

4th ACM Conference on Information-Centric Networking (ICN 2017)

Grafting opportunistic communications onto ICN:
the UMOBILE project

The UMOBILE Lab

Angela D'Angelo

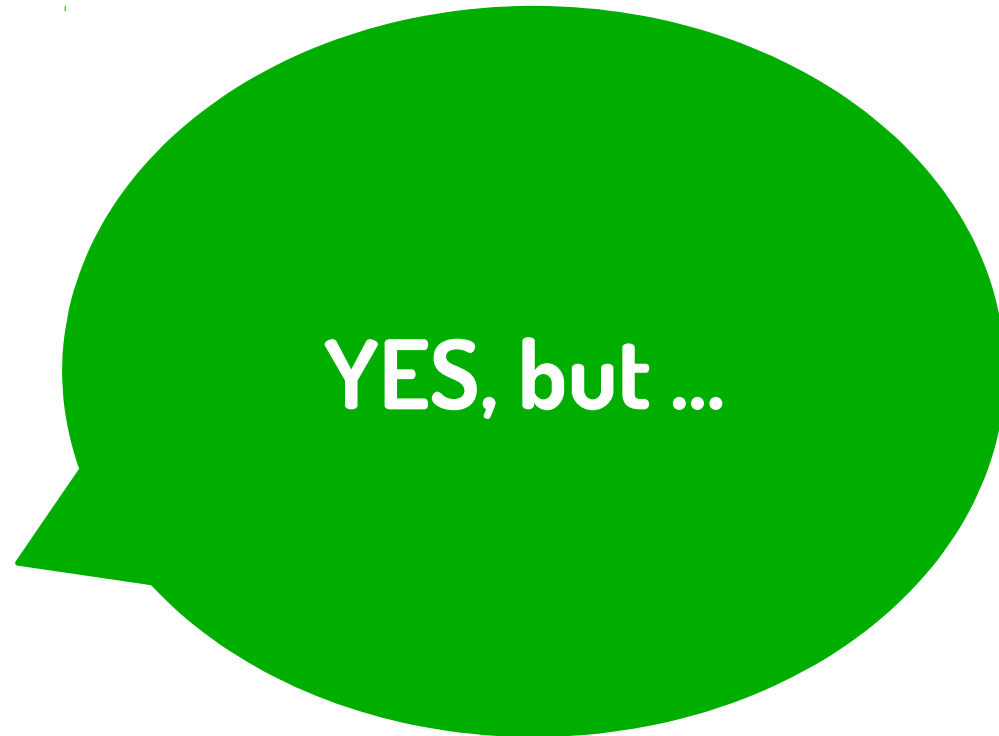
Gianmichele Russi

September 26th, 2017

ACM ICN 2017, Berlin



**YET
ANOTHER
NETWORKING
TESTBED?**



Let's start from the beginning: the idea was...



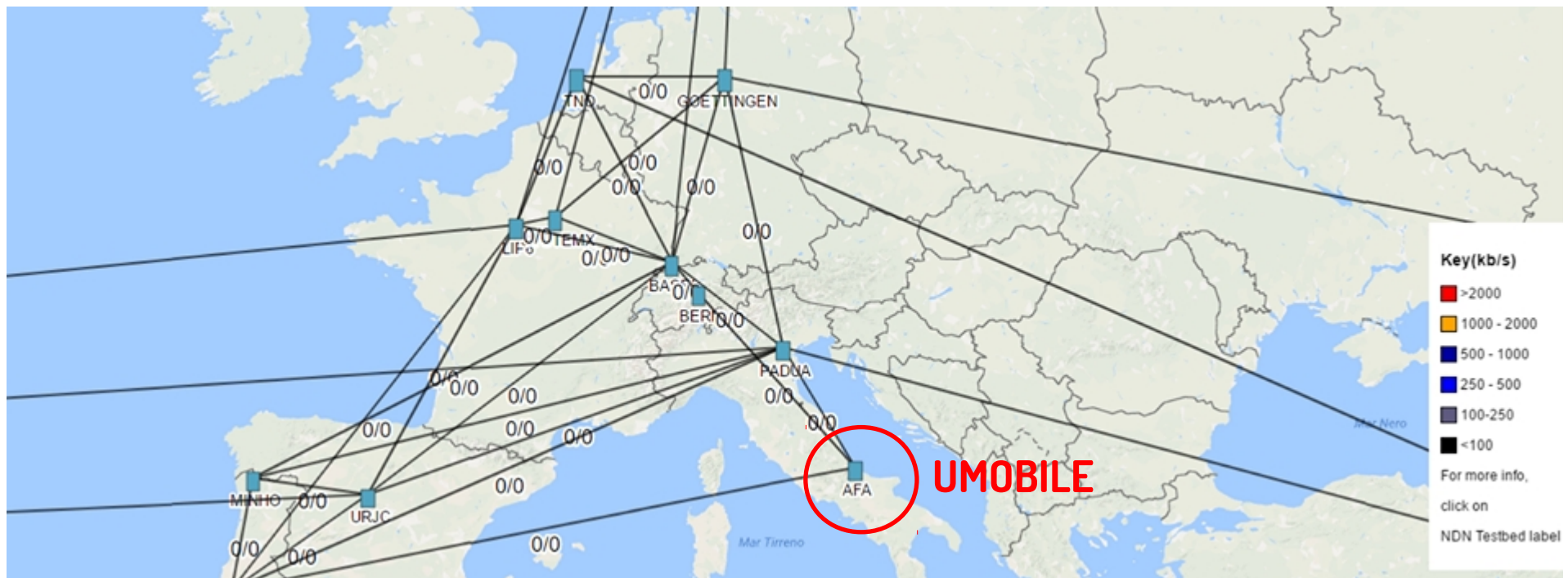
The UMOBILE lab help the consortium to practically **demonstrate the overall platform of the project.**

It will be a **prototype implementation of UMOBILE, an overall technological validation and a working proof-of-concept.**

We needed a testbed implementing Wi-Fi and Wi-Fi Direct

Let's join other communities

- **Name Data Networking Testbed:** The UMOBILE Lab is a node of the NDN Testbed, that include software routers at several participating institutions, application host nodes, and other devices.



Let's join other communities

- **Future Internet Research and Experimentation Testbed: The UMOBILE Lab is joining the FIRE Federation (Fed4Fire+)**



[FED4FIRE+](#)

[OPEN CALLS](#)

[RUN YOUR EXPERIMENT](#)

[F4F+ FACILITIES](#)

[NEWS](#)

[FEC & EVENTS](#)

[CONTACT](#)



WELCOME TO

FED4FIRE+

THE LARGEST FEDERATION
OF TESTBEDS IN EUROPE

Open the UMOBILE Lab to the scientific community

We are working to **open the UMOBILE lab to the scientific community**, in the next months. Researchers will be able to:

- to perform their own experiments
- to implement and test scenarios with increasing complexity
- to improve the performance of the operational procedures
- to test the limits of the system and of its operational capabilities.

Which kind of experiments can I perform?

LET'S INTRODUCE THE LAB

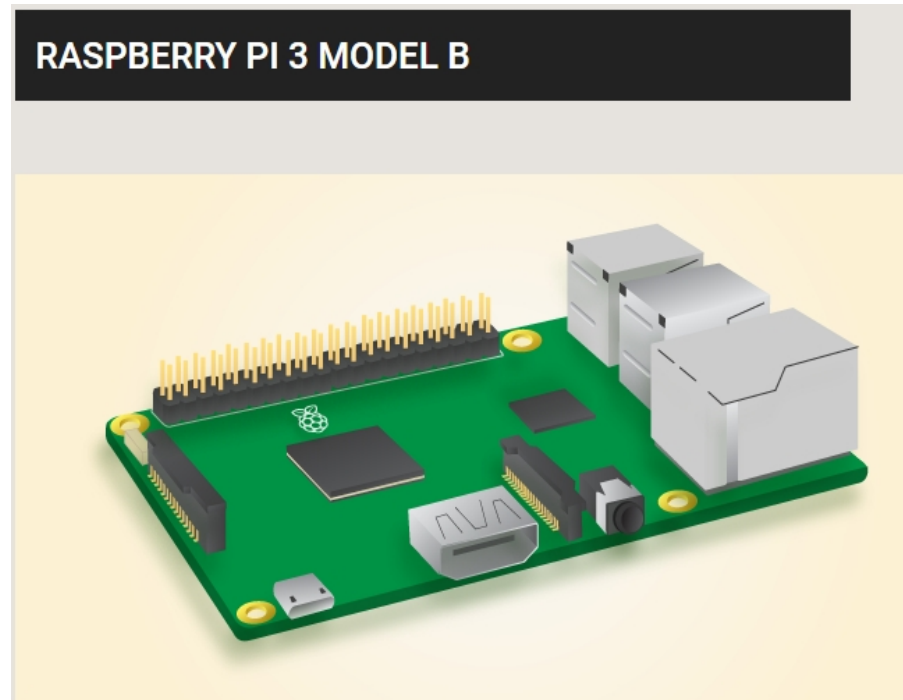


LET'S INTRODUCE THE LAB

- The lab can be remotely accessed by the users through a **VPN connection**
 - Human users and their devices are replaced by **Android and Linux black-boxes**, and **Android smartphones**.
 - Black-boxes will receive commands from a **test robot**. The test robot is connected to each black-box through the **test network**.
-

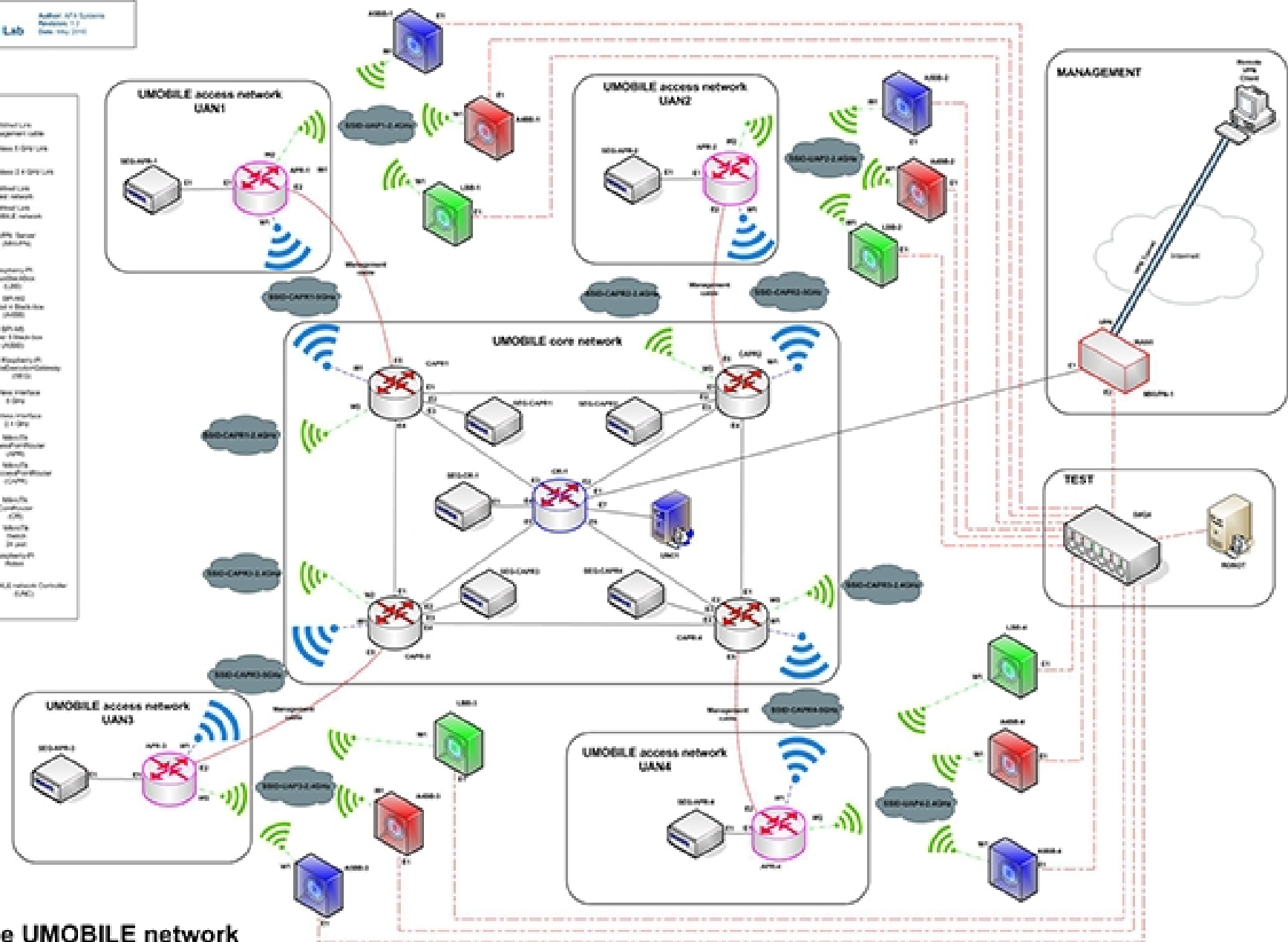
The lab is constituted by the following devices

- **Mikrotik RouterBoard**
 - Wi-Fi access points (2.4Ghz, 5Ghz)
 - Routerboard
- **Linux systems**
 - Raspberry PI III
- **Android systems**
 - Banana PI M3, Android OS 5.1
 - Android smartphones OS 5.1



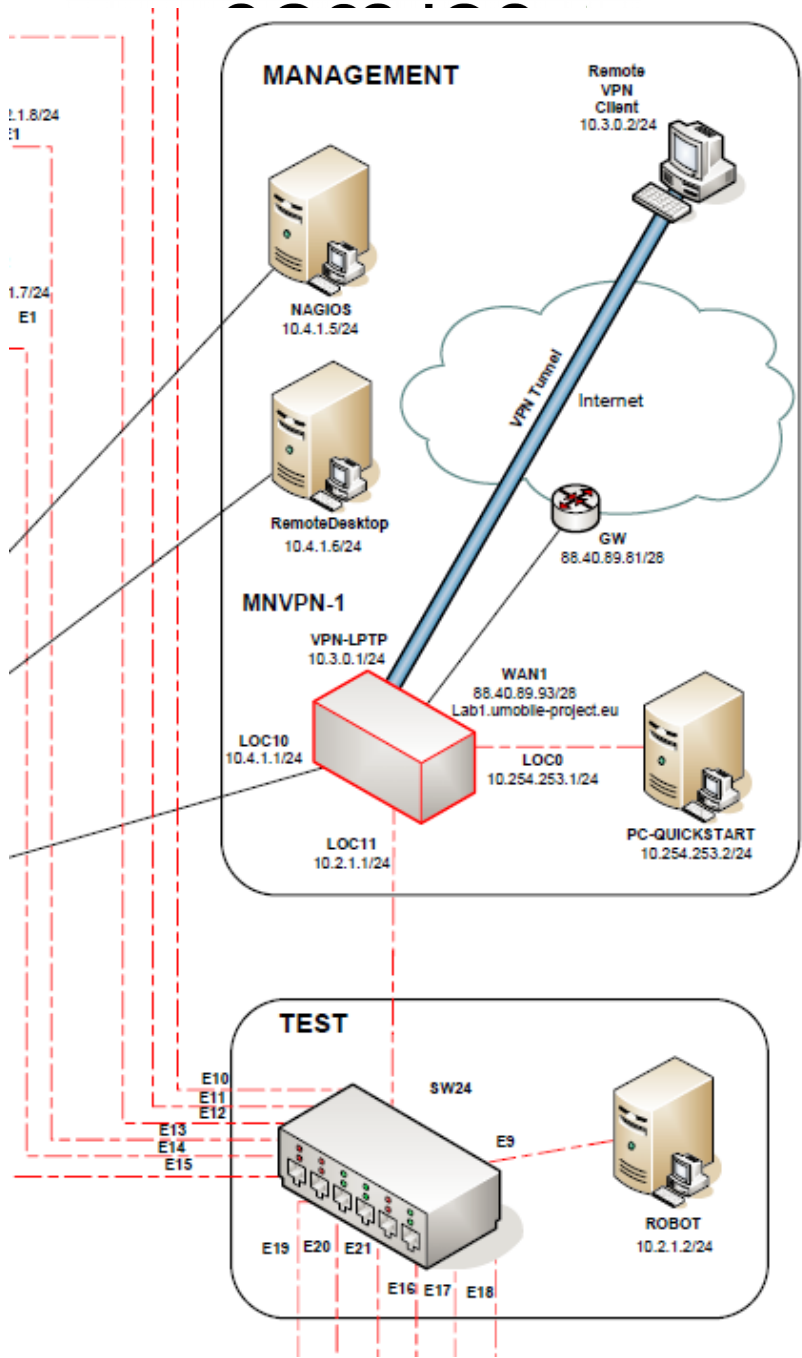


- Legend**
-  UMOBILE access network (UANI)
 -  UMOBILE core network (UCN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)
 -  UMOBILE access network (UAN)



The UMOBILE network

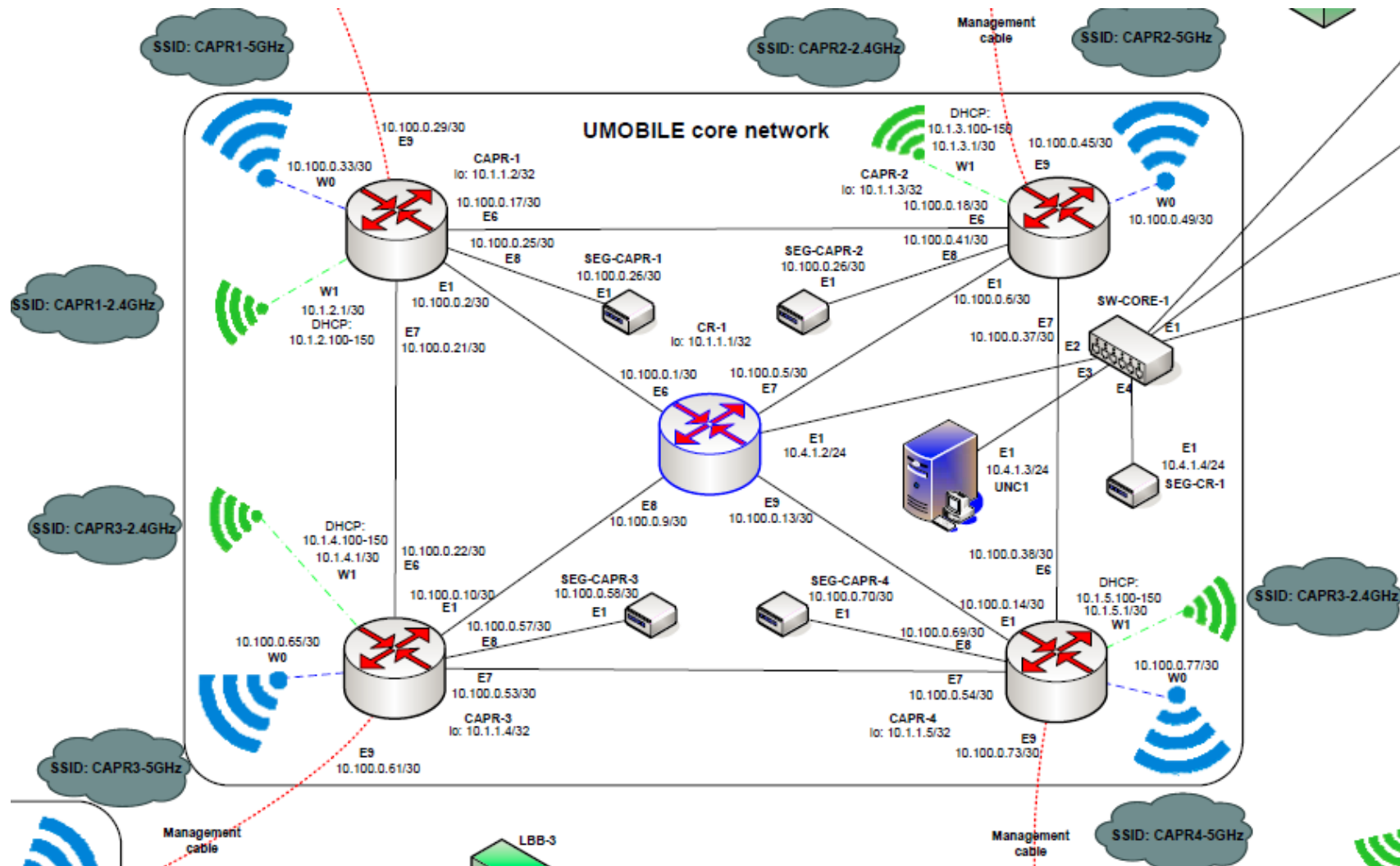
MANAGEMENT NETWORK



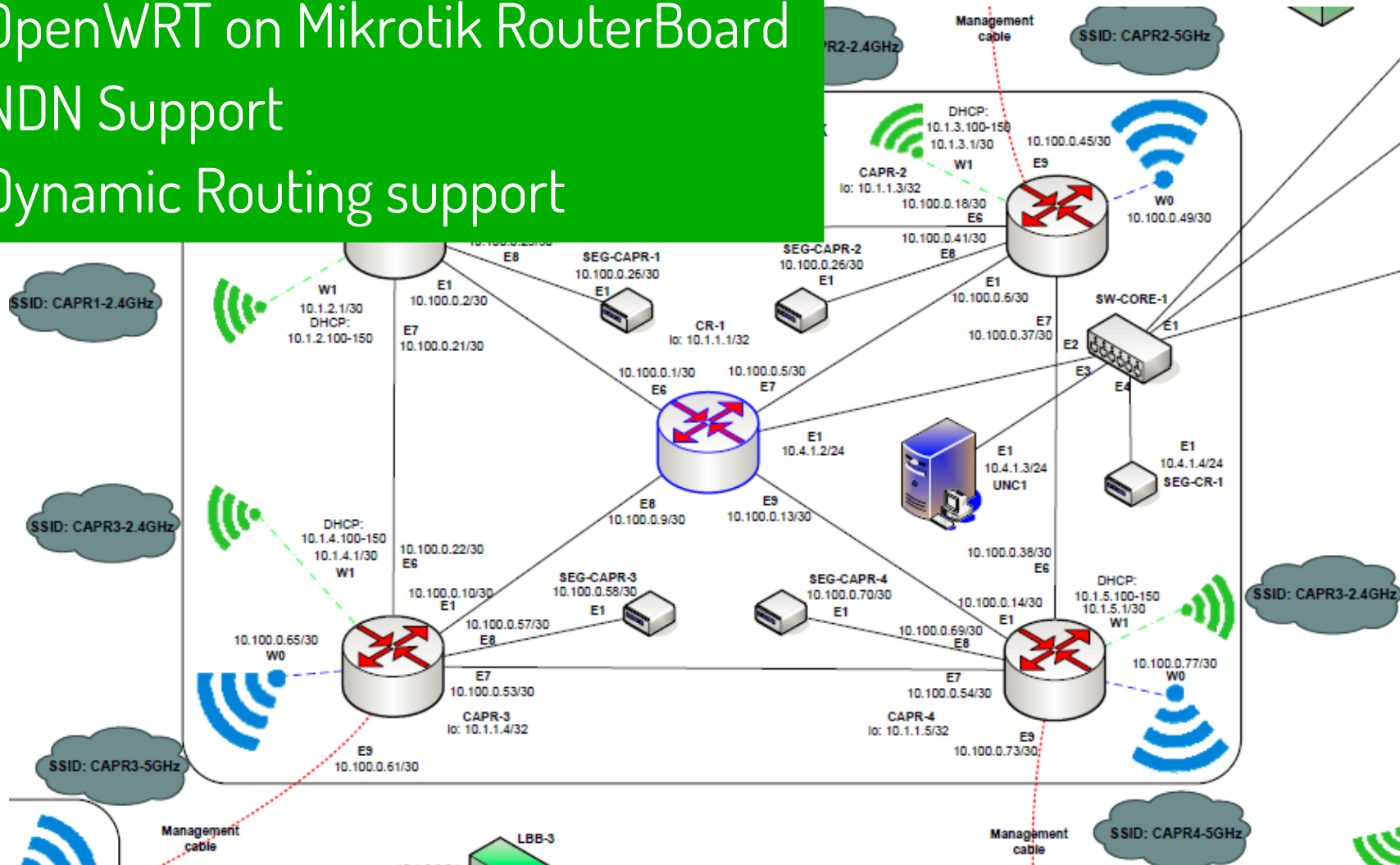
NETWORK SUBNET

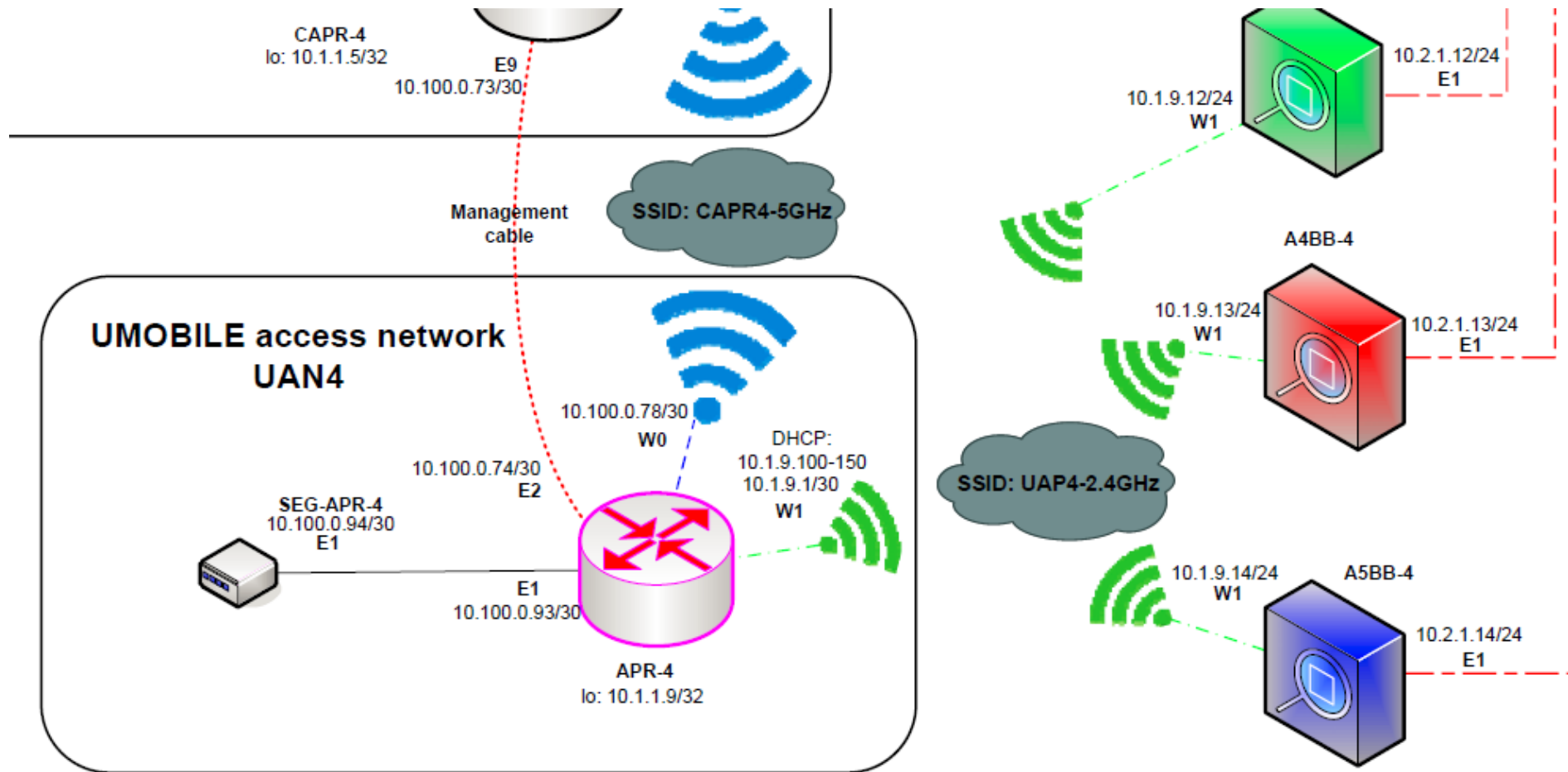
- P-t-P: 10.100.0.0/16
- LoopBack: 10.1.1.0/24
- CAPR-1-Wi-Fi-2.4Ghz: 10.1.2.0/24
- CAPR-2-Wi-Fi-2.4Ghz: 10.1.3.0/24
- CAPR-3-Wi-Fi-2.4Ghz: 10.1.4.0/24
- CAPR-4-Wi-Fi-2.4Ghz: 10.1.5.0/24
- UAP-1-Wi-Fi-2.4Ghz: 10.1.6.0/24
- UAP-2-Wi-Fi-2.4Ghz: 10.1.7.0/24
- UAP-3-Wi-Fi-2.4Ghz: 10.1.8.0/24
- UAP-4-Wi-Fi-2.4Ghz: 10.1.9.0/24
- TEST: 10.2.1.0/24
- VPN: 10.3.0.0/24
- CORE-LAN: 10.4.1.0/24
- QUICKSTART: 10.254.253.0/24
- MANAGEMENT: 10.254.254.0/24

The management network allows users to reach any device in the testbed, through an IPV4 **VPN** over the Internet (L2TP or OpenVPN).

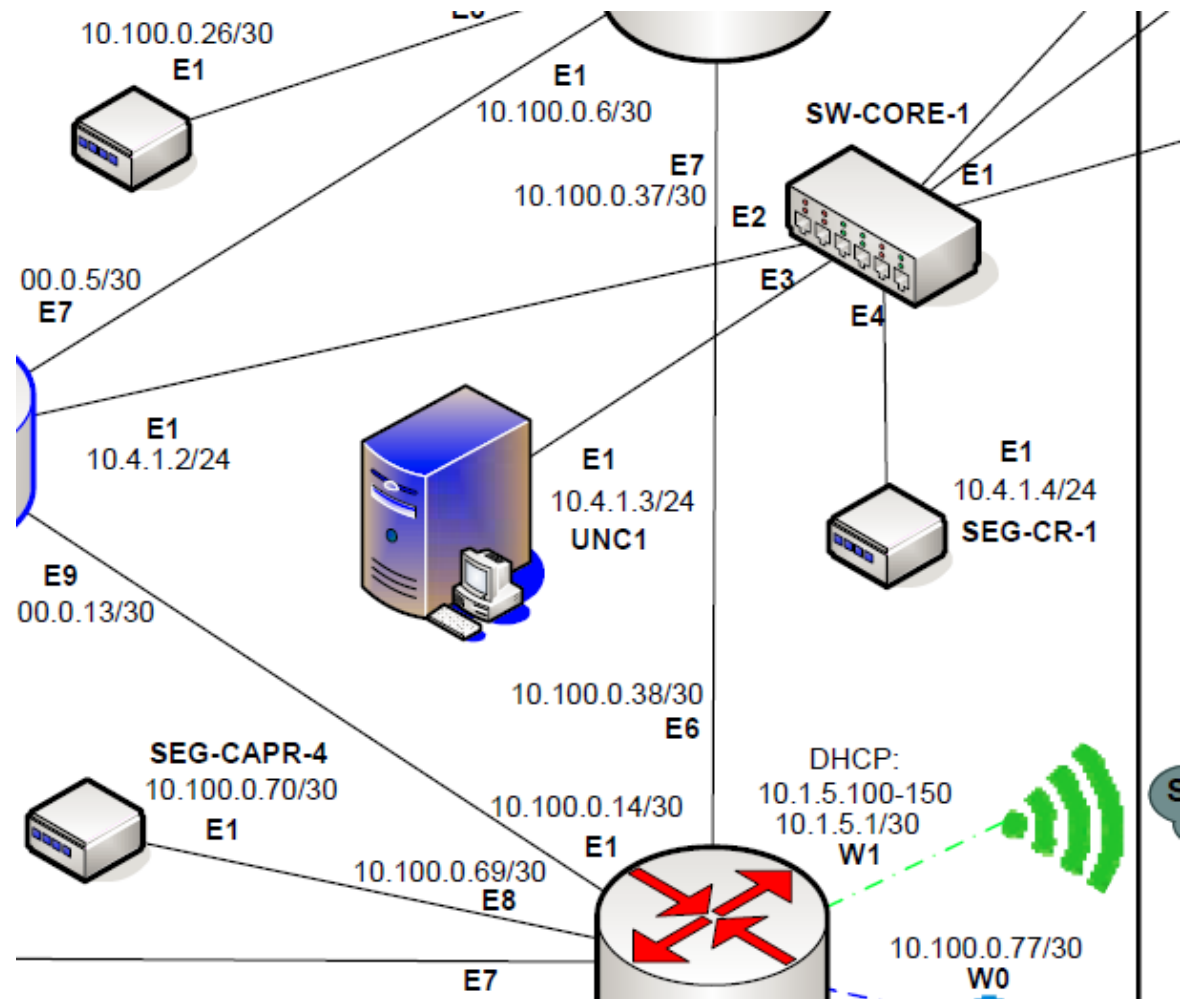


OpenWRT on Mikrotik RouterBoard
NDN Support
Dynamic Routing support





- SERVICE MANAGER
 - It manages the migration of services and applications in the network



Now we are able to reply to the following question



**YET
ANOTHER
NETWORKING
TESTBED?**



Yes, but...

- It's the first EU **NDN testbed with end-user devices**
- You will be able to access over the NDN global tested a significant set of NDN-enabled mobile devices (smartphones, raspberry Pi, ...).
- You can test NDN capacity to collect large amounts of sensing data
- You can test NDN capability to set up voice communications
- Etc...
- You will be able to simulate mobility (by bringing up and down wireless interfaces)

How to join UMOBILE?
How can I access and use the LAB?




Sorry,
it's still working
in progress

It will be opened to the
scientific community by
the end of january 2018




UMOBILE HOME OVERVIEW PARTNERS ▾ DOWNLOAD NEWS AND EVENTS CONTACTS UMOBILE LAB ▾ PROJECTDOCS 🔍



Universal, mobile-centric and communications architecture

- Testbed
 - Connecting to the testbed
- Architecture
- Codebase
 - Service Detail
 - Status Map
 - Experimentation with the testbed

Facebook Page



Umobile H2020 ICT project
Liked 110 likes
circa 3 mesi fa
Now@ application being shown at Encontro Ciencia 2017.
Now@ is a named data networking application developed by Omar




UMOBILE Lab joins the NDN project

21 June 2017

The Named Data Networking (NDN) project (<https://named-data.net/project/>) aims to develop a new Internet architecture that can capitalize on strengths — and address weaknesses — of the Internet's current host-based, point-to-point communication architecture in order to naturally accommodate emerging patterns of communication. The NDN research testbed is a shared resource created for research purposes, that include software routers at several participating institutions, application host nodes, and other devices.

UMOBILE Lab, located at AFA Systems (www.afasystems.it), is part of the Named Data Networking (NDN) project.

Partners



obile-project.eu/umobile-lab/testbed

- umobilelab@afasystems.it

UMOBILE

HOME

OVERVIEW

PARTNERS ▾

DOWNLOAD

NEWS AND EVENTS

CONTACTS

UMOBILE LAB ▾

PRO

Connecting to the testbed

WORK IN PROGRESS

Policies for Accessing the UMOBILE Lab

To access the UMOBILE Lab, please read these policies first, then contact umobilelab@afasystems.it.

In order to ensure proper usage of the UMOBILE Lab, please agree with the policies outlined below.

1. ...
2. ...
3. ...

If the above policies cannot be met, we encourage you to contact us to discuss access to the testbed. For more information and to access the Lab, please, contact ndntestbed@arl.wustl.edu.

Francesco Amorosa,

AFA Systems

Partners



ACCESSING THE LAB



The image shows a login form for MajorNet. At the top is the logo, which consists of a stylized 'm' in a circle followed by the text 'ajonet'. Below the logo are two input fields: 'Username' and 'Password'. At the bottom of the form is a blue button with the text 'SIGN IN'.



- Once logged into UMOBILE Lab, it is possible to access: each device in the lab, UMOBILE website and UMOBILE project-wiki, the Internet (through a captive portal)

Service Detail

WORK IN PROGRESS

Current Network Status

Last Updated: Tue Sep 19 11:25:20 CEST 2017
 Updated every 320 seconds
 Nagios® 2.10 - www.nagios.org
 Logged in as manager

[View History For all hosts](#)
[View Notifications For All Hosts](#)
[View Host Status Detail For All Hosts](#)

Host Status Totals

Up	Down	Unreachable	Pending
30	0	0	0
All Problems		All Types	
0		30	

Service Status Totals

Ok	Warning	Unknown	Critical	Pending
35	0	0	0	0
All Problems		All Types		
0		35		

Service Status Details For All Hosts

Host ↑	Service ↑	Status ↑	Last Check ↑	Duration ↑	Attempt ↑	Status Information
backup	24x7_Ping	OK	19-09-2017 11:21:15	80d 22h 16m 36s	1/2	PING OK - Packet loss = 0%, RTA = 0.76 ms
dna	24x7_Ping	OK	19-09-2017 11:20:53	378d 22h 14m 44s	1/2	PING OK - Packet loss = 0%, RTA = 0.82 ms
engine	24x7_Ping	OK	19-09-2017 11:21:15	542d 7h 52m 54s	1/2	PING OK - Packet loss = 0%, RTA = 13.68 ms
assistance	24x7_Ping	OK	19-09-2017 11:20:53	1026d 9h 39m 37s	1/2	PING OK - Packet loss = 0%, RTA = 3.88 ms
majorafa	24x7_Ping	OK	19-09-2017 11:21:16	91d 16h 15m 20s	1/2	PING OK - Packet loss = 0%, RTA = 0.64 ms
	http_port_80	OK	19-09-2017 11:20:53	0d 6h 49m 27s	1/2	HTTP OK HTTP/1.1 200 OK - 5902 bytes in 0.410 seconds
majordemo	24x7_Ping	OK	19-09-2017 11:21:27	24d 17h 43m 53s	1/2	PING OK - Packet loss = 0%, RTA = 13.61 ms
majorins-sanvto	24x7_Ping	OK	19-09-2017 11:20:53	24d 19h 9m 27s	1/2	PING OK - Packet loss = 0%, RTA = 163.86 ms
majorhosting0_0-sanvto	24x7_Ping	OK	19-09-2017 11:21:35	24d 19h 8m 47s	1/2	PING OK - Packet loss = 0%, RTA = 14.39 ms
majorhosting0_3-sanvto	24x7_Ping	OK	19-09-2017 11:21:15	24d 19h 9m 5s	1/2	PING OK - Packet loss = 0%, RTA = 13.70 ms

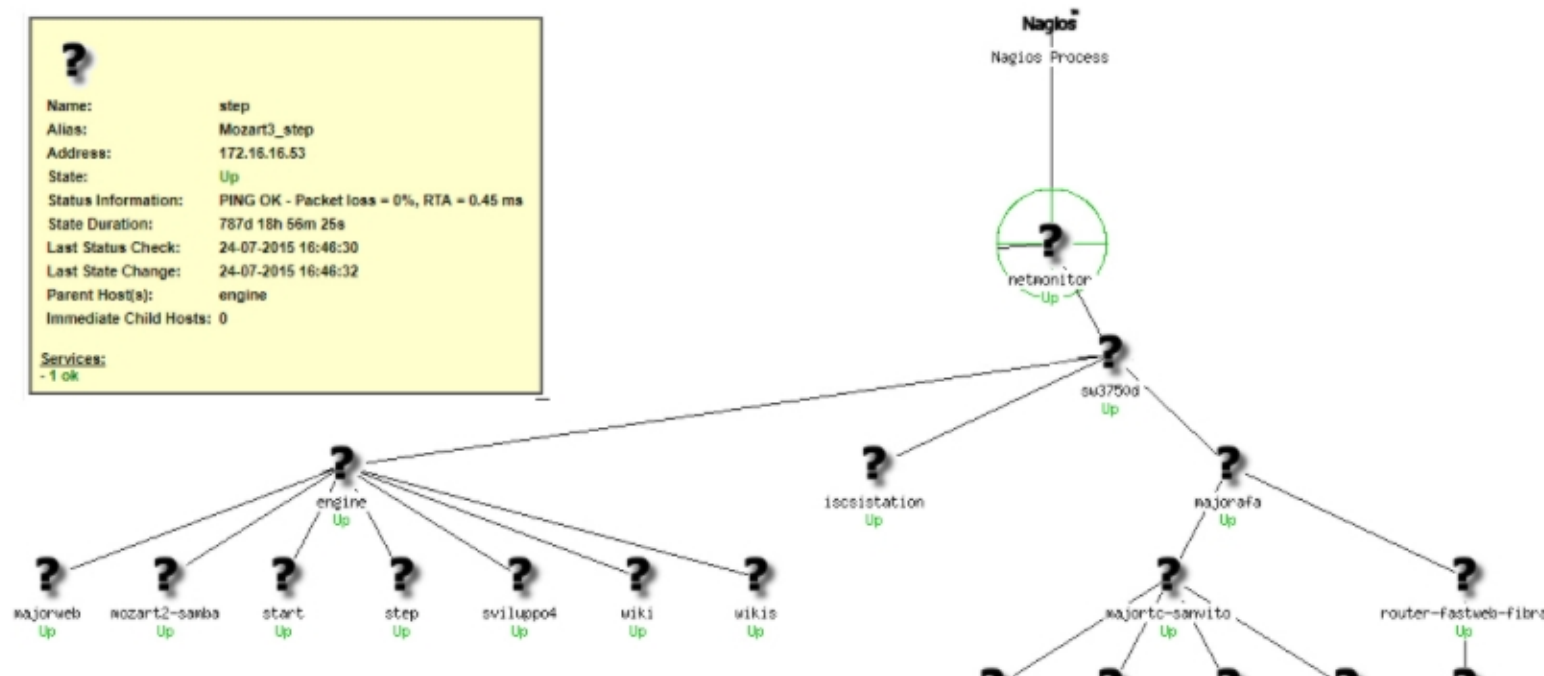
Partners



Status Map

Work in progress

?	
Name:	step
Alias:	Mozart3_step
Address:	172.16.16.53
State:	Up
Status Information:	PING OK - Packet loss = 0%, RTA = 0.45 ms
State Duration:	787d 18h 58m 25s
Last Status Check:	24-07-2015 16:46:30
Last State Change:	24-07-2015 16:46:32
Parent Host(s):	engine
Immediate Child Hosts:	0
Services:	- 1 ok



Partners



FIB

Prefix	NextHops			
/ndn/pt/ulusofona/copelabs/%C1.Router/ndn	Faceld	273	21054	274
	Cost	0	25487	29010
/ndn/it/afasystems/repo-ng-2/delete	Faceld	270		
	Cost	0		
/localhost/repo-ng-2/watch	Faceld	270		
	Cost	0		
/ndn/org/caida/%C1.Router/click	Faceld	21054	273	274
	Cost	19401	30149	30708
/ndn/edu/ucla	Faceld	21054	273	274
	Cost	22032	29450	29735
/ndn/nl/tno/%C1.Router/tno-ndntestbed-bordernode	Faceld	21054	273	274
	Cost	22077	23174	24628
/ndn/jp/ac/osaka-u/%C1.Router/NDNtestbed	Faceld	21054	274	273
	Cost	29767	32806	33931
/ndn/pt/uminho	Faceld	273	21054	274
	Cost	8001	25487	29010
/localhost/nfd/rib	Faceld	258		
	Cost	0		

Architecture

WORK IN PROGRESS

Lab components

device	usage	Ethernet	additional ports	USB port	role in UM Lab	UM acronym
RB493G	infrastructure	9 GE	serial	y	CORE NETWORK	CRCAPR
RB435G	infrastructure	3 GE	serial	y	ACCESS NETWORK	APR
R52n-M	infrastructure	-	-	-	radio add-on	-
Raspberry Pi3	infrastructure	1	HDMI	y	SERVICE EXECUTION	SEG
Raspberry Pi3	hand-held device emulation	1	HDMI	y	USER DEVICE	LBB
BPI-M2	hand-held device emulation	1	HDMI	y	USER DEVICE	A4BB
BPI-M3	hand-held device emulation	1	HDMI	y	USER DEVICE	A5BB

"Jump-start" table to the Lab

Nr.	IP	Hostname	OS	zone	ssh access	http access
1	10.1.1.2	CAPR-1	OpenWRT CHAOS CALMER (15.05.1, r48532) – AP	core	ssh://capr-1.umobilelab.local/	http://capr-1.umobilelab.local
2	10.1.1.3	CAPR-2	OpenWRT CHAOS CALMER (15.05.1, r48532) – AP	core	ssh://capr-2.umobilelab.local	http://capr-2.umobilelab.local
3	10.1.1.4	CAPR-3	OpenWRT CHAOS	core	ssh://capr-3.umobilelab.local	http://capr-3.umobilelab.local

Partners



- TOOLS
- DOCUMENTATION
- GITHUB SOURCE
 - [Www.](#)

OPEN QUESTIONS



THANKS FOR YOUR ATTENTION

www.afasystems.it

www.majornet.it

contact.us@afasystems.it

