Experimentation on Cloud, Edge, IoT

*the SLICES approach*

Andrea PASSARELLA

IIT-CNR, Pisa, Italy – SLICES-IT Coordinator
SLICES in a nutshell

• *Digital transformation* is at the heart of our society!

• There is *no* digital transformation *without digital infrastructures*.

• Launched in 2017, **SLICES** is an *RI* to support the *academic and industrial research community* that will design, develop and deploy the *Next Generation of Digital Infrastructures*:

  • **SLICES-RI** is a *distributed RI* providing several *specialized instruments* on challenging research areas of Digital Infrastructures, by *aggregating* networking, computing and storage *resources* across countries, nodes and sites.

  • **Scientific domains**: networking protocols, radio technologies, services, data collection, parallel and distributed computing and in particular cloud and edge-based computing architectures and services.

www.slices-ri.eu
Fully Controllable, programmable Virtualized Digital Infrastructure Test Platforms


China CENI
Chinese Experimental National Infrastructure
2018-20223
190 M€
SLICES methodology for scientific dimension

1. Grand Challenge
   “DIs of the next century”

2. Stakeholders

3. Research Vision

4. Research Areas

5. Prioritised Topics

Long-term enough to be stable during the SLICES RI lifetime.

Continuously updated based on the SLICES workplan.
3. Definition of a research vision on future DIs

- Massive diffusion of IoT devices/Cyber Physical Systems at the edge.
- Large amounts of data generated in real time.
- Pervasive connectivity across wireless, mobile and fixed.
- Need for decentralised complexity towards the edge.
- DIs not mere “dumb pipes” to move data to centralised Cloud/HPC infrastructures...
- but decentralised, interconnected infrastructures characterised by distributed intelligence and highly efficient communications.
Prioritisation of research topics – pervasiveness of Cloud/Edge/IoT

- AI-centric DIs
- Human-centric DIs
- Cross-prop.
- Indus. verticals demand
- Cloud-to-Edge scalable DIs

5. Breaking down in priority research topics

Simultaneous but progressive exploration of research topics

- **ADVANCED WIRELESS NETWORKING**
  - New waveforms, higher frequencies up to THz.
  - Spectrum and wireless management.
  - Integrated sensing and communication.
  - Heterogeneous radio management.

- **SMART INFRASTRUCTURE**
  - Advanced protocols and architectures (virtualization, softwareization, programmability).
  - AI applied to infrastructure operation and optimization.
  - Generation of data to train algorithms.
  - Distribution of intelligence into (and beyond) the Edge of the network.

- **DESIGN & VALIDATION OF NEW DIs AND HYPER CONVERGED INFRA**
  - Fog/Edge/cloud hyper converged infras
  - Software component deployment.
  - Distributed resource management & microservices.
  - Geo-distributed data management.
  - Federated deep learning.
  - Datacentres infras for distributed systems, appl., and software stacks.

- **ADVANCED FUNCTIONALITIES**
  - New challenges arising from the verticals and the ubiquitous networks.
  - Interoperability, composable infrastructure services on-demand (RI as a Service).
  - Seamless user experiences across technologies and domains.

- **ENERGY EFFICIENCY AND CARBON FOOTPRINT**

- **SECURITY AND PRIVACY**

23.6.2022

IoT Week 2022
Speakers (12’ each) & Agenda

- Konstantinos Filis, COSMOTE, Greece
  - LeonR&Do testbed: A scalable IoT platform for facility automation and energy control
- Bartosz Belter, PSNC, Poland
  - SLICES-PL: research infrastructure for science and industry
- Cédric Crettaz, Mandat International, Switzerland
  - What to test for IoT?
- Raymond Knopp, EURECOM, France
  - Some IIoT Use-Cases and associated challenges @ SOPHIA-NODE
- Thanasis Korakis, U. of Thessaly, Greece
  - SLICES-GR - NITOS: An integrated facility for beyond 5G research
- Enrico Buracchini, TIM, Italy
  - An operator view on 6G perspectives, and the role of European projects’ experimental platforms
- Open Floor
Thank you!

Find more: Slices-ri.eu