

Unleashing Innovation with 5G, Edge and AI

September 28, 2021

AGENDA

12:00 PM Welcome

12:05 PM Perspectives: 5G Edge and AI landscape
Chris Smith- VP Civilian & Shared Services, AT&T
Terry Halvorsen- GM US Federal Market, IBM
Nancy Greco- Distinguished Engineer, IBM Research

12:30 PM Panel Discussion

13:30 PM Q&A

13:45 PM Close



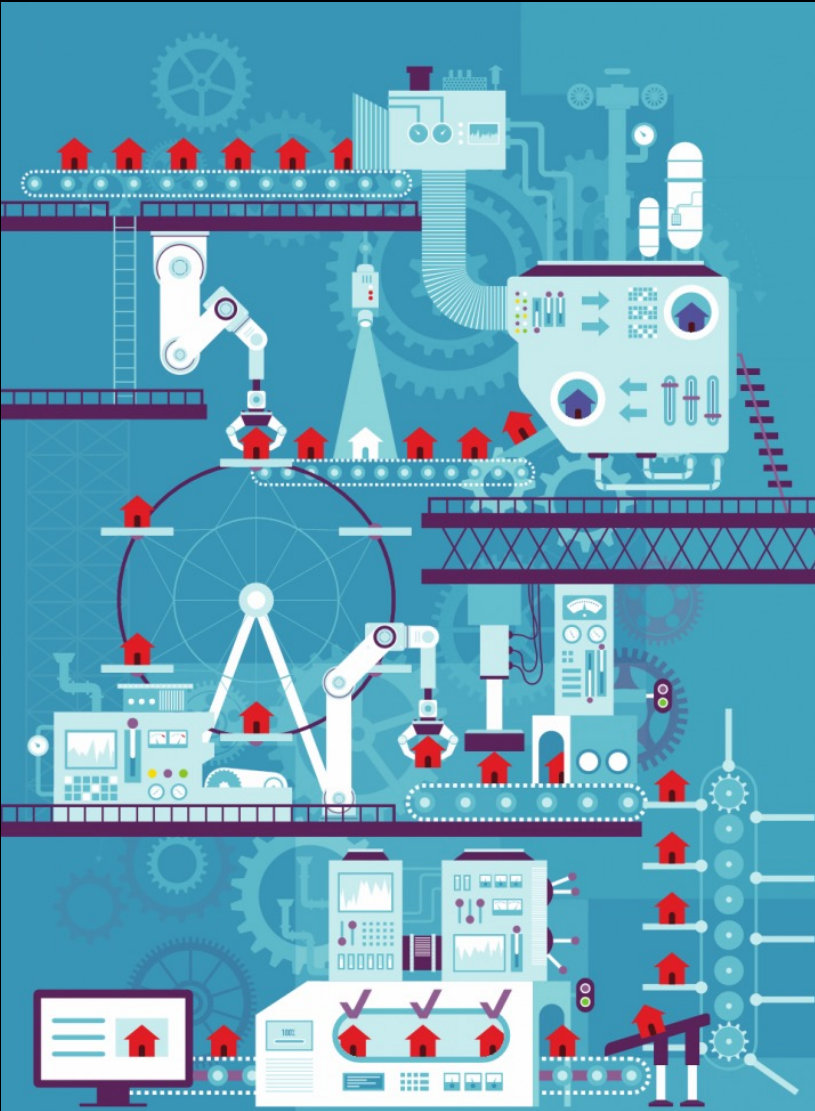
Winning with 5G and the Edge- AI Anywhere

Let's make smart easy



The Prediction from 2006: Industry 4.0 a revolution

utilizing IoT and other technology to enable automation, analytics and seamless interoperability driving productivity, new services and ecosystems



What has impacted the rapid adoption forecasts?

Cost

- Instrumentation
- Power and connectivity when scaling 10-1000 devices
- Cloud/ server costs to move, analyze and store all that data

Security Concerns

- more devices
- more interfaces
- more security risks

Connectivity

- network constraints
- latency requirements (msec)

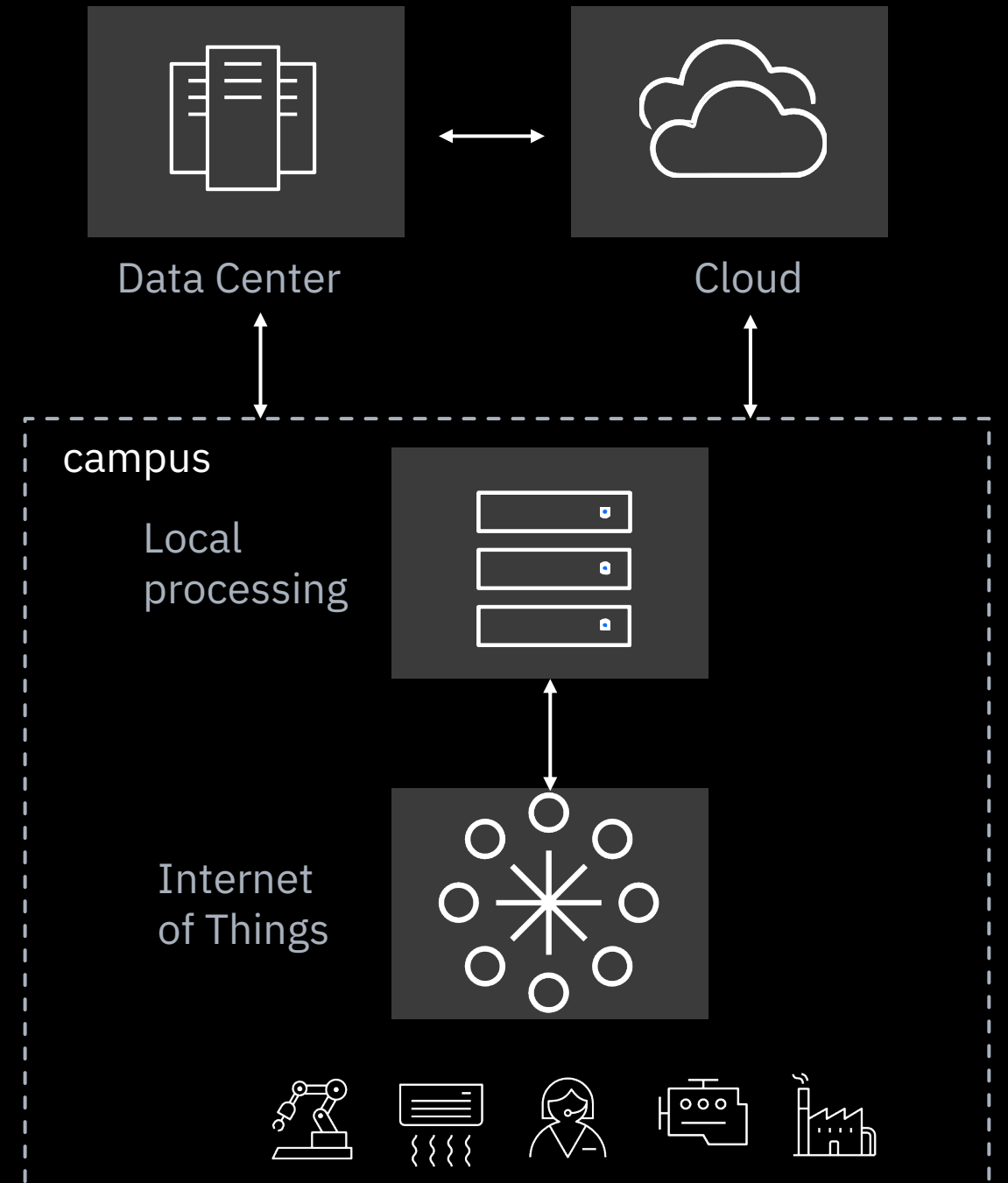
What has changed? Edge computing and 5G

WHAT IS EDGE COMPUTING?

Bring computing, application functions, storage, communications, and power closer to data sources and points of action

Coordination through direct communication with devices without necessity for data centralization

AI brings intelligence to the edge for immediacy of insights and responses



IBM RESEARCH CORE COMPONENTS FOR EDGE AI

To Address Data Challenges

Edge Data System

data loss/corruption due to data movement and privacy challenges

Core Sets

Send compressed snapshots to reduce cost and improve speed of data movement

Distributed Entity Registry

Entities and information at different locations need to be addressed uniquely; need to track context/location of data sources

Policy Generator

Data appearing at different locations has different quality and provenance

Policy Generator

Data needs to be self-managing without manual intervention across the diverse edge sites

Topic Modelling

Semantically characterize unstructured text into categorical topics using NLP

To Address AI Challenges

AI Model Selector

Choosing the best model in consideration of need at edge site

AI Model Adaptation

Cloud-trained models may require too much resource for edge site. Adapt one suitable for the site.

AI Model Fusion

Models created at different edges need to be combined

AI Model Fusion

Sites need to avoid moving or centralizing data because of some constraint. Training is still possible.

Federated Inference

Analytics processing at different edges need to be combined

Edge Performance

Performance of model at edge without ground truth is difficult

DELIVER VALUE

across industry
sectors

- **Cut Industry 4.0 program execution time by half**
- **Build use cases that are enterprise-ready**
- **Augment and Enhance OT investment;** No more rip and replace
- **Retain and Augment Knowledge;** Enhance operator skills

GBS Offering Management / © 2020 IBM Corporation

Automotive



Body Weld: COPQ ↓ 10%
Powertrain: WIP ↓ 5%
Assembly: Cycle time ↓ 2s



Electronics



PCB Assembly: Yield ↑ 5%



Cement



Milling: Energy ↓ 10%
Kiln: Energy cost ↓ 5%



Fiber



Extrusion: Yield ↑ 1%
(Each 1% improvement =
\$10M in Savings per plant)



Metals



Smelting: Availability ↑ 2%
Arc Furnace: Yield ↑ 3%



Beverage



Filling: Yield ↑ 2%
Mixing: Scrap ↓ 5%



5G BENEFIT

How 5G boosts smart factories, smart cities and smart citizens

Singapore, Samsung and IBM envision countrywide, enterprise-level 5G connectivity

By Matt A.V. Chaban | 4 minute read | September 15, 2020

Smart factories where edge computing and AI will drive economic growth, jobs and safety through myriad Industry 4.0 uses.

Smart streets where IoT sensors and vast data enable new forms of mobility, emergency services and environmental monitoring.

Smart commerce where supply chains, ports, offices and retail outlets are seamlessly connected, allowing the easy flow of goods and ideas.

Smart citizens who can work, play and connect from anywhere, including at home or out and about, boosting productivity and resiliency.



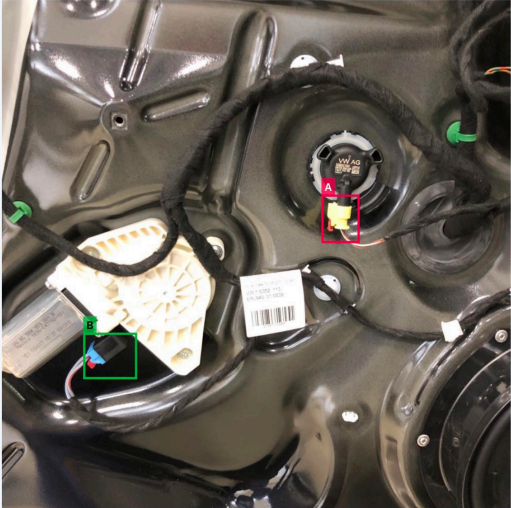
Enterprise-level 5G could transform numerous industries in Singapore.

<https://www.ibm.com/blogs/industries/enterprise-5g-smart-cities-singapore-samsung-ibm-partnership/>

IBM Visual Inspector

Real examples of time to build visual inspection models

Results



Confidence threshold

0.5

1

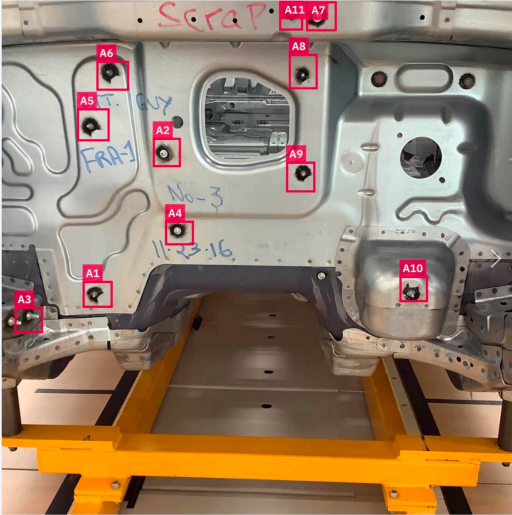
0.5

	OBJECTS	RESULT	AVERAGE
A	airbag unseated 1 objects	0.990	-
B	window unseated 1 objects	0.971	-

Door connectors

80 mins

Results



Confidence threshold

0.5

1

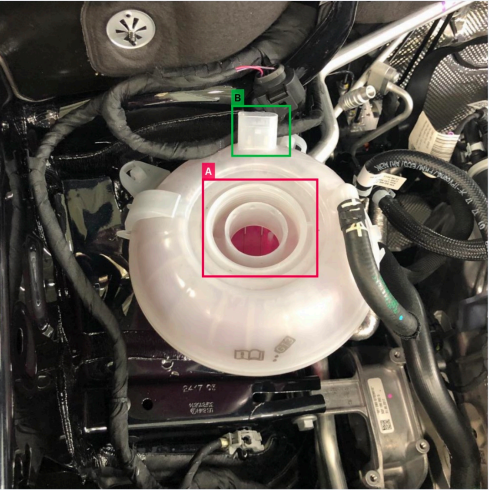
0.5

	OBJECTS	RESULT	AVERAGE
> A	good 11 objects	-	0.990

Stud welds

45 mins

Results



Confidence threshold

0.5

1


0.5

	OBJECTS	RESULT	AVERAGE
A	cap off 1 objects	0.999	-
B	connector off 1 objects	0.997	-

Under hood

60 mins

Results



Confidence threshold

0.5

1

0.5

	OBJECTS	RESULT	AVERAGE
> A	wrong_lugnut 2 objects	-	0.974

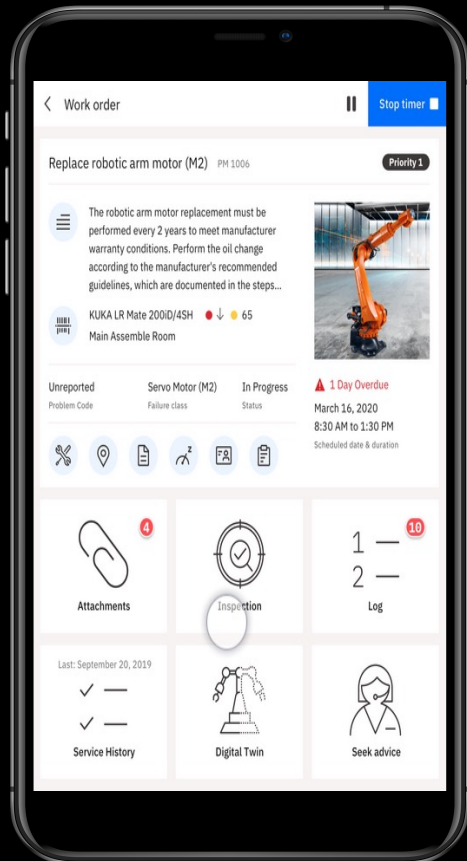
Wheel bolts

30 mins

Remote Expert Collaboration

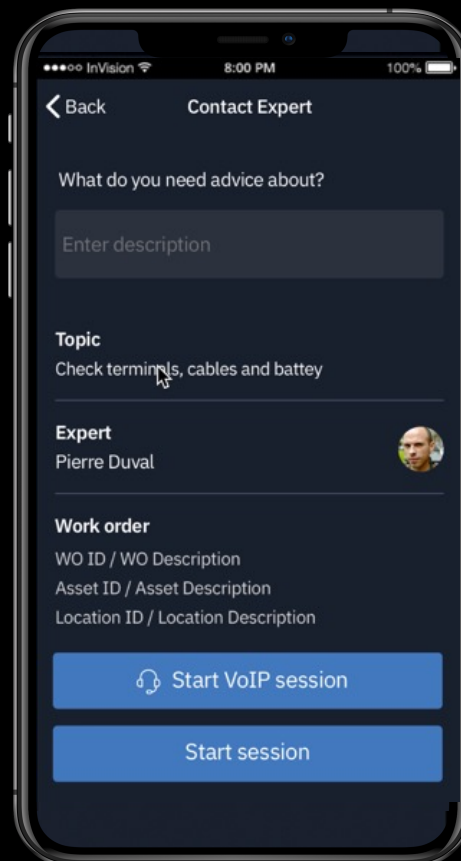
1. Seek Advice

Seek Advice and Contact Expert with Work Order Details in Context



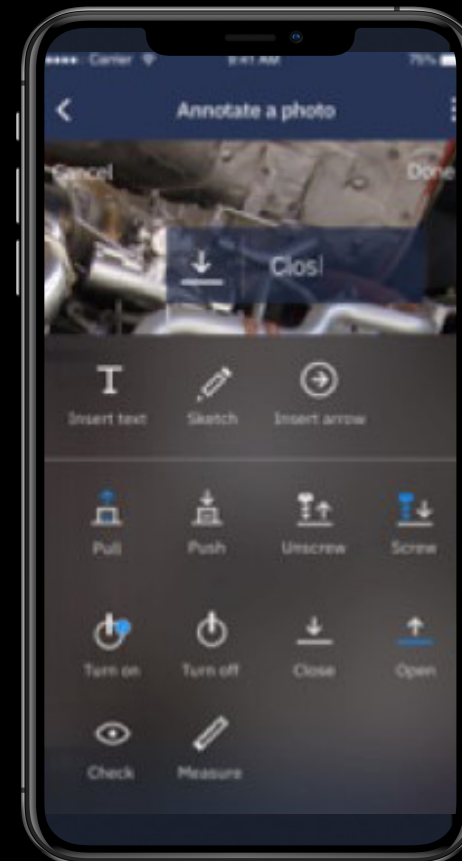
2. Collaborate

Collaborate with an expert based on areas of expertise



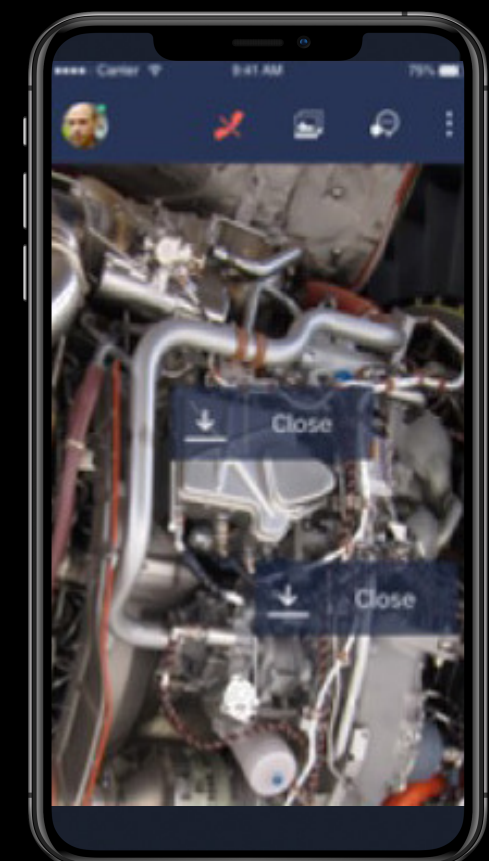
3. Guide

Annotate, diagnose and get guidance via Augmented Reality



4. Fix & Learn

Fix and Learn while saving sessions for reference and training



Robotics@Edge

Using IBM technology and services combined with the advanced mobile robots from Boston Dynamics, enterprises can achieve higher levels of safety, resilience and efficiency in real time.

Solution content includes:

- Maximo Application Suite
- Visual Inspection
- Acoustic Inspection
- Asset Performance Management for Edge
- IBM Edge Application Manager
- 5G Integration
- Weather integration
- Digital Twin
- Additional Research Assets
- IBM Cloud Data Management
- AI and Machine Learning
- SAP/Workday Integration
- AWS/Azure cloud option with RHOS



Equipment Maintenance

Improved Uptime/Cost Avoidance
O&M Cost Reduction
Security
Capital Savings
Improved Monitoring



Resiliency Challenges

Perform critical functions autonomously with inspection and manipulation of objects

Digitize facilities and identify changes



Safety

Biohazards
Gas leaks
High voltage
High/low temperature
Difficult terrain and weather

AT&T

Partnership

Industries & Settings:

- Healthcare
- Manufacturing
- Energy and Utilities
- Public Facilities
- Supply Chain
- Worker Safety

AT&T and IBM: Helping Businesses Adapt to New Work Environments



By Mo Katibeh and Steve Canepa

In coping with the coronavirus crisis, organizations around the world have been using digital technology to continue operating their businesses remotely while they wait for the world to return to normal—or at least to settle into the next normal.

From that crisis has come an opportunity: to accelerate the business world's digital transformation. That's why AT&T and IBM, building on our long-standing collaboration, are now focused on the use of 5G wireless networking and edge computing as key ways to help enterprises emerge smarter, more efficient and more resilient as they get fully back to business.

IBM, at its storied Thomas J. Watson Research Center, is deploying AT&T's 5G and multi-access edge computing (MEC)—a private cellular, low latency solution that can process data on a business site's premise, instead of routing traffic over public networks.



IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.

<https://newsroom.ibm.com/ATT-IBM-work-environments>

Edge Computing

- **Lowers cost : cloud, storage, compute and network by analyzing the data at the source.**
“ If everything is in spec- why send data out?”
- **Reduces Mean Time To Detect, a problem or defect. Minutes and now milliseconds matter.**
- **Reduces Mean Time to Correct a problem**
“ Expert guidance is a click away.”

5G Enables

- **Low latency where and when you need it. 5G can complement wifi, address dead zones or areas outside wifi zone.**
- **Higher reliability and lower COO to support large scale IoT**
- **Private Enterprise gives an additional level of security control.**

For Additional Information or To Visit IBM Yorktown, Contact

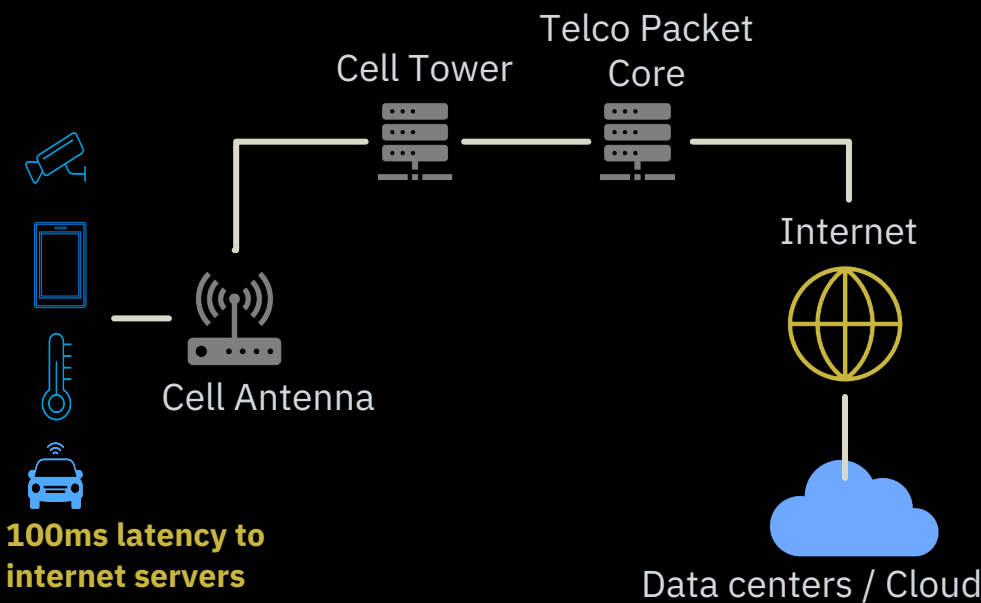
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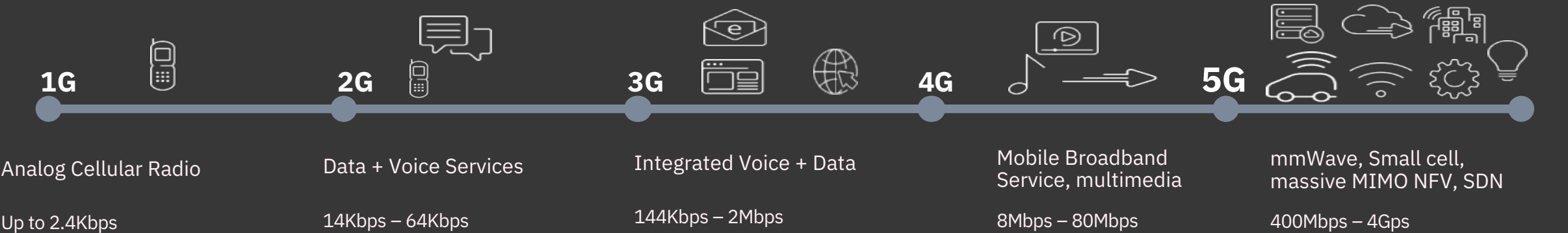
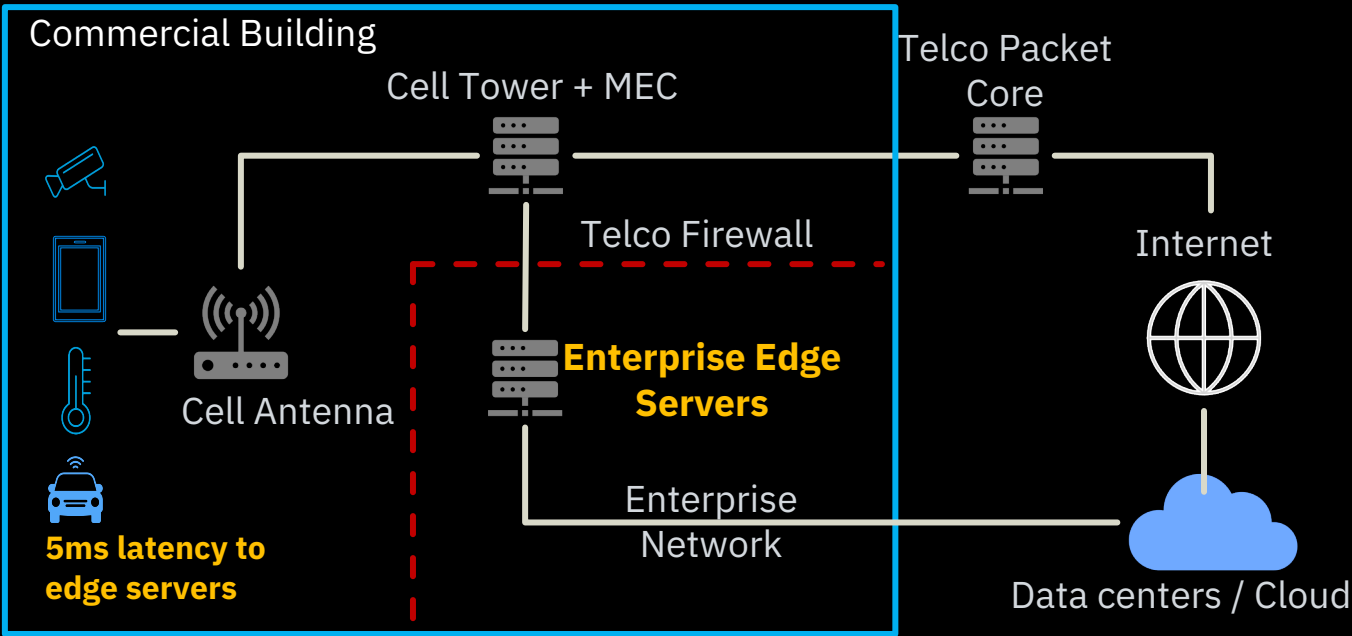
Thank
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5G IS A CATALYST FOR EDGE COMPUTING


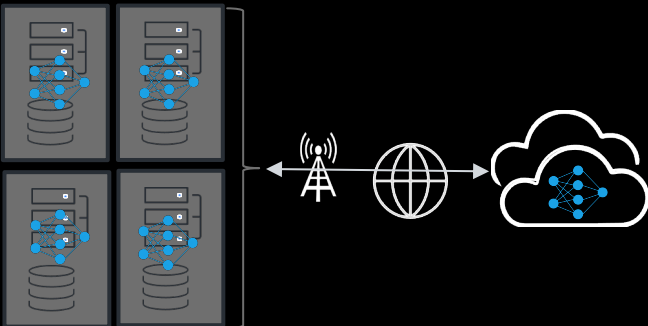
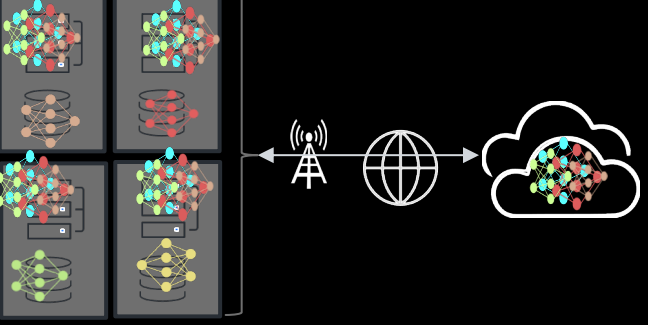
TYPICAL 4G NETWORK CONFIGURATION



Typical 5G Network Configuration



MOVING AI TO THE EDGE

named pattern	salient graphic	use case description		developed application
Train and infer from Cloud using Edge data		<ol style="list-style-type: none">1. An AI model provides the logic for an AI application.2. It could be anomaly detection to generate alerts for human intervention3. Business and technical constraints expect ongoing Cloud-level access to data4. Data is pulled from Edge sites and used to train and infer in Cloud		<div><div>Custom Dev</div><div>Model Mgmt</div><div>Sequence Mining</div><div>Federated DataOps</div><div>Core Sets</div><div>AI Core</div></div>
Deploy models from Cloud for Edge based inference		<ol style="list-style-type: none">1. An AI model is used to spot defects in manufacturing2. Models are trained in the Cloud and deployed to Edge3. Business and technical constraints require Edge level responsiveness4. Training data derives from Edge sites		<div><div>Custom Dev</div><div>Model Mgmt</div><div>Federated DataOps</div><div>Core Sets</div><div>AI Core</div></div>
Federated training, federated inferencing		<ol style="list-style-type: none">1. An AI model is used to spot systems intrusions.2. Intrusions are rare, so all sites can contribute their locally trained model to a better, fused model.3. The fused model is deployed to all sites4. With the enhanced model, each site reports on the threat from its unique context-specific perspective		<div><div>Custom Dev</div><div>Model Fusion</div><div>Model Mgmt</div><div>Federated DataOps</div><div>AI Core</div></div>

IBM Yorktown AT&T 5G MEC Partnership

