BCO Network

BCO Network WEBseries 17

Bridging the digital divide: two success stories of broadband deployment in rural areas

16 December 2025

Speakers:

ERMES:

Paolo Perucci, Autonomous Region of Friuli Venezia Giulia & Emanuele Maggi, INSIEL

FTTH Gigabit Access Network Deployment in ultra-rural areas in Castilla Y León:

Pedro Abad & Manuel Garnelo, ASTEO Red Neutra

With an introduction by: **Angelo Cerqueti, DG AGRI, European Commission**

Funded by the European Union

What's next

WEBseries 18

- 13 January 2026

Cyprus presidency digital priorities

- 20 January 2026

Seal of Excellence session

- 10 February 2026

Lessons learned on simplified cost models

Funded by the European Union

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In detail:

ERMES & FTTH Gigabit Access Network Deployment in ultra-rural areas in Castilla Y León:

- More about the projects
- Watch the video interviews
- More about the EDC Awards 2025

Funded by the European Union

REGIONE AUTONOMA FRIULI VENEZIA GIULIA

BCO Network

insiel

ERMES

(an Excellent Region in a Multimedia European Society)

Paolo Perucci

Deputy Director of Heritage, State Property, General Services and Information Systems - Autonomous Region of Friuli Venezia Giulia

Emanuele Maggi

Director of Infrastructure - Insiel S.p.A.

FVG CONTEXT
AND PROJECT OVERVIEW

Friuli Venezia Giulia autonomous Region

- Population: 1.2 million
- Territory: 7,933 km^2, 43% of which is mountainous
- Population density: significantly below the national average
- 151 rural municipalities out of a total of 220

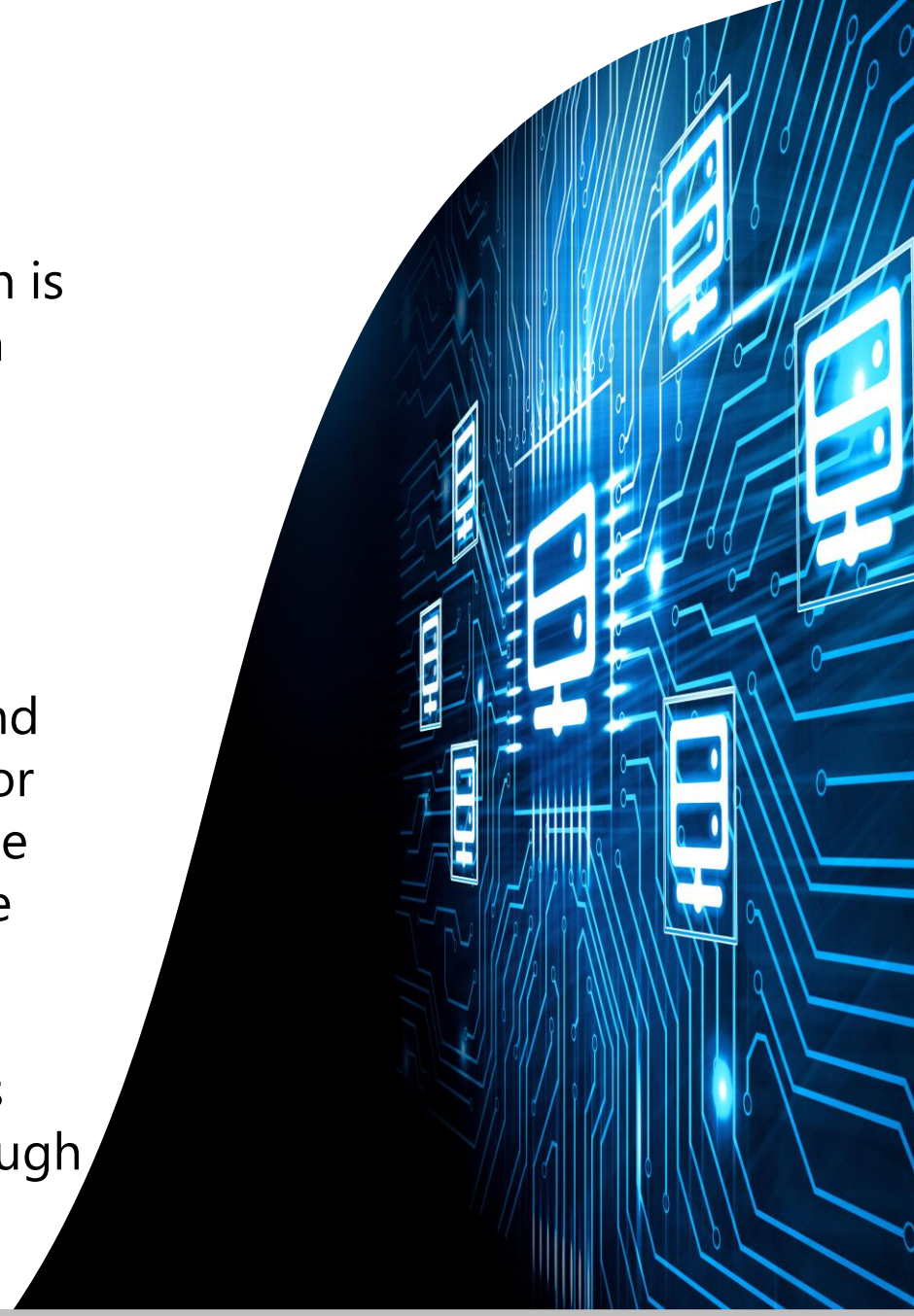
DIGITAL DIVIDE CHALLENGE

Regional ICT governance

The Regional Integrated Information System (RIIS)
Established under Regional Law LR 9/2011. Regional Administration is responsible for developing, promoting and integrating Information and Communication Technologies (ICT) across all local public administrations.

The Telecommunications Sector
Under Regional Law LR 3/2011, the Region has developed a **Public Regional Network (PRN or RPR in Italian)** that ensures broadband connectivity for public administrations and supports connectivity for businesses, associations, and citizens. This initiative helps bridge the digital divided and enables access to advanced services even to the most difficultly reachable areas.

Both the RIIS and RPR are **free of charge** to municipalities, schools and hospitals and are developed and managed by the Region through its fully owned in-house company: **INSIEL S.p.A.**



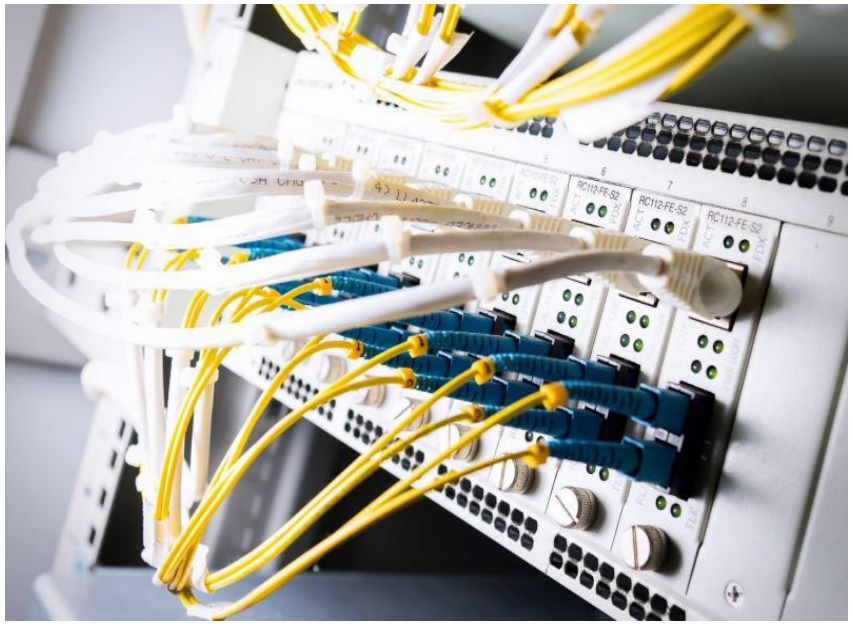
ERMES

ERMES is the program that has developed the Public Regional Network (RPR), approved in 2005.
It serves as a strategic enabler of public service innovation within the region FVG.

It's goal; technology, everywhere for everyone!

Primary mission: to bridge the **digital divide** by ensuring uniform technological development throughout the region—**so that no community is left behind.**

ERMES > *Key Connectivity Goals*



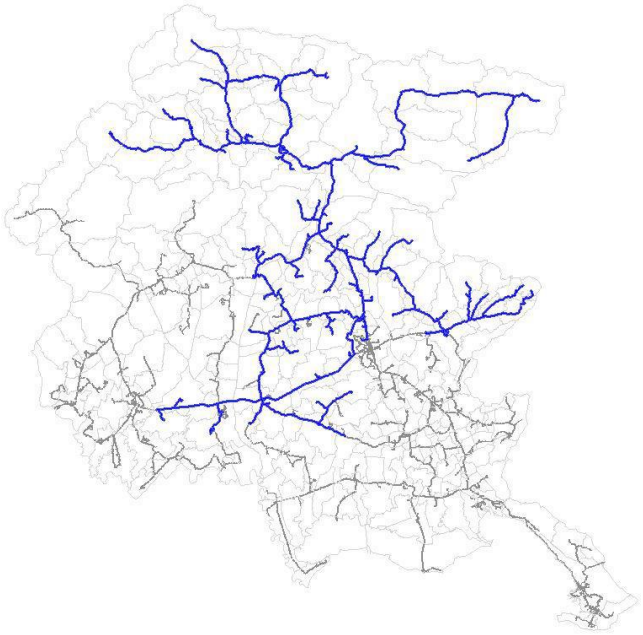
Public network owned by Regional administration

Deployment of a Region-owned fiber-optic **Public Regional Network (RPR)**

- Connection of Public Local Administration sites: all municipalities, all hospitals, and most schools
- Priority also given to universities, research institutions, education centres, industrial areas, and new or previously unconnected public and healthcare sites.

Primary goal: Improve public service effectiveness, efficiency, cost savings and competitiveness

ERMES > *Key Connectivity Goals*



Market failure & economic growth

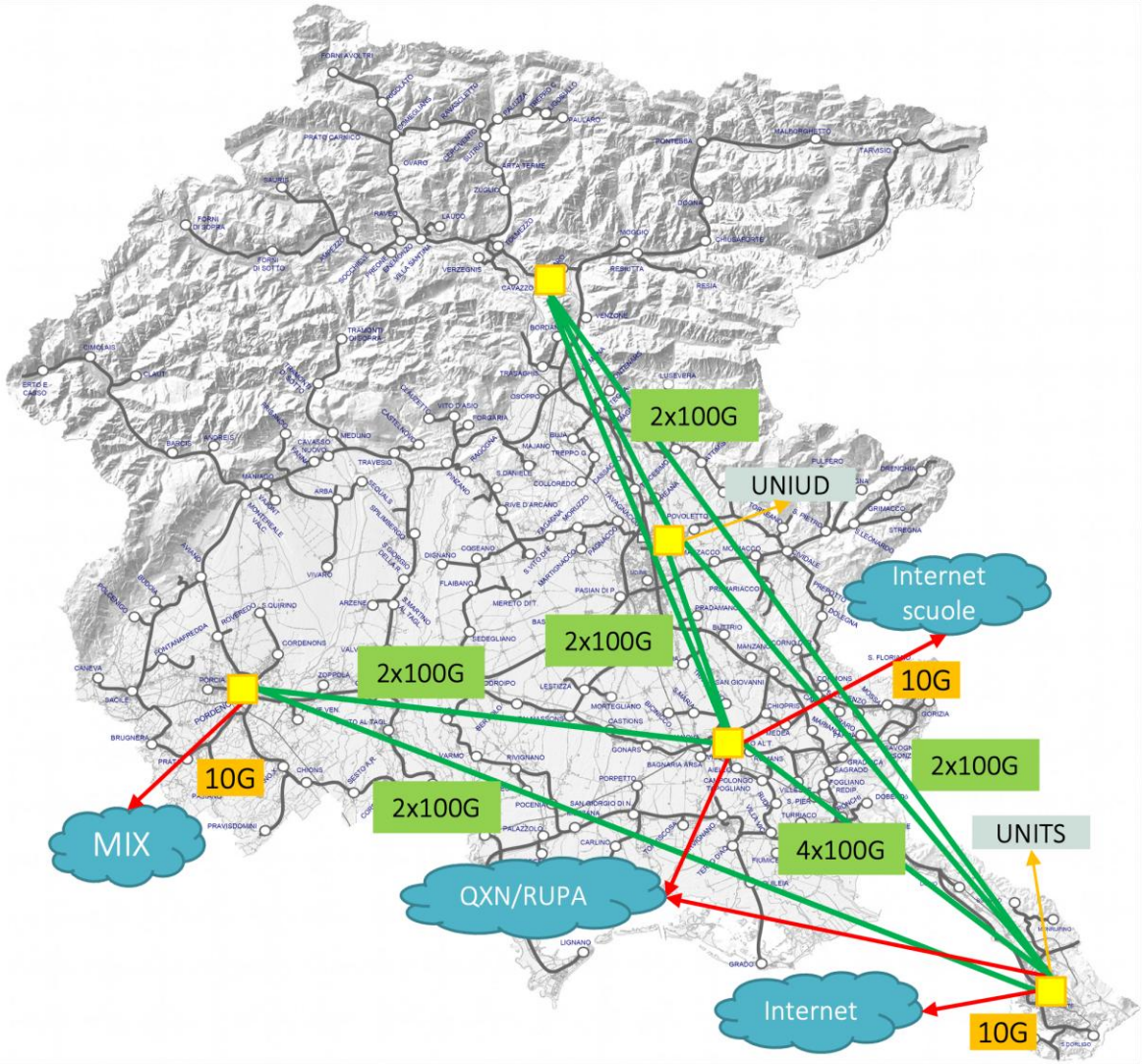
- State Aid Decision SA.31687 (N.436/2010) — Broadband in Friuli Venezia Giulia (Project ERMES) (May 2011)
- Authorized use of RPR's excess capacity (dark fiber-optic) to resolve market failure by offering open, neutral, access to Telecommunication Providers.
- Connectivity for industrial areas (SED or ZI in Italian) through backbone infrastructure and access networks
- Excess capacity is offered to the Telecommunication Providers through public tenders --> all requests have been satisfied

ERMES > *Key Connectivity Goals*

Security and resilience

- Reinforcement of infrastructure to ensure continuity of service and rapid recovery during emergencies—particularly for critical sites such as hospital and others.
- Enhanced cooperation within local authorities
- Integration of fiber infrastructure into broader public works to promote coordination between them according to Gigabit Infrastructure Act

ERMES TODAY



- **1,900 Km** backbone network 2x100 Gbps;
- **5 Backbone network nodes**;
- **220 Point of Presence (PoP)**;
- **260,000 Km** of optical fiber laid;
- **11,000 Km** of fiber optic to private operators;
- **1,000 Km** of fiber optic to research bodies;
- **220 Municipalities** connected;
- **>1,300 public buildings active** (hospitals, schools, etc.)
- **800+** Hot Spot **FVG Wi-Fi**

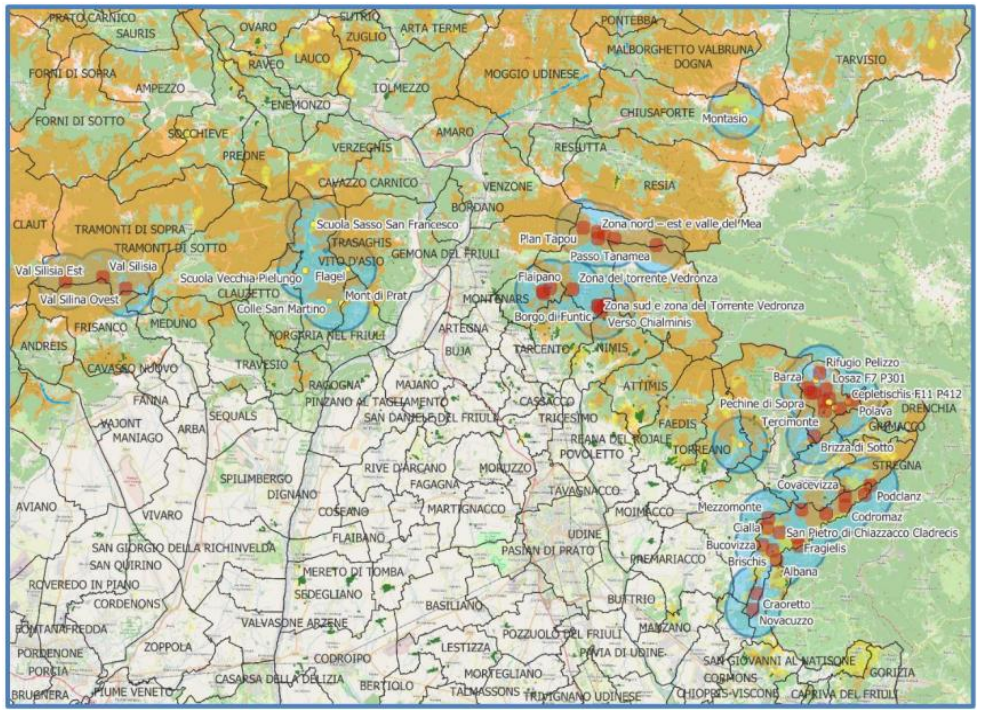
Total investment: € 140 M

ERDF and EAFRD (3%)
National funds (24%)
Regional funds (73%)

Synergies with national plans (BUL – ITA1G (PNRR - RRF) – ITA5G (PNRR - RRF) and local authorities

- Ad-hoc agreements for infrastructure joint development and cooperation with the national government
- Centralized permit management for the National Ultra-Broadband Plan (White Areas)
- € 10 Millions from framework agreements with the National Ministry to activate school connections (regional or national networks)
- Agreement with the Municipality of Trieste to implement the Metropolitan Area Network (MAN)
- Collaboration with local and national police to improve security (license-plate recognition and video surveillance)

Recent initiatives – Tackling Mobile Market Failures



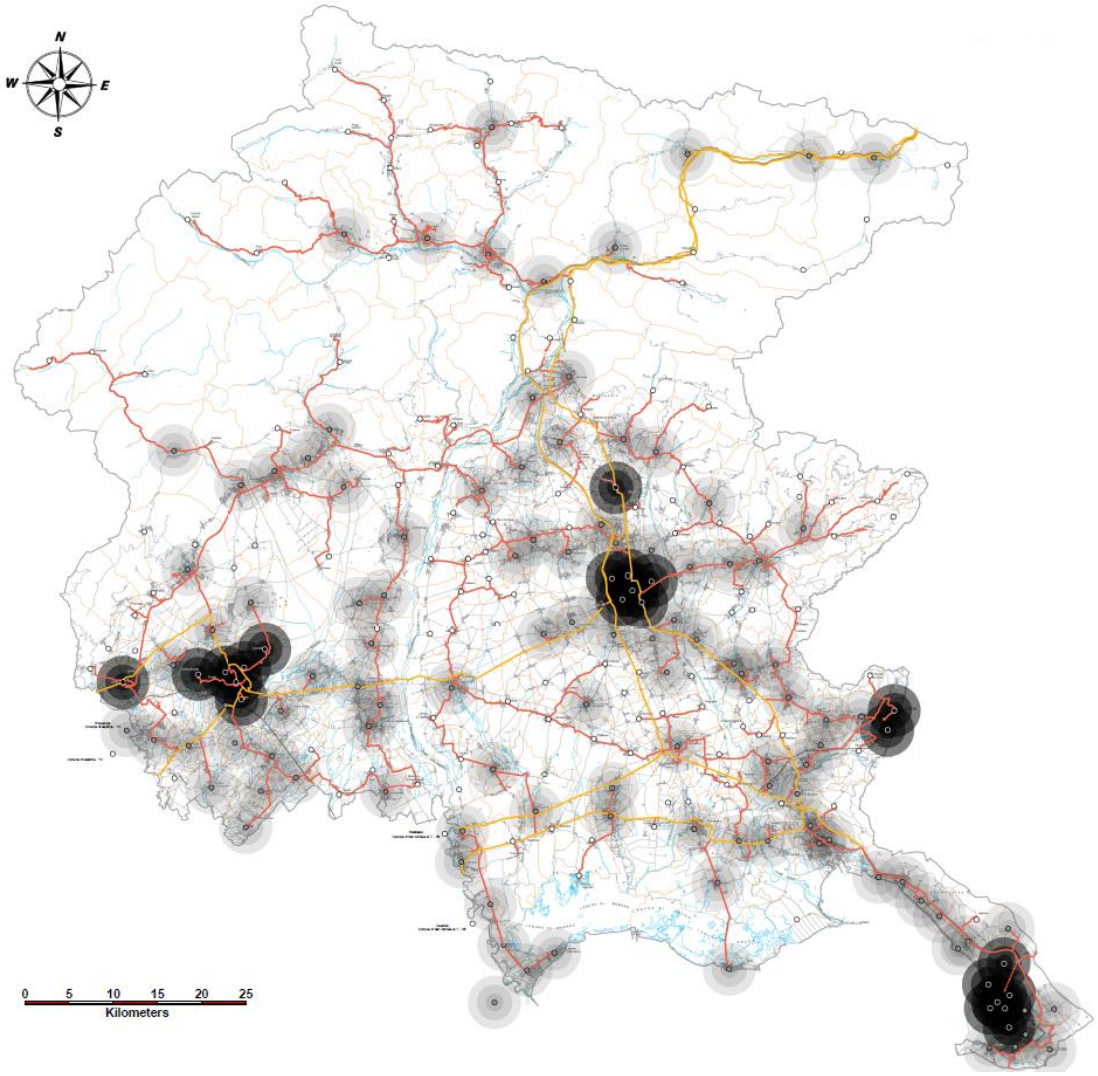
- Extension of Regional Law LR 3/2011
- Compliance with the General Block Exemption Regulation (GBER) for areas affected by market failures
- Expansion of public infrastructure to include passive mobile components (poles, masts, towers)
- Regional fundings to municipalities for building passive infrastructure
- Assessment of DAS (Distributed Antenna Systems) and next-gen mobile solutions

THE REGIONAL NETWORK FROM THE TECHNICAL POINT OF VIEW

ERMES Key Connectivity Goals

- Create a **fiber optics intranet**, connecting all offices of the Regional Public Administration
- **Create a technological advantage**
- **Economic advantage** due to abandoning connections with commercial Providers.
- **Resilience network by design**: ability to maintain IP connectivity during faults or disasters, and recover quickly, ensuring business continuity through redundancy, security, adaptability, fast recovery, minimizing service downtime.
- **Actively contribute to reducing the digital divide** in regional areas by granting usage rights of RPR resources to commercial Telco Provider for broadband connections to citizens, using excess fiber optics capacity.
- **Enhance infrastructure security**, ensuring service continuity and immediate restoration in emergencies, particularly for critical sites such as hospitals and Civil Protection headquarters.

Regional Network before ERMES project (2005)



• Connected regional offices, municipalities, hospitals.

• Not designed to provide directly connectivity to end-user, as-is now

• Used leased connections from commercial Provider:

1. Fiber from Providers (limited)
2. ADSL
3. Hyper LAN
4. ISDN

→In many cases bandwidth was inadequate for needs
→Economically burdensome

RPR FVG NOW (2025)

The RPR is an overlay transport network based on MPLS protocol and Multi-Protocol BGP, enabling L3 VPN (its primary purpose). It connects also Regional Data Centers and centralized Internet access through redundant BGP peering with other AS

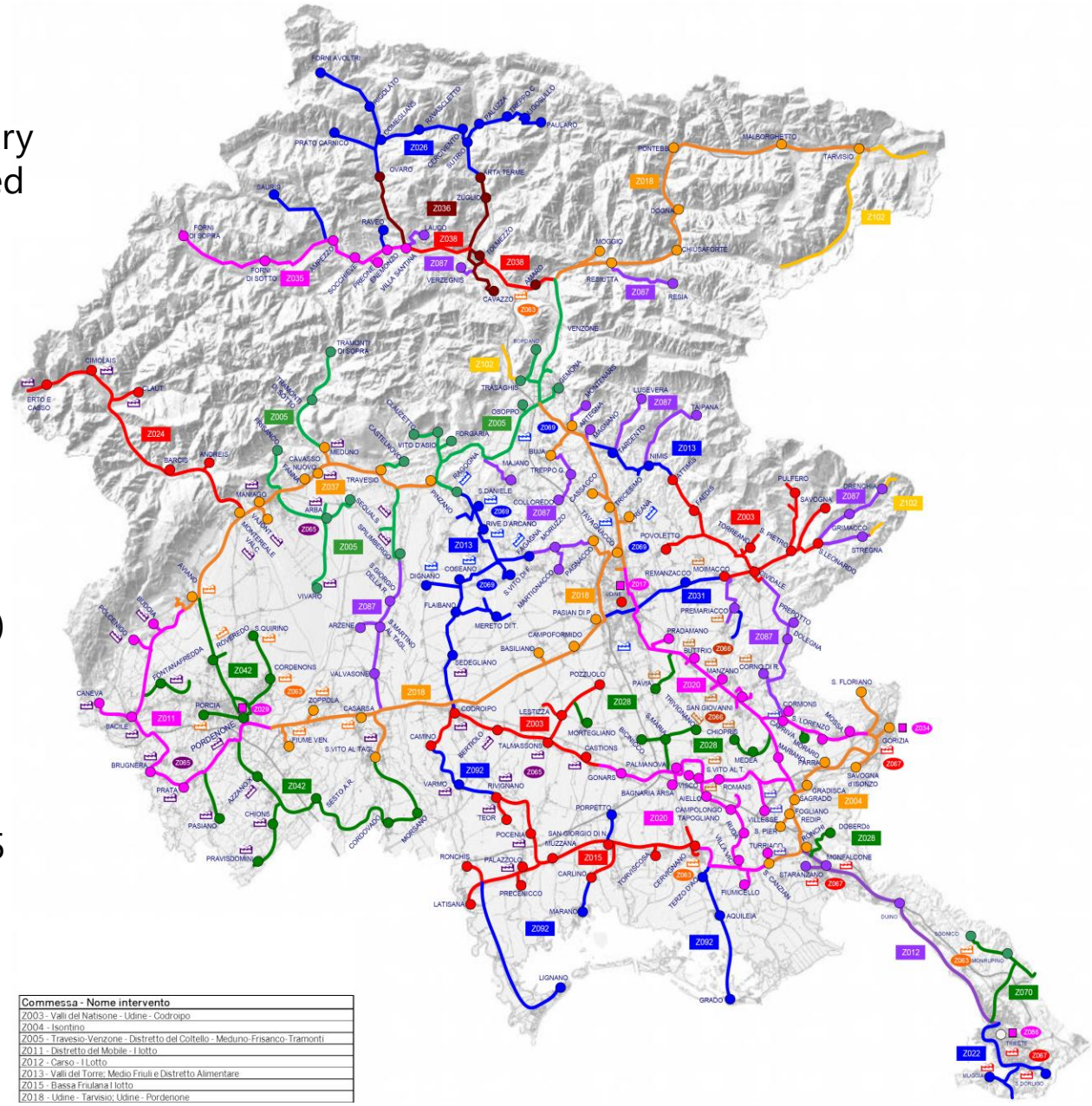
- **1,900 km** backbone infrastructure
- More than180 km MAN network in 4 capitals (Udine, Trieste, Gorizia, Pordenone)
- More than 380 km distribution in **industrial zones (ZI)**
- **2,600 km total fiber-optic cables**

Backbone Network (Core):

- **5 main nodes** (Trieste, Udine, Pordenone, Palmanova, Amaro)

Distribution Network:

- **220 POP** (Point of Presence, one per municipality)
- 100 Concentration Points in **industrial zones**
- More than **1,100 public offices** connected via fiber (275 through Open Fiber)
- More than **670 schools**
- 20 hospitals directly connected to backbone
- **Primary Data Center (AI2 ACN qualified, TIER-3 TIA) and secondary DR Data Center**



Commessa - Nome intervento
Z003 - Valli del Natisone - Udine - Codroipo
Z004 - Isontino
Z005 - Travesio-Venzone - Distretto del Coltello - Meduno-Frisanco-Tramonti
Z011 - Distretto del Mobile - I lotto
Z012 - Carso - I Lotto
Z013 - Valli del Torre; Medio Friuli e Distretto Alimentare
Z015 - Bassa Friulana I lotto
Z018 - Udine - Tarvisio; Udine - Pordenone

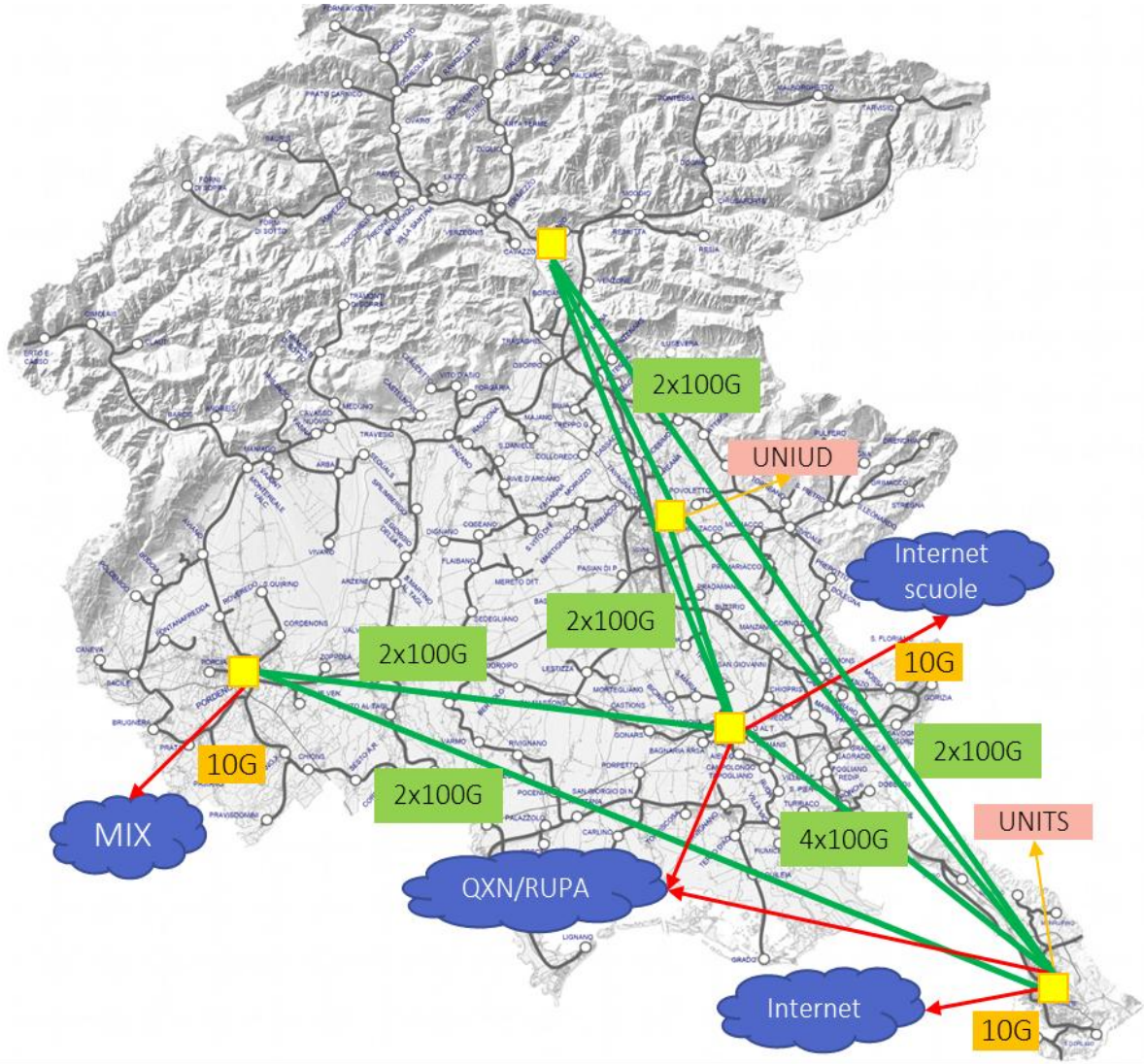
RPR Backbone (Core Network – Layer 1)

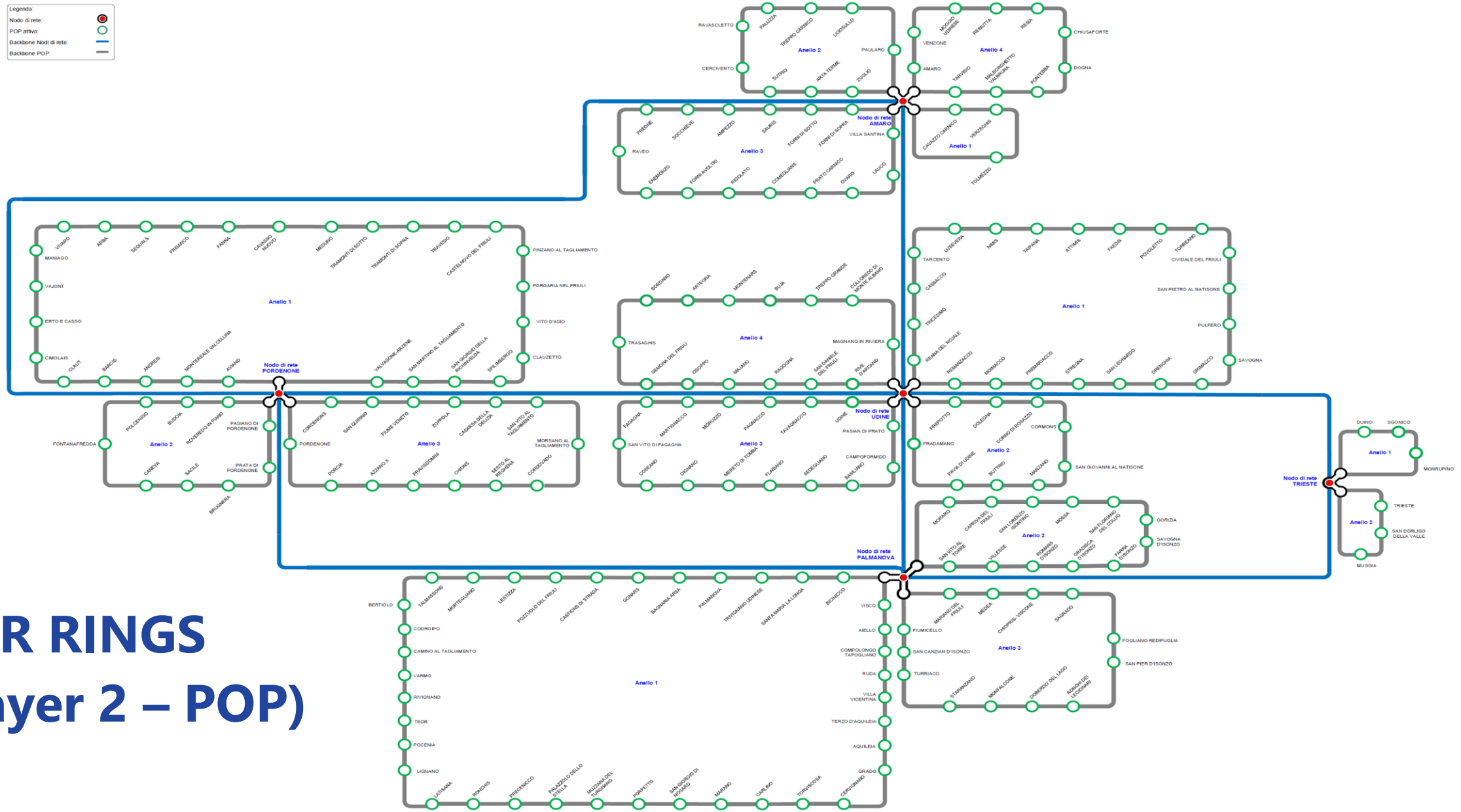
Available bandwidth:

- **200 Gbps** between 5 RPR nodes (DWDM)
- **10 Gbps** between POP and backbone nodes
- 10 Gbps rings (Second layer, completed by 2026)
- **10 Gbps** to hospitals (dual physical path)
- **400 Gbps between primary and DR Data Centers**

- Internet access:
- **2x10 Gbps** Trieste node (dual AS, different Provider, both have dual physical paths)
- **10 Gbps** Pordenone node → **MIX** (direct private link to **Mil InterExchange Point,** ASN 44831)
- **10 Gbps** Palmanova node → dedicated **Internet access to schools**
- **10 Gbps** Udine node (**DR Internet acccess**)
- Lightnet/UniTS, UniUD

Evolution:
- **User access (Layer 3)** from 1 Gbps → up to 10 Gbps
- **400 Gbps** between 5 RPR nodes (DWDM)





RPR RINGS
(Layer 2 – POP)

QUICK FOCUS on REGIONAL DATA CENTER


EVER ENERGY

CERTIFICATE OF CONFORMANCE
CONSTRUCTED FACILITY

This is to certify that the constructed data center facilities of
INSIEL S.p.A.
Data Center Regione FVG
Via San Francesco 43
34133 Trieste
Italy
has been independently assessed and found to conform to the requirements of:

ANSI/TIA-942-C-2024
Rated-3

for the following scope:

Architecture	Telecom	Electrical	Mechanical
Rated-3	Rated-3	Rated-3	Rated-3

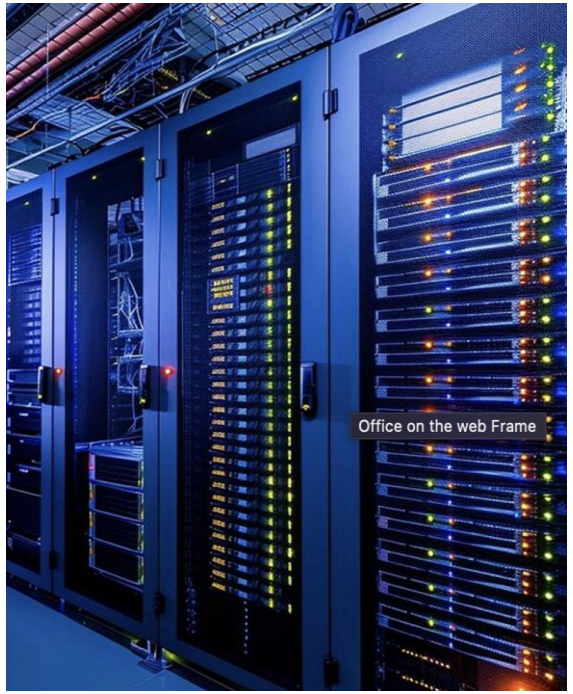
Certificate Number: TIA942IT250329001
Certificate Validity: 29-Mar-2025 until 28-Mar-2028
Initial Certification: 30 March 2019

NICOLA CEGALIN
Certification Manager
EPI Certification Pte Ltd

TIA-942

Surveillance audits due by:

Lack of fulfillment of certification terms and conditions may render this certificate invalid. This certificate can be verified at https://tiaonline.org/tia-942-datacenters/



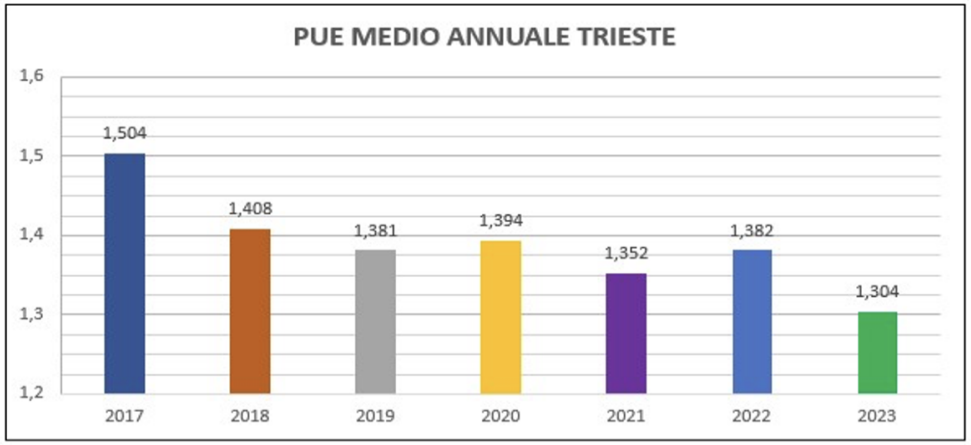
DC Certified ANSI/TIA-942-C-2024 Rated-3

- Managed storage: **7.9 PB**
- Hosted data: **41 PB** (+61% trend)
- IOPS: 315k (+22% annual trend)
- Hosts: ~90 ESXi
- **VMs: ~4200**
- Virtual platform: ~9 THz CPU, ~60 TB RAM

Certifications/Qualifications:

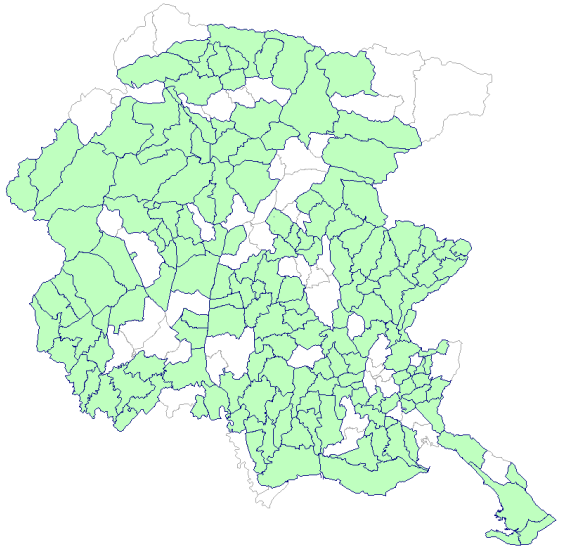
- **ACN AI2 (critical data)** and **AC2** IaaS Cloud Service
- NIS-2 (in progress), ISO 50001 & ISO 22237 (in progress)

- **PUE = 1.3** (FVG Green Award 2025)



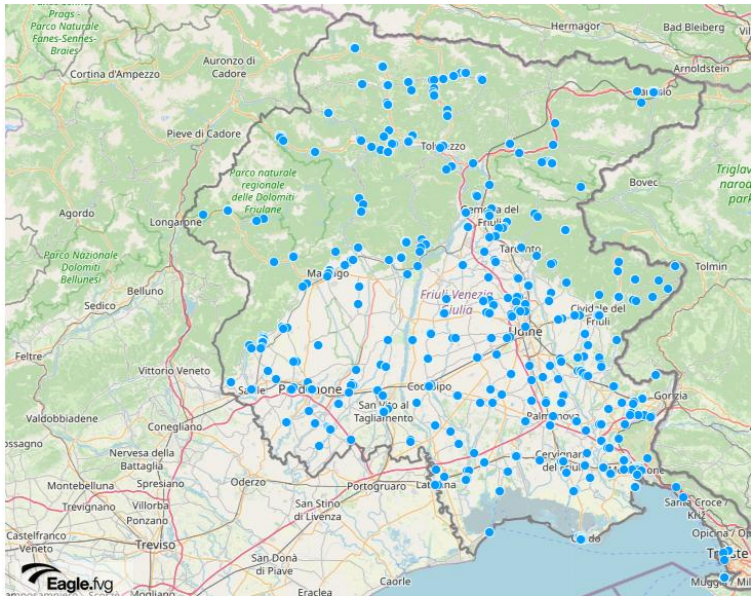
$$PUE = \frac{Energia\ totale}{Energia\ IT}$$

Custom Services developed by the Region



fvg VoIP

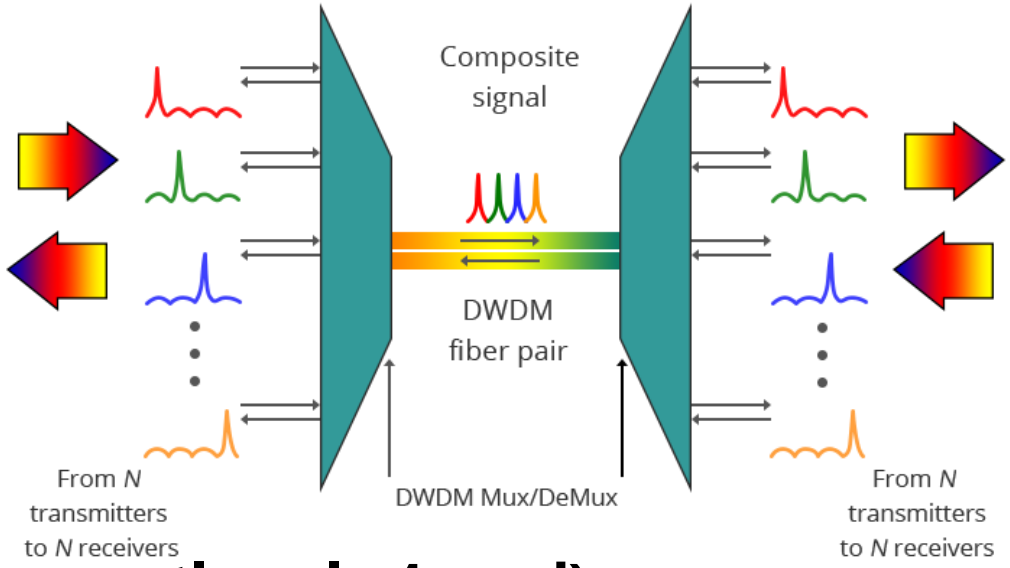
- **Free VoIP service for municipalities**.
- **Centralized system entirely created and managed by Insiel, based on open-source technologies** using RPR infrastructure.
- 202 municipalities, > **8,000 VoIP phones**.



fvg WiFi

- **Free WiFi in public areas**, libraries, meeting places.
- Based on OpenWisp OS, using RPR infrastructure.
- **800 access points, >95,000 registered users**

SOME TECHNICAL DETAILS…



- Fiber cables: 12 to 192 fibers per cable
- Cable types: ITU-T G.656 (backbone), ITU-T G.652D
- **DWDM backbone scalability up to 96 wavelengths (currently only 4 used)**

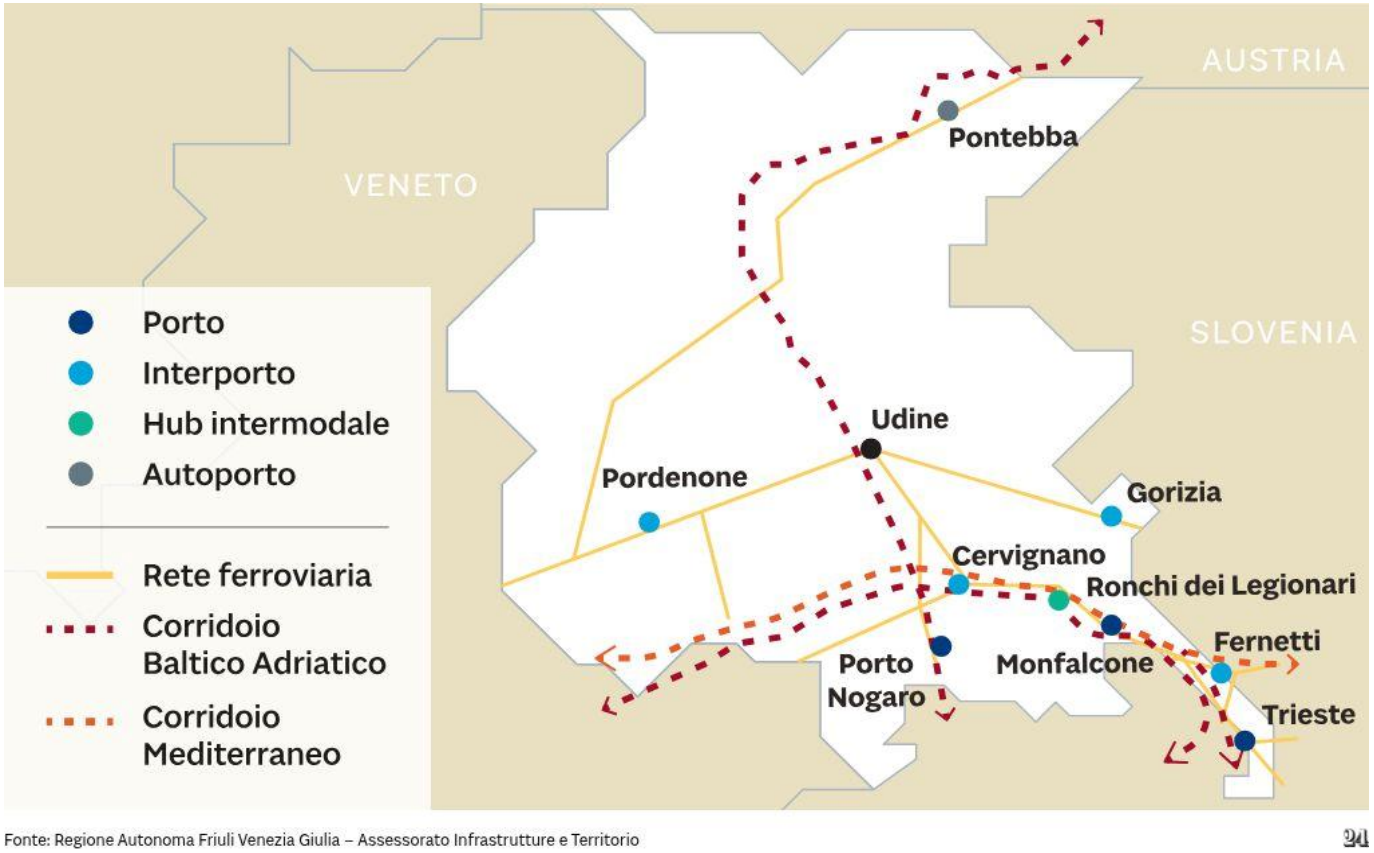
Resilience via diversified fiber paths, triangular mesh, multiple lambdas for traffic protection (IP routing protection, optional optical re-routing)

Evolution and Developments:

- DWDM scalability → backbone bandwidth up to 10 Tbps (with current equipment).
- **Fiber not only enables technology for everyone everywhere but also protects its citizens as it's being used as a sensor network** (pipe leaks, GPS sensors, landslide alerts, OGS earthquakes).
- **Fiber use for quantum key distribution**

Future Prospects
(Fiber Optics applications)

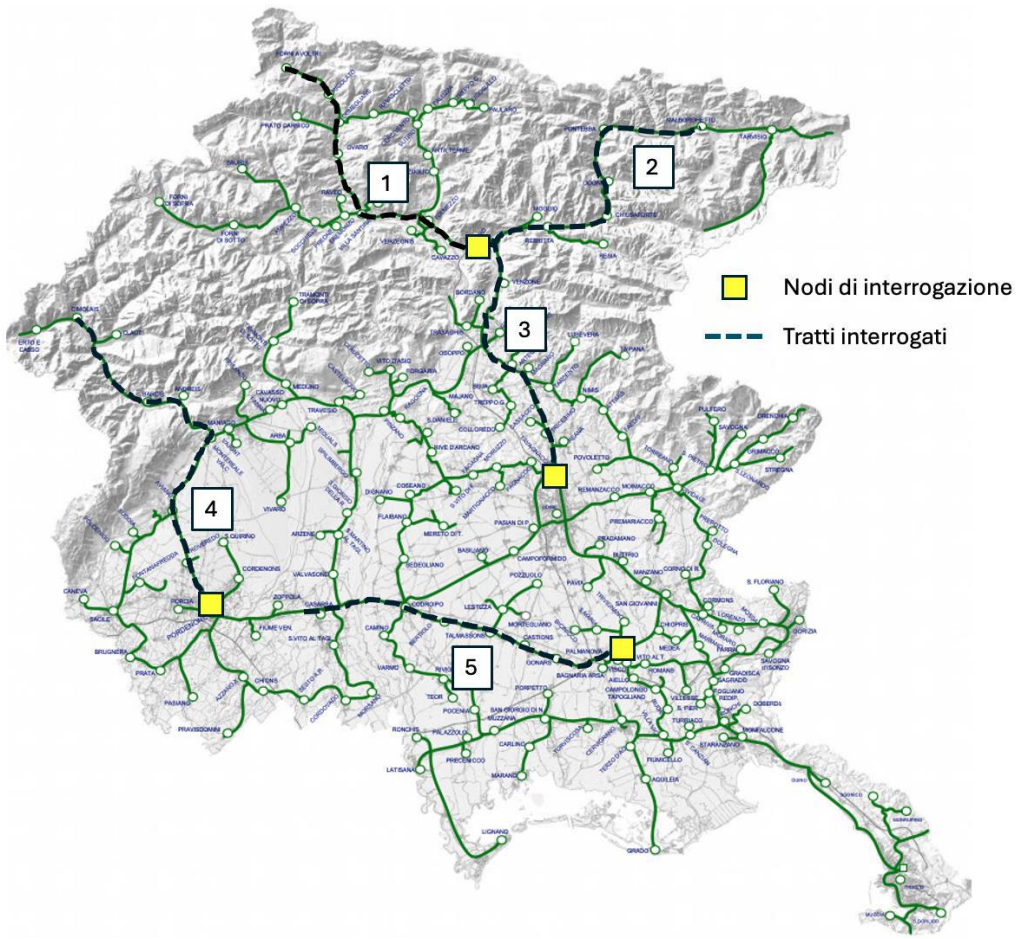
New applications of fiber optics



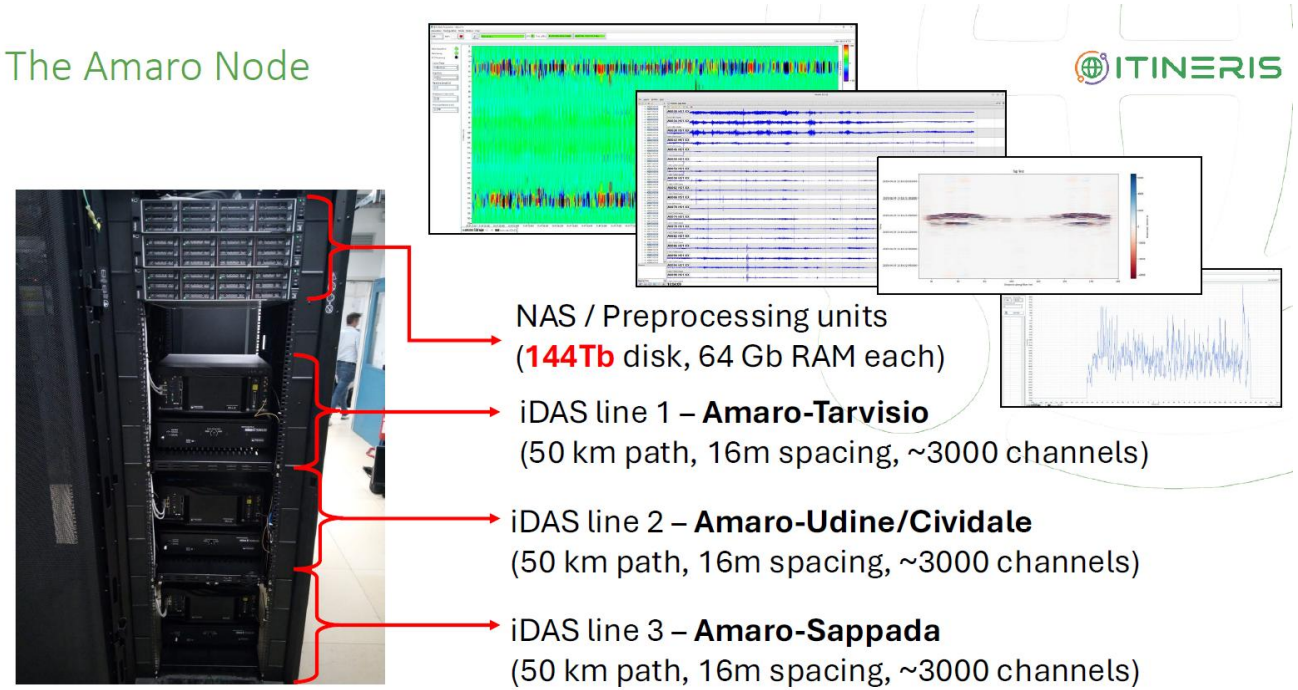
Fonte: Regione Autonoma Friuli Venezia Giulia – Assessorato Infrastrutture e Territorio

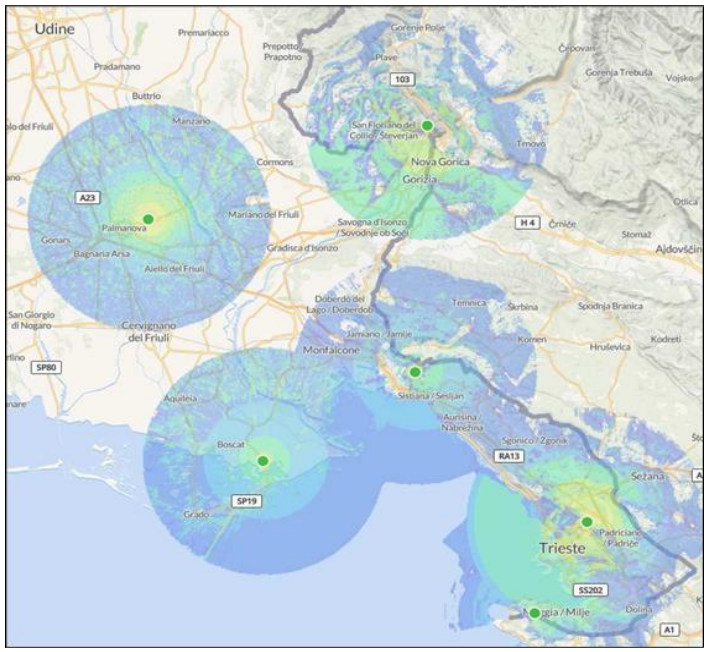
- **Quantum Communication**: Distribute cryptographic keys under the EuroQCI framework, in collaboration with universities and CNR
- Regional investment of € 3,8 M to implement a quantum network on the regional logistic platform
- Italy-Austria cross-border quantum communications - QCIMED Project funded under CEF-DIG-2024-EUROQCI-WORKS

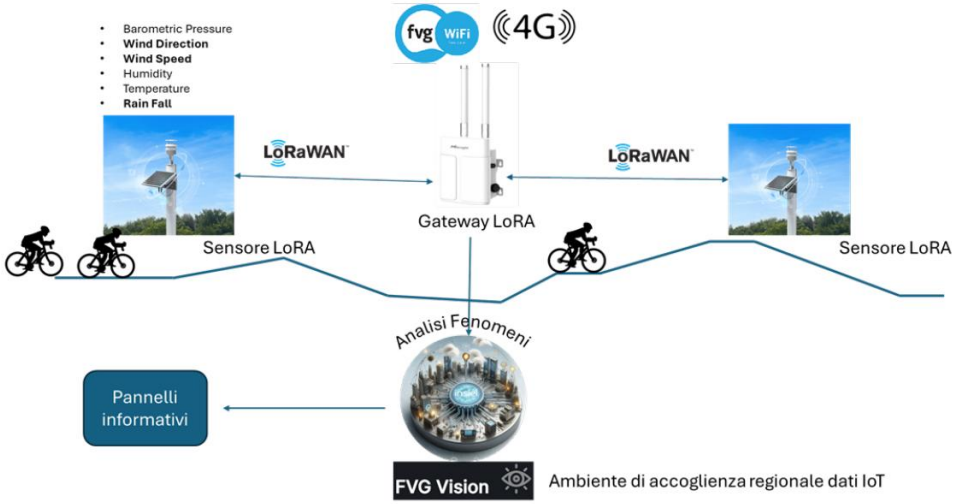
New applications of fiber optics



- **Distributed Acoustic Sensing (DAS):** Monitor earthquakes, water leaks and ground movements (in collaboration with OGS – National Institute of Oceanography and Applied Geophysics)







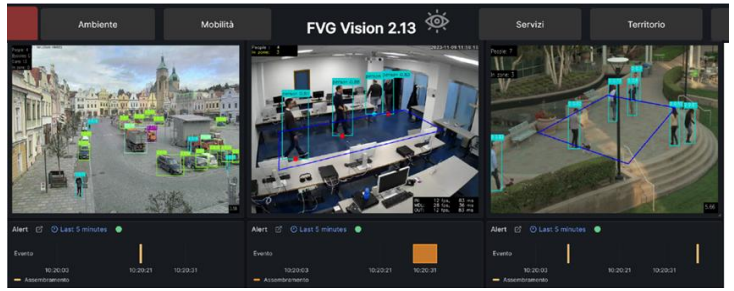
Network extension in strategic areas

Implementation of Wi-Fi and LoRaWAN networks in mountain huts and hiking trails to improve public safety

Transformation of regional cycling routes into **Smart Cycle Paths** to enhance tourism, safety, and digital services while having a minimum impact to the environment

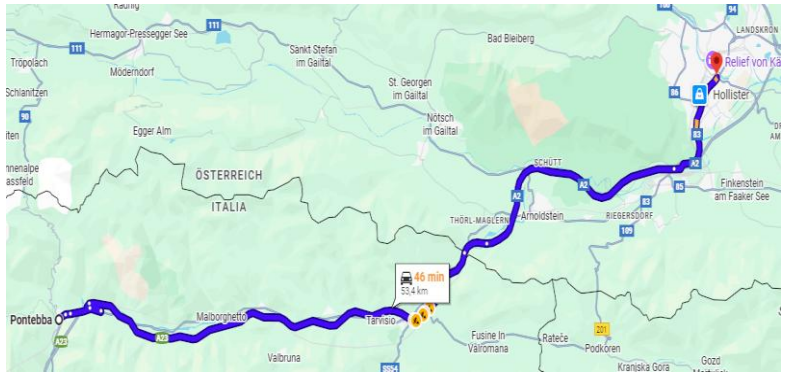
EU level cooperation

RPR – *Back to the Future*: a Public infrastructure ready by design to be ahead of its time!



5G-SITACOR (CEF2-STUDIES)
Slovenia - Italy cross-border section

On going... PV5G (CEF-DIG-2023-5GSMARTCOM-EDGE)



Forthcoming: QCIMED (CEF-DIG-2024-EUROQCI-WORKS)
Pontebba (I) - Tarvisio (I) - Villach (A)

Connecting RURAL
to the world

asteo
Red Neutra

Dec 16th, 2025

Asteo Red Neutra

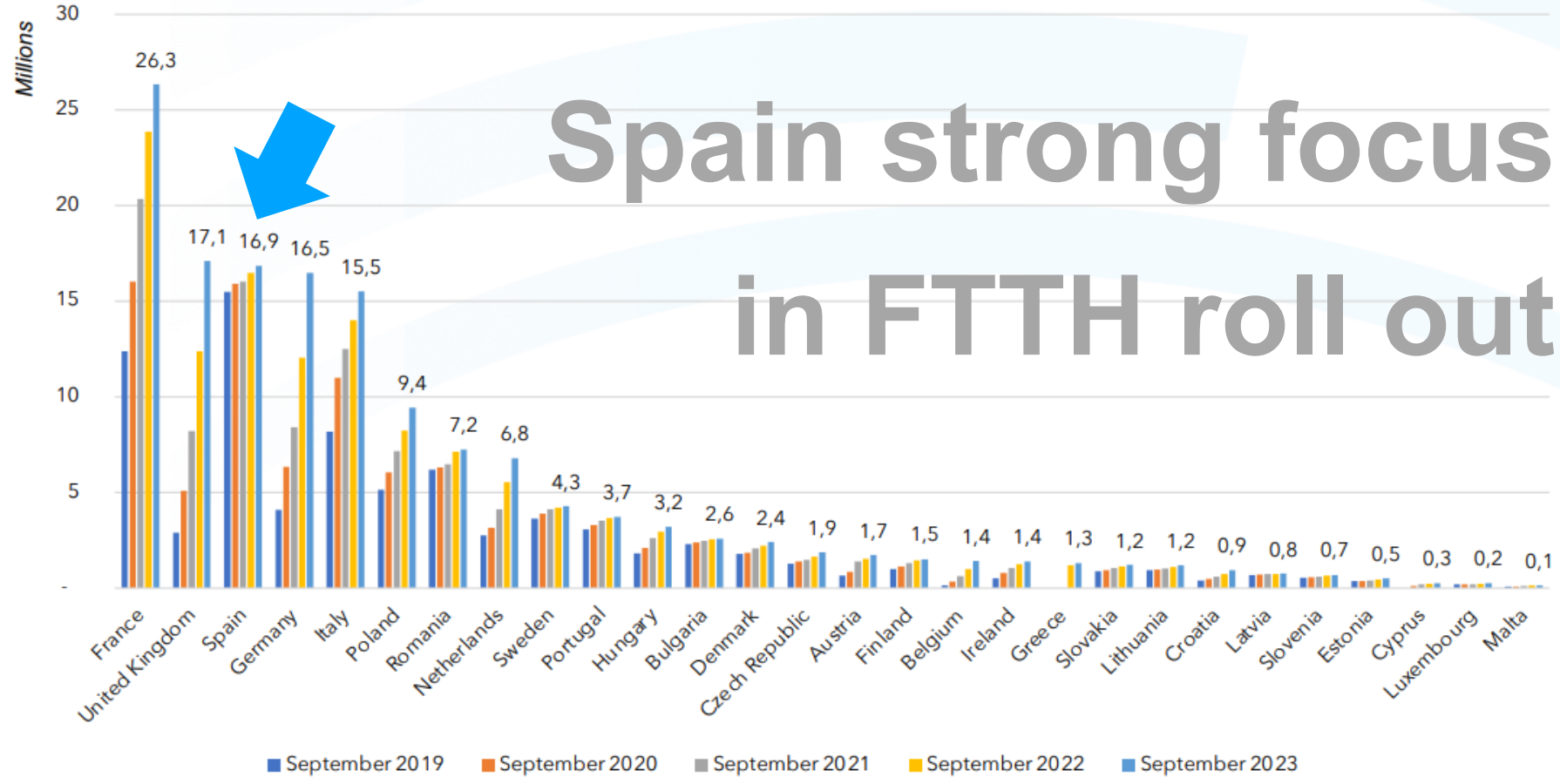
Why? Where? How?

Pedro Abad. CEO

Manuel Garnelo. CTO

FTTH/B Homes Passed - EU27 + UK Ranking

EU27+UK ranking in terms of FTTH/B Homes passed over time (in million homes)
Data comparison between Sept. 2019 and Sept. 2023

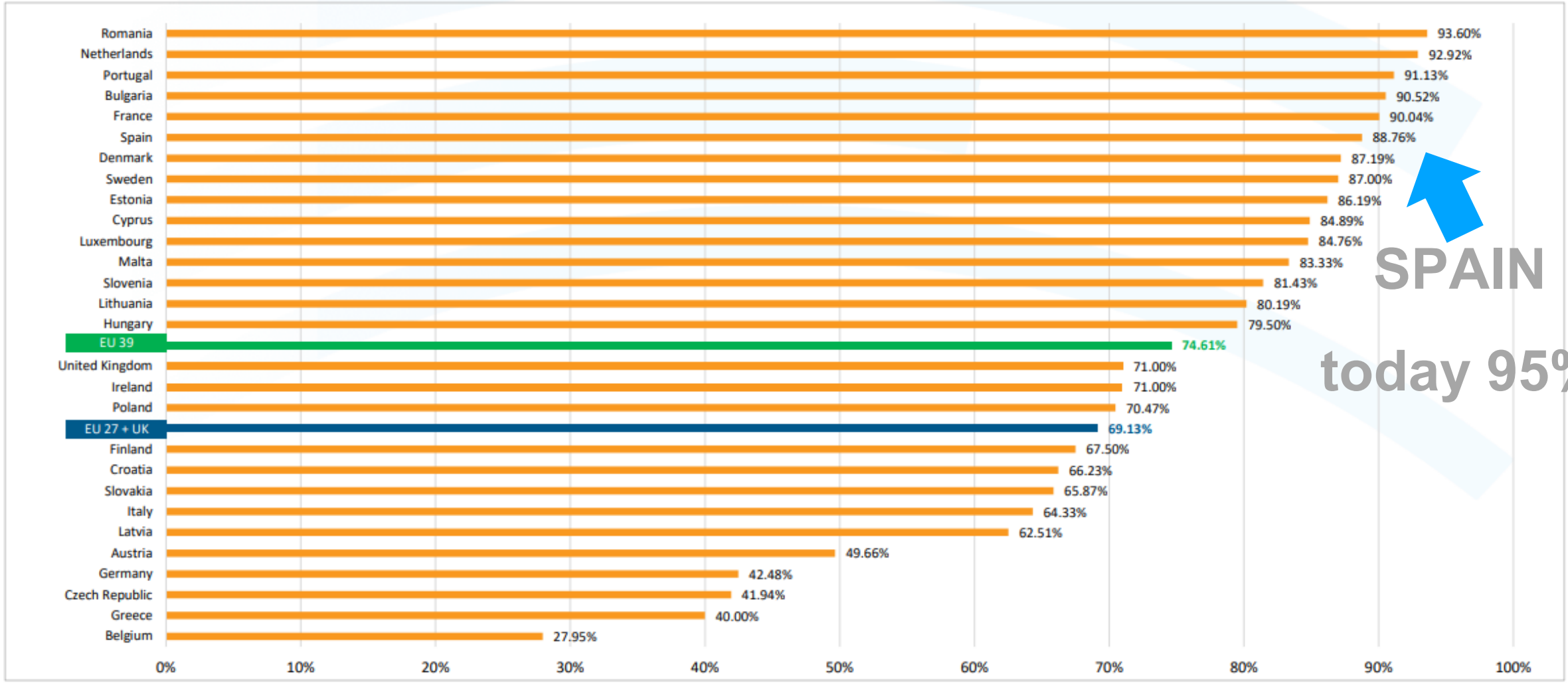


Spain strong focus in FTTH roll out

FTTH-B Market Panorama Update 2023. *Source: FTTH Council Europe 2024*

Coverage rate, European leaderboards – EU27+UK

FTTH/B coverage rate (households passed / households) in EU27+UK as of September 2024



FTTH roll out challenges beyond 90% coverage

Spain is a rural country:

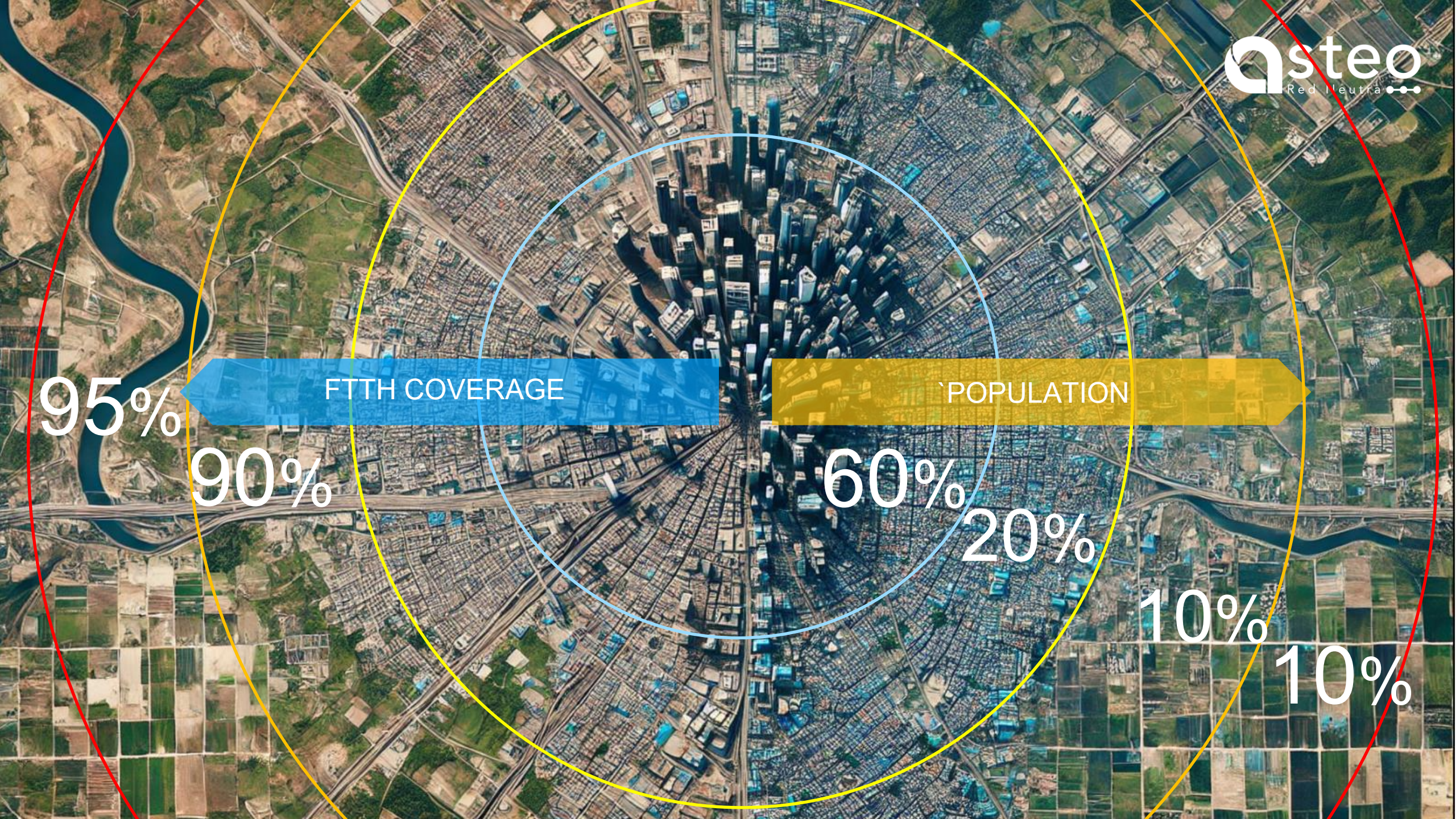
114 out of 8115 total municipalities over 50.000 inhabitants

84% municipalities below 5.000 inhabitants

Municipality Size (Number of Inhabitants)	Percentage of Total Population	FTTH COVERAGE	Percentage of Municipalities	number of municipalities
More than 100,000	50.4%	95%	0.6%	49
50,001 to 100,000	10.1%		0.8%	65
10,001 to 50,000	21.7%		7.0%	568
1,001 to 10,000	14.7%		29.9%	2426
Less than 1,000	3.1%		61.7%	5007

Spanish municipalities mix

Source: Instituto Nacional de Estadística (INE) *INE Spain. January 2024*


FTTH COVERAGE
`POPULATION
95%
90%
60%
20%
10%
10%

FTTH roll out **challenges** beyond 90% coverage

roll out challenges in RURAL*

Specially the Backhaul & Transport Networks

How Asteo is approaching rural deployment

Key pillars:

1

WHOLESALE-ONLY OPEN NETWORK

Technology adoption and business model

2

TWO NETWORKS

Access Network
Transport Network

3

INNOVATION

Roll Out Execution Engineering, Project Management and Civil Works permits

How Asteo is approaching rural deployment

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Roll Out Execution Engineering, Project Management and Civil Works permits

Tecnology adoption and business model

1

- Neutral Open Network
- End client Installation (Provision, Configuration and Commissioning)
- FTTH Network Maintenance

National ISPs

ONIVIA, yoigo, euskaltel, telecable, pepephone.com, Lyca Mobile, llamaya, lyntia, LEBARA, GRUPO R, cellnex, vodafone, finetwork, adamo, fibriTEL

Local ISPs

FIBRIX, CVIP, fibra burgos, adetel, ElectroSan, fibergreen, Telecable Extremadura, @SETEL Conecta, Blancatel, RED-LOW, BELCOM, TelesaT, SEGOCOM, Wifex

How Asteo is approaching rural deployment

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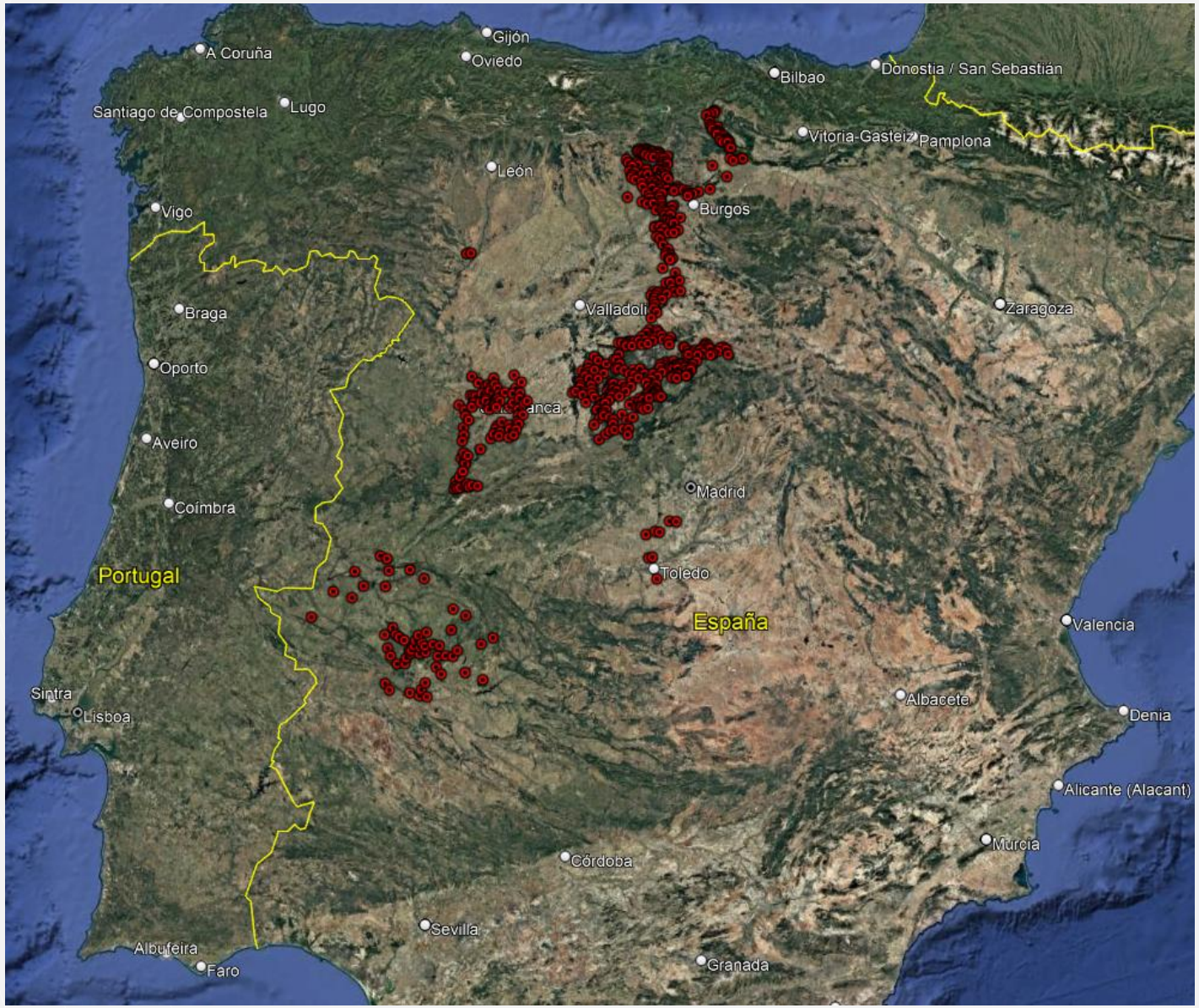
INNOVATION

Roll Out Execution Engineering, Project Management and Civil Works permits

Two networks: Access Network

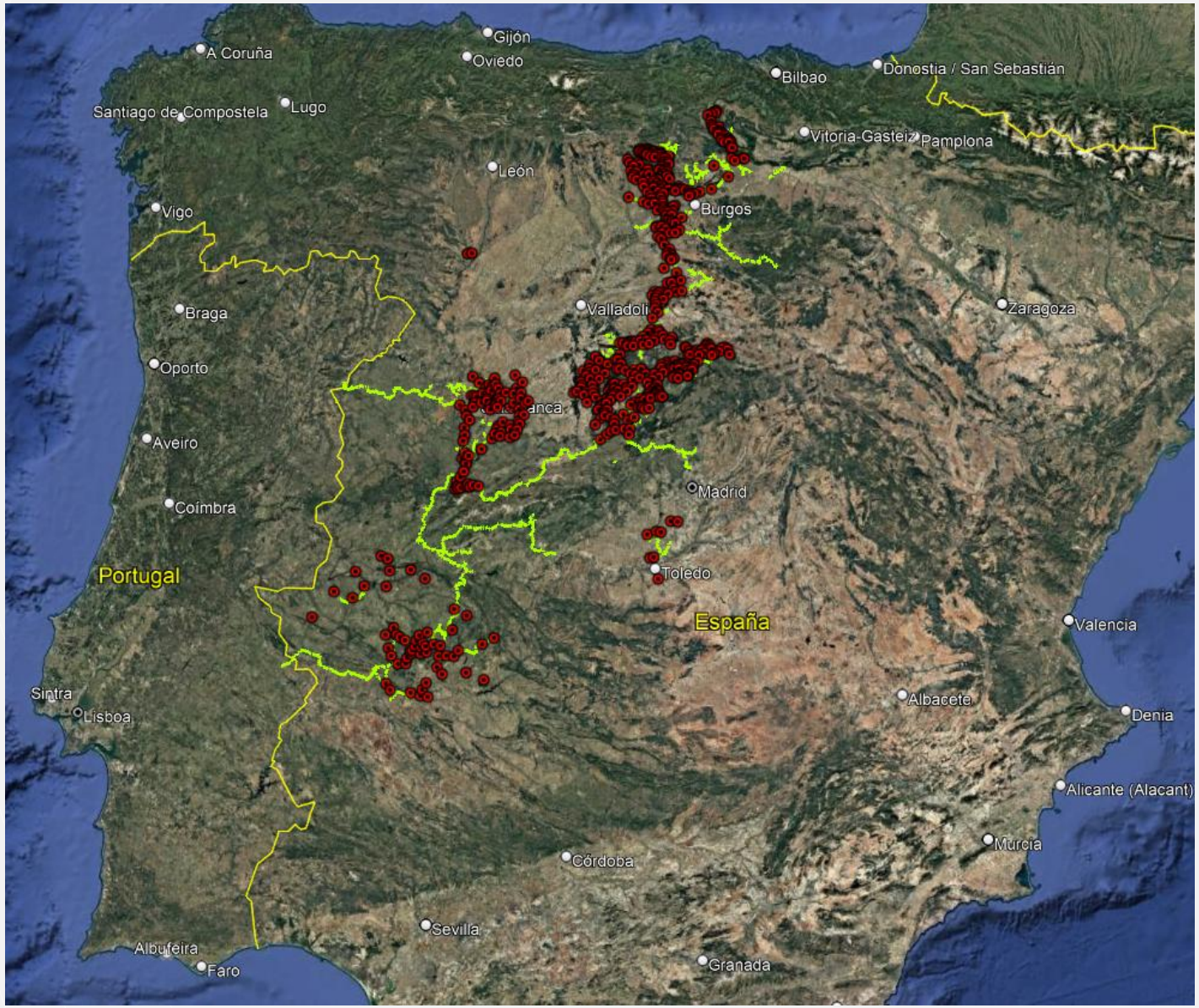


718
Municipalities

325.000
HPs

- Average HP / municipality: **450**
- **11m** of backhaul / HP
- **XGS-PON** Technology

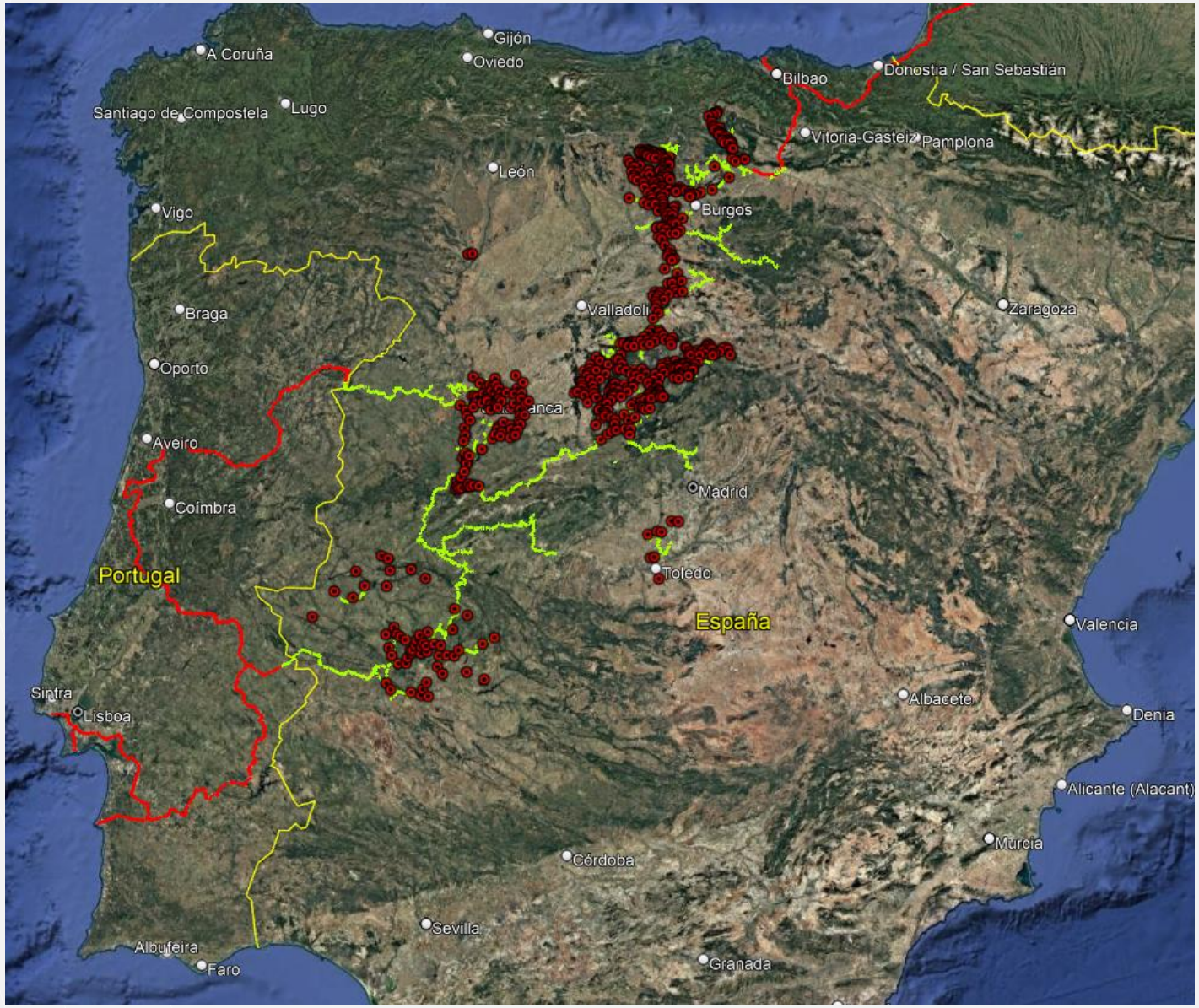
Two networks: Transport Network (Longhaul)



4.100
Kms

- **>250** active PoPs
- **XGS-PON** Technology

VENUS Project



Cross-border Longhaul connecting Spain-Portugal-France through the rural FTTH areas

- Asteo FTTH Access
- Asteo Longhaul
- 3rd Party Partner

How Asteo is approaching rural deployment

Key pillars:

1

WHOLESALE-ONLY OPEN NETWORK

Technology adoption and business model

2

TWO NETWORKS

Access Network
Transport Network

3

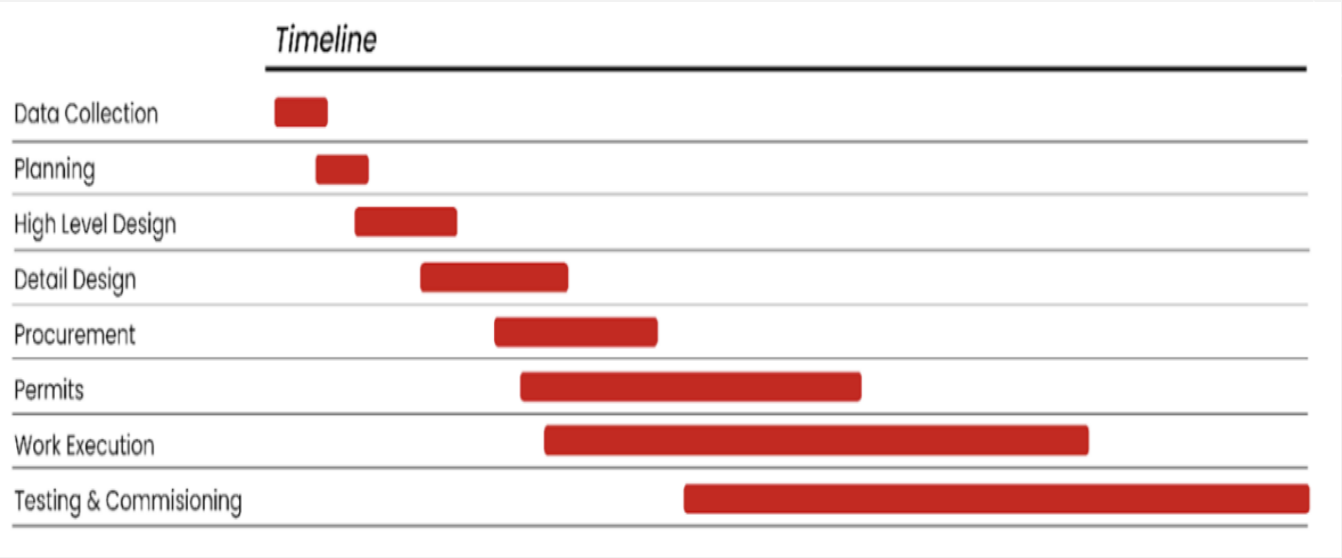
INNOVATION

Roll Out Execution Engineering, Project Management and Civil Works permits

Engineering, Project Management and Civil Works permits

3

- More than 7.000 files working in progress at the moment
- Dedicated team to interface with different Public Administrations
- Specific Call Center for Public Administration



BURGOS	AYUNTAMIENTOS BH	CALIFICACIÓN URBANÍSTICA/ USO EXPCIONAL	CARRETERA COMARCAL	CARRETERA NACIONAL	AUTOVIA	CONFEDERACION	FFCC(ADIF)	AREA PROTEGIDA	VIA PECUARIA	GASEODUCTO	OTRAS INFRAESTRUCTURAS	AYUNTAMIENTO FTTH	TOTALES PERMISOS	% PERMISOS
Autorizada	171	17	111	13	3	187	5	276	114	8	82	81	1068	45%
Presentado	181		19		2	21	5	60	43	6	51	68	456	19%
Resolviendo	149	13	26	7	3	73	4	14	54	2	4	101	450	19%
Requerimiento	17	2	12			31		2			126	58	248	11%
Requerimiento Tasa	9			5	2	5	1	1	86			4	113	5%
Recuperación Fianza	5		4	2			2					7	20	1%
Respondido a falta de documento	3												3	0%
Pendiente Registro													0	0%
Desistido por la Administración												2	2	0%
TOTALES PERMISOS	535	32	172	27	10	317	17	353	297	16	263	321	2360	100%

Example of Permits roadmap for 1 region

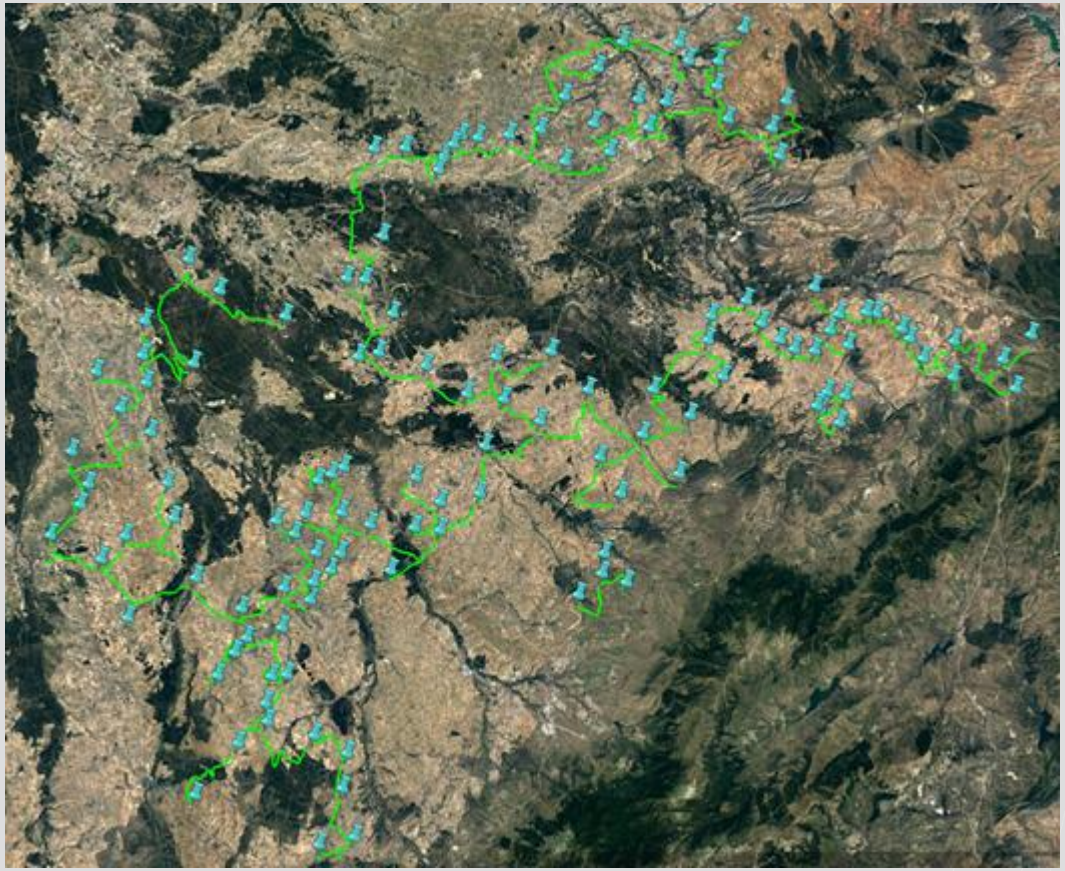
Innovation Access Network

Practically all the access network (FN and DN) is over façade. Most of the premises are SDUs.

- **Strong enabling environment for rural rollouts**: supportive regulation in Spain, public funding programs, and close coordination with municipal authorities.
- **Industrialized construction model:** deployment, testing and preliminary acceptance completed within ~1 week. Central offices are assembled in-house and shipped to site ready to operate.
- **Façade deployment enables speed and cost efficiency**: minimal civil works, faster execution, and competitive unit costs.
- **Agile planning and execution:** manageable deployment sizes allow on-the-fly design adjustments and sequential rollouts across nearby locations.

Innovation Transmission Network

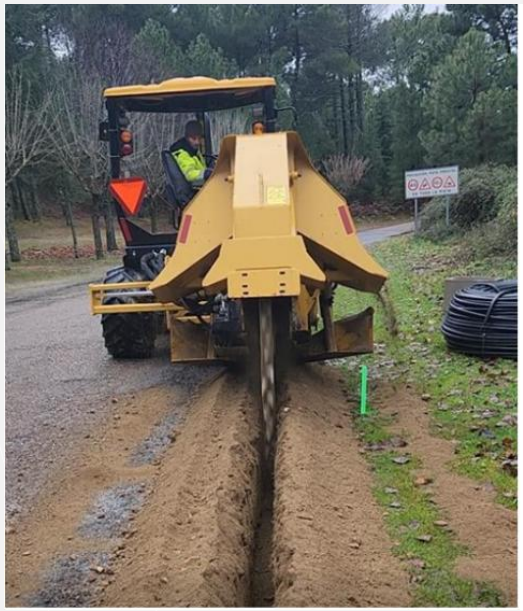
- **Complex permitting & multi-authority coordination:** backhaul permits typically involve several authorities. ASTEO runs a dedicated permitting team to coordinate, track and resolve requests efficiently, leveraging strong public–private cooperation.
- **Every backhaul segment is unique:** we carry out thorough surveys of alternatives and perform detailed pre-construction planning, selecting the optimal solution per segment (constraints, crossings, terrain, risk, and schedule).
- **Limited flexibility once construction starts:** design changes are costly and “on-the-fly” decisions are rarely feasible. We mitigate this by pre-defining alternative routes and maintaining two construction fronts to keep crews productive and avoid downtime.
- **Fast, reliable build with cable-in-duct:** standardized methods and controlled installation in ducts improve speed, quality, and repeatability while reducing exposure to weather and ground risks.



Innovation Transmission Network

3

- Microtrench methodology for Backhaul
- Very fast and reliable deployment using cable-in-the duct.



CSR (Corporate Social Responsibility)

- **Environmental responsibility:** Minimizing footprint through efficient network design, reduced civil works, waste segregation and recycling, and supplier alignment on sustainable materials and logistics.
- **People & safety:** Health and Safety-first culture for field teams and contractors, training and qualification requirements, and continuous HSE improvement across all sites. HSE supervised by a 3rd company specialized in this.
- **Community engagement:** Collaboration with municipalities and local stakeholders to enable rural connectivity, reduce disruption during works, and create local economic activity.
- **Ethical supply chain:** Clear procurement standards, fair tendering, compliance requirements for partners, and traceability on critical materials and execution quality.
- **Data & service integrity:** Secure-by-design operations and disciplined documentation (as-built, testing and acceptance) to ensure long-term reliability and accountability.

Asteo: Experts in Rural Roll Out




Thank you

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