GARR-T: a new generation of network

Boosting capacity, resilience and capillarity: the Italian research and education network is ready for the paradigm shift

To be technologically advanced, widespread over the national territory and at the same time tailored on research and education users: this is the challenge for the new generation of the Italian Research and Education Network, GARR-T. The “T” in the name is an hint to the Terabit, the reference point for the project. GARR-T is the new generation of a more capable and resilient network, that has got into the thick of things with the field trials and the first installations. The numbers of the new network speak for themselves: 700 km of new fibre optic sections, 42 optical PoPs distributed over approximately 6,000 km of fibre and 9 new metropolitan PoPs. 6 more cities will boast a double PoP, which will ensure redundancy and increase reliability.

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GARR-T is a network built with a clear vision of the future and, for this reason, it will be equipped with scalable capabilities and manageability that go beyond the current traffic and features. It is an infrastructure ten times more powerful in relation to the packet network, the backbone will go from a total capacity of 3.5 Tbps to 40 Tbps, while for the user access, it will go from 2 to 10 Tbps.

The GARR-T network project is expected to be completed by the end of 2022. A total upgrade is planned for the packet network, with the replacement of all equipment. The activation of the transmission network will be operated in continuity with the production network, without disruptions in the service. The architecture of the packet network recalls the one generally used for the interconnection of data centres. The optical network, is based on a partially disaggregated model and the adoption of an open line system (OLS, Open Line System) . This technology enables a flexible management of the optical spectrum for spectrum sharing and the development and dissemination of applications such as time and frequency transport or Quantum Key Distribution.

One of the most innovative feature available is the Data Centre Interconnect (DCI), a technology used to connect two or more data centres together over short, medium, or long distances using high-speed packet-optical connectivity. This model maximises power efficiency and cost savings, while providing ultra-high capacity and scalability; it has automation as a key element and is able to respond to the computing needs of large scientific collaborations (Data Lakes), where management and access to data take place locally, while computing resources can be geographically distributed. Another GARR-key feature that will be made available with GARR-T is the spectrum-sharing capacity. Fibre optical cables are expensive resources: the spectrum sharing capacity makes it possible for users to take advantage of part of an existing infrastructure, such as a submarine cable or a fibre cable in remote areas, in order to increase the potential of the network in a cost-effective way.

Last, but not least, one of GARR core values is collaboration with and within its community. GARR-T offers new opportunities to foster cooperation with the network experts in the community, being built to provide an environment for experimentation and collaborative development. While developing the GARR-T project, we launched two initiatives: the GARR Lab and an optical laboratory, both of which are examples of an open environment for the community to work together and find new solutions for the Italian research and education community.