About Transforma Insights

- A technology industry analyst firm focused on the impact of emerging technologies and technical and commercial best practices.

- Helping technology adopters to understand the opportunities associated with new technologies.

- Helping technology vendors to understand the changing market dynamics and the associated market opportunity.

DIGITAL TRANSFORMATION

TECHNOLOGIES

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USE CASES
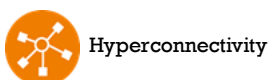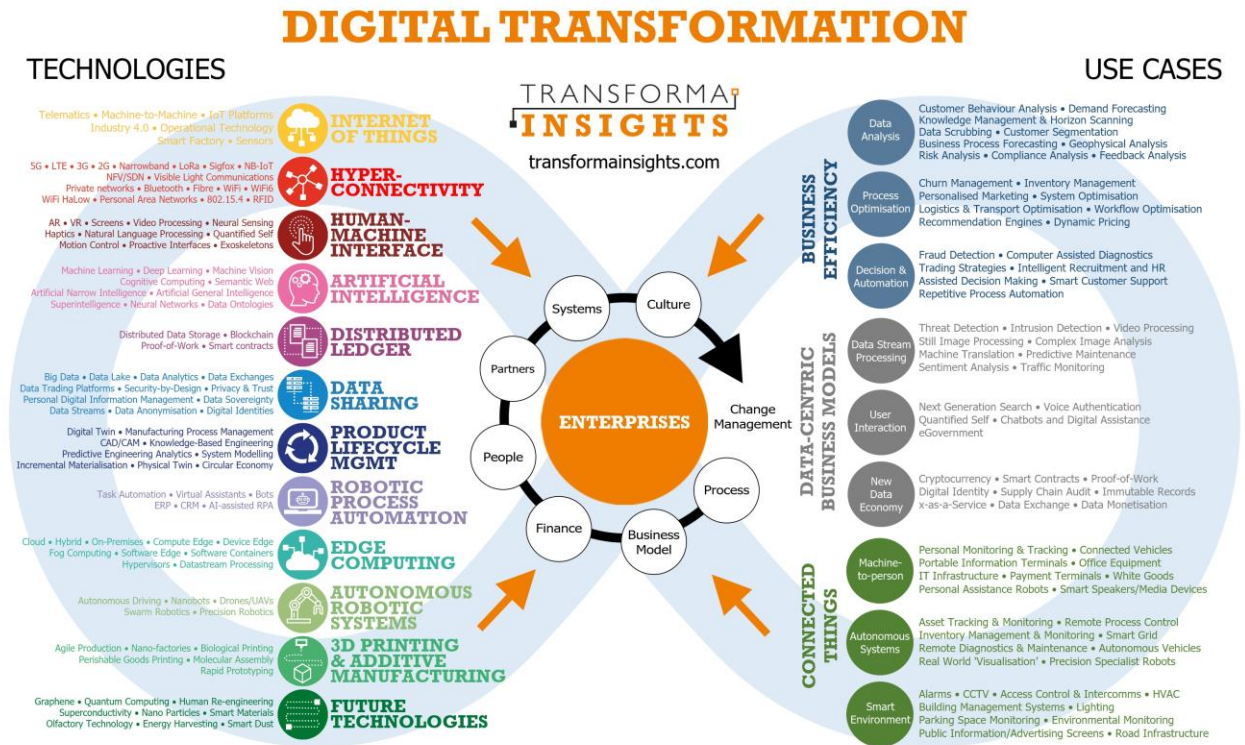
IoT forecasts are a key focus area

Granular and Rigorous

Machine-to-Person

Connected Vehicles			
	eCall	Road Fleet Management	In-Vehicle Infotainment
	In-Vehicle Navigation	Roadside Assistance	Stolen Vehicle Recovery
	Usage-Based Insurance	Vehicle Diagnostics	Vehicle Head Unit
	Vehicle Rental, Leasing & Sharing Management	Dash Cams	Road Public Transport
	Air Transport	Sea & River Transport	Rail Transport

Consumer Internet & Media Devices	Personal Portable Electronics	Smart Home	AV Equipment
IT Infrastructure	IT Infrastructure		
Office Equipment	IT & Other Office Equipment		
Payment Terminals	ATMs	Payment Processing	Vending Machines
Personal Assistance Robots	Personal Assistance Robots		
Personal Monitoring & Tracking	Child & Pet Tracking	Security Tracking	Assisted Living
	Healthcare Monitoring	Worker Safety	Telemedicine
	Trigger Devices		
Portable Information Terminals	Portable Information Terminals		
White Goods	White Goods		

Autonomous Systems

Asset Tracking & Monitoring	Asset Monitoring	Bike & Scooter Sharing	Container Tracking
	Disposable Devices	Loss Prevention	Real Time Location Systems
	Track & Trace	Waste Management	
Autonomous Vehicles	Autonomous Road Freight Vehicles	Autonomous Road Passenger Vehicles	Delivery Robots
	Unmanned Aquatic & Aerial Vehicles (Drones)	Unmanned Non-Road Vehicles	
Inventory Mgmt & Monitoring	Inventory Mgmt & Monitoring		
Precision Specialist Robots	Precision Specialist Robots		
Remote Diagnostics & Maintenance	Remote Diagnostics & Maintenance		
Remote Process Control	Remote Process Control		
Real World 'Visualisation'	Connected Glasses		
Smart Grid	Generation	Grid Operations	Electric Vehicle Charging
	Electricity Smart Meters	Gas Smart Meters	Water Smart Meters

Smart Environment

Access Control & Intercoms	Access Control & Intercoms		
Building Automation	Building Automation		
Building Safety & Security	Building Safety & Security		
Environmental Monitoring	Agriculture	Environment Monitoring	Infrastructure Monitoring
HVAC	HVAC		
Lighting	Building Lighting	Public Space Lighting	
Parking Space Monitoring	Parking Space Monitoring		
Public Information & Advertising Screens	Public Information & Advertising Screens		
Public Safety	CCTV	Public Alarms & Monitors	
Road Traffic Monitoring & Control	Road Traffic Monitoring & Control		

	Road Pricing Infrastructure
	Traffic Monitoring
	Connected Road Signs
	Traffic Lights
	Enforcement Cameras
	In-Vehicle Road Pricing Devices

Global

Accessible at transformainsights.com

Connected Things   Artificial Intelligence

IoT Parameters
◉ Highest embedded technology ⓘ   ○ All embedded technologies ⓘ

Select All Deselect All   Select All Deselect All   Select All Deselect All

Metrics
- ✓ RGUs
- ✓ Connected Devices
- ✓ Connected Devices Unit Sales
- ✓ Revenue (Service Wrap)
- ✓ Revenue (Module)
- ✓ Revenue (VAC)
- Communication Technology Availability
- Communication Technology Additions

Metrics (Aggregations)
- Total Revenue (Service Wrap, Module, VAC)
- Recurring Revenue (Service Wrap, VAC)

Communication Technologies
- 5G non-mMTC
- 5G mMTC
- 4G
- 3G
- 2G
- LPWA (non-mMTC)
- Satellite
- Short Range
- Other

Communication Technologies (Aggregations)
- ✓ Total
- 2G, 3G, 4G, 5G
- 2G, 3G, 4G, 5G non-mMTC
- 5G (mMTC, non-mMTC)
- LPWA (LPWA non-mMTC, 5G mMTC)

Network Types
- Public
- Private

Network Types (Aggregations)
- ✓ Total

Internet of Things   Hyperconnectivity   Data Sharing   RPA   3D Printing   Distributed Ledger
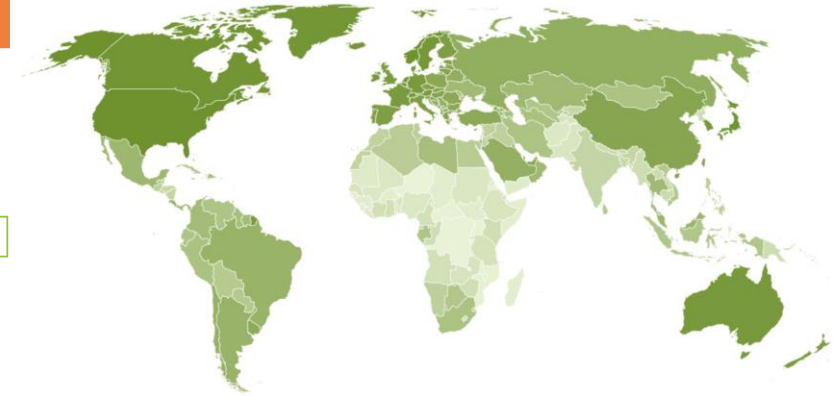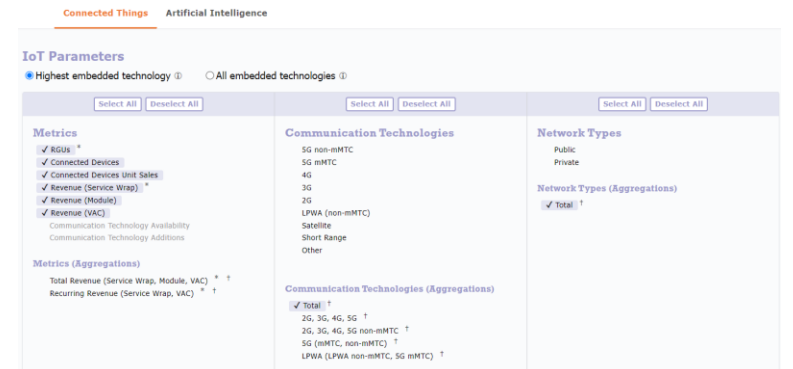
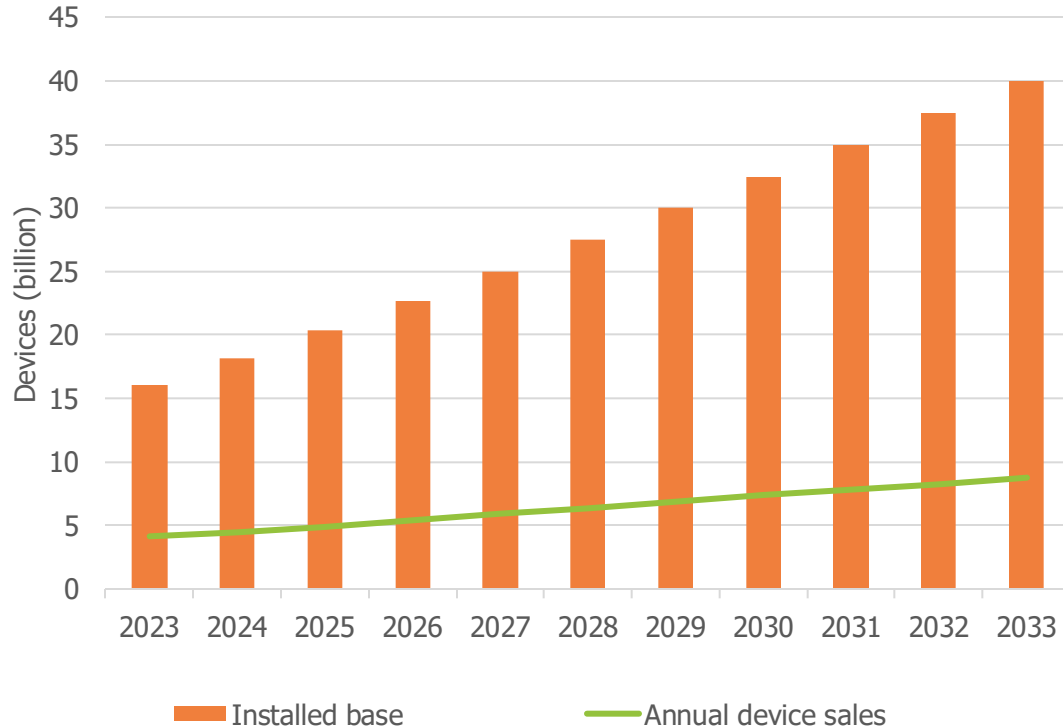AI   HMI   Edge   Robotics   Next Gen PLM   Future Tech

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40 billion connected devices by the end of 2033

Global IoT Connections 2023-2033
[Source: Transforma Insights TAM Forecasts, 2024]

- Total IoT connections will grow from 16 billion at the end of 2023 to 40 billion in 2033. More than doubling thanks to a CAGR of 10%.

- New device sales will grow from 4.1 billion in 2023 with a CAGR of 8%, to 8.7 billion.

- New device sales represent 26% of the 2023 installed base, but this is down to 22% in 2033.

Internet of Things · Hyperconnectivity · Data Sharing · RPA · 3D Printing · Distributed Ledger

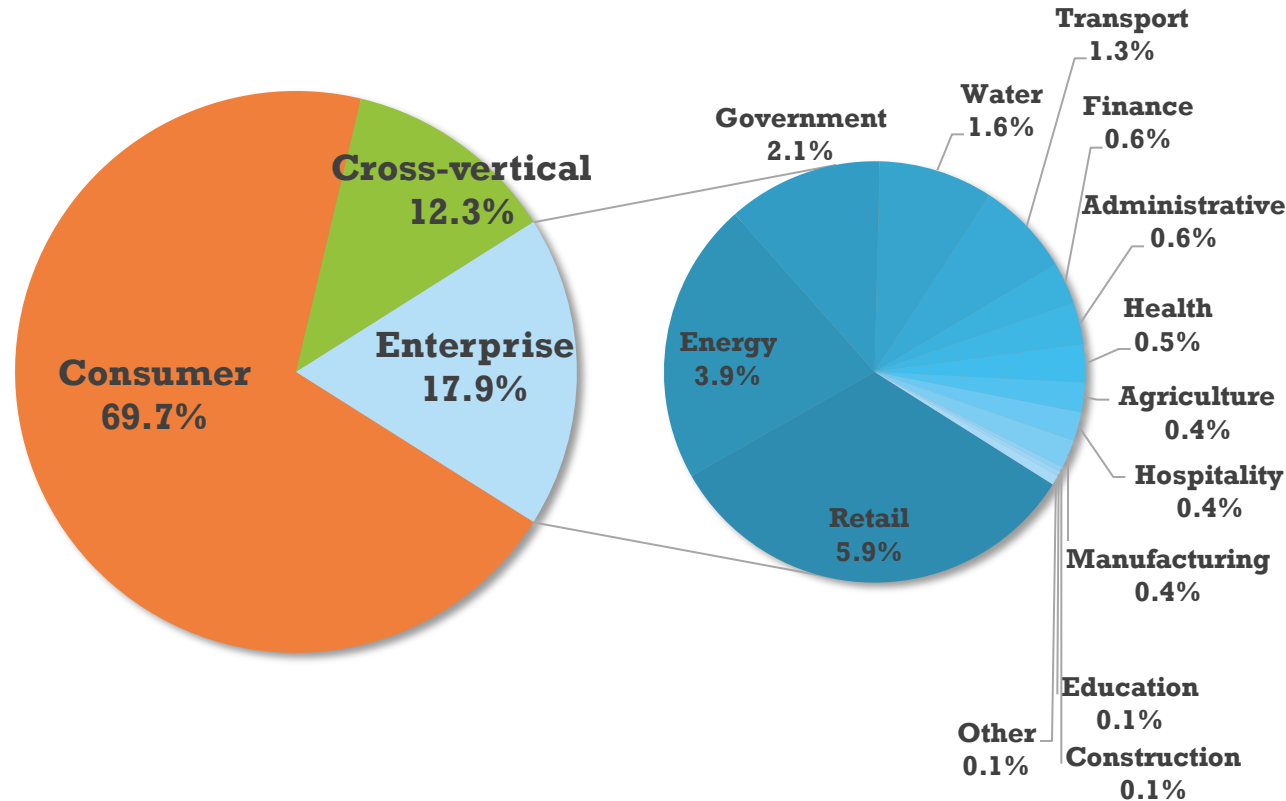AI · HMI · Edge · Robotics · Next Gen PLM · Future Tech

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Consumer vs cross-vertical vs enterprise

IoT shipments 2024 by vertical
[Source:Transforma Insights TAM Forecasts, 2024]

- The lion's share of IoT is consumer: 69.7% in 2024, rising to 70.1% in 2033.
- Cross-vertical (applications that are similarly applied across all verticals) is a consistent 10% of the market.
- Enterprise is 18% in 2024, and remains 18% in 2033. Biggest sectors: retail and energy.

Internet of Things   Hyperconnectivity   Data Sharing   RPA   3D Printing   Distributed Ledger

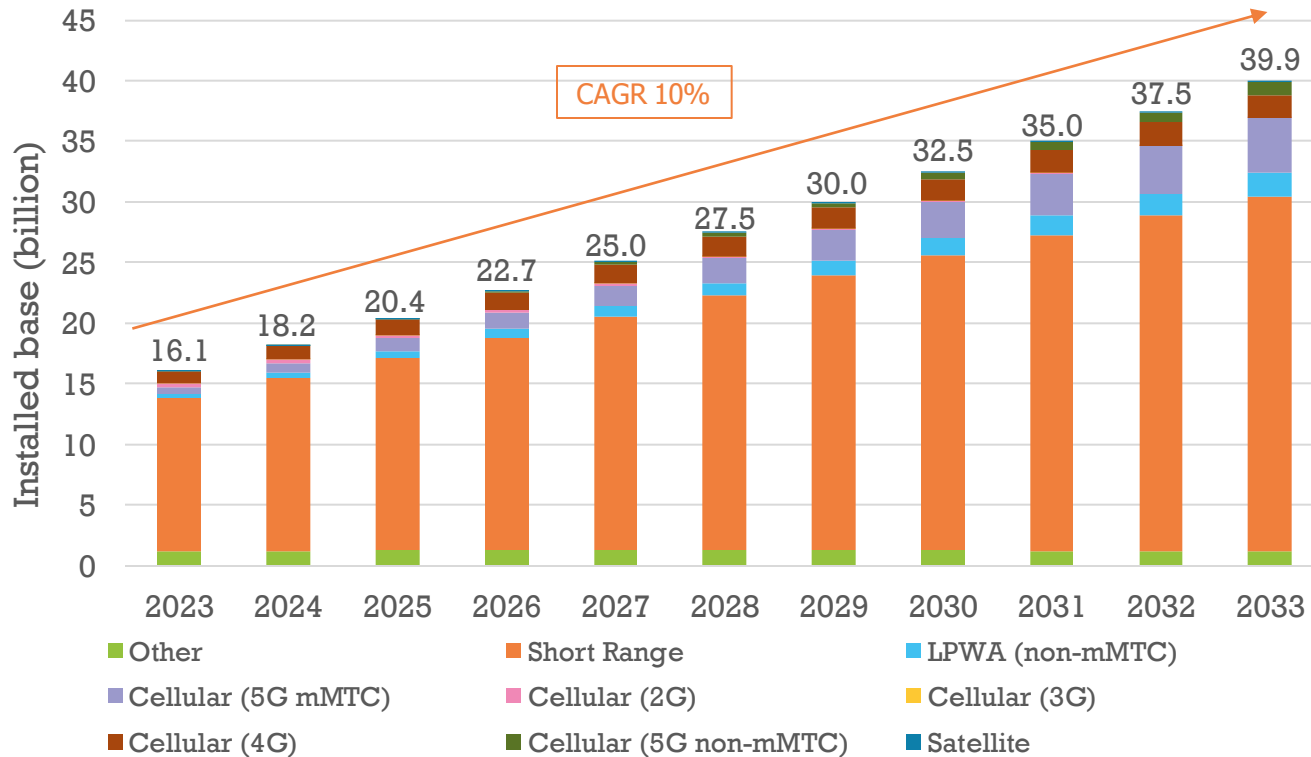AI   HMI   Edge   Robotics   Next Gen PLM   Future Tech

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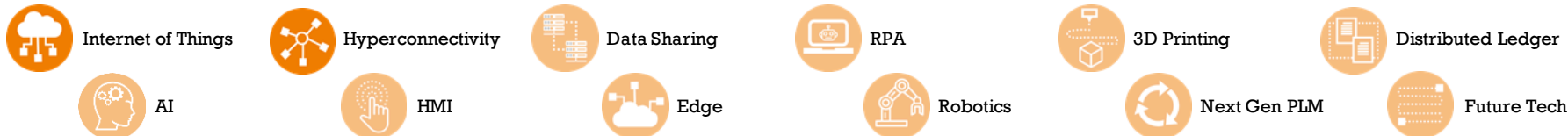
Global IoT market forecast by technology group

IoT connections forecast 2023-2033, by technology
[Source: Transforma Insights TAM Forecasts, 2024]

Installed base (billion)

CAGR 10%

16.1 · 18.2 · 20.4 · 22.7 · 25.0 · 27.5 · 30.0 · 32.5 · 35.0 · 37.5 · 39.9

2023 · 2024 · 2025 · 2026 · 2027 · 2028 · 2029 · 2030 · 2031 · 2032 · 2033

Legend:
- Other
- Short Range
- LPWA (non-mMTC)
- Cellular (5G mMTC)
- Cellular (2G)
- Cellular (3G)
- Cellular (4G)
- Cellular (5G non-mMTC)
- Satellite

| Technology	CAGR 2023-33	Leading applications
Satellite	25%	Track & Trace, Container Tracking, Drones, Military, Assisted Living People Tracking
5G non-mMTC	43%	Vehicle Head Unit, Smart Watches, CCTV, Road Fleet Management, E-Bikes
4G	7%	Vehicle Head Unit, Electricity Smart Meters, Road Fleet Management, Smart Watches, CCTV
2G/3G	-18%	Smart Meters, Emergency Call, Smart Grid, EV Charging, Track & Trace.
5G mMTC	22%	Track & Trace, Smart Meters, White Goods, Fire & Security Alarms, Stock Level Monitoring
LPWA (non-mMTC)	19%	Smart Meters, White Goods, Crop Management, Public Space Lighting, Track & Trace
Short Range	9%	Electronic Shelf Labels, Headphones, Building Lighting, Televisions, Building Automation
Other	0%	Smart Meters, Public Space Lighting, Crop Management, Connected Glasses, Fire Alarms

The Transforma Insights IoT Forecast is based on a comprehensive analysis of 243 applications spanning the entirety of the IoT market opportunity. Forecasts cover 196 countries, with metrics including connected devices, annual shipments, RGUs, technology split, public vs private network split, vertical sector, and revenue (hardware, connectivity and services) all accessible via the online Transforma Insights Forecast Database. All connections are counted based on their highest embedded technology. Cellular (5G mMTC) includes NB-IoT, LTE-M and subsequent future evolutions. LPWA (non-mMTC) includes LoRaWAN, Sigfox and other unlicensed technologies. Short Range includes Bluetooth, WiFi, Zigbee and other similar technologies..

- Internet of Things
- Hyperconnectivity
- Data Sharing
- RPA
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- Distributed Ledger
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Cellular: 5G (incl. mMTC) replaces 2G (and 4G)

Global cellular IoT installed base technology split, 2023-2033
[Source: Transforma Insights TAM Forecasts, 2024]
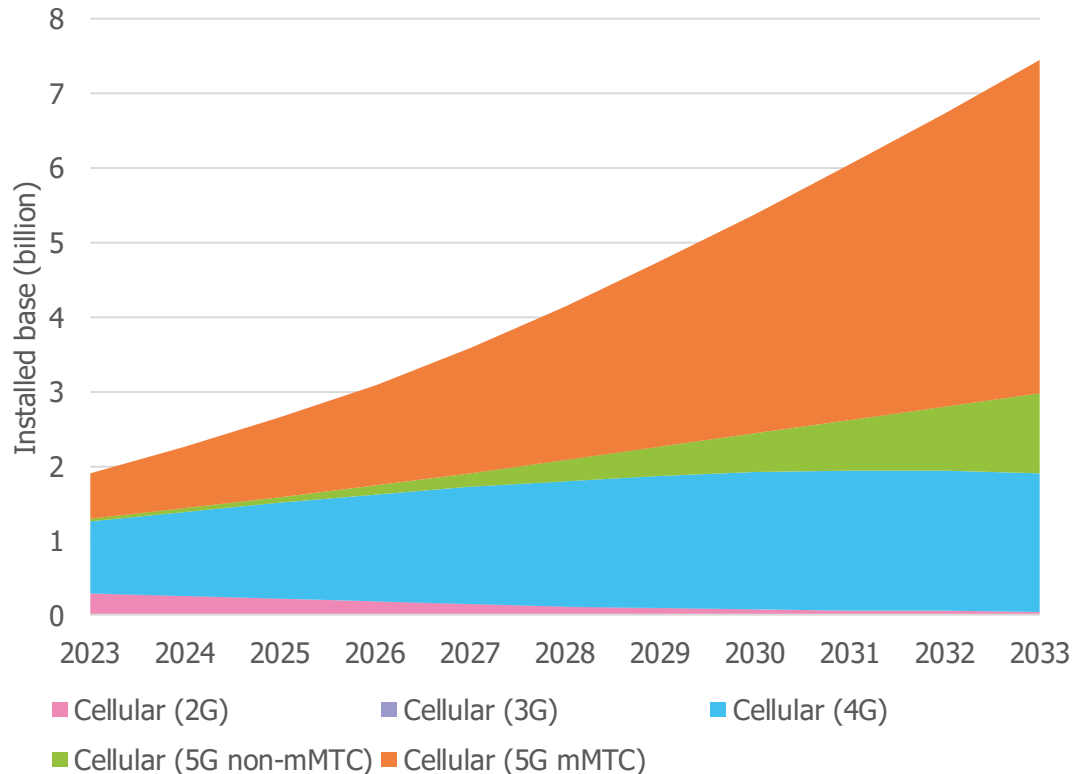
- Total 1.9bn cellular-based IoT connections in 2023, going to 7.5bn in 2033.

- 2G from 15% in 2023 to 1% in 2033 (3G already non-existent)

- 4G from 50% to 25%.

- 5G non-mMTC from 2% to 14%.

- 5G mMTC from 33% (mostly in China) to 60%.

Internet of Things   Hyperconnectivity   Data Sharing   RPA   3D Printing   Distributed Ledger
AI   HMI   Edge   Robotics   Next Gen PLM   Future Tech
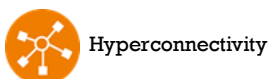
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1.66 billion cellular gross additions in 2024-26, application drivers vary significantly by region
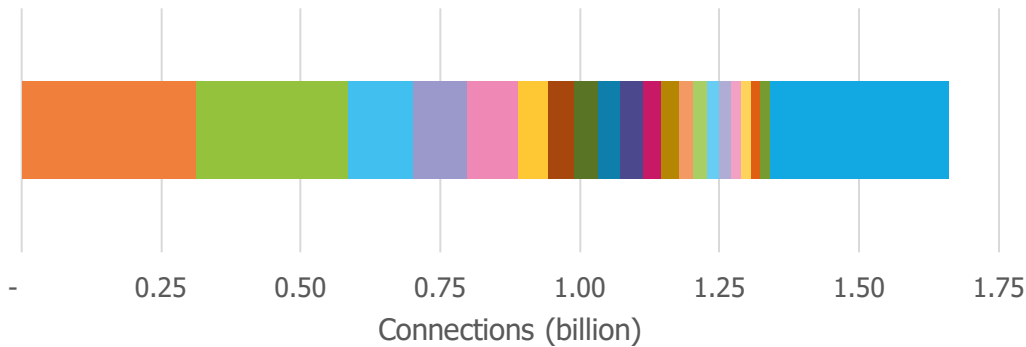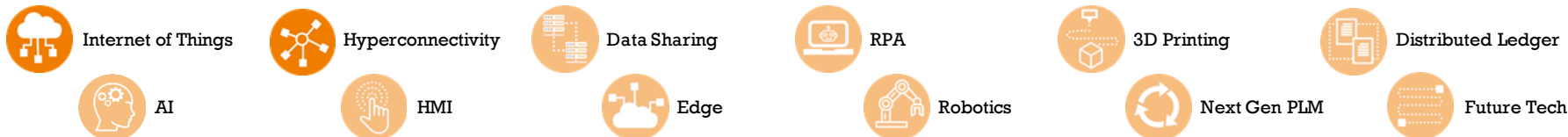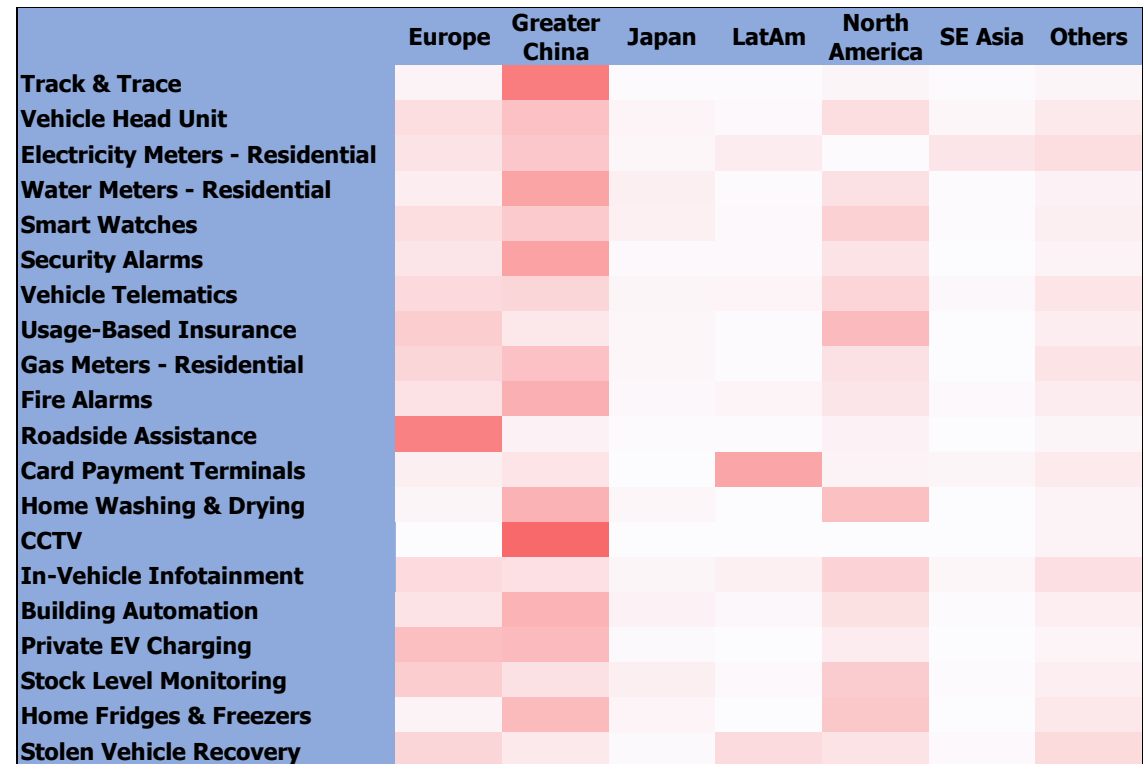
3GPP Gross Additions, billion, 2024-26
[Source:Transforma Insights TAM Forecasts, 2024]

Connections (billion)

Axis: - | 0.25 | 0.50 | 0.75 | 1.00 | 1.25 | 1.50 | 1.75

Legend:
- Track & Trace
- Vehicle Head Unit
- Electricity Smart Meters - Residential
- Water Smart Meters - Residential
- Smart Watches
- Security Alarms
- Vehicle Telematics Devices - Light Duty Vehicles
- Usage-Based Insurance Aftermarket
- Gas Smart Meters - Residential
- Fire Alarms
- Roadside Assistance Aftermarket
- Card Payment Terminals
- Home Washing & Drying
- CCTV
- In-Vehicle Infotainment Aftermarket
- Building Automation Systems
- Private Electric Vehicle Charging
- Stock Level Monitoring
- Home Fridges & Freezers
- Stolen Vehicle Recovery Aftermarket
- Other

Application breakdown of 3GPP Additions, 2024-26
[Source:Transforma Insights TAM Forecasts, 2024]

	Europe	Greater China	Japan	LatAm	North America	SE Asia	Others
Track & Trace							
Vehicle Head Unit							
Electricity Meters - Residential							
Water Meters - Residential							
Smart Watches							
Security Alarms							
Vehicle Telematics							
Usage-Based Insurance							
Gas Meters - Residential							
Fire Alarms							
Roadside Assistance							
Card Payment Terminals							
Home Washing & Drying							
CCTV							
In-Vehicle Infotainment							
Building Automation							
Private EV Charging							
Stock Level Monitoring							
Home Fridges & Freezers							
Stolen Vehicle Recovery							

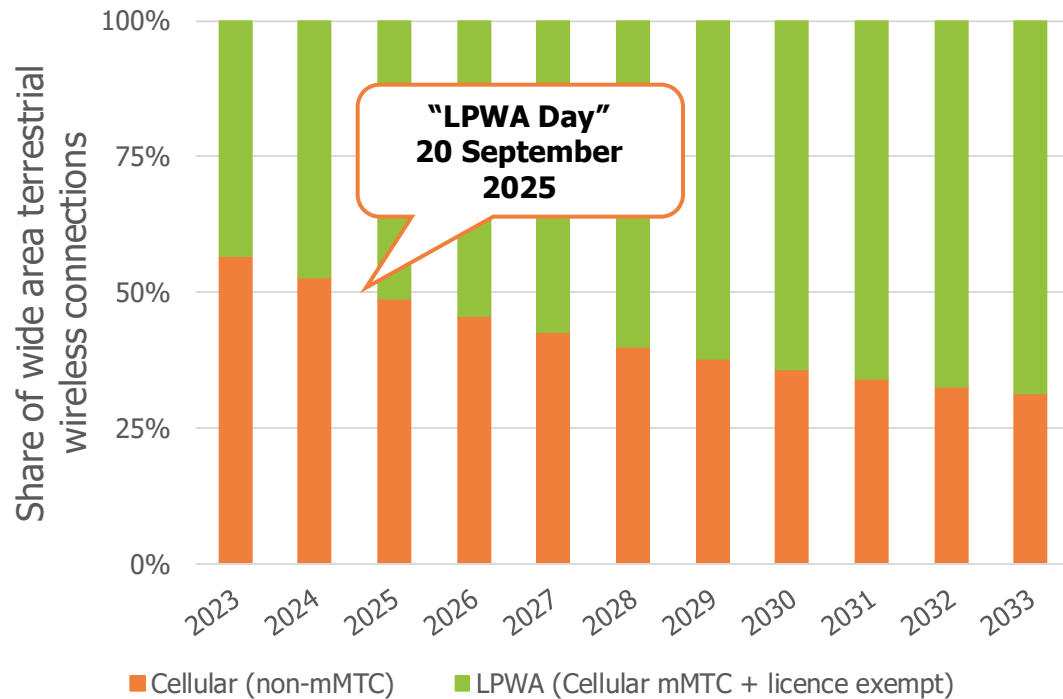Internet of Things · Hyperconnectivity · Data Sharing · RPA · 3D Printing · Distributed Ledger · AI · HMI · Edge · Robotics · Next Gen PLM · Future Tech

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LPWA will dominate WWAN for IoT by 2025

LPWA and Cellular connections for IoT
[Source:Transforma Insights TAM Forecasts, 2024]

"LPWA Day"
20 September 2025

Share of wide area terrestrial wireless connections

Cellular (non-mMTC)   LPWA (Cellular mMTC + licence exempt)

LPWA connections, detail of net additions 2023-2025
[Source:Transforma Insights TAM Forecasts, 2024]
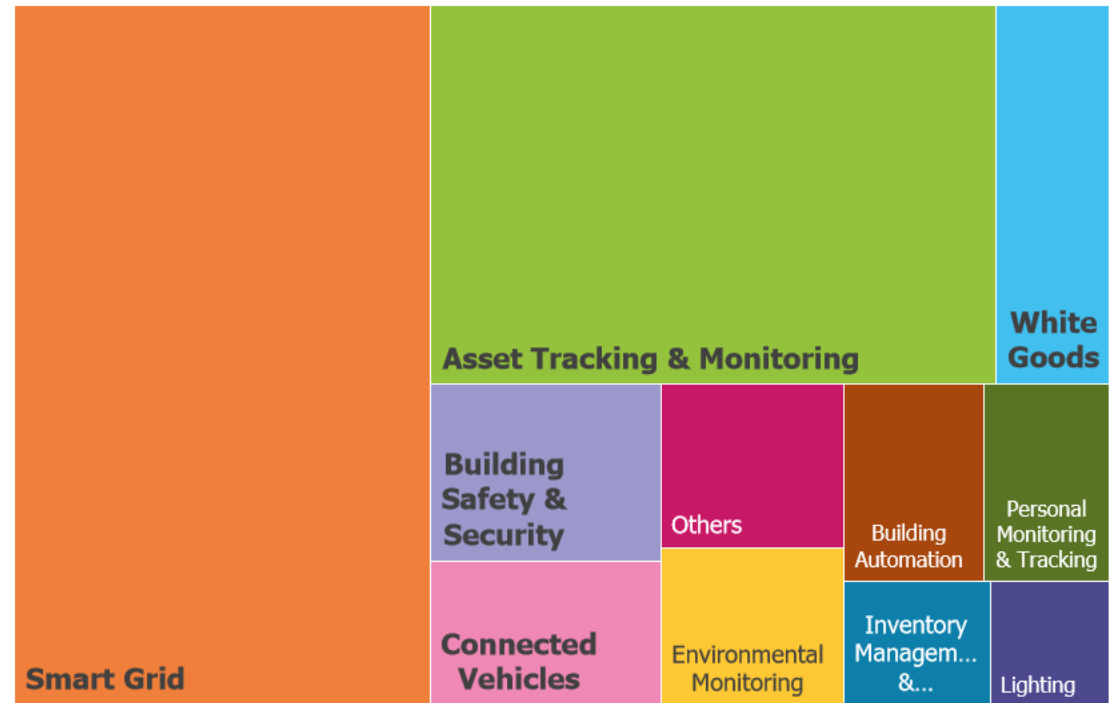
Smart Grid
Asset Tracking & Monitoring
Building Safety & Security
Connected Vehicles
Others
Environmental Monitoring
Building Automation
Inventory Managem… &…
White Goods
Personal Monitoring & Tracking
Lighting

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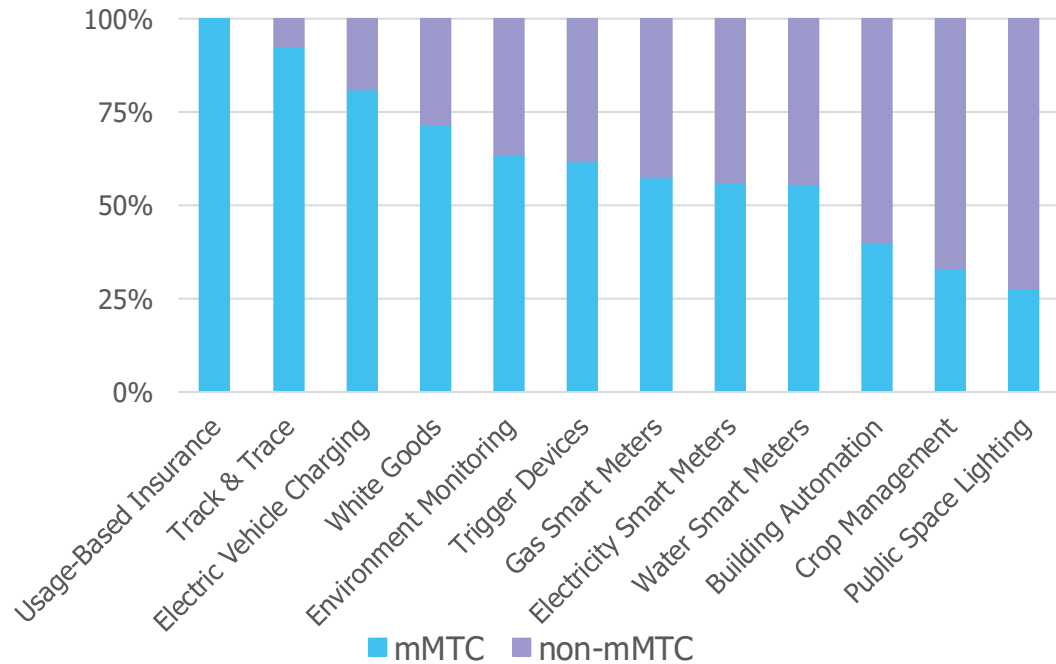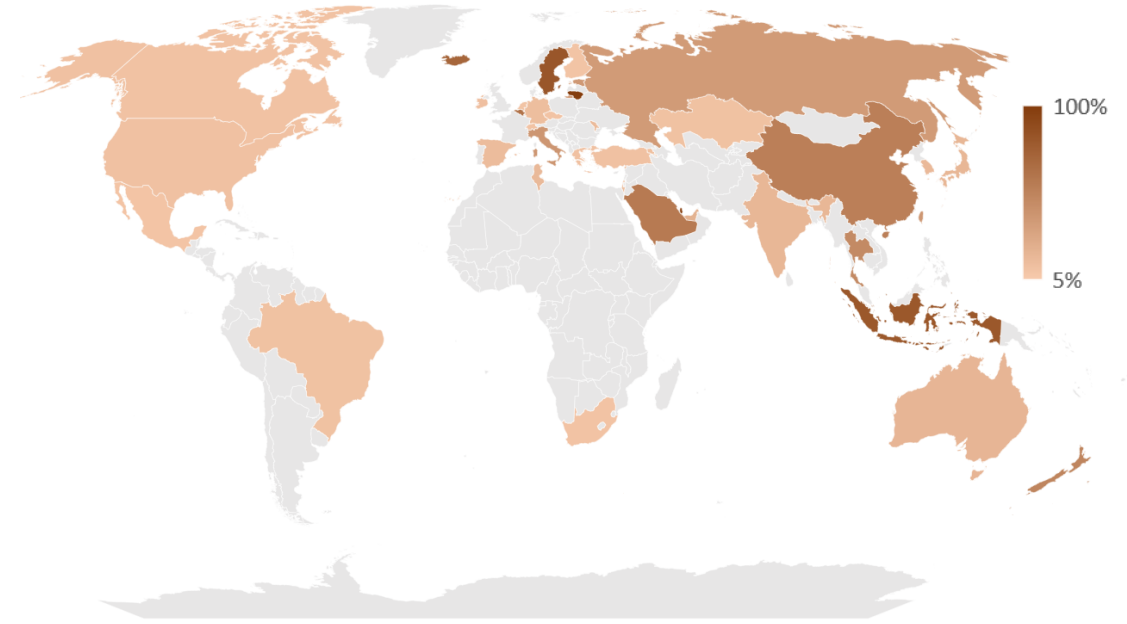
# mMTC share of connections will vary significantly by application and geography

mMTC and non-mMTC LPWA connections, selected applications 2033
[Source: Transforma Insights, 2024]

Legend: mMTC, non-mMTC

5G mMTC share of smart meter gross additions 2021-2024
[Source: Transforma Insights TAM Forecasts, 2024]

100%
5%

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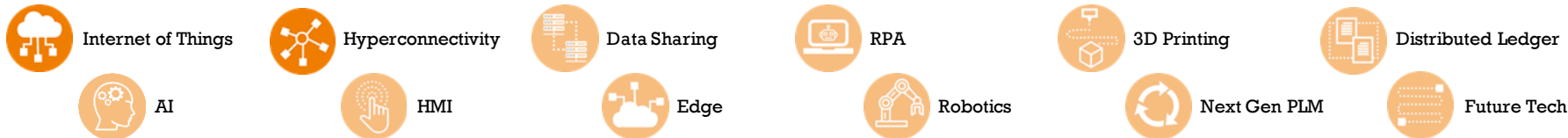
IoT presents many opportunities for RedCap

5G requirements of Top 32 cellular IoT application groups
[Source: Transforma Insights, 2024]

Legend: eMBB, mMTC, URLLC
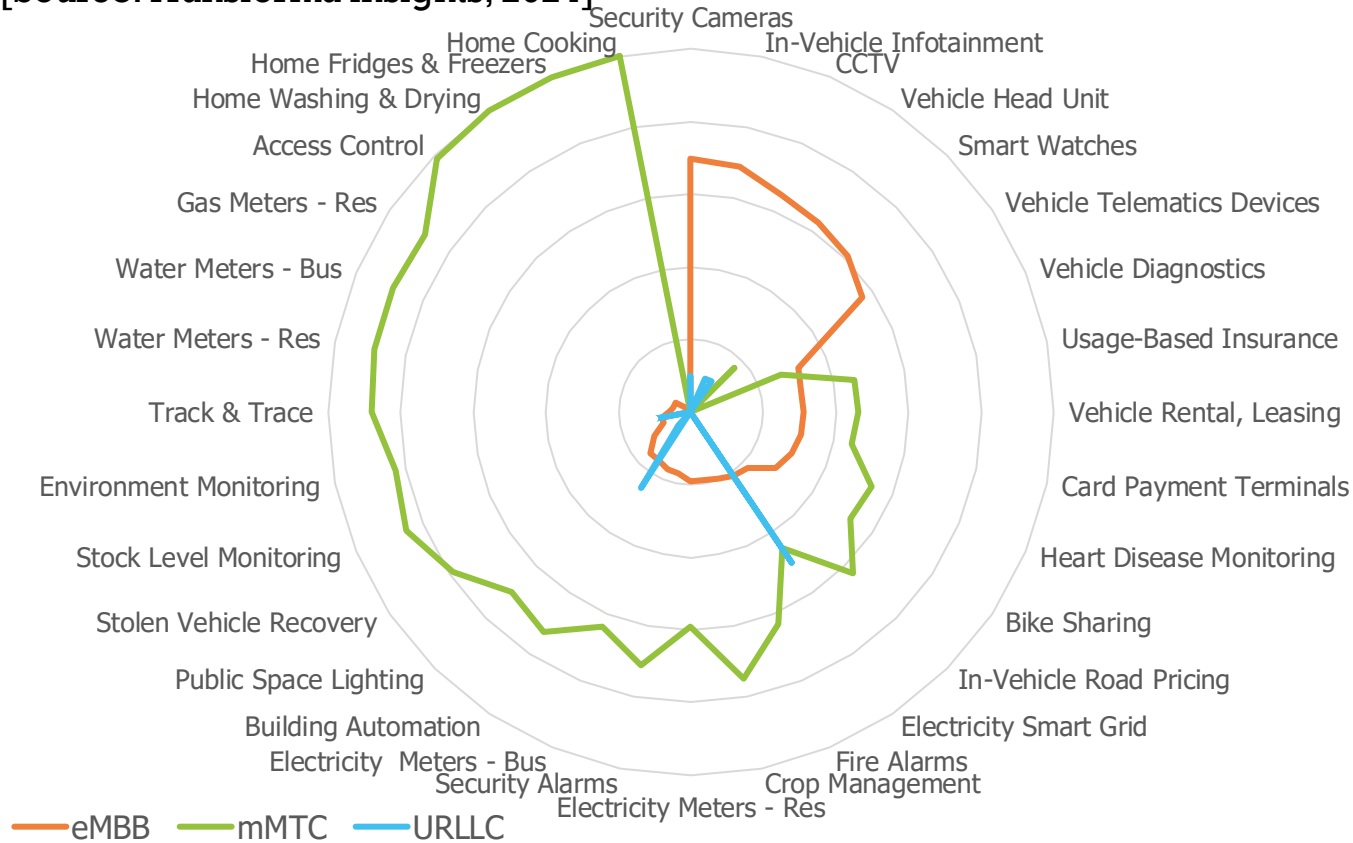
- Suitable substitute for many eMBB-type connections.
  - 4G+ capabilities on a 5G core.
  - Futureproofed vs. 4G.
- For mMTC connections:
  - Opportunity to enhance data throughput.
  - Power Saving Mode preserves battery life.
- Can't substitute for (~1ms) URLLC connections but can achieve <100ms.

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