

The Road to ETRI/UMU Testbed Federation

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Objectives

- ⚡ Federate UMU and ETRI testbeds:
 - | Establish a direct connection between the testbeds
 - | Deploy testbed controllers (OMF/SFA) and connect them to achieve the federation
- ⚡ Deploy MOFI into the federated testbed
 - | Build a new MOFI site into UMU's testbed
 - | Connect it to other MOFI sites already built in Korea
- ⚡ Execute MOFI experiments in the resulting wide experimentation infrastructure

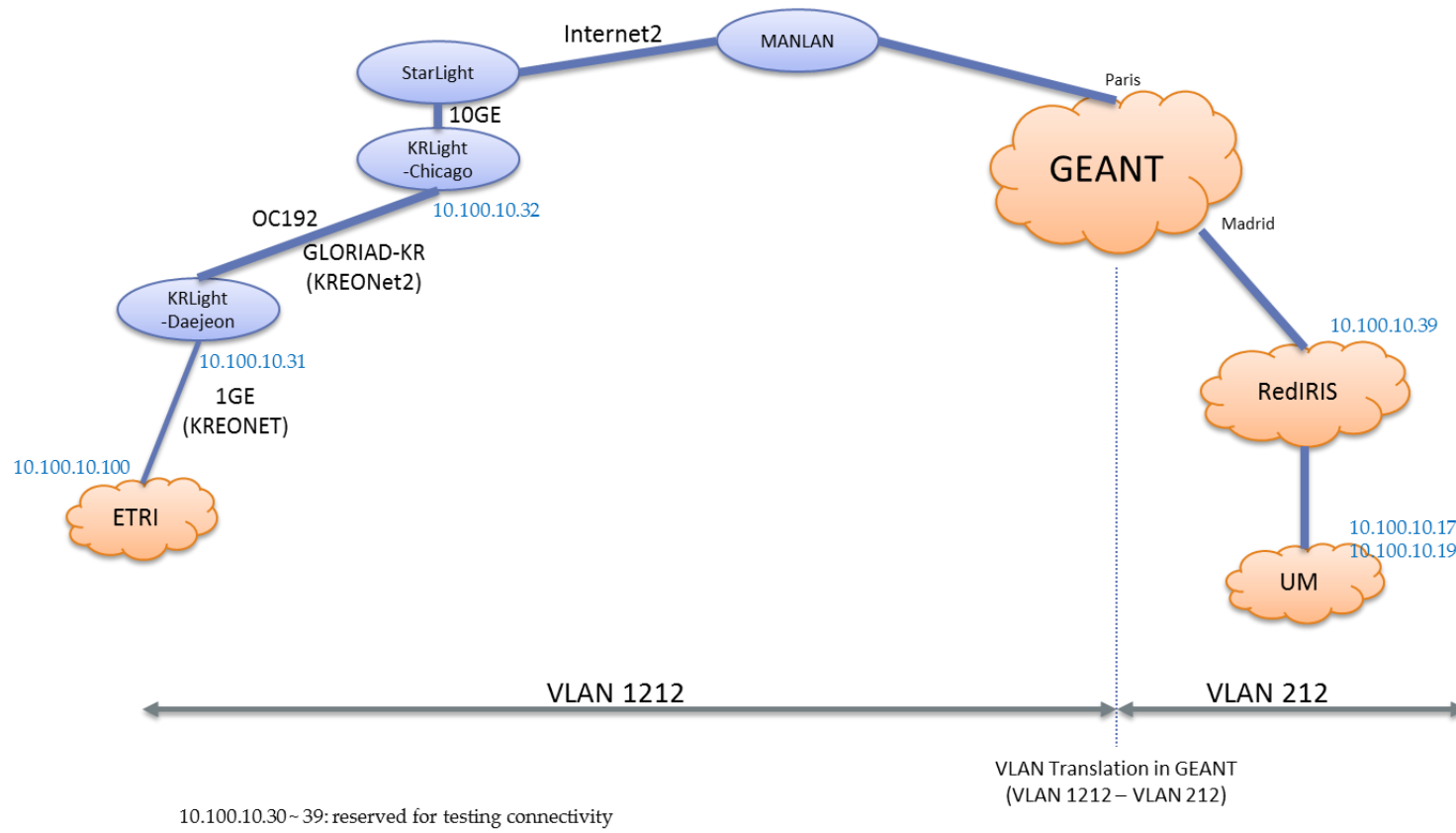
Current Status

- 🔥 The interconnection between UMU and ETRI has been established and tested.
- 🔥 MOFI has been deployed into UMU's testbed and a test has been performed to validate the environment execution.
- 🔥 OMF 6 has been installed and a connection with the current testbed resources has been researched:
 - 🔥 We require new mechanisms to connect OMF 6 with our OpenStack based resources and OpenFlow based SDN.

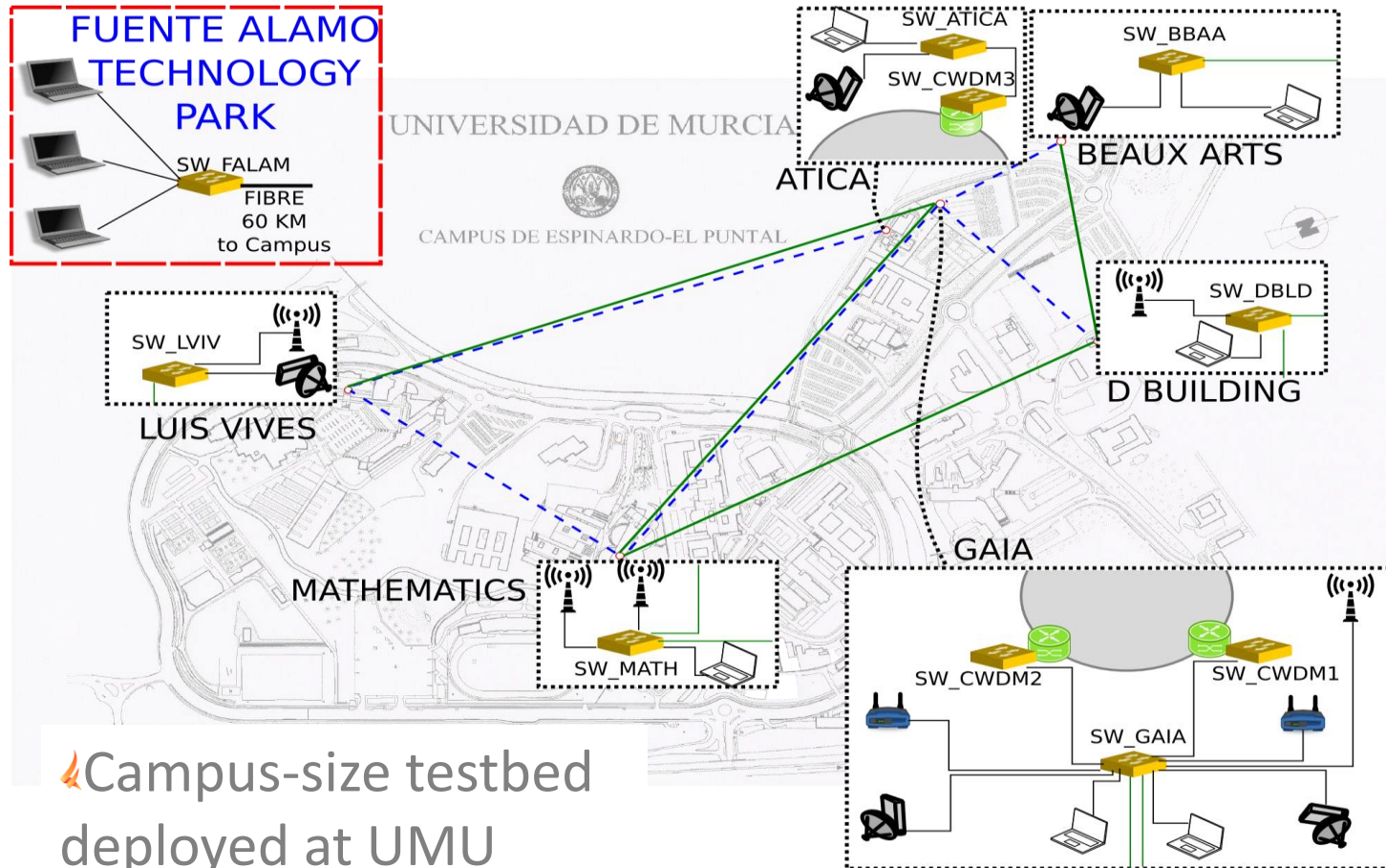
Current Status: UMU/ETRI Interconnection (I)



Current Status: UMU/ETRI Interconnection (II)



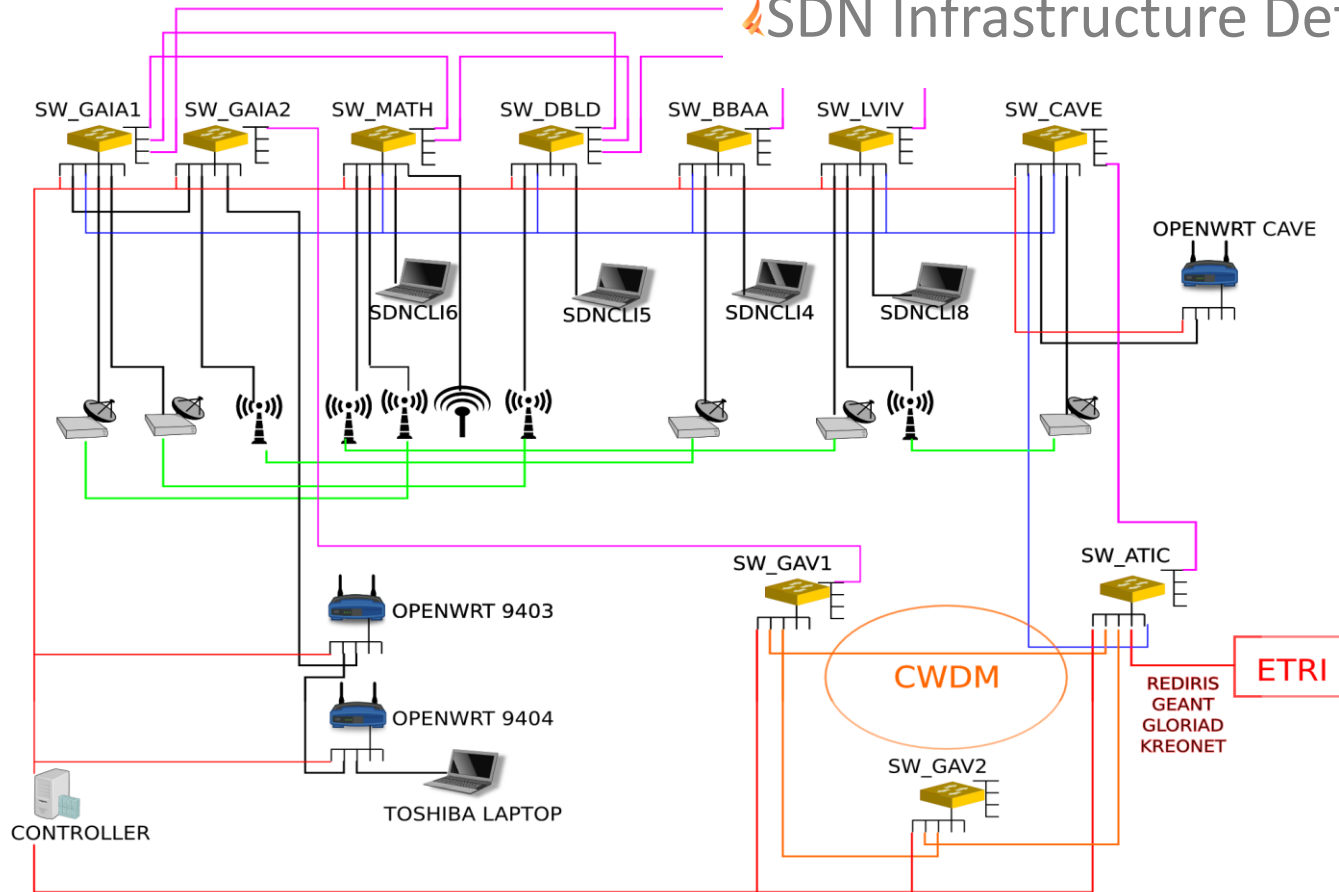
Current Status: UMU Testbed (I)



🔥 Campus-size testbed
deployed at UMU

Current Status: UMU Testbed (II)

SDN Infrastructure Details



Current Status: UMU Testbed (III)

Hardware Details:

|Fiber-based backbone network provided by the university, V TUN links over a VLAN.

|WiMax based on Alvarion BreezeMax Extreme omnidirectional and unidirectional antennas 4.9Ghz/5.4Ghz.

|Wireless LAN based on Linksys WRT54GL, CISCO AP-AIR1142n and CISCO E4200, together with two outdoor antennas installed in separate buildings (Faculty of Mathematics and Faculty of Beaux Arts).

Current Status: UMU Testbed (IV)

Switching Nodes :

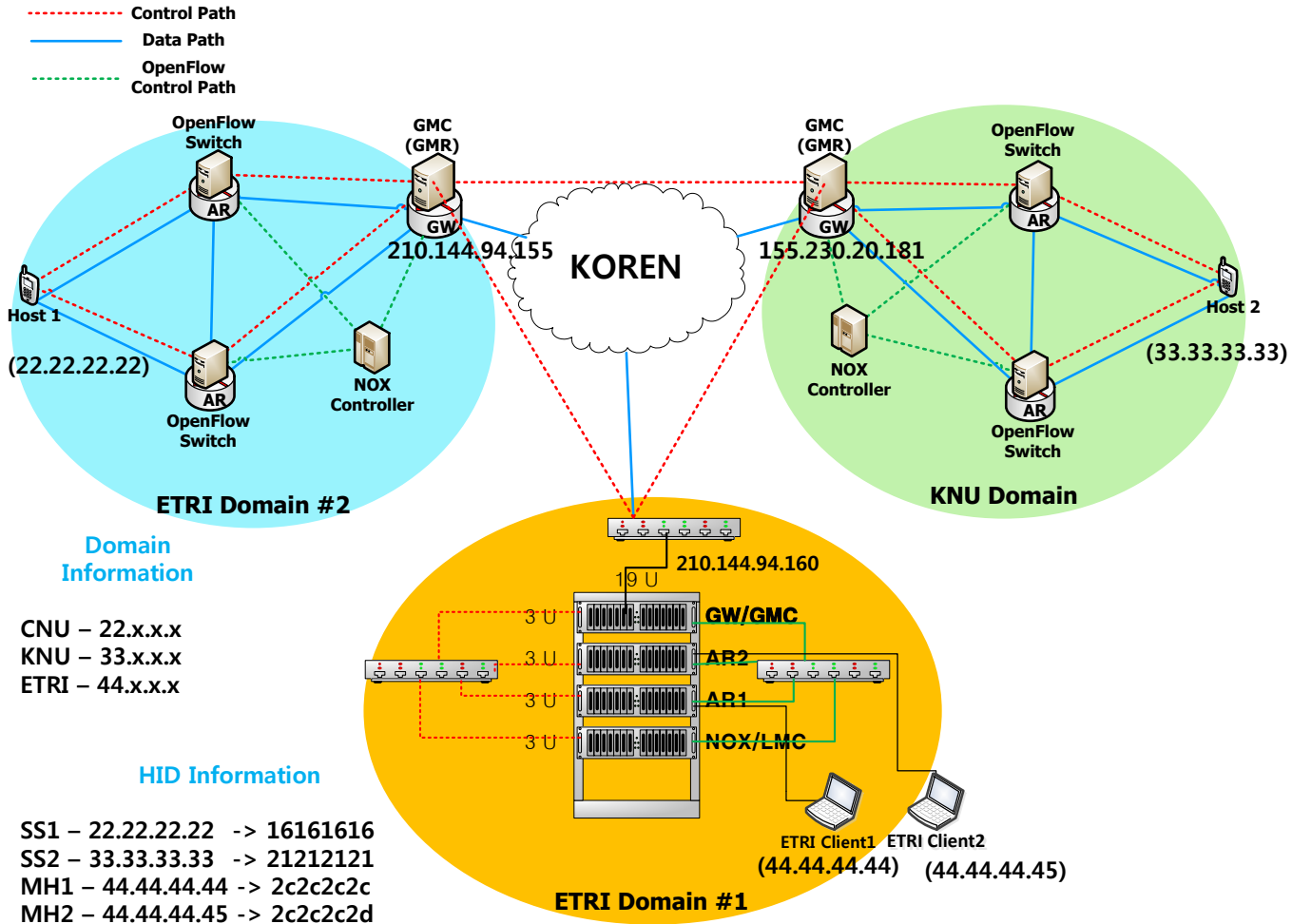
- |Based on Linux hosts with OpenVSwitch
- |The hardware has been provided by the RECICLATICA project of the UMU:
 - |Pentium 4 alike computers.
 - |Multiple PCI Interfaces.
 - |Cost-free extensibility.
- |Two independent networks to separate control and data planes.

Current Status: ETRI/MOFI Testbed (I)

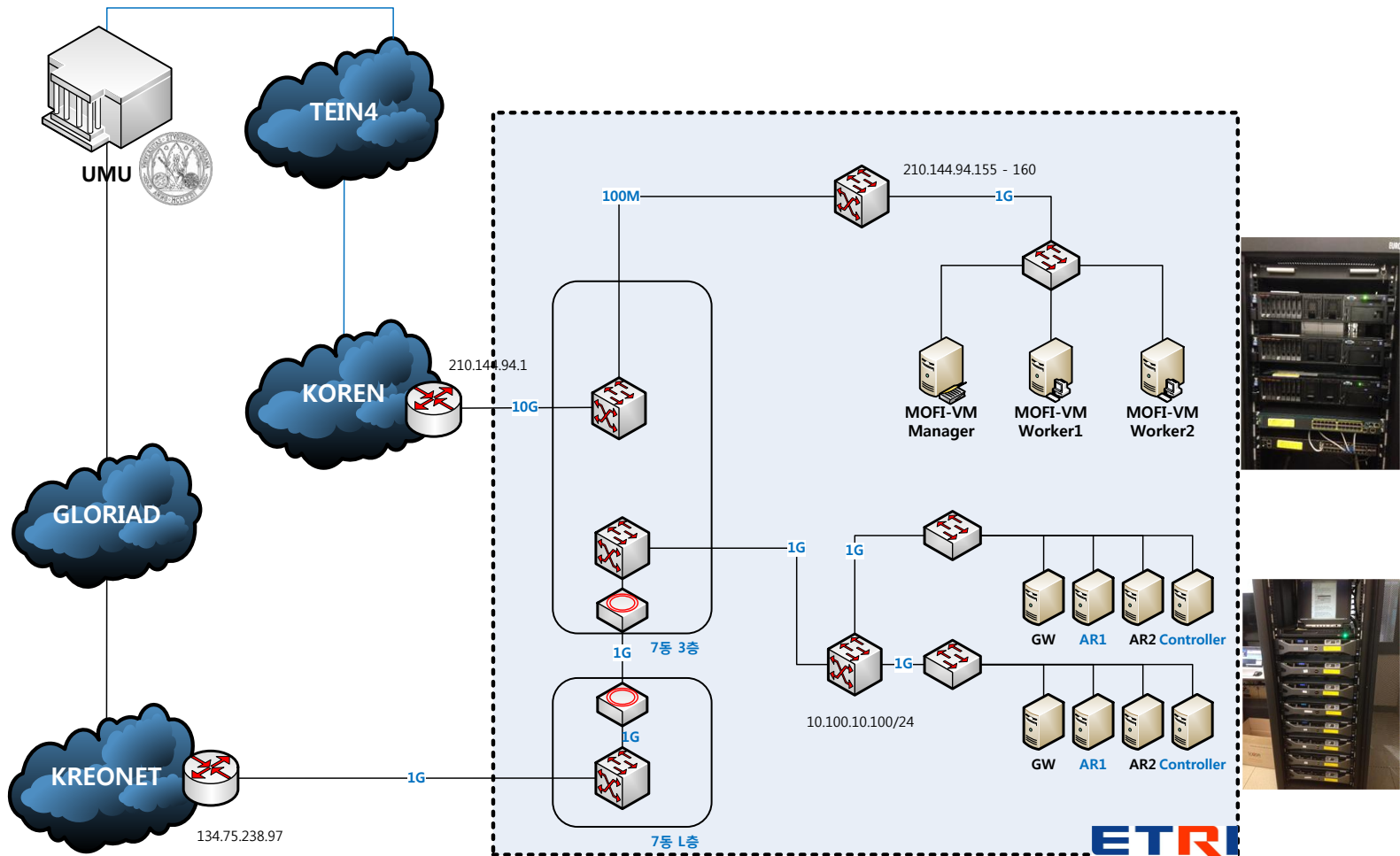
- 🔥 Mobile Oriented Future Internet Architecture (MOFI)
 - | ID/LOC split based Architecture (Host Identifier based communication)
 - | LOC query before data delivery for optimal routes (Query-First delivery)
 - | Dynamic and Distributed Mapping management (DDMS)

- 🔥 Implementation
 - | Software architecture by NS-3 simulator
 - | OpenFlow based Architecture
 - | More information from <http://www.mofi.re.kr>

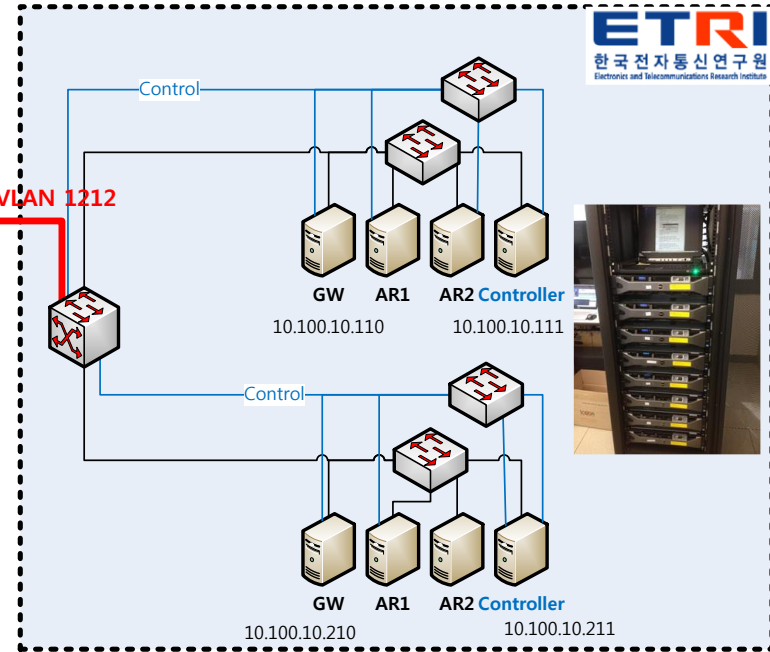
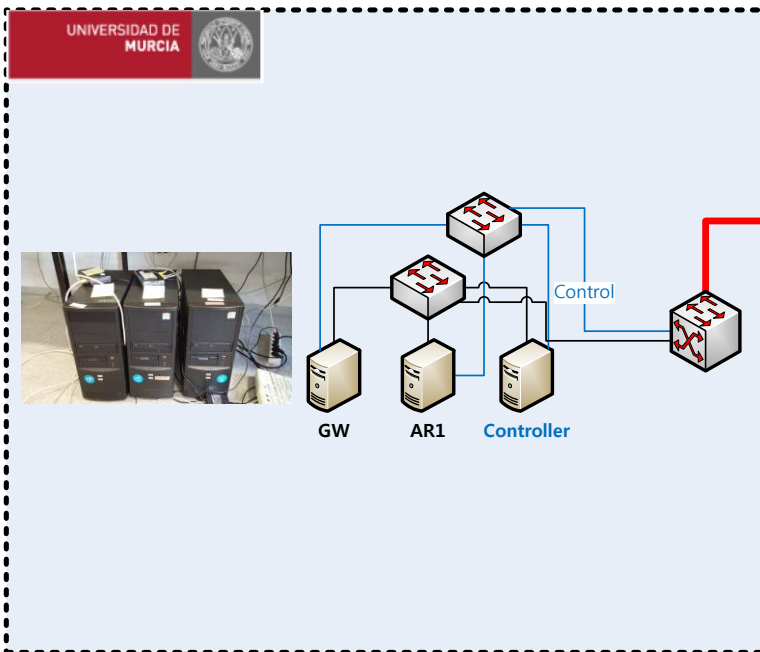
Current Status: ETRI/MOFI Testbed (II)



Current Status: ETRI/MOFI Testbed (III)

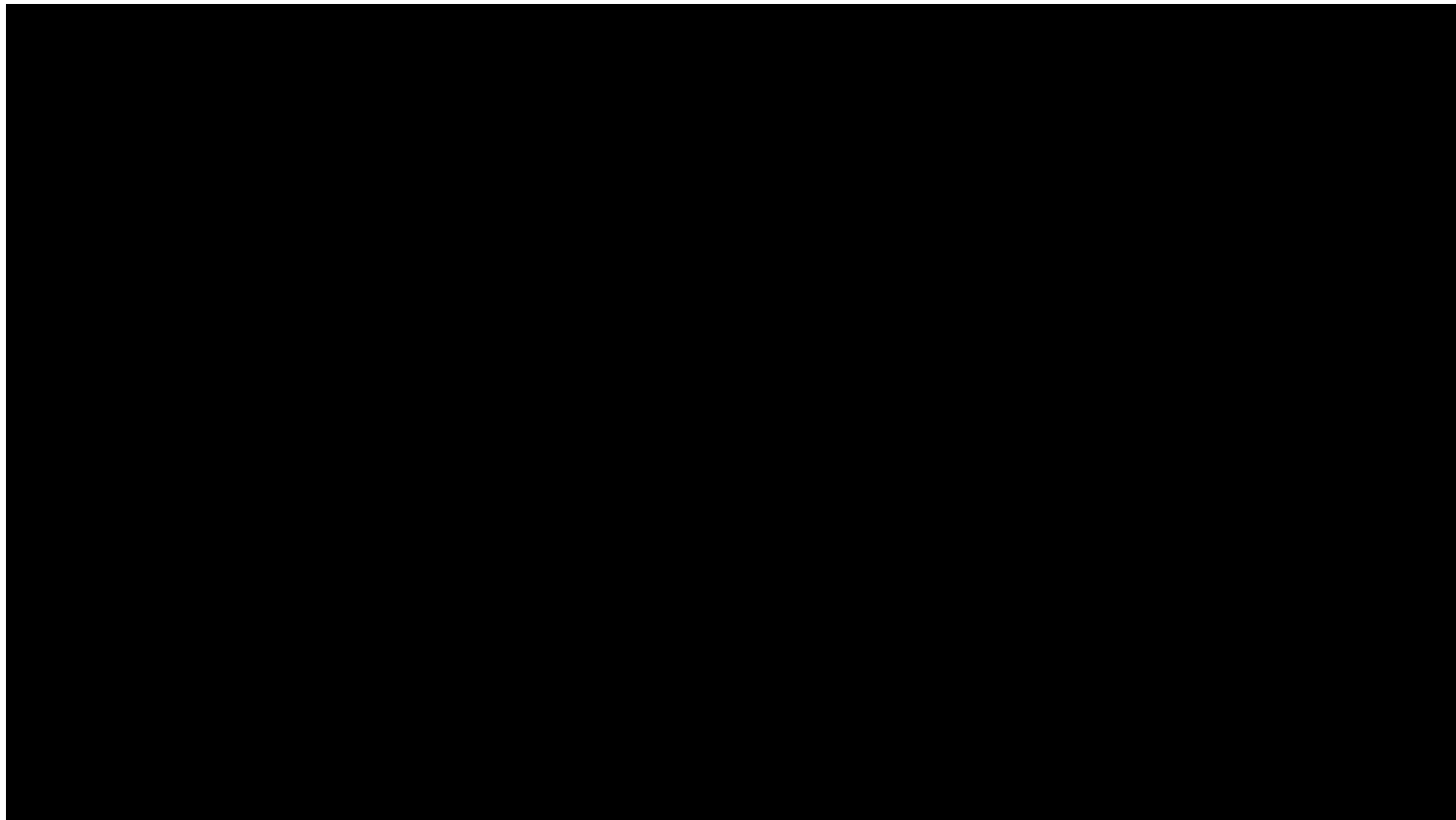


Building MOFI Sites into ETRI and UMU (I)



Building MOFI Sites into ETRI and UMU (II)

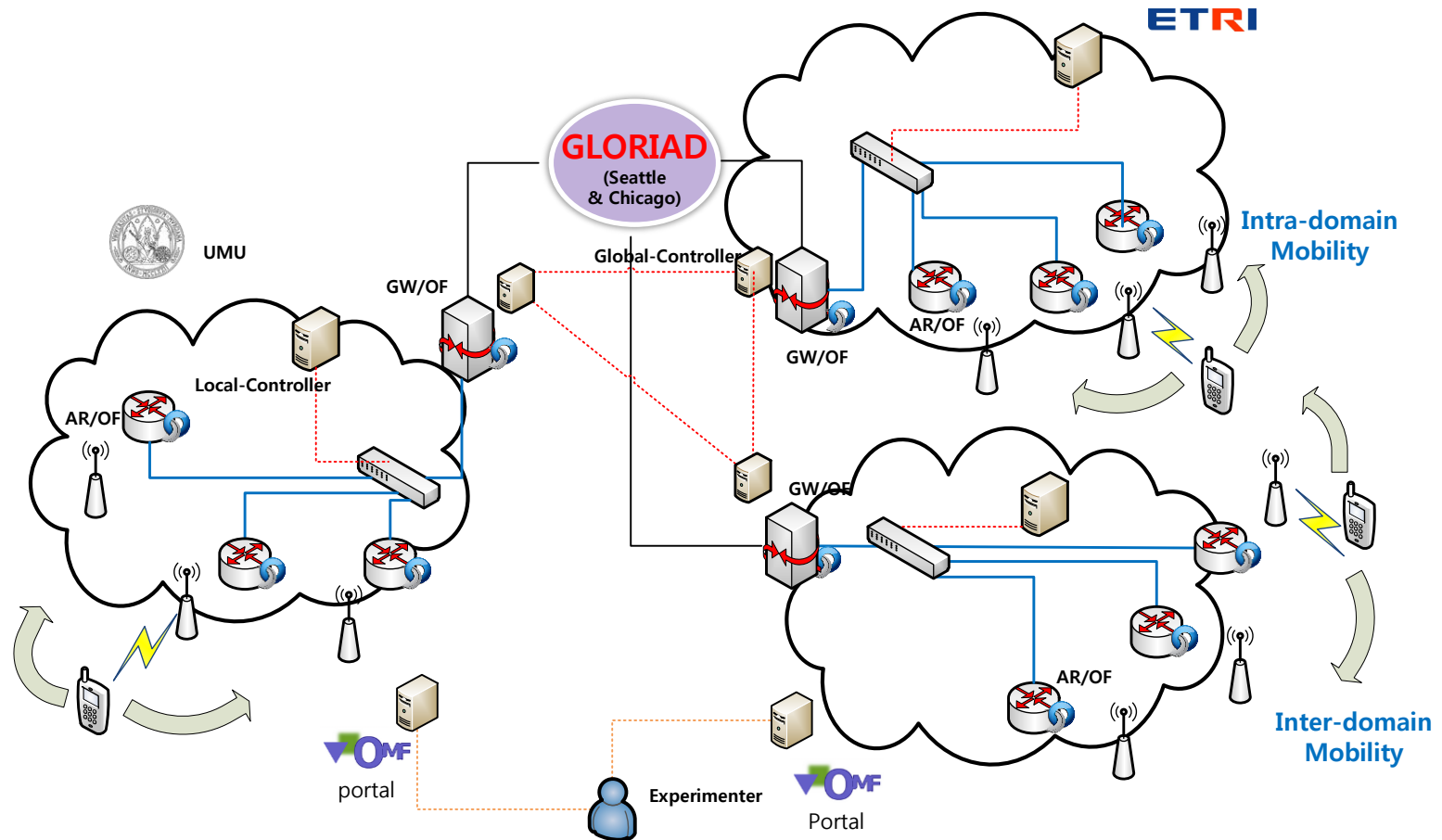
🔥 Test a simple video streaming service between ETRI and UMU



Main Use-Case: Mobility (I)

- Scenario 1. Service continuity under the host mobility event
 - Video streaming service are started between UMU & ETRI
 - A host moves another access router (AR),
 - Then video data can be forwarded to new AR Automatically
 - Video streaming service are provided continuously
- Scenario 2. Service continuity under the host roaming (Inter-domain mobility) event
 - A host which was already registered in ETRI moves to another domain network
 - Video data can be forwarded continuously by the local and global controller

Main Use-Case: Mobility (II)



Peer to peer Video Streaming Service under the host mobility event and the inter-domain mobility event

Optional Use-Case: Multiple Screens (I)

🔥 HID based N-Screen (multi-homing) Scenario

| Suppose All of MOFI host must have one or more global unique identifier (HID)

| MOFI MH (Android Phone) takes a role as primary screen

| The other screens can be assigned to another ID

| Other screens can negotiate to be assigned to HID as same as MH's HID

| MH (Android) select a Screen and streaming can be forwarded to selected screen continuously

Optional Use-Case: Multiple Screens (II)

🔥 N-screen (Multi-homing)

- | Screens find & launch Apps

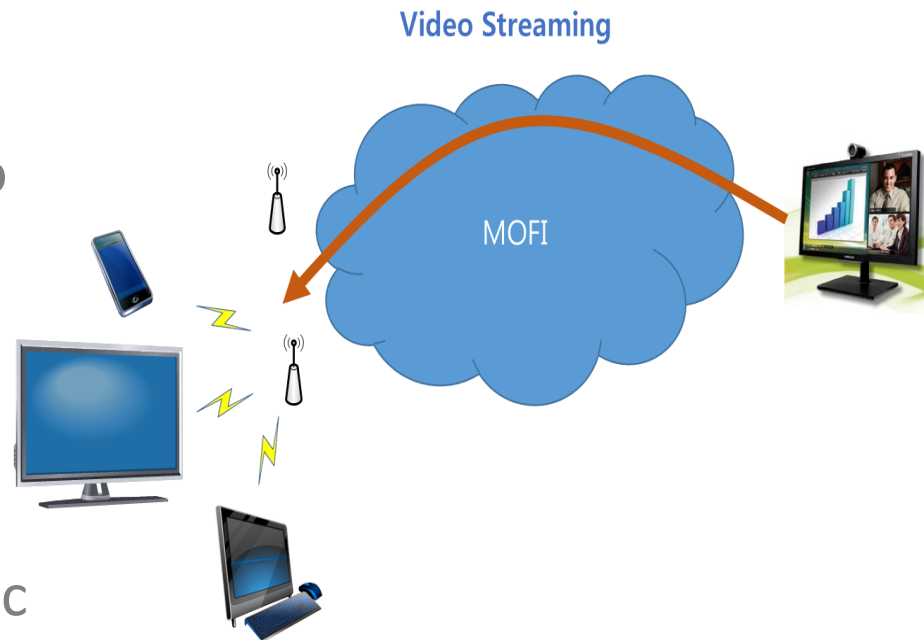
- | Group HID set up

- | Obtain Screen Information

- | Select a screen

- | on Smart Phone

- | Service continuity on multi-screen



Future Work (I)

- 🔥 Deploy three OpenStack islands connected to the SDN that has been already deployed into the UMU testbed.
- 🔥 Finalize the deployment of OMF 6 and SFA to federate our testbeds (UMU and ETRI) and connect them to both the SDN and OpenStack resources.
- 🔥 Achieve the enhancement of inter-networking management.
- 🔥 Complete use-cases more precisely with full description of resources involved on them and measurements to be taken from the experiments.

Future Work (II)

- 🔥 Design experiments for MOFI to be executed on top of the infrastructure, with dynamic deployment of both clients and intermediate elements into the OpenStack islands.
- 🔥 Run the experiments and analyze the results obtained, giving feedback to other partners of the project.
- 🔥 Explore the possibility to adapt MOFI elements as NFV elements to be deployed on-demand into the network infrastructure.

Conclusions

- 🔥 We will continue the close collaboration (UMU and ETRI) to achieve the federation of our testbeds while studying different aspects of network architectures for the Future Internet.
- 🔥 We will provide various use-cases that fit in our testbeds.
- 🔥 We will study and explore the adoption of MOFI elements as virtualization technologies such as NFV, OpenStack, etc.
- 🔥 We will provide our experience to other partners and give feedback to activities in charge of the infrastructure to improve the results of the project.

감사합니다

Thank you