IEEE IoT Vertical & Topical Summit for Agriculture

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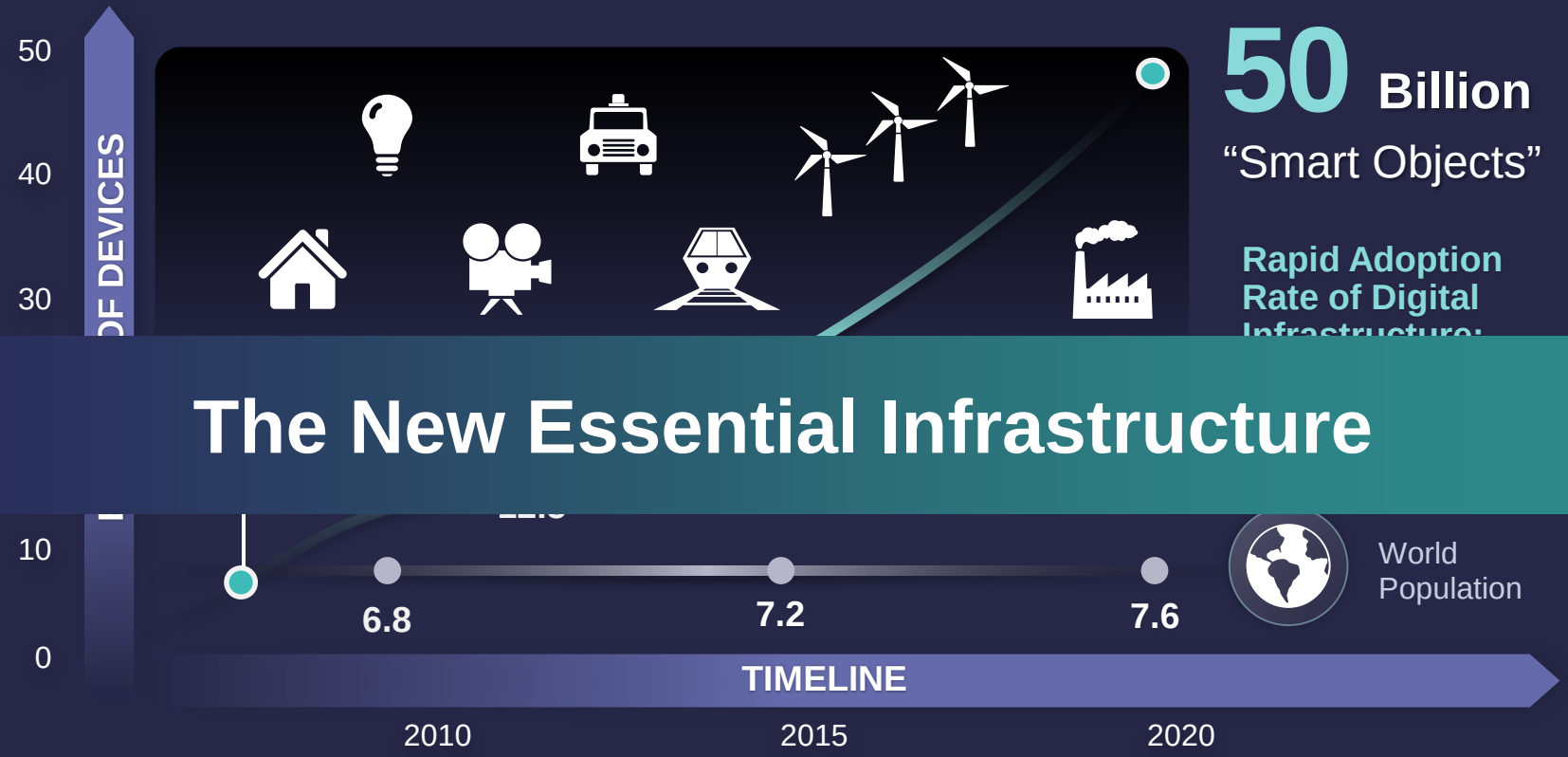
What Is the Internet of Things?

*"**The Internet of Things** is the intelligent connectivity of physical devices driving massive gains in **efficiency, business growth, and quality of life**."*

IoT Is Here Now – and Growing!



50 Billion

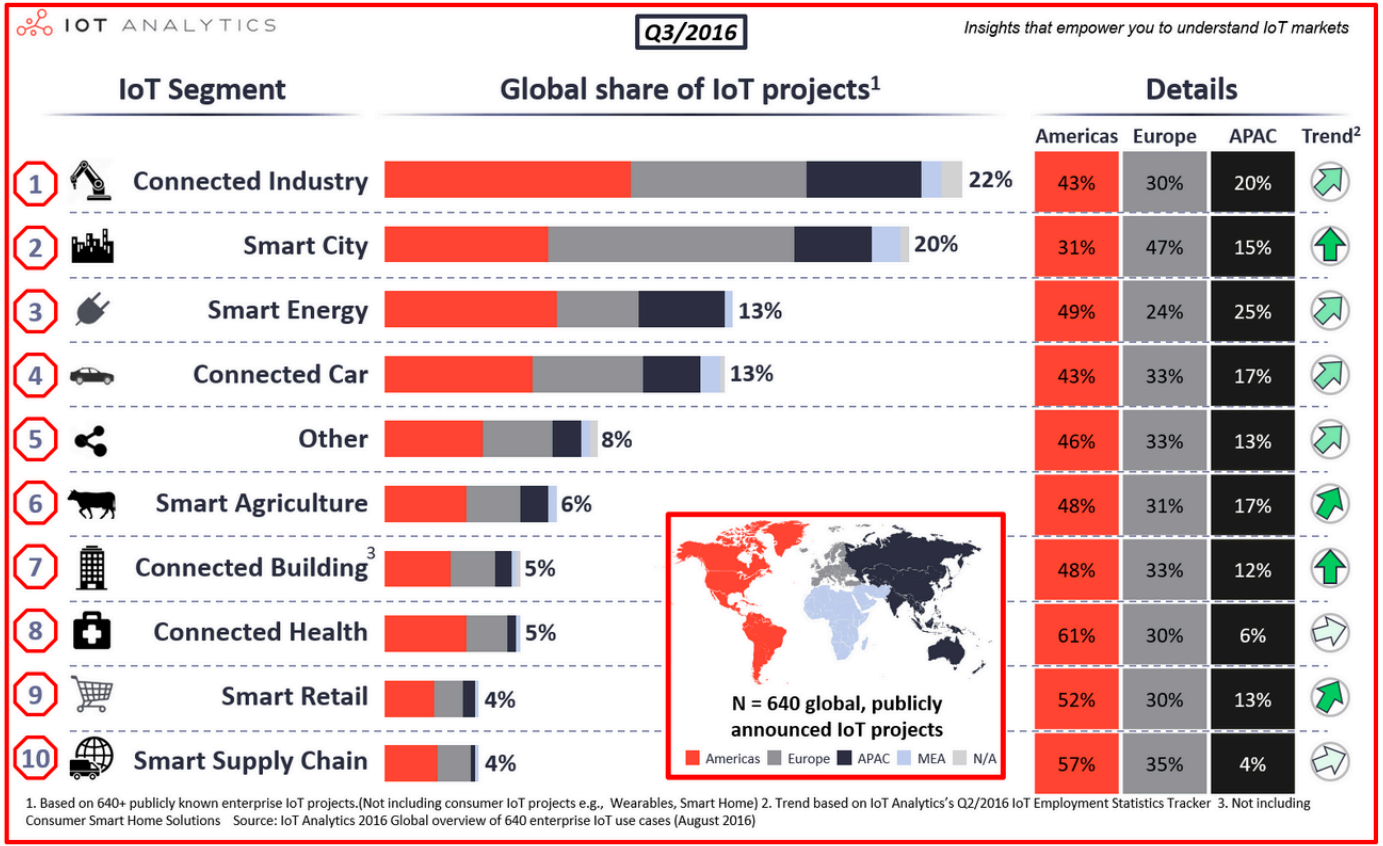
"Smart Objects"

Rapid Adoption Rate of Digital Infrastructure:

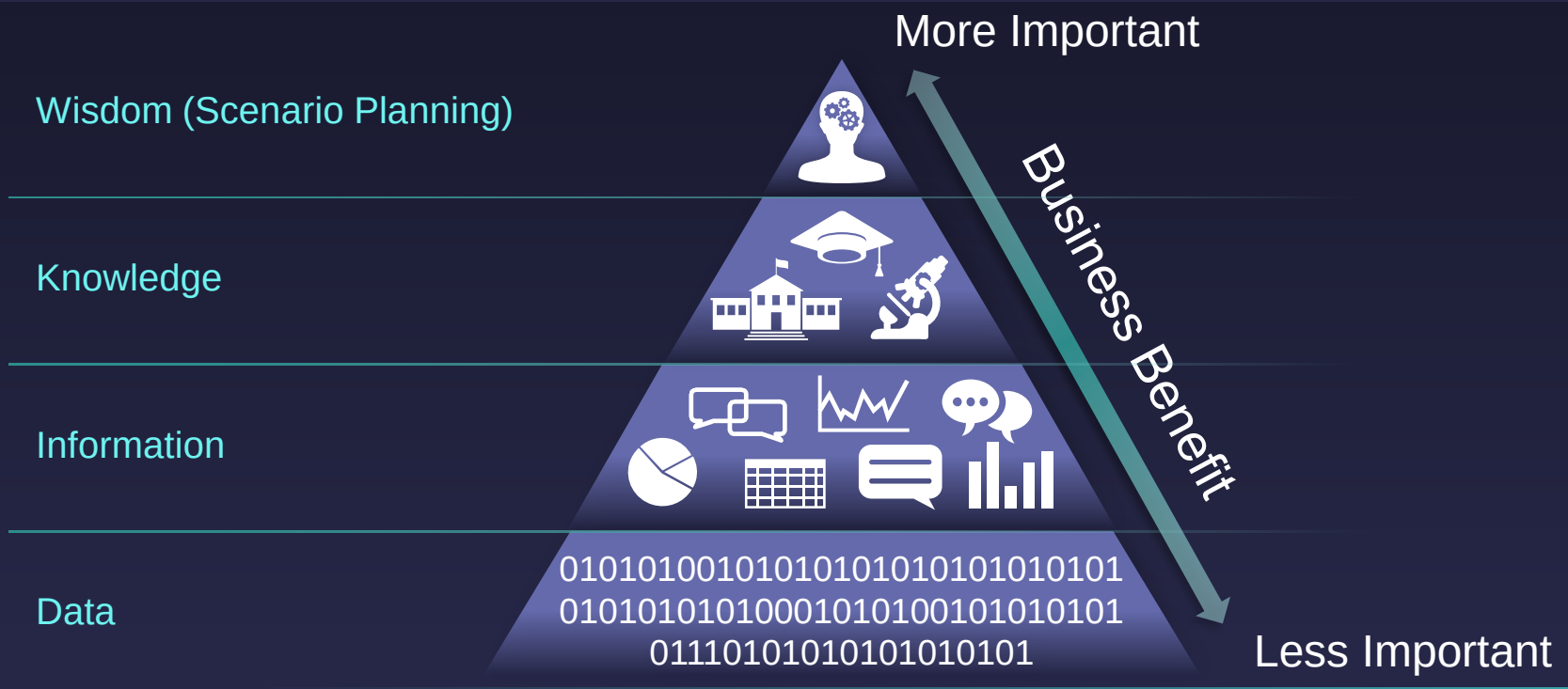
The New Essential Infrastructure

Source: Cisco IBSG, 2011

Smart Agriculture



IoT Transforms Data into Wisdom



Big Data becomes Open Data for Customers, Consumers to Use

But It Also Adds Complexity

Services

APPLICATION AND BUSINESS INNOVATION

Applications

- **Data Integration**
- **Big Data**
- **Analytics**
- **Control Systems**
- **Application Integration**

Application Interfaces

IoT CONNECTIVITY PLATFORM

Infrastructure Interfaces

IoT SPECIFIC NETWORK ELEMENTS

Device and Sensor Innovation

Cloud-based Threat Analysis / Protection

Network and Perimeter Security

Security

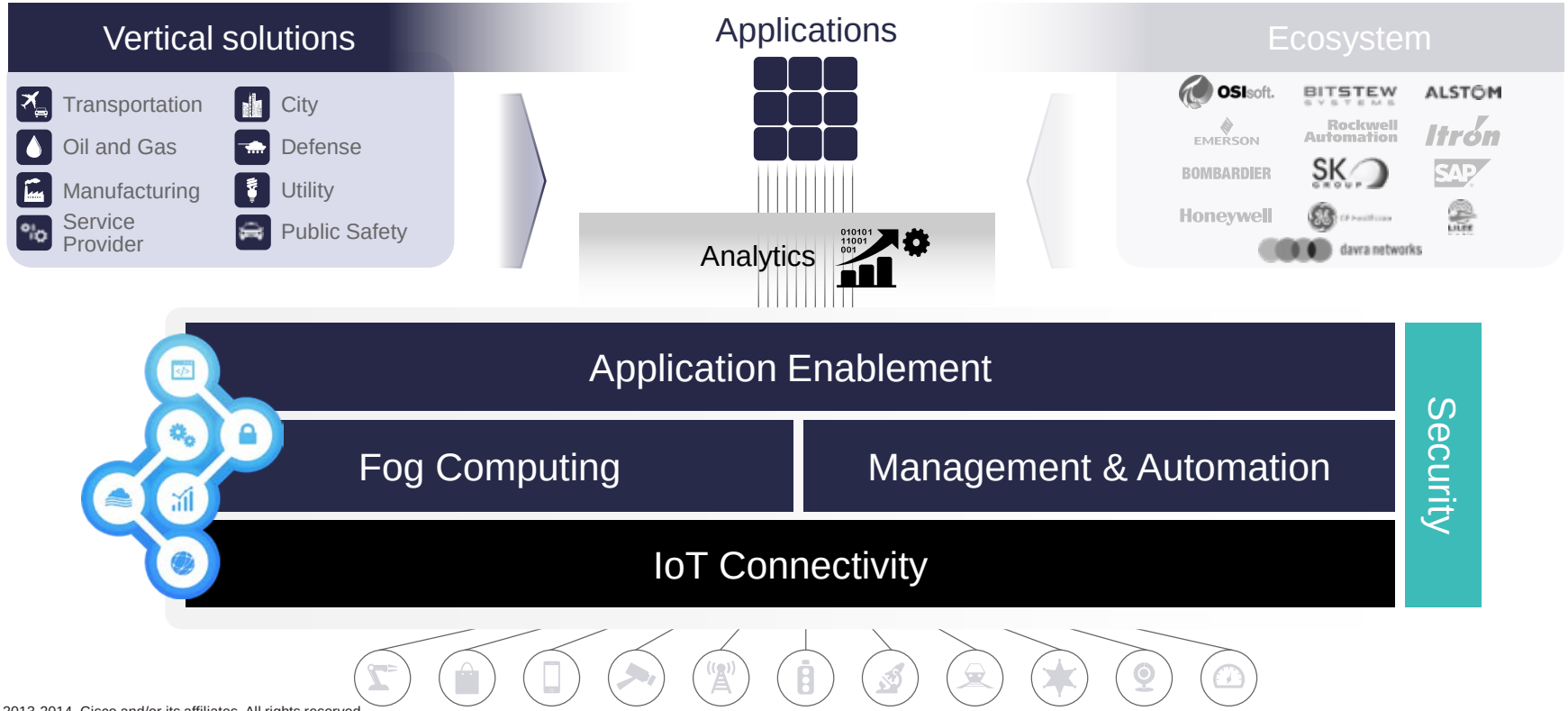
Physical Security

Device-level Security / Anti-tampering

End-to-End Data Encryption

Cisco IoT Architecture:

Secure IT & OT Convergence



What Industries Are We Focused On?


Manufacturing


Mining


Energy-Utility


Oil and Gas


Transportation


City


Defense


SP/M2M

REAL TIME SCALE BIG DATA/ANALYTICS SECURITY

The Data Aggregation Challenge

1.1 Billion

Data points generated by sensors **daily**

500 Gigabytes

Data generated by an offshore oil rig **weekly**

1000 Gigabytes

Data generated by an oil refinery **daily**

10,000 Gigabytes

Data generated by a jet engine every **30 minutes**

2.5 Billion Gigabytes

Data generated worldwide **daily**

90% of the world's data

Has been created in the last **2 years!**

It’s a Game Changer in all technical domains

Architecture

Addressing

Security

RF Allocation / Planning

Gateways

Low Power

Determinism

Wireless

Standardization

Regulation

Privacy

Deployment models

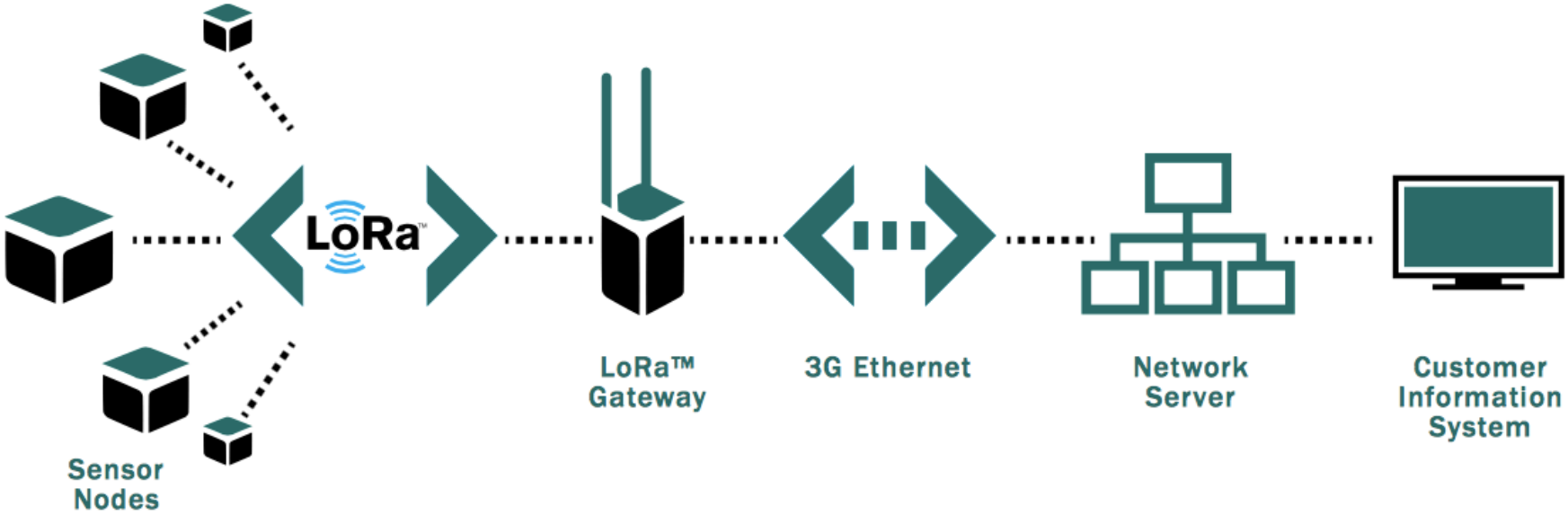
Sustainability

Analytics

Learning Machines

LPWA Low Power and Wide Area

IoT LoRa Achitecture



Low Powered Wireless Access (LPWA) provides optimal economics for low bandwidth applications, but does have some competition

Segment	Personal Area			Local Area			Field Area		WAN Area			
									Cellular		LPWA	
Radio Technology	**NFC**	**BT**	**RFID**	**ZigBee**	**Wireless HART**	**802.11N WLAN**	**802.15.4g**	**W-MBUS**	**3G**	**LTE**	**Sigfox**	**LoRa**
Outdoor Range	< 10 m			< 200 m			< 10 kms		> 10 kms			
Licensed Spectrum	Unlicensed								Licensed		Unlicensed	
Standardization	Standard										Proprietary	
Data Rate (bps)	400 K	1 M	250 k	250 k	100 k	600 M	75 k	1.2 k	14 M	100 M	1 k	10 k
Tx Current (mA)	0-10	6	0-10	34	28	400	35	80	1000	1100	70	18
Standby Current (mA)	< 0.001			0.003	0.008	1.1	0.005	0.01	3.5	5.5	0.005	0.001
Module Cost	$1	$1	$1	$3	$5	$5	$3	$10	$30	$50	$1	$3

LoRaWAN™ Use Cases Applicability

Smart water/
gas metering

Public lighting

Smart building

Smart parking

Assets Tracking

Smart Agriculture, i.e. leak detection and irrigation

Water level and flood management

Fault management

Security services, i.e. Smoke detectors

Smart energy and fast demand response

Waste management

Traffic management

Addressing and Gateways

Where are we?

IPv6 for the IOT is a must (same as radio technologies)

- ➔ ETSI ISG IP6 best practices documents

IPv6 up to the end device

- ➔ Close but not yet there
- ➔ IETF 6lowPan, 6lo, LPWAN, IPWave

Gateways ➔ will be your (our) next nightmare:

- Manageability (maintenance, configuration, deployment…)
- Energy consumption
- Security: Breaking end to end security, Network entry point.

Distributing Intelligence

Why Distributed Intelligence?

Vast Amounts of Data

Local Control Loops

Detached Applications

Expensive Bandwidth

Low Cost of Edge Compute

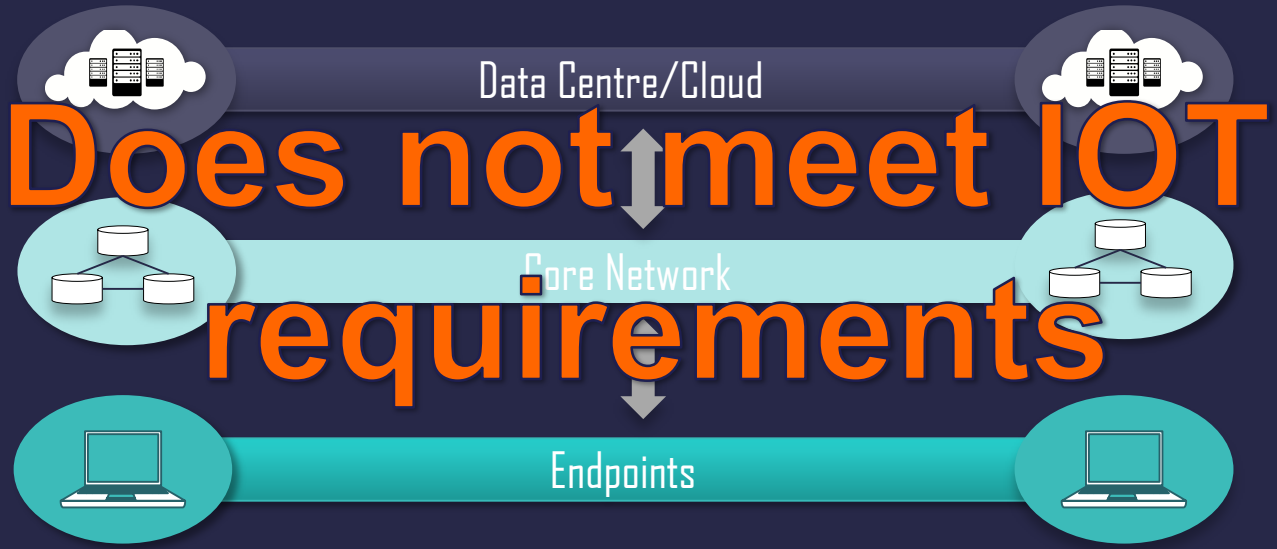
Scale

Converged, Managed Network	Resilience at Scale	Security	**Distributed Intelligence**	Application Enablement

IoT CONNECTIVITY

Traditional Computing Architecture

Terminal-Mainframe, Client-Server, Web



Does not meet IOT requirements

IoT and Fog Computing Architecture

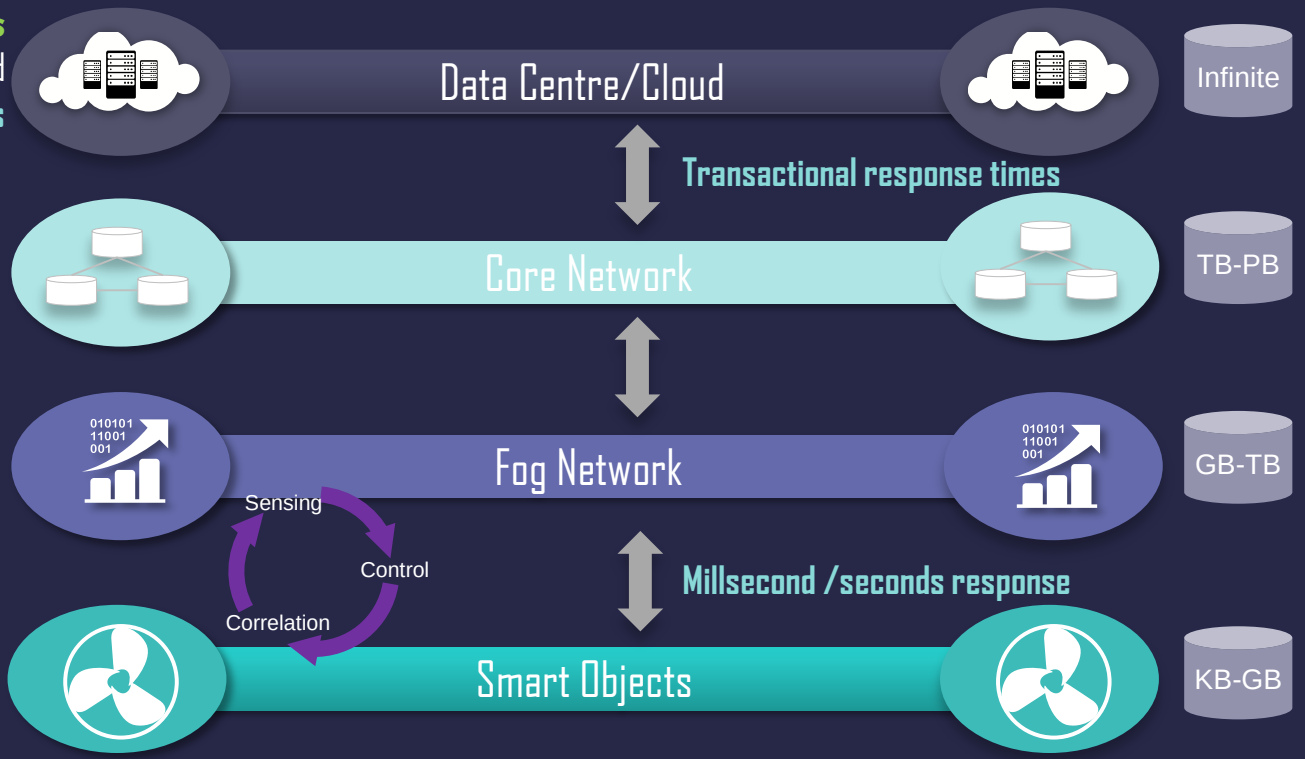
Data Points, Variety & Velocity, Security, Resiliency, Latency

Hundreds
Data Centre/Cloud
Hosting IoT Analytics

Thousands
Backhaul
IP/MPLS, Sec., QoS, Multicast

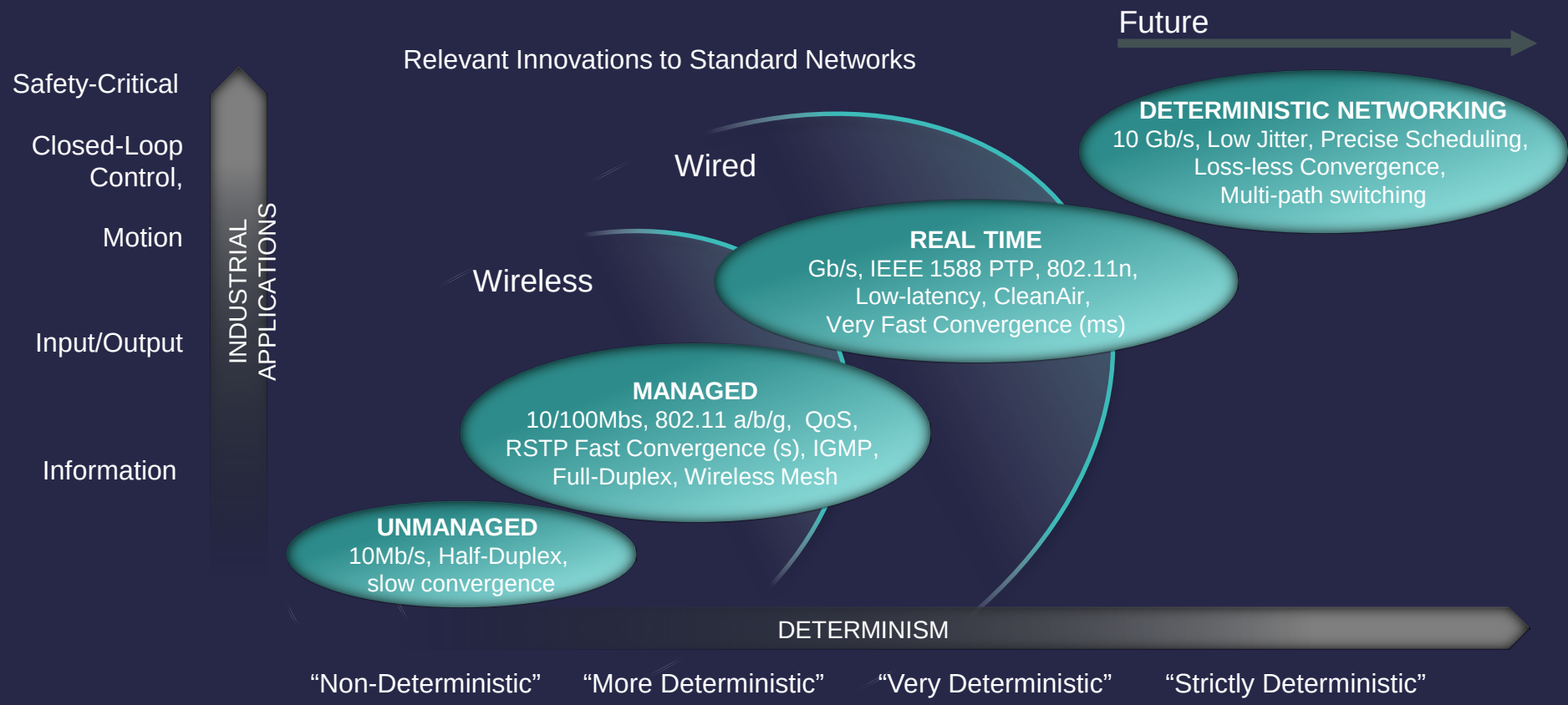
Tens of Thousands to Millions
Multi-Service Edge
2G/3G/LTE/WiFi/RF Mesh/PLC
TSN: Time Sensitive Networks
6TiSCH

Tens of Millions to Billions
Embedded Systems & Sensors
Low power, low bandwidth



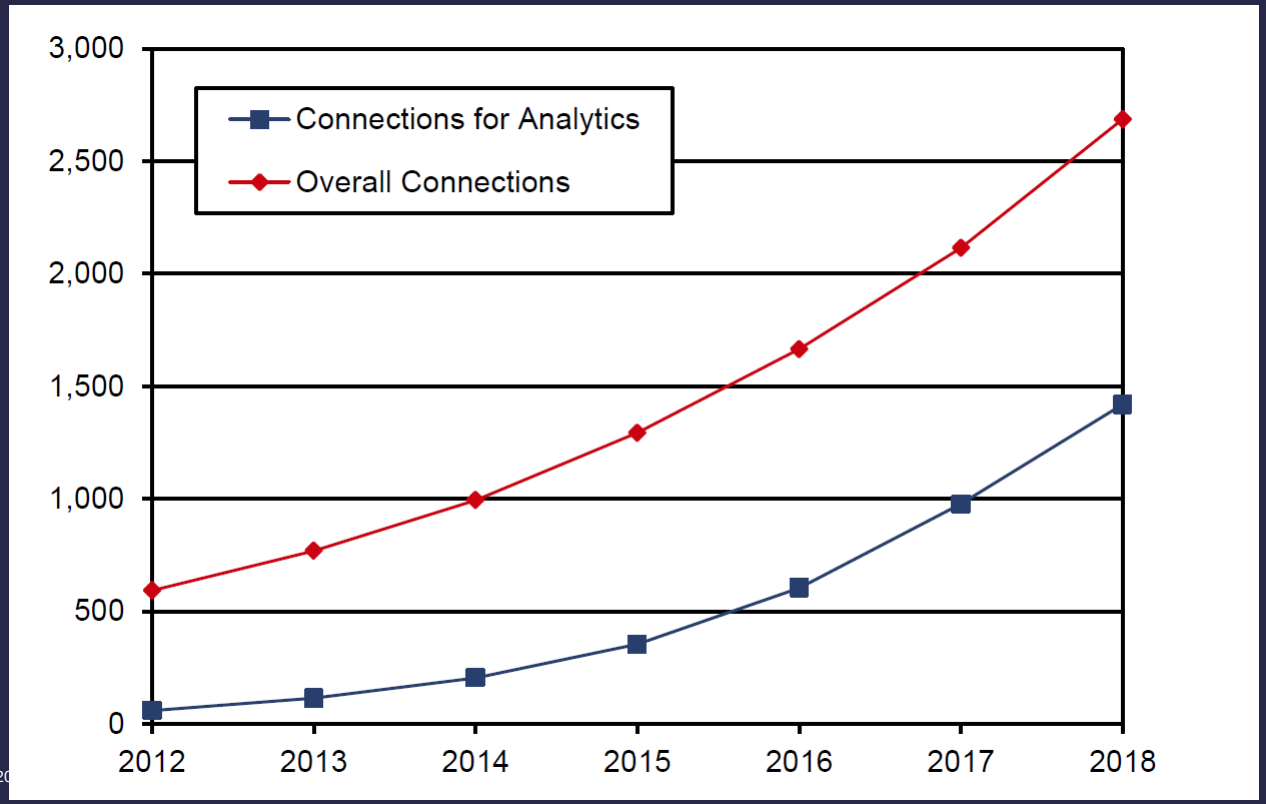
Need for more determinism

Industrial Intelligence Requires Evolution



Analytics

Analytics vs. Overall M2M connection ratio *



15M to 115M Analytics related connections*

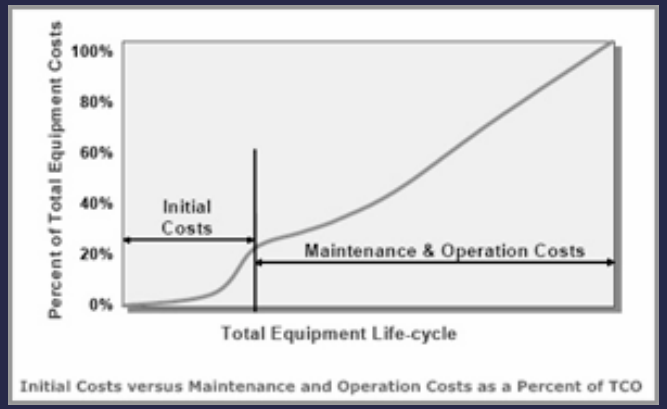
Classical Monitoring only doubles

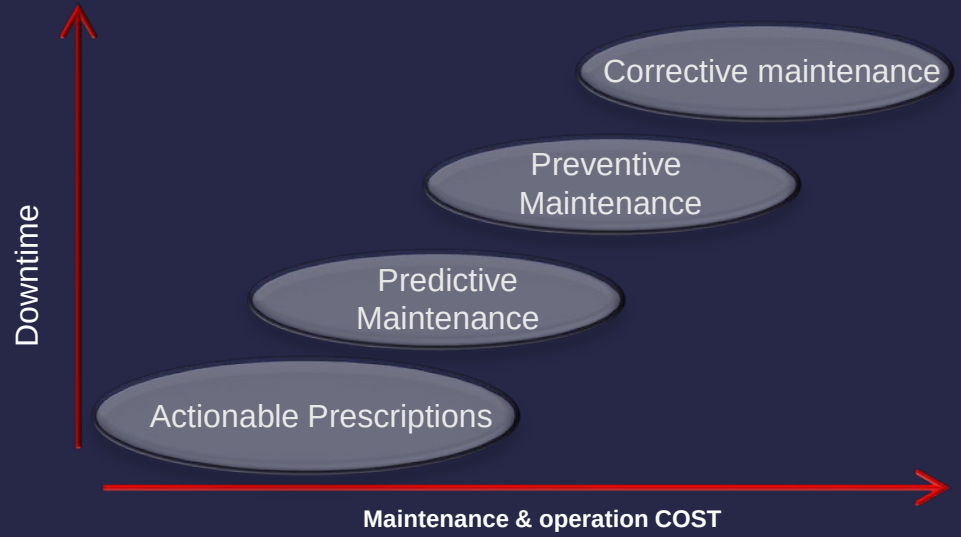
Analytics related M2M connections surge

* Source: ABI Research

Industrial Internet Application: OPEX reduction

Maintenance and operation represent 75% of the Total equipment cost





➔ Deployment of Wireless sensors is seen as an efficient solution

key take away

IOT requires Innovation and new paradigms not only communications:

Distributed Intelligence

Intelligent Networks

Deterministic Networking

Analytics

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Thanks You