Trentino: a wide innovation network

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Agenda

- Province of Trento vision
- Trentino broadband initiatives
- The Testbed-based innovation model
Province of Trento vision
Trentino is an autonomous Province in the heart of the Alps

Legislative and administrative powers awarded by Italy's Constitution and a special statute from the year 1948

Direct administration of 90% of tax revenue

Area: **6,233 km²** (2.06% of Italy)

**Territory:**
- 20% above 2,000 meters
- 10% below 500 meters
- 65% forest

**Inhabitants:** 529,457

**217 municipalities**, 5 with more than 10,000 inhabitants

Combination of different cultures and lifestyles:
- Linguistic minorities
- Mountain/Rural/Urban areas

Sources: Autonomous Province of Trento & ISTAT
Leveraging on digitalisation, innovation and the availability of broadband infrastructure to promote local economic growth, while remaining rooted in its social fabric but projected into the future.

The main objective of the Autonomous Province of Trento is to turn Trentino into the "land of innovation", positioning it as an area of excellence in ICT.

In a digital future, broadband infrastructure is the backbone of the economic fabric of the territory, which is why the Province has decided to take major steps allowing its citizens and companies not to be excluded from the economic, social and occupational development resulting from innovation in telecommunications.

Estimates show that every Euro invested in ICT generates a 1.45 Euros increase in the Province’s GDP
The Province, through its Department of Innovation & ICT is adopting an integrated approach involving 5 local institutions, to achieve the pre-set goals with maximum efficiency and effectiveness, ensuring the innovative nature of technology and service developments.
The Province of Trento project focuses on implementing **three strategic and concrete objectives**:

**Resolution of the *Digital Divide***
- To ensure **fast internet connections** to all citizens and businesses of Trentino
- To bring in **5 / 6 years, ultra-broadband** to all citizens and businesses of Trentino

**Development of innovative services**
- **Healthcare**: Digital Healthcare, Telemedicine, Telecare and Tele-connections with high-definition video to the virtual contact, etc..
- **Energy Management**: reduction in energy costs and consumption
- **Territory Monitoring**: Environment, Agriculture and Security

**Promotion of local initiatives**
- **Generating employment and work** in high technology sectors to promote partnerships between local ICT companies and stakeholders in the productive world
The Province is developing innovative projects in the field of:

- Health Care;
- Energy Management;
- Risk Assessment and Land Monitoring.

**eInclusion/eHealth**

Applications such as telemedicine reduce health care costs, while improving the quality of life for patients on long-term care.

**Energy Management**

- Reducing energy consumption is an increasingly pressing problem:
  - expectations of reducing energy costs are high, as are investments in actions to optimize power consumption;
  - ICT can play a key role as enabler to reduce energy consumption.

**Risk Assessment and Land Monitoring**

- The availability of a pervasive network in the territory allows to introduce and integrate monitoring services for agriculture and risk prevention.
- Monitoring agriculture will ensure a more efficient farming management and savings on water consumption.
- Monitoring the territory for risk prevention will allow to prevent avalanches and landslides risks, which are highly significant in a mountainous areas such as Trentino.
The Province is promoting innovative projects involving local stakeholders and industry partners at national and international level.

Examples of Province initiatives:

- **Control and monitoring of road tunnels** through wireless sensors networks and intelligent cameras for **risk prevention and reduction of energy consumption**.

- **Home Automation**: domotic technologies in buildings for low-income users, particularly aimed at elderly people in order to facilitate household activities.

- **E-learning**: involvement of education agencies from basic to university education, training for teachers, trainers and tutors (over 1,000 teachers involved) on the use of new learning technologies.
Trentino broadband initiatives
Geographical distribution of population
To turn Trentino into a **land of innovation** and enable all citizens and businesses to benefit from it, the Province of Trento has been implementing a medium-long term plan based on three steps:

1. Fast actions to **overcome the 1st generation Digital Divide** with the aim of providing **urban areas** with a connection speed of up to **2 Mbps**

2. Improving the usability of services for citizens, by deploying a network able to provide **100% of the population** with a connection speed of at least **20 Mbps** (peak downstream bandwidth)

3. Deployment of a **Next Generation Access Network**, with a fiber optic link to residential users and companies (FTTH)
Overcoming the 1st generation Digital Divide

Ongoing deployment of a Province-wide fiber optic backbone network

- laying of over 750 kms of fiber optics throughout the Trentino territory
- deployment of about 80 network nodes
- establishment of a Network Operations Centre designed to accommodate also the emergency unit
- direct fiber optic connections to about 400 public administration users

Wireless connection provided to about 90% of the population and businesses with a speed of up to 2 Mbps

- one of the largest wireless networks in Europe, using WiFi and Hiperlan technologies on ISM frequency bands
- about 1,600 access points in more than 760 sites
  - 63 fiber-optic network nodes
  - primary radio links at 155 Mbps
  - voice and data transport with guaranteed QoS
  - Internet access provided by multiple ISPs
  - continuous monitoring of the transport network
Step 1: **Fiber Optic Backbone Network**

F.O. Backbone Status of deployment
Autonomous Province of Trento

Step 1: **Wireless Network**

Even Refuge Vioz Mantova, the highest Apline Refuge in Central-West Alps is covered with Wi-Fi and VoIP.
Overcoming the 2nd generation Digital Divide

Province of Trento objectives:

1. Ensure a min. 20 Mbps connection to 100% of telecommunications networks users by 2012
2. Promote the development of innovative services through the deployment of a new open network, available to all interested telecom operators

Status of the project:

1. In 2010 the Province launched a tender to fund an investment program for those areas that will not be covered by 20Mbps connectivity service by 2012
2. The initiative is aimed at granting broadband access services coverage potentially to 100% of potential users in the targeted municipalities
3. The Stait Aid was approved by EC DGComp (N 305/2010 “Reduction of the digital divide in Trentino, Italy on 16/11/2010”)
4. The Public Tender expired on 24/01/2011 and was assigned to Telecom Italia, which should deploy the infrastructure in less than 36 months
5. The project is ongoing and already 65 COs migrated to ADSL2+ service
Step 3: NGN initiative in Trentino

The NGN project is part of the PAT strategy, which includes covering the whole territory with ultra-broadband and stimulating the demand, as recommended by the European Digital Agenda objective to provide at least 100 Mbit/s for at least 50% of EU families by 2020.

- Various analysis of the main economic, demographic and telco market indicators show that the PAT includes only areas with medium profitability (MPA) and low profitability (LPA) for wireline Network Operators.

- The PAT has decided to pursue this initiative through two companies:
  1. Trentino NGN, a PPP open to private investors and operators for developing and managing the FTTH network in 42 municipalities of the so-called “Medium Profitability Areas” – MPA, representing around 60% of the total Province population.
  2. Trentino Network, a fully public company working on “Low Profitability Areas” – LPA, covering the remaining 40% of the population in mountain (market failure) areas.
The cost model for the preliminary evaluation of the investment analyzed multiple architectural choices (P2P vs GPONs)

- It included the opportunity of reusing other infrastructures presents in the area, used for the public administration network and by other services (e.g. public lighting, electricity, etc.)
- The model led to a cost estimate for the construction of a fiber access network from scratch as follows:

<table>
<thead>
<tr>
<th>CAPEX (*) (Mln€)</th>
<th>2 GPON + P2P <em>business</em></th>
<th>3 GPON + P2P <em>business</em></th>
<th>P2P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenfield</td>
<td>478</td>
<td>492</td>
<td>562</td>
</tr>
<tr>
<td>Reusing Trentino Network infrastructure</td>
<td>453</td>
<td>468</td>
<td>538</td>
</tr>
<tr>
<td>Reusing Trentino Network infrastructure + Public lighting</td>
<td>401</td>
<td>416</td>
<td>495</td>
</tr>
</tbody>
</table>

(*) covering 95.4% of the population, excluding remote buildings

- Reusing Trentino Network infrastructure it saves around 547Km of NW (out of 1.632 Km of long distance NW), which means about 24 Mln€
- Reusing public lighting infrastructure it saves around 52 Mln€ on the G-PON case and 43 Mln€ on the P2P one

This model was the base the discussions and negotiations with the Telco Operators to verify their interest on participating to the initiative and the potential cost and time saving of reusing their infrastructures.
On September 2010 the Province started the **public consultation** on Trentino’s NGAN initiative with Network Operators and financial investors.

The following **Operators** have been involved: Aria, Brennercom, Fastweb, Mc-link, MNET, Retelit, Telecom Italia, Tiscali, Vodafone, and Wind. After the first phase of public consultation Aria, MNET and Retelit did not express concrete interest and a second phase started with the others.

On **December 2010**, the Province **founded the Trentino NGN s.r.l. (TNGN)**, initially **100% PAT** with minimal capital (less than 100.000 euro) but opened to include private Operators.

On **December 2011**, PAT, Telecom Italia (TI), Mc-link and La Finanziaria Trentina signed the **sharholders’ agreement**. The expected **in kind contribution from TI** which respectively **minimize the costs and timing of the roll-out of the fiber network** and will enable Trentino NGN to **control the migration** of customers from copper to fiber is made at two different stages:

- **a first contribution**, at the beginning, through a **twenty-years rent (IRU) of all available spaces in the underground and aerial infrastructure** within the Province, which will lead TI to get around 41% of the company (the evaluation is subject to a third party advice)

- **a second contribution**, expected in 2015, through the sale of the **whole copper access network within the MPA**, which will give TI the **control of the company** (the evaluation is subject to a third party advice)

The other Operator involved, **Mc-link**, **provides cash for corresponding about 1.5% of the shares**, while the **private fund** La Finanziaria Trentina provides cash for about **5.2% of the shares**.
The reference architecture defined for the project is shown in the figure, including a civilian infrastructure sized to accommodate all possible configurations (GPON and P2P).
Concerning the optical components (cables, mittens, splices, splitters, optical distribution nodes and cabinets), for each Central Office area has been considered:

- the sizing for a P2P network to cover current and prospective business users. Investments are estimated for collecting within a P2P architecture all business customers and commercial and industrial areas.

- the size of the network also considers a number of P2P connections to link the base stations of the Mobile Operators in the area.

- the sizing of the network for residential customers and SOHO is based on a GPON architecture, with investments to cover up to 3 stacked GPON with 1:64 share ratio.

- The civilian infrastructure (excavation, conduits, manholes, etc..) is sized to accommodate network capacity to deploy both P2P and GPON networks (both in primary and secondary).
The Testbed-based innovation model
**Testbed History**

**INTEGRATION and PARTICIPATION**

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Medium</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Vertical Tests</td>
<td>Initiative: CREATE-NET Testbed ITC-IRST LABS UNITN LABS</td>
<td></td>
<td></td>
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<tr>
<td>Field-test:</td>
<td>-Wi-MAX -Assisted Living -Video and voice recognition</td>
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<td></td>
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<td>2008</td>
<td>Initiative: WOTBL</td>
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<tr>
<td>Integrated Tests</td>
<td>Actors: University of Trento CREATE-NET Province of Trento</td>
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<tr>
<td>Field-test:</td>
<td>-Optical networks -Value Added Services -Wireless networks</td>
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<tr>
<td>2012</td>
<td>Initiative: Trentino Testbed</td>
<td></td>
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<tr>
<td>Participative Tests</td>
<td>Actors: PAT TrentoRISE FBK CREATE-NET UNITN other R.C.</td>
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</tbody>
</table>

**TESTBED 1.0**

**TESTBED 1.5**

**TESTBED 2.0**
Trentino Testbed Actors

**Actors**

- Autonomous Province of Trento
- Trentorise
- CREATE-NET
- University of Trento - Italy
- Informatica Trentina SpA
- Trentino Network

**Activities**

1. **First User of Services**
   - Domain expert into Government processes and services

2. **Catalyst for open innovation and integration with EIT ICT Labs**
   - Facilitating the local ICT Know-how with international projects

3. **Experimentation on future internet services**
   - Know-how on HCI, video processing, semantics, etc.

4. **Experimentation on future internet technologies**
   - Know-how on future networking

5. **Experimentation on future internet technologies and services**
   - Know-how on ICT

6. **Interfacing with the P.A. and supporting UT serv. experimentation**
   - Domain expert into e-Government

7. **Managing the Network, supporting telco serv. experimentation**
   - Know-how on operations (NOC) and T-gov services

**Competences**

8. **Numbers**

- 217 Municipalities with one central administration

Including participated centers in Trento:

- 800 Researchers on ICT (with more than 200 PhD students)
- 15 Laboratories
- 300 Employees
- 55 Employees
Testbed 2.0: Participative Open Innovation

- **Innovation** driven by users directly involved on service creation and experimentation
- **Public Administrations** as the first user of services and applications
- **Grassroots movement** from researchers, institutions, entrepreneurs and companies
- **Common infrastructure** management and shared access policies
- Incentivate shared **best practices** and award remarkable initiatives
- **Coaching** and **facilitating** investment opportunities on projects and spin-offs ideas
The Open Testbed for Innovation

Living Lab:
- Innovation driven by users directly involved on service creation and experimentation
- Based on the concept of Public institutions as ‘first customer’
- Show-case on Future Internet technologies, services and products
- Fast deployment framework for innovative solutions

Common basic infrastructure:
- Fiber: 800 Km for 92 POPs
- Carrier Ethernet backbone
- GMPLS-controlled optical network
- WiFi-based access network: 750 APs
- PON/P2P FTTH access network

Research interconnected facilities:
- 802.11 Mesh & Wireless Sensor Networks
- SOA and Service Integration Lab
- Domotic House
- Vision & Recognition Lab
- Knowledge & Media Labs
Thank you!