



FUTURE INTERNET TESTBEDS
EXPERIMENTATION BETWEEN
BRAZIL AND EUROPE

Why Future Internet research?

The Internet, as we know it today, is around 40 years old! It began within research networks, with few users and limited economic impact. Today's Internet has billion of users and trillions of web pages. It has become a global engine for business, entertainment and education, facilitating the circulation of services and knowledge. Its size, complexity and the role it plays in modern society has far exceeded the expectations of its creators. It is a complicated and constantly expanding structure that has become an essential part of our lives, work, communication and entertainment.

Although the original Internet design has successfully enabled the development of several services and applications, novel societal and commercial usages are continuing to push the original Internet architecture to its limits. Unforeseen and extremely useful and popular applications, such as Skype, YouTube, online banking, gaming etc. have anticipated demanding technological and policy challenges

in different domains, such as security, mobility, heterogeneity and ad-hoc connections.

The solutions found so far to address these concerns are seen by some observers as 'patches', which cannot last forever. The inclusion of new functionalities, which had not been anticipated in the original design, is transforming the Internet architecture in a sort of "patchwork". In every adaptation, the degree of complexity of the resulting architecture increases, preventing the continuous development of the Internet. Overcoming limitations of today's Internet in order to make it more **efficient and secure** will require a radical redesign or change of paradigms in the medium or long-term. The major goal of **Future Internet** (FI) research is to propose and evaluate alternative architectures to evolve or replace the current Internet design.

Check out some of the disadvantages of the current Internet Architecture:

- The exhaustion of IPv4 network addresses, inhibiting the development of the so-called Internet of Things.
- Limitations of network growth and performance, due to not scalable size of routing tables in IP routers.

- Need of large investments in palliative measures to contain security problems such as spam, Denial of Service attacks and theft of information.
- Difficulty of combining seamless mobile access with individual privacy.

Future Internet scientists and testbeds

Just like astronomers use telescopes and biologists use microscopes, “Future Internet scientists” use **testbeds** as research instruments.

Future Internet testbeds are programmable networks devoted for experimentation, connected to the current Internet. The use of testbeds is required to test and validate new network architectures without disturbing the operation of the current Internet.

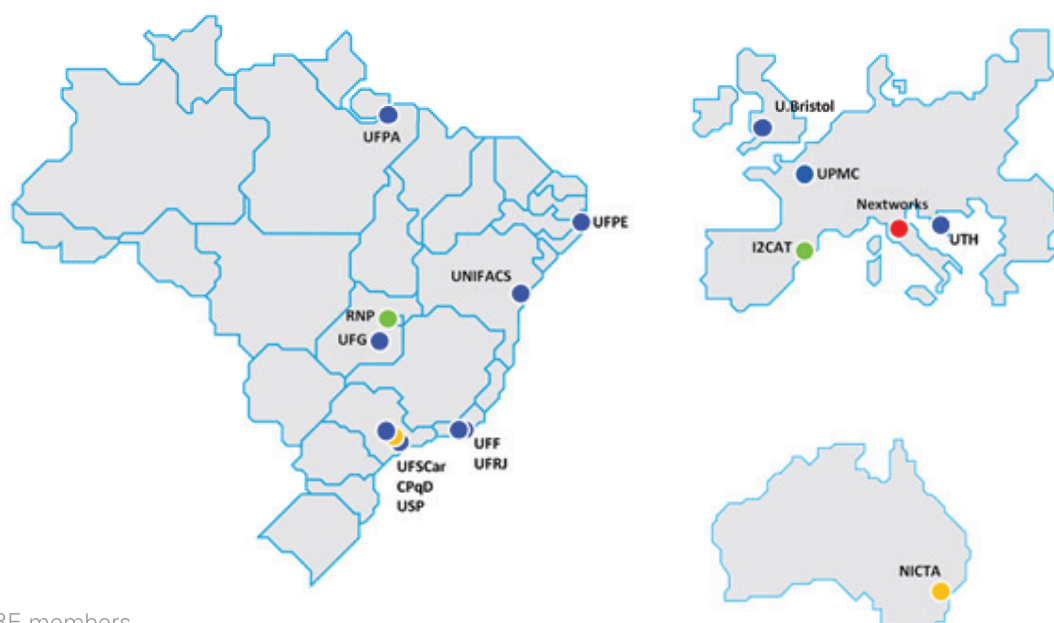
In other words, testbeds work like a “playground” for researchers (or “experimenters”) to test new models of network architectures and applications.

The FIBRE project

The main objective of the FIBRE project is to design, implement and validate a Future Internet testbed in Brazil, integrated with other existing ones in Europe. In order to achieve this goal the project is carrying out four main activities:

1. The deployment of a new testbed in Brazil from scratch.
2. The enhancement of already existing European testbeds by improving the different software designed to manage different testbeds.
3. The federation of the Brazilian and European experimental facilities, both at the physical connectivity and control framework level, to support the provisioning of resources from both testbeds.
4. The design and implementation of three pilot applications (a.k.a. project showcases) to validate the federated testbed by demonstrating the public utility of FIBRE infrastructure.

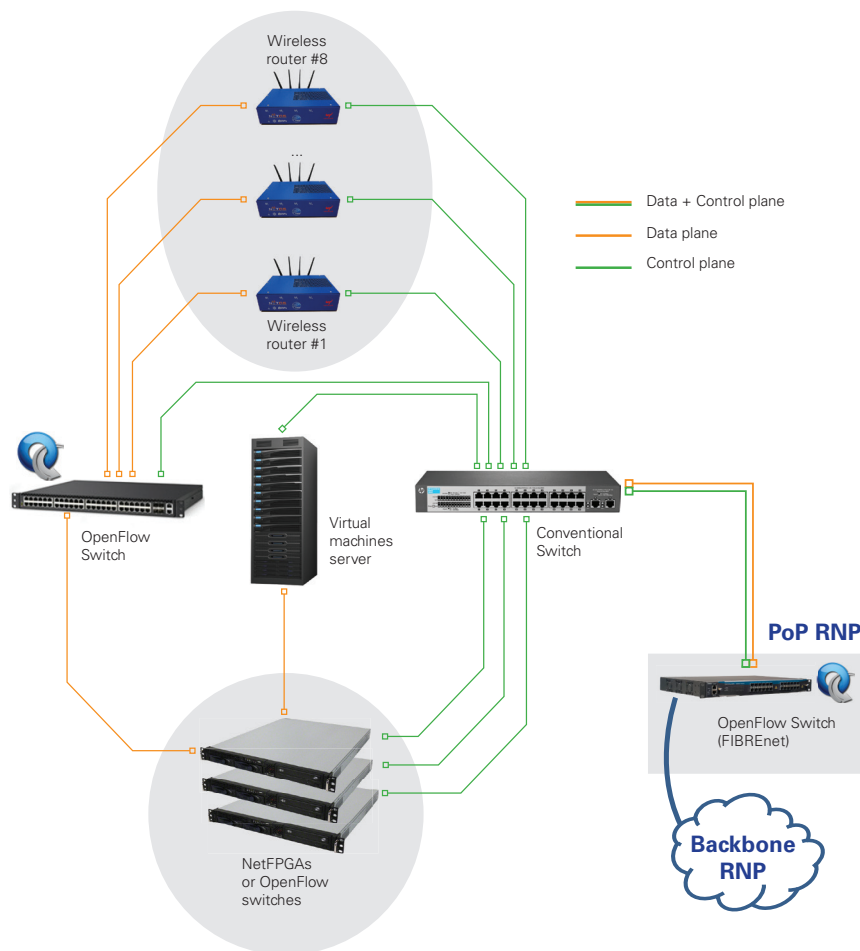
● Universities ● R&E Network
● R&D Center ● SME / Industry



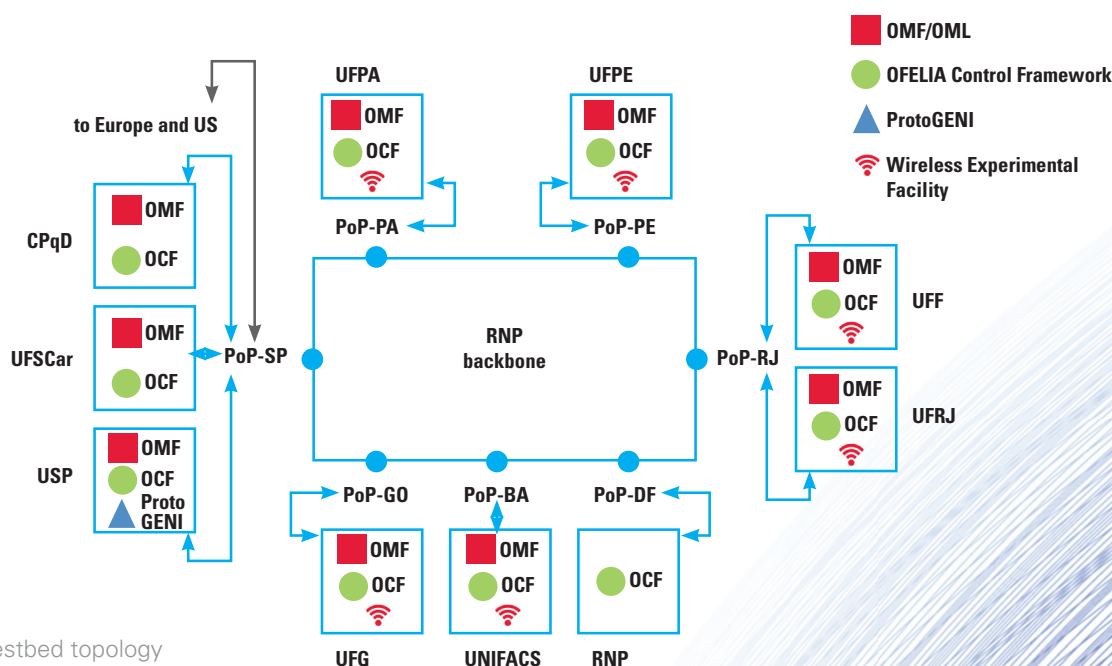
FIBRE members

The software in charge of managing Future Internet experiments and the operation of the testbed itself is called **Control and Monitoring Framework (CMF)**. FIBRE adopts 3 CMFs in its current implementation: OFELIA Control Framework, OMF and ProtoGENI.

Two of the European islands are based on previous FIRE IP project **OFELIA** (<http://www.fp7-ofelia.eu/>) and are deployed by the University of Bristol and the i2CAT Foundation in Barcelona. The third European island is based on the **NITOS** testbed (<http://nitlab.inf.uth.gr/NITlab/>), maintained by the University of Thessaly (Greece) as part of Fed4Fire (<http://www.fed4fire.eu>) and OpenLab FIRE IPs projects. In Brazil, all islands are being deployed from scratch, according to the following reference design:



Universities, research centres and even SMEs participate in the FIBRE project. Many of these institutions host “**experimental islands**”, which are local small testbeds. In practice, the FIBRE testbed is a **federation** of 13 experimental islands across Europe and Brazil.



FIBRE testbed topology

Project acronym: FIBRE

EU Grant Agreement n°:

288356

CNPq process n°:

590022/2011-3

Project type: STREP

Start date: 01/10/2011

Duration: 30 months

Overall budget:

EUROPE

1.560.457,00 €

BRAZIL

R\$ 3.314.800,00

Funding from the EC:

1.09 M€

Funding from CNPq:

R\$ 2.3 M

Funding from RNP + INCT:

R\$ 1.014.800,00

Total funded effort in

person-month: 1074,5 PM

(EU 181,5 + BR 893)

Web site:

<http://www.fibre-ict.eu>**Twitter:**

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BRAZIL:

UFPA

CPqD

RNP

UFF

UFG

UFPE

UFRJ

UFSCar

UNIFACS

USP

EUROPE:

i2CAT (ES)

Nextworks (IT)

U. Bristol (UK)

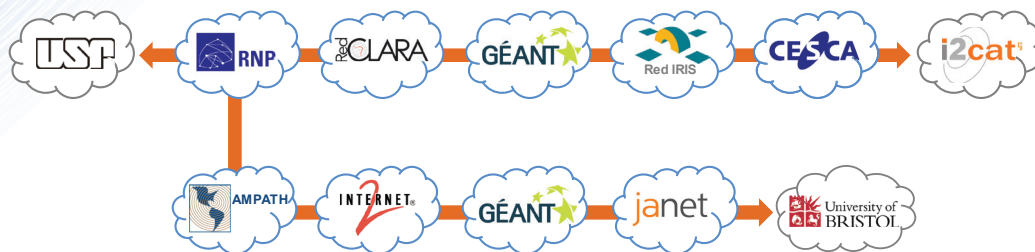
UPMC (FR)

UTH (GR)

NICTA (AU) – third country

Intercontinental connections

The physical interconnection of Brazilian and European islands is deployed through two point-to-point circuits (a.k.a. lightpaths) linking FIBRE's Brazilian gateway at the University of Sao Paulo (USP, Brazil) to i2CAT (Spain) and University of Bristol (UK), spanning multiple network domains.



Get prepared for running Future Internet experiments on FIBRE

Once the FIBRE facility is operational, experimenters will be offered with a transparent federation of heterogeneous platforms across continents. Any researcher will be welcome to submit proposals to run experiments on the FIBRE infrastructure. Stay tuned to the latest FIBRE news and announcements by following us on Twitter (@FIBRE_project), Facebook (<http://facebook.com/fibre.project>) and subscribing to our public mailing list. Find it more at <http://www.fibre-ict.eu>

