



ALIEN

Abstraction Layer for Implementation of Extensions in Programmable Networks

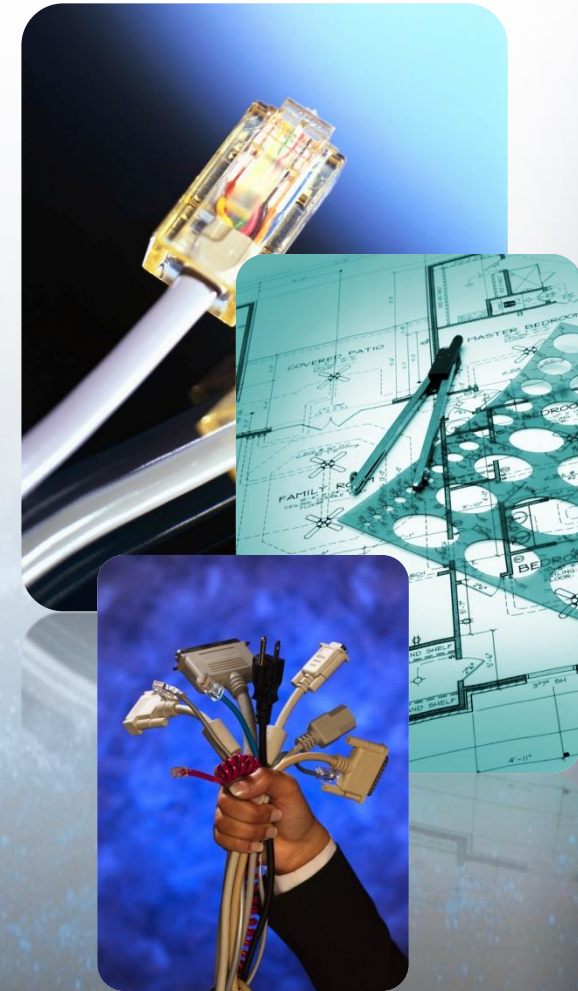
Deliverable D1.1 – Project Presentation

EXTENSIONS IN PROGRAMMABLE NETWORKS

October 2012

Problem Statement

- OpenFlow is a relatively new technology. Still not supported in a number of network equipment
- Variety of network solutions available on the market causes problems with the definition of common network abstractions
- Current approaches for network control planes are mainly based on distributed models (e.g. ASON/GMPLS or MPLS)



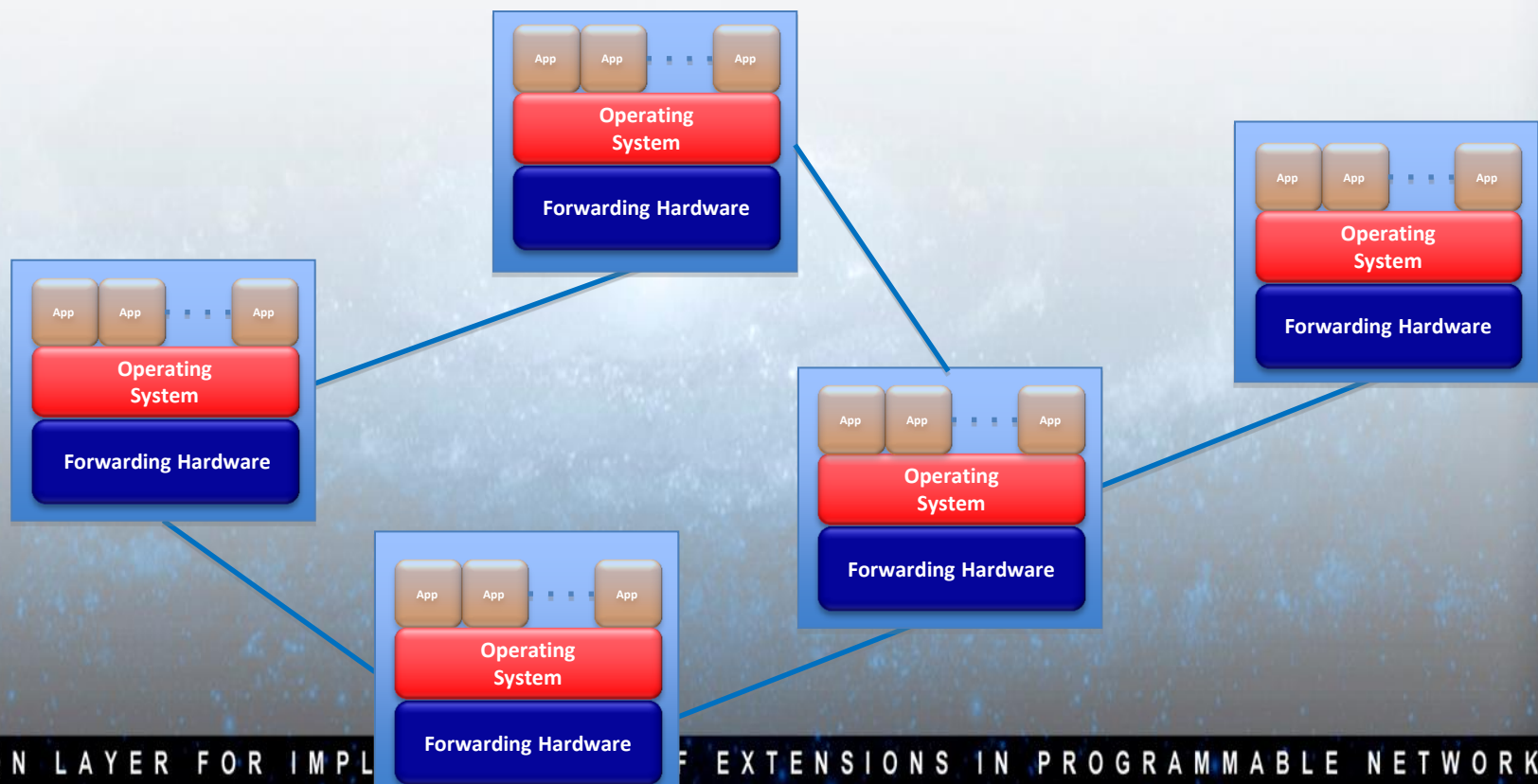
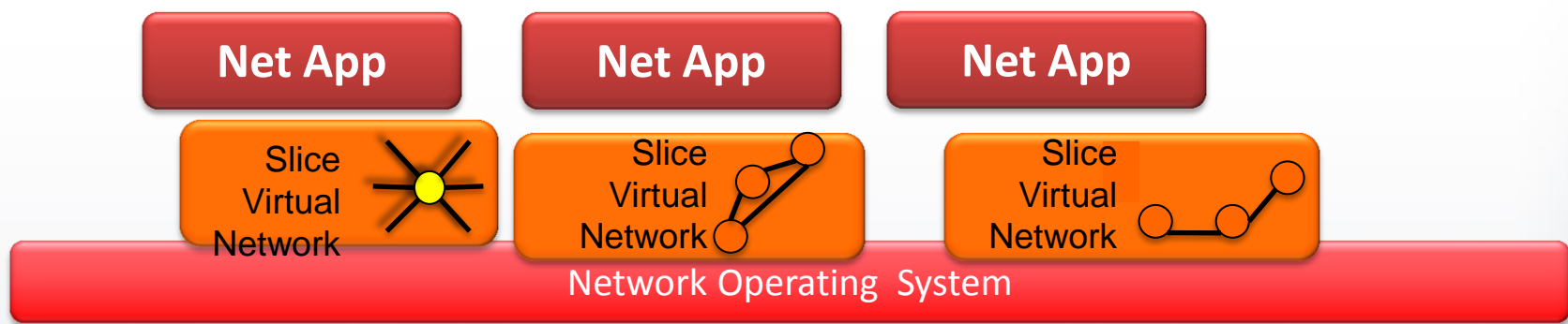
Challenges

- **Upgrading network infrastructure with new OpenFlow compatible hardware**
 - Incompatibility issues (remaining hardware vs new hardware; OF versioning)
 - Affects network management, in a consequence may increase OPEX factor
- **OpenFlow design and implementations are frames and packets network oriented specific**
 - The protocol initially was intended to simplify management and control of frame switching hardware (i.e. L2 switches)
 - Easily adopted also to IP networks (RouteFlow project)
 - Protocol extensions for L1 optical networks are nowadays considered as a hot research topic, but still not finalized with standards (but: WG @ONF)

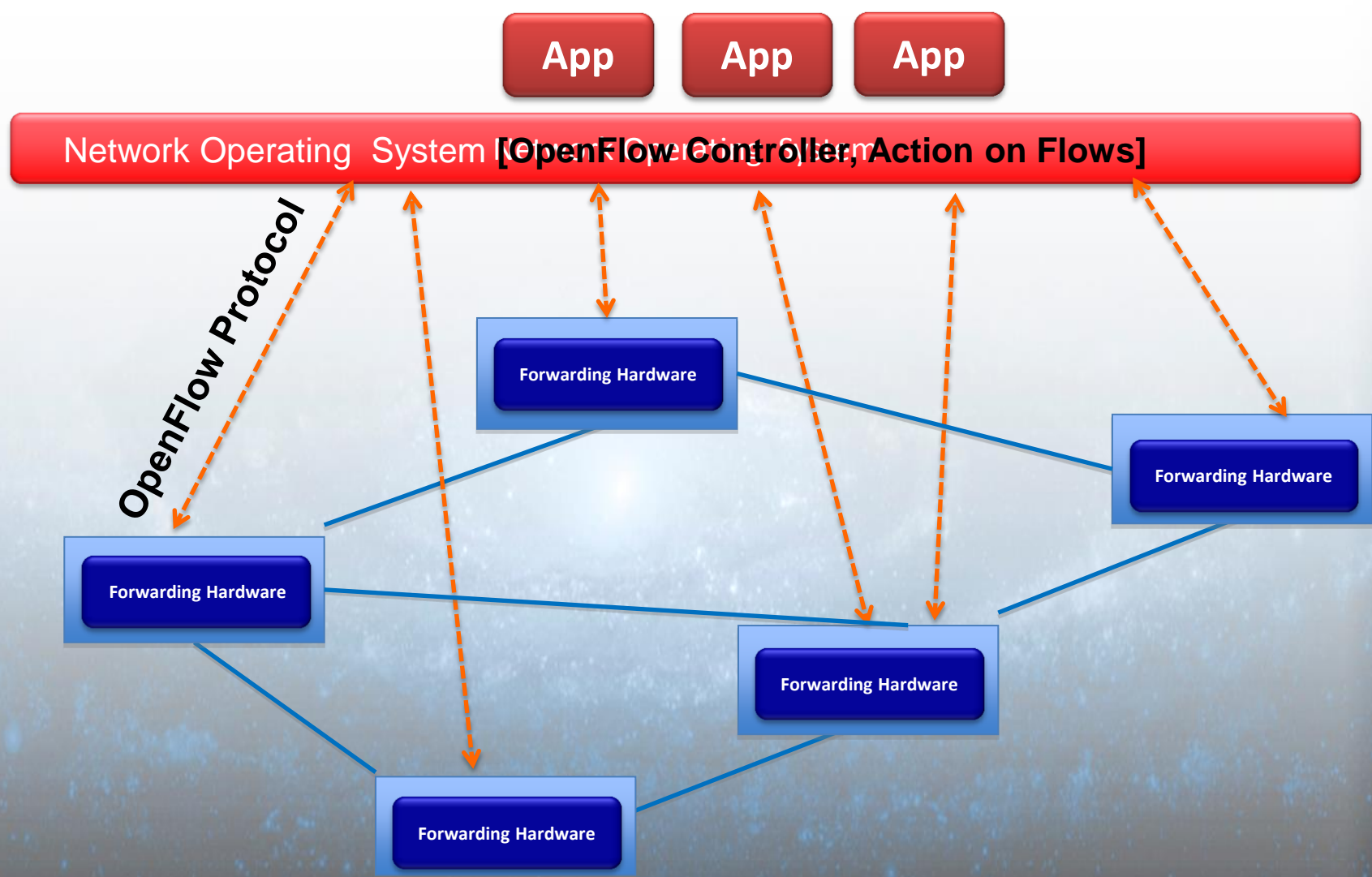
Challenges (cont.)

- **SDN architecture is still evolving**
 - OpenFlow plays an important role in SDN, but:
 - OF versioning (new features, incompatibility between OF versions)
 - The scope of network virtualization, a natural property of OF-based architecture, should be re-considered and re-shaped, taking into account capabilities introduced by new, non-OF hardware

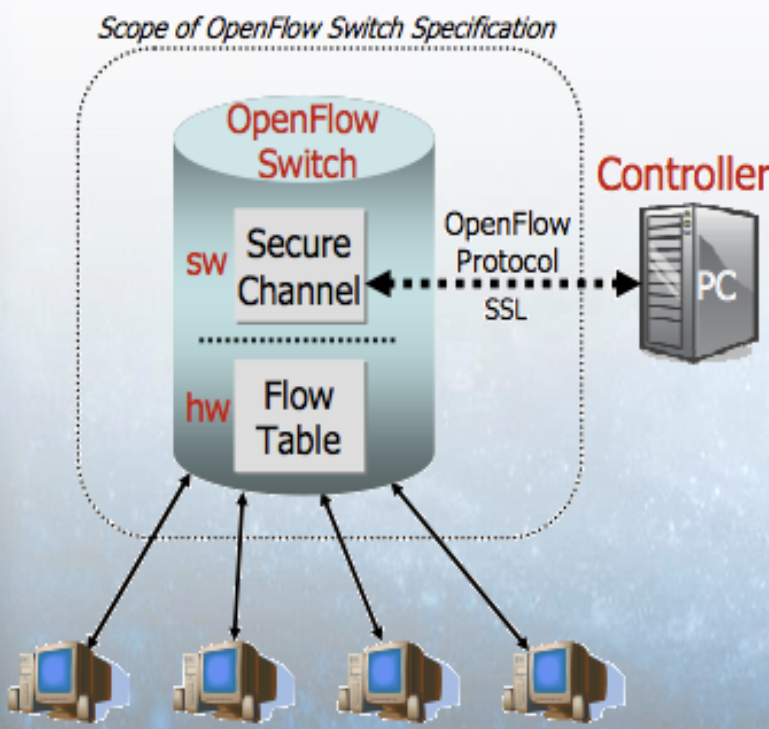
What is SDN?



OpenFlow - an enabler for SDN



OpenFlow concept for packet networks



Rule	Action	Stats
		Packet + byte counters

- 1. Forward packet to zero or more ports
- 2. Encapsulate and forward to controller
- 3. Send to normal processing pipeline
- 4. Modify Fields
- 5. Any extensions you add!

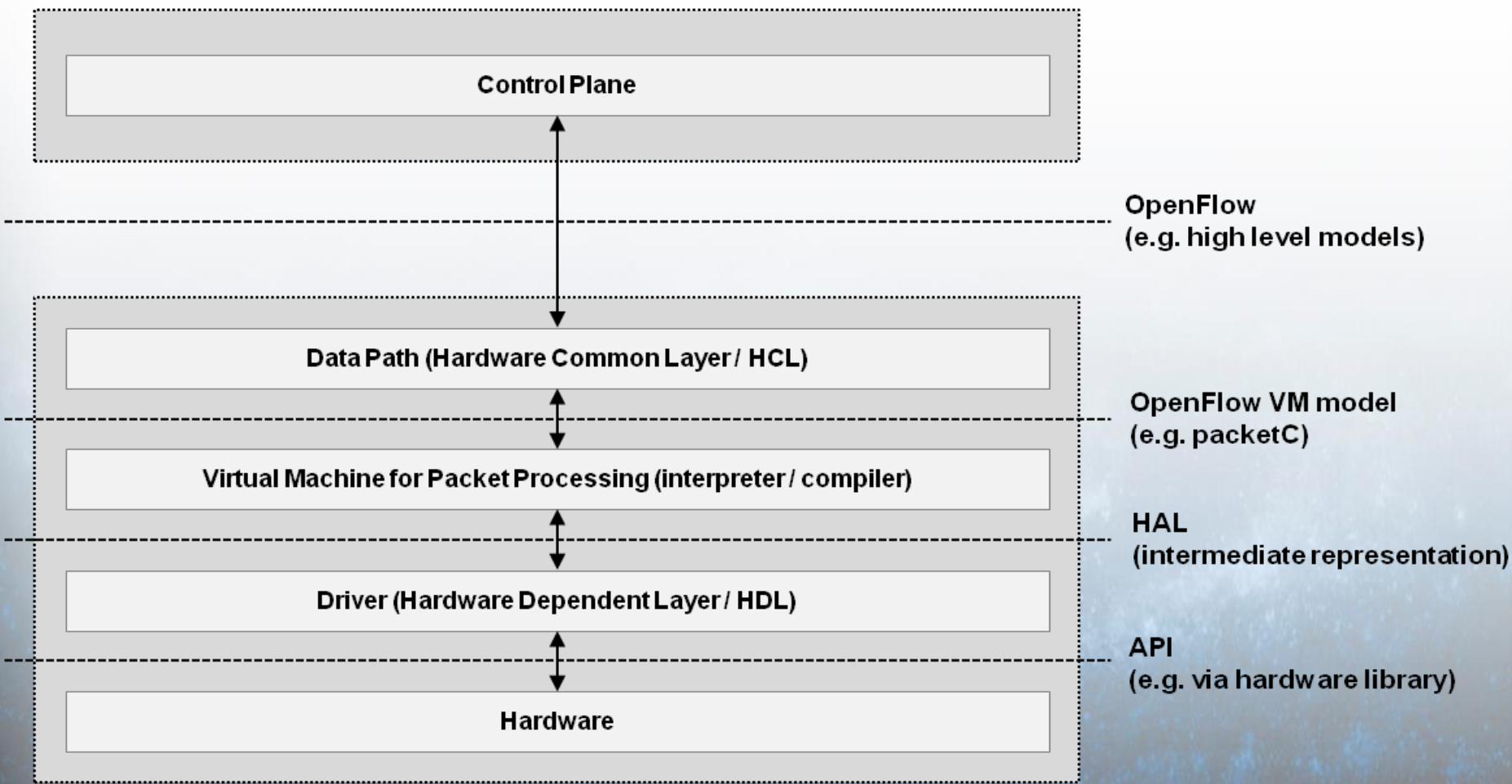
Switch Port	VLAN ID	VLAN pcp	MAC src	MAC dst	Eth type	IP Src	IP Dst	IP ToS	IP Prot	L4 sport	L4 dport
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+ mask what fields to match

ALIEN Approach

- ALIEN ambition is to develop an OpenFlow based programmable network architecture over non-OpenFlow capable hardware
 - ALIEN by providing a novel concept of **Hardware Abstraction Layer** enables non-OpenFlow platforms (aka “alien hardware”) to participate in network experiments and behave as standard Open Flow switch to control and management layer residing on top of the physical infrastructure
- Alien hardware is any type of network hardware that doesn't support natively OpenFlow:
 - Packet switching equipment: e.g. traditional L2 packet switches without OpenFlow support,
 - Non-packet switching equipment: e.g. optical switches, EPON devices,
 - Packet processing and monitoring equipment: e.g. FPGA cards, network processor,
 - CATV equipment: e.g. HFC modems.

Do we need a common Hardware Abstraction Layer?



Network Abstractions @standardization bodies

Industrial perspective

- ONF: Forwarding Abstractions Working Group
 - dedicated to accelerating the innovation and availability of OpenFlow on hardware forwarding targets such as ASICs, NPUs, and network flow processors

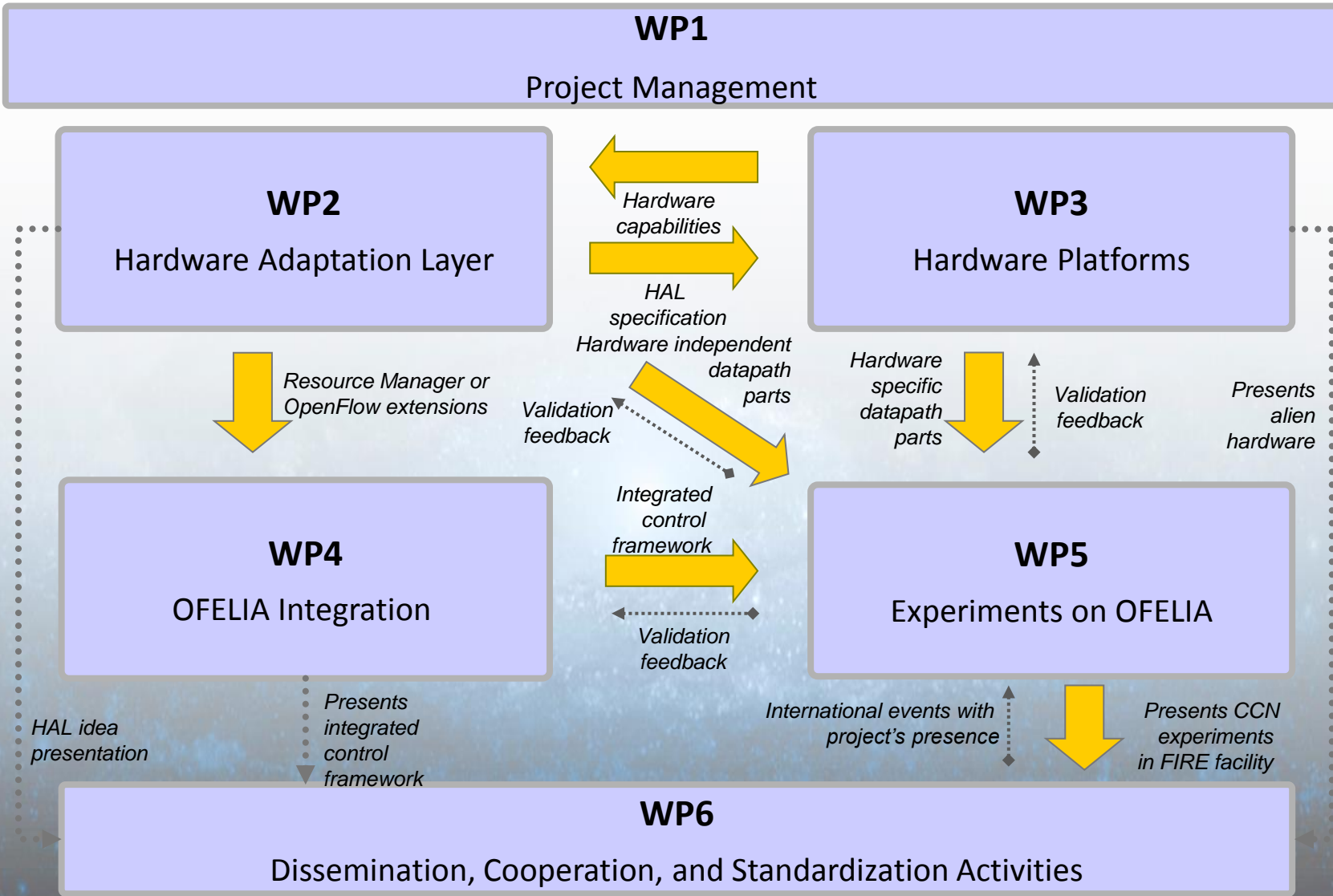


Academic perspective

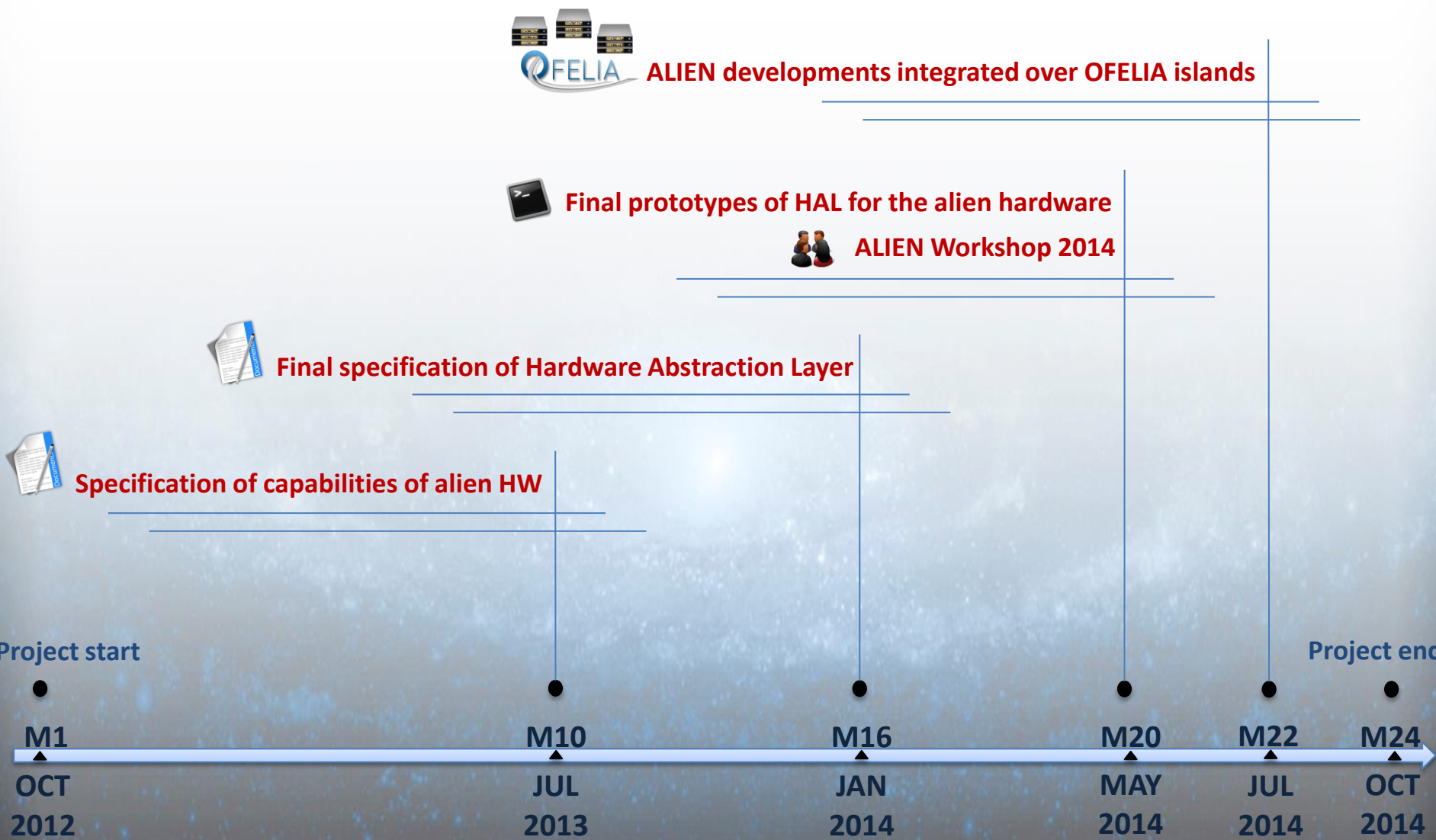
- OGF: Network Markup Language workgroup
 - standardizes a data format for topology description (e.g. Network Description Language – NDL)



Project Implementation



Project important milestones



Expected results



Hardware Description Language that can facilitate uniform representation of any type of alien hardware and their capabilities

- Analogy to OpenCL, Google's LLVM or Java VM Intermediate Representation



Hardware Abstraction Layer which together with the proposed Hardware Description Language can interface with different type of alien hardware and can hide their complexity as well as technology and vendor specific features from OpenFlow control framework



Extensions to the current Open Flow protocol and architecture to support new network technologies (including L0/L1/L2) and non-OF compliant equipment:

- the new flow concept
- the generic flow action i.e. switching, processing and monitoring to be performed on new flow concept

ALIEN at a glance

ALIEN – Abstraction Layer for Implementation of Extensions in Programmable Networks

- Project web site: <http://fp7-alien.eu/>
- Project start: 1st October 2012 for 24 months
- Budget (requested contribution): 1 450 000,00 €
- Project type: STREP (FIRE)
- Consortium: 8 partners from EU

- PSNC
- CREATE-NET
- EICT
- DELL
- PUT
- UCL
- UNIVBRIS
- UPV/EHU





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