



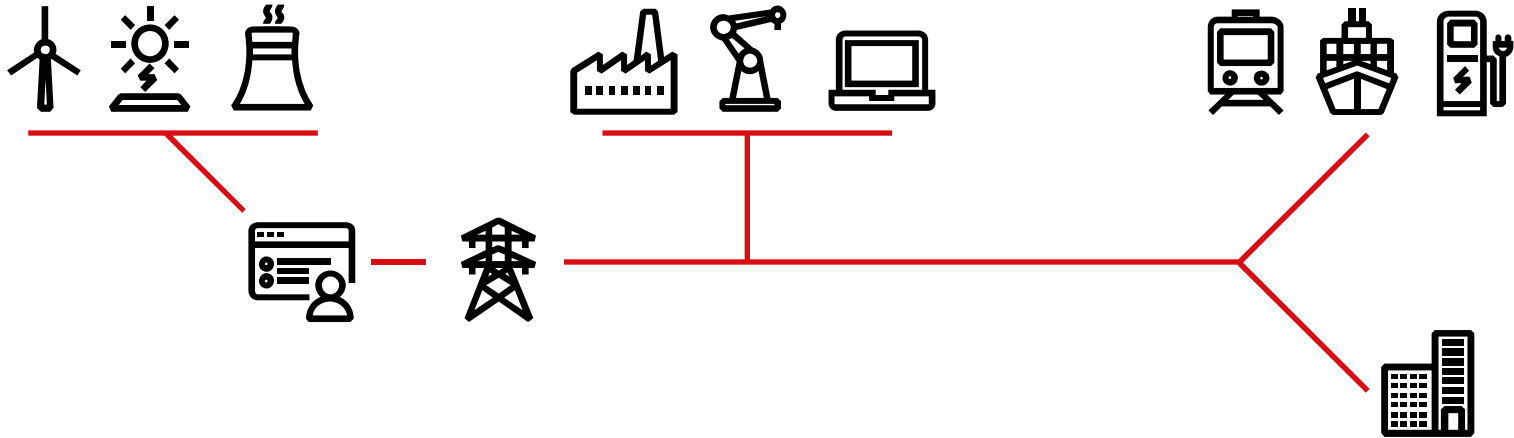
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WiFi for Industrial Applications

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Connectivity Market

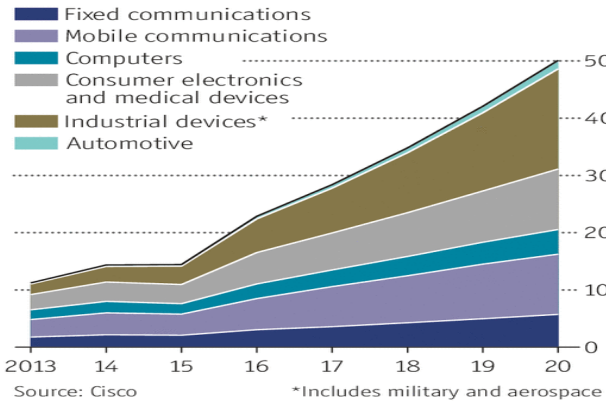
Industrial Sector



The 50 billion question

Worldwide number of internet-connected devices, forecast, bn

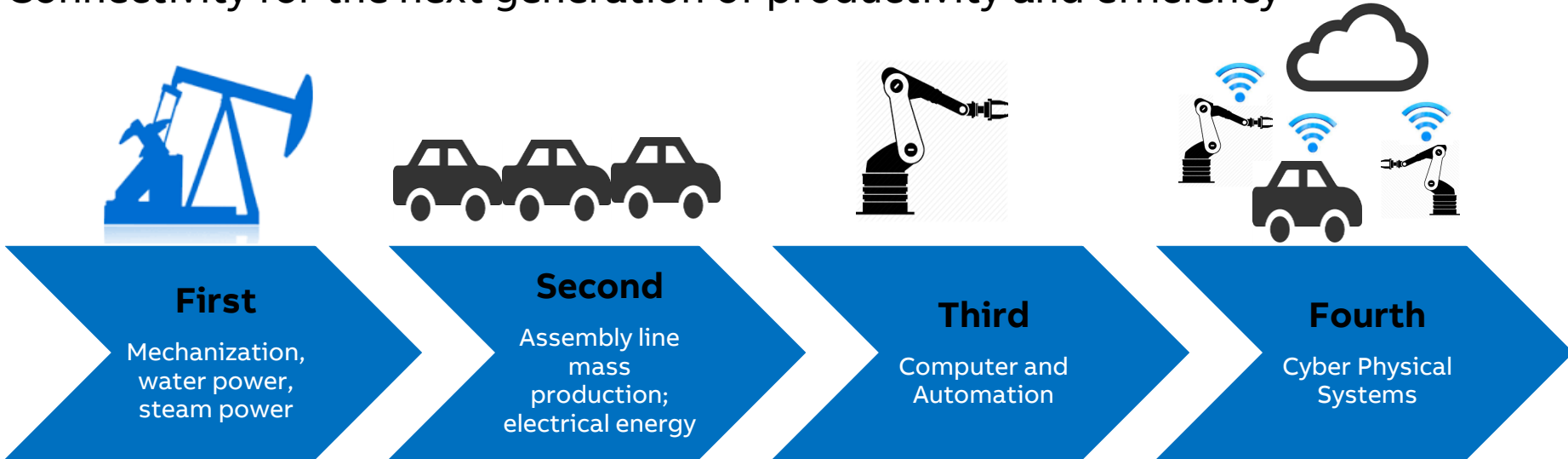
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- Industrial sector to be the biggest by 2020.
 - Utility will be one of the major space
- Objects can be connected in wired mode, not always necessarily in wireless mode.
- Wireless will play an increasing role in M2M.
- Focus more on reliability, range, number of connections rather than data rate

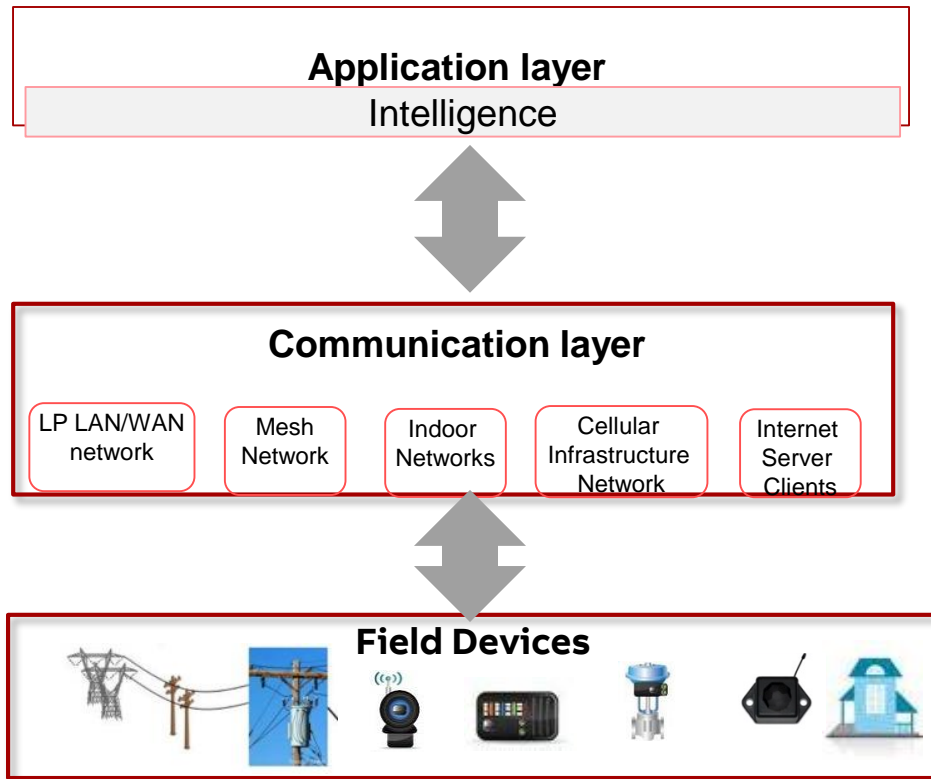
Industry 4.0

Connectivity for the next generation of productivity and efficiency



- Industry 4.0 - Started as a German initiative to promote smart factories, also commonly referred to as 4th industrial revolution.
- The concept has gone beyond factories to all industrial sectors where we need to interconnect assets, industries and users with advanced analytics
- Communication technology to play a key enabler in Industry 4.0

Industry 4.0 Components

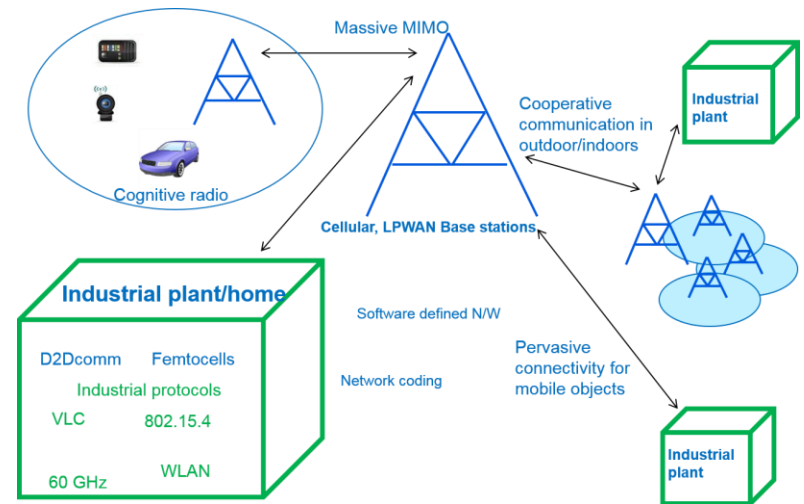


- Intelligence/smart applications are the most important features
- Wires and Wireless Networking Technologies
- Acquire data and control assets

Industry 4.0 and Wireless Technology Ingredients

- Seamless communication based on different access technologies
- Licensed and unlicensed access technologies to be used
- Real time data needs with high reliability and availability
- Heterogeneous networking solution with better coordination needs

Requirements	Desired Value	Application example
Latency	< 5 ms	Control and safety applications
Battery life	> 10 years	Connect hard to reach physical elements, low maintenance
Connectivity	300,000 devices per AP	Massive M2M connectivity
Reliability	99.99%	Protection and control
Data rate	1-10 Gb/s	Virtual representation
Seamless and quick connectivity		Mobile physical devices

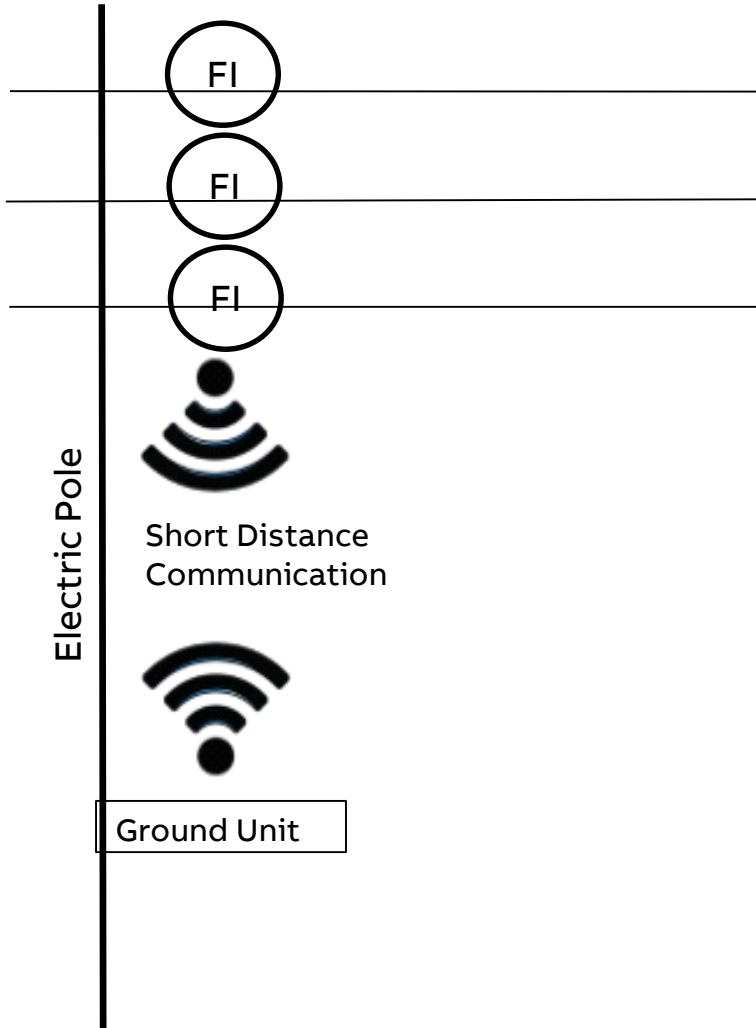


WiFi as an Industrial Solution

- One of the biggest advantage of WiFi is its availability
- However it is commonly considered to be power hungry and thus not considered in many of the Industrial IoT solutions.
- Some of the vendors do have very low power WiFi client devices that show pretty good energy consumption numbers during non-active states.
- In many cases the devices can last for weeks, months and sometimes even years !
- **Advantage:** Access data from these end-devices from any tablet or phone.
- Find a great fit in segments that are remote and hazardous. Also in places where power line connectivity is limited.

- Ex: Mines, Oil & Gas, etc

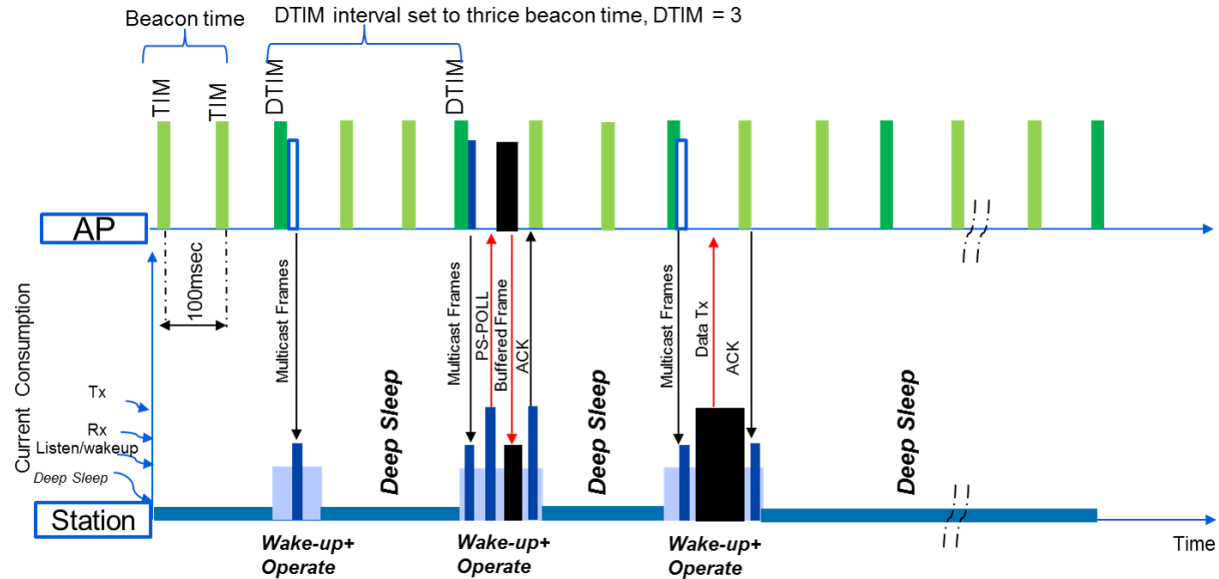
Industrial Wireless Example: Fault Detection



- **Application:** Detection, Location, Isolation and Restoration (FDIR) of transmission line faults
- About 600 voltage and current samples are aggregated and sent as 150 messages per second.
- The application uses Fault indicators (FI) which monitor voltages and currents on the transmission lines to detect faults.
- Only transmission of values takes place. During the remaining period the device can go to sleep state

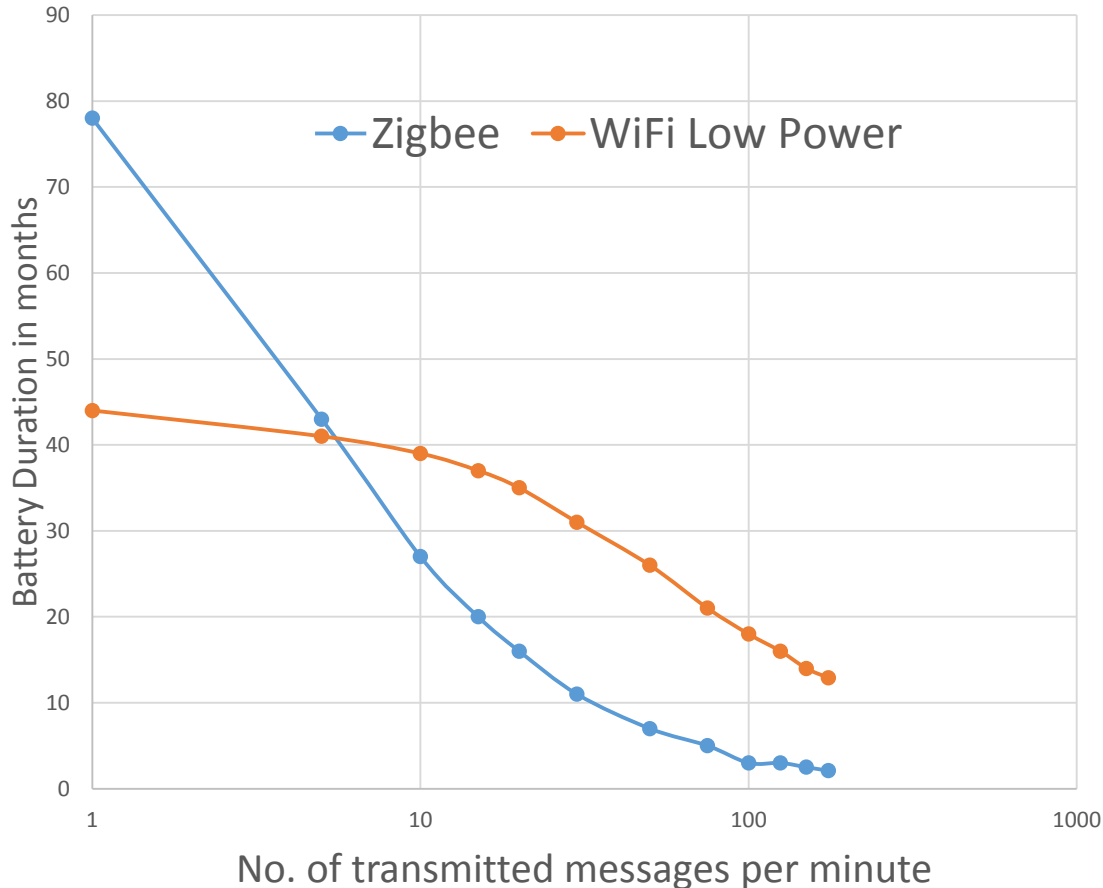
WiFi as an Industrial Solution

- We did some tweaking at the client station side.
- Allow the device to sleep as much as possible in order to save the battery life.



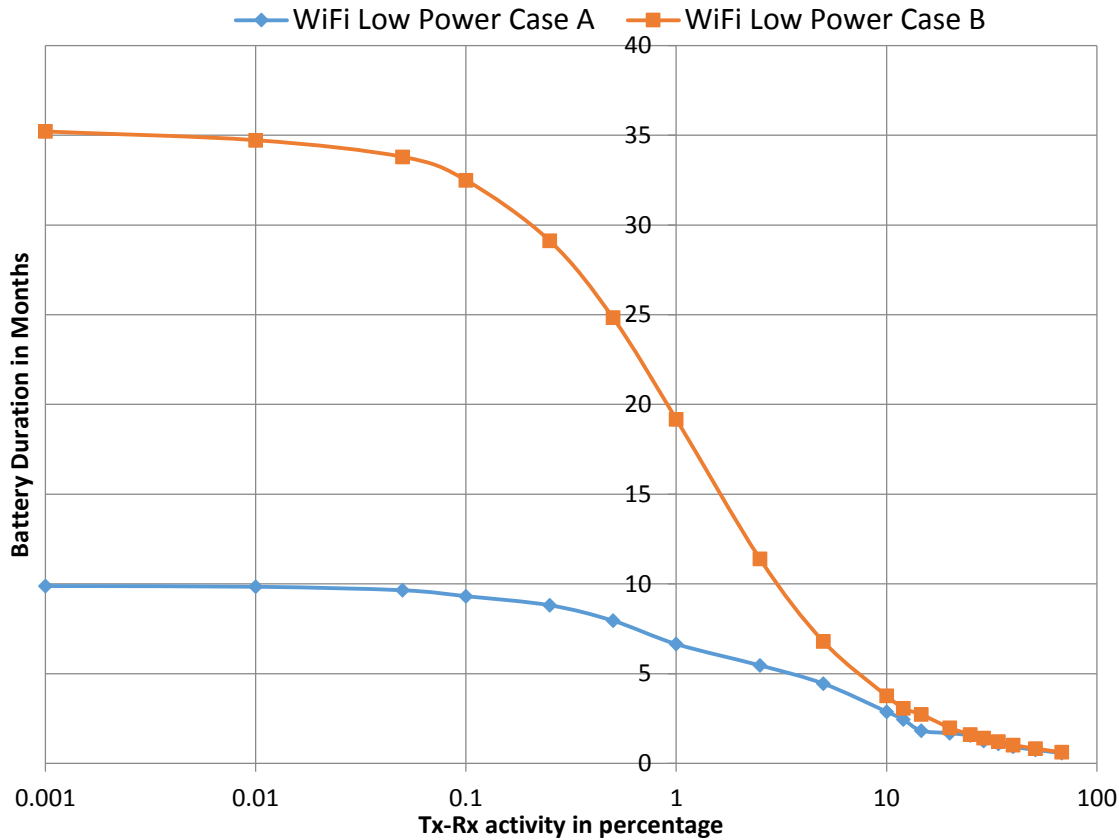
WiFi as an Industrial Solution

Battery life comparison



- The sleep consumption of WiFi client device is > 70 times that of a Zigbee device
- Transmission current consumption for WiFi is >7 times that of Zigbee device
- Zigbee appears to be a clear winner!
- However the reality is different
- Due to higher data rates, WiFi has more time to go into the sleep state

WiFi as an Industrial Solution



- Case B consumes current less than 5 times during sleep state than Case A.
- More the sleep better it is !

Summary

- Our use-case example showed that WiFi in certain cases can be a good candidate in Industrial IoT applications.
- There is a sweet spot for WiFi when it comes to the trade-off between battery life, data rate and availability !
- As technology improves, better battery lifetime can only be expected to be delivered from these kind of devices.



ABB