

# Verizon IoT and NB NTN

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As required by SEC rules, we have provided a reconciliation of the non-GAAP financial measures included in this presentation to the most directly comparable GAAP measures in materials on our website at [www.verizon.com/about/investors](http://www.verizon.com/about/investors).

# Verizon IoT and NB NTN

Building Blocks

Key Directions

Network Slicing

Network Evolution

Right Sized IoT

NB IoT

IoT Architecture

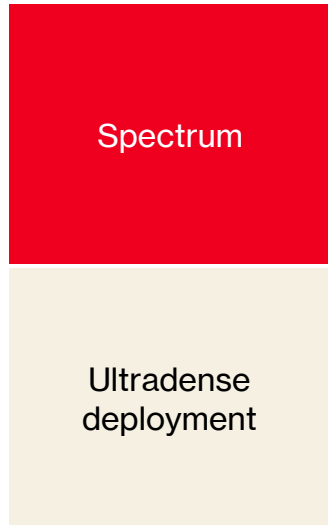
Security

Gartner Magic Quadrant

We're proud to offer an IoT capability that's expansive, mobile, and conveniently managed through Verizon ThingSpace.

Shamik Basu,  
Vice President, Strategic Connectivity, Verizon Business

# Building Blocks



## New radio

- Advanced coding and modulation
- Massive multiple input, multiple output (MIMO)
- Waveforming
- Flexible spectrum use
- Flexible/full duplex



## Software-defined networking (SDN)/network function virtualization (NFV) + 5G next-generation core (NGC)

- Network evolution
- Network slicing
- Service-based architecture
- Operational agility
- Universal adaptive core

# 5G Key Directions

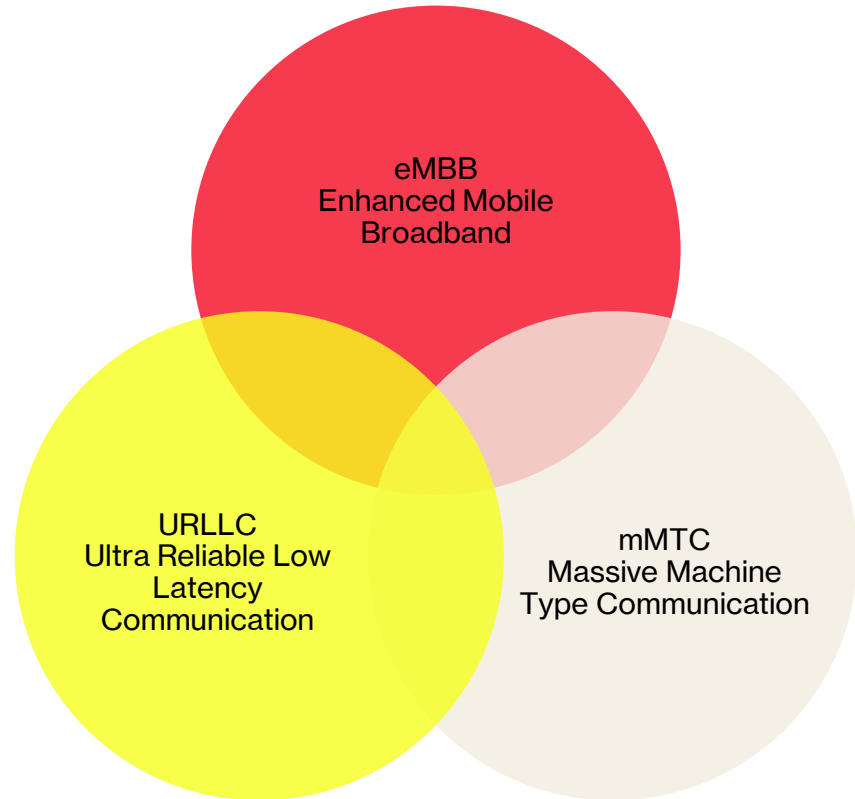
## A network designed for your use case

5G combines the power of Software Defined Networks with Network Function Virtualization to connect applications.

eMBB – Data driven use cases requiring high data rates across a wide coverage area.

URLLC – Strict latency and reliability for mission critical communications such as remote surgery, autonomous operations or the tactile internet.

mMTC – Low bandwidth and data rates but very dense deployments.

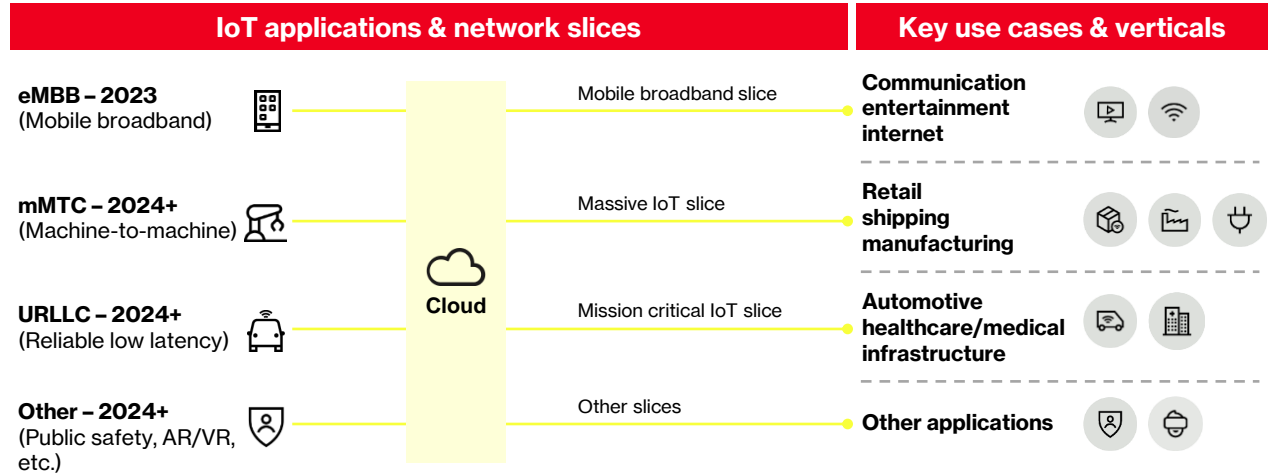


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5G Network Slicing

# 5G Network Slice Overview

- Network slicing enables virtual end-to-end networks tailored to applications
- Faster and flexible 5G enables range of services
- Customers can pay for just the services needed, and dynamically scale with requirements
- Pre-configured basic or custom slices available



# 5G Network Evolution



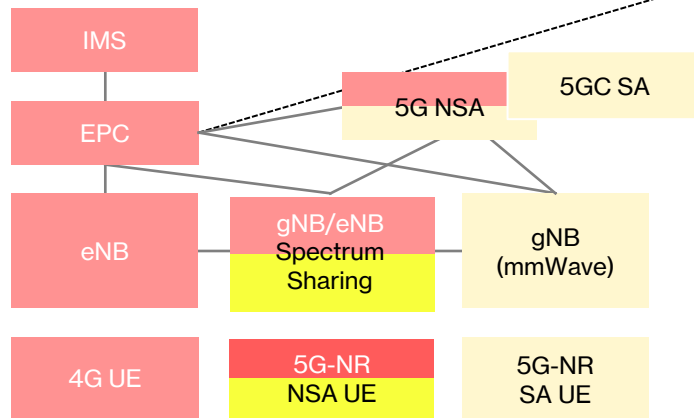
NTN

## Verizon cloud platform

Container-based Network Functions to support:

- RAN virtualization
- Slicing
- Automation

## CORE



## RAN

New interfaces to 5GC and NAS signaling



## Transport

Slice and SLA-related network design and management



## Device

New UICC, new slice-related features



## IT

New Service Assurance

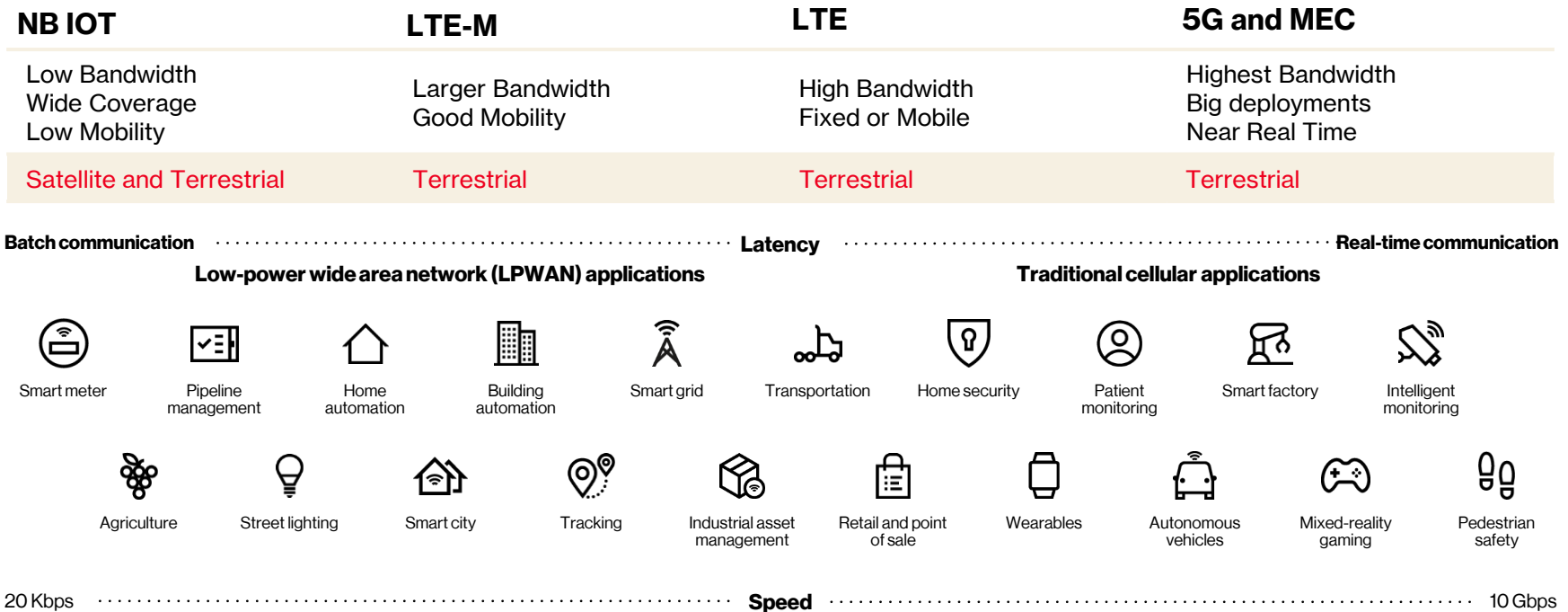
## Orchestration

Life Cycle Management of Network Slicing and Virtual Network Functions

**5G Core is nucleus of the 5G evolution to maximize NaaS benefits.**



# Right Sized IoT



# What sets NB IoT Apart

## **NB IoT enables massive deployments today!**

Low cost

Low Complexity

Highly Scalable

Ubiquitous Coverage

Long battery life

Security, Reliability, Longevity



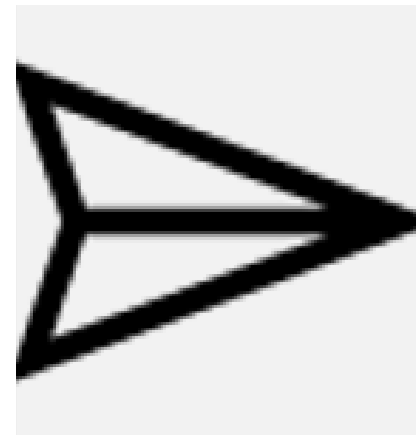
**Narrowband NTN**

Widest coverage today for any cellular based technology



**Cellular Narrowband**

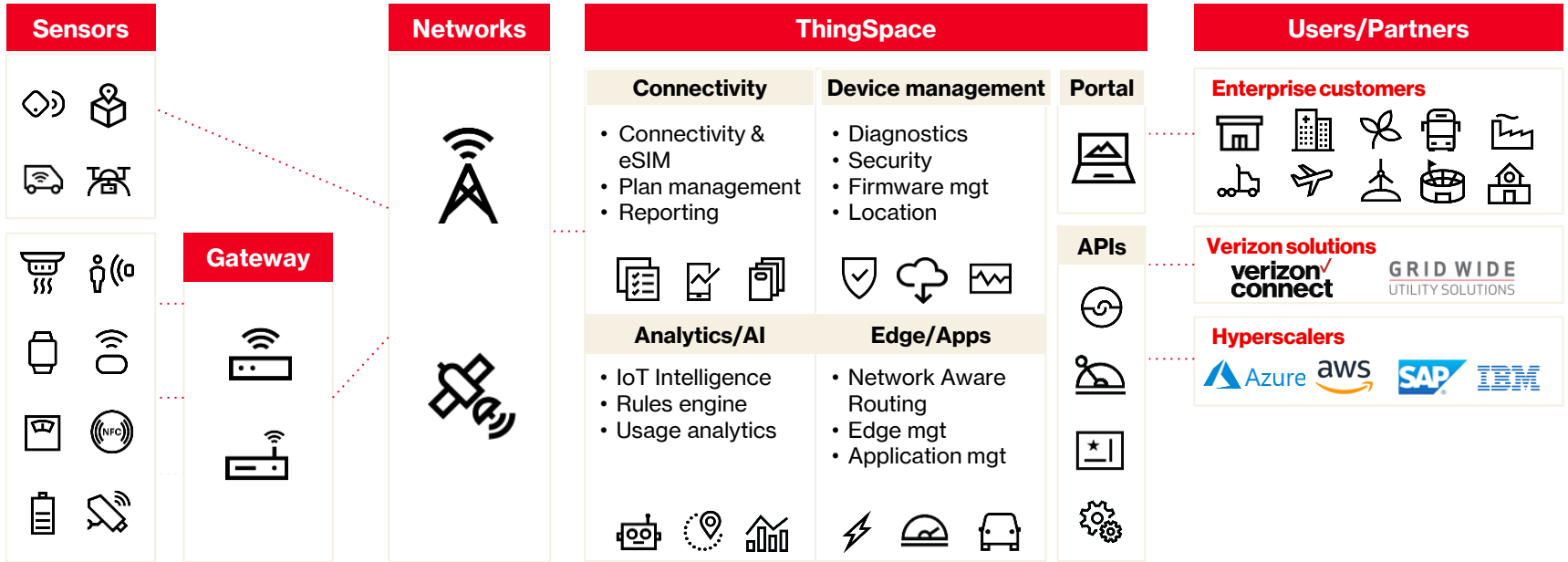
Extended coverage modes, power saving modes, available everywhere on Verizon



**Non IP Data Delivery**

A new way to communicate, no more IP communication to manage. No keep alives. REST API based communication with end point. (CoAP, LWm2m)

# IoT Architecture and Ecosystem



End to end sensor to cloud platform. ThingSpace API layer for enterprises, carriers and partners.

# Security

**Wireless device and access** – We use UMTS SIMs (soon 5G SA capable SIMs). Available are 2 other bespoke products, Verizon Device Management and Mobile threat defense. On the device side, all Verizon certified devices have undergone Verizon's IoT Platform Security compliance.

**Secure cloud GW** – Secure Cloud Gateway delivers a secure, cloud-based, distributed web gateway. Acting as both a first and last line of defense, it protects users, apps and data on any device, while maintaining performance and eliminating the need to backhaul traffic.

**Threat analytics** – Protect, Detect, Investigate, Respond – Intelligence based product that monitors and reports on anomalies. Standard rules are available and custom rules can be defined.

## Security in 5G standards

Wireless  
subscriber  
authentication

Network  
authentication

Binding security  
relationship

Protecting UE  
identity

Key agreement  
procedure

# Gartner Magic Quadrant



- ✓ Leader in IoT Managed Connectivity
- ✓ Continuous progress in execution and vision



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