Status of OpenFlow research and test facilities in Europe

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Agenda

Software Defined Networks and OpenFlow

- Architectural Splits in Networking
- OpenFlow is one means to split the stack
- Current Status of OpenFlow, Standardization, alternatives

Research in Europe around OpenFlow (not complete!)

- FP7 SPARC, OFELIA

OFELIA: OpenFlow in Europe – Linking Infrastructure and Applications

- Project data: duration, partners, budget
- How to use the test facility
- Open Calls and invitation to collaborate

Software Defined Networks (SDN)

Currently, networks are hardware-defined

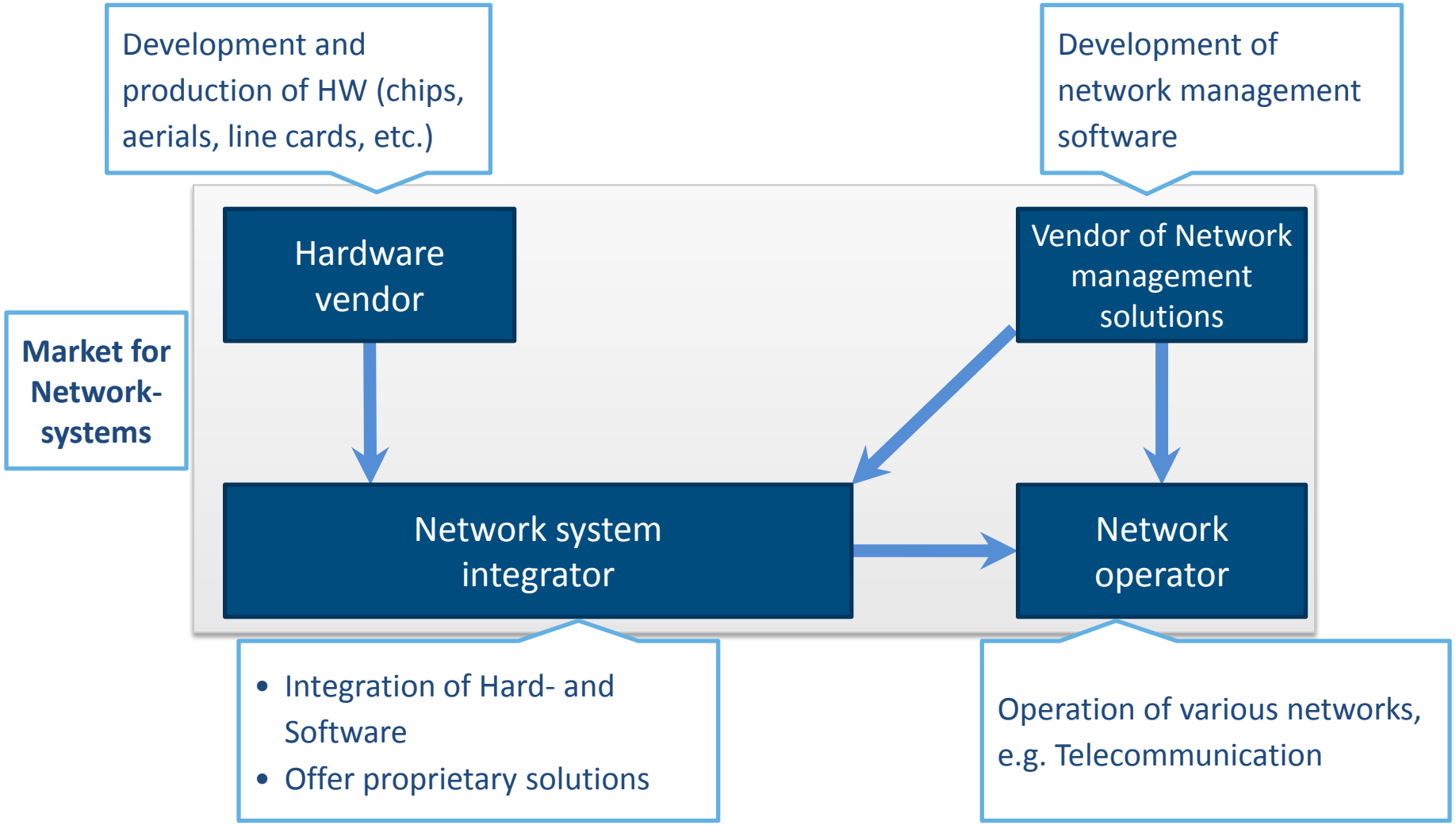
- Functionality comes in boxes: routers, switches, transmitters/-ponders,
- Added functionality comes in additional boxes: bulky, costly
  - Introduction of new protocols or applications is slowed
- New functions have to be deployed ***over the top***

When software *would* define the network

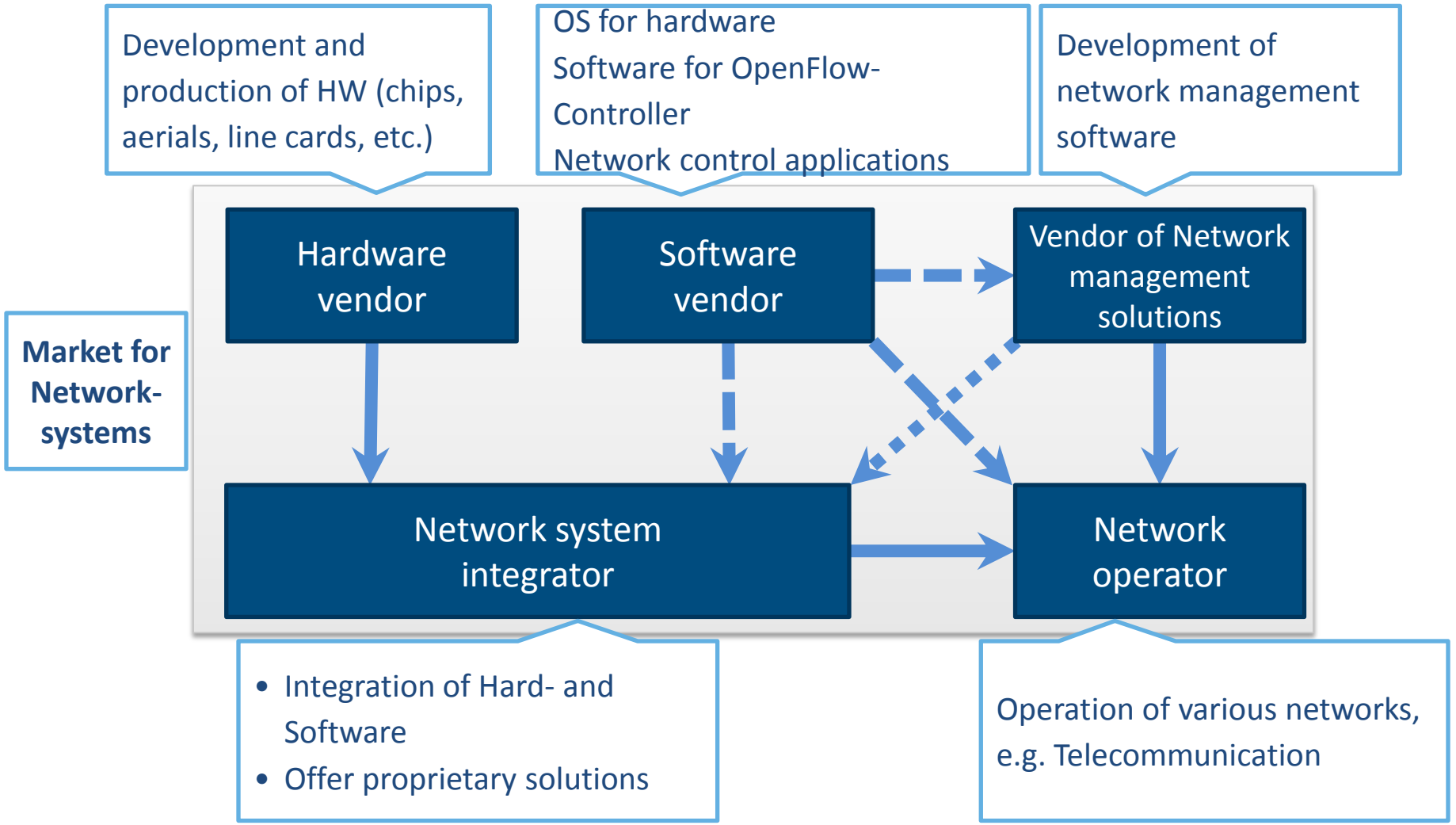
- Run on commodity hardware (larger quantities make it cheaper)
  - Network operating system can span hardware of different vendors and be carrier-specific
- New functions come with software updates
- New markets are opened
  - Vertical integration of hard-and software is broken up
  - The position of a Microsoft or Linux in networking is still open

Wishful thinking –
or a vision to work for!

Business scenario: Situation today. Integrators have a dominant market presence.



Business scenario.
A market for network software arises.



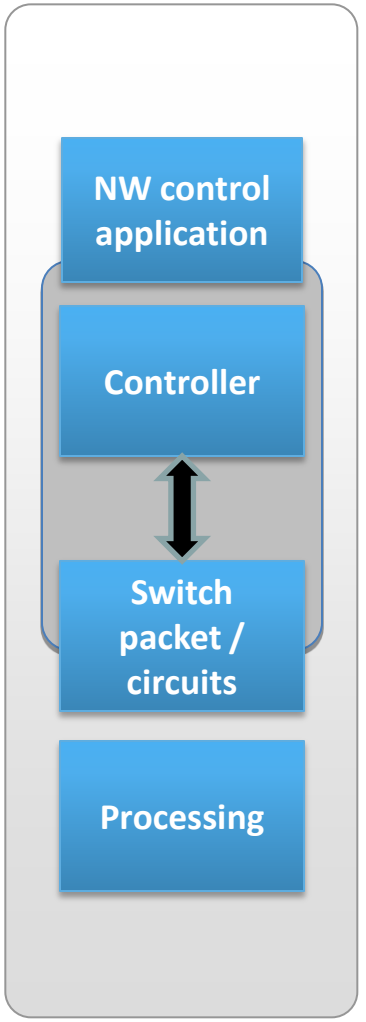
Architectural Splits in network architecture

Split architecture

- How to split the functionalities and software to enable flexible and cost efficient systems ?
- Is there a general control abstraction to cover multiple technologies?

Open Interfaces

- Is there an opportunity to build “routers and switches” based on open source software? How far can we go? How to change the system architecture to support it ?



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.

Timeframe of project phases

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

Gradual expansion of early operative facilty

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

Promotion/ implementation of open calls

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

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)

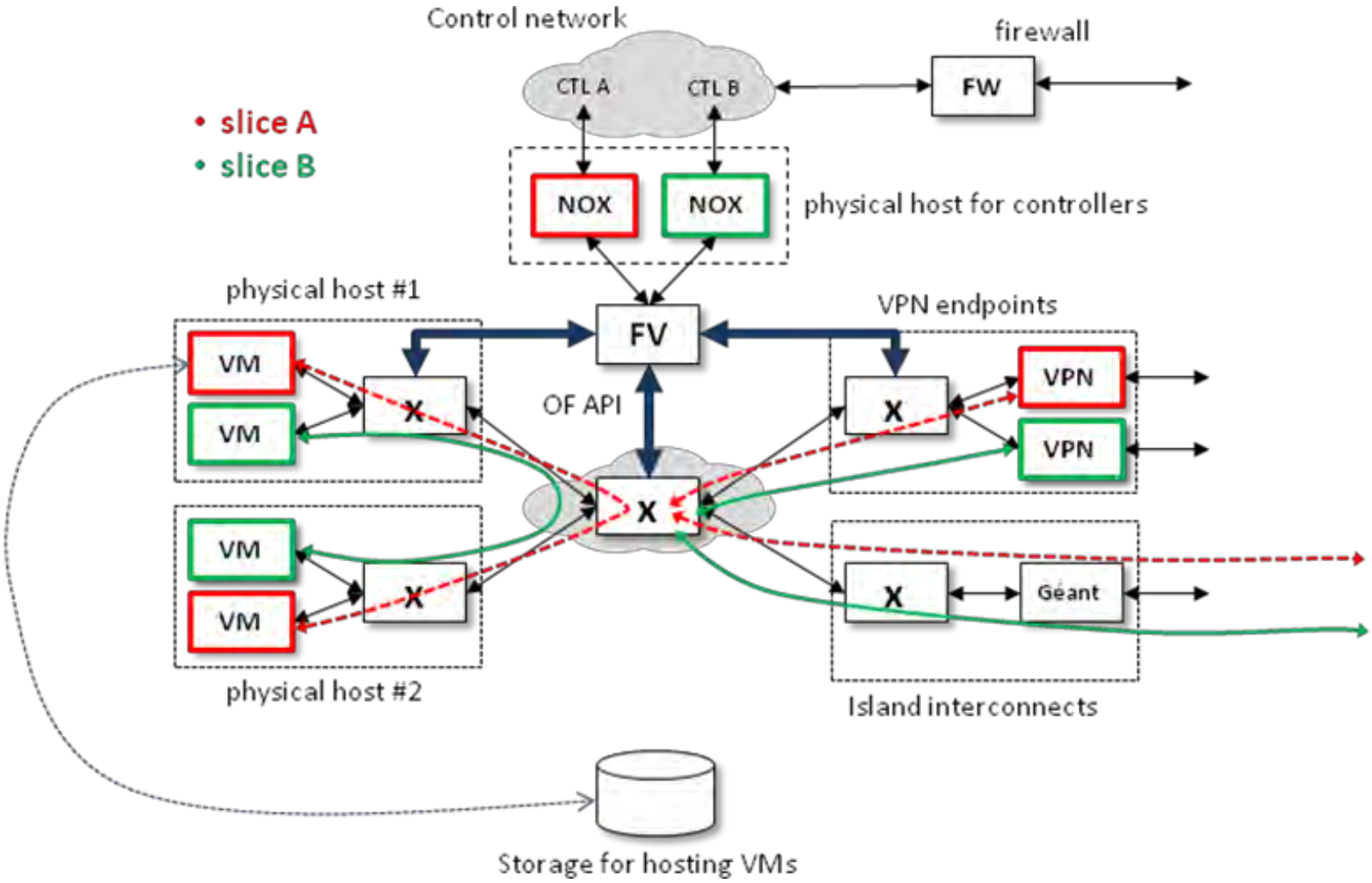
Phase 1 completed, additions for phase 2

- New islands:
  - Rome/Catania (Italy)
  - Trento (Italy)
- Optical extension:
  - UEssex: 3x ADVA FSP 3000 ROADMs, 1x Calient DiamondWave Optical Fiber Switch
- Wireless (mesh) extension:
  - TU Berlin: Open Wireless Lab (BOWL) – Campus WLAN
  - IBBT Ghent: WiLab inhouse WLAN testbed

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



Conclusion

- Three invitations:
  - Participate in the next Open Call (deadline March 28, 2012)
    - EU funding possible if you are from South Africa
    - Max 200.000€ funding for a reasonable extension of OFELIA
    - Target ~5 proposals 100K€ each
  - 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
    - Last licensing issues open (GPL vs. BSD-like), contact me for further information

More information

- Instructions, Wiki, Videos, Open Calls, press releases, contact:

http://fp7-ofelia.eu