OFELIA – Pan-European OpenFlow Testbed

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(Future Internet Testbed Workshop)
Future Internet Research and Experimentation (FIRE) in Europe

The project OFELIA
- Partners, duration, objective
- Status after phase one (what is available)
- Phase two (what are we working on?)

Extensions through Open Calls
- Virtual topology generation through Vertigo
- Content based routing on OpenFlow

How to use OFELIA’s test facility?
- Registration
- Setting up a project
- Configuring an experiment
FIRE: Future Internet Research and Experimentation

- Set of EU-funded projects that would eventually grow into a single facility.
  - Currently: single portal at http://www.ict-fire.eu
- Running projects:
  - 2 on cloud computing (BonFIRE, TEFIS)
  - 1 on heterogeneous wireless testbeds (CREW)
  - 1 large-scale sensor network deployment (SmartSantander)
  - ... one constructing an OpenFlow testbed (OFELIA)
Three years EU FP7 project, started Sept. 2010

– Total budget 6.3, funding 4.45M€

– 10 partners (12 after the first Open Call)

– 5 OpenFlow-enabled islands at academic institutions:
  • Berlin (TUB) – partial campus network with OF-switches
  • Gent (IBBT) – central hub, 100 (200) node emulab instance
  • Zürich (ETH) – connection to OneLab and GpENI
  • Barcelona (i2CAT) – control framework development
  • Essex (UEssex) – optical and L2 (Extreme) switches

Industry partners Deutsche Telekom, NEC, ADVA
Stanford university (Nick McKeown, Guru Parulkar) official partner (control framework, architecture, experience)
Create-Net, CNIT (both Italy) added through Open Call
OFELIA - Operation and extension of the facility.
From isolated islands to centralized resource management –
two phases of open calls.

Operation of the individual islands, one partner per island has the lead
- Phase i: OF controllers and switches in place, first local experiments concluded
- Phase ii: Connect islands and extend OF experimentation to wireless and optics
- Phase iii: Automate resource assignment and provide connections to other FIRE and non-European research facilities

Open Calls to extend facility & consortium will be published after M5 & M17
- Total budget €830,000 max. 200 K€ funding per experiment
- First closed March 30, 2011, 2 new partners
  - second call will close end of March 2012

Open Calls are be promoted through www.fp7-ofelia.eu and
- FIRE Station
- Standard communication channels (mailing lists, IEEE ComMag)
- Industry fora: Optical Internetworking Forum, Open Grid Forum

Timeframe of project phases
Gradual expansion of early operative facility
Promotion/implementation of open calls

i: Create islands on L2
ii: Connect islands and extend to wireless/optics
iii: Ressource assignment automatization and connection to other facilities

M7 M19

Asia-Pacific Advanced Network 32nd Meeting (APAN 32) New Delhi
Island equipment - phase 1 completed

**i2CAT**: 5x NEC switches model IP8800/S3640-24T2XW, 3x HP E3500-48G-PoE+ yl switches and 5x SuperMicro SYS-6010T-T servers.

**IBBT**: one NEC IP8800 /S364 0-48T2XVV-LW equipped with a 10G XFP, virtual servers. WiLab facility, a large-scale real-life wireless test environment. Virtual Wall facility.

**UEssex**: 4x Campus grade OpenFlow enabled switches (NEC), 3x Carrier grade Ethernet switches, 2x Virtex-4 FPGA boards, 5x Dell PowerEdge servers (OFELIA CF), ultra high definition video streaming/visualization, high capacity storage (10TB), 3-5 Openflow enabled soft switches, one cluster of physical servers

**ETH**: 3x OpenFlow switches NEC IP8800/S3640-24T2XW with two optical 10GBase interfaces (each of them), an Intel Quad-core processor with 4 GB of RAM PC to deploy FlowVisor

**TUB**: 5x NEC IP8800/S3640-48TWLW with 48 10/100/1000 BASE-T LAN interfaces and 4x SFP, one HP 5400 with a 24 port SFP module with 16x HP SFP MM-SX duplex transceivers, Rack-Server-PC for OpenFlow Controller

Star topology of dedicated links. Additional L2 links to Trento, Rome, Catania, and mesh links (e.g., Uessex⇔ i2CAT)
Phase 1 completed, additions for phase 2

- **New islands:**
  - Rome/Catania (Italy)
  - Trento (Italy)
- **Optical extension:**
  - UEssex: 3x ADVA FSP 3000 ROADMs, 1x Calient DiamondWave Optical Fiber Switch
- **Wireless extension:**
  - TU Berlin: Open Wireless Lab (BOWL) – Campus WLAN
  - IBBT Ghent: WiLab inhouse WLAN testbed
Control Framework based on eGENI’s *expedient*
- SFA-based (SFA-inspired...)
- *Expedient* is a web interface
- VT Plug-in: Expedient’s logic to communicate with VT AM.
- OF Plug-in: Expedients’s logic to communicate with Opt-in
- VT AM: Manage Virt. Servers
- Opt-in: Manage OpenFlow resources
- Agent: controls virtualization servers
Deployment diagram for phase 1/2
• **LDAP support.**

A centralized LDAP has been configured. OFELIA users register to the central LDAP, and can access in a unified way to the control framework and SSH VMs. SSH to VMs take into account users and slices.

• **Support for generic computer virtualized resources:**

  – A new Aggregate Manager component has been implemented to manage virtualized resources. Design ensures the support for multiple virtualization technologies.
  
  – Xen agent that:
    
    • Deals with VM networking configuration complexity (L2)
    • Deals with other VM configuration details (LDAP...)
  
  – Provides basic functionality (clone, start, stop, reboot), and monitoring
AdVisor: extension to FlowVisor, introduces topology virtualisation layer

Developed by Create-Net, Trento

Will be extended and integrated into OFELIA control framework in phase 2
What can an experimenter get from OFELIA?

• An experiment/slice consists of
  – A number of end points
    • Xen-based virtual machines, currently
  – OpenFlow access to a set of switches that connect the end points
    • User’s OF controller can be deployed on one of the VMs
  – Links between end points and switch ports
    • best effort (shared), mostly
    • Dedicated capacity will be available at least on some lines
Challenges: Use case
How to use OFELIA? – Step 1: register

http://www.youtube.com/watch?v=UgDcAPUTBUA
How to use OFELIA? – Step 2: set up a project

http://www.youtube.com/embed/Ie2zvpViFf8
How to use OFELIA? – Step 3: configure your experiment.

http://www.youtube.com/embed/QZIr07aEs-c
Conclusion

• Three invitations:
  – Participate in the next Open Call (deadline end of March 2012)
    • EU funding possible if you are from China or India (or Brasil, Russia)
    • Max 200.000€ funding for a reasonable extension of OFELIA
  – Use the facility and provide feedback
    • Be gentle, this facility is a free offer to be used by researchers all over the world, accept our usage policy (similar to PlanetLab)
    • It’s fresh and still quite shaky, but it works
  – The control framework software is free
    • Build your own OFELIA islands, connect over to us, develop further
• Instructions, Wiki, Videos, Open Calls, press releases, contact:

http://fp7-ofelia.eu