slices RI

slices-ri.eu

Introduction of SLICES (and SILECS)

Slides merged from C. Perez (LIP/JCAD'21) & A. Lebre (LS2N/LabClass'22)

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CC 11/2/2022

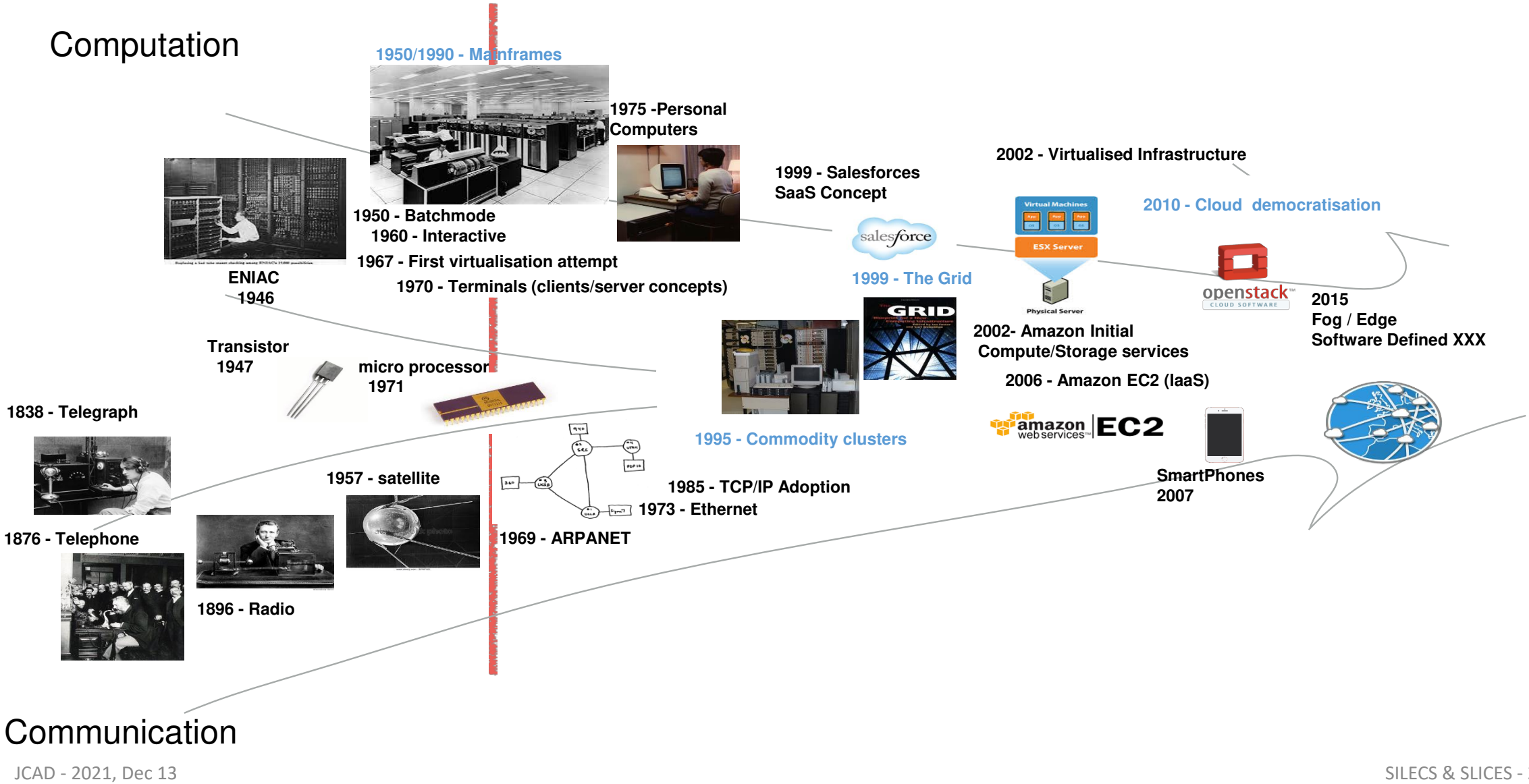
Sources

- Feuille de route ESFRI 2021

  https://www.esfri.eu/latest-esfri-news/new-ris-roadmap-2021

- Talks
  - https://jcad2021.sciencesconf.org/data/silecs_slices_JCAD_2021.pdf
  - https://indico.mathrice.fr/event/313/contribution/0/material/slides/0.pdf
  - https://www.silecs.net/wp-content/uploads/2018/04/Desprez-SILECS.pdf

Convergence of Computation and Communication



Motivations

CISCO predicted ~29,3 billion networked devices by 2023, up from 18.4 billion in 2018.

~60% growth in 6 years!

Exponential improvement of

- Electronics (energy consumption, size, cost)
- Capacity of networks (WAN, wireless, new technologies)

Exponential growth of applications near users

- Smartphones, tablets, connected devices, sensors, ...
- Large variety of applications and large community

Large number of Cloud facilities to cope with generated data

- Many platforms and infrastructures available around the world
- Several offers for IaaS, PaaS, and SaaS platforms
- Public, private, community, and hybrid clouds
- Going toward distributed Clouds (Fog, Edge, extreme Edge)

Validation in (Computer) Science

Two classical approaches for validation :

- Formal : equations, proofs, etc.
- Experimental: on a scientific instrument

Often a mix of both :

- In Physics, Chemistry, Biology, etc.
- In Computer Science

SILECS (French Level)

https://silecs.net

Wireless – Internet Of Things

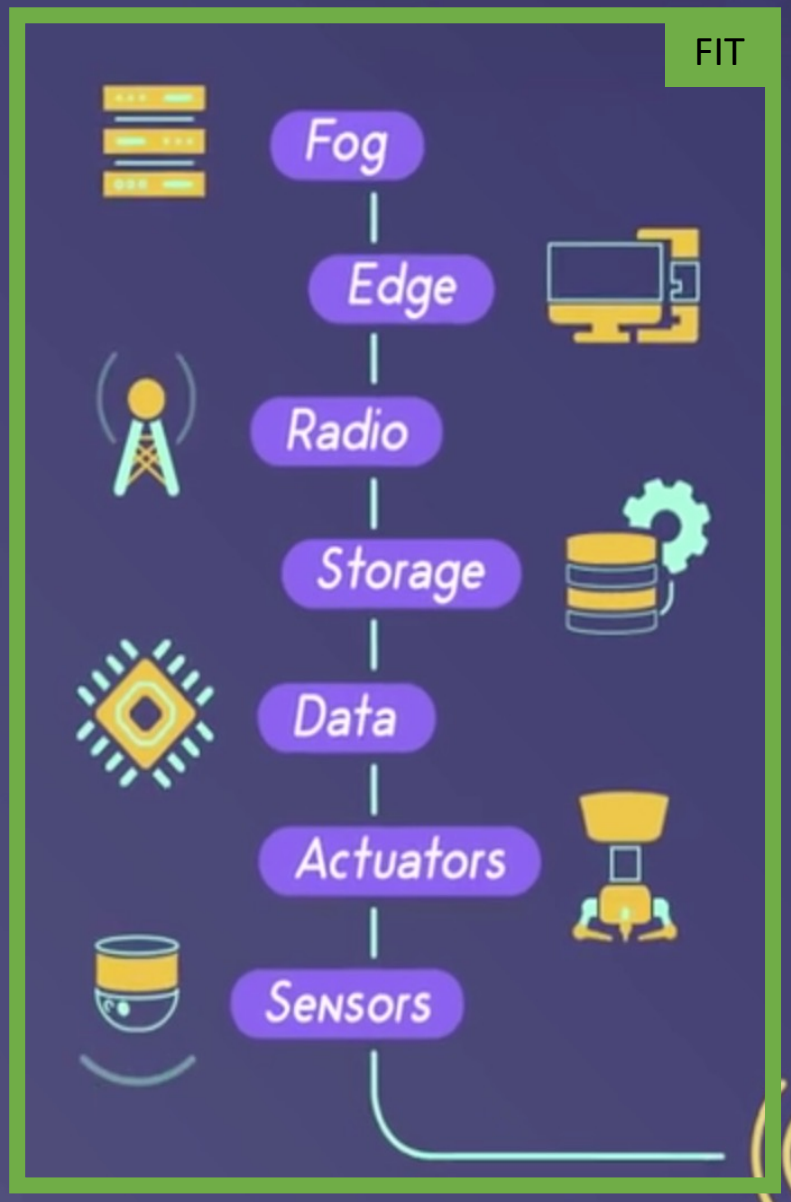
- Proving Internet players access to a variety of fixed and mobile technologies and services, thus accelerating the design of advanced technologies for the Future Internet
- 4 key technologies and a single control point: FIT-IoTLab (connected objects & sensors, mobility), CorteXlab (Cognitive Radio), R2Lab wireless (anechoic chamber), Network Operations Center, Advanced Cloud technology including OpenStack
- 9 sites (Paris, Evry, Rocquencourt, Lille, Strasbourg, Lyon, Grenoble, Sophia Antipolis)

Grid'5000 (https://www.grid5000.fr)

- A scientific instrument for experimental research on large future infrastructures: *Clouds, datacenters, HPC exascale, Big Data infrastructures, networks, etc.*
- 10 sites (dont Nantes), service nodes, >8000 cores, with a large variety of network connectivity and storage access, dedicated interconnection network granted and managed by RENATER

On the *feuille de route nationale des Infra de recherche* since 2018

SILECS explained in vidéo https://vimeo.com/521314225



SILECS

GRID'5000

Experimental conditions injector

Applications

Programming Environment

Middleware

Application Runtime

Operating System

Virtualization layers

Networking

Measurement tools

SLICES (European Level)

https://slices-ri.eu

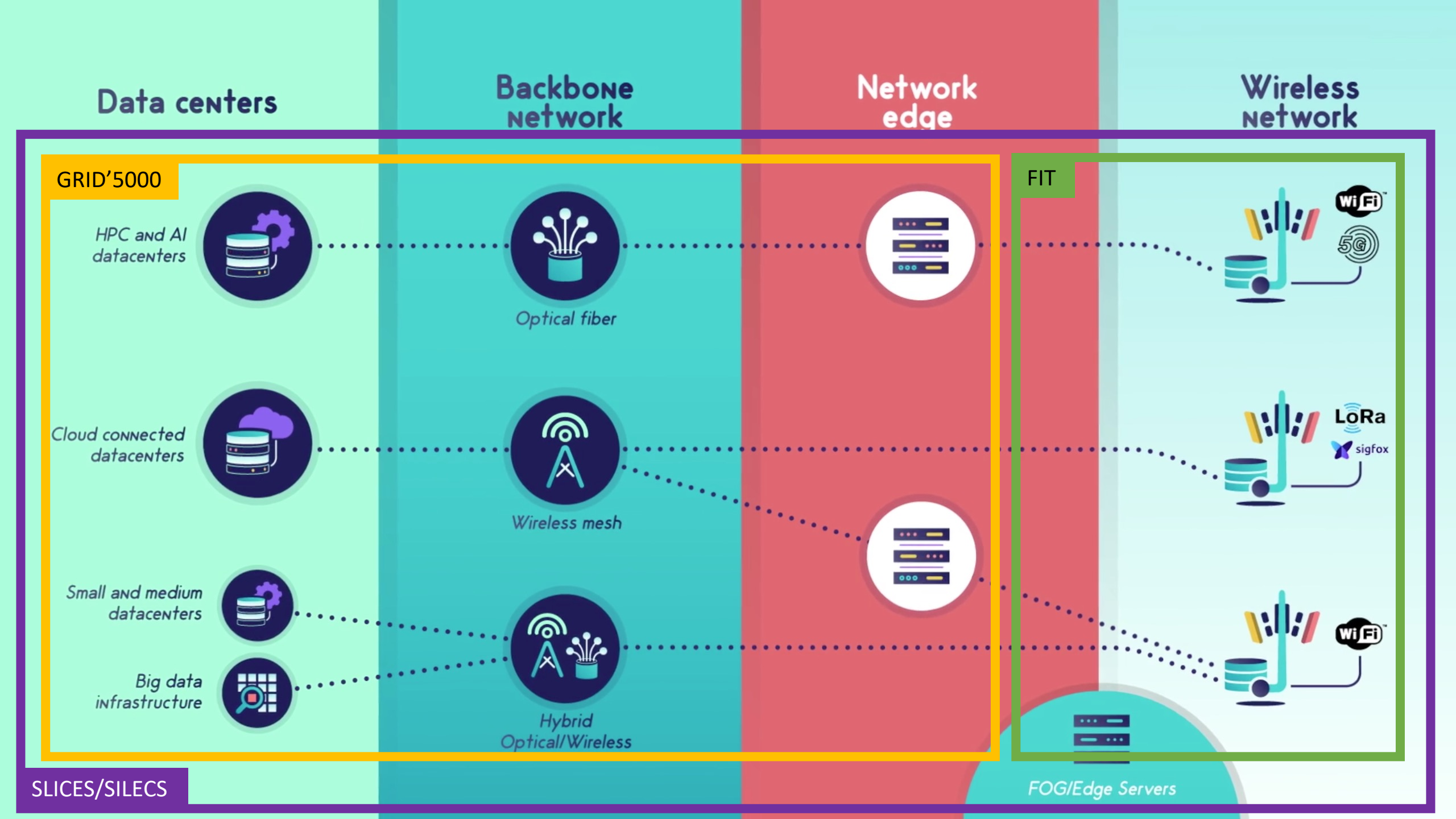
Flexible platform designed to support largescale, experimental research focused on

- Networking protocols
- Radio technologies
- Services
- Data collection
- Parallel and Distributed Computing and in particular
- Cloud and Edge-based Computing architectures and services.

The first European the first Research Infrastructure in computer science

Announced as an ESFRI Project 2021

25 Participants from 15 countries (France project-leader)


Data centers
Backbone network
Network edge
Wireless network
GRID'5000
FIT
HPC and AI datacenters
Optical fiber
Cloud connected datacenters
Wireless mesh
Small and medium datacenters
Big data infrastructure
Hybrid Optical/Wireless
FOG/Edge Servers
Wi Fi
5G
LoRa
sigfox
Wi Fi
SLICES/SILECS

In summary

- **SLICES**: ESFRI Research infrastructure for experimental computer science and future services in Europe. Experiment on a single infrastructure, from edge to cloud
- **SILECS**: French Research infrastructure based on existing instruments (FIT and Grid'5000)
- **Challenges**
  - Design a software stack that will allow experiments mixing both kinds of resources while keeping reproducibility level high
  - Keep the existing infrastructures up while designing and deploying the new one
- **Keep the aim of previous platforms (their core scientific issues addressed)**
  - Scalability issues, energy management, ...
  - IoT, wireless networks, future Internet
  - HPC, big data, clouds, virtualization, deep learning, ...
  - City-Scale wireless experimentations
- **Address new challenges**
  - IoT and Clouds controllable testbeds
  - New generation Cloud platforms and software stacks (Edge, FOG)
  - Data streaming applications
  - Big data management and analysis from sensors to the (distributed) cloud
  - New Mobility models
  - Country-Scale wireless experimentations
  - Next generation wireless