Advances in the CLOUDY Community Network Cloud Distribution

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***Abstract*—A community cloud is a cloud deployment model, which is designed for the needs of a specific user community. In this demo we present advances in an operational community cloud which is deployed in the Guifi.net community network. It consists of geographically distributed cloud infrastructure with tenths of nodes at user premises, decentrally managed by the users, prepared for organic growth, and with operational application services enabled through the Cloudy distribution.**

***Index Terms*—community networks; cloud computing;**

I. Introduction

The cloud deployment, which we show in this demo, materializes the concepts of the community cloud computing paradigm [1], combined with the socio-technical characteristics of community networks [2], into an operational community network cloud deployed in Guifi.net[1].

The operational community cloud is an outcome of volunteer efforts combined with research contributions. Important research results which has enabled this community network cloud were contributed by the Community-lab testbed on which experimental results were obtained [3], by wireless network measurements [4], and by research on network and service archtectures for volunteer computing systems [5].

II. Community network clouds for citizens

A. The vision of clouds in community networks

Similarly to the availability of cheap Wifi routers in the early 2000, which enabled citizens to start building community wireless networks, nowadays cheap and powerful Mini-PCs as well as Single Board Computers (SBCs), such as the Raspberry Pi, have become popular. At the same time, these devices have a large number of open software applications available, at reach of end users, stimulating the creativity and contributions of services by users. Both factors create a favourable environment for community network clouds to happen.

The current momentum on Fog Computing [6], supported by industry sectors, which advocates the shift of large data center cloud installations towards smaller distributed, close to the user located devices, is another trend which is expected to play an important role for facilitating the take-up of community network clouds.

[1]http://guifi.net/

B. The Cloudy distribution

The software, which we have developed to build the community network cloud, is a Debian-based Linux distribution called *Cloudy*[2]. Cloudy can be downloaded from public repositories[3].

Figure 1 shows the Cloudy Web-GUI and a list of Syncthing instances that were found by the search service. Cloudy offers to the user five main types of services (see top left side): 1) Search, 2) Guifi.net, 3) Personal cloud, 4) Community cloud and 5) Enterprise cloud. If clicked for instance on the community services, a list of applications appear which the Cloudy user can activate. Currently, in the *Community cloud* Cloudy provides Peerstreamer, Tahoe-LAFS and WebDAV. In *Personal cloud* the Syncthing application is provided. In previous works we evaluated specific services, such as Tahoe-LAFS [7] and Peeerstreamer [8], which found satisfactory performance of these applications in the community network cloud. In *Enterprise cloud*, the user is able to deploy applications by means of Docker containers.

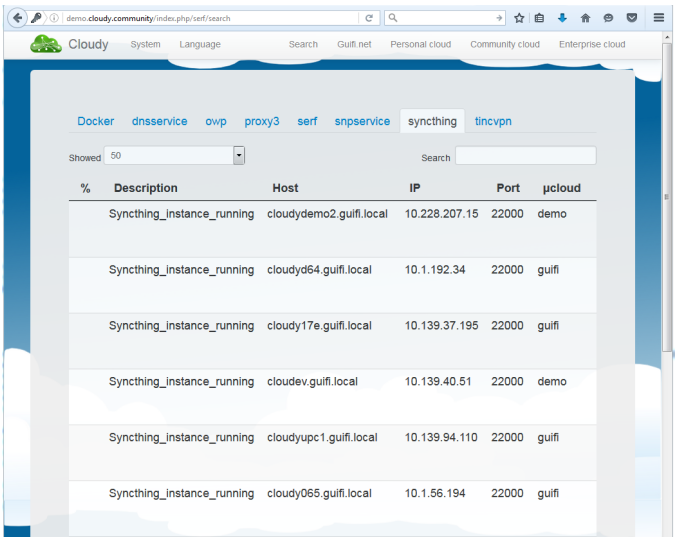

Fig. 1. Cloudy Web-GUI. Syncthing services are discovered by the search service.

[2]http://cloudy.community/
[3]http://repo.clommunity-project.eu/images/

C. Hardware in the community cloud

Cloudy should be installable on any kind of on-premise devices, which then can become part of the community network cloud. Cloudy has been tested and installed on desktop PCs, mini-PCs, as well as on low-resource single-board-computers such as RaspberryPI[4]. Cloudy has therefore shown to be suitable as operating system for low-energy consuming 24/7 operated home computing devices.

Figure 2 shows a typical node which has been recently deployed in the Guifi community cloud. The device from Minix[5] comes with a low energy consuming Intel Z3735F (64-bit) processor, 2 GB of RAM and 32 GB of internal storage. Over the USB port, additional storage capacity can be added by the user.

Fig. 2. Example of a community cloud node.

D. Service provision with Docker containers

The integration of Docker in Cloudy targets at achieving an end user friendly Docker configuration and control. To this end, the approach we followed is to hide the technical complexity of the Docker usage behind graphical Web interfaces, more suitable for end users.

The Cloudy administrator can find a list of pre-configured applications available that can be started in Docker containers. These applications can be installed and un-installed with a click on the web interface. The user can also choose if these applications should be published (shared) to the community network cloud.

III. Demonstration

The demo of this community network cloud in Guifi.net at the LCN 2016 conference is given in two parts:

1) We will show through live access the community cloud in Guifi.net, as seen by the community network cloud user who hosts a Cloudy node[6]. We will connect to the Web-GUI of Cloudy instances and explore the cloud instances deployed in the community network, use the service discovery and see some cloud services, e.g. Tahoe-LAFS, Peerstreamer and Syncthing.
2) We will show and discuss the support tools, which we have used so far to enable an environment for the creation of an ecosystem around this citizen-driven cloud deployment.

This demo will therefore showcase to the audience an operational participatory community cloud, in which citizens can not only be service consumers, but also service providers. Flexible service provision is achieved by leveraging Docker containers, which has been made accessible to end-users by its integrating in the Cloudy distribution.

From the technical feasibility shown by this demo, several research directions are suggested to make the system more integrated, adaptive and sustainable.

[4]see boards and guides in http://wiki.clommunity-project/howto

[5]http://www.minix.com.hk/Products/MINIX-NEO-Z64-ANDROID-TV.html

[6]Access will be done through a publicaly available Cloudy instance at http://demo.cloudy.clommunity/, with login guest:guest.

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