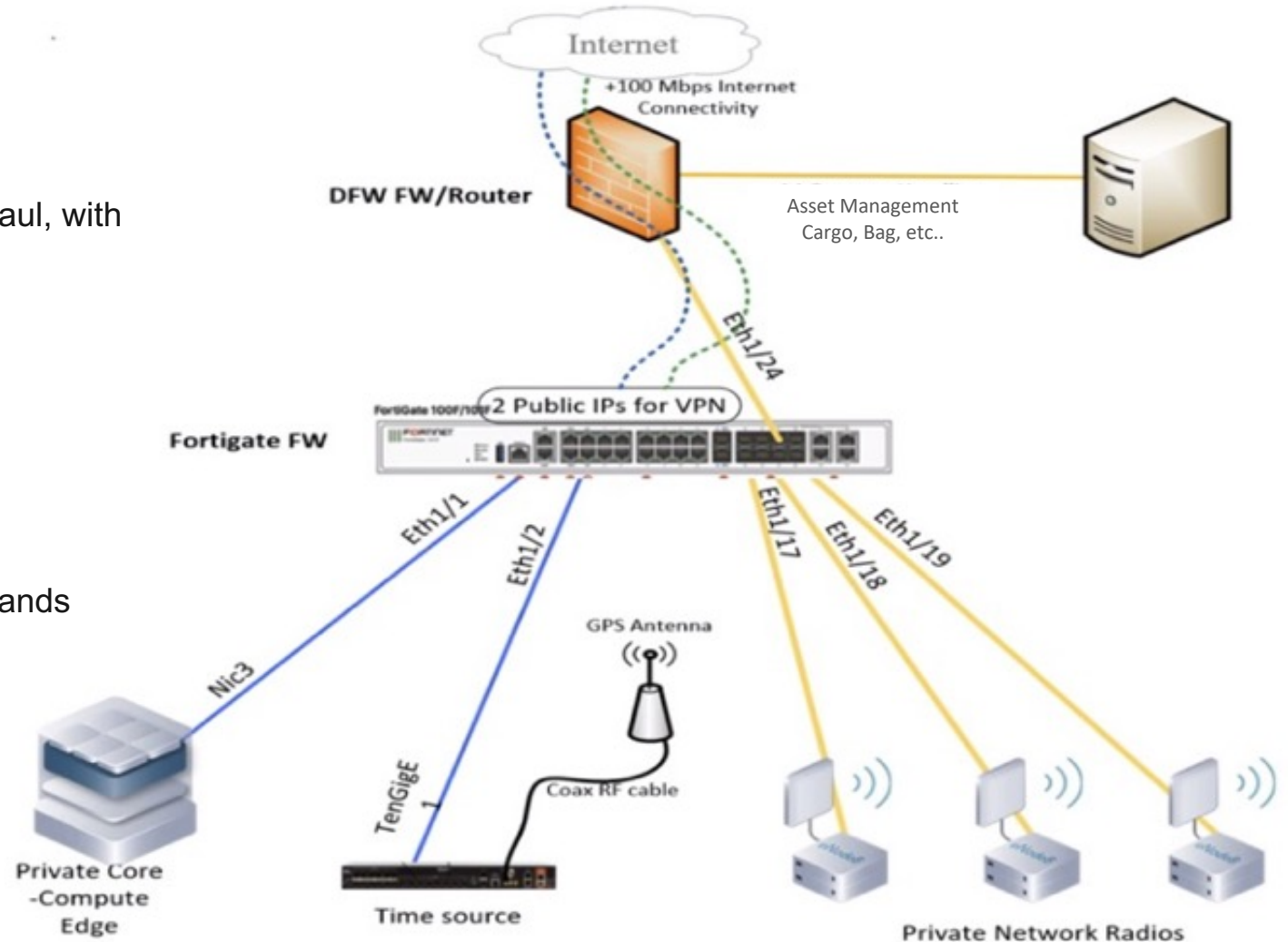
Private LTE Network Architecture for Asset Tracking

Selected as best option for network deployment:

- Network topology requires fiber and coax RF cable backhaul, with utilization of rooftop GPS antennas.
- Core on site
- Microsoft Azure and edge computing solutions

Hardware and connectivity requirements:

- ✓ Private core onsite
- ✓ Utilize 2 public IPs to support VPN (simplicity)
- ✓ 1 or 2 radios with multi-tenant, Band 48 and mid-bands
- ✓ Connectivity for desired coverage area
- ✓ CBRS enabled devices





What We Learned

It Takes a Village

Private wireless alleviated congestion, allowed for technology integration, and improved operational productivity on the ramp.

Key Take-Aways:

- ❑ Multiple ecosystem players needed
- ❑ Band 48 met performance expectations
- ❑ Devices need to have multi-SIM, CBRS enablement
- ❑ Dedicated network eliminated traffic congestion on network – Wi-Fi from Terminal hand-off

POC Network Performance:

Availability: 100%

Devices: 3

Latency: 0.003%

Scan tests: 4

Indoor Node: Bag Belt

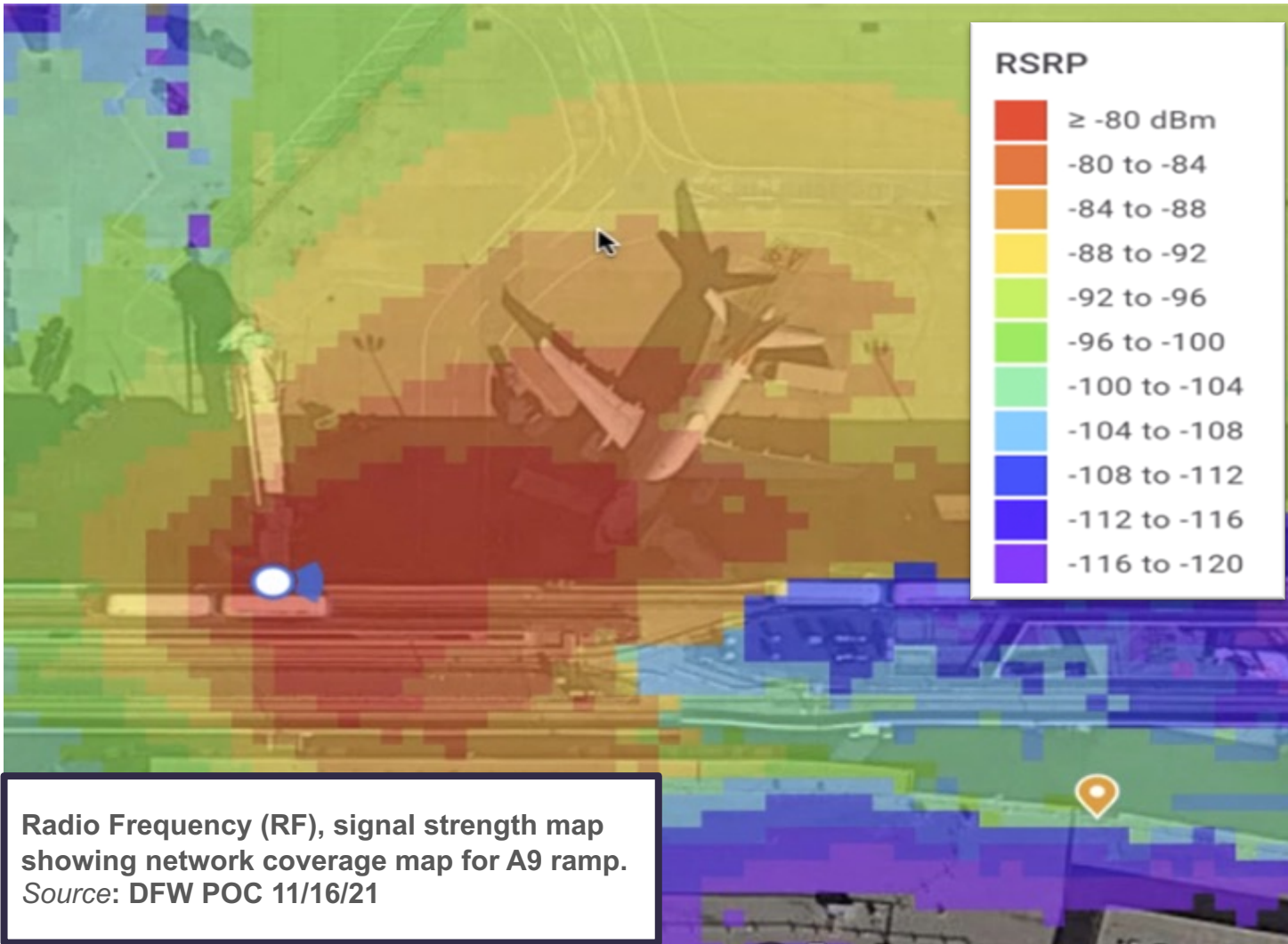
- Average upload speed: 25.5 Mbps
- Average download speed: 28.7 Mbps

Outdoor Node: Ramp

- Average upload speed: 20.2 Mbps
- Average download speed: 26.7 Mbps



Connectivity Coverage Map – Deployment Site on Ramp

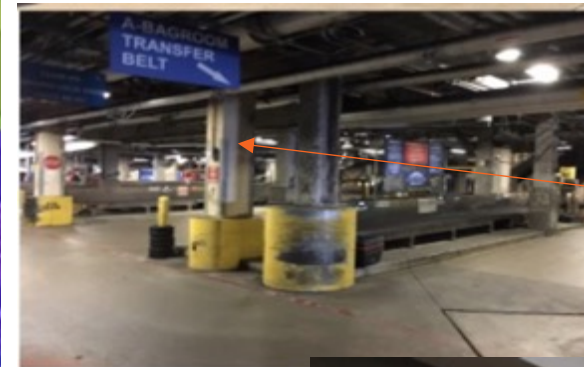


RSRP: Reference Signal Received Power

Signal performance and strength target is -80 dBm whereas -100 dBm is minimal signal.

4G LTE signal to be greater than -58 dBm.

Meets POC KPI for reliable coverage via a CBRS, PLTE



Radio deployment sites



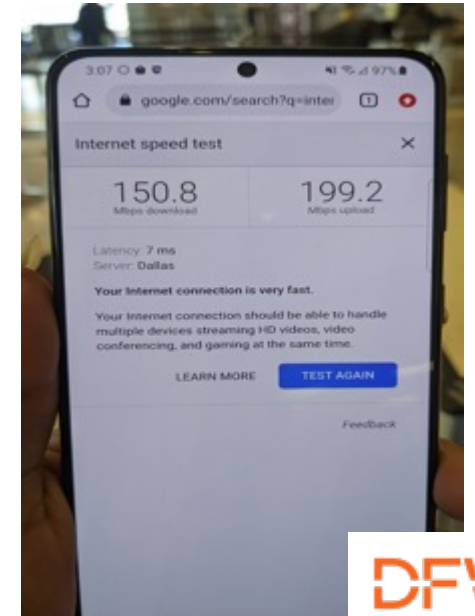
Achieved KPIs

POCs focused on coverage, connectivity, and real-time data collection

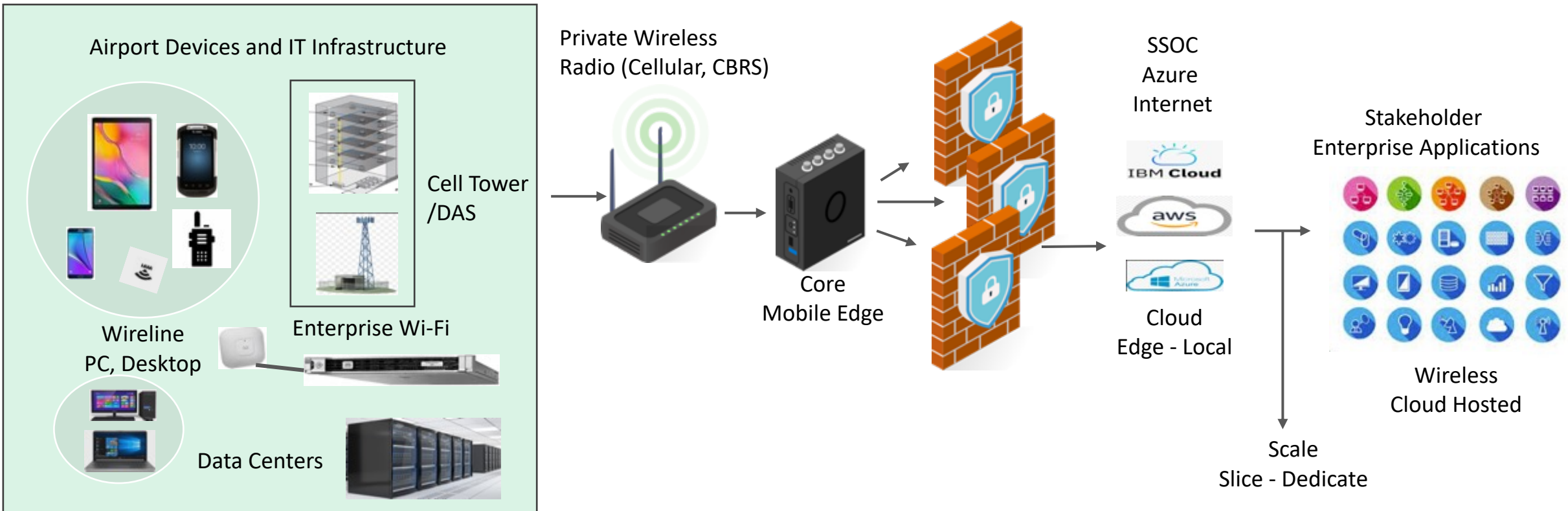
- 1) Network reliability: Is there connectivity during peak traffic times, available everywhere, anytime?
 - ✓ Tested network on multiple days with high and low traffic.
- 2) Network hand-off from indoor to outdoor and vice versa
 - ✓ No connectivity drops or latency issues.
- 3) Test CBRS unlicensed spectrum as option for connectivity in a private LTE network offering
 - ✓ Issued network “slice” to DFW ramp and to airline and or device vendor. Data real-time transfer.
- 4) Ecosystem partner ability to support use case
 - ✓ Both vendors provided support for network up-time, technical support, device integration, dashboards

Key Performance Indicators (KPIs)

Data Journey and Network Performance



Architecture Meets Stakeholders' Needs



Build in the requirements for mobile connectivity and edge computing:

- Low Latency
- Eliminate or minimize dependency on Wi-Fi and back-up networks
- Prioritized access via a dedicated network

Focus on Business ROI

New business models that include the best solutions from our ecosystem partners, will enable enable a smart, intelligent, lean airport.

The model enables business applications to run on a dedicated, multi-band, reliable network leaving the airport Public Wi-Fi for passenger use.

Airports are deploying the next-generation in connectivity

- ✓ **Competitiveness**
 - Less cost to operate
 - Service offering tiered based on need
 - Reduce IoT costs: Per device, data packet, cloud services

- ✓ **Services provided meet current and future business needs**
 - Customization
 - Licensed, unlicensed spectrum
 - Flexible architectures for scale and as needed basis

- ✓ **Ownership model allows for control**
 - Faster deployments, less time to rollout
 - Integration of emerging technologies

- ✓ **Revenue sharing opportunities**
 - Network slicing (share model)
 - Bundled services
 - Network as a Service



Transforming Our Airport

The Future is Here - Are We Ready?





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