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NFV ACCELERATION INTRODUCTION

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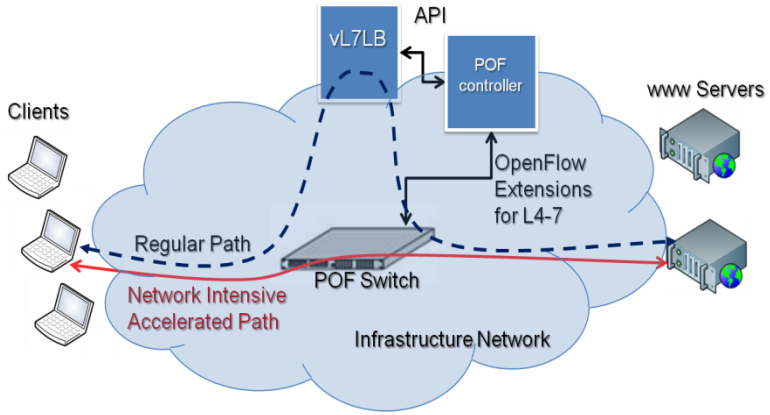
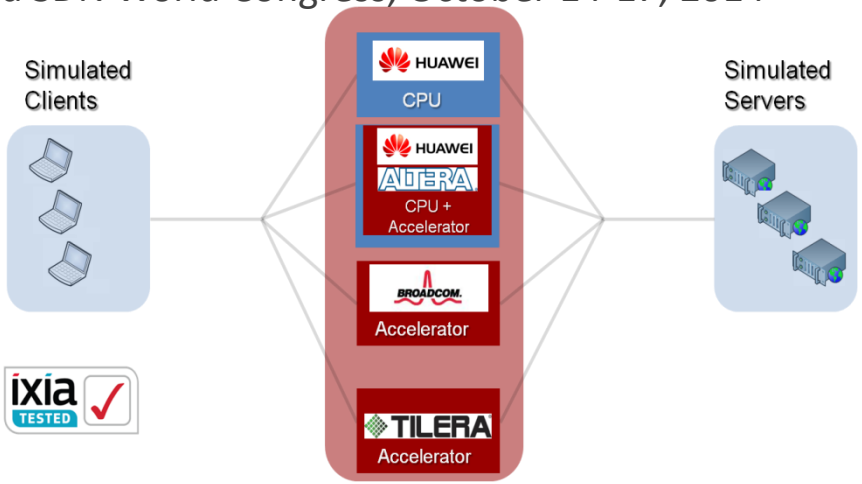
Some History
- Why Acceleration is Beneficial to NFV

- PoC#21 - Network Intensive and Compute Intensive Hardware Acceleration
  - ETSI NFV PoC zone at Layer 123 OpenFlow and SDN World Congress, October 14-17, 2014



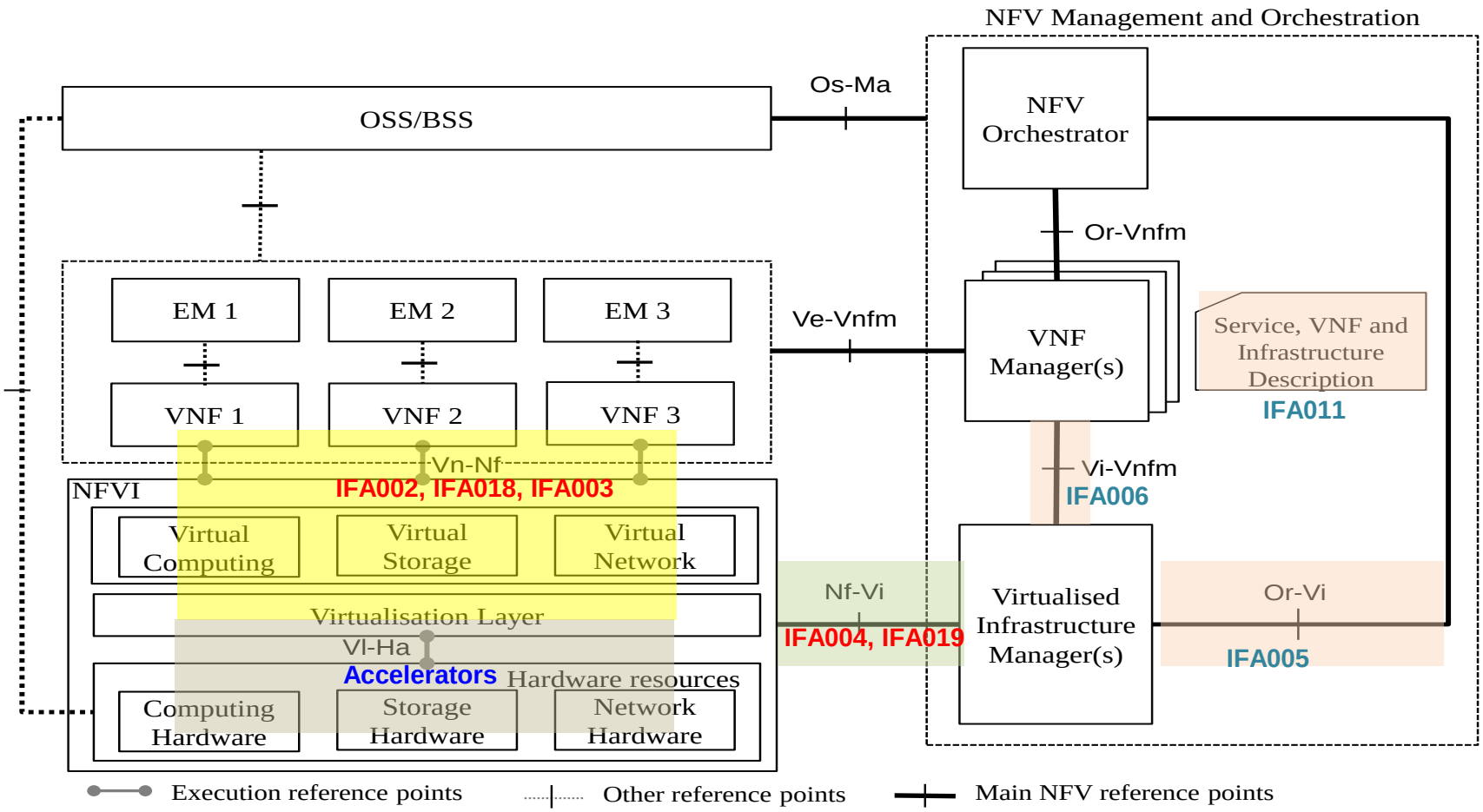


Objective:	Layer 7 Load Balancer
Description:	Demonstrates the benefits of Network Intensive acceleration by rerouting load balanced traffic to a switch using SDN principles
Results:	1) Decreases VNF CPU utilization by 50 - 90% 2) May decrease traffic to server (when accelerated by infrastructure switch as opposed to server NIC) 3) Demonstrated throughput delivered by VNF increased from 40MB/s to 300-1000MB/s
Lessons & Recommendations	The benefits of network intensive acceleration are significant but the solution is not yet standardized and requires extensions to OpenFlow to enable VNFs to benefit from this functionality.

Objective Id:	IPsec
Description:	Demonstrates the benefits of accelerating compute intensive functions using IPsec gateway and accelerating authentication and encryption/decryption
Results Details:	Authentication acceleration 1) Increases transaction rates per server from 160 sessions/s to few thousands sessions/s. Encryption/Decryption acceleration 1) Frees CPU resources 2) Allowing other VNFs to utilize the CPU resources 3) Can support throughput near line rate at 10-30Gbit/s
Lessons & Recommendations	VNF APIs to hardware acceleration through standards or open source is necessary to enable portability

NFV Reference Points related to Acceleration

- Focus on the features and interfaces for the accelerators inside NFVI



Acceleration GS (Release#2)

- Acceleration Use Cases (IFA001) provides an overview of NFV acceleration including an acceleration framework, and a set of acceleration use cases.
  - *http://www.etsi.org/deliver/etsi_gs/NFV-IFA/001_099/001/01.01.01_60/gs_nfv-ifa001v010101p.pdf*
- Acceleration Interfaces (IFA002) specifies requirements for abstract interfaces enabling a VNF to leverage acceleration services from the infrastructure.
  - *http://www.etsi.org/deliver/etsi_gs/NFV-IFA/001_099/002/02.01.01_60/gs_NFV-IFA002v020101p.pdf*
- vSwitch Benchmarking (IFA003) specifies performance benchmarking metrics for virtual switching, with the goal that the metrics will adequately quantify performance gains achieved through virtual switch acceleration
  - *http://www.etsi.org/deliver/etsi_gs/NFV-IFA/001_099/003/02.01.01_60/gs_nfv-ifa003v020101p.pdf*
- Acceleration Resource Mgt. (IFA004) describes requirements for the infrastructure and NFV management entities, from the perspective of acceleration resource management.
  - *http://www.etsi.org/deliver/etsi_gs/NFV-IFA/001_099/004/02.01.01_60/gs_NFV-IFA004v020101p.pdf*

IFA001 – Acceleration Use Cases

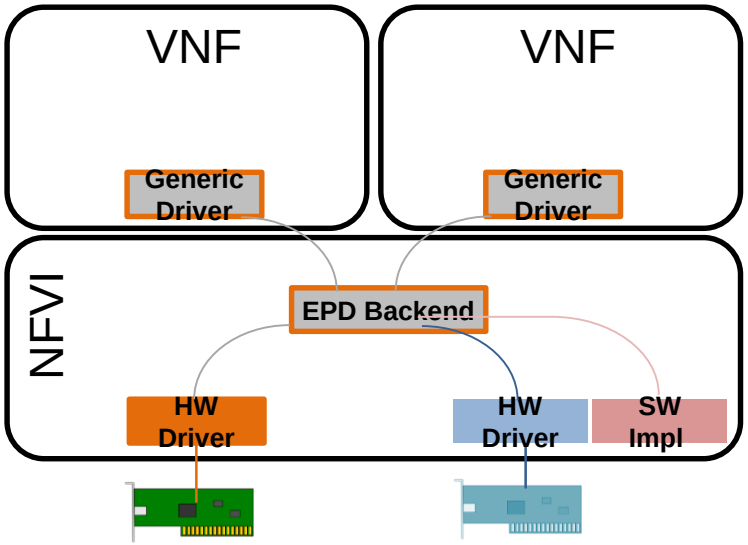
- Accelerator taxonomy
  - Type: look-aside, inline, fast path, etc.;
  - Location: integrated CPU, iNIC, network / bus attached, memory slot, etc.;
  - Functionality: compute intensive, packet processing, storage, etc.;
- Compute acceleration cases
  - IPSec tunnelling
  - Trans-coding
  - DPI
  - L1 acceleration for VBS
- Network acceleration cases
  - Load balancing and NAT
  - Dynamic optimization of Packet Flow Routing
- Storage acceleration cases

Acceleration GS (Rel#2 Cont. and Rel#3)

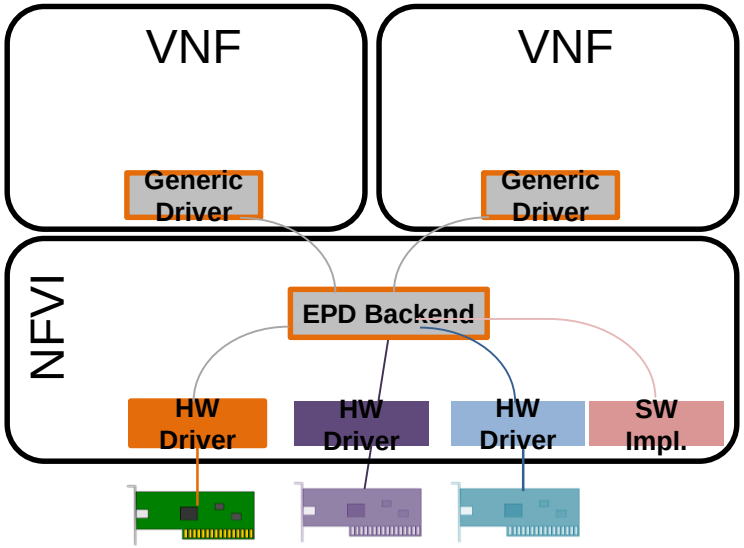
	Focus	Status	Related IFA GS
IFA002ed221	A set of interface specifications in the form of message flows and information elements fulfilling the requirements specified in v2.1.1	V2.1.5	IFA015 (IM Report) IFA017 (UML Guide)
IFA018	Message flows and information elements on the interface between the VNF and allocated switch controlled by the VNF	V0.2.0	IFA015 (IM Report) IFA017 (UML Guide)
IFA019	Message flows and information elements on the interface used for acceleration resource management (fulfilling the requirements specified in IFA004)	V0.1.0	IFA005 (Or-Vi) IFA006 (Vi-Vnfm) IFA010 (Or/Vi/Vnfm req.) IFA011 (VNFD) IFA015 (IM Report) IFA017 (UML Guide)

IFA002 Challenges & Key Technologies - Abstract Model for Acceleration

- NFVI (e.g. hypervisor domain) exposes acceleration capabilities to VNF through Extensible Para-virtualised Devices (EPD).
- EPD allow execution of NFVI provided plug-in to allow for acceleration abstraction.



Operator ensures its NFVI is loaded with relevant hardware drivers



Operator update its NFVI to benefit from new hardware (accelerator)

IFA002 Challenges & Key Technologies - Detailed Interface Specification

- Acceleration Interfaces Requirements
  - Common requirements
    - Channel: multiple channel control; unidirectional / bidirectional; synchronous / asynchronous;
    - Accelerator: read capabilities, capacities, statistics; send and read configuration; state transfer;
  - Functional specific requirements
    - Support acceleration of crypto operation such as IPSec / SSL / TLS / HTTP2 / SRTP, crypto functions, algorithms, random number / key mgt.;
    - Support offloading network functions like IPSec, NAT, TCP, VxLAN, QoS;
    - Support acceleration of video / audio operations, e.g. trans-coding, codec, mixing;
    - More functions like Storage, RDMA, re-programmable computing … …;
- Acceleration Interfaces Information and Data Modelling (on-going work!)
  - Sequence Diagrams & Lifecycle
  - Information & data modelling

Call for more contributors

IFA018 Key Technologies

- Motivation:
  - Designing an abstract Interface used by the network-intensive functions to control/configure the accelerator in a uniform manner.
- Scope:
  - The abstract Interface is self-adaptive to different network-intensive functions as its semantics.
  - The abstract Interface allow the VNF to offload its data plane to the accelerator, and enable transparent network acceleration to the VNF (independent of accelerator vendor and type)
- Content:
  - Defining the message flows between the abstract interface and the information elements exchanged.

Call for more contributors

New PoC: Network Function Acceleration with Resource Orchestration

- Motivation:
  - This PoC focuses on the hardware acceleration in the NFV Infrastructure with dynamic acceleration resources management.
  - demonstrating the benefits of using management API to enable MANO to manage acceleration resources and benefits using universal API to enable VNF to control its data plane in a uniform manner.
- Content:
  - vIPSec Cryptograph acceleration with resource management.
  - vBNG data plane offloading acceleration.
  - vCPE service-function-chain acceleration.
- Timelines:
  - Submitting PoC proposal to NFV TST: Sep/Oct, 2016
  - vIPSec: Mar, 2017
  - vBNG: June, 2017
  - vCPE: Sep, 2017

Still open to more participants

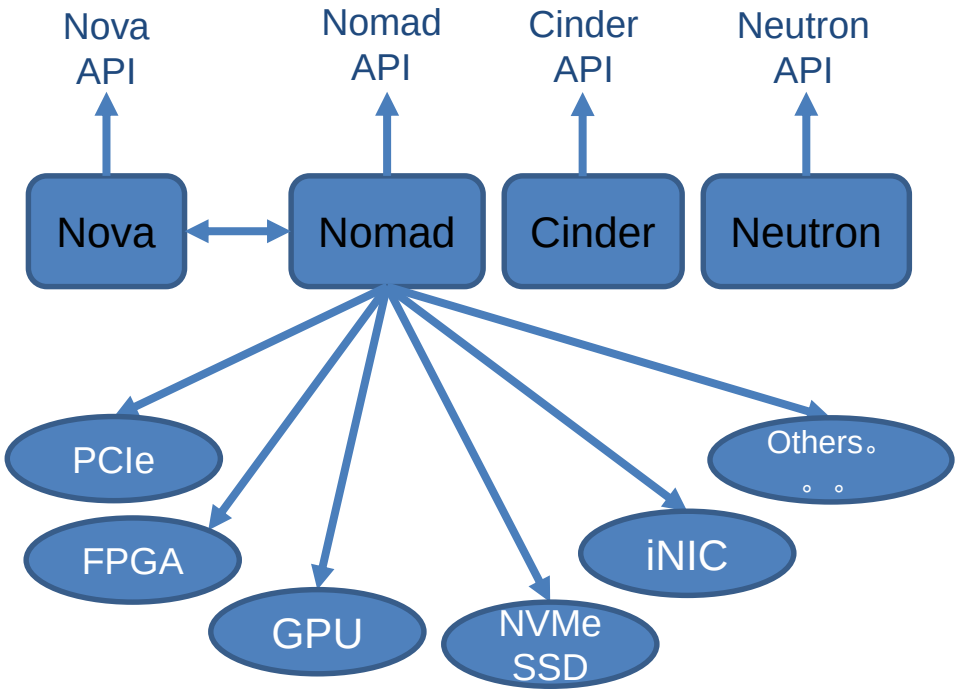
IFA019 Key Technologies

- Motivation:
  - Standardizing the Nf-VI interface regarding NFV acceleration management to facilitate the functionalities defined in IFA004.
- Scope:
  - The information elements of Nf-Vi interface regarding NFV acceleration management will be defined.
  - The functionality which includes accelerator life cycle management provided by the acceleration management function within VIM to the acceleration agent function within NFVI will be defined.
- Content:
  - Defining the message flows between the abstract interface and the information elements exchanged.

Call for more contributors

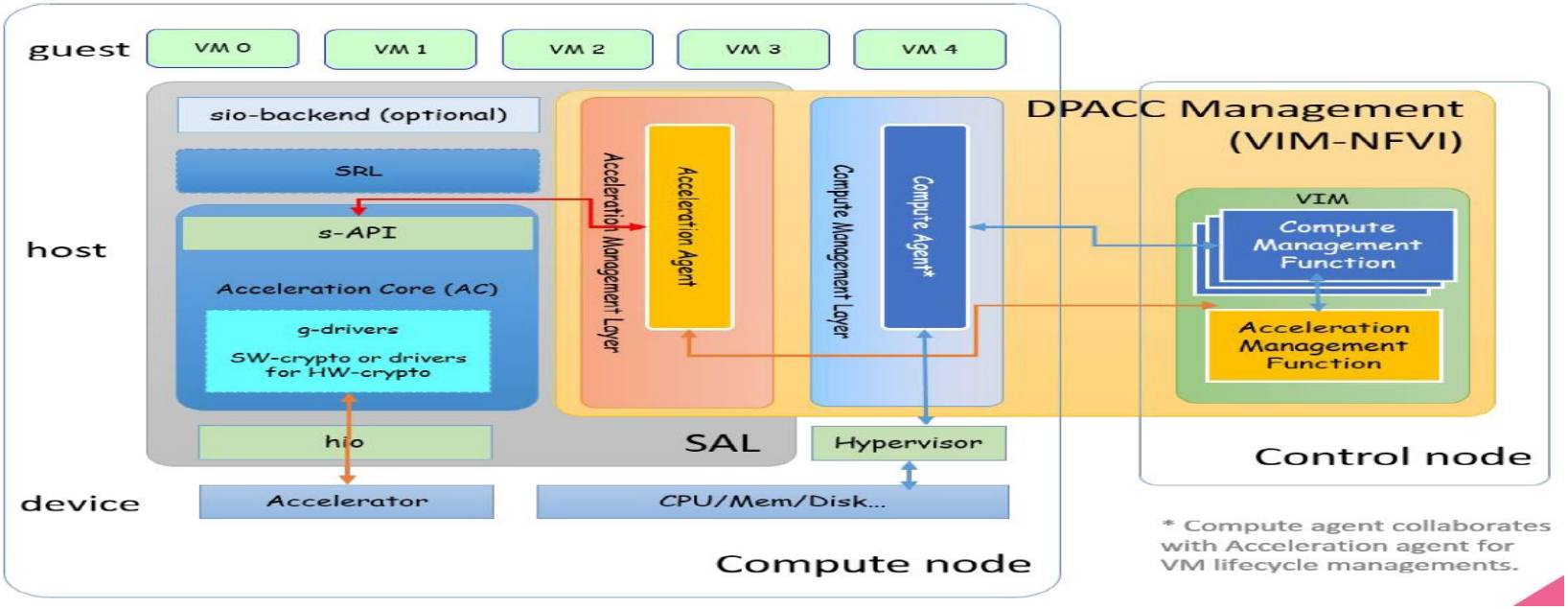
Collaboration with Open Source Communities

- Collaboration with Nomad project in OpenStack
  - Nomad is a new project in OpenStack which aims to provide a unified service framework for distributed accelerators. It is established based upon the work in IFA004 and IFA019, meanwhile extends the scope beyond NFV.



Collaboration with Open Source Communities

- Collaboration with DPACC project in OPNFV
  - DPACC is a requirement project that focus on the data path acceleration. In its current release, IFA004 is used as high level requirements. In future release D, DPACC will integrates Nomad projects as its upstream projects which means it will also includes IFA019 as part of requirement.



Encourage Acceleration Technologies

- Adopt standard + open source as a good way forward
  - Standard specs in ETSI ISG NFV + Open source implementations in OPNFV / OpenStack / etc.;
  - Same team participates in both communities;
  - Needs to enhance such interaction to make sure alignment and continuous improvement;
- Need to build more connections with other communities
  - Wider adoption of acceleration technologies in NFV environment;
  - Inter-operability based on specs;
  - More input from other communities to improve the quality of specs;

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More information:

NFV Technology Page (information)
http://www.etsi.org/technologies-clusters/technologies/nfv

NFV Portal (working area)
http://portal.etsi.org/portal/server.pt/community/NFV/367

NFV Proof of Concepts (working area)
http://www.etsi.org/technologies-clusters/technologies/nfv/nfv-poc

Open Area:
Drafts http://docbox.etsi.org/ISG/NFV/Open/Drafts/
Issue tracker http://nfvwiki.etsi.org/index.php?title=NFV_Issue_Tracker