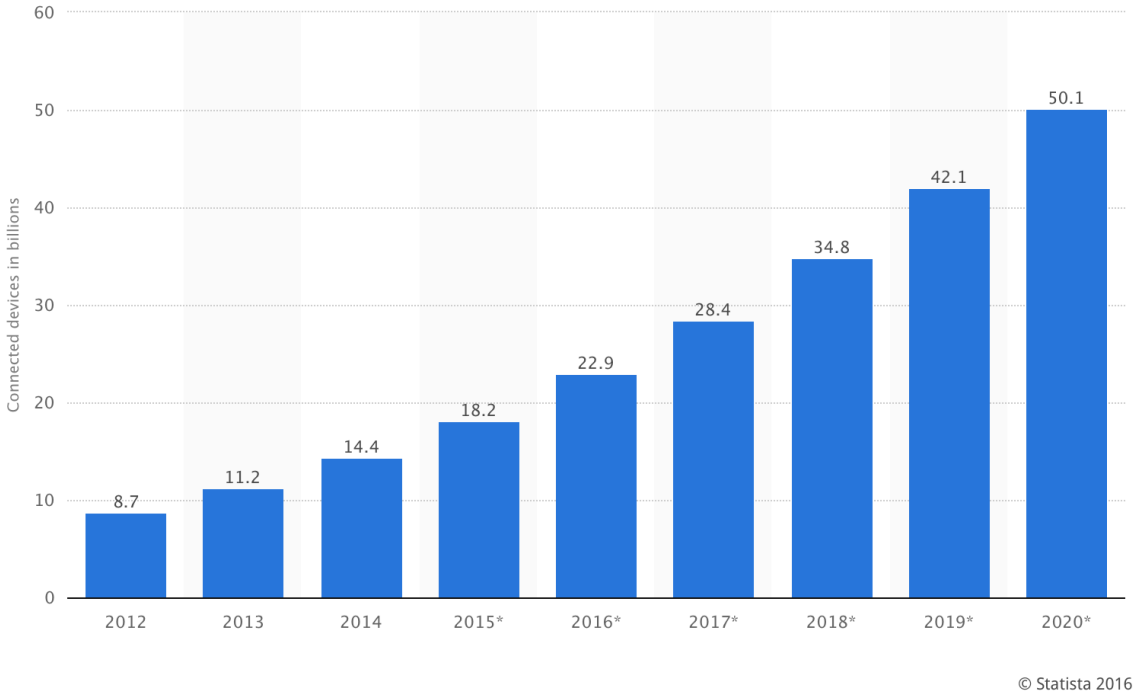
NETLAB
NETWORKED SYSTEMS RESEARCH LABORATORY

Roaming vNFs at the Network Edge using Glasgow Network Functions

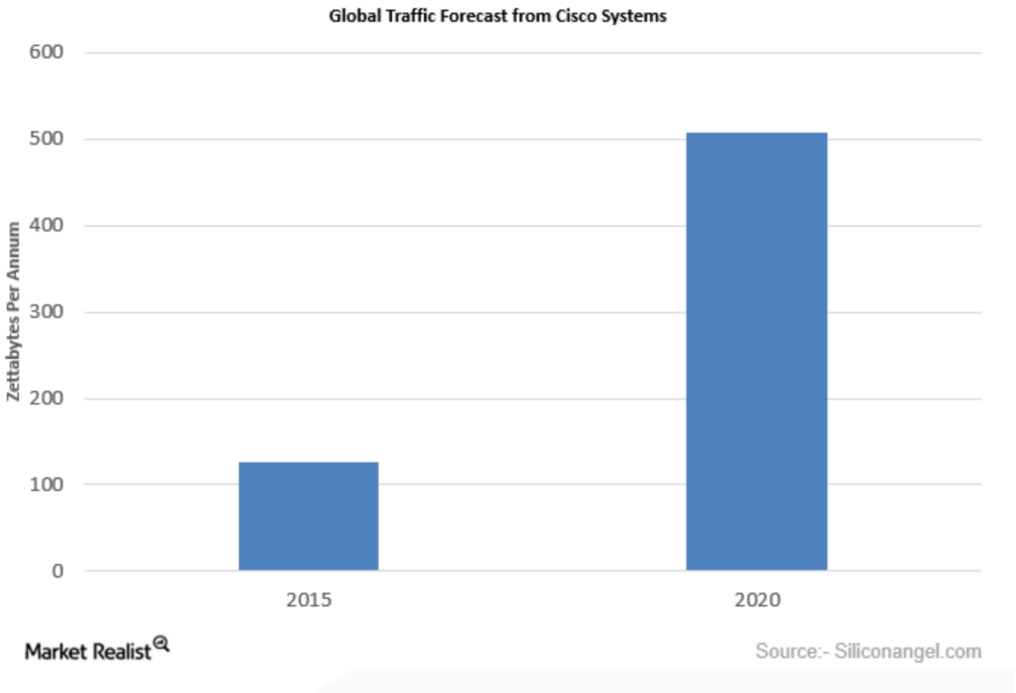
Richard Cziva - University of Glasgow, United Kingdom
Joint work with Simon Jouet and Dimitrios Pezaros
Richard.Cziva@glasgow.ac.uk
Multi-Service Networks Workshop, Abingdon, UK 08/06/2016

Next Generation Clients

Increase of connected devices



Growth of network traffic

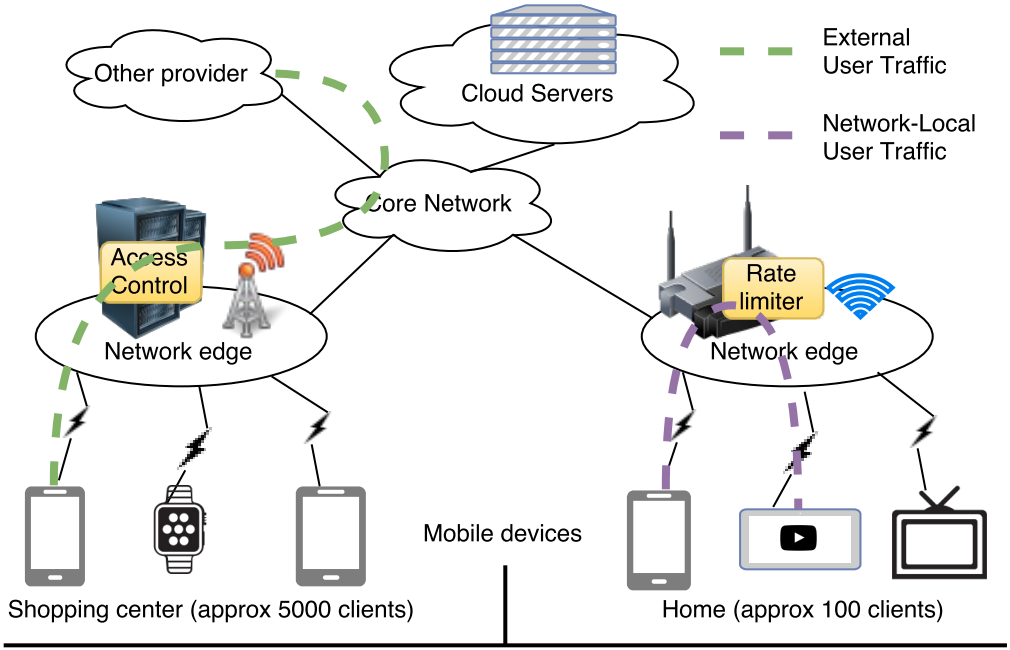


Cisco: *"growth is due to mobile devices and wearables"*

Requirements for the Next Generation Network

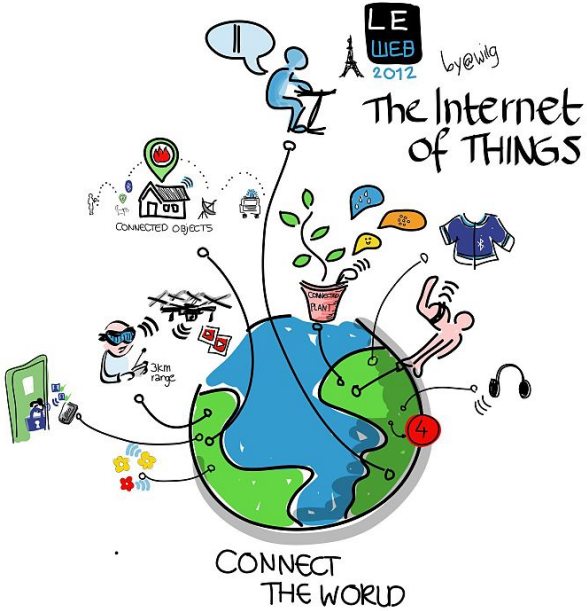
- Personalized services
  - security, QoS, parental control, rate limiter …
  - reconfigured quickly
  - lower latency / higher throughput
  - Support for new type of services
    - Machine-to-Machine communication
    - IoT
- Supporting mobility
  - Location agnostic services

Network Edge vNFs



Internet of Things (IoT)

- Physical objects
  - Devices
  - Vehicles
  - Software
  - Sensors

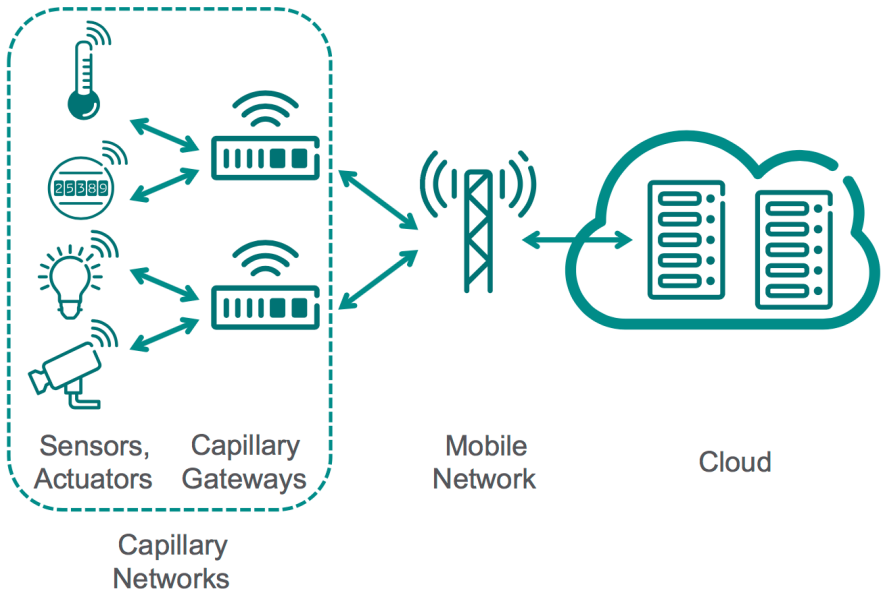


- Connected using a network

IoT support at CSPs

- CSPs are transforming to support multiple IoT applications:
  - Connected cars
  - Surveillance systems
  - Smart cities
  - Smart metering
  - Environment sensors
  - …

IoT architecture

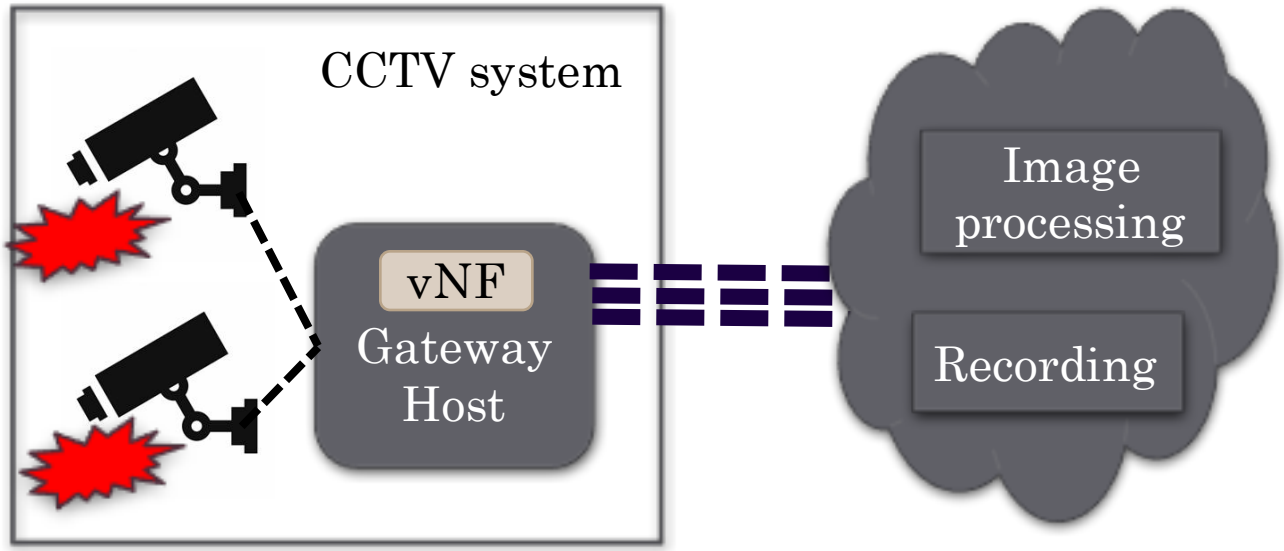


Ref.: *Capillary Networks – Bridging the Cellular and IoT Worlds* - Oscar Novo, Nicklas Beijar, Mert Ocak, Jimmy Kjallman, Miika Komu, Tero Kauppinen Ericsson Research

Challenges

- Next generation applications have diverse network requirements
- The network requirements are constantly changing in an unpredictable fashion
- Network reconfiguration needs to be fast (and frequent)

Example: Change in network requirements



Goal: Increase bandwidth (video quality) in case of event of interest

The other question is: What type of virtual Network Functions fit the Network Edge architecture?

vNFs at the Network Edge

- vNFs need to run on wide variety of devices
  - Most devices or capillary gateways are low cost (e.g., single chip computers)
- vNFs need to support fast lifecycle mgmt.
  - A vNF should be started in few seconds
- The virtualization overhead should be minimal
- vNFs should be as simple as possible

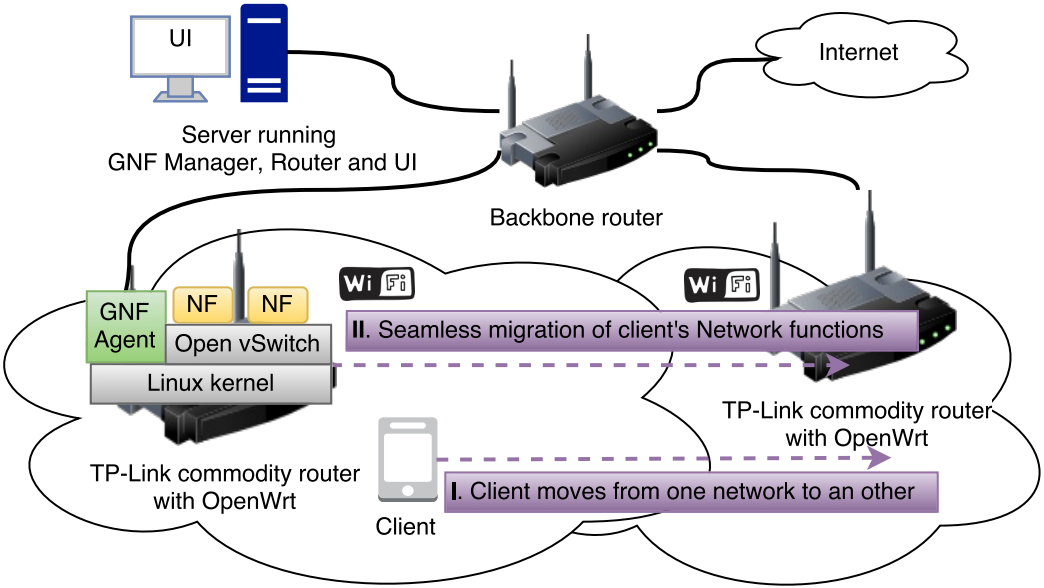
Glasgow Network Functions

- Glasgow Network Functions (GNF)
  - Research and development project from Netlab
- Main characteristics of GNF are:
  - Minimal footprint
  - Container-based
  - Supports function roaming
  - Transparent traffic handling

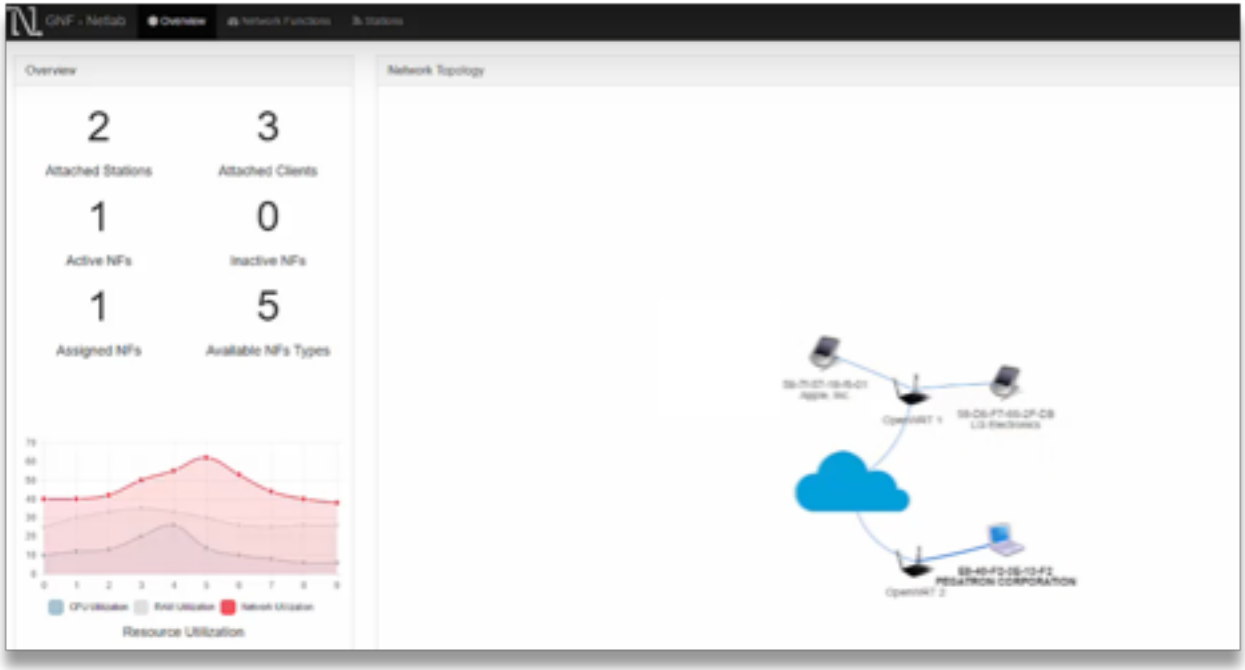
Containers

- Lightweight “virtualization”
  - Shared kernel on the host
- Fast create/start/stop/delete
- High performance
  - Small delay, high throughput, low memory usage
- Reusable / shareable
- Traditional software environment
- Micro-services architecture

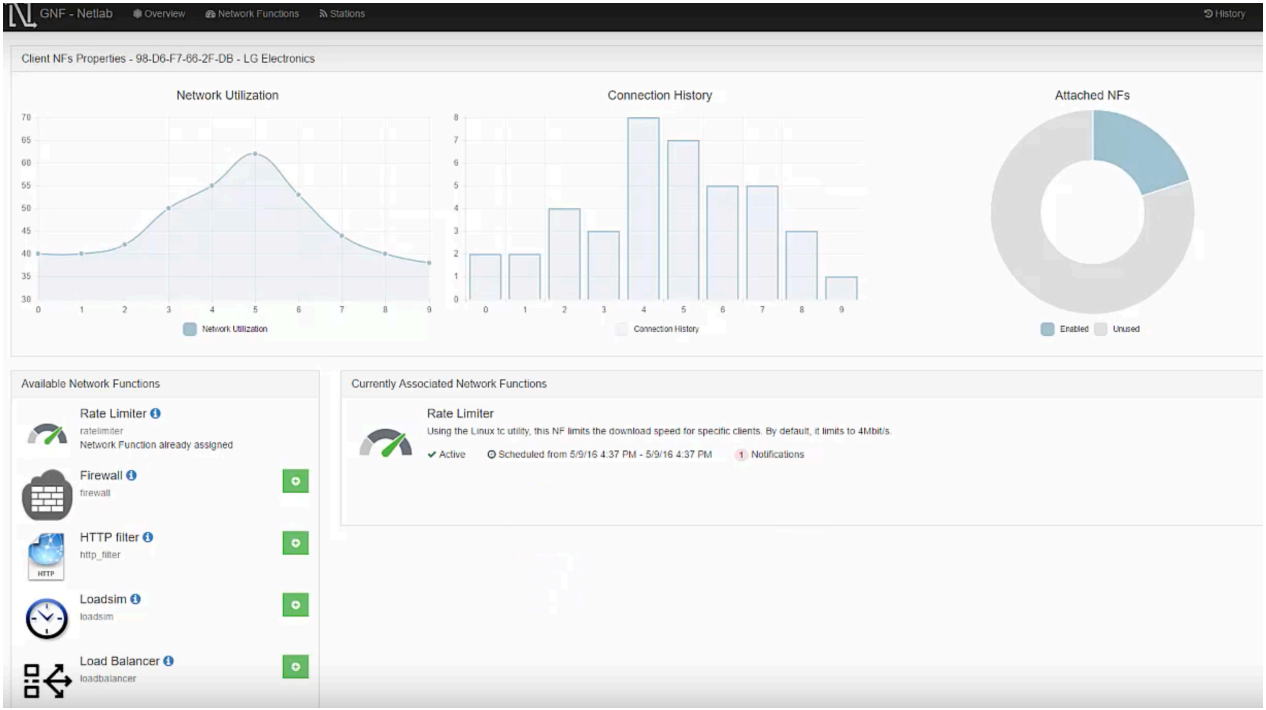
Mobility use case: Supporting vNF roaming



GNF User Interface



GNF User Interface



GNF components (in brief)

- Router
  - Runs on top the Open Daylight Controller
  - Creates and inserts the rules to apply a specific forwarding policy
- Manager
  - Provides a REST API to the system
- Agent
  - Daemon running on the GNF hosts
  - Manages (starts and stops) containers and local forwarding
  - Provides host/container status information to the Manager
- UI
  - Talks to the Manager
  - Adds/removes network functions

Step-by-step

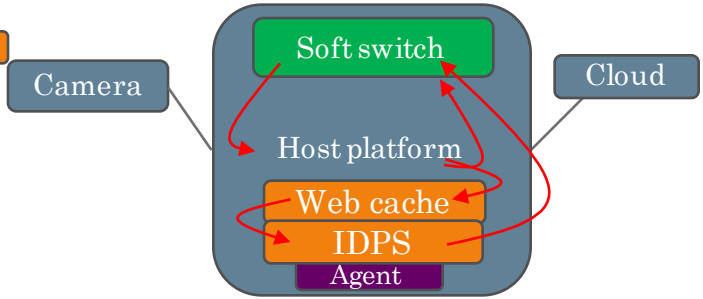
- Traffic from Camera to Cloud
- Need a new Rate Limiter placed between them?
  - Controller finds a suitable host platform
  - Pulls the rate limiter
  - Spawns an instance

Rate Limiter

- Apply the policy
  - Reroute the traffic matching:
    - FROM Camera
    - TO Cloud

OF rule

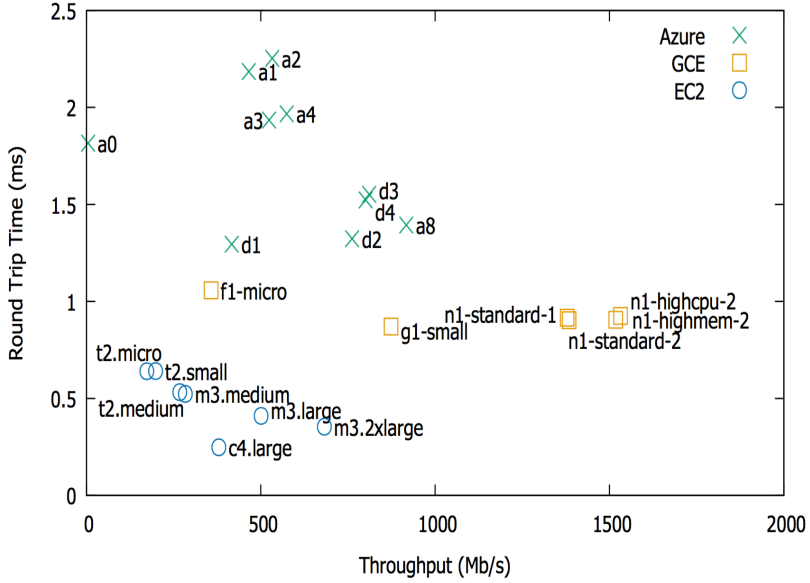
- Chaining containers
  - Web Cache
  - IDPS



Example GNF vNFs

- Examples vNFs available on our website: https://netlab.dcs.gla.ac.uk/projects/glasgow-network-functions
  - Firewall
  - Parental control
  - HTTP proxy
  - Network measurement functions
  - Introducing delay
  - Rate limiter
  - DNS load balancer
  - SNORT

GNF in public clouds



More in: *GNFC: Towards Network Function Cloudification.*
Richard Cziva, Simon Jouet and Dimitrios P Pezaros, IEEE NFV-SDN`15.

GNF runs in public clouds

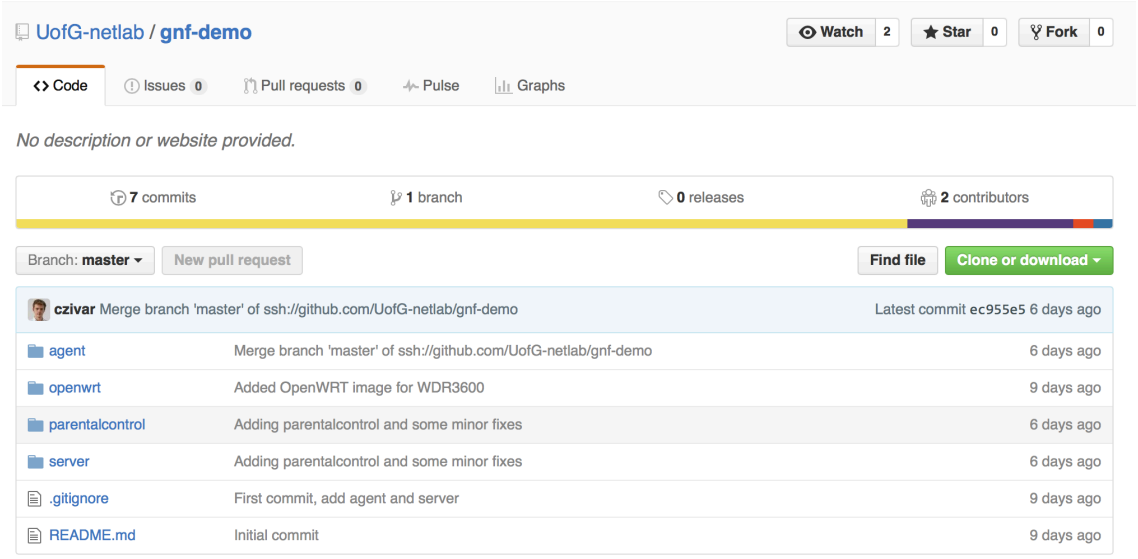
- As GNF does not require any virtualization or special kernel, it runs on public clouds using generic VMs
- We have evaluated three public cloud providers and used various instance types for host VMs for vNFs
- Results show: **there is a significant difference in RTT and throughput between *instance types* and *providers***

Google
Cloud Platform

Microsoft
Azure

Published in: *GNFC: Towards Network Function Cloudification.*
Richard Cziva, Simon Jouet and Dimitrios P Pezaros, IEEE NFV-SDN`15.

Thank you!



UofG-netlab / **gnf-demo**

Watch 2 | Star 0 | Fork 0

Code | Issues 0 | Pull requests 0 | Pulse | Graphs

No description or website provided.

7 commits | **1** branch | **0** releases | **2** contributors

Branch: **master** | New pull request | Find file | Clone or download

czivar Merge branch 'master' of ssh://github.com/UofG-netlab/gnf-demo — Latest commit `ec955e5` 6 days ago

agent	Merge branch 'master' of ssh://github.com/UofG-netlab/gnf-demo	6 days ago
openwrt	Added OpenWRT image for WDR3600	9 days ago
parentalcontrol	Adding parentalcontrol and some minor fixes	6 days ago
server	Adding parentalcontrol and some minor fixes	6 days ago
.gitignore	First commit, add agent and server	9 days ago
README.md	Initial commit	9 days ago