



mec

BETTER THAN WIRED

Wire performance in your plant – without a wire!

CONFIDENTIAL – INTERNAL USE

DATA COMMUNICATION IS INDUSTRY 4.0 'S ACHILLES HEEL

INCREASED DATA AND RECONFIGURABILITY REQUIREMENTS ARE A STRETCH



Wire lacks the required flexibility and reconfigurability (Fiber – Ethernet – CAN)

Wireless is limited to low/medium data rates with sub-critical latency and reliability, susceptible to congestion and coexistence issues

TYPICAL APPLICATION REQUIRING WIRELESS CONTROL

WHY INDUSTRY 4.0 DRIVES USERS TO TURN TO WIRELESS CONTROL

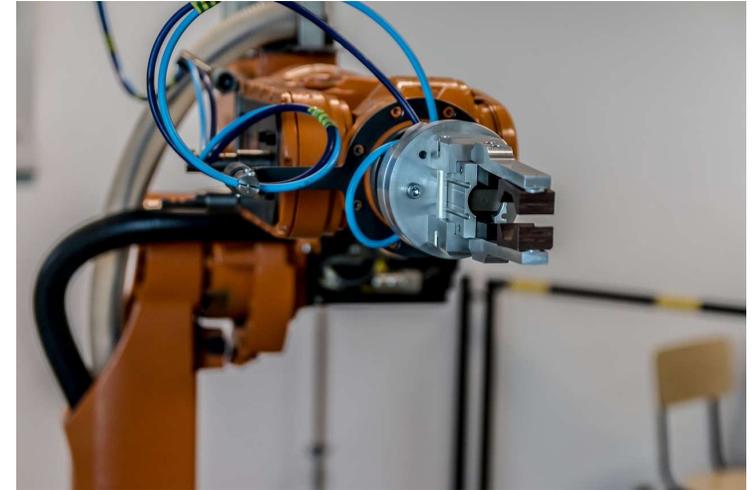
- Cost for a flexible manufacturing/production line re-configuration is high
 - Machinery must have network access in their new location
 - New wired lines must be deployed/routed to the new positions of machinery
 - This is a repetitive cost
- Cost for wireless network management is considerable when multiple technologies coexist
 - Also a repetitive operation, that is needed frequently to ensure proper wireless network operation
- Moving assets that require deterministic connectivity, like AGVs, AMRs, Rotary tables, etc..



What if you could have the wired QoS advantages with the wireless deployment flexibility with significant lower CAPEX and OPEX costs?

TARGETED APPLICATIONS

- We target applications that require:
 - Low bounded latency
 - Extreme packet reliability
 - Battery powered operation (no cable access)
- Based on those requirements we aim at:
 - AGVs , fleet control, platooning
 - Transport tracks – Smart conveying Systems
 - Adaptive and Flexible Assembly lines (like automotive industries)
 - Robotics with increased flexibility requirements (avoid moving cable wear)
 - Rotary tables & Carousels
 - Autonomous mobile Robots



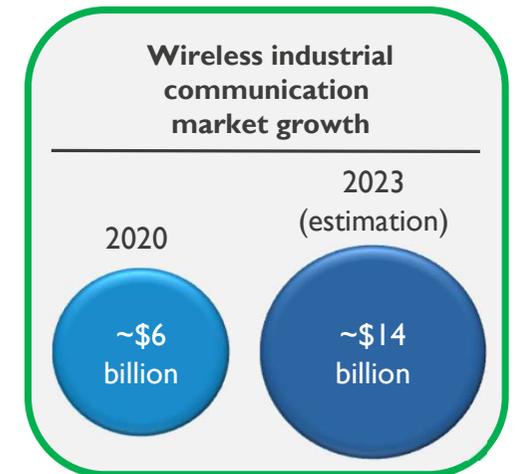
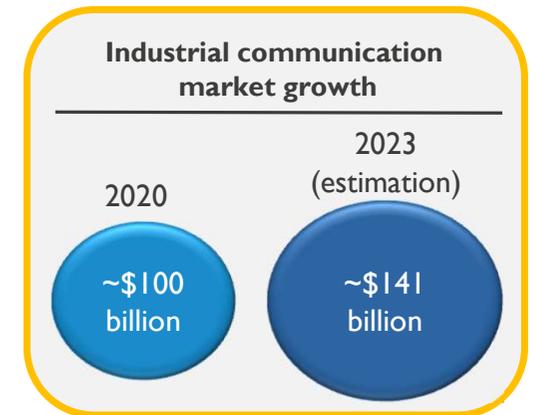
MARKET SHARES AND WHY THAT IS

There is a reason why the Industrial Communication market is 141B and the Wireless Industrial Communication market is 14B, being only 10% of the whole market.

WHY ?

Because wireless technologies never proven their ability to provide robust and timeliness operation for core Industrial Control (Class 0-2 industrial applications), so they are used mainly for monitoring applications (Class 3-5)

We aim to change that !!!!



SOLUTION: IT'S CALLED BTW (BETTER THAN WIRED)

A NOVEL TECHNOLOGY ENABLING GUARANTEED LATENCY AND RELIABILITY

A next generation wireless technology

- Support for Class 0-2 industrial applications requirements
 - **Wired-like** communication **reliability, 99,9999% PSR (Six 9s)**
 - **Bounded latency** for real time applications **down to 2ms**
 - **Up to 12 Mbps** throughput per link
- Designed to **extend/replace** Profinet/Modbus TCP/Ethernet/IP related wired infrastructure with point-to-point links (replace the wire) or wireless BtW islands (extend wired infrastructure with wireless access).
- **Low Capex** : Low product complexity and integration cost
 - vs wired and 5G: Infrastructure-less operation
 - vs other wireless: No pre-deployment frequency mapping and RSSI map generation needed.
 - Ability to offer standard WiFi connectivity in parallel to support class 4-5 services
- **Low Opex**: Unmanaged deployment, operation and redeployment
 - Vs wired: No cost for adaptation of network topology when production lines need reconfiguration
 - Vs Wireless: Self-managed, self-healing and highly adaptive, generic and unmanaged coexistence with other wireless technologies, no need for human intervention in normal operation for spectrum allocation and interference avoidance
 - Vs 5G: Aiming to cost a fraction of a 5G private cell deployment

TRULY A BETTER THAN WIRED WIRELESS TECHNOLOGY, BUT CHEAPER THAN WIRED

AUTONOMOUS OPERATION BTW

UNMANAGED DEPLOYMENT, OPERATION AND REDEPLOYMENT

Self Managed

Self Healing

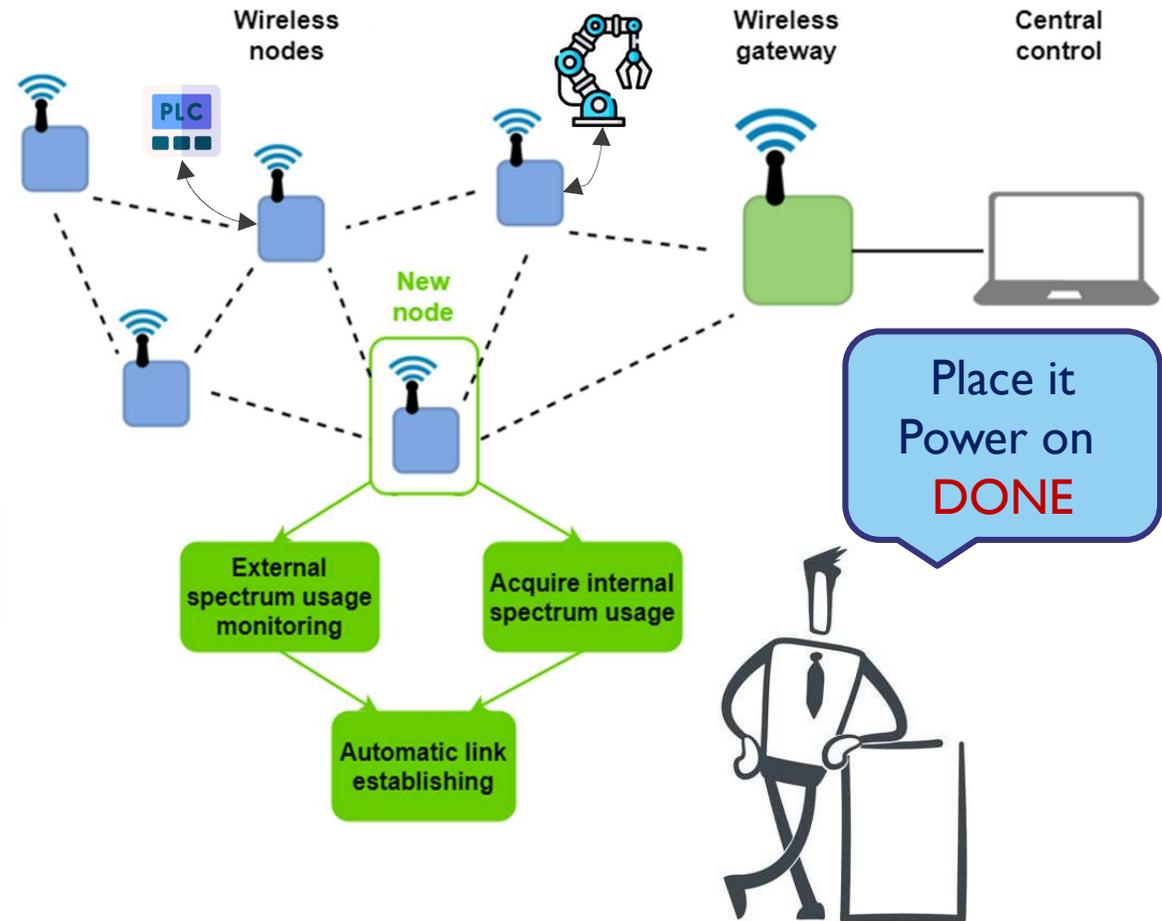
Autonomous
Join/leave
procedure

Automatic
Topology detection

Can operate on
ISM and LSA-DSA
bands

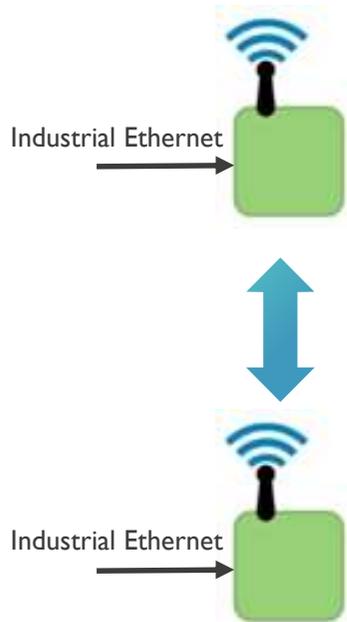
Actively avoiding
incumbent technologies

Data driven link setup

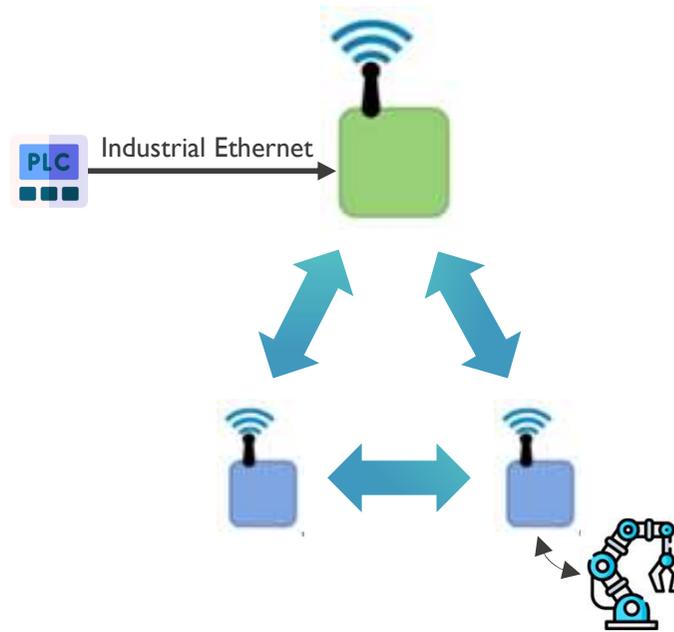


INITIAL SIMPLER TOPOLOGIES SUPPORTED

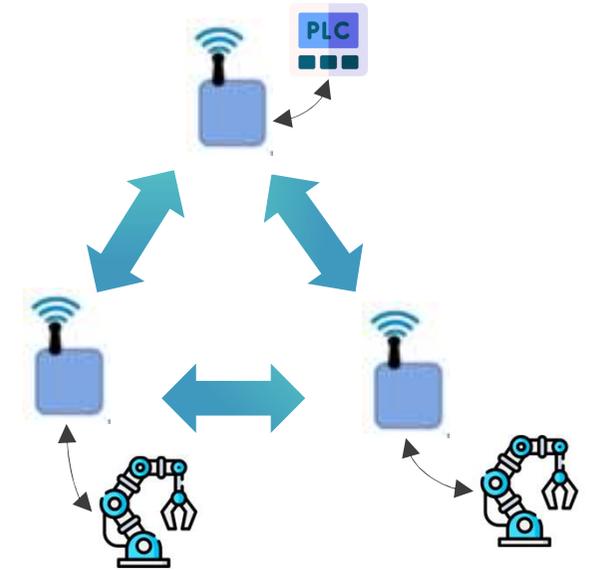
Wireless tunneling



Connected Control island



Lone Control island



MAIN WIRELESS TECHNOLOGIES FOR INDUSTRIAL APPLICATIONS (AND THEIR MAIN DOWNSIDES)

WirelessHART®

High Latency
Low Throughput

IO-Link
wireless

Small range I/O bus
Few bytes/packet

zigbee

Low Reliability
Low Throughput
Undeterministic Latency

ISA
100
WIRELESS

Low Throughput
Limited Coexistence

5G

Heavy Infrastructure
Limited Coexistence
High Cost

WiFi™

Low Reliability
Not scalable
Undeterministic Latency

SUPPORT FOR CLASS 0 INDUSTRIAL APPLICATIONS REQUIREMENTS

HOW WE GUARANTEE 99.999% RELIABILITY AND SUB-MS LATENCY

RF Sensing

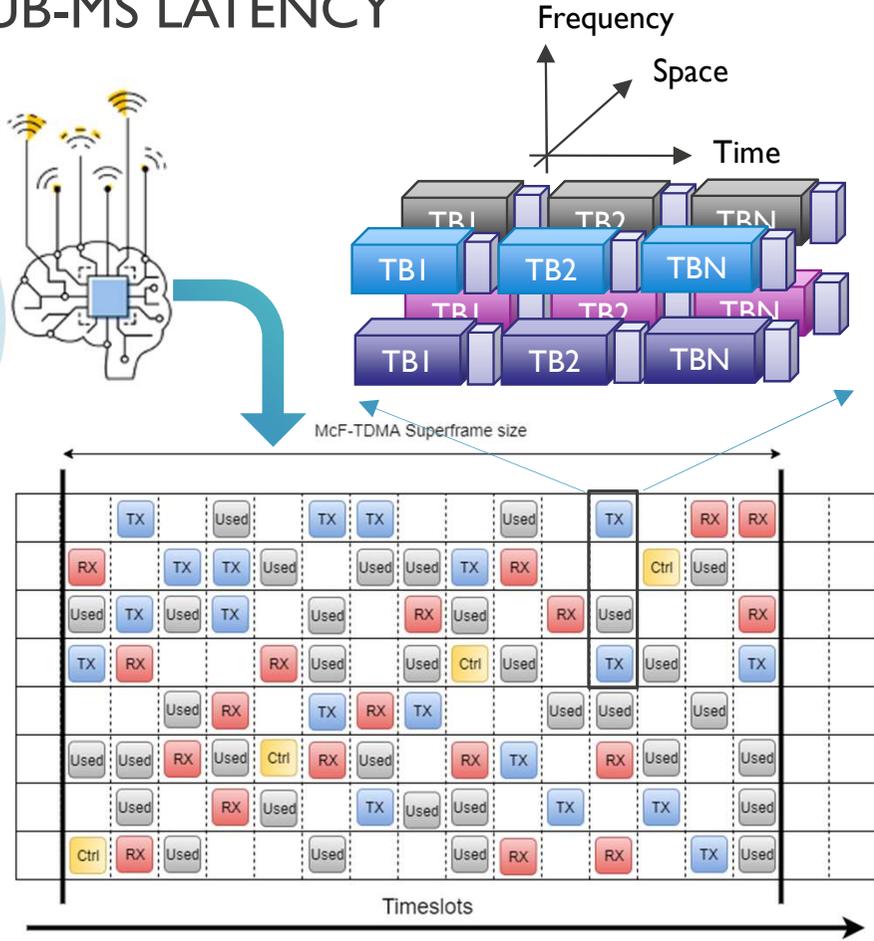
Sense usage of RF spectrum
Decentralized sensing
All the time at all locations

AI

Identify incumbent Wireless technologies
Predict spectrum usage
Allocate safest slots (time – frequency)

Smart MAC

Ensure timely message delivery
Redundancy same packet sent multiple times
Diversity spreads risk (physical path, frequency, timeslot)
Prioritize (time critical traffic first)



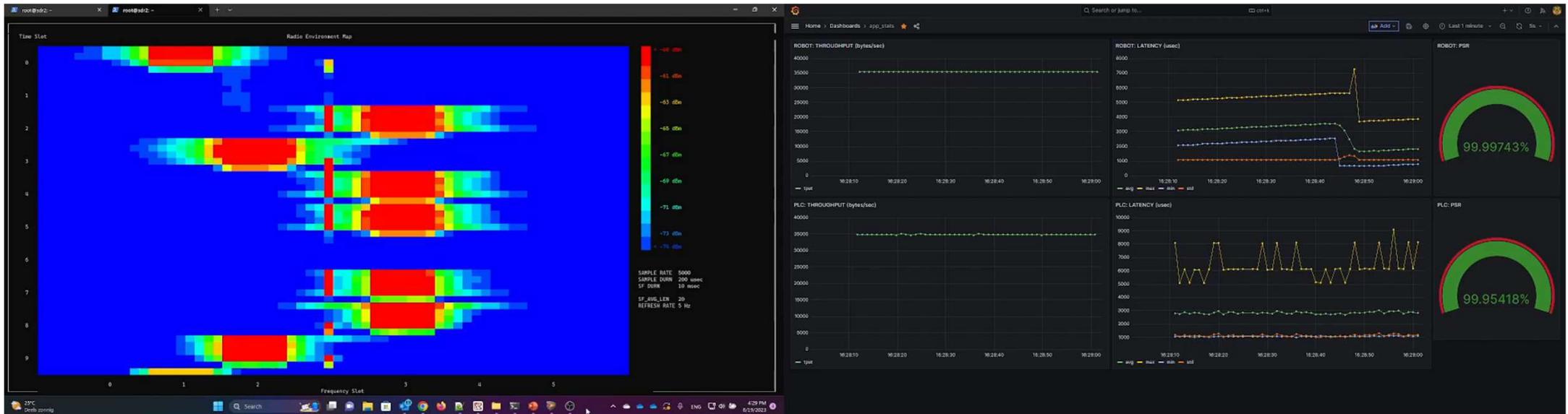
SYSTEM TECHNICAL DETAILS

- Our system **guarantees 0 internal collisions** (between BtW nodes).
 - Our patented MAC slot allocation protocol **eliminates hidden and exposed node** problems, while making it **near impossible for nodes to interfere** with each other by using the same slot.
- Uses Spectrum Sensing to actively avoid 3rd party/external interference
 - Monitor and **identify external incumbent wireless technologies** operating in the local collision domain per node, marking slots as externally used when needed
- Employs over-the-air μ s synchronization
 - **Eliminates need for oversized guard spaces** in the MAC TDMA superframe structure
 - Able to **monitor in runtime per-packet-delay** from time of creation on sender until consumption on receiver

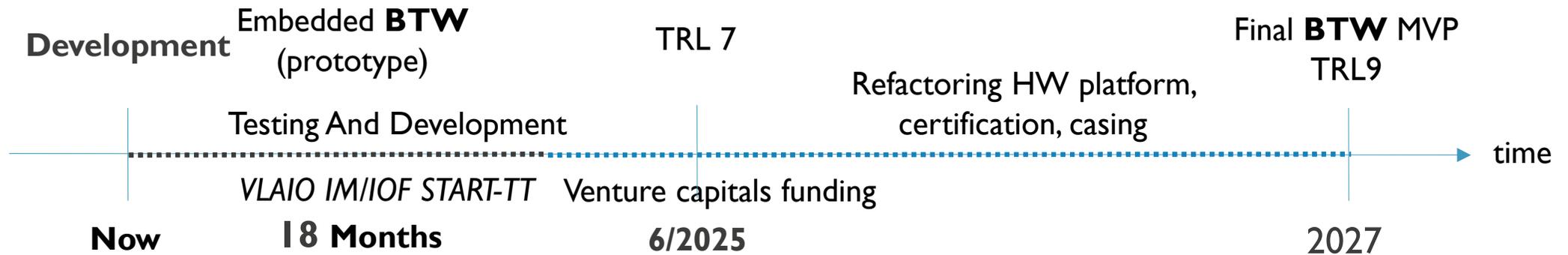
POC DEMO AT ITF 2023



POC MEASUREMENTS IN REAL TIME



TIMELINE



- Finalizing the prototype based on an Xilinx ZCU-102 development platform
- Within the next 16 months, extensive tests will be conducted against interference
- Further funding needed for miniaturization, lowering cost of HW by refactoring HW platform and designing casing.
- Certification of the final MVP and shipping out first units by start of 2027



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embracing a better life