

On Supporting Service Selection for Collaborative Multi-Cloud Ecosystems in Community Networks

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The 29th IEEE International Conference on
Advanced Information Networking and Applications (AINA-2015)

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Gwangju, Korea, March 25-27, 2015



Community Networks

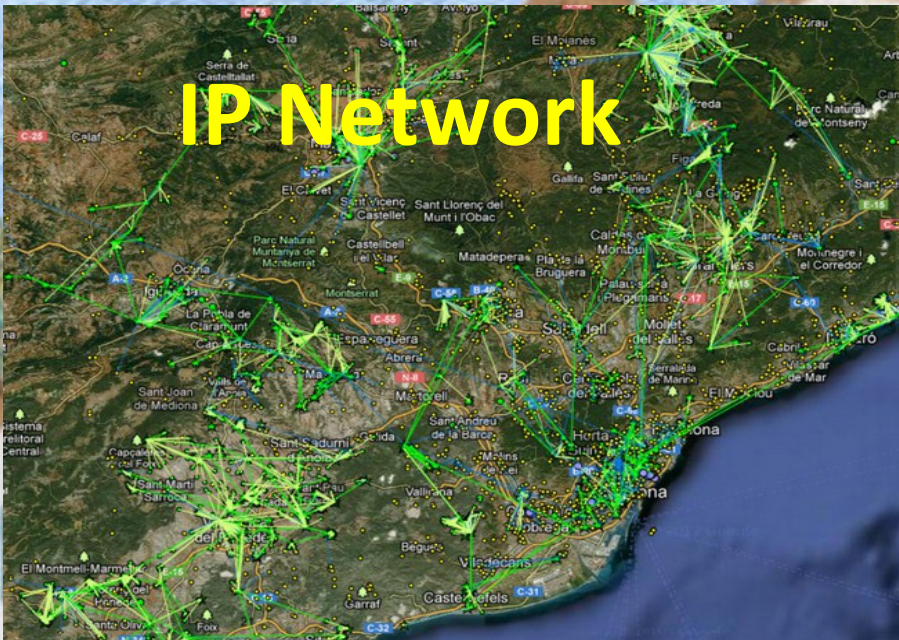
Collaboration



Heterogeneous Hardware



IP Network



ninux.org

guifi-net

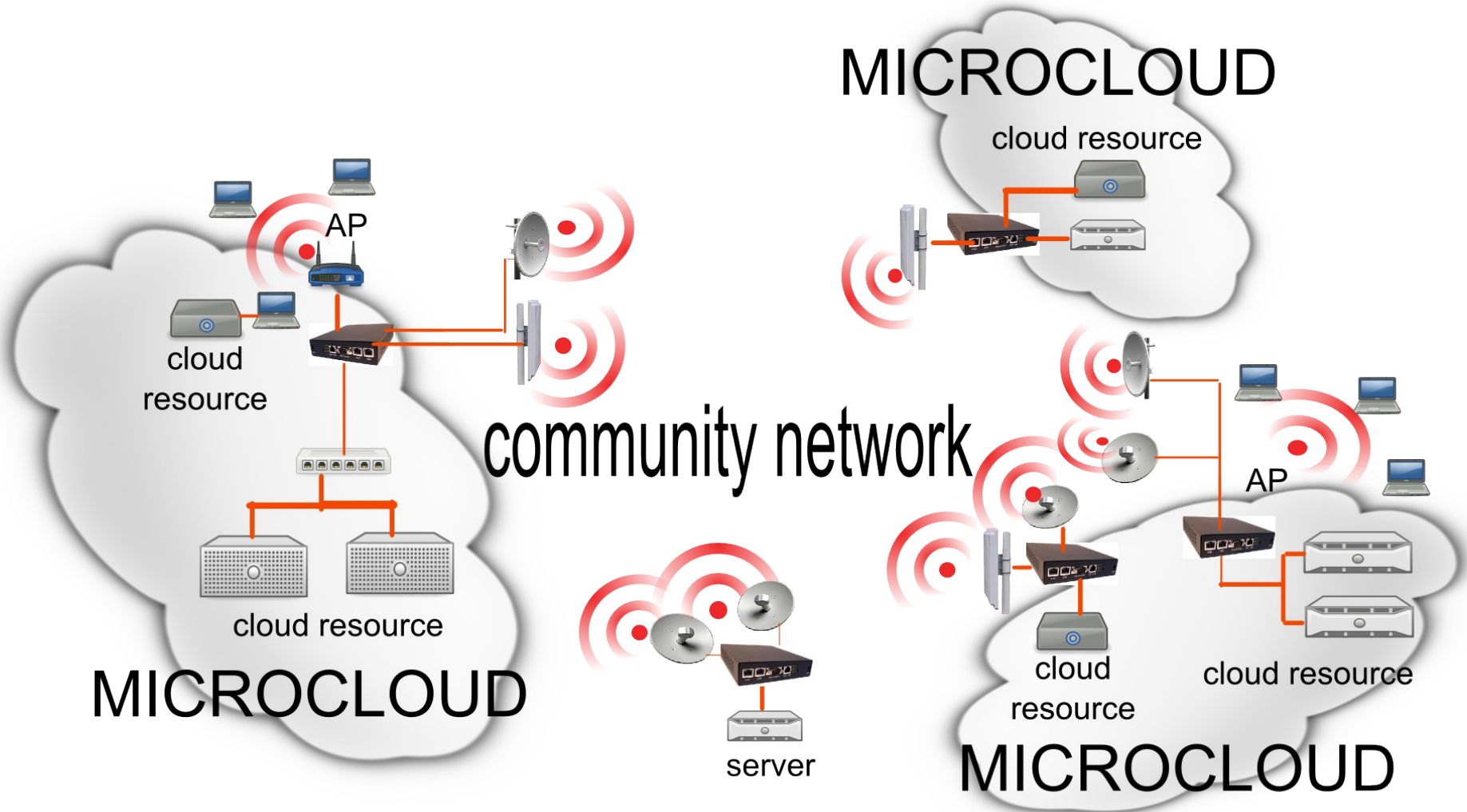
0xFF FUNKFEUER
FREE NET



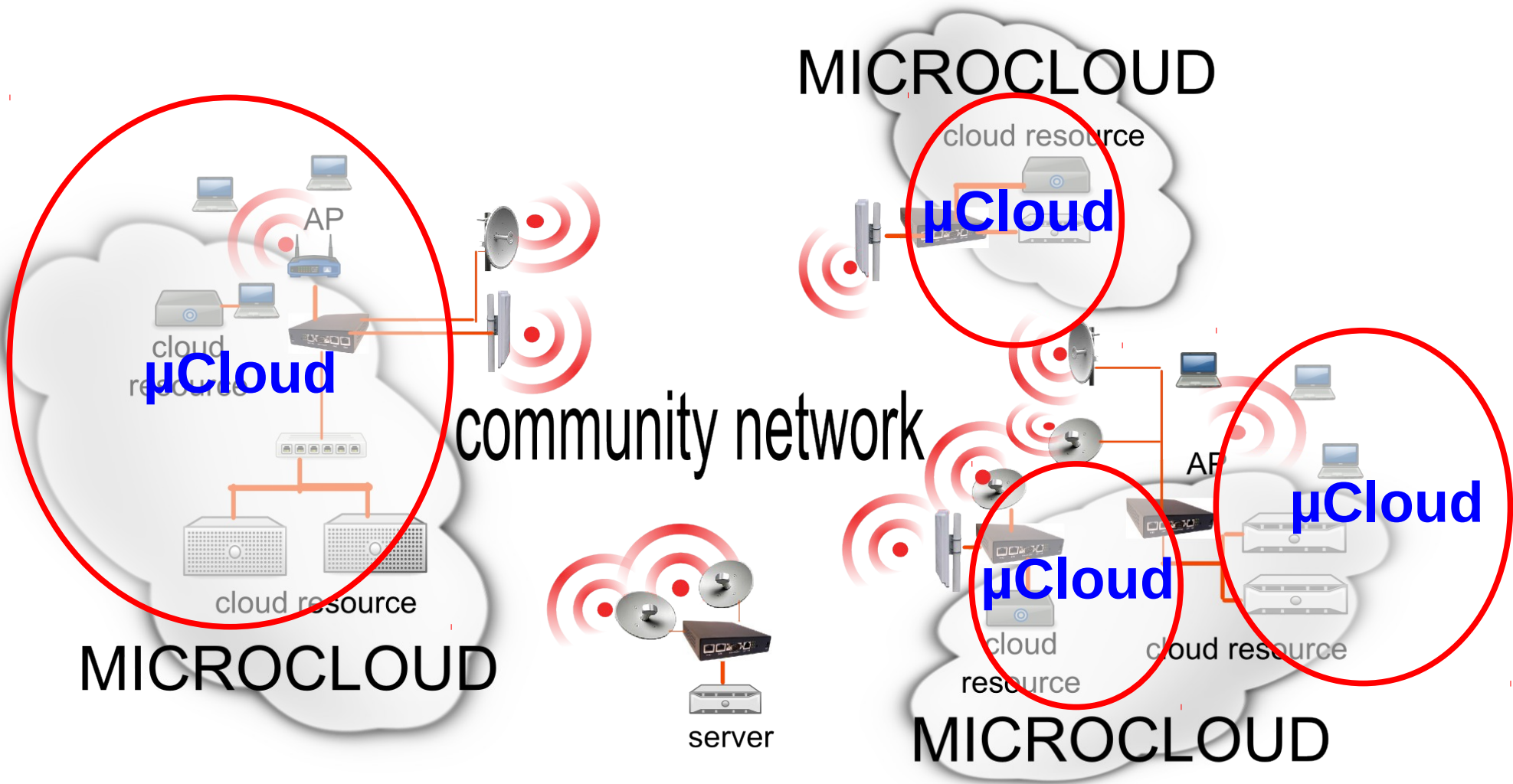
freifunk.net



Expected scenario



Microclouds



Several service providers

MICROCLOUD

- 3 Secure Personal Data Storage
- 4 Reliable Backup Service

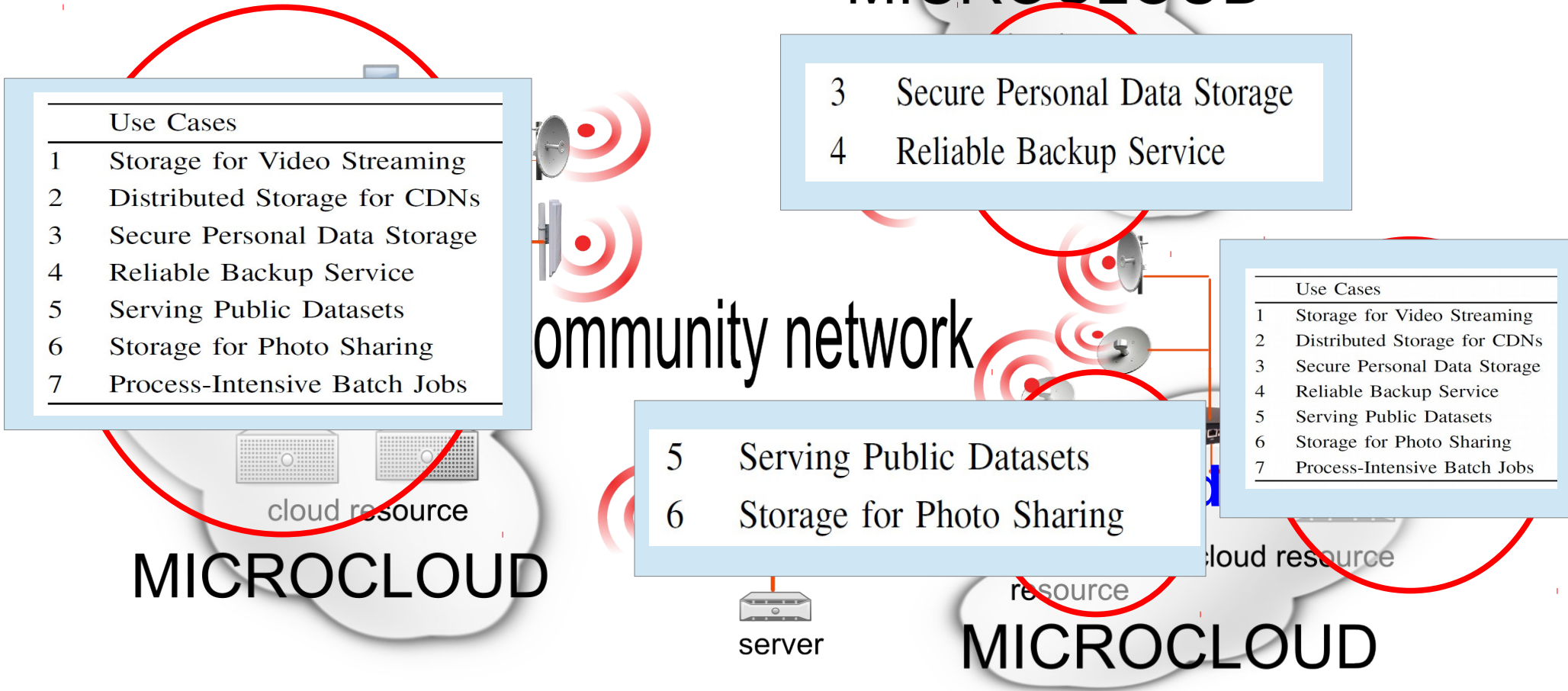
community network

- | Use Cases | |
|-----------|------------------------------|
| 1 | Storage for Video Streaming |
| 2 | Distributed Storage for CDNs |
| 3 | Secure Personal Data Storage |
| 4 | Reliable Backup Service |
| 5 | Serving Public Datasets |
| 6 | Storage for Photo Sharing |
| 7 | Process-Intensive Batch Jobs |

- 5 Serving Public Datasets
- 6 Storage for Photo Sharing

MICROCLOUD

MICROCLOUD



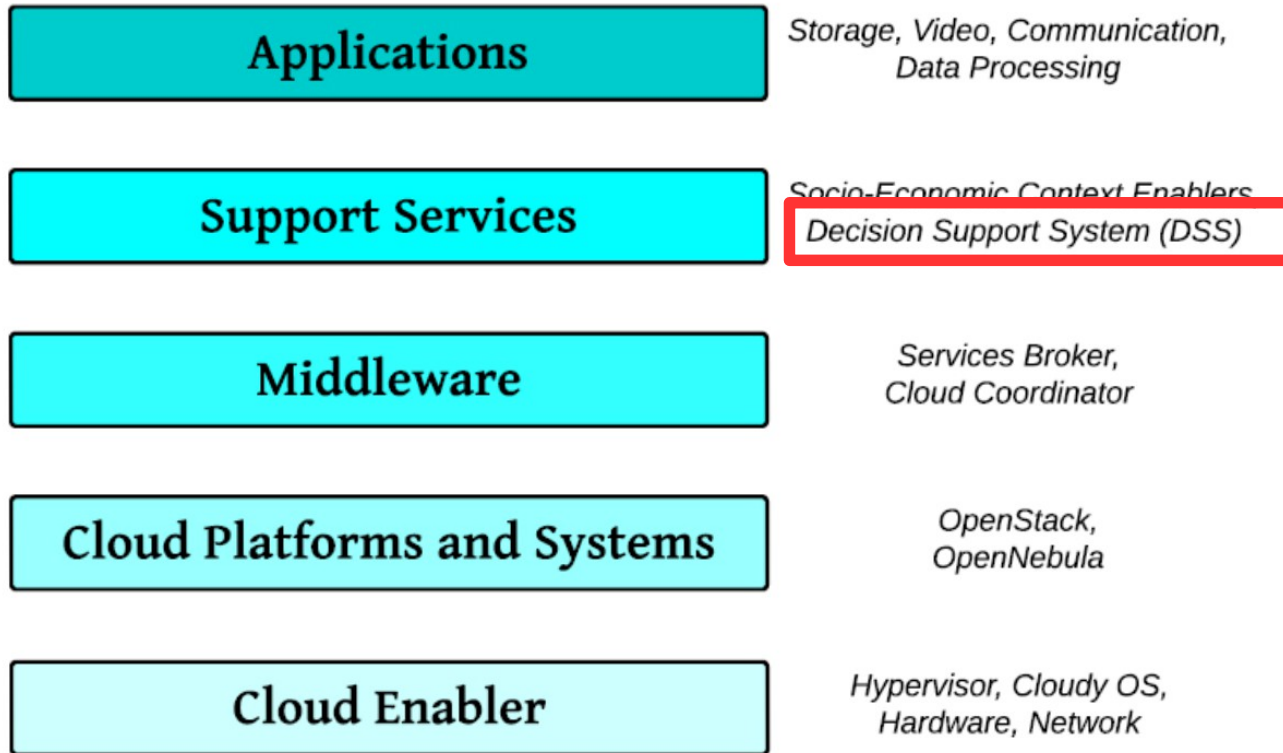
How can we help users to select among multiple cloud service providers?

We follow a practical approach:

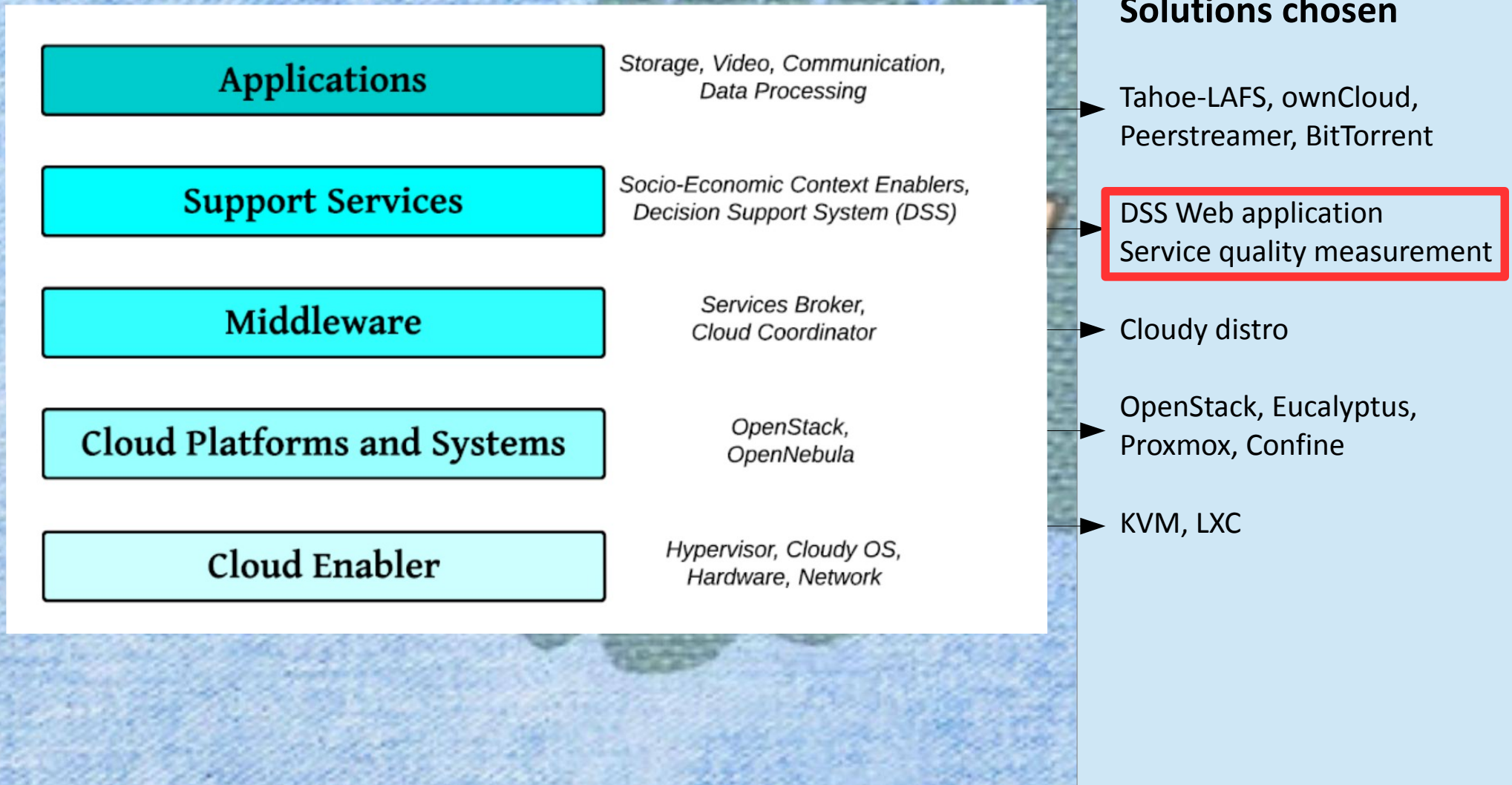
- architecture
- build the community network cloud
- deploy real services
- address challenges



Layered architecture



Solutions chosen



DSS Web application

The screenshot shows a web browser window with the URL `84.88.85.45:2490/app/index.html`. The application header features the MODA Clouds logo. The main content area is divided into two sections. On the left, there is a vertical list of seven metrics: Accountability, Agility, Assurance, Financial, Performance, Security And Privacy, and Usability. Each metric has a progress bar and a 'Details' link. The 'Agility' metric is currently set to 0. On the right, an 'Agility' configuration panel is open, showing several settings: 'Auto scaling' (with an 'Add' button), 'Site Infrastructure' (set to 'Yes'), 'Load Balancer' (set to 'available'), 'Minimum Contract Commitment' (set to '2000'), and 'Auto Scaling' (set to 'basic').

84.88.85.45:2490/app/index.html

MODA Clouds

Accountability [Details »](#)

Agility [Details »](#)

Assurance [Details »](#)

Financial [Details »](#)

Performance [Details »](#)

Security And Privacy [Details »](#)

Usability [Details »](#)

Agility

Auto scaling

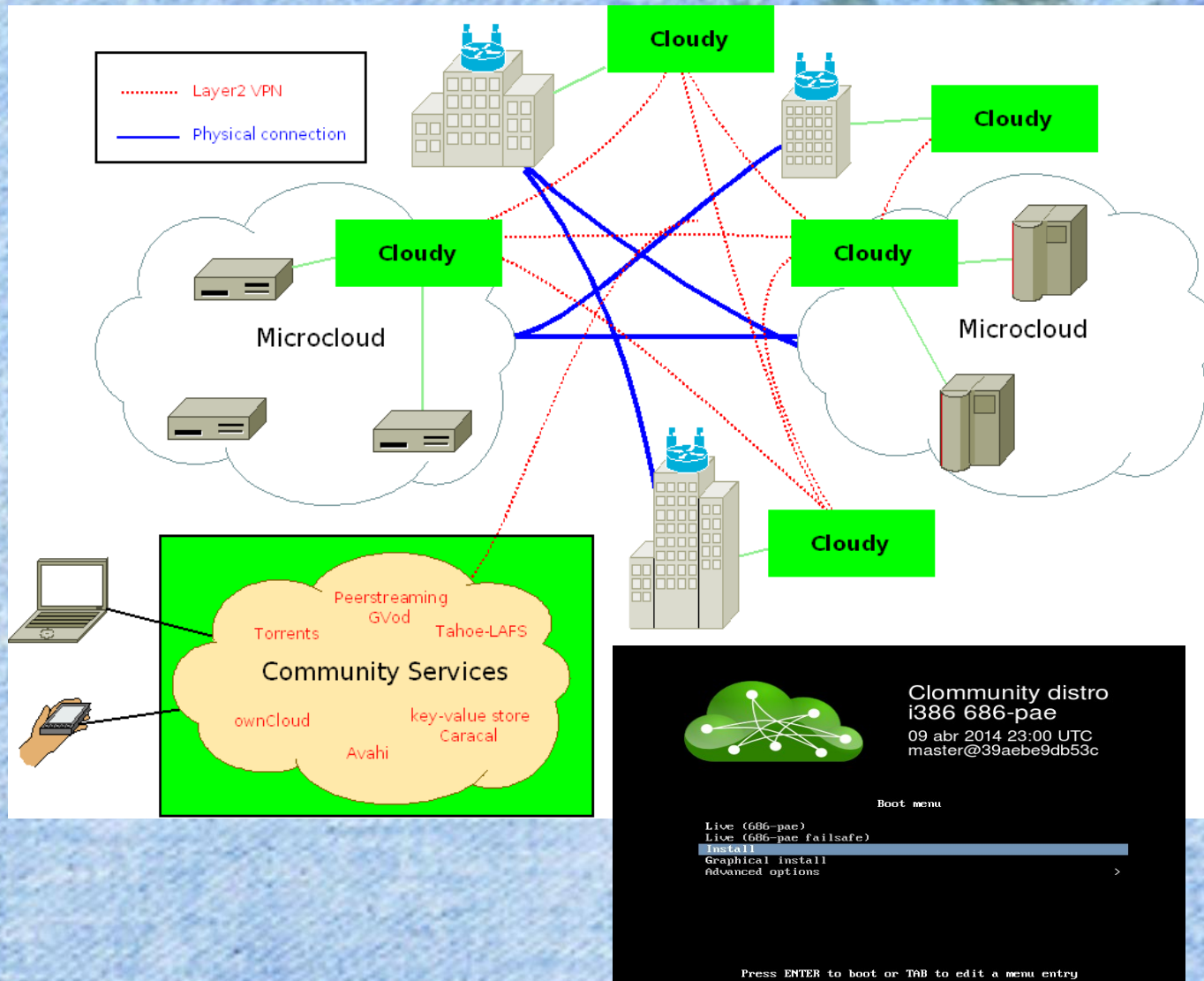
Site Infrastructure

Load Balancer

Minimum Contract Commitment

Auto Scaling

Cloudy distribution



Cloudy is:

Debian-based Linux distribution

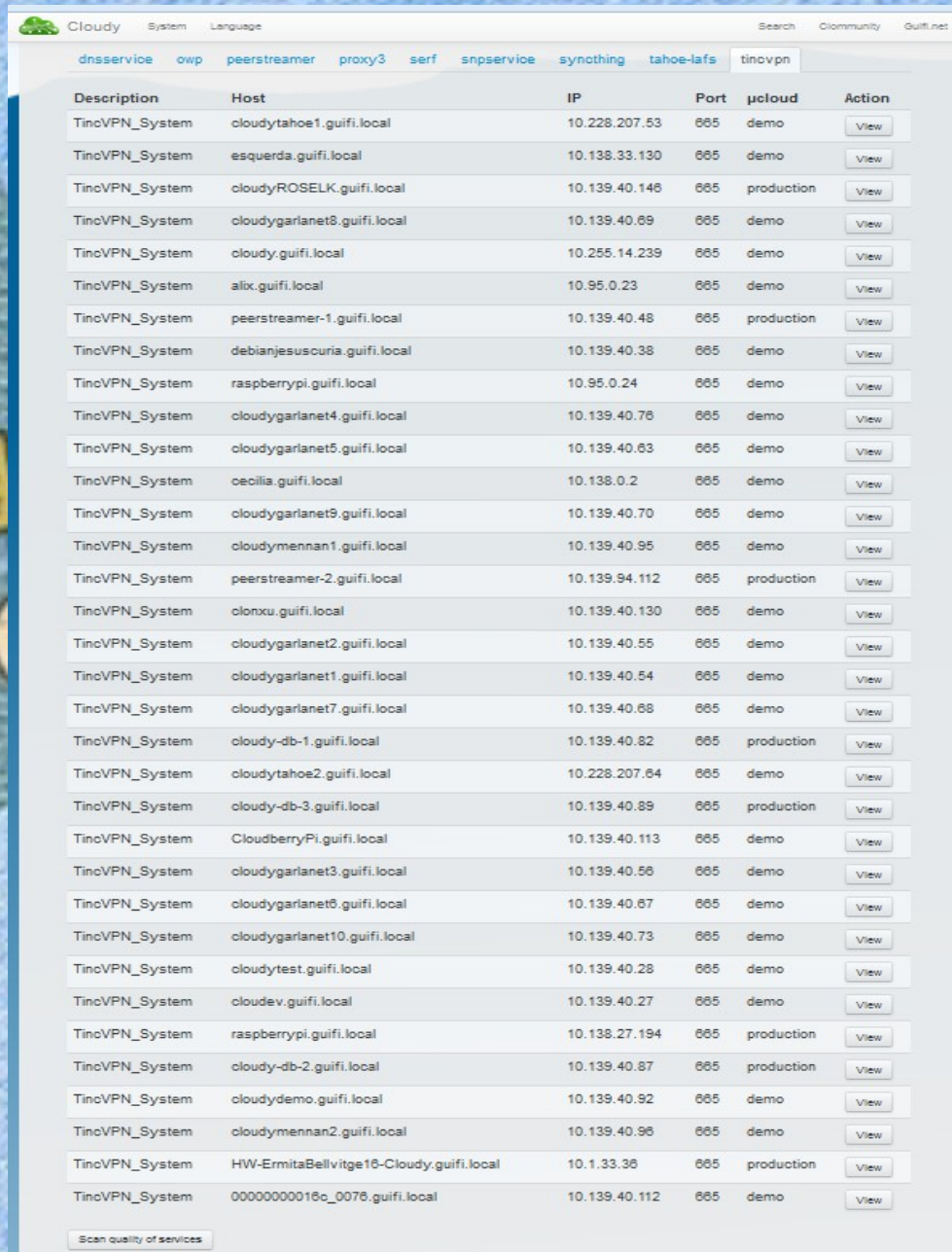
Contains cloud services (Tinc&Avahi) and applications (Tahoe-LAFS, Peerstreamer, VoIP)

Contains some CN-specific tools

To be installed in VM or "bare metal"

Cloudy download: <http://repo.clomcommunity-project.eu/images/>

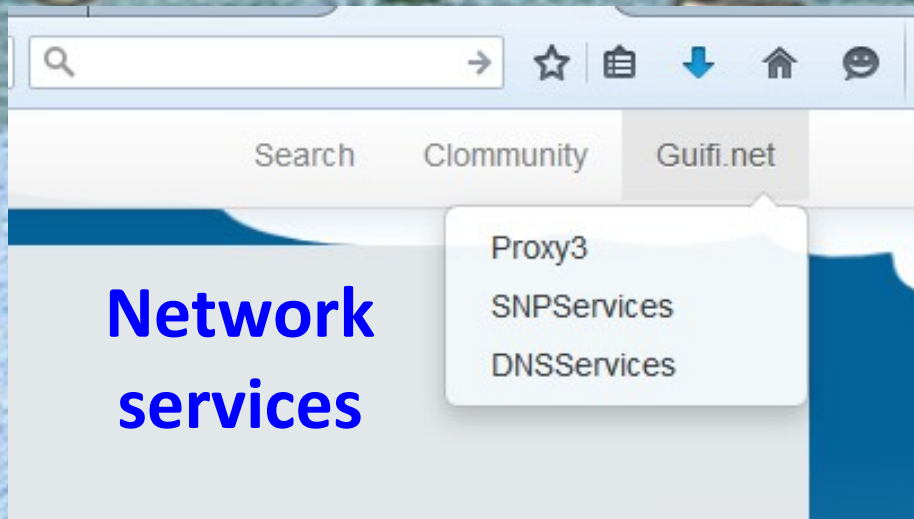
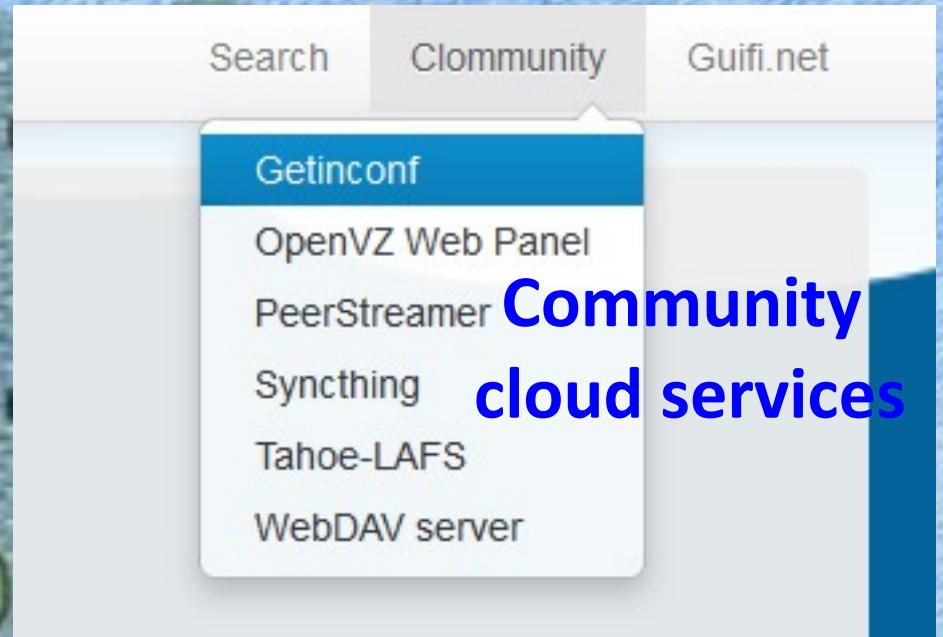
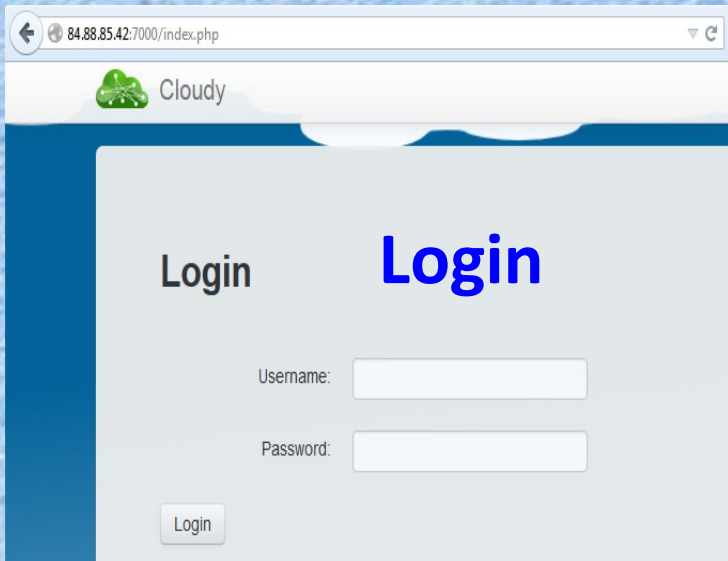
Community cloud nodes deployed



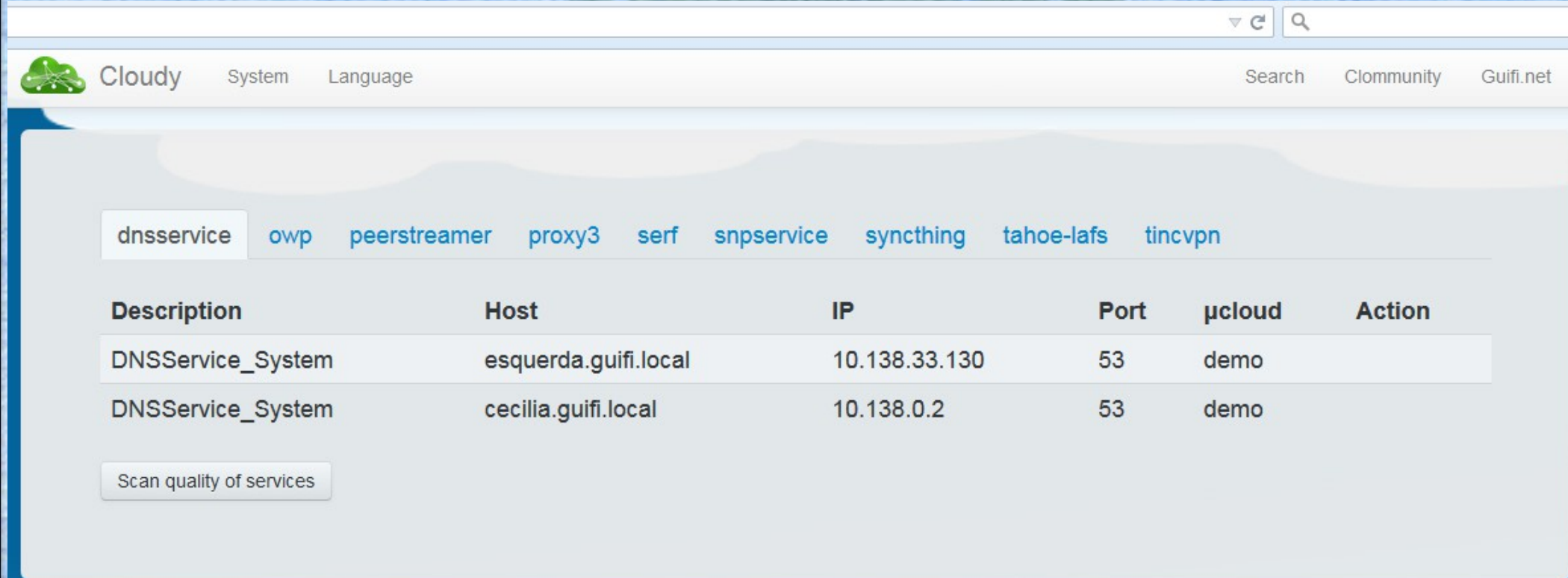
Description	Host	IP	Port	µcloud	Action
TincVPN_System	cloudytahoe1.guifi.local	10.228.207.53	665	demo	View
TincVPN_System	esquerda.guifi.local	10.138.33.130	665	demo	View
TincVPN_System	cloudyROSELK.guifi.local	10.139.40.146	665	production	View
TincVPN_System	cloudygarlanet8.guifi.local	10.139.40.69	665	demo	View
TincVPN_System	cloudy.guifi.local	10.255.14.239	665	demo	View
TincVPN_System	alix.guifi.local	10.95.0.23	665	demo	View
TincVPN_System	peerstreamer-1.guifi.local	10.139.40.48	665	production	View
TincVPN_System	debianjesuscuria.guifi.local	10.139.40.38	665	demo	View
TincVPN_System	raspberrypi.guifi.local	10.95.0.24	665	demo	View
TincVPN_System	cloudygarlanet4.guifi.local	10.139.40.76	665	demo	View
TincVPN_System	cloudygarlanet5.guifi.local	10.139.40.63	665	demo	View
TincVPN_System	cecilia.guifi.local	10.138.0.2	665	demo	View
TincVPN_System	cloudygarlanet9.guifi.local	10.139.40.70	665	demo	View
TincVPN_System	cloudymennan1.guifi.local	10.139.40.95	665	demo	View
TincVPN_System	peerstreamer-2.guifi.local	10.139.94.112	665	production	View
TincVPN_System	clonxu.guifi.local	10.139.40.130	665	demo	View
TincVPN_System	cloudygarlanet2.guifi.local	10.139.40.55	665	demo	View
TincVPN_System	cloudygarlanet1.guifi.local	10.139.40.54	665	demo	View
TincVPN_System	cloudygarlanet7.guifi.local	10.139.40.68	665	demo	View
TincVPN_System	cloudy-db-1.guifi.local	10.139.40.82	665	production	View
TincVPN_System	cloudytahoe2.guifi.local	10.228.207.64	665	demo	View
TincVPN_System	cloudy-db-3.guifi.local	10.139.40.89	665	production	View
TincVPN_System	CloudberryPi.guifi.local	10.139.40.113	665	demo	View
TincVPN_System	cloudygarlanet3.guifi.local	10.139.40.56	665	demo	View
TincVPN_System	cloudygarlanet6.guifi.local	10.139.40.67	665	demo	View
TincVPN_System	cloudygarlanet10.guifi.local	10.139.40.73	665	demo	View
TincVPN_System	cloudytest.guifi.local	10.139.40.28	665	demo	View
TincVPN_System	cloudev.guifi.local	10.139.40.27	665	demo	View
TincVPN_System	raspberrypi.guifi.local	10.138.27.194	665	production	View
TincVPN_System	cloudy-db-2.guifi.local	10.139.40.87	665	production	View
TincVPN_System	cloudydemo.guifi.local	10.139.40.92	665	demo	View
TincVPN_System	cloudymennan2.guifi.local	10.139.40.96	665	demo	View
TincVPN_System	HW-ErmitaBellvitge16-Cloudy.guifi.local	10.1.33.36	665	production	View
TincVPN_System	0000000016c_0076.guifi.local	10.139.40.112	665	demo	View

[Scan quality of services](#)

Community cloud services (Cloudy GUI)



9 different service types deployed

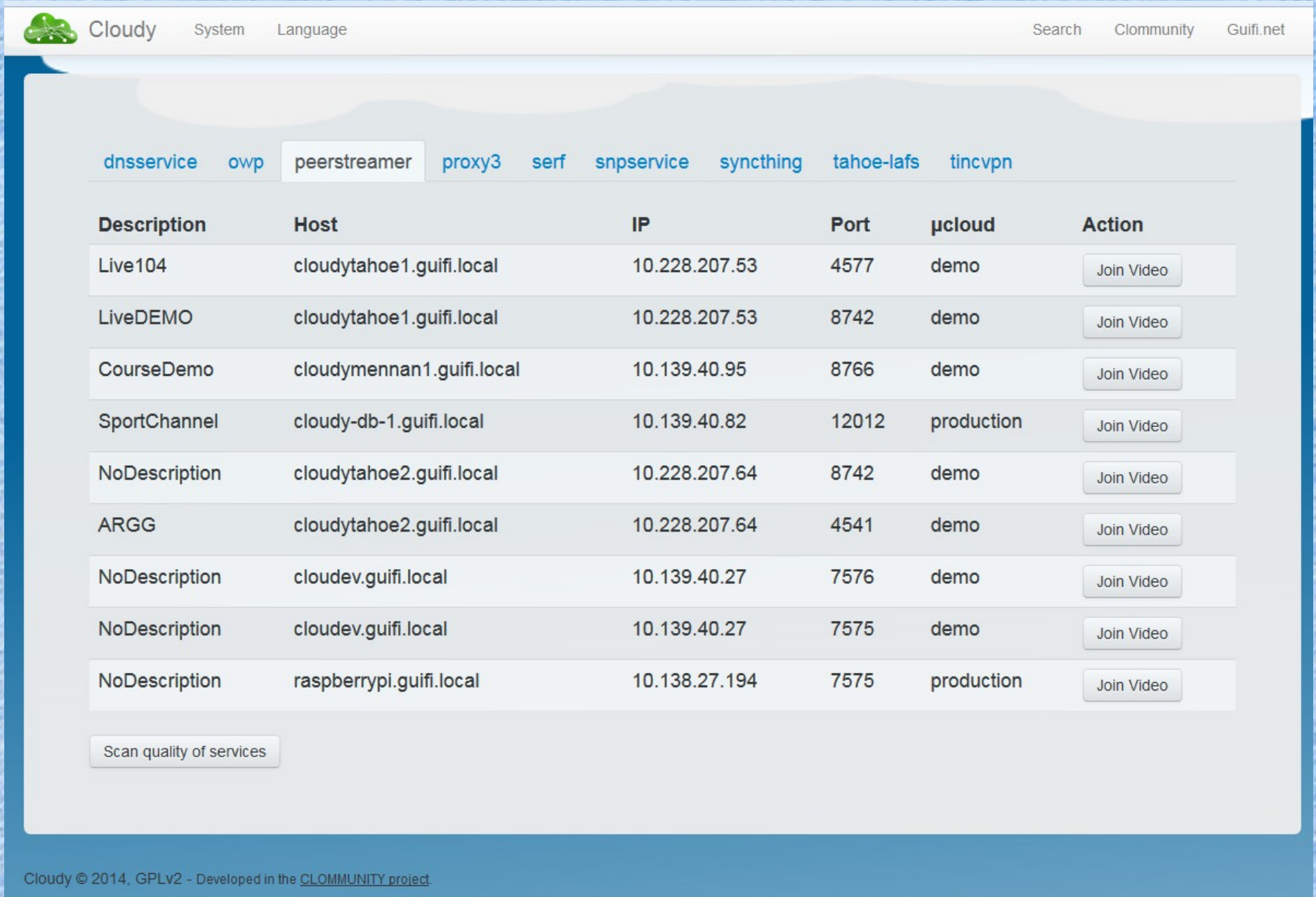


The screenshot shows the Cloudy web interface. At the top, there is a navigation bar with the Cloudy logo, 'System', and 'Language' links. On the right side of the navigation bar, there are links for 'Search', 'Clommunity', and 'Guifi.net'. Below the navigation bar, there is a horizontal menu with tabs for different service types: 'dnsservice', 'owp', 'peerstreamer', 'proxy3', 'serf', 'snpservice', 'syncting', 'tahoe-lafs', and 'tincvpn'. The 'dnsservice' tab is currently selected. Below the menu, there is a table with the following columns: 'Description', 'Host', 'IP', 'Port', 'µcloud', and 'Action'. The table contains two rows of data. Below the table, there is a button labeled 'Scan quality of services'.

Description	Host	IP	Port	µcloud	Action
DNSService_System	esquerda.guifi.local	10.138.33.130	53	demo	
DNSService_System	cecilia.guifi.local	10.138.0.2	53	demo	

Scan quality of services

Several providers for the streaming service



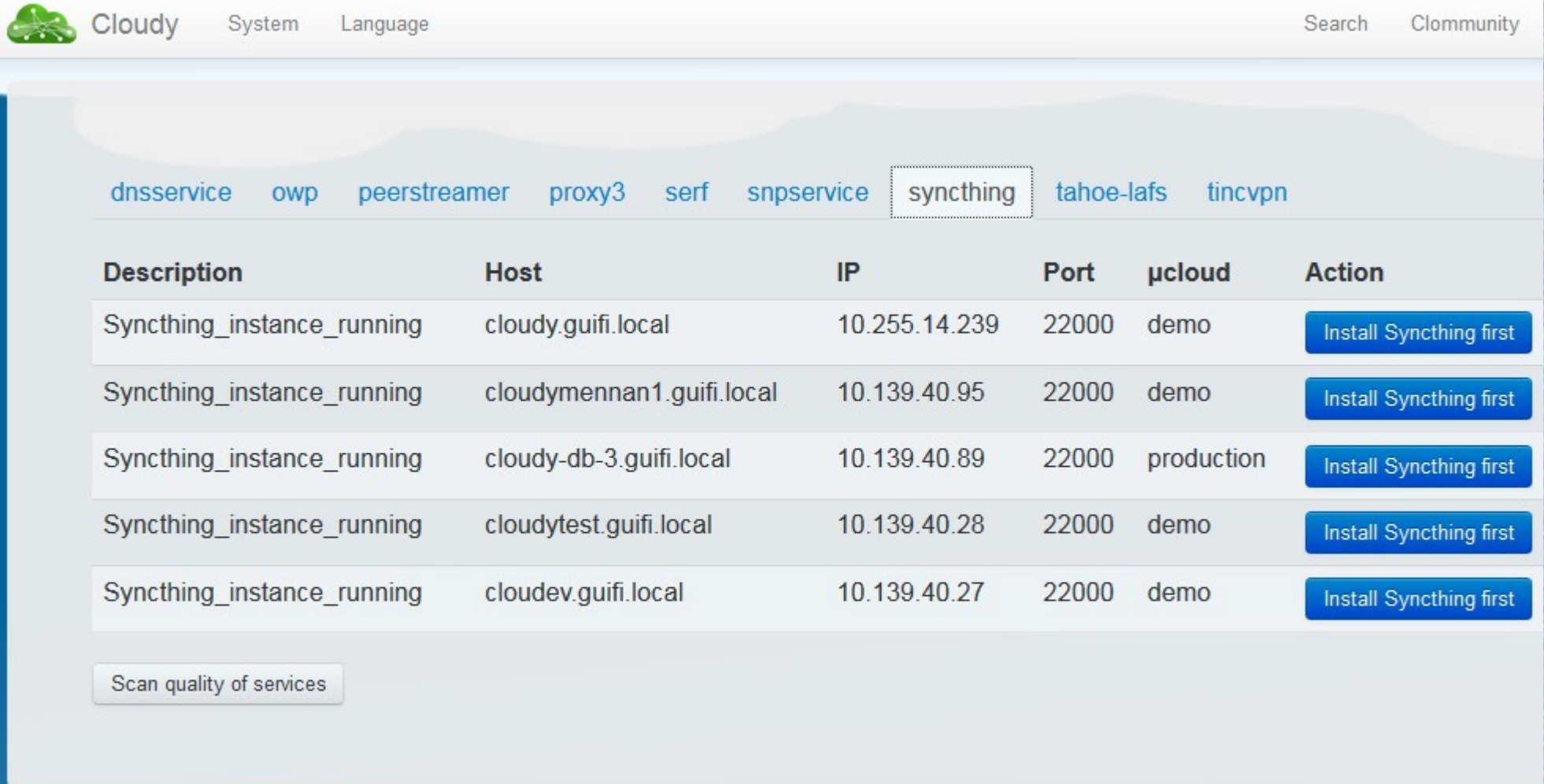
The screenshot shows the Cloudy web interface. At the top, there is a navigation bar with the Cloudy logo, "System", "Language", "Search", "Clommunity", and "Guifi.net". Below the navigation bar, there are several tabs: "dnsservice", "owp", "peerstreamer" (which is selected), "proxy3", "serf", "snpservice", "syncthing", "tahoe-lafs", and "tincvpn". The main content area displays a table of streaming service providers. The table has columns for Description, Host, IP, Port, µcloud, and Action. Each row represents a different service, with a "Join Video" button in the Action column. At the bottom of the table, there is a button labeled "Scan quality of services".

Description	Host	IP	Port	µcloud	Action
Live104	cloudytahoe1.guifi.local	10.228.207.53	4577	demo	Join Video
LiveDEMO	cloudytahoe1.guifi.local	10.228.207.53	8742	demo	Join Video
CourseDemo	cloudymennan1.guifi.local	10.139.40.95	8766	demo	Join Video
SportChannel	cloudy-db-1.guifi.local	10.139.40.82	12012	production	Join Video
NoDescription	cloudytahoe2.guifi.local	10.228.207.64	8742	demo	Join Video
ARGG	cloudytahoe2.guifi.local	10.228.207.64	4541	demo	Join Video
NoDescription	cloudev.guifi.local	10.139.40.27	7576	demo	Join Video
NoDescription	cloudev.guifi.local	10.139.40.27	7575	demo	Join Video
NoDescription	raspberrypi.guifi.local	10.138.27.194	7575	production	Join Video

[Scan quality of services](#)

Cloudy © 2014, GPLv2 - Developed in the [CLOMMUNITY project](#).

Several providers for the syncthing service



The screenshot shows the Cloudy web interface. At the top, there is a navigation bar with the Cloudy logo, "System", and "Language" links. On the right, there are "Search" and "Ccommunity" links. Below the navigation bar, there is a horizontal menu with several service names: dnsservice, owp, peerstreamer, proxy3, serf, snpservice, **syncthing** (highlighted with a dashed border), tahoe-lafs, and tincvpn. Below the menu is a table with the following columns: Description, Host, IP, Port, µcloud, and Action. The table contains five rows of Syncthing instances. At the bottom left of the table area, there is a button labeled "Scan quality of services".

Description	Host	IP	Port	µcloud	Action
Syncthing_instance_running	cloudy.guifi.local	10.255.14.239	22000	demo	Install Syncthing first
Syncthing_instance_running	cloudymennan1.guifi.local	10.139.40.95	22000	demo	Install Syncthing first
Syncthing_instance_running	cloudy-db-3.guifi.local	10.139.40.89	22000	production	Install Syncthing first
Syncthing_instance_running	cloudytest.guifi.local	10.139.40.28	22000	demo	Install Syncthing first
Syncthing_instance_running	cloudev.guifi.local	10.139.40.27	22000	demo	Install Syncthing first

[Scan quality of services](#)

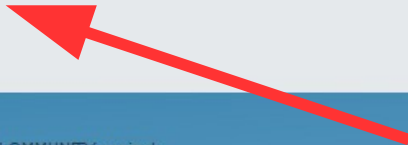
Scanning quality of the streaming service

Cloudy System Language Search Clomunity Guifi.net

dnsservice owp **peerstreamer** proxy3 serf snpservice syncting tahoe-lafs tincvpn

Description	Host	IP	Port	µcloud	Action
CourseDemo	cloudymennan1.guifi.local	10.139.40.95	8766	demo	Join Video
SportChannel	cloudy-db-1.guifi.local	10.139.40.82	12012	production	Join Video
NoDescription	cloudytahoe2.guifi.local	10.228.207.64	8742	demo	Join Video
ARGG	cloudytahoe2.guifi.local	10.228.207.64	4541	demo	Join Video
NoDescription	cloudev.guifi.local	10.139.40.27	7576	demo	Join Video
NoDescription	cloudev.guifi.local	10.139.40.27	7575	demo	Join Video
NoDescription	raspberrypi.guifi.local	10.138.27.194	7575	production	Join Video
Live104	cloudytahoe1.guifi.local	10.228.207.53	4577	demo	Join Video
LiveDEMO	cloudytahoe1.guifi.local	10.228.207.53	8742	demo	Join Video

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Scanning quality of the syncthing service

Cloudy System Language Search Clomunity Guifi.net

dnsservice owp peerstreamer proxy3 serf snpservice **syncthing** tahoe-lafs tincvpn

Description	Host	IP	Port	µcloud	Action
Syncthing_instance_running	cloudymennan1.guifi.local	10.139.40.95	22000	demo	Install Syncthing first
Syncthing_instance_running	cloudy-db-3.guifi.local	10.139.40.89	22000	production	Install Syncthing first
Syncthing_instance_running	cloudytest.guifi.local	10.139.40.28	22000	demo	Install Syncthing first
Syncthing_instance_running	cloudev.guifi.local	10.139.40.27	22000	demo	Install Syncthing first
Syncthing_instance_running	cloudy.guifi.local	10.255.14.239	22000	demo	Install Syncthing first

Scan quality of services

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Lessons learnt

Service quality for each user is **location-dependent**.

Centralized solution needs to be extended with network and infrastructure measurements to be efficient (or using decentralized approach)

For each service, **different service quality metrics** should be applied.

Limited expressiveness of technical service quality metrics for socio-technical system.

Conclusions and Future Work

Community cloud deployment was shown, with several cloud services, multiple service providers.

Service selection supported, using service quality estimation.

Next step should involve **real users** to participate, understand **non-technical metrics** for service selection.

Permanent cloud services maintained by users.

Ultimately, create a community cloud service **ecosystem**.



A Community networking Cloud in a box

CLOMMUNITY

clommunity-project.eu

Thank you

Felix Freitag
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