F4FP – SME Call – Stage 1 CloudBots

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Canonical Robots S.L.

Fed4FIRE+ - SME Call experiment - Formal Review

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Experiment description

CLOUDBOTS

Background and Motivation

Canonical Robots S.L. is a robotics company focused on the design, manufacture, and commercialization of collaborative robots.

We are now living in COVID times, and Canonical Robots have used robots to help people and companies to work in virus-free spaces, like the CLBots:

- It disinfects rooms and areas in workplaces.

- It can use automatic navigation and mapping functionalities.

- It is also used as an assistant to clients.

This experiment is the beginning to achieve the next steps of our company with CLBots:

- To sell more than one CLBots to big workplaces.

- To separate software and hardware components, thereby it is possible to build lightweight, low-cost, smarter robots with an intelligent "brain" in the cloud.
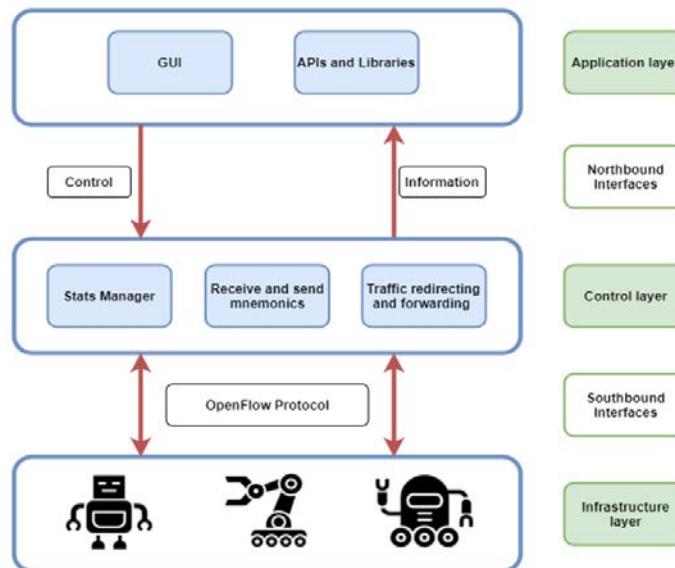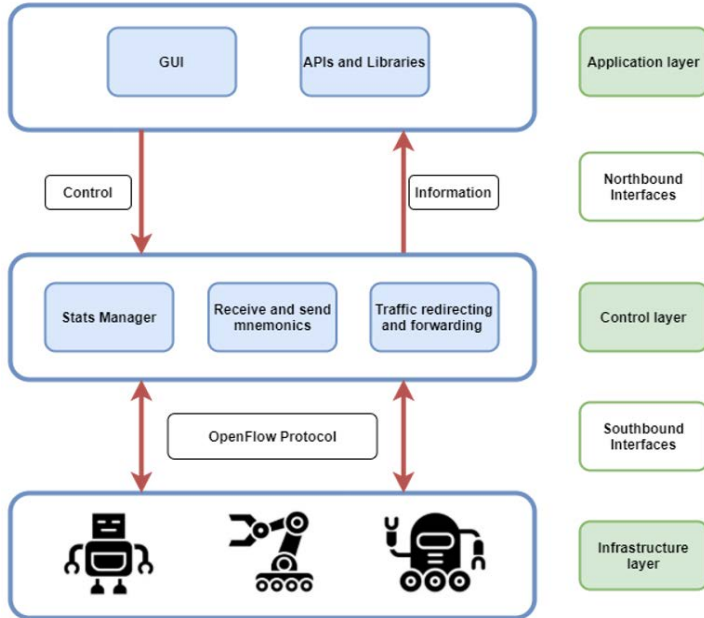
Concept and Objectives

Concept:
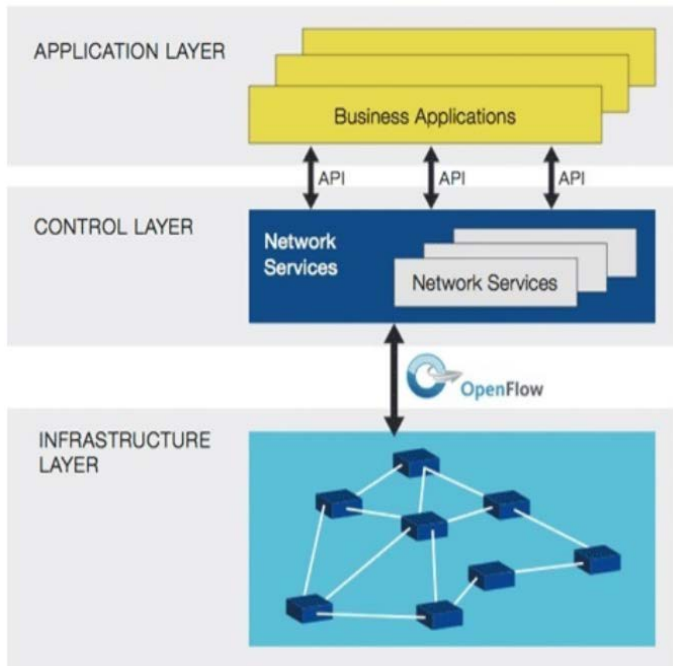
Objectives:

To create a network framework where the CLBots applications are removed from the physical robot and can be replace for standard and general applications in a web server with an intuitive GUI for the user to send mnemonic commands to the robots.
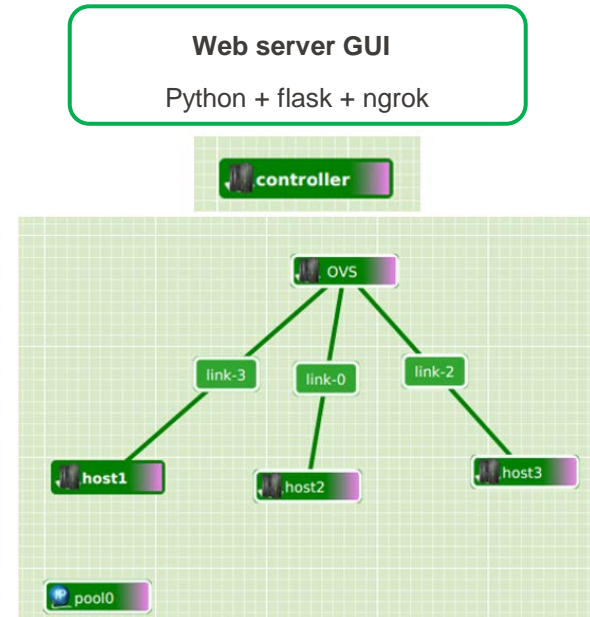
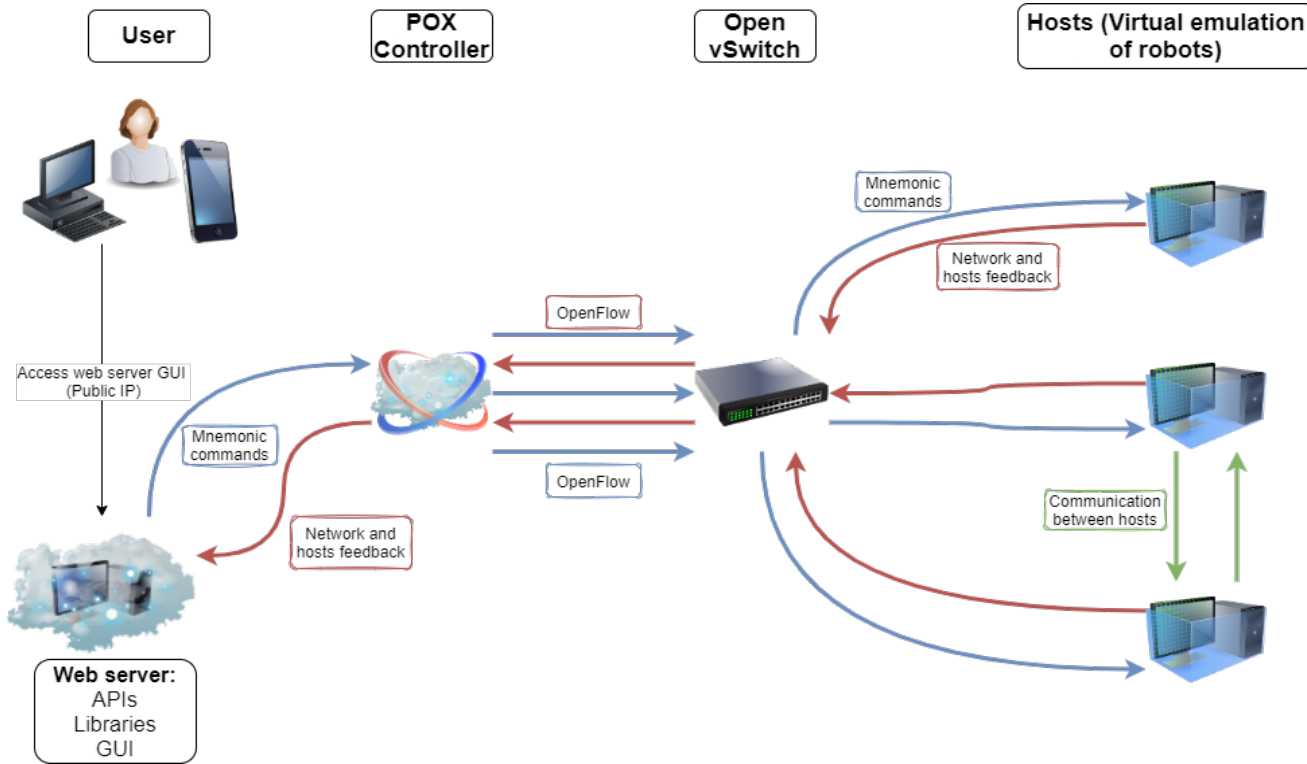# Experiment set-up

IDEA

SET-UP ON VIRTUAL WALL TESTBED

CANONICAL ROBOTS

# PROJECT RESULTS

Technical results

Communication: Bidirectional communication with one specific host, a group of them or all of them at the same time, and direct communication between hosts.

Feedback: Network and hosts parameters.

Remote control: Remote maintenance, upgrading and updating of functionalities, and direct control over hosts actions.

Technical results

- This is the **CLBots chat APK** outside the robot and **embedded for the user in a web server.**

- CLBots have now a chat where you can tell them by voice or by typing it, what you want them to do.

- We made this as an **example of how we can extract all programs and applications from the robot hardware and have it in the cloud.**

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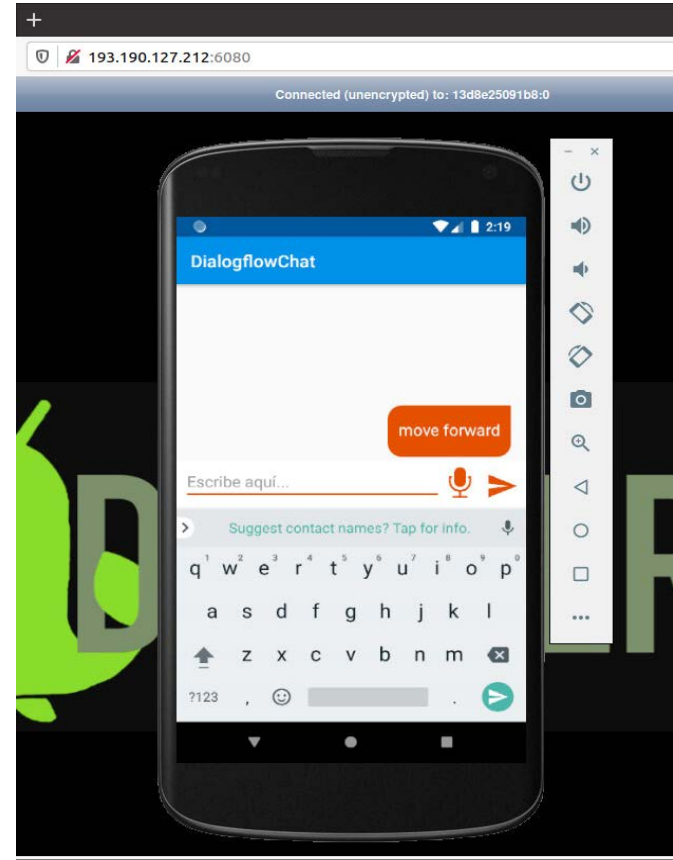
Lessons learned

- **Knowledge**: Gained knwoledge and experience on SDN architecture and OpenFlow.

- **Limitations**: We could not work with real robots because of time and the use of virtual resources.

- **Future work**: We learned that we could implement this idea in the real world if we physically have the used testeb resources with us and the budget to get a robot for this experiment specifically.

BUSINESS IMPACT

CLOUDBOTS

Impact on our business

Freedom on software development
Applications and new software development would be on our server:

- Freedom on programming languages.

- No compatibility problems with CLBots.

- Applications updating without interfering with the robot.

Costs reducing + Revenue growth

- We would not need to acquire robots with new applications, only robots with new hardware or different base OS.

- We could offer a group of CLBots to work together as a team for big areas instead of just one.

Benefits for our clients

- Remote software maintenance work.

- Remote updating/upgrading of applications.

- Centralized control of all the robots from a user GUI.

How did Fed4FIRE helped us?

Resources

- We do not have the computational and hardware power to apply this idea until the end and mantain it.

- Fed4FIRE gave us the virtual resources needed to start developing this project.

Knowledge

- We did not have much experience on SDN and Openflow.

- Fed4FIRE gave us the neccessary documentation, practises and tools to gain experience on these fields.

- Fed4FIRE also allowed us to have direct communication with testbed experts.

Budget

- We did not have financial support to start with this project.

- Fed4FIRE gave us a boost to our idea and the initial trust to make it happen.

Value perceived

Gained knowledge and competences

- Network architectures.

- OpenFlow Protocol.

- POX controllers.

New business vision

- New software development ideas for our robots.

- Flexibility and greater facility on our robotic AI applications.

- Unified control of all of our robots, not just CLBots.

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Why did we come to Fed4FIRE?

1. Their open, accessible and reliable facilities.

2. Their experimental processes are simple and effective and that is what we needed to start giving form to our idea.

3. We could utilize common tools of the federation, allowing us to focus on our experiments and not in the maintenance of an infrastructure.

4. Their support on SME like us, to develop new solutions that we could not perform without a proper infrastructure, community and budget.

5. We can make at least a little contribution on building a European facility for internet research and experimentation .

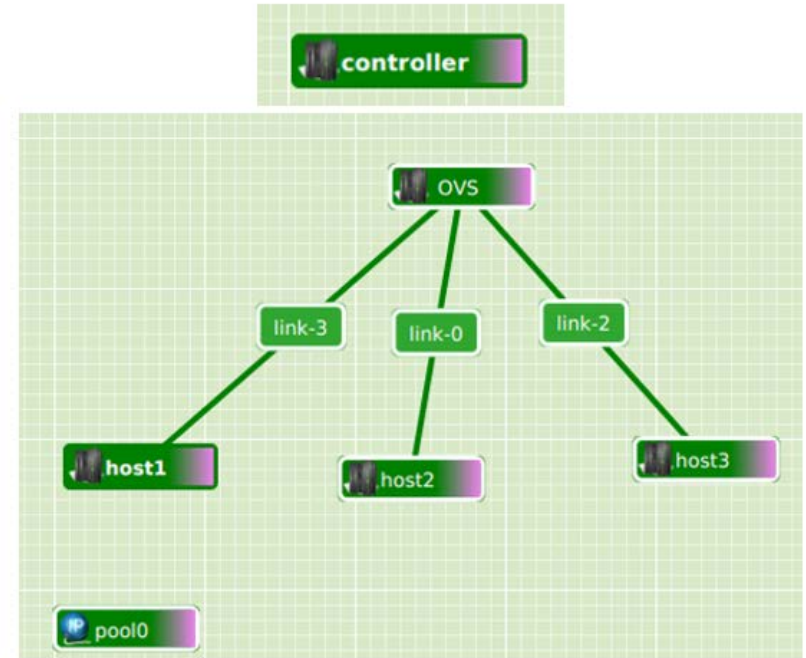**WWW.FED4FIRE.EU**

CANONICAL ROBOTS

FEEDBACK

CLOUDBOTS

Used resources

VIRTUAL WALL TESTBED

- 4 physical nodes (controller, Open vSwitch, and 3 hosts)

- 1 pool to test a virtual Android device emulation in one of the hosts via public IP on a web browser.

- Actually using the resources during the times we made reservations of resources for the experiment.

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Used tools

JFED

Tool	Positive aspects	What did not work?
jFed	• Available documentation of the testbed and tutorials. • Bugreport • Intuitive and simple. • jFed warns you when your experimenter expires in less than an hour. • We could renew the experiment time every moment we needed to. • Great user experience because you have plenty of options so you don´t have to waste time with code or programming to do simple tasks that do not have anything to do with the actual experiment, such as: transfer files, manifests, ssh connection…	• Error log was not very descriptive. • We could not use XEN VM or Virtual Machine nodes.

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Added value of Fed4FIRE

1. Diversity of available resources.

2. Support and documentation.

3. Tools offered.

4. Easy setup of experiments.

5. Combining infraestructures.

WIRED   WIRELESS   5G   IOT   OPENFLOW   CLOUD   BIG DATA

Future work

WHAT WE´VE DONE

- To learn how to develop a SDN architecture and apply OpenFlow protocol in virtual environments (no physical robots).

WHAT WE WANT TO DO

- To have a longer time project where we can translate this experiment set-up to a real robot in a real environment.

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THANK YOU FOR YOUR ATTENTION!

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