



2 Days Training on IoT Architecture and Simulation using ns-3

CHAPTER 1 – The IoT Story

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Internet of Things

- Imagination of the IoT World.
 - In house, transport, office, cafe, manufacturing sites, bike riding
- History of the IoT – back 1997 when Kevin Ashton that make RFID tag



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History of Internet of Things

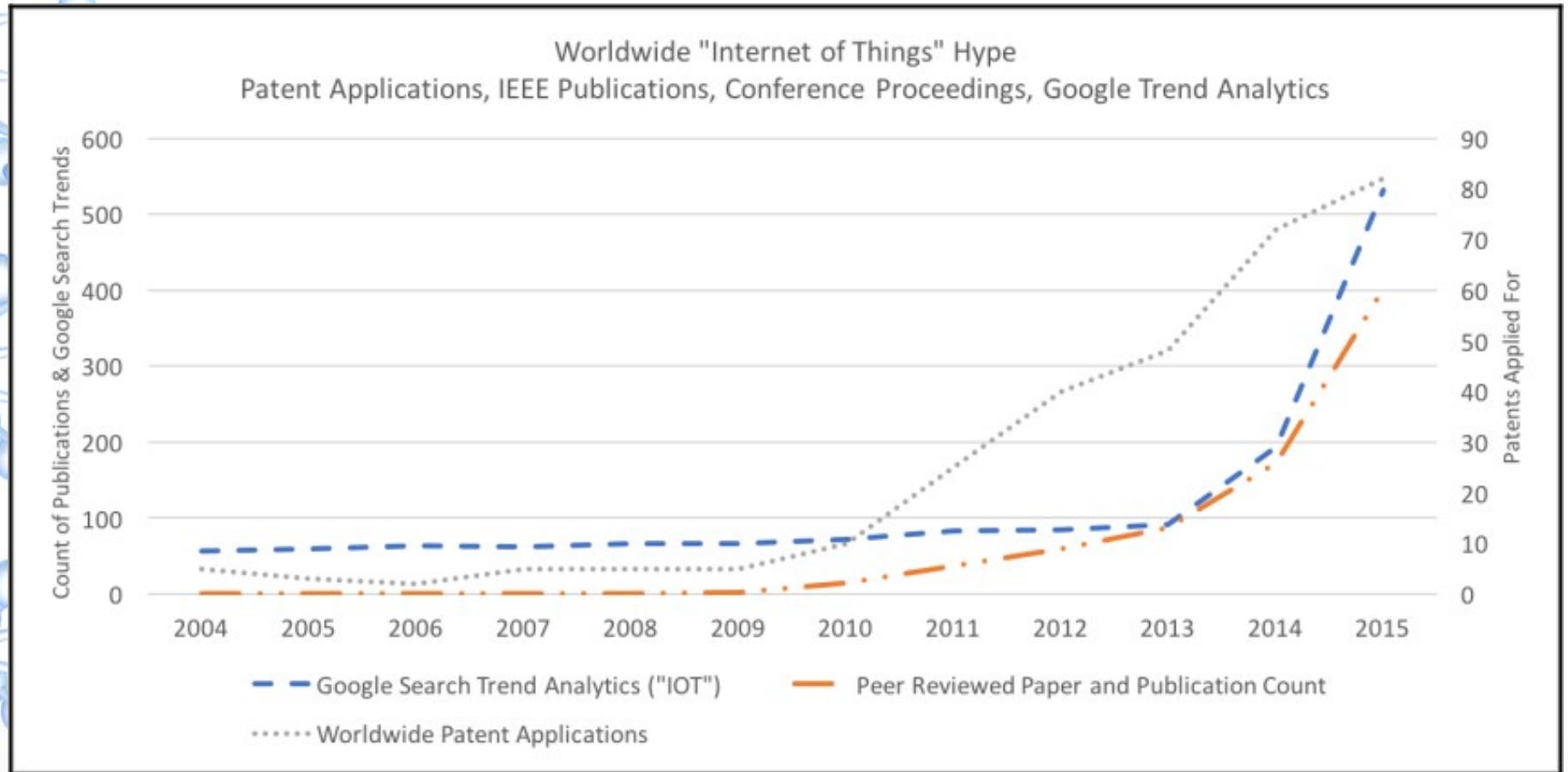
Year	Device	Reference
1973	Mario W. Cardullo receives the patent for first RFID tag	US Patent US 3713148 A
1982	Carnegie Mellon internet-connected soda machine	https://www.cs.cmu.edu/~coke/history_long.txt
1989	Internet-connected toaster at Interop '89	IEEE Consumer Electronics Magazine (Volume: 6, Issue: 1, Jan. 2017)
1991	HP introduces HP LaserJet IIISi: first Ethernet-connected network printer	http://hpmuseum.net/display_item.php?hw=350
1993	Internet-connected coffee pot at University of Cambridge (first internet-connected camera)	https://www.cl.cam.ac.uk/coffee/qsfc/coffee.html
1996	General Motors OnStar (2001 remote diagnostics)	https://en.wikipedia.org/wiki/OnStar
1998	Bluetooth SIG formed	https://www.bluetooth.com/about-us/our-history
1999	LG Internet Digital DIOS refrigerator	https://www.telecompaper.com/news/lg-unveils-internetready-refrigerator--221266



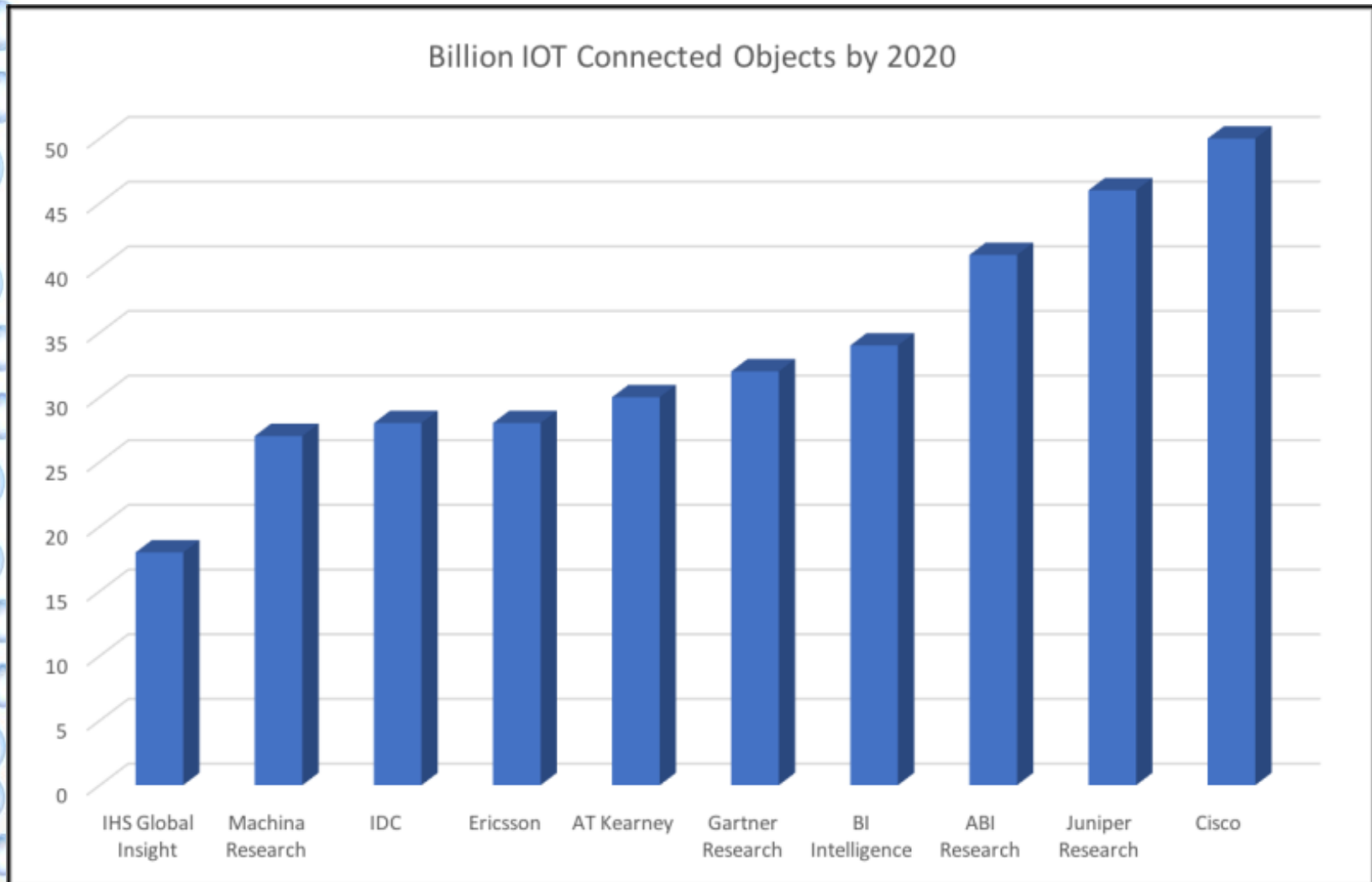
History of Internet of Things(2)

2000	First instances of <i>Cooltown</i> concept of pervasive computing everywhere: HP Labs, a system of computing and communication technologies that, combined, create a <i>web-connected experience for people, places, and objects</i>	https://www.youtube.com/watch?v=U2AkkuIVV-I
2001	First Bluetooth product launched: KDDI Bluetooth-enabled mobile phone	http://edition.cnn.com/2001/BUSINESS/asia/04/17/tokyo.kddibluetooth/index.html
2005	United Nation's International Telecommunications Union report predicting the rise of IoT for the first time	http://www.itu.int/osg/spu/publications/internetofthings/InternetofThings_summary.pdf
2008	IPSO Alliance formed to promote IP on objects, first IoT-focused alliance	https://www.ipso-alliance.org
2010	The concept of Smart Lighting formed after success in developing solid-state LED light bulbs	https://www.bu.edu/smartlighting/files/2010/01/BobK.pdf
2014	Apple creates iBeacon protocol for beacons	https://support.apple.com/en-us/HT202880

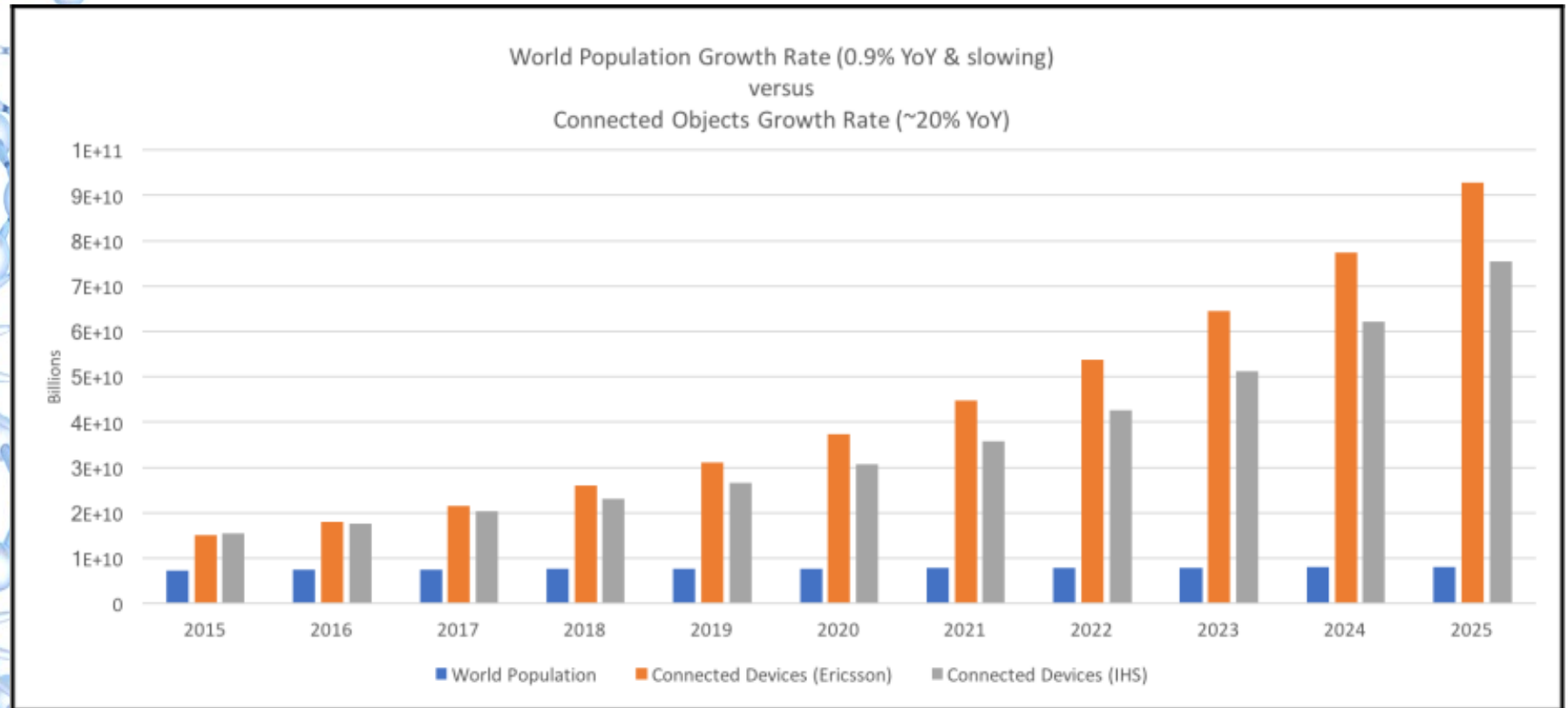
Internet of Things Potential



Internet of Things Potential(2)



Internet of Things Potential(2)



What can we see from this?



Internet of Things Potential(2)

It should be noted that economic impact is not solely revenue generation. The impact from IoT or any technology comes in the form of:

- New revenue streams (green energy solutions)
- Reducing costs (in-home patient healthcare)
- Reducing time to market (factory automation)
- Improving supply chain logistics (asset tracking)
- Reducing production loss (theft, spoilage of perishable)
- Increasing productivity (machine learning and data analytics)
- Cannibalization (Nest replacing traditional thermostats)



IoT in Industrial and Manufacturing

- Following are the industrial and manufacturing IoT use cases and their impact:
 - Preventative maintenance on new and pre-existing factory machinery
 - Throughput increase through real-time demand
 - Energy savings
 - Safety systems such as thermal sensing, pressure sensing, and gas leaks
 - Factory floor expert systems



IoT in Consumer Devices

- The following are some of the consumer IoT use cases:
 - Smart home gadgetry: Smart irrigation, smart garage doors, smart locks, smart lights, smart thermostats, and smart security.
 - Wearables: Health and movement trackers, smart clothing/wearables.
 - Pets: Pet location systems, smart dog doors.



IoT in Retail, Finance and Marketing

- Some of the retail IoT use cases are as follows:
 - Targeted advertising, such as locating known or potential customers by proximity and providing sales information.
 - Beacons, such as proximity sensing customers, traffic patterns, and inter-arrival times as marketing analytics.
 - Asset tracking, such as inventory control, loss control, and supply chain optimizations.
 - Cold storage monitoring, such as analyze cold storage of perishable inventory.
 - Apply predictive analytics to food supply.
 - Insurance tracking of assets.
 - Insurance risk measurement of drivers.
 - Digital signage within retail, hospitality, or citywide.
 - Beacons systems within entertainment venues, conferences, concerts, amusement parks, and museums.



IoT in HealthCare

- Some of the healthcare IoT use cases are as follows:

- In-home patient care
- Learning models of predictive and preventative healthcare
- Dementia and elderly care and tracking
- Hospital equipment and supply asset tracking
- Pharmaceutical tracking and security
- Remote field medicine
- Drug research
- Patient fall indicators



IoT in Transportation and Logistics

• Following are some of the transportation and logistics IoT use cases:

- Fleet tracking and location awareness
- Railcar identification and tracking
- Asset and package tracking within fleets
- Preventative maintenance of vehicles on the road



IoT in Agriculture and Environment

- Some of the agricultural and environmental IoT use cases are as follows:
 - Smart irrigation and fertilization techniques to improve yield
 - Smart lighting in nesting or poultry farming to improve yield
 - Livestock health and asset tracking
 - Preventative maintenance on remote farming equipment via manufacturer
 - Drones-based land surveys
 - Farm-to-market supply chain efficiencies with asset tracking
 - Robotic farming
 - Volcanic and fault line monitoring for predictive disasters



IoT in Energy

- The following are some of the use cases for energy IoT:
 - Oil rig analysis of thousands of sensors and data points for efficiency gains
 - Remote solar panel monitoring and maintenance
 - Hazardous analysis of nuclear facilities
 - Smart electric meters in a citywide deployment to monitor energy usage and demand
 - Real-time blade adjustments as a function of weather on remote wind turbines



IoT in Government and Military

- Following are some of the government and military IoT use cases:
 - Terror threat analysis through IoT device pattern analysis and beacons
 - Swarm sensors through drones
 - Sensor bombs deployed on the battlefield to form sensor networks to monitor threats
 - Government asset tracking systems
 - Real-time military personal tracking and location services
 - Synthetic sensors to monitor hostile environments
 - Water level monitoring to measure dam and flood containment



Summary

- Welcome to the world of the IoT
- We now start exploring the topology of an IoT system as a whole then break down individual components throughout the rest of the book.
- Remember, data is the new oil.