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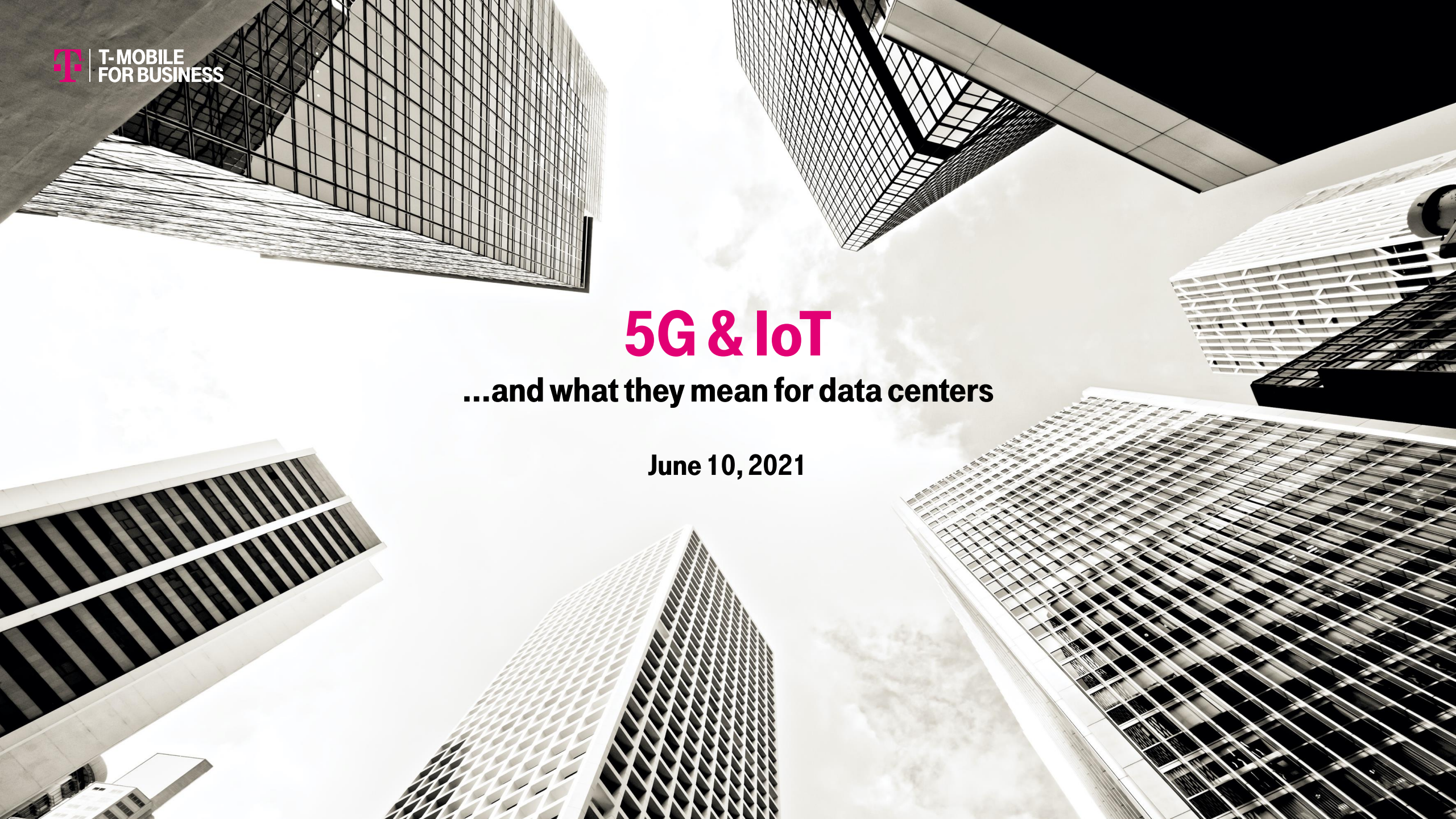
5G & IoT

...and what they mean for data centers

June 10, 2021



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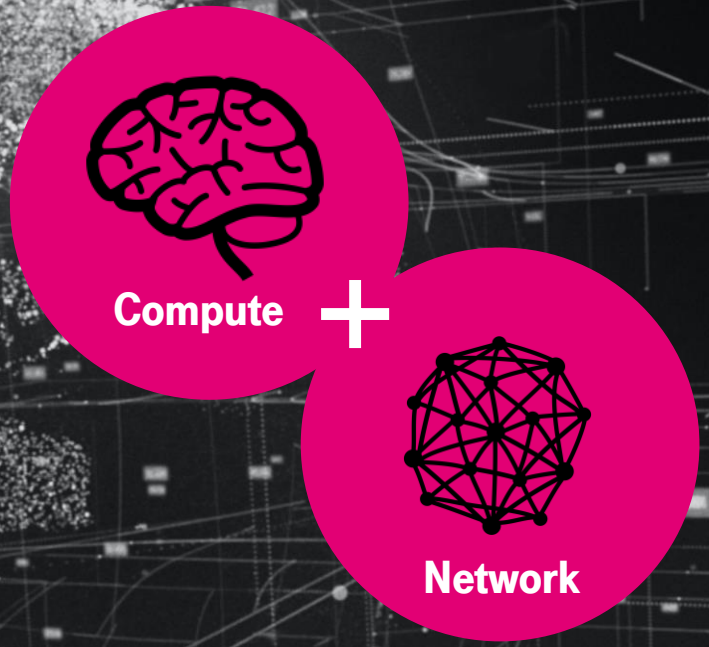
The world is changing at a dramatically accelerating pace.



Hunter-Gatherers
Able to think & process quickly
Internal network (neural)

Agricultural Revolution
Able to plan ahead
Societal networks for trade

Industrial Revolution
Able to invent & multiply human energy through machinery
Transportation networks (e.g., rail)

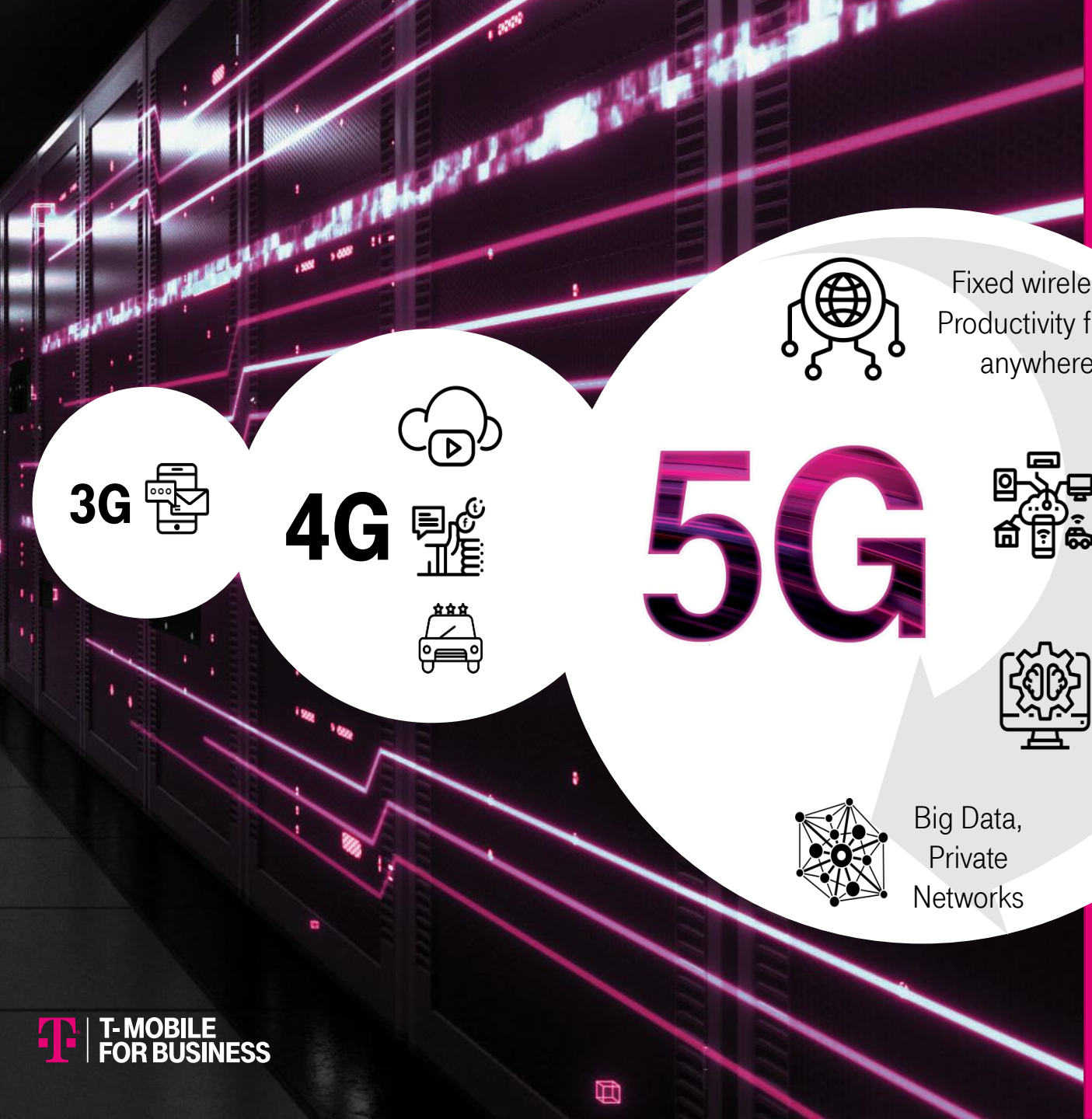
Technological Revolution
Massive change in processing ability
Communications networks (voice)

World Wide Web
Client-server architecture
Data Networks

Mobile computers
Microprocessors & displays
Voice & Data networks everywhere (mostly)

Always-on Society
Computing devices, cameras & sensors everywhere
Fast fiber & mobile networks

12,000 years | 100 years | 25 years



Networks are now at the leading edge of evolution.

3G facilitated basic messaging & data apps prompted by the smartphone

4G enabled exponential growth of data hungry streaming apps, social networks, and on-demand services

5G accelerates the convergence of data, cloud & compute, fueling digital transformation across industries

The network is the critical currency in the digital era, and more valuable than ever in our connected world

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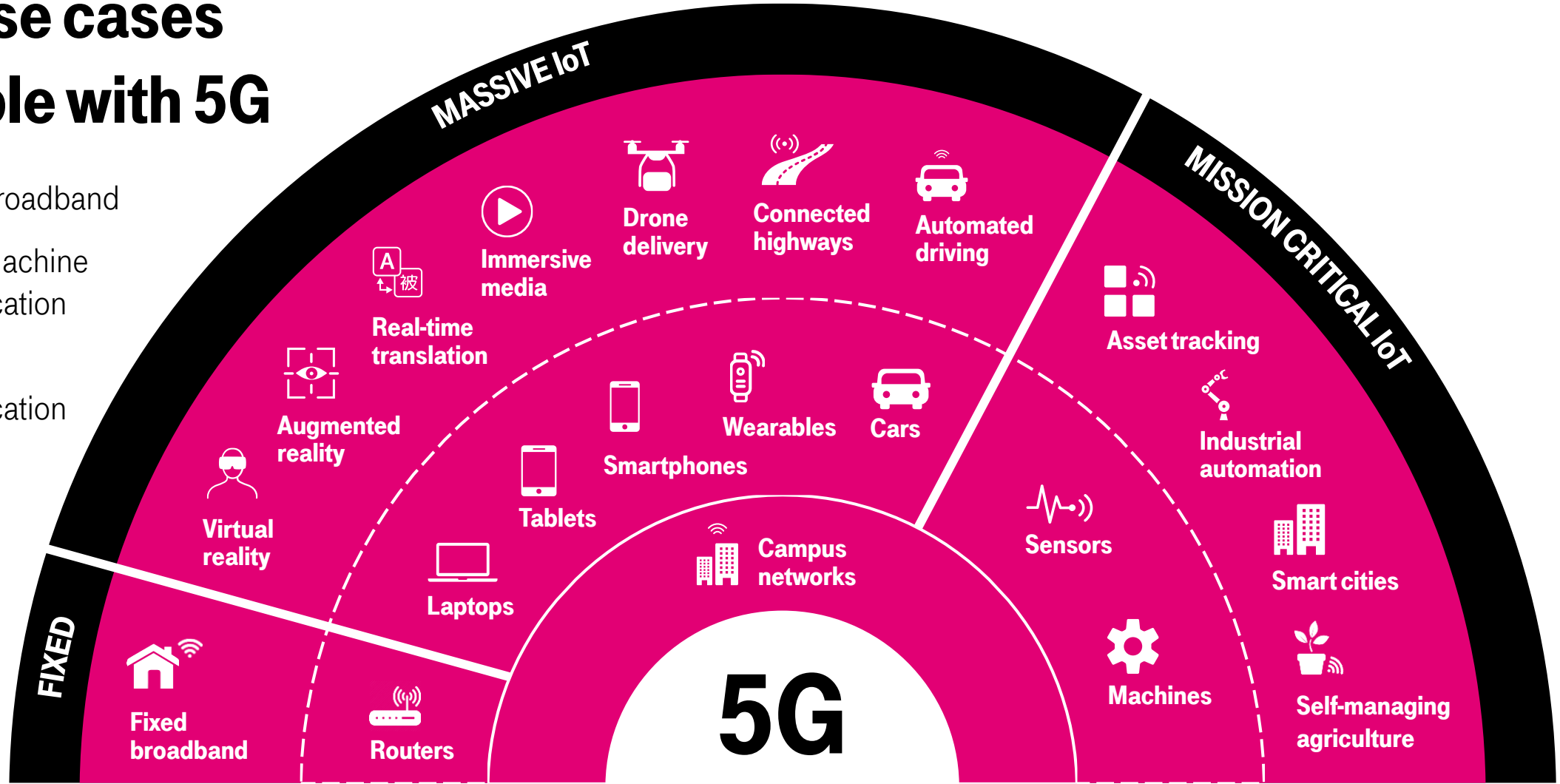
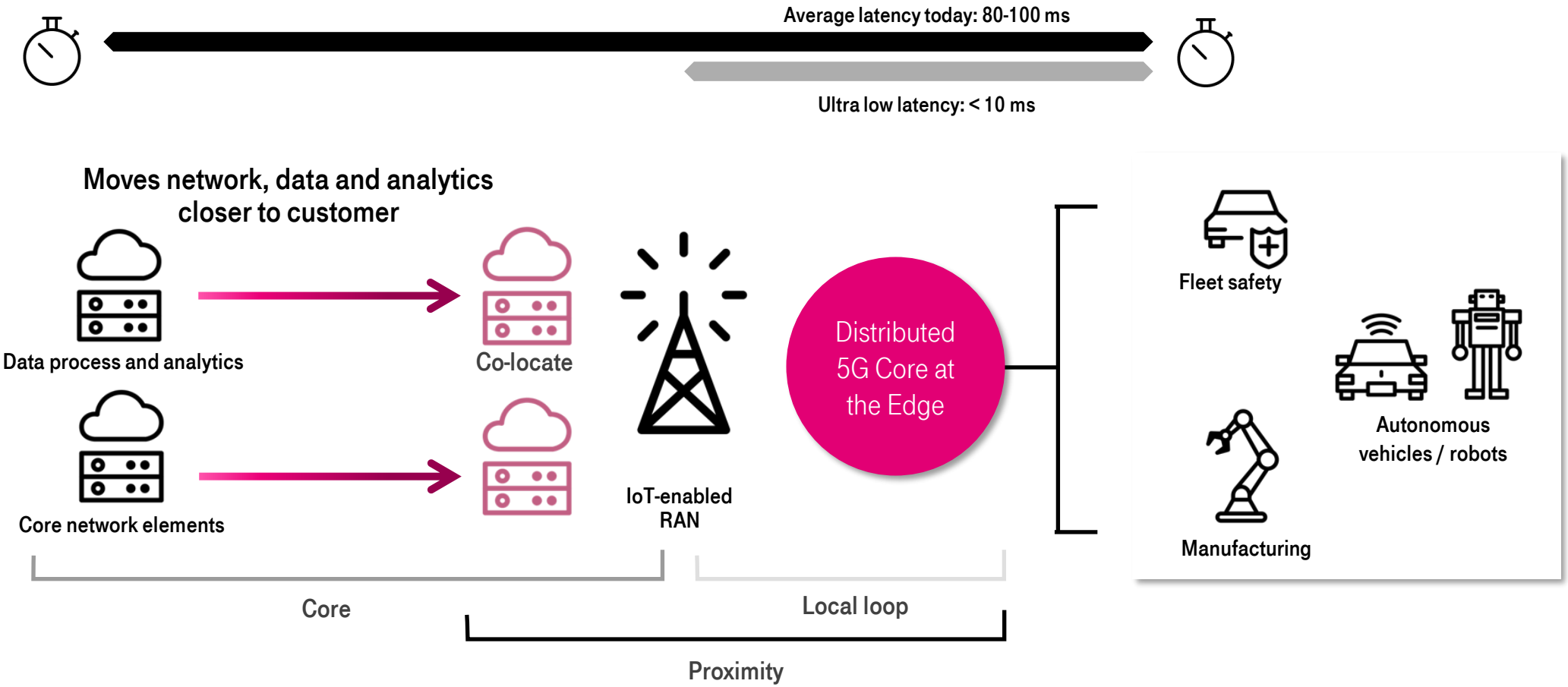
New use cases possible with 5G

- Massive broadband
- Massive machine communication
- Critical communication



Distributed data centers are critical in the 5G era

Providing high availability, low latency and low jitter needed for IoT applications



Let’s review a few use cases in further detail…

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AI-based Video Analytics for Smart Cities

Autonomous Drones for Supply Chain

Industrial Robots for Manufacturing

Cities everywhere want to use data and technology to become more efficient, responsive and sustainable…

AI-based Video Analytics for Smart Cities

Traffic Management

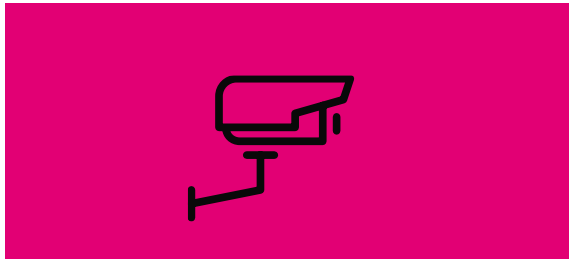
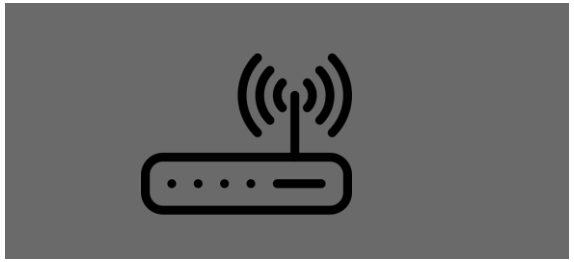
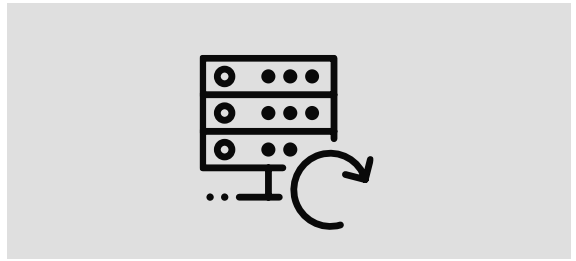
- Classify and monitor vehicles
- Reduce traffic congestion
- Manage parking space

Community Safety

- Monitor and count pedestrians
- Identify stolen vehicle
- Detect suspicious objects

...With Smart video analytics solutions, optimized for distributed edge analytics

AI-based Video Analytics for Smart Cities

Smart Devices	On Premise Gateway	Edge Data Center	Cloud Data Center
			
Cameras / LiDARs	**IoT Gateway**	**Video Analytics Server**	**Video and Data Storage**
• People Counting • Directional Analysis • Parking Space Monitoring • License Plate Recognition • Object Detection	• Traffic optimization across multiple video cameras • Parking space management across multiple lots • Video transcoding to normalize disparate feeds	• Video/data visualization • Incident monitoring • Predictive analytics • Insights and alerts	• Digital asset archiving • Historical data storage and management • Data availability, resilience, fault tolerance and scalability

Autonomous drones in supply chain help improve decision making, enhance efficiency, and reduce cost…

Autonomous Drones for Supply Chain

Inventory and Tracking

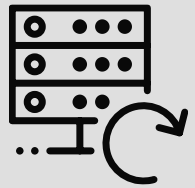
- More frequent cycle counts
- Faster and safer item search
- Shorter shut-downs

Inspection and Mapping

- Early structural damage detection
- Worker safety and productivity
- Accurate empty/full slot detection

...With effectively distribution of IT workload across the edge-cloud architecture

Autonomous Drones for Supply Chain

Autonomous Drone	On Premise Gateway	Near Edge	Cloud Data Center
			
UAV Sensors/Cameras	**IoT Gateway**	**Data and Analytics**	**Video and Data Storage**
• Collision Avoidance • Precision Location • Object Tracking • Video Streaming Auto Config	• Indoor Navigation • Mission Task Coordination • Volumetric Analysis	• Fleet Management • 3D Reconstruction • Crack and Corrosion Detection • Real-time Object Classification	• Video archiving • Historical data storage and predictive analysis • Data availability, resilience, fault tolerance and scalability • Optimize routes for power management

Cobots enable manufacturers to boost productivity, lower cost, and deliver consistent quality products

Industrial Robots for Manufacturing

Assembly Line

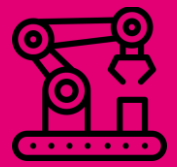
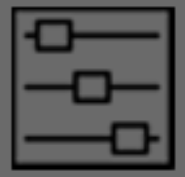
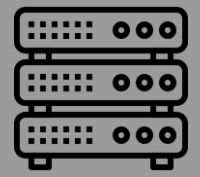
- Automate high risk tasks
- Produce consistent quality output
- Safe collaboration with humans

Pick and Place

- Automate repetitive motion tasks
- Inspect for consistent quality
- Package and palletize

5G enabled cloud robots power mobility at lower cost, while reducing complexity and maintaining safety

Industrial Robots for Manufacturing

Cloud Cobot	Controller	On Premise Private Core Edge	Cloud Data Center
			
Standard Functions	**Ultra Low Latency**	**Medium Latency / Low Jitter**	**Data Storage and Analytics**
• Perception • Navigation • Manipulation	• Action and Situation Recognition and Labeling • Action Execution • Object Recognition • Data Encoding	• Collaborative Learning • Environment Modeling • Master Control • Predictive analytics	• Teleoperation • Digital Twin • Historical data storage and predictive analysis • Data availability, resilience, fault tolerance and scalability

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How can data centers use 5G and IoT themselves?

- 5G
  - Fixed wireless for primary and/or secondary connectivity
- IoT
  - Video Analytics
  - Predictive Maintenance
  - Remote Monitoring
  - Power Management

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Q&A