

"Industry 4.0 reloaded A New Industry 4.0 Vision"

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I2T Research Group at UPV/EHU

- I2T Research Group Staff

- Around 20 members, 80% of senior members with previous experience in IT related enterprises
- 2 Business promoted PhD researchers CAF (Wireless Train Signalling Communications) y Soc-e (Industrial applications of SDN)
- Recognized Research Group “A” financed by Basque Government
- Two Extraordinary PhD Thesis Prizes (in mobility and sensor security) in last 4 years.
- 7 European FP7 and H2020, 3 National projects in last 10 years
- A SpinOff in the “Cibersecurity for Industry 4.0” area Keynetic.tech
- <http://i2t.ehu.es>



Research Lines

- Reconfigurable architectures for advanced services provisioning.
 - ◆ Research on AAA and Security in Virtualized Networks.
 - ◆ Experimental platforms: EHU-OEF, SN4I
 - ◆ Software Defined Networking and Network Function Virtualization.
 - ◆ Traditional networking problems revisited at the SDN/NFV light.
- Communications technologies for service deployment in Intelligent Transportations Systems.
 - ◆ Improving resiliency in ITS (wireless)
 - ◆ Railway Signaling modeling and simulation.
 - ◆ Efficient and secure network mobility management.
- Security in Distributed Systems (transversal line)
 - ◆ AAA for low performance equipment (IoT, IP sensors)
 - ◆ AAA for highly dynamic service provisioning.
 - ◆ SmartGrid, Railway and Industrial Network (4.0...) cybersecurity.

What's Telematic Engineering

- About how to send and receive information...
 - But in a secure, efficient and predictable way.
 - Not just “Plug and Pray”
 - Adaptating to different media
 - Wired vs Wireless
- Communications are –not– a static commodity (like, perhaps, electricity or drinking supply networks)

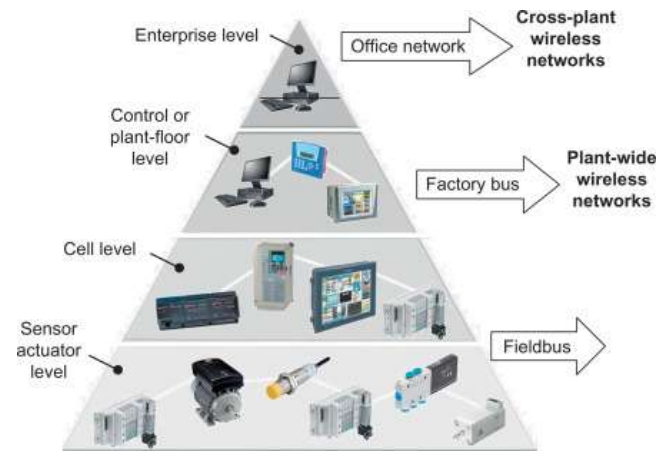
Industry 4.0 related Research and activities

- Plataform “Smart Networks for Industry”

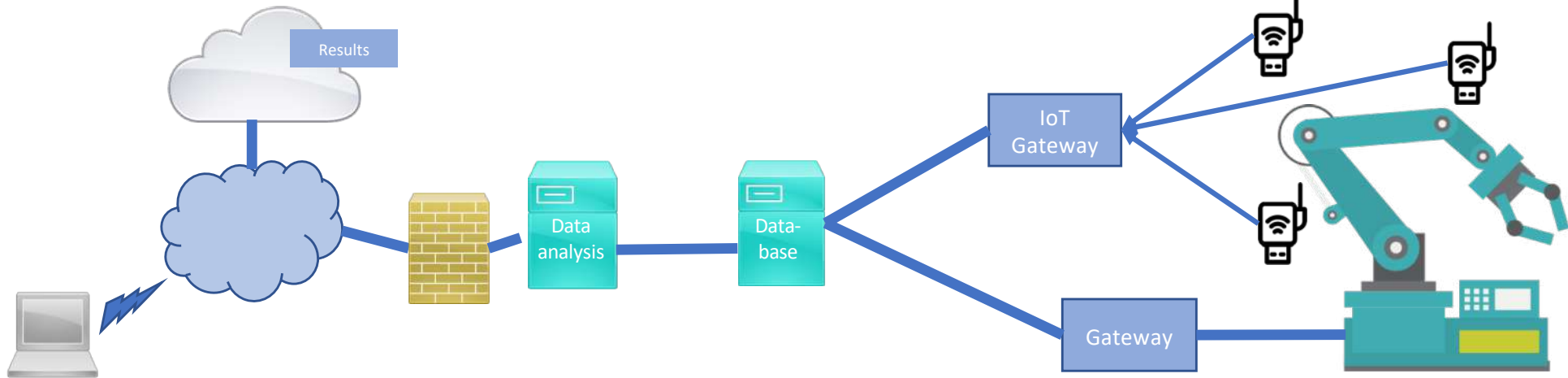


- End-2-End Secure IoT, authenticated and fine-grained Access.
- Machine shop micro segmentation and authenticated access (a product, but with research activities still available)

Industry 4.0 Traditional view



Isochronous wireless communication system for industrial automation
E. Sisinni, F. Tramarin, in Industrial Wireless Sensor Networks, 2016

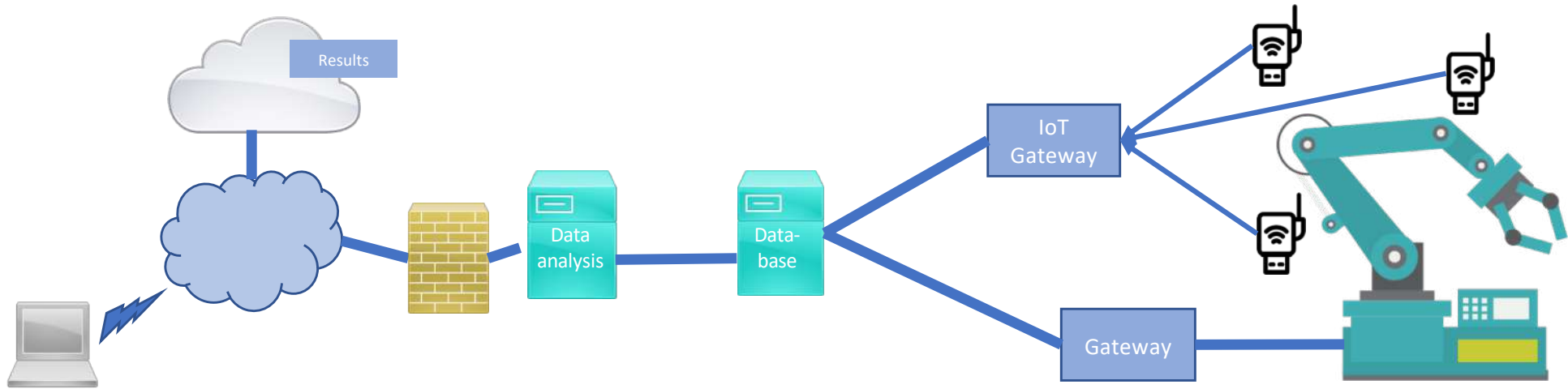


Presentación de resultados

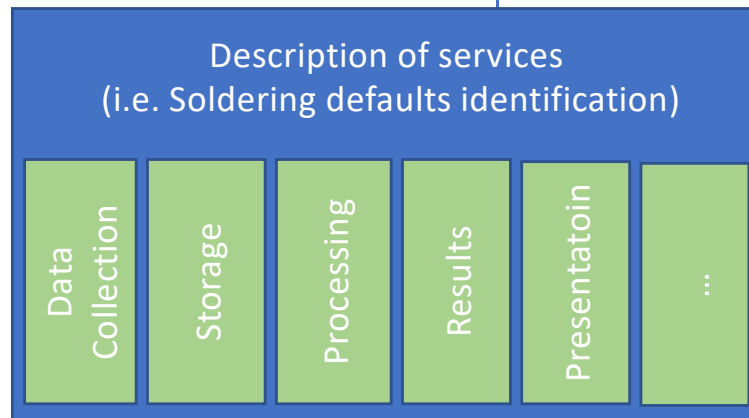
The nerves and the brain in Industry 4.0

- Processing and communication capabilities
- How to manage them
- But actual technology gives the opportunity to have brains on almost any point of the “body”
 - End elements... at your fingertip
 - At your nerve junctions...
 - You can even deploy a temporary brain linked to your stomach to specially manage Christmas dinners!

Industry 4.0: Our view



Presentación de resultados

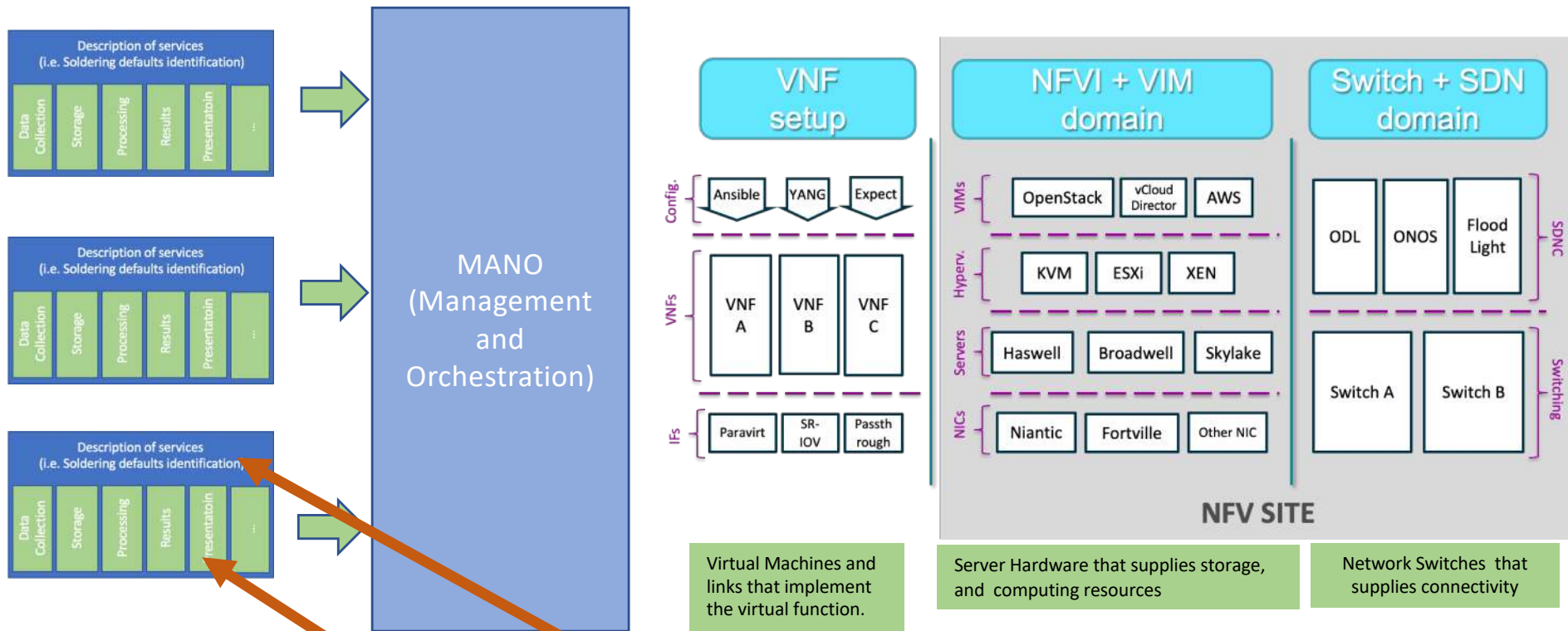


- M x Compute (x cores, y Gb Ram)
- N x Storage (z Gb HD)
- Ox Communications(1Gbs, delay< 100ms)

The promise



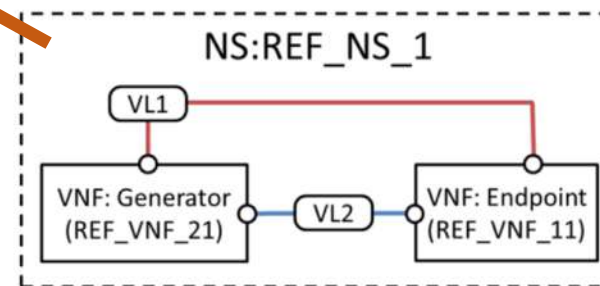
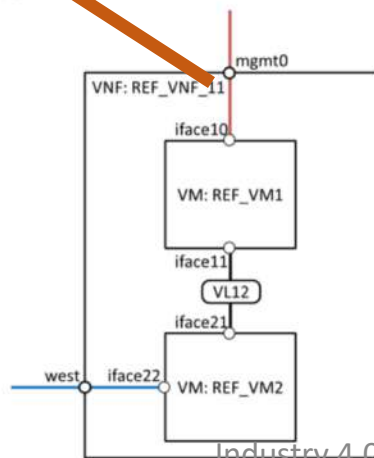
No longer a disaggregated view, but a (network) service...
 No longer services running on a specific server...
 No longer static solutions



Reference VNF#11: Endpoint VNF

Description in common language

- **Name:** Ref_VNF_11
- **Component:** Ref_VM1
 - **Memory:** 2 GB
 - **CPU:** 2 vCPU
 - **Storage:** 8 GB
 - **Image:** ref_vm1.qcow2
- **Component:** Ref_VM2
 - **Memory:** 4GB
 - **CPU:** 2 vCPU
 - **Storage:** 16GB
 - **Image:** ref_vm2.qcow2
- **Internal Virtual Link:** VL12
 - No DHCP server is enabled.
 - Static addressing may be used at CP iface11 and CP iface21.



How to do research in Industry 4.0 IT related fields?

- With a communication infrastructure made available...
- Deployed in a manufacturing facility...
- With a clear focus on research...

The UPV/EHU's Aeronautics Advanced Manufacturing Centre

Tier 1(2)
member type A :
(OEM & Tier 1)



Diciembre 2014
Diciembre 2016
Marzo 2017
Septiembre 2017
January 2018

Tier 2(16)
member type B
(machine-tools)



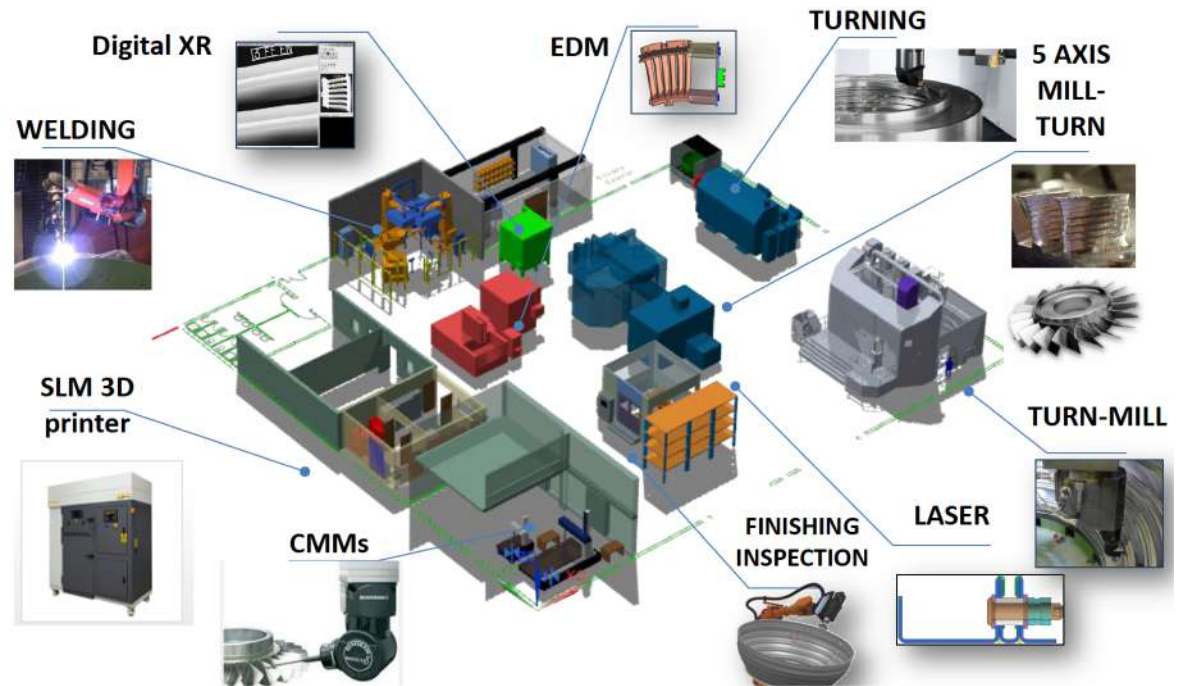
member type C
(components)



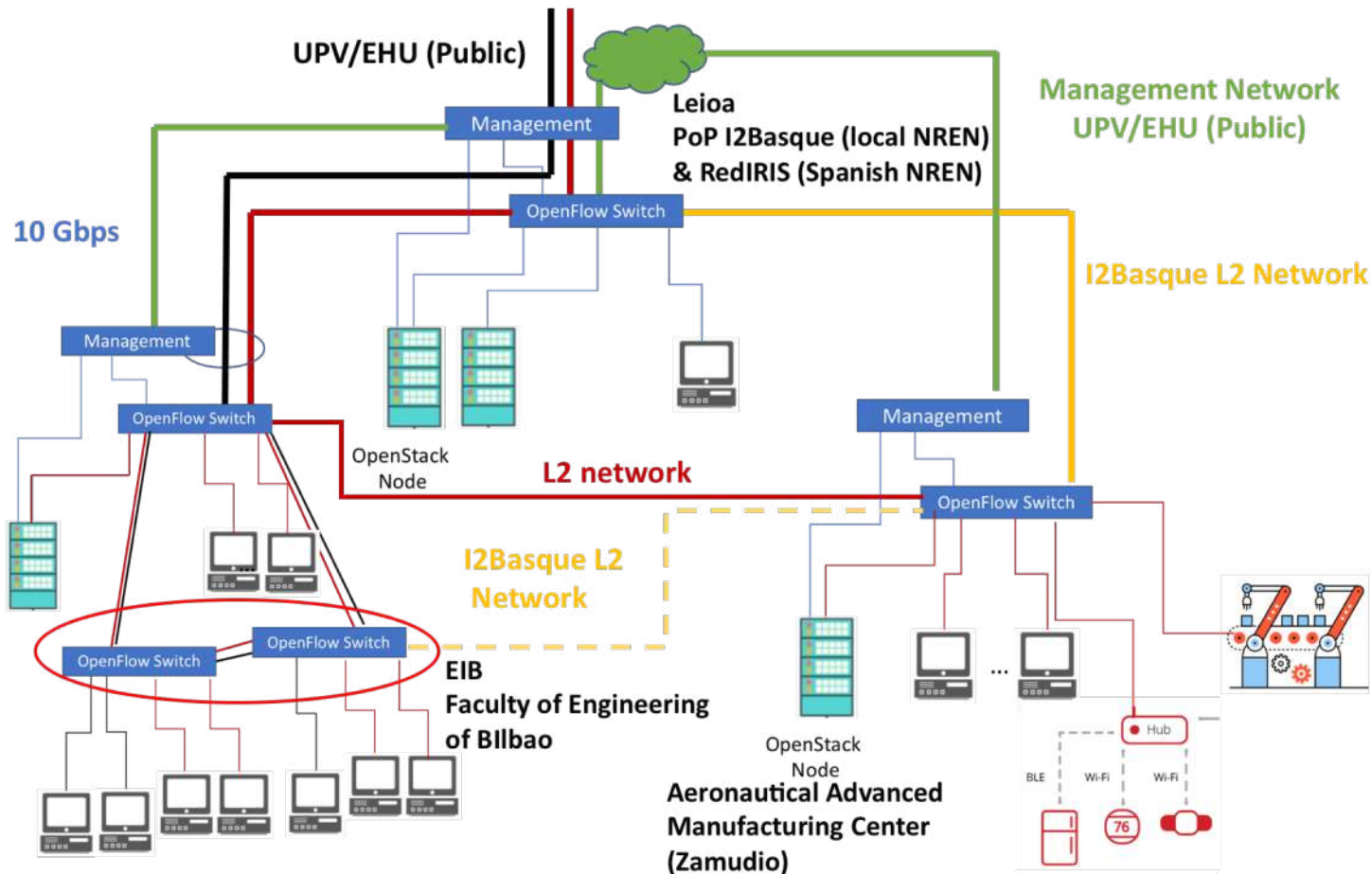
Tech providers (27)
member type D
(in kind)



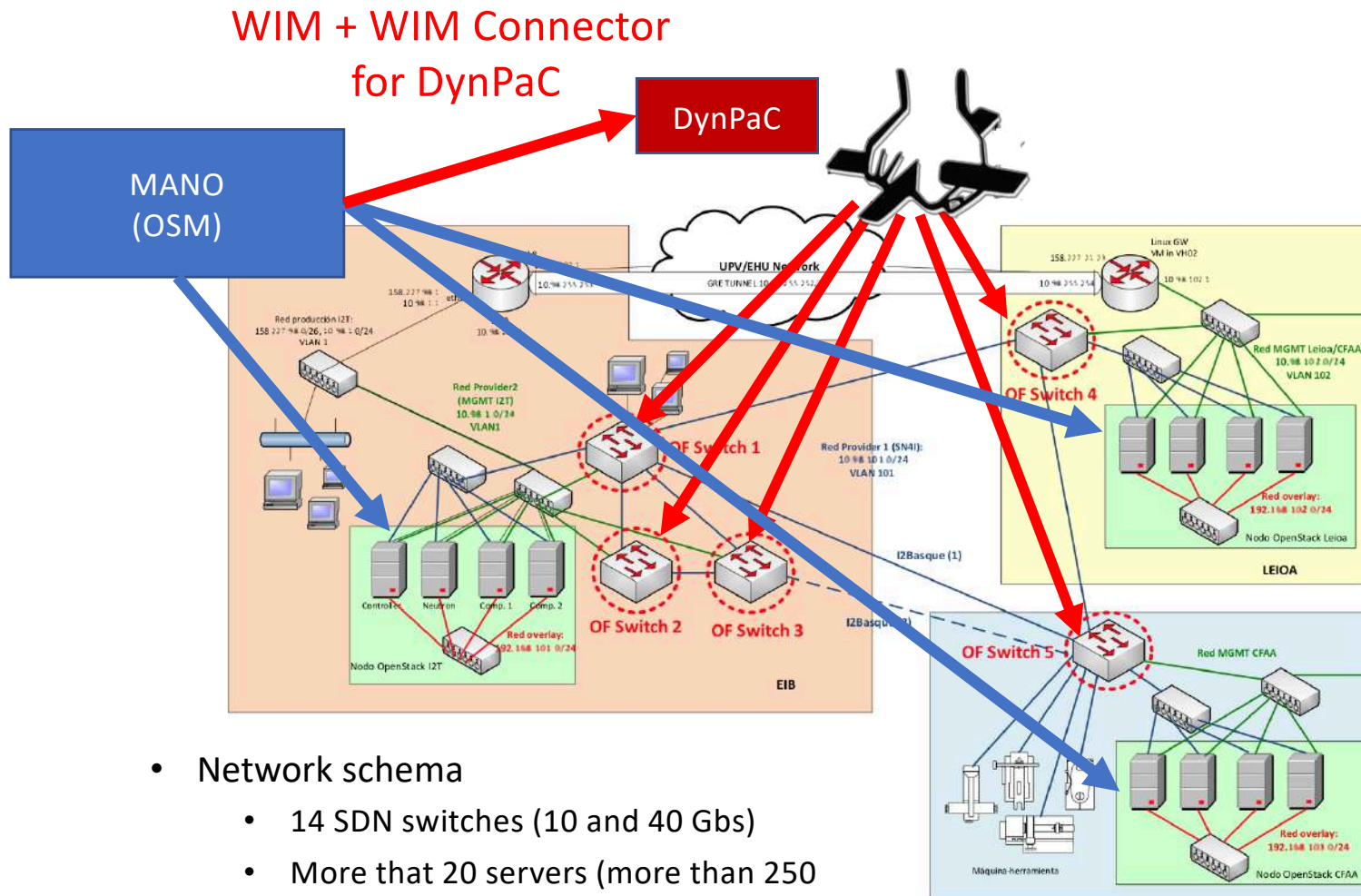
Collaborators(4)
(support)



And the SN4I Smart Networks for Industry infrastructure.

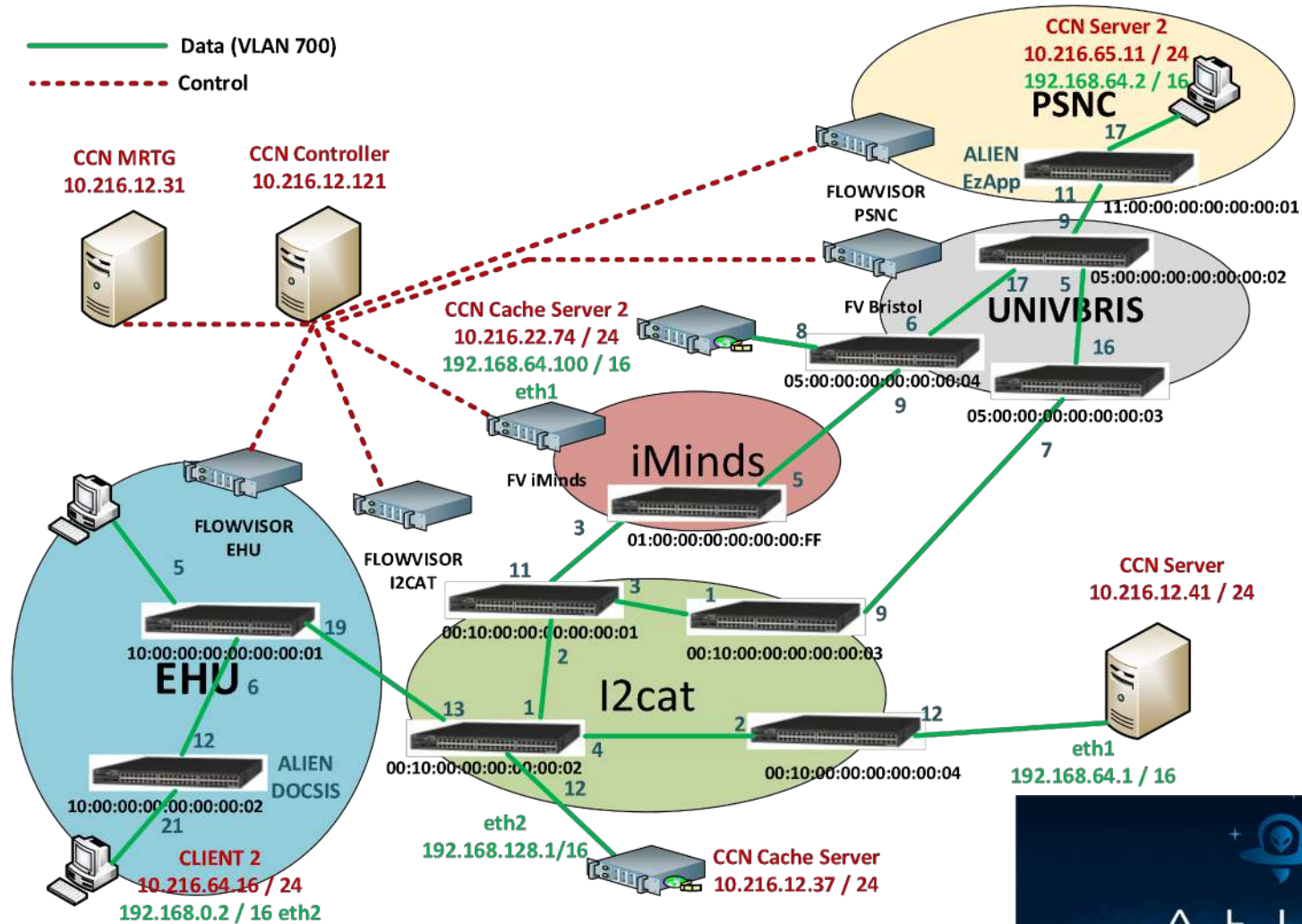


The brains and nerves



- Network schema
 - 14 SDN switches (10 and 40 Gbs)
 - More that 20 servers (more than 250 cores and 1Tb RAM, 75 Tb storage)

With a clear drive to run interconnected experiments.



Objective

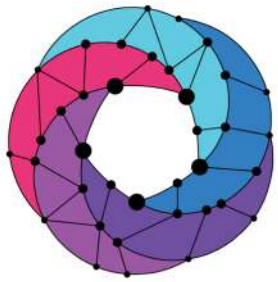
A new paradigm!

- Not about doing the same things with new tools...
- A playground to experiment with new exciting features
 - Process isolation (from physical manufacturing process to process control through data collection and treatment).
 - Private/Secure by design.
 - Supporting new IoT technologies.
 - Hardware supported isolation (identity, performance, access, security...).



- Brings telco proven technologies to Industry 4.0
 - Software Defined Networking (SDN)
 - Network Function Virtualization (NFV)
 - High bandwidth (>10Gbs)
 - Low delay and jitter
 - Cloud based.
 - 5G





Open Source MANO



European
Telecommunications
Standards Institute

OSM community is really **LARGE AND DIVERSE**, with **105+** members today



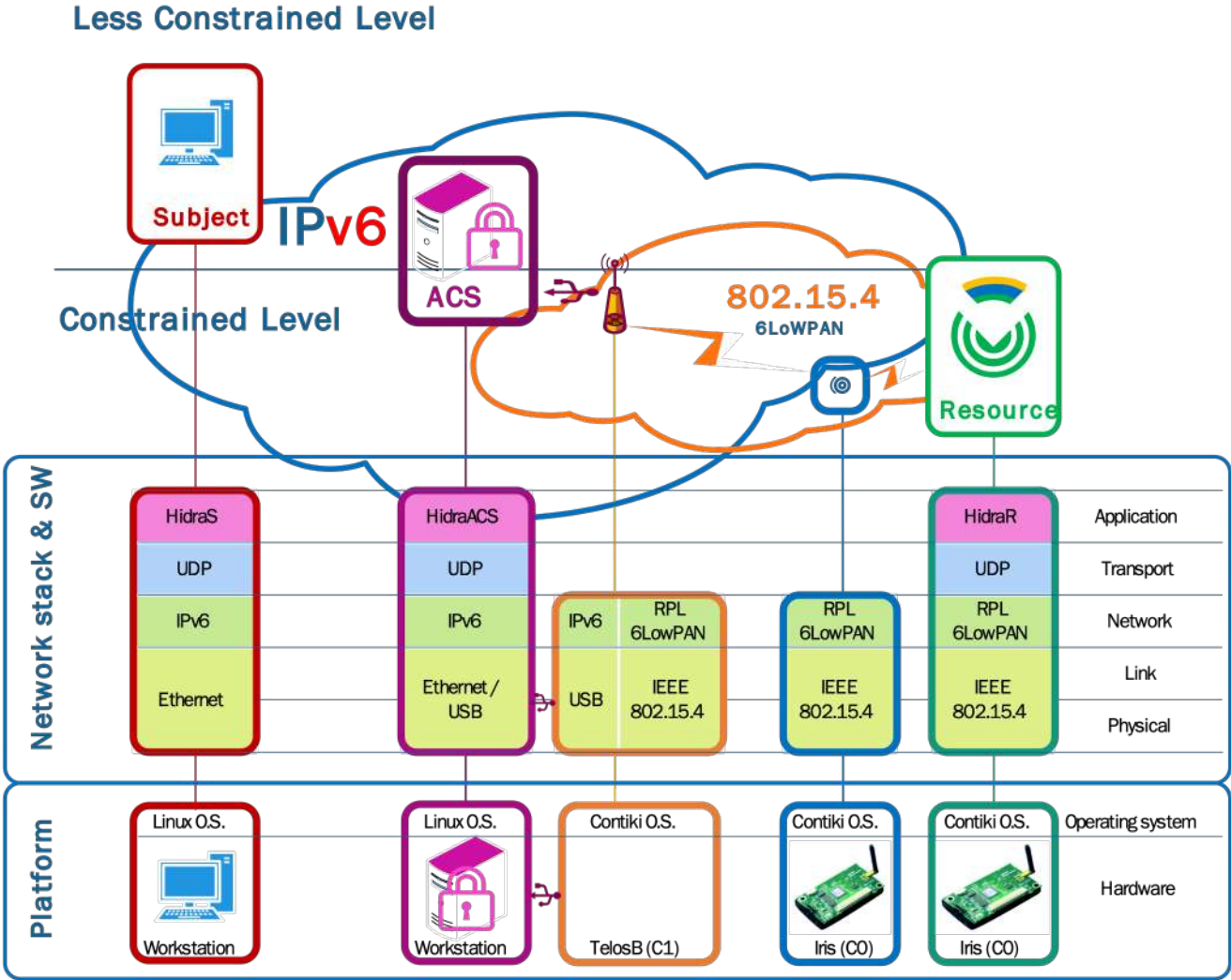
- 12 Global Service Providers
- Leading IT/Cloud players
- VNF providers



Secure IoT

- Data sovereignty
 - Critical on shared machine shops.
- Sensor Virtualization
 - Physically and Logically
- Authenticated Access
 - With extensible and fine grained security policies
- Implemented over different sensor architectures
 - Modular: communication technology and network independence
- Demonstrator in AAMC Q3 2019 (over SN4I)

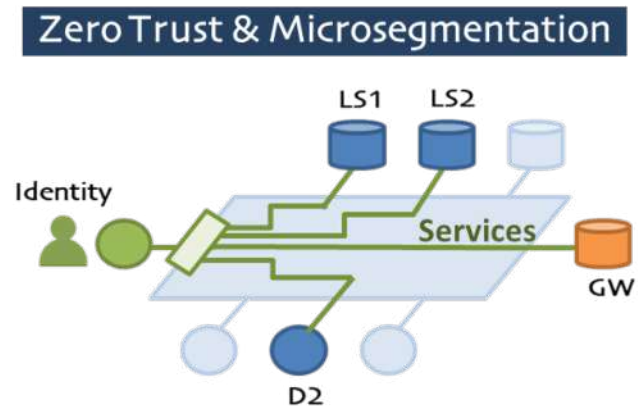
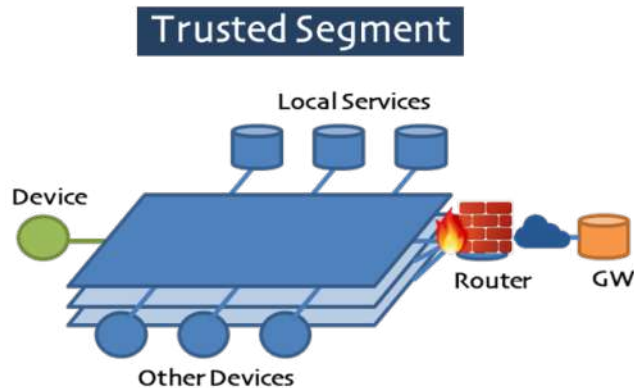
Ladon & Hidra



Micro-segmentation and Zero-trust solution based on SDN in NFV

- Pre-Industry 4.0 scenario
 - Disconnected machine tools:
 - Without security, static or burnt-in passwords
 - With operating systems not updated
 - Some time a machine is a full network with a switch, an Access point and several CPU connected.
 - Managed by own personal but also with manufacturer Access.
- How do we digitize this?
 - FlowNAC: Result of several EU and national research projects.
 - Nowadays a spinoff of the research group.

FlowNAC



Complex



Partitioned



Visibility



Control

Gracias

Merci

Eskerrik Asko