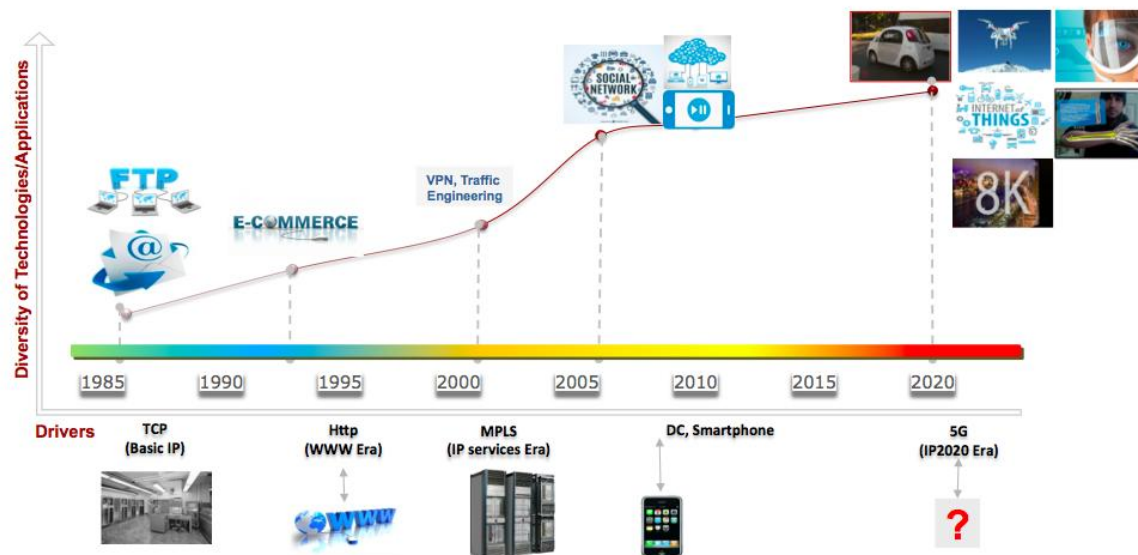


A stylized world map is centered on the image, rendered in a light blue color. The map is overlaid with a network of glowing blue lines and dots, representing global trends and connectivity. The lines are curved and connect various points across the globe, suggesting a global network or data flow. The dots are small, bright blue spheres that appear to be nodes in this network. The background is a dark blue gradient, and the overall aesthetic is futuristic and technological.

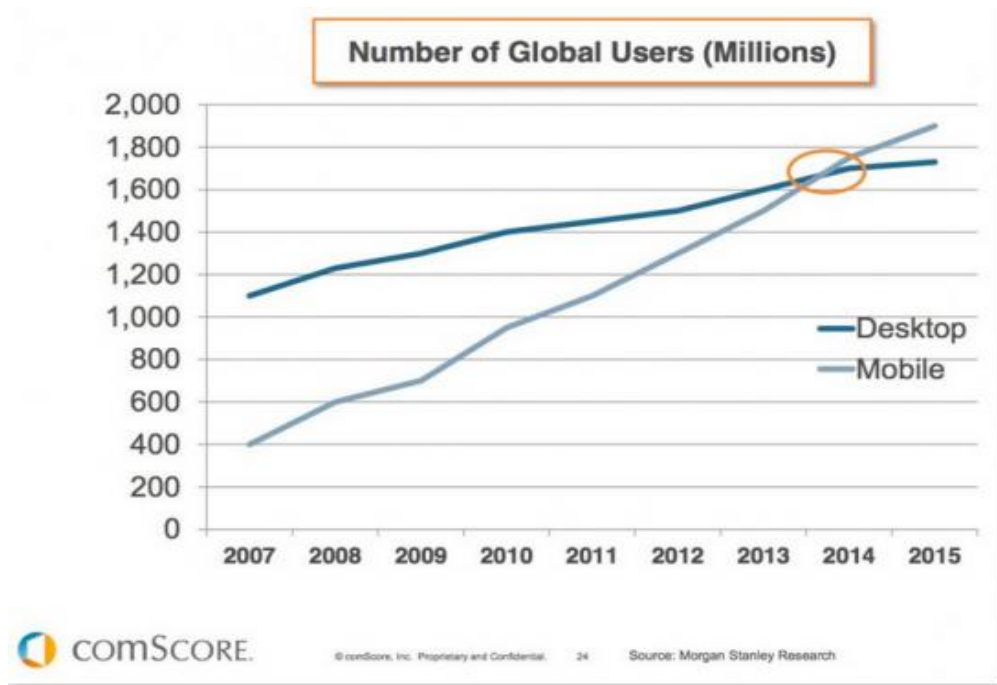
■ Trends

Trends and Landscape ...

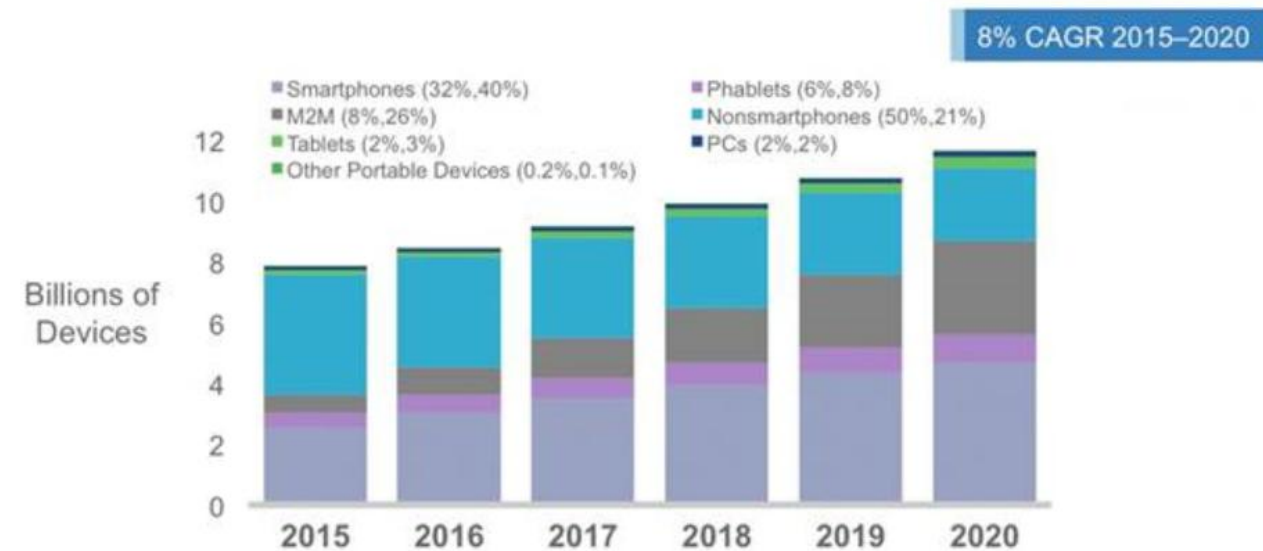
- The world is connecting faster than ever before
- The physical and digital world are getting intertwined.



Trends – Number of devices mobile vs fixed



Global Mobile Devices and Connections Growth



Figures in parentheses refer to 2015, 2020 device share.

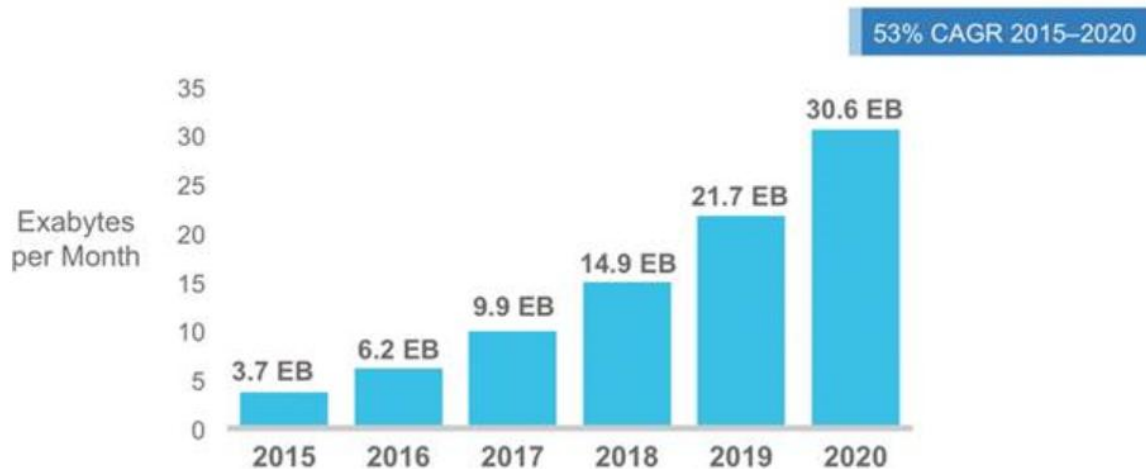
Source: Cisco VNI Mobile, 2016

- More than half a billion (563 million) mobile devices and connections were added in 2015
- By 2020 there will be 1.5 mobile devices per capita. There will be 11.6 billion mobile-connected devices by 2020, including M2M modules—exceeding the world's projected population at that time (7.8 billion).

➤ **Mobility is the new norm!**

Trends – Traffic Mobile vs Fixed

Cisco Forecasts 30.6 Exabytes per Month of Mobile Data Traffic by 2020

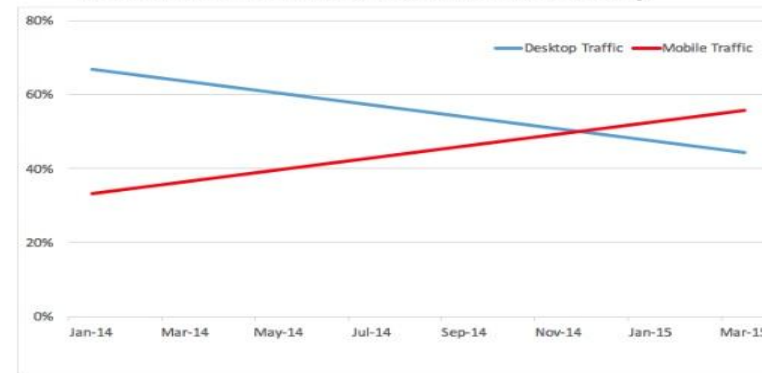


Source: Cisco VNI Mobile, 2016

- Global mobile data traffic grew 74 percent in 2015
- Mobile video traffic accounted for 55 percent of total mobile data traffic in 2015
- Three-fourths of the world's mobile data traffic will be streaming video by 2020

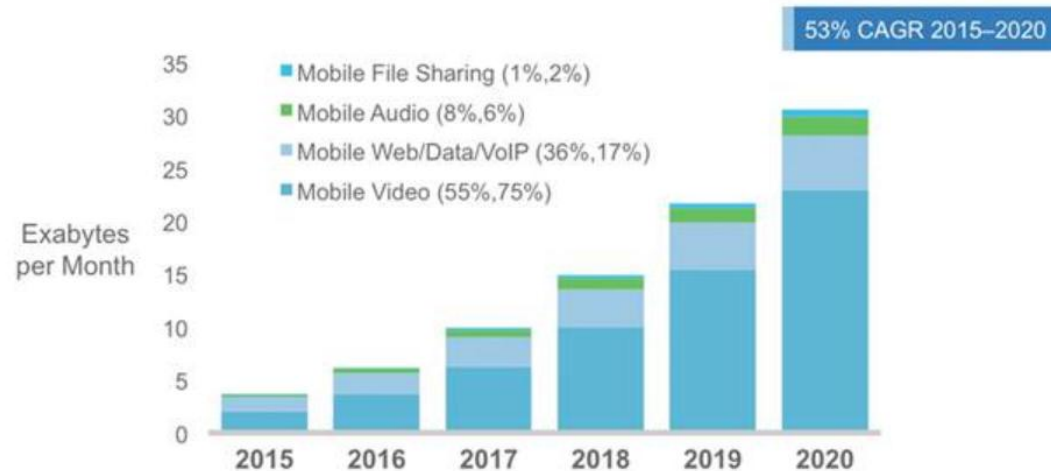
Mobile Traffic Passed Desktop in 2014

Percent of Internet Traffic, Mobile vs Desktop



Taboola
Content You May Like

Mobile Video Will Generate Three-Quarters of Mobile Data Traffic by 2020

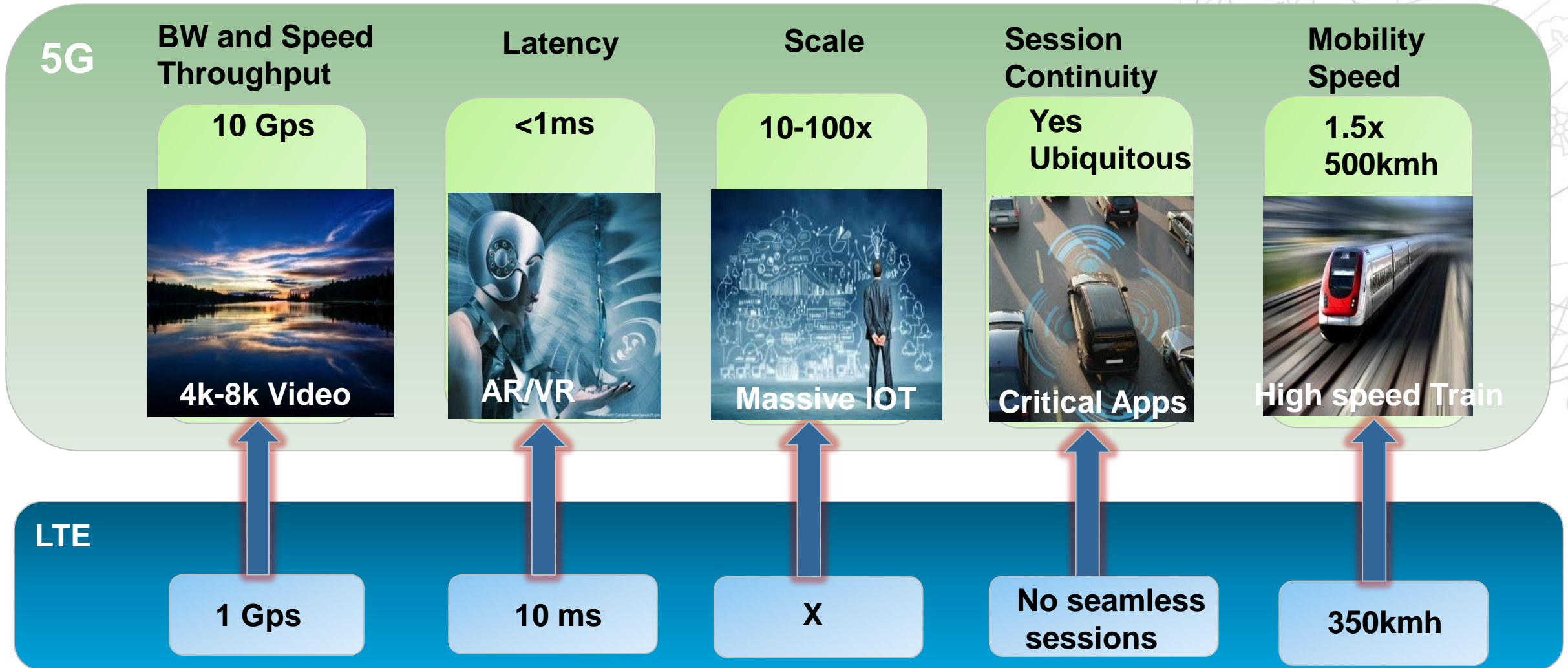


Figures in parentheses refer to 2015 and 2020 traffic share.
Source: Cisco VNI Mobile, 2016



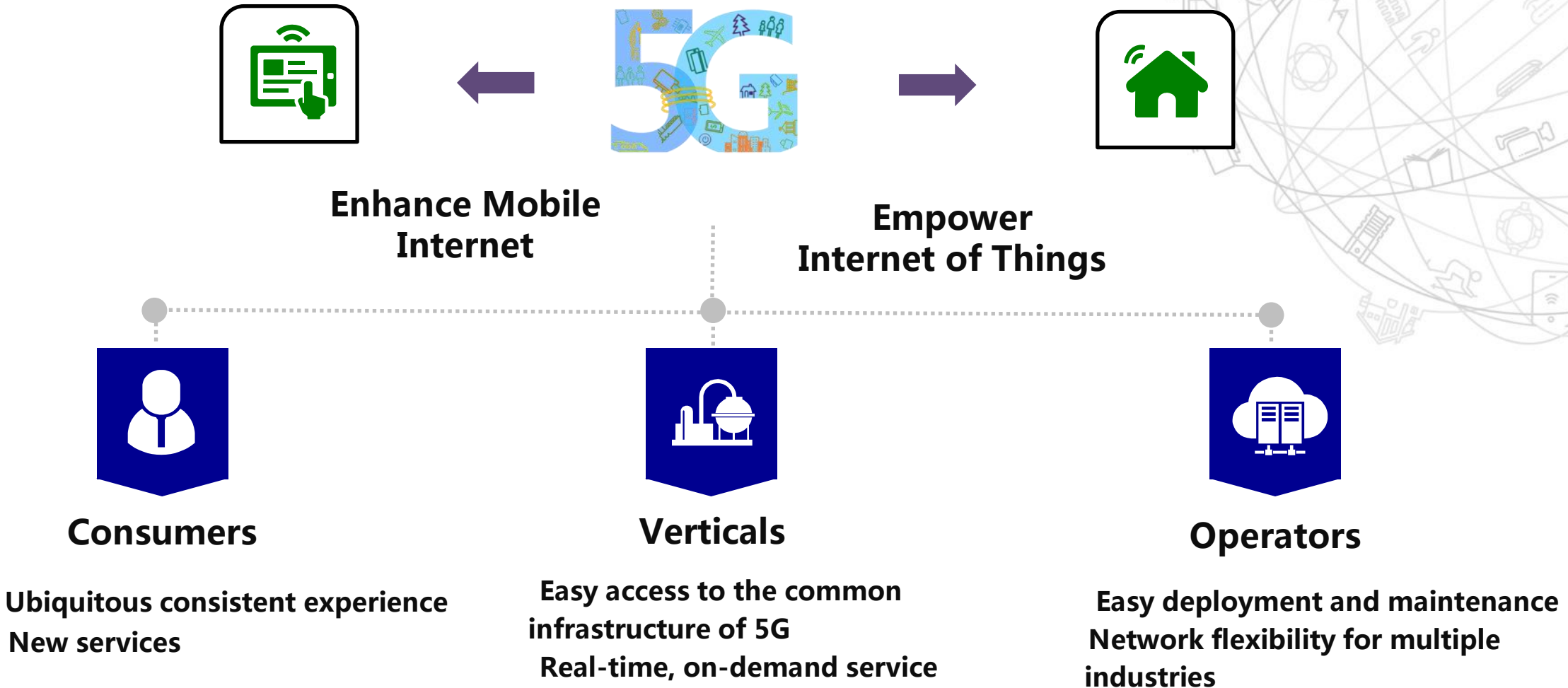
■ Driving Forces

5G Redefining Mobility experience in Future Networks

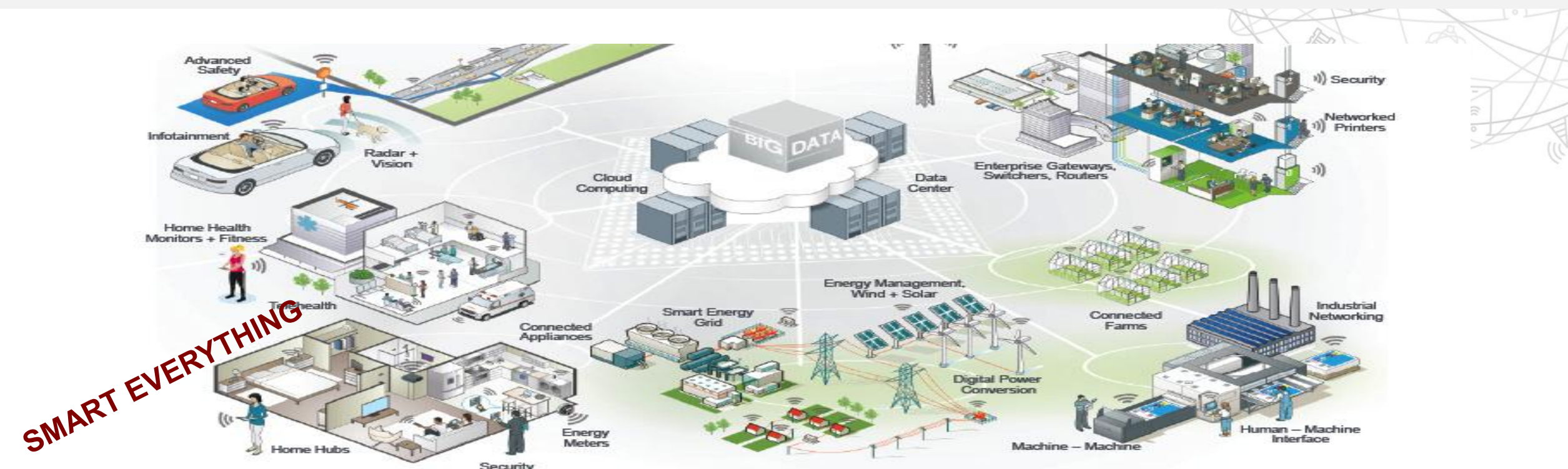
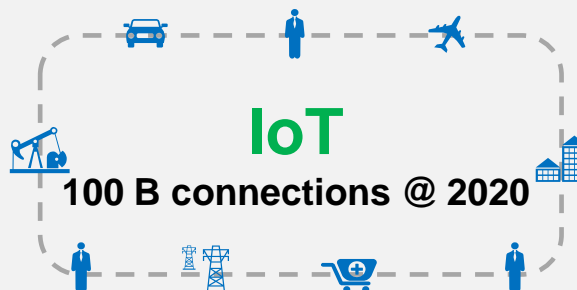
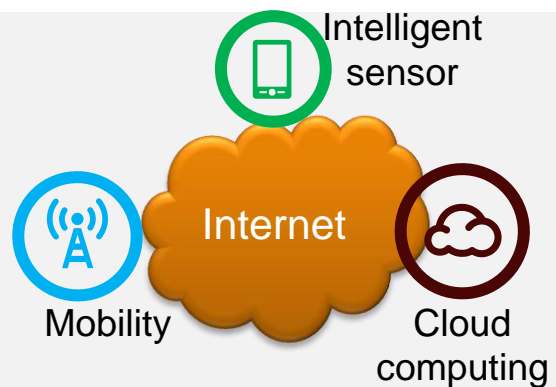


■ Various Sources for Data: Huawei – 5G: A technology Vision & 3GPP

5G – New opportunities for industries



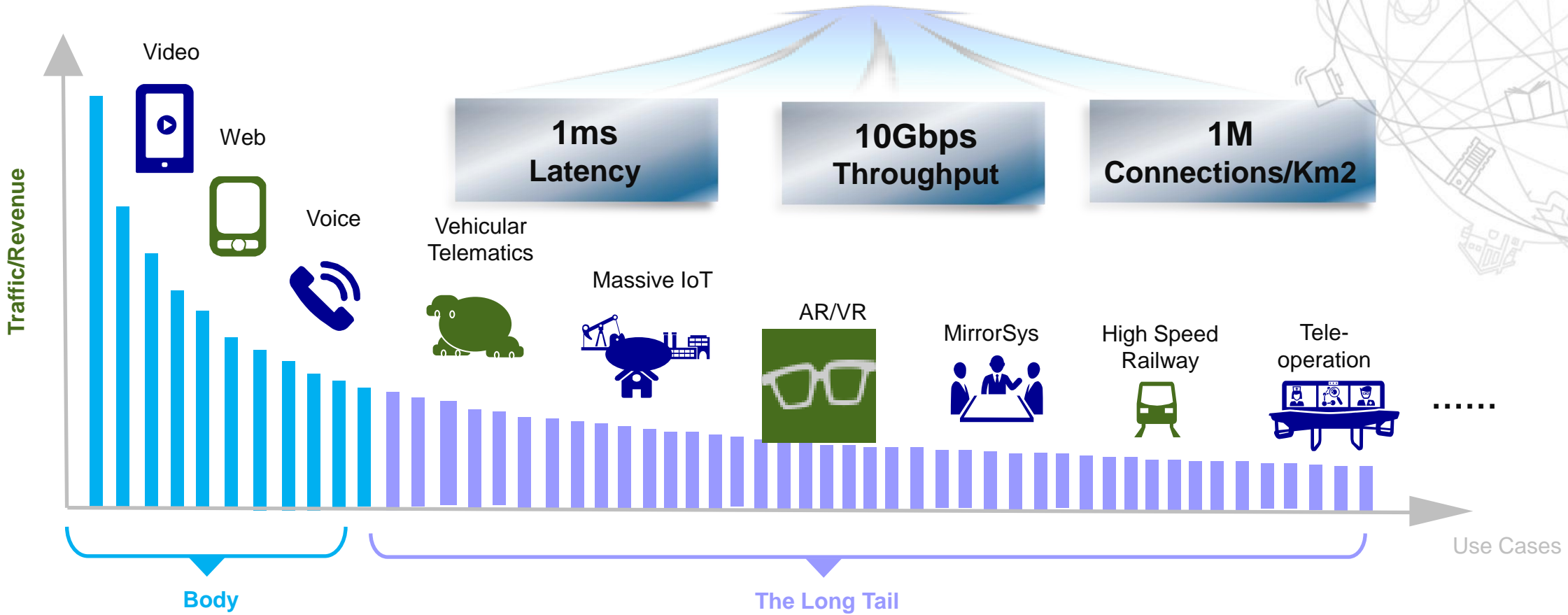
Everything meets Internet Era



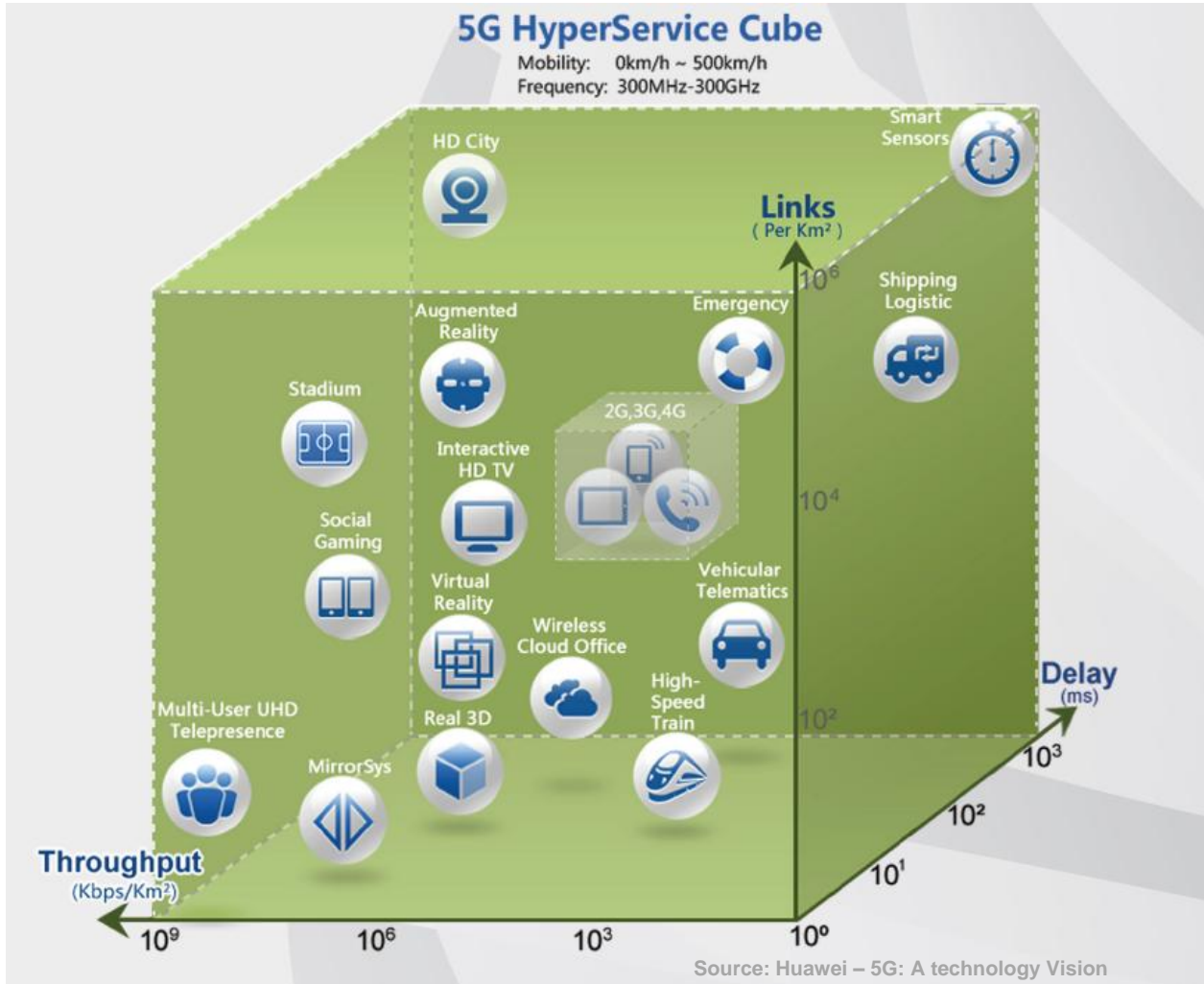
Long Tail Use Cases Drive 5G Technical Requirements



New Use Cases + New Business Models



Newer Applications - Multidimensional Requirements



■ Requirements are actually **n-dimensional**

- Low power device
- Security
- Context awareness
- Retention of profile
- Single signon
- QOS
- Session continuity
-



■ The Digital Connected Society

Mobile Data Services as a Pillar to New Experiences in 2020



Near Reality Experience



Tele-surgery



Robot Assisted Care



Connected Cars
Collision avoidance



Drone delivery



Internet Of Things

Immersive Technologies

Tactile Networks

Smart Mobility

Artificial Intelligence

Wearables, sensors, Monitors

Always On

Pervasive bandwidth

Near Zero Latency

No perceived data loss



Industrial Robots

Imagine



**Enhance
Connectivity/ BW**



**Enable Vertical
Industries**

Industry level: Embrace opportunities and transformation in a Digital Connected Society

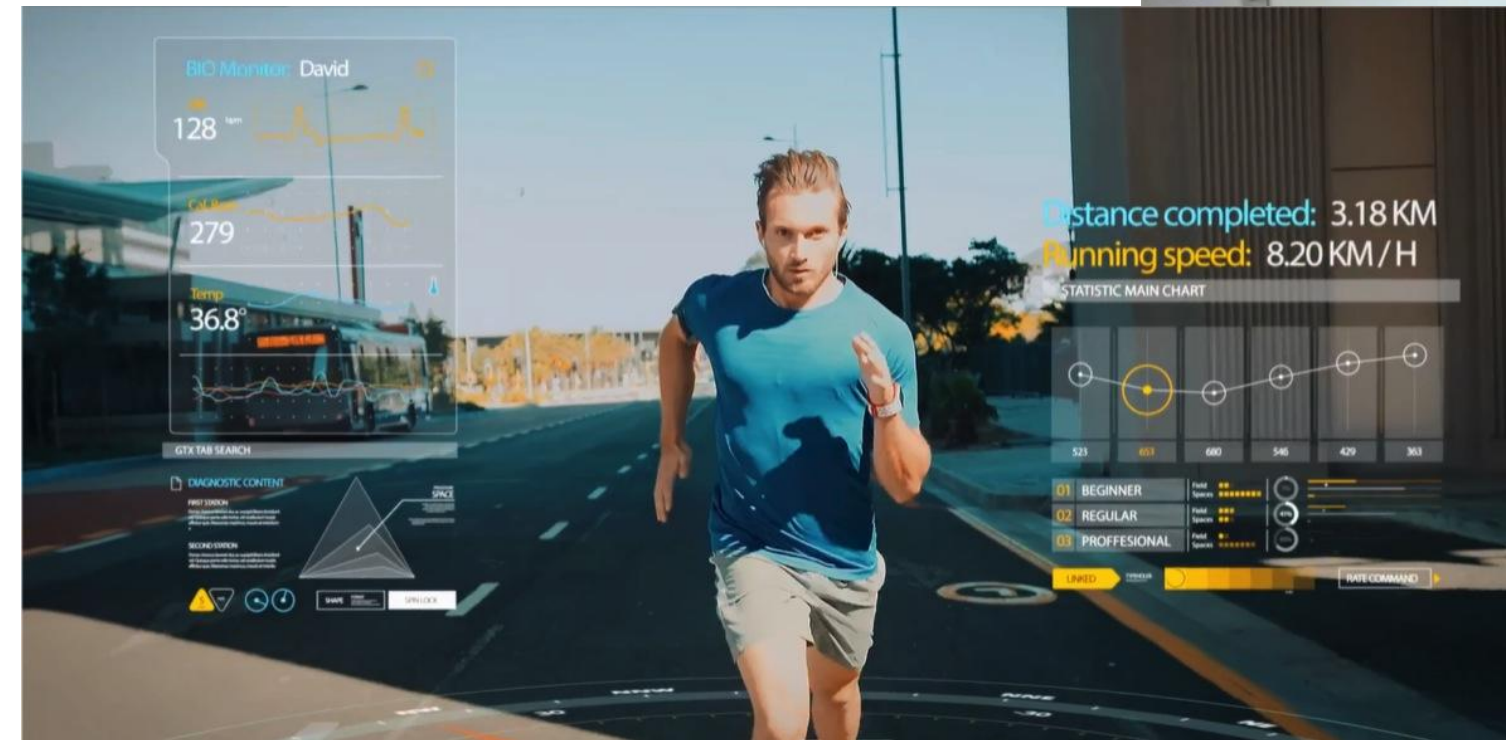
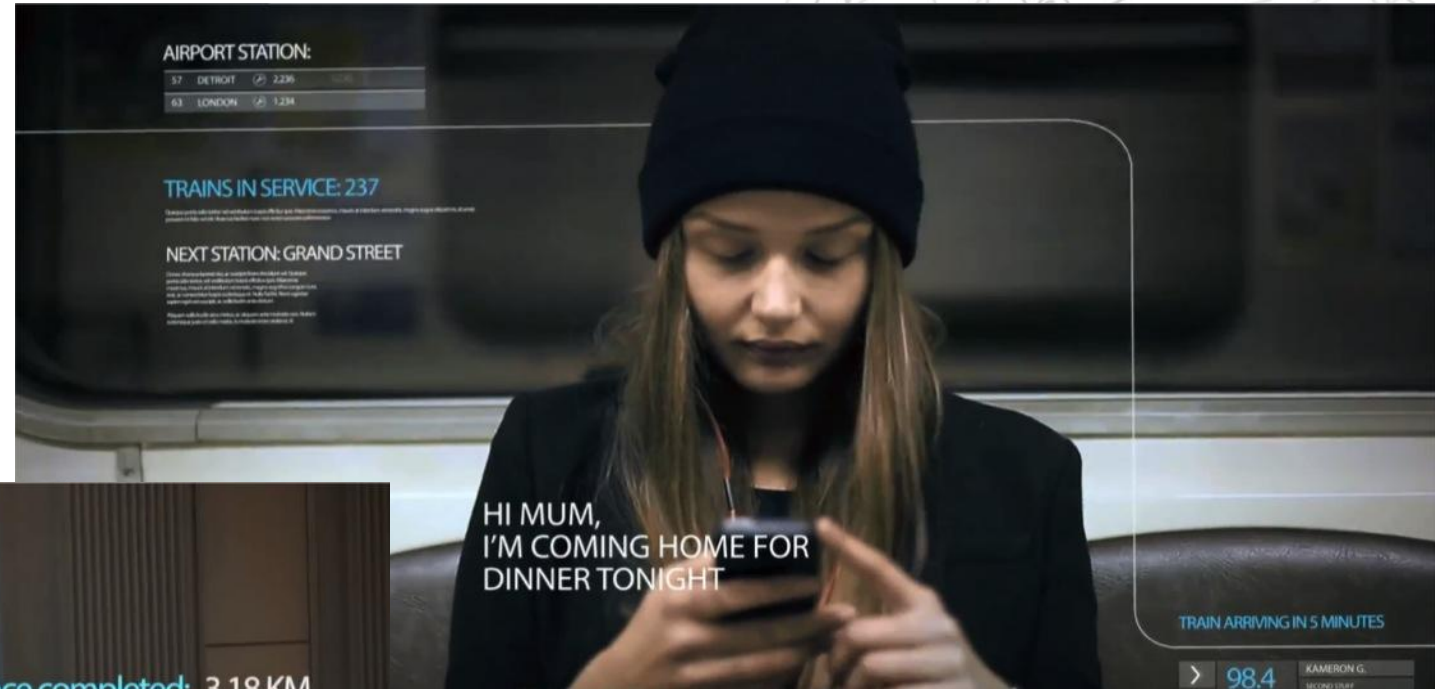


**Improved
User
Experience**

**Enable Ubiquitous
Access**



Always connected



Source Huawei: <https://www.youtube.com/watch?v=4z9i4q5t0Bo>

Connected Cars



Intelligent Transport Systems



Smart Agriculture

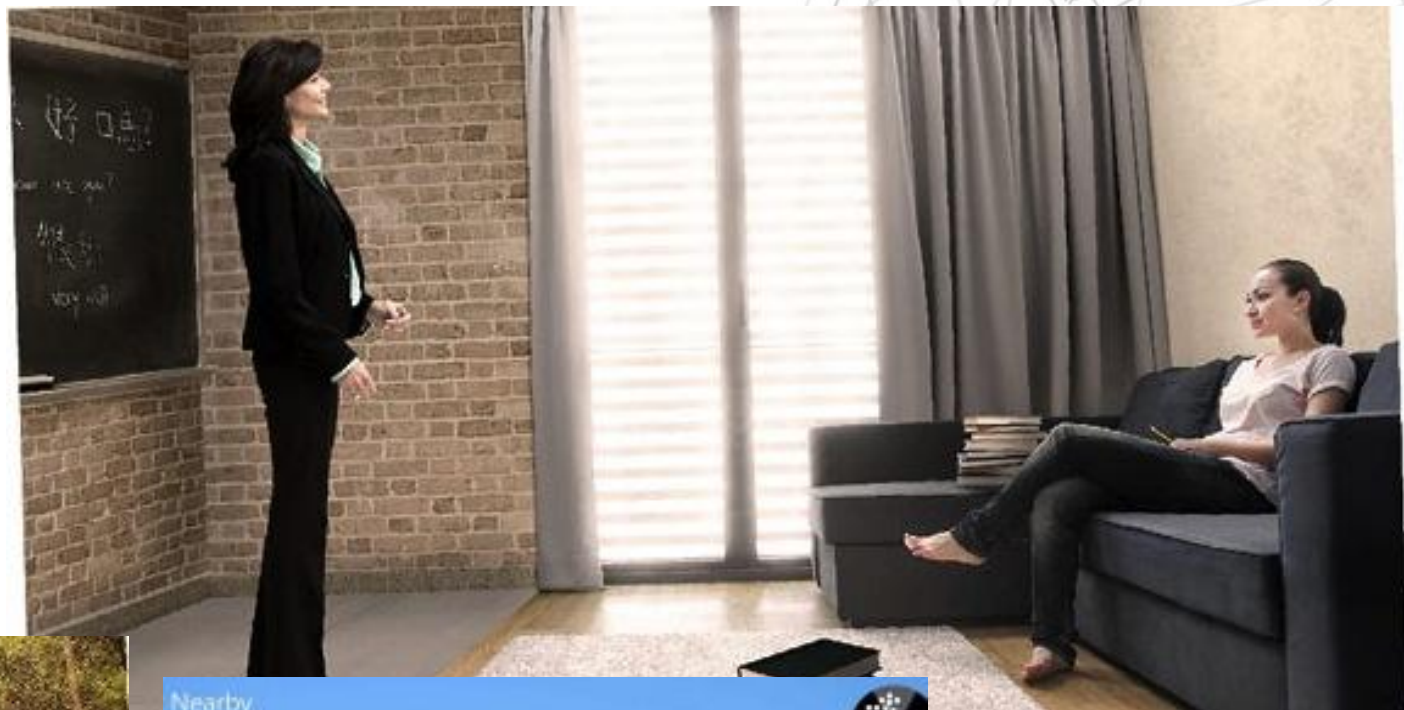


Tele-Healthcare



Source Huawei: <https://www.youtube.com/watch?v=4z9i4q5t0Bo>

Augmented Reality



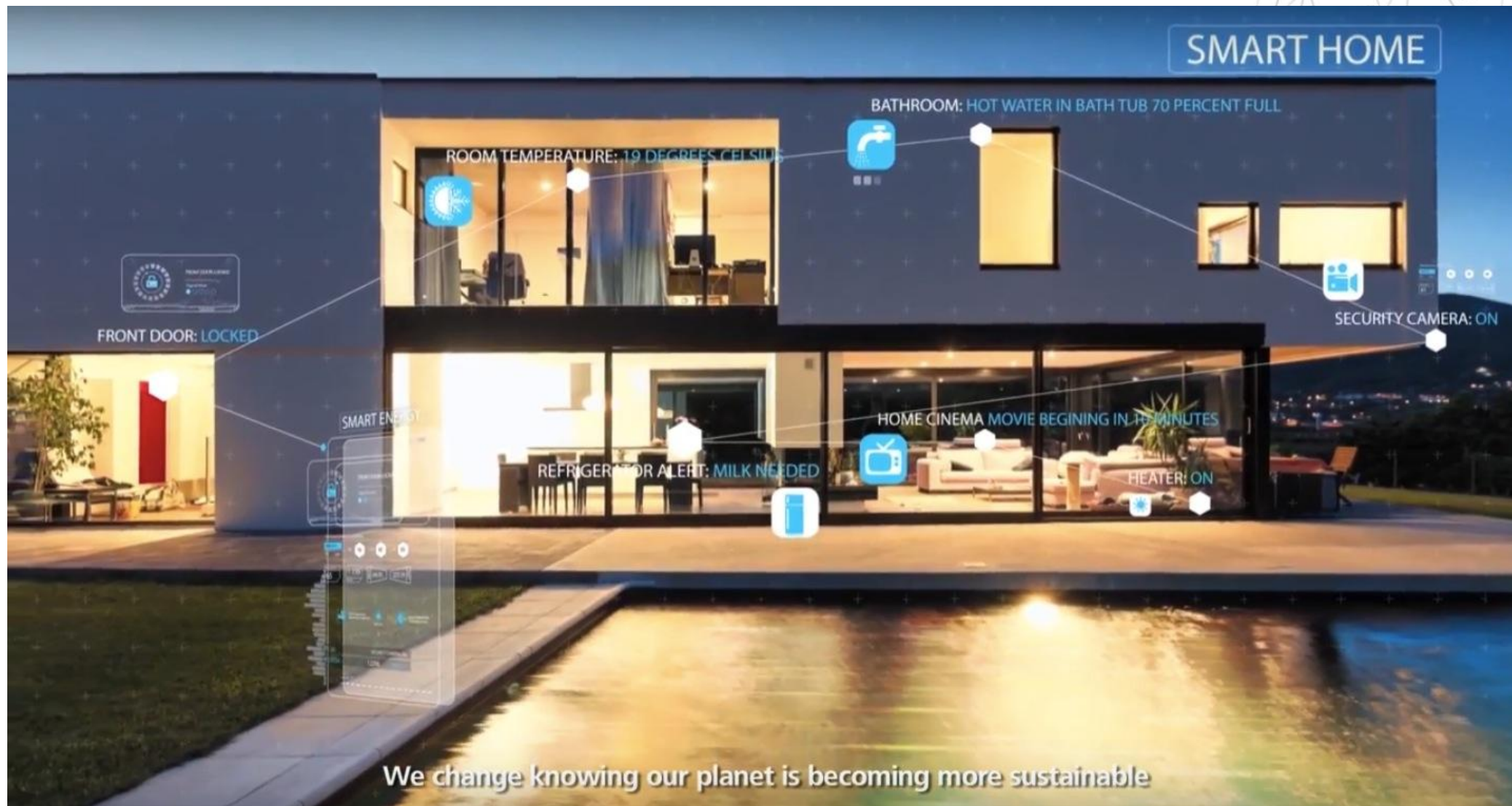
Virtual Reality



Source pic http://www.rmmagazine.com/wp-content/uploads/2014/09rm10.14_virtualreality.jpg

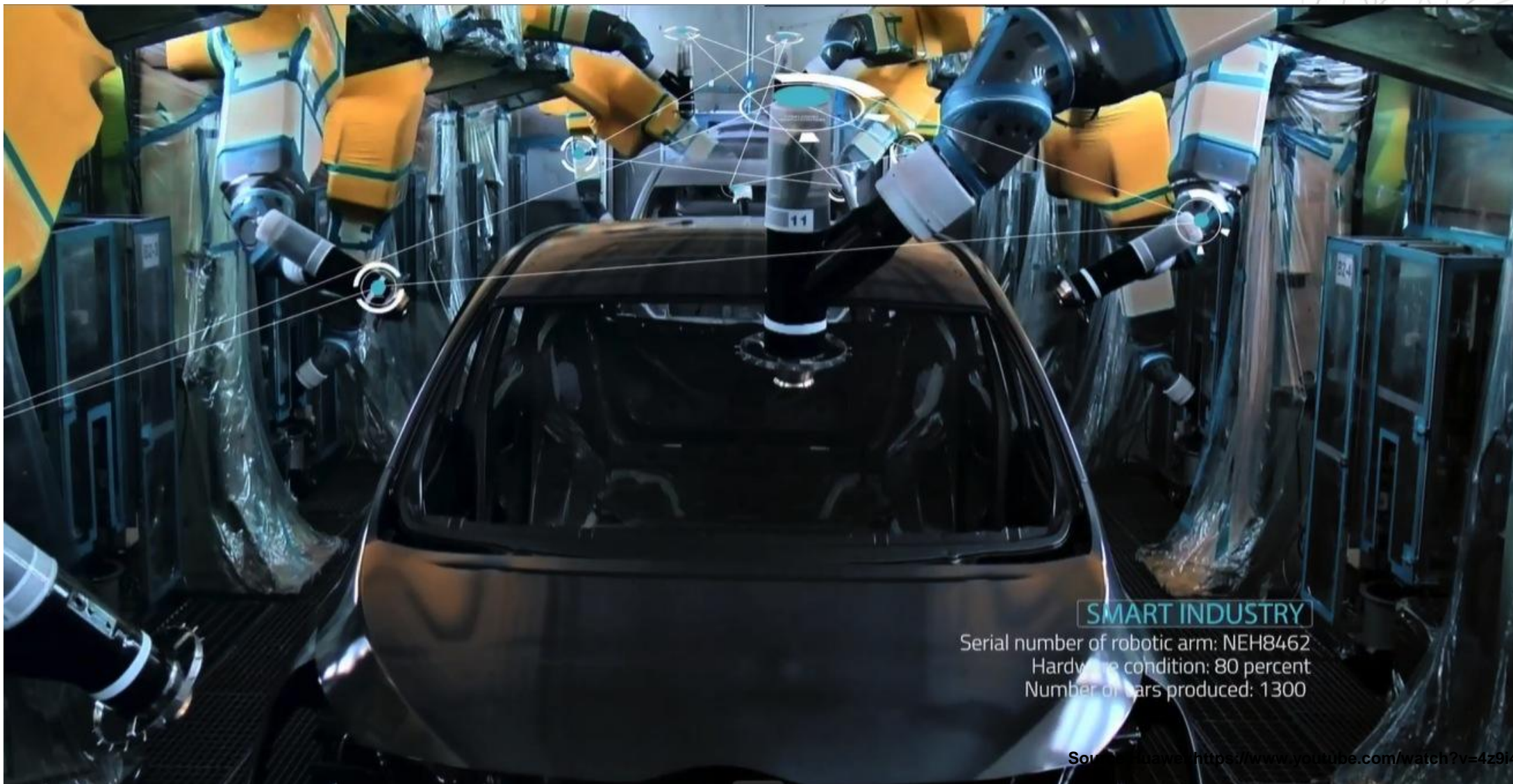
<http://www.businesswire.com/news/home/20160303005342/en/Flags-Magic-Mountain-Announces-North-America's-Virtual>

Smart House/City



Source Huawei: <https://www.youtube.com/watch?v=4z9i4q5t0Bo>

Smart Industry



Source Huawei: <https://www.youtube.com/watch?v=4z9i4q5t0Bo>



■ IP 2020

What's the next gen network?

Everything is



The Bliss Point is

Technology Aspect

- Simpler
- Faster to deploy
- Mobile

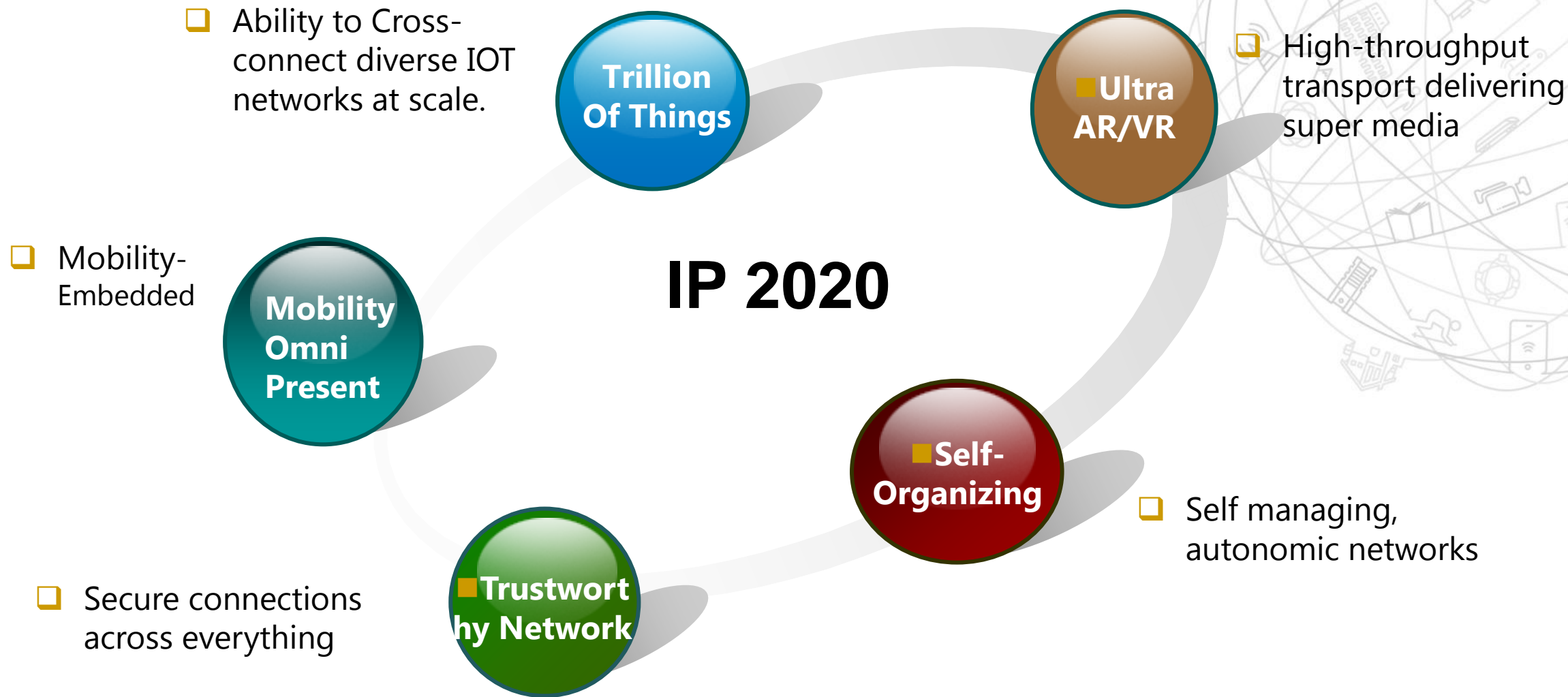
Financial Goals

- Almost zero-touch config (less opex)
- Virtualized (Less capex)
- Everything over anything (commodity HW)

User Experience

- Accessible anywhere
- New Experience
- Fast and smart services
- Self aware apps

What IP 2020 Delivers?



Tomorrow's needs and today's network ...

The adoption of 5G with its new requirements are going to challenge the infrastructure.

- **Scale**
 - **Mobility (large range and fast)**
 - **High throughput and low latency**
 - **Security**
 - **Self- Aware/Managing Network**

 - **Energy preservation and low power consumption for devices**
 - **Deployment over a heterogeneous Access**
 - **Session continuity**
- **The Internet was originally designed as a static network.**
 - **The EPC/RAN interconnects with the core IP network - hybrid of 2 Architectures**
 - **Good enough for 5G and beyond?**
 - **Scale with more density?**
 - **Bigger “pipes” & Faster CPU vs Green**
 - **Context Awareness?**
 - **Identity Awareness?**
 - **Session continuity?**

ID Oriented Networks in a nutshell

Basics

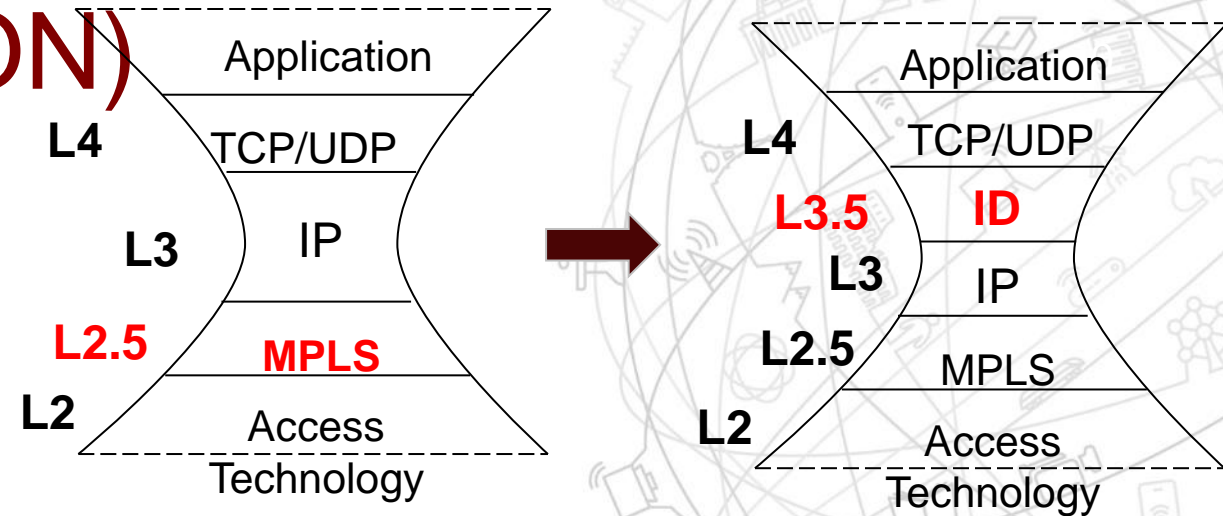
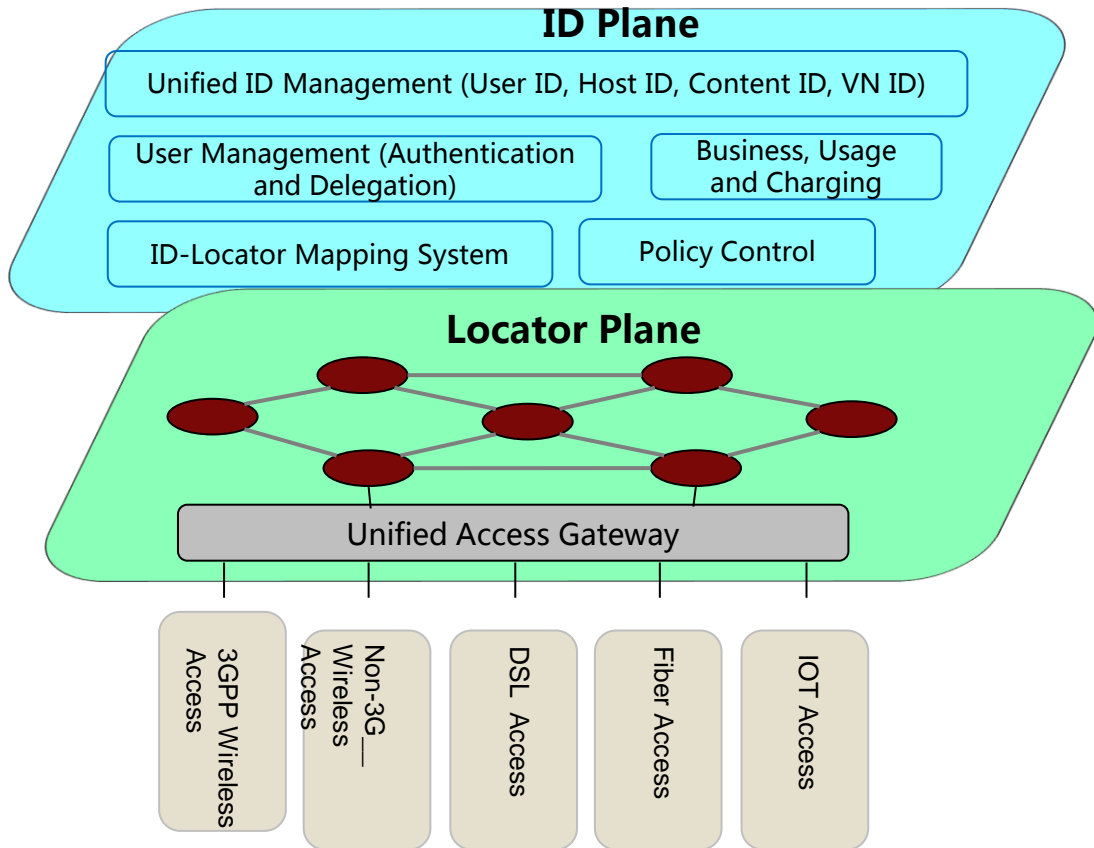
- Principle : Need to dissociate the name and location and make them independent.
- ID can be the name of a node, an app or anything
- The Identifier movement is transparent to the higher layers.
- The forwarding is achieved by binding the ID with an ip address or locator.

➤ One user can have multiple IDs or

Properties

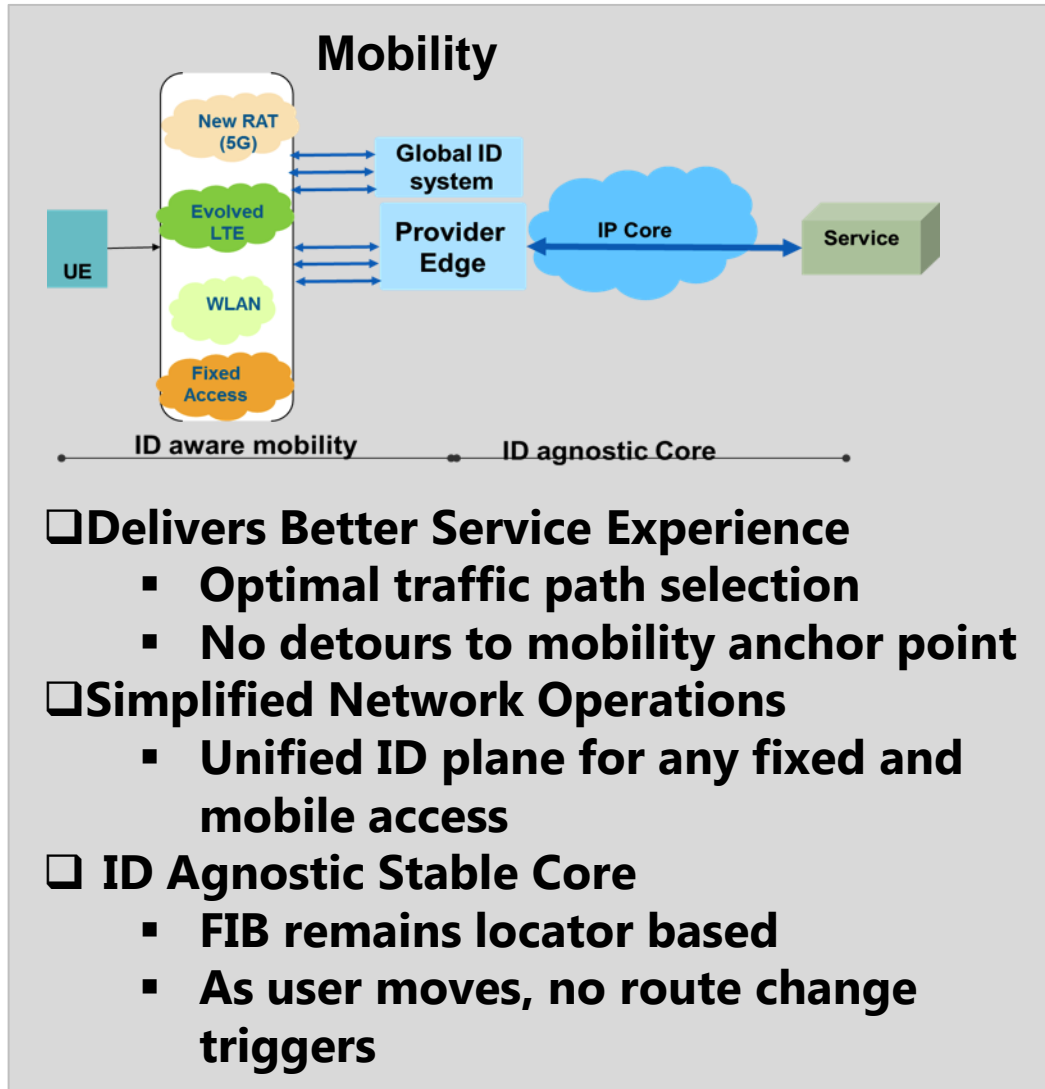
- Native mobility
- Apps can be based on ID
- Addresses multi-homing ID have global significance(scope),
- Context awareness based on ID profile
- Security also can be ID based
- Fast deployment – Reuses already deployed and working (if IP)

ID-Oriented Networking (ION)



- No need for clean slate
- Reduced Capex and Opex
- **Global Reachability Possible: Everything, allocated with a unique ID,**
- **Innovation Speedup : Locator plane as a transport layer, while ID plane as a service and business layer. New services and business can be developed on top of ID without changing the underlying locator plane.**
- **Map and Encapsulate packets which can run on an IP core**

ION Unlocks New Opportunities Beyond Mobility

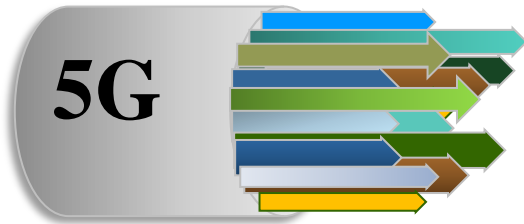
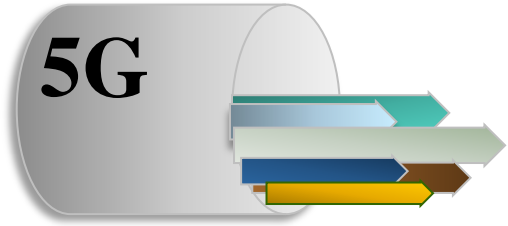


Benefits and Opportunities



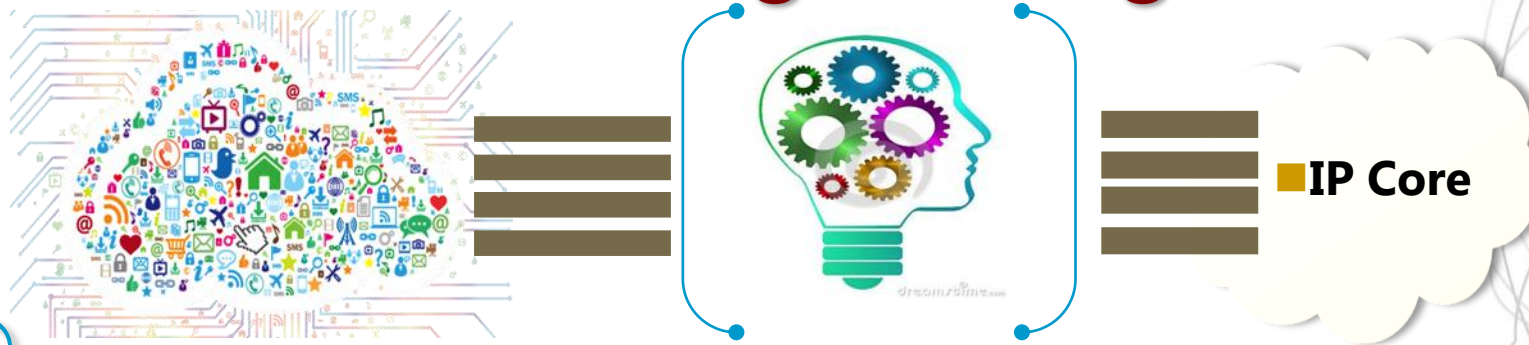
- Context Aware**
- Security based on ID**
- Communication**
 - P2P Communications without servers
 - Cross-silo communication possible
 - ID based Group-communication (PIM free)
- Accelerated applications deployment**
 - Network/Topology change agnostic
 - Focus on business logic not network
- Refined Edges**
 - Fine grained ID aware TE, Policy, LBs
 - ID based End to End Security

Throughput Matters!



- ❑ User experience is more related to the session throughput.
- ❑ The session throughput is dependent on TCP which is an end to end solution
- ❑ Links of varying quality can be perceived by TCP as congested causing unnecessary throttling
- ❑ Throughput issues which will not work for UHD and other sensitive applications

Self-X Network for Intelligent Edge



Intelligent Edge

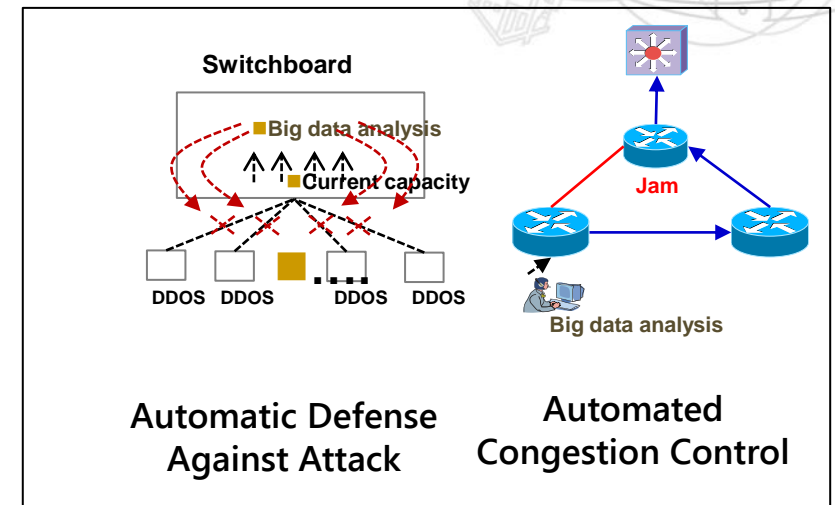
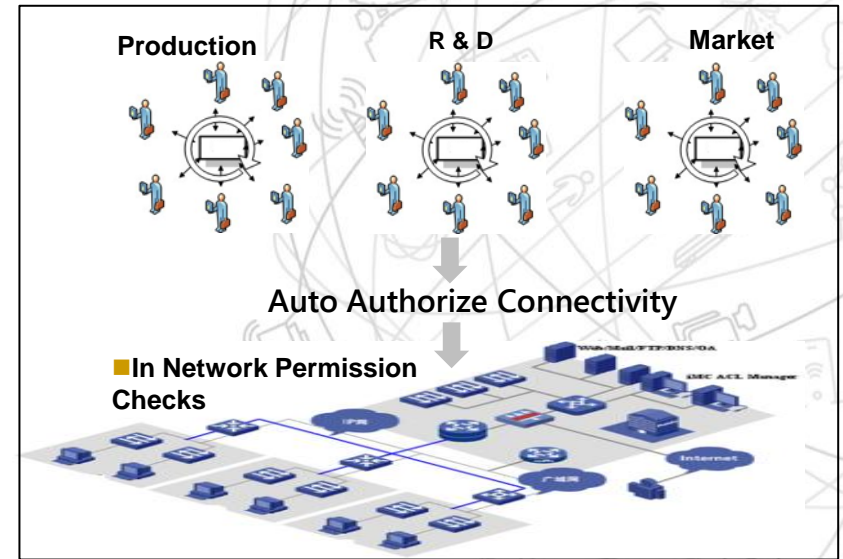
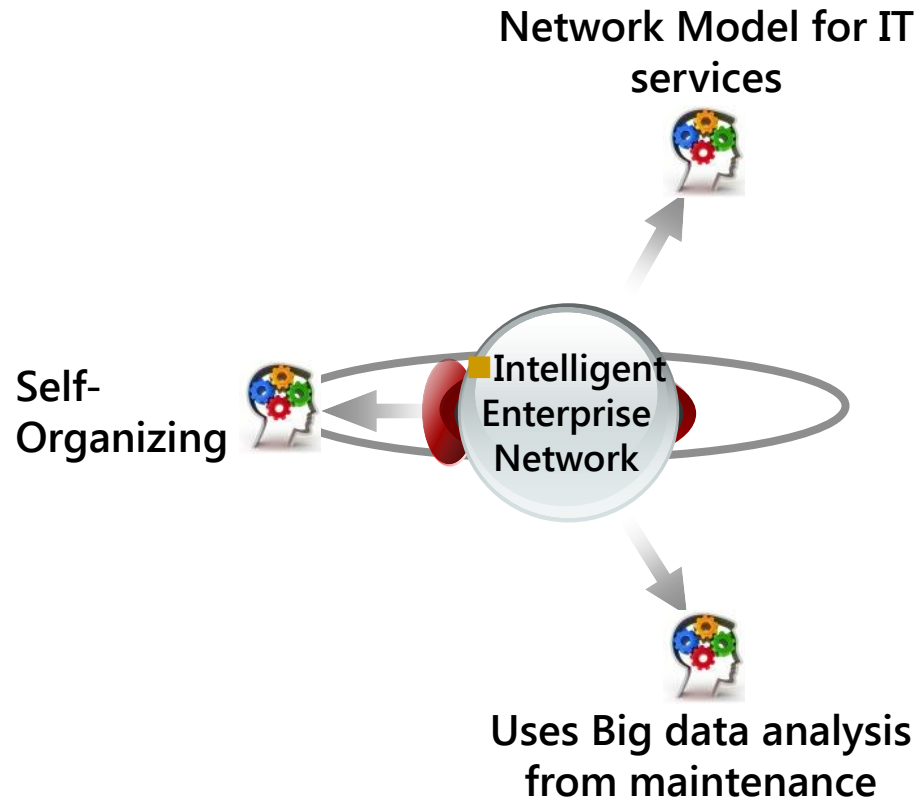
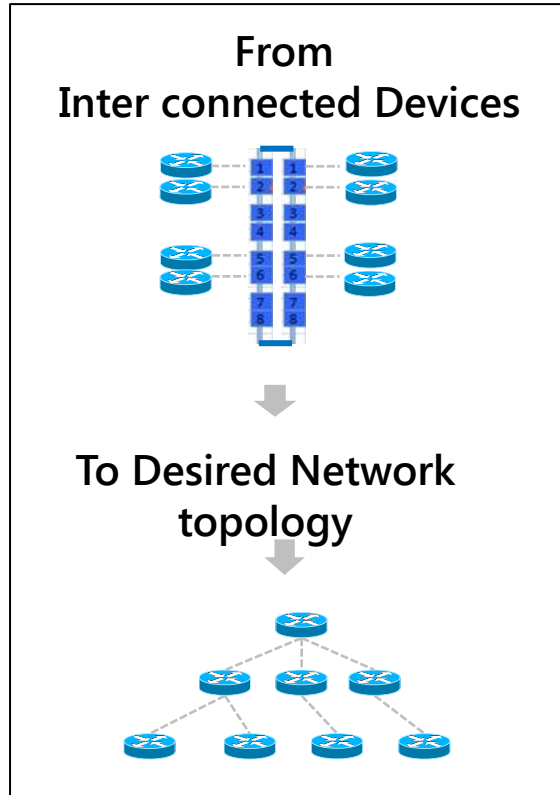
■ **Massive Connections**
■ (100b by 2025)

- **Light-weight network**
- **Self-organized network**
- **Thing to thing connect**



- **Network modeling based IT service and network node auto-connect**
- **Protocol and algorithm for self-organization network**
- **Auto detect, self protect for network attacking**
- **Auto monitoring, self-repair for network defects**

Self-X Enterprise Network: Zero config/maintenance



Eliminate Human Interaction. Move towards Big Data Analysis and Automation

A stylized world map is centered in the lower half of the image, rendered in a light blue, glowing, semi-transparent style. The map is overlaid with a complex network of glowing blue lines that form arcs and loops across the globe, suggesting global communication or data flow. Numerous small, bright blue dots are scattered across the map, particularly concentrated in the Americas, Europe, and Asia. The background is a deep, dark blue gradient. In the upper right quadrant, a semi-transparent dark blue rectangular box contains the text 'Concluding Remarks' in white, bold font, preceded by a small yellow square icon.

■ **Concluding Remarks**

IP2020

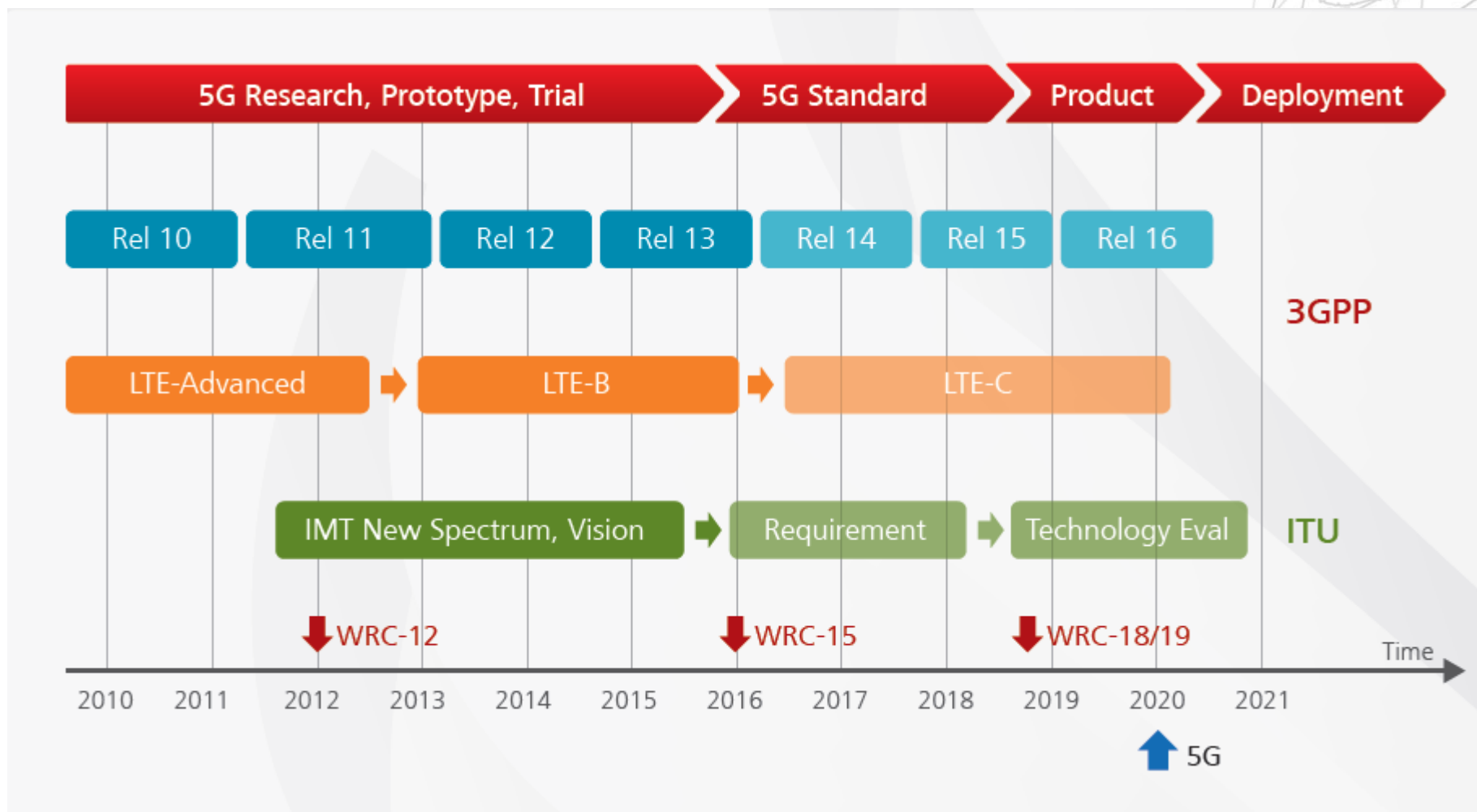
Applications	Requirement	Today	IP2020 proposals
IOT	Scale	IPv6 proposal for IOT	ID can be anything, free format from string to ipv4, ipv6, coordinates, names, temporary Id ...
Mobile devices	Mobility with low latency	IP mobile solutions have triangular routing issues	ID dissociation between Identity and location in IP Smart delocalized MS
AR,VR,4k 8k video	High Throughput	TCP has end to end congestion which impacts the throughput	Need to change transport Under discussions
Transactions, Privacy	Security	Ipssec solution expensive and not desirable	Native Security in network DNA. Encryption.
Low maintenance, self organizing network	Self Aware/Self Healing	none	Self-X, Machine learning ...

Where are we at regarding standards?

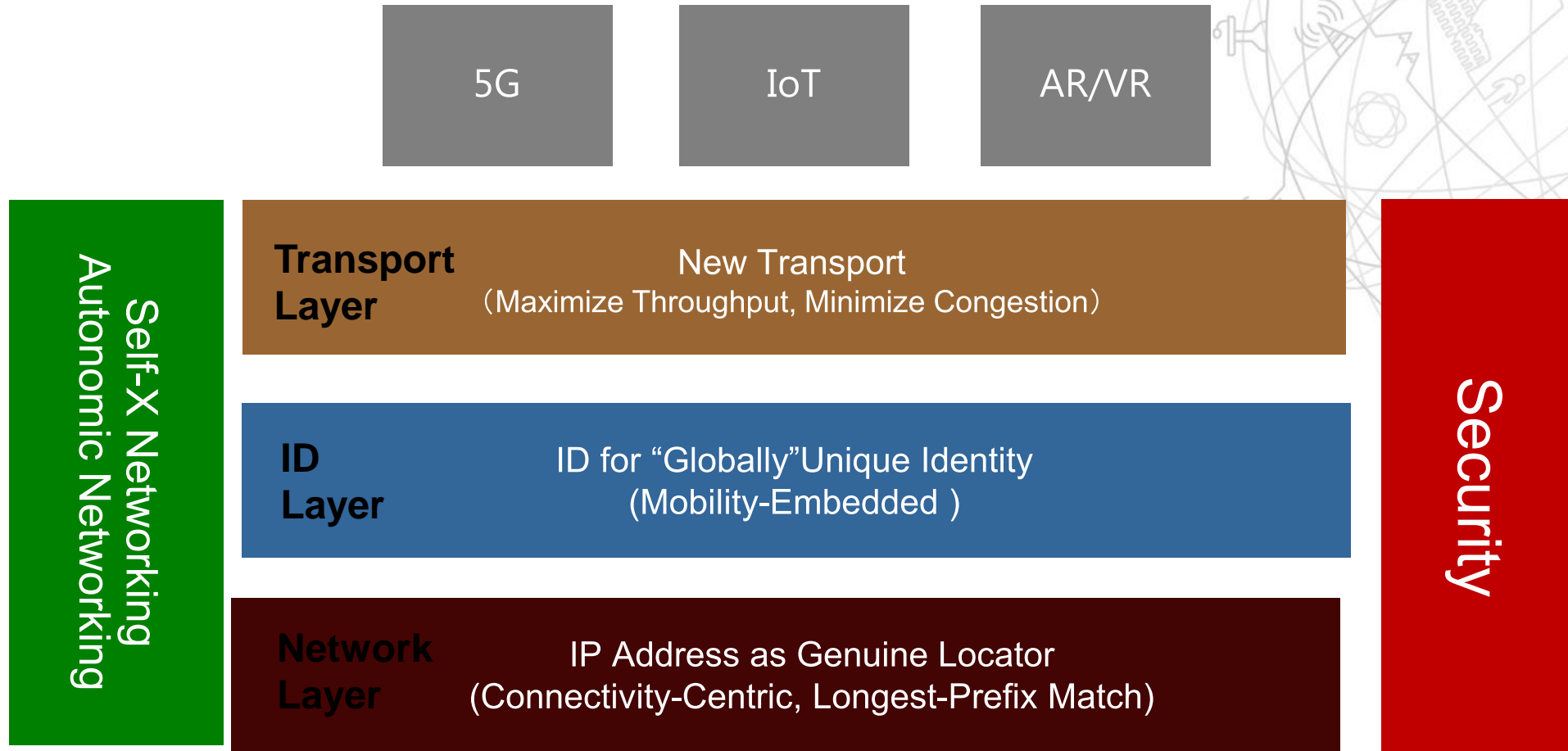
- **5G will intersect with many technologies**
- **A practical approach is necessary to aim for a deployment in 2020.**
- **It is a unique opportunity to have a holistic view and to simplify/flatten the topology.**
- **Multiple Standard bodies are working on different aspects**
 - ✓ **IETF/IRTF**
 - ✓ **3GPP**
 - ✓ **ETSI NGP**



The timeline for 5G (3GPP)



Protocols for IP 2020: A Summary



Thank you

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