
cisco Live!
Let's go

The bridge to possible

Ultra Reliable Wireless leveraging AI/ML to enable autonomous driving

Andrea Orioll, Director, Product Management IIoT Wireless

cisco Live!

PSOIOT-1876

Agenda

- Autonomous Driving
- V2X – Connected Cars
- IIoT Wireless Portfolio
- Ultra Reliable Wireless Backhaul
- 1000MAD
- Mobility as a service
- Conclusion

Speaker Intro

Andrea Orioli

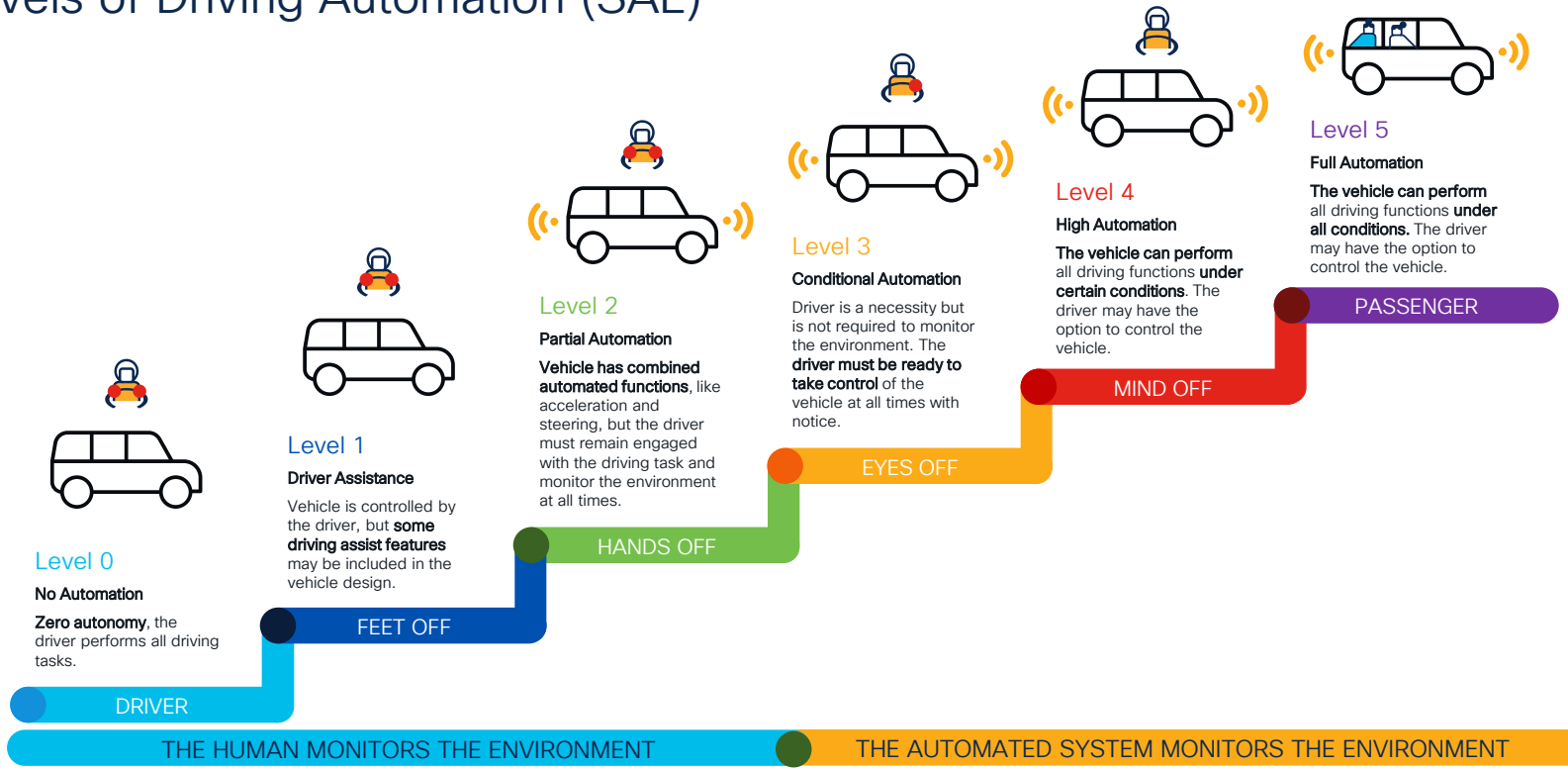
Director, Product Management – IIoT Wireless CISCO

Email: aorioli@cisco.com
Cell: +39 3478682785

Co-founder of Fluidmesh Networks, acquired by Cisco in 2020. I have been involved with wireless technologies for the past 15 years, mainly focusing on IIoT use cases and industrial automation. Father of two kids. Love sailing and skiing.

Autonomous Driving

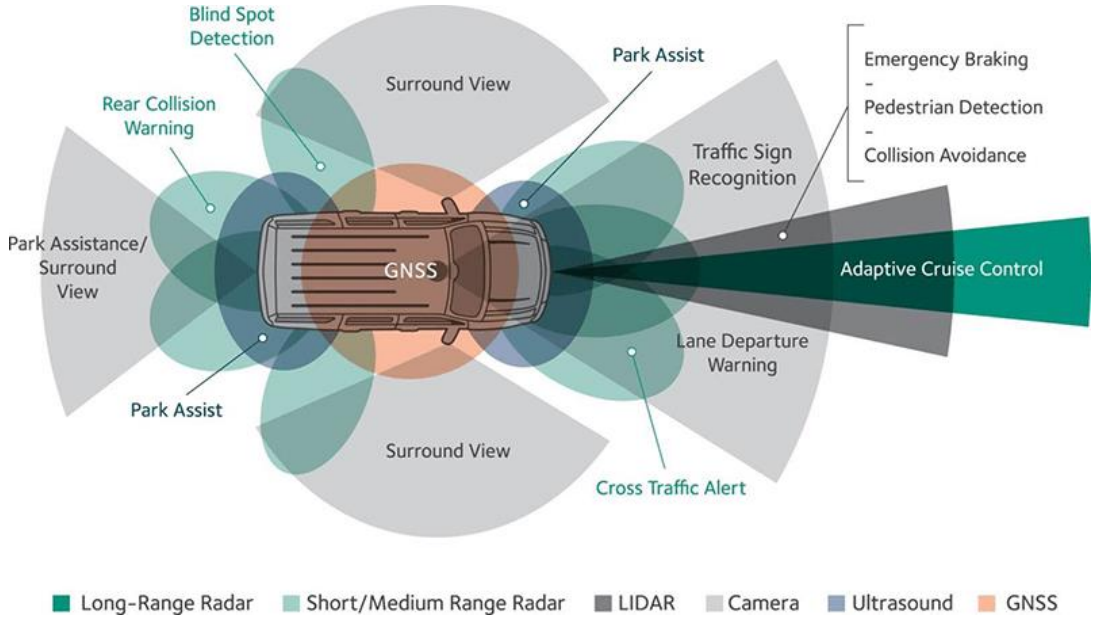
Levels of Driving Automation (SAE)



Source: sae.org Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles J3016_202104

Connected Cars

A lot of sensors = a lot of data

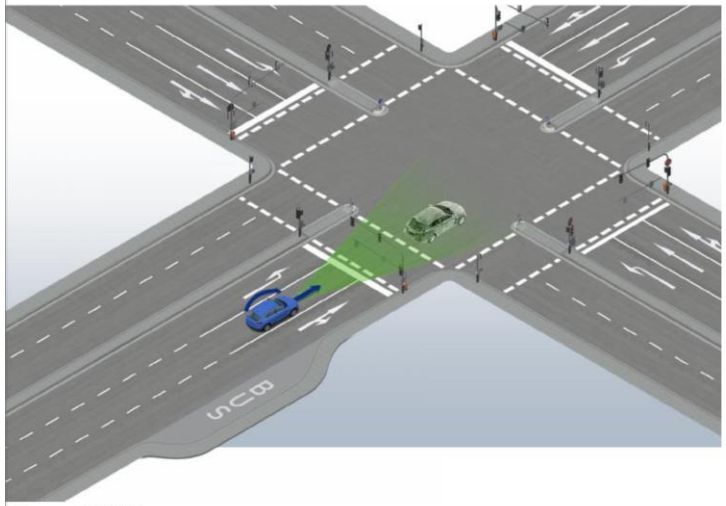


Source: https://www.ai-online.com/2021/05/novatel-announces-automotive-gnss-positioning-module-for-adas-and-autonomy/

V2X use-cases: Deployment phases

Connected Cars

Day 0: no communication



Source: C2C-CC

	Day 1 Awareness Starts	Day 2 Automation Starts	Day 3 Cooperation Starts	Day 4 Future Mobility
Cooperative	"I share where I am and what I hear"	"I share what I see"	"We share our intentions"	"We coordinate all maneuvers"
Connected	Hybrid ITS G5/LTE-V + 3G/4G	Hybrid +5G	Hybrid + New Technologies	Hybrid + New Technologies
Automated	Advanced Driver Assistance System (ADAS)	Some Roads Human Back-up	Most Roads No Human Back-up	Fully Automated

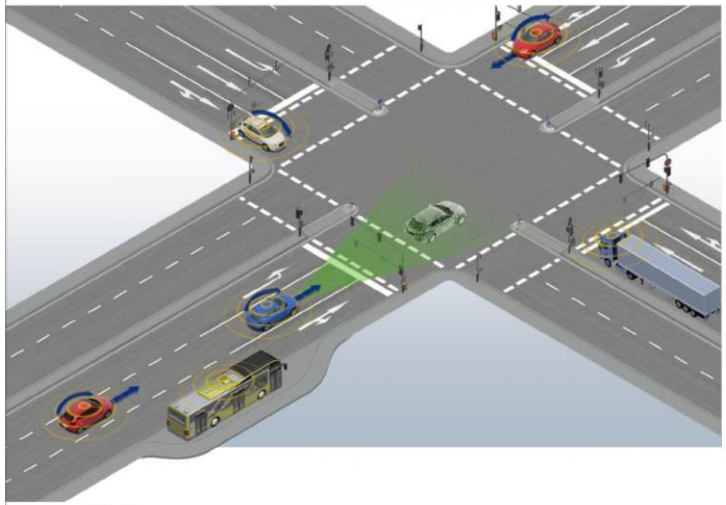
Source: European Commission

Source: https://www.osservatori.net/it/ricerche/osservatori-attivi/connected-car-mobility

V2X use-cases: Deployment phases

Connected Cars

Day 1: exchange of status data (position, speed, events, ...)



Source: C2C-CC

	Day 1 Awareness Starts	Day 2 Automation Starts	Day 3 Cooperation Starts	Day 4 Future Mobility
Cooperative	"I share where I am and what I hear"	"I share what I see"	"We share our intentions"	"We coordinate all maneuvers"
Connected	Hybrid ITS G5/LTE-V + 3G/4G	Hybrid +5G	Hybrid + New Technologies	Hybrid + New Technologies
Automated	Advanced Driver Assistance System (ADAS)	Some Roads Human Back-up	Most Roads No Human Back-up	Fully Automated

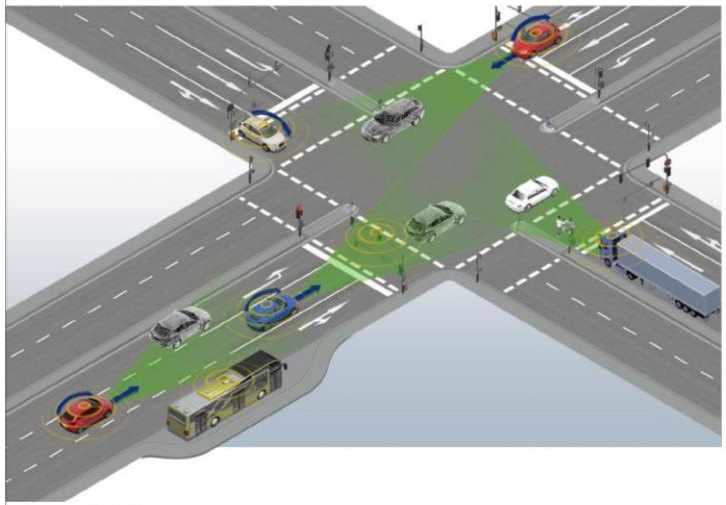
Source: European Commission

Source: https://www.osservatori.net/it/ricerche/osservatori-attivi/connected-car-mobility

V2X use-cases: Deployment phases

Connected Cars

Day 2: exchange of sensor data (objects, filed of view, ...)



Source: C2C-CC

	Day 1 Awareness Starts	Day 2 Automation Starts	Day 3 Cooperation Starts	Day 4 Future Mobility
Cooperative	"I share where I am and what I hear"	"I share what I see"	"We share our intentions"	"We coordinate all maneuvers"
Connected	Hybrid ITS G5/LTE-V + 3G/4G	Hybrid +5G	Hybrid + New Technologies	Hybrid + New Technologies
Automated	Advanced Driver Assistance System (ADAS)	Some Roads Human Back-up	Most Roads No Human Back-up	Fully Automated

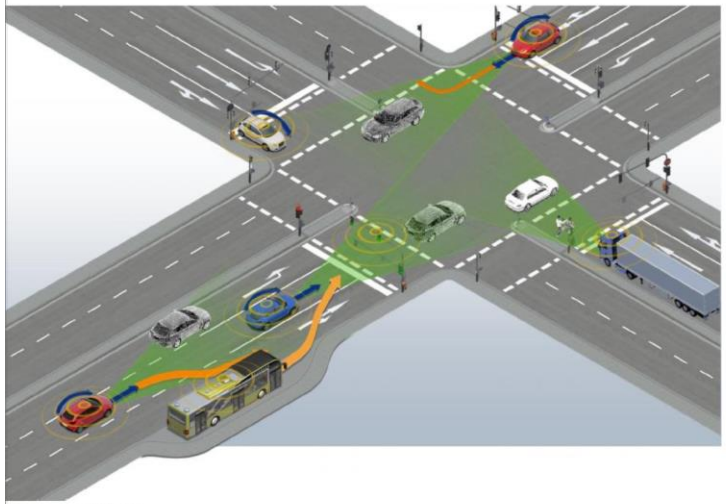
Source: European Commission

Source: https://www.osservatori.net/it/ricerche/osservatori-attivi/connected-car-mobility

V2X use-cases: Deployment phases

Connected Cars

Day 3: exchange of intention data



Source: C2C-CC

	Day 1 Awareness Starts	Day 2 Automation Starts	Day 3 Cooperation Starts	Day 4 Future Mobility
Cooperative	"I share where I am and what I hear"	"I share what I see"	"We share our intentions"	"We coordinate all maneuvers"
Connected	Hybrid ITS G5/LTE-V + 3G/4G	Hybrid +5G	Hybrid + New Technologies	Hybrid + New Technologies
Automated	Advanced Driver Assistance System (ADAS)	Some Roads Human Back-up	Most Roads No Human Back-up	Fully Automated

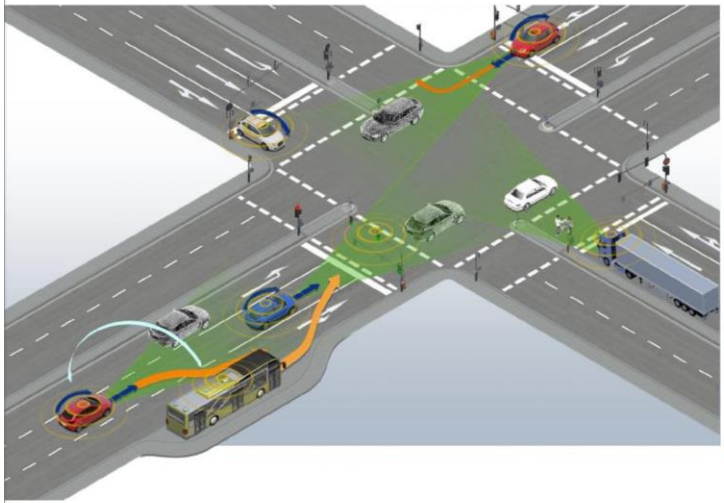
Source: European Commission

Source: https://www.osservatori.net/it/ricerche/osservatori-attivi/connected-car-mobility

V2X use-cases: Deployment phases

Connected Cars

Day 4: exchange of coordination data



Source: C2C-CC

	Day 1 Awareness Starts	Day 2 Automation Starts	Day 3 Cooperation Starts	Day 4 Future Mobility
Cooperative	"I share where I am and what I hear"	"I share what I see"	"We share our intentions"	"We coordinate all maneuvers"
Connected	Hybrid ITS G5/LTE-V + 3G/4G	Hybrid +5G	Hybrid + New Technologies	Hybrid + New Technologies
Automated	Advanced Driver Assistance System (ADAS)	Some Roads Human Back-up	Most Roads No Human Back-up	Fully Automated

Source: European Commission

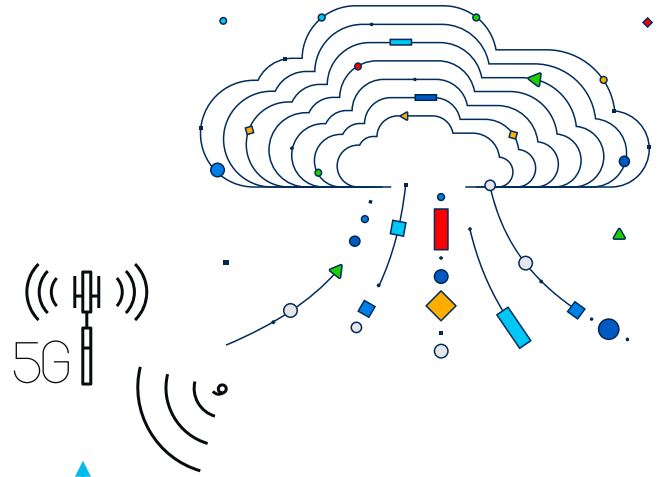
Source: https://www.osservatori.net/it/ricerche/osservatori-attivi/connected-car-mobility

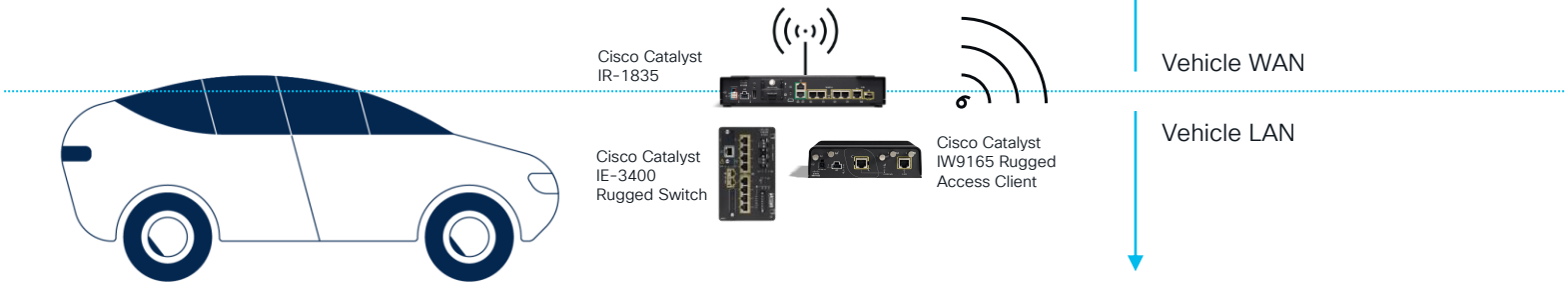
Cloud to Edge architecture

AI and Cybersecurity

Autonomous driving requires cars to be always connected to Ultra-Critical Cloud-Edge infrastructures.

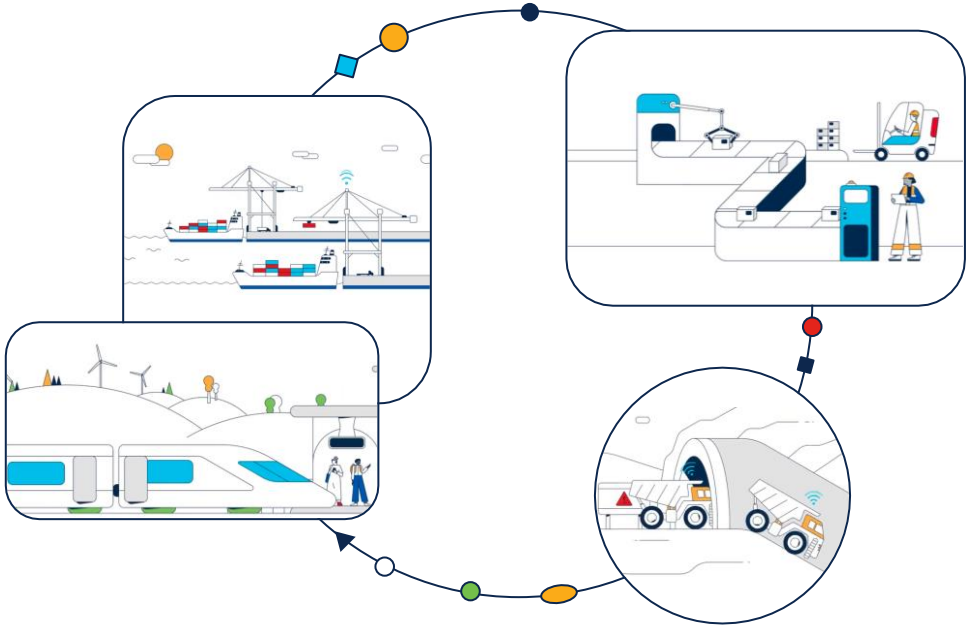
The vast data handled by these infrastructures demands **advanced artificial intelligence** algorithms and **cybersecurity**





Autonomous operations for industries

Autonomous operations meet the needs for efficiency, business resiliency, and employee safety across industries.



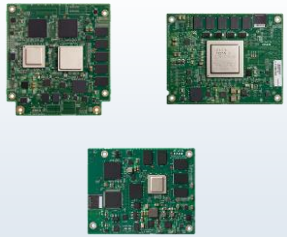
Comprehensive Industrial IoT Networking Portfolio

Industrial Switching
IE1000, IE3100, IE3200, IE3300, IE3400, IE4000, IE5000, IE9300

Industrial Routing
IR1101, IR1800, IR8100, IR8300

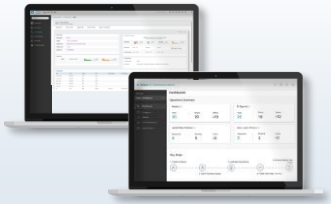
Industrial Wireless
IW9167E, IW9167E-HZ, IW9167I, IW9165E, IW9165D, IXM Gateway, IW on IoT OD, IW Monitor

Embedded Networking
ESS3300, ESS9300, ESR6300

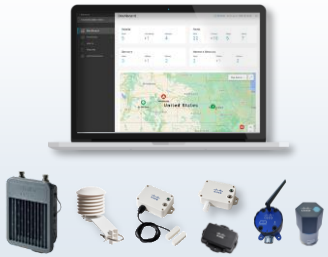


Industrial Cybersecurity
Cyber Vision, Secure Equipment Access

Data Control and Exchange
Edge Intelligence, Application Hosting



Industrial Sensor Solution
Industrial Asset Vision



Management & Automation
Cisco Catalyst Center, Cisco Catalyst SD-WAN, Field Network Director

Cisco Industrial Wireless Portfolio

Industrial and outdoor Wi-Fi and Ultra-Reliable Wireless Backhaul

IW9167E
Cisco URWB, WGB &
Wi-Fi 6/6E-ready* AP

IW9167I
Wi-Fi 6/6E-ready* AP

FCS July 2024

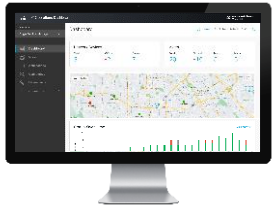
IW9167E Hazloc
Cisco URWB, WGB &
Wi-Fi 6/6E-ready* AP

Cisco DNA Center
(Wi-Fi)

IW9165D
Cisco URWB &
Wi-Fi 6/6E-ready* AP

IW9165E
Cisco URWB, WGB &
Wi-Fi 6/6E-ready* AP

IEC6400 Cisco Edge
Compute Appliance for
Large Cisco URWB
deployments



IoT Operations Dashboard
(Cisco URWB)

*Wi-Fi 6E subject to regulatory agencies' regulations and approvals.

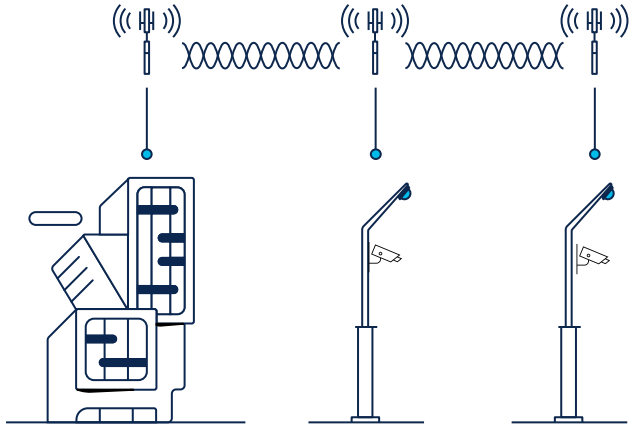
IW9165E Rugged Wireless Client & AP

Automation enabler – Powered by URWB

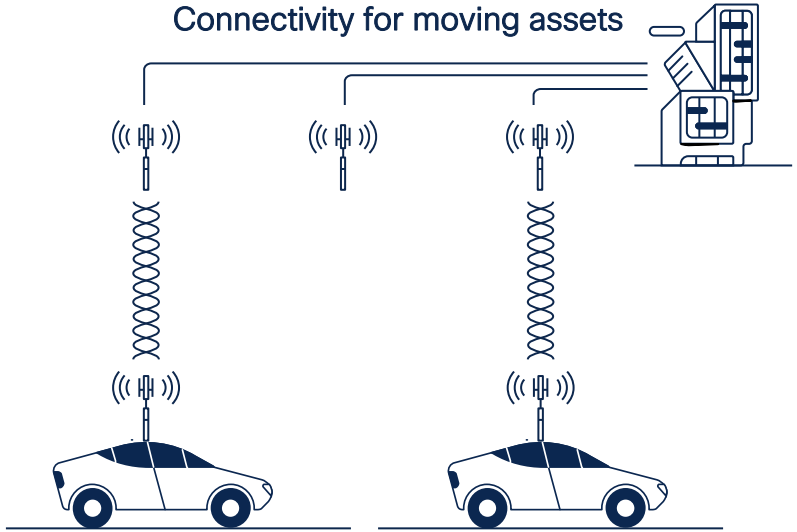
What is Cisco Ultra-Reliable Wireless Backhaul?

Reliable fiber-like wireless connectivity, anywhere

Connectivity where fiber isn't available or is too costly



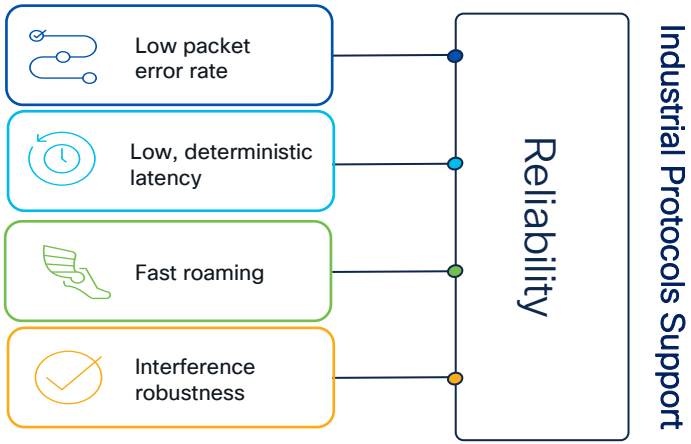
Connectivity for moving assets

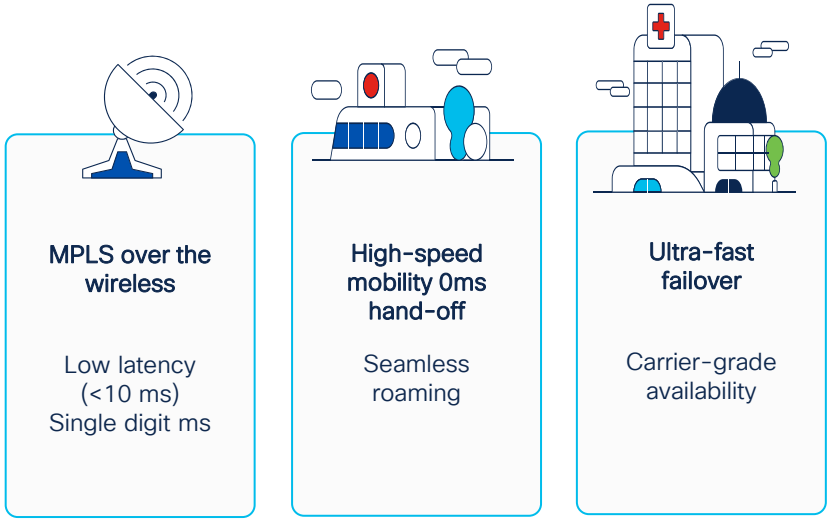


Proven · Deploys like Wi-Fi · Full control of your network · Unlicensed spectrum

What makes Cisco URWB Reliable?

Reliability as the enabler for industrial wireless automation





Self-healing network for up to 99.999% reliability

What makes Cisco URWB *Ultra*-Reliable?

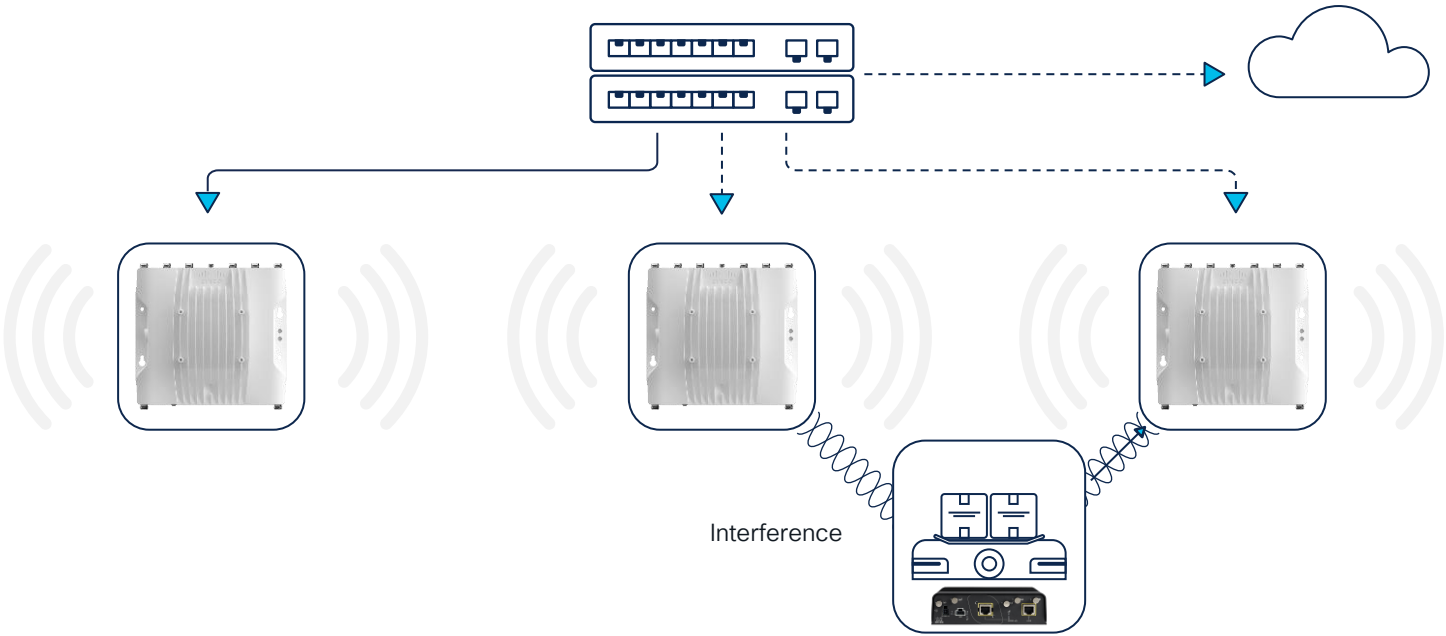
Cisco URWB's new patented technology: Multipath Operations

Take advantage of the «Diversity»

Time Diversity
Mitigates Fading and Medium Contention

Spatial Diversity
Mitigates blockages and obstacles

Frequency Diversity
Mitigates Interference



Duplicate high priority packets over up to 8 different paths

1000 Miglia Autonomous Drive (1000 MAD)

1000 MAD

1000 Miglia: The past and the future

The 2023 Edition

> "The most beautiful race in the world"
>
> - Enzo Ferrari

Brescia-Rome-Brescia - Since 1927 a unique race along an extraordinary route

Cisco and the Polytechnic of Milan driving innovation together

Source: https://1000miglia.it/en/events/1000-miglia/

Convoy

Front Warning Vehicle

Pace Car

Autonomous Vehicle

Rear Warning Vehicle

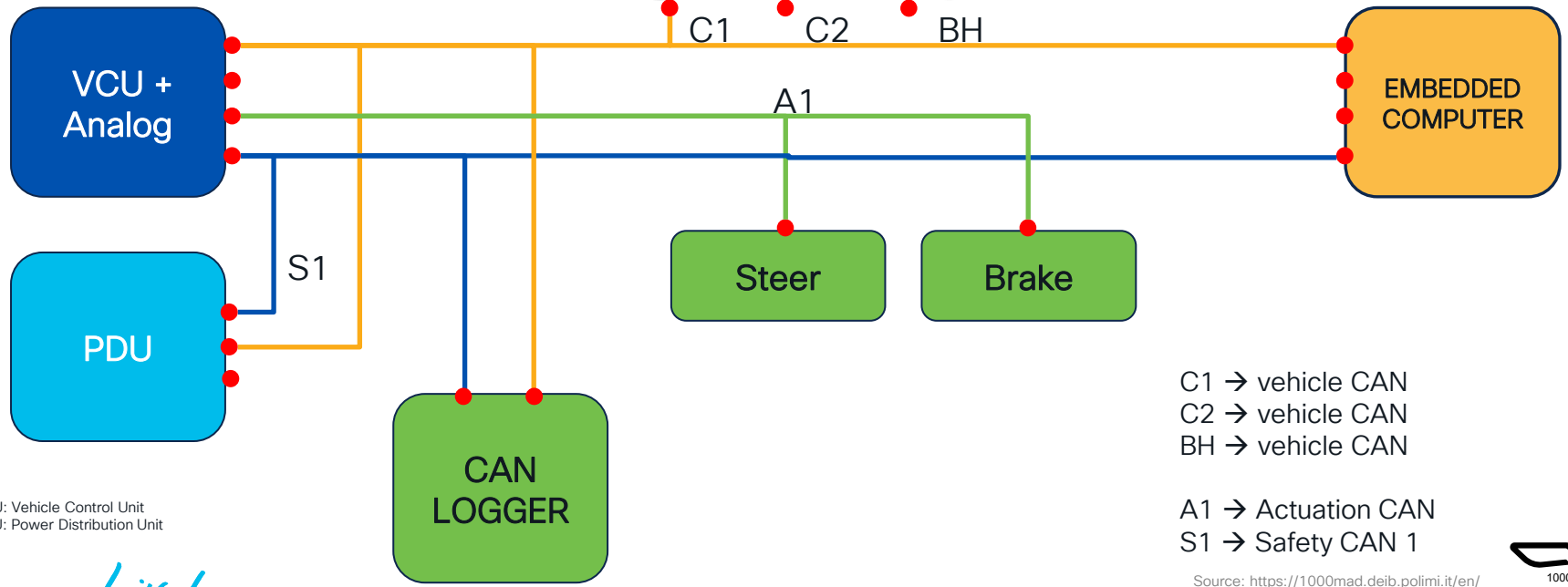
Engineer support car for surveillance and road verification

DM70/2018 Special requirement

Source: https://1000mad.deib.polimi.it/en/

On-board Network and architecture

CAN Network



C1 → vehicle CAN
C2 → vehicle CAN
BH → vehicle CAN

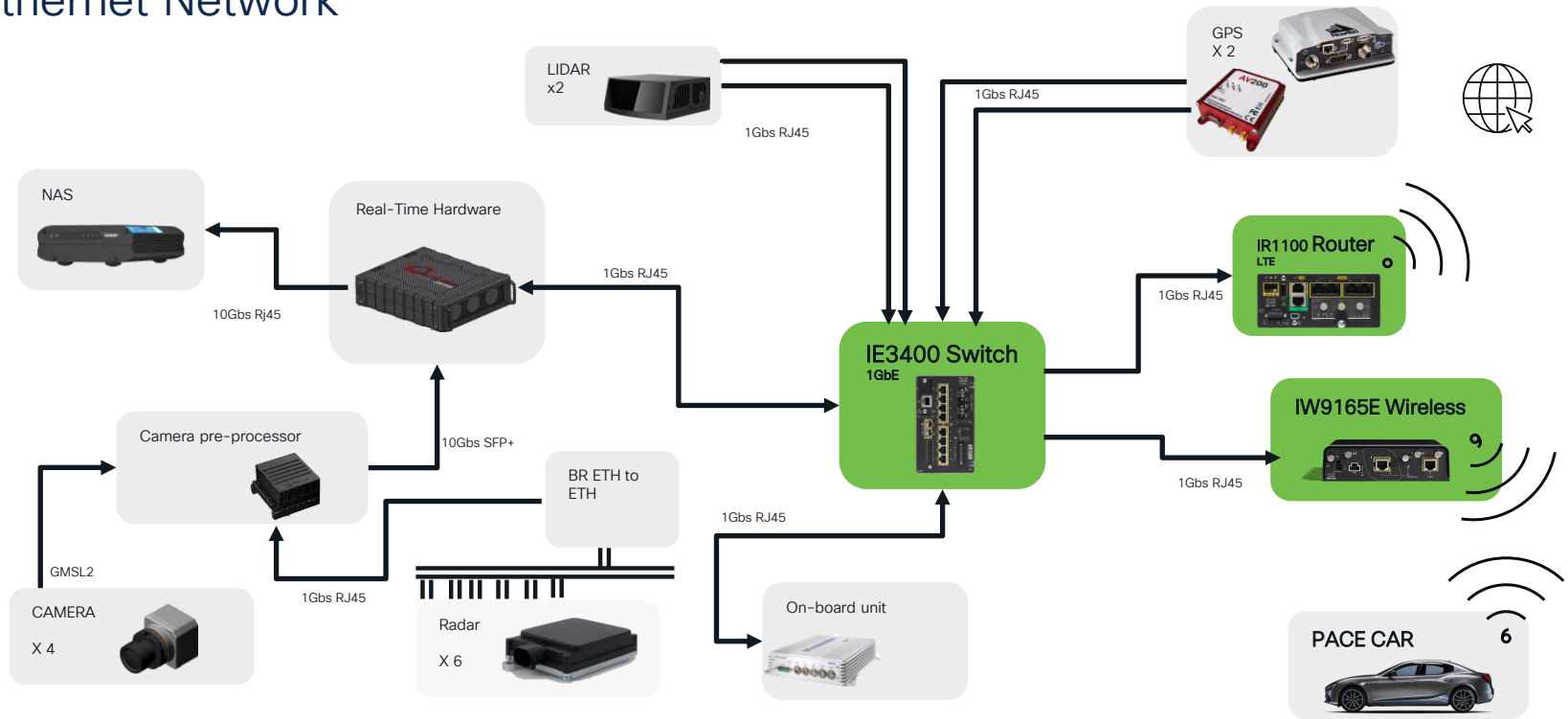
A1 → Actuation CAN
S1 → Safety CAN 1

VDU: Vehicle Control Unit
PDU: Power Distribution Unit

Source: https://1000mad.deib.polimi.it/en/

On-Board Network and architecture

Ethernet Network



Source: https://1000mad.deib.polimi.it/en/

Let’s go for a ride!

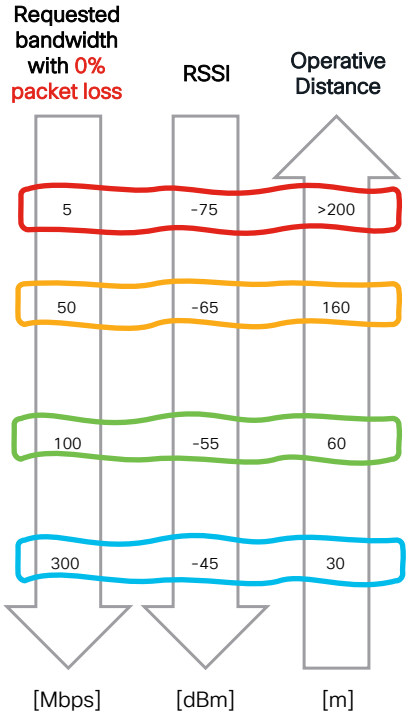
Source: https://1000mad.deib.polimi.it/en/

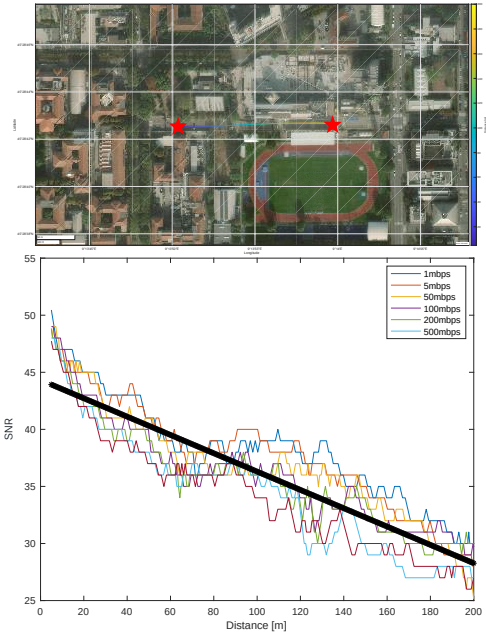
1000 MAD

Cisco URWB

Adaptive Telemetry based on available bandwidth

Antenna setup: IW-ANT-OMN-53-N (3dBi)





Controlled INPUT
Distance (5→200 [m])

Throughput request
(1 →500 [Mbps])

Using RSSI to determine which application can be sent across the link

Source: https://1000mad.deib.polimi.it/en/

1000 MAD

1000 Miglia – The 2024 Edition

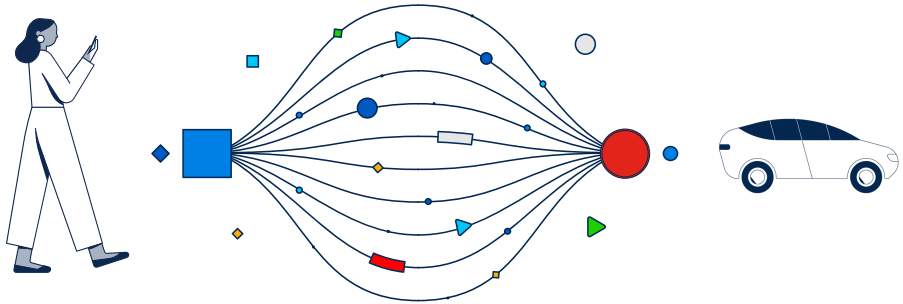
New Maserati GranCabrio Folgore - Full Electric

300Km of tests: travel 60Km x 5 days

Source: https://1000mad.deib.polimi.it/en/

Why autonomous driving?

Car-Sharing: Mobility as a service (MAAS)

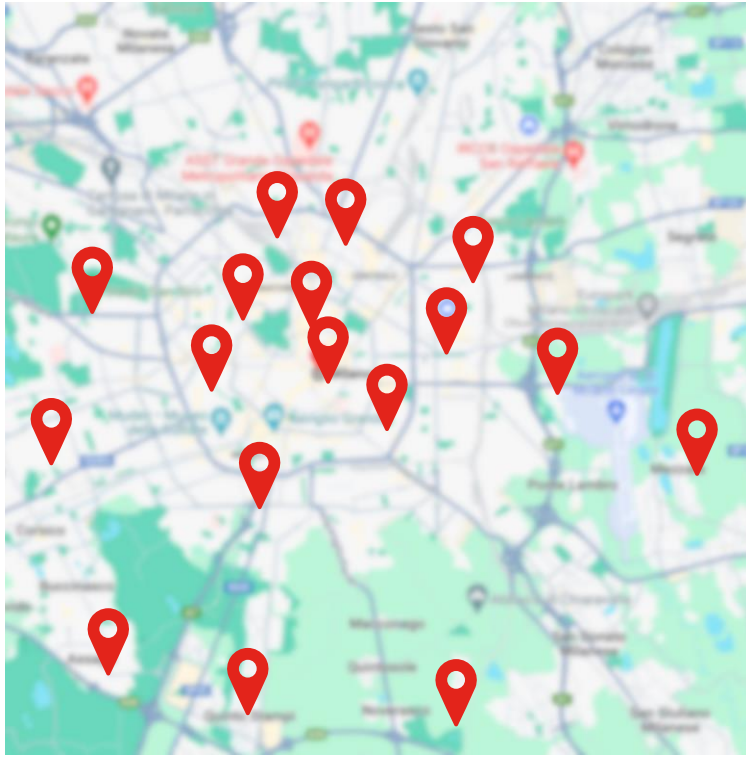


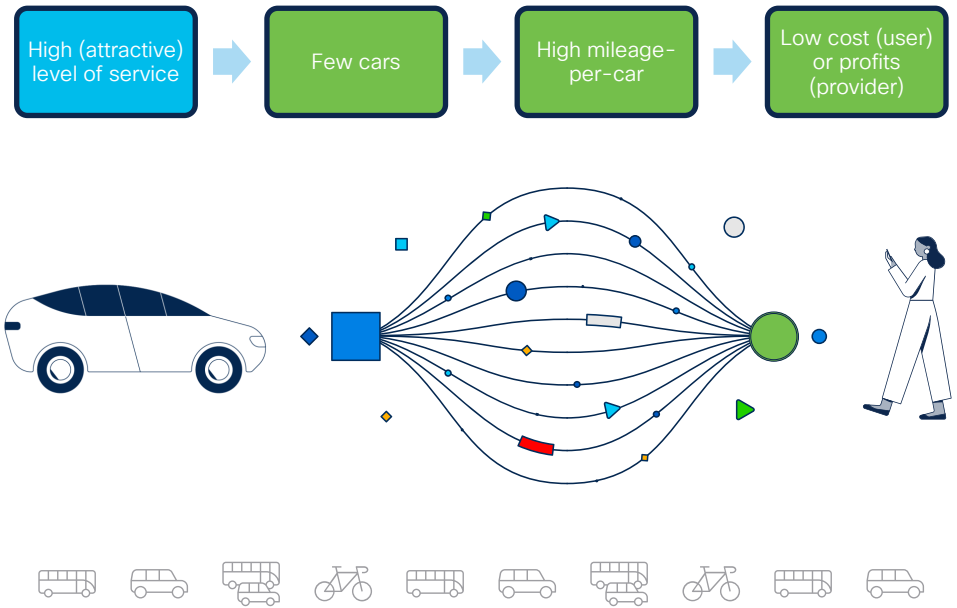
High (attractive) level of service → (Too) many cars → Low mileage-per-car → High cost (user) or non-profits (provider)

Source: https://www.osservatori.net/it/ricerche/osservatori-attivi/connected-car-mobility

What if the car autonomously picks you up?

MAAS & Autonomous Driving





Source: https://www.osservatori.net/it/ricerche/osservatori-attivi/connected-car-mobility

Robot-Taxi with Autonomous Driving Simulation

Replacement target: cars with 90% trips «in-in»

Optimal Vehicle Number	4021
Users per car (efficiency)	10.9
Replaced private cars	43.800
Average Mileage	44.372 Km/y
Average Wait Time	2mins 20s

Case Study: Milan, Italy

Source: https://www.osservatori.net/it/ricerche/osservatori-attivi/connected-car-mobility

Thank You

“In the new era, thought itself will be transmitted by radio.”

Guglielmo Marconi – 1931

Continue your education

- Visit us at the IIoT Section of the **World of Solution**
- Book your one-on-one **Meet the Engineer** meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the IIoT site: https://www.cisco.com/c/en/us/solutions/internet-of-things/overview.html

Continue your education

Catalyst IW9165 & IW9167 Access Points

- Catalyst IW9165 & IW9167 on Sales Connect
- Catalyst IW9167 on cisco.com
- Catalyst IW9165E on cisco.com
- Catalyst IW9165D on cisco.com
- Catalyst IW9167 Data Sheet
- Catalyst IW9165 Data Sheet
- Questions:
  - Email: iot-iw-pteam@cisco.com
  - Webex space:
  - https://eurl.io/#_PNsCCCix


cisco
The bridge to possible
Thank you
cisco Live!


cisco Live!
Let's go