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An overview of Fed4FIRE testbeds – and beyond?

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1 Introduction and motivations

We have now reached a point where there is a large number of testbeds available for experimenters throughout the world, each with its own features and capabilities. This is a good thing of course, but also a bad thing, because it is getting increasingly difficult for potential users to identify which testbeds would better match their needs. It is not unusual at all to encounter researchers that were not aware that the experiments they performed could have been done much more efficiently on a publicly available testbed. Also, one could also argue that this results in useless duplication of efforts between testbed efforts, even if there is some value to exploring different ways to solve the same issues.

In the context of the Fed4FIRE+ project, we have been working on presenting a better overview of Fed4FIRE testbeds – the current state being the Fed4FIRE website¹. Section 2 provides the current state of this overview (and can serve as a technical introduction to Fed4FIRE testbeds), while Section 3 discusses possible future work in that area, in the context of GEFI.

2 Fed4FIRE testbeds

17 testbeds (14 from Fed4FIRE, 3 outside Fed4FIRE) were analyzed, and are described in Table 1 and Table 2. 13 are wireless testbeds, while 4 testbeds address wired networking, cloud, HPC, or nodes distributed at large.

Wireless testbeds (Table 1) differ on various aspects:

- The environment they are deployed in: anechoic chambers, various indoor or outdoor environments
- The protocols they support
- The hardware they rely on, and the services they provide

The other testbeds (Table 2) are much more diverse, even if Grid'5000 and VirtualWall (which is based on the Cloudlab software stack) are similar in terms of features, as it was pointed in the past [1].

3 Plans for collaboration

This work is still at a preliminary stage. And despite discussions about surveys during the previous GEFI meetings, we have not made much progress towards building an overview of the available testbeds offerings. The GEFI workshop could be a good opportunity to discuss ways to make concrete progress. One idea that could be explored is to start small, and aim for a Wikipedia comparison page². But that still requires us to refine comparison criterias.

References

- [1] Lucas Nussbaum. Testbeds Support for Reproducible Research. In *ACM SIGCOMM 2017 Reproducibility Workshop*, Los Angeles, United States, August 2017.

¹<https://www.fed4fire.eu/testbeds/>

²example: https://en.wikipedia.org/wiki/Comparison_of_text_editors

| Name & website | Categories (F4F web) | Patron, Country | Hardware | Environment | Typical protocols | Services |
|----------------------------|----------------------|---------------------------------|--|--|--|-------------------------------|
| FuSeCo | Wireless | Fraunhofer, Berlin | | | | |
| IRIS | Wireless | Trinity College Dublin, Ireland | 20x USRP N210 | Indoor | 5G, any (SDR) | |
| LOG-a-TEC | Wireless | JSI, Slovenia | | Outdoor | 6LoWPAN, ZigBee | |
| NETMODE | Wireless | NTUA, Greece | | Indoor + roof | Wi-Fi | |
| PerformLTE | Wireless | UMA, Spain | | Indoor ? | | 4G / LTE |
| Smart Santander | Wireless | UC, Spain | | outdoor | 802.15.4 | access to collected data only |
| w-iLAB.t | Wireless | imec, Belgium | embedded PCs with several wireless NICs | Indoor (utility room + offices) | Wi-Fi + 802.15.4 + BT + some USRPs (SDR) | bare-metal access to nodes |
| CityLab | Wireless, IoT | imec, Belgium | 32 nodes. embedded PCs with several wireless NICs | Outdoor (city) | Wi-Fi + 802.15.4 + BT + LORA | bare-metal access to nodes |
| Portable Wireless Testbeds | Wireless, IoT | several | embedded PCs with several wireless NICs | depends on deployment | Wi-Fi, 802.15.4, spectrum scanners | bare-metal access to nodes |
| NITOS | Wireless, OpenFlow | CERTH, Greece | embedded PCs with several wireless NICs + some USRPs | indoor and outdoor | Wi-Fi, WiMAX, LTE | |
| FIT IoT-Lab | Not in F4F | SU / Inria / others, France | MSP430 or STM32 micro-controllers, Cortex A8 linux board. some mobile robots | indoor (several deployments, dedicated rooms or offices) | 802.15.4. some BLE | |
| FIT CortexLab | Not in F4F | SU / Inria / others, France | 29 x USRP N2932, Nutaq PicoSDR | indoor (anechoic chamber) | any (SDR) | |
| FIT R2Lab | Not in F4F (yet) | SU / Inria / others, France | Nitos X50, USRP B210, USRP N210, USRP 2, and USRP 1, LimeSDR, smartphones | indoor (anechoic chamber) | Wi-Fi, any (SDR) | bare metal access |

Table 1: Wireless testbeds

| Name & Website | Categories on F4F website | Patron, Country | Type of hardware |
|---------------------|----------------------------------|------------------|--|
| Tengu | Big Data | imec, Belgium | Deployment of Big Data software stacks |
| OFELIA I2CAT island | OpenFlow | i2CAT, Spain | OpenFlow-enabled switches (NEC IP8800) + end hosts (VMs) |
| PL-LAB | Wired | PSNC, Poland | Traffic generator + NetFPGA (as Programmable switches) + routers + some bare-metal servers |
| PlanetLab Europe | Wired | UPMC, France | nodes distributed over the Internet |
| ExoGENI | OpenFlow | UvA, Netherlands | OpenStack cloud |
| Virtual Wall | Wired, Cloud | imec, Belgium | Two clusters of nodes with network emulation |
| Grid'5000 | Wired, OpenFlow, Cloud, Big Data | Inria, France | About 30 clusters of nodes, on 8 sites |

Table 2: Other testbeds