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# Predictive Fault and Performance Management for Carrier Grade Reliability and Availability of Virtual Network services on Multiple clouds

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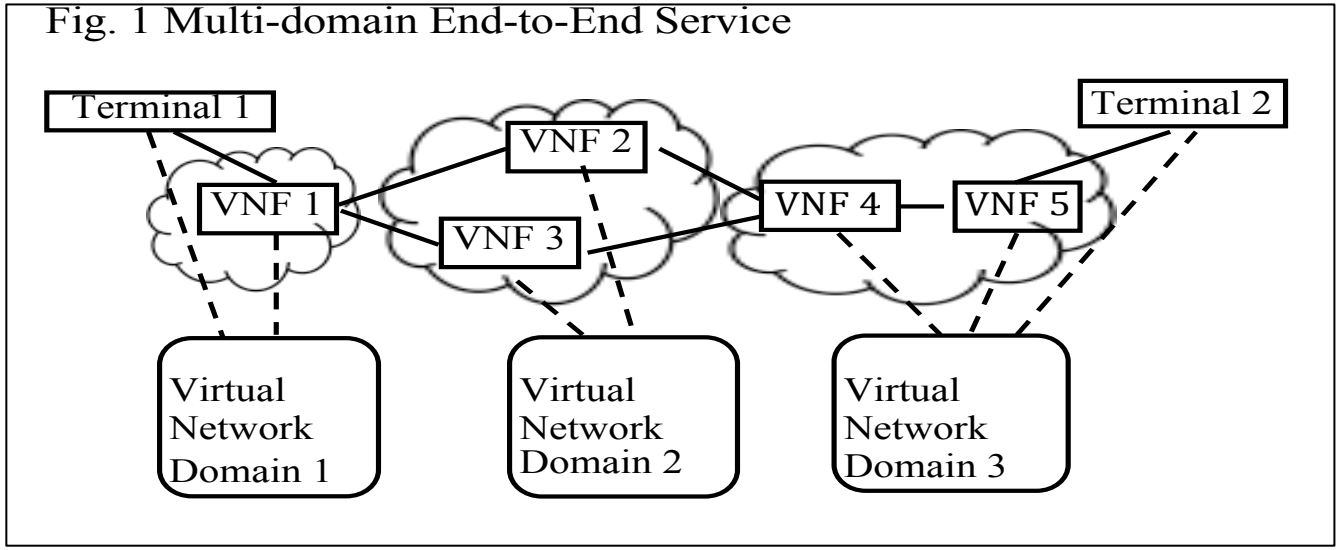
# Motivation for this contribution

- Cloud technology is reaching maturity for IT applications.
- Virtualization techniques can be applied to telecommunications network functions – in both data and control planes.
- Current network maladies reduce flexibility and increase cost
- Virtualizing network services over multiple clouds brings the promise of obliterating or mitigating these maladies.
- However, service providers' networks have stringent reliability and availability requirements.
- And in virtualized services FCP issues have complex geneses and cannot be effectively handled by traditional rule bases systems.
- Therefore, a standards based robust fault and performance handling mechanism is required to assist service providers.

# Inter-relation among VNFs, SFC and VNS

1. ETSI specifications and IETF RFC**
   Virtual Network Functions (VNF) → Service Function Chains (SFC) → Virtual Network Services (VNS)




2. VNFs are hosted on virtual machines (VM) instantiated over physical data center and network resources.

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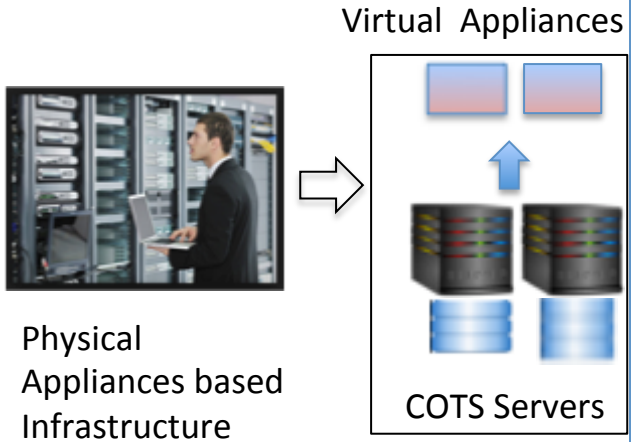
* ETSI GS NFV 002 V1.1.1 – 2013  ** RFC 7665 - 2015

# Why virtualize services?

- Virtual network services' deployment are expected to bring a number of benefits over traditional deployments using physical applicances:
  - Freedom from proprietary hardware and software
  - Flexibility of obtaining resources
  - Ease of scaling and descaling
  - Ease of redeploying resources
  - Ease of deploying new services
  - Risk mitigation
  - Reduced total cost of operation.



## Use Case – Telecommunications Networks over Multiple Clouds

- Telecommunications networks are distributed, dynamic and real time.
- Virtualization over multiple clouds adds advantages like reduced risk of total failure, closer PoPs and resource availability.
- Such deployments introduce complexities beyond well studied IT services where problems can be traced to virtual machines or the physical infrastructure underlying virtualization.
- In VNS, the VNFs may themselves randomly malfunction in addition to the already existing complexities.
- Fault and performance management in cloud based telecommunication networks (VNS) is not amenable to traditional methods.

# Challenges in NFV over multiple clouds

- In traditional networks standards relating to fault, configuration, accounting, performance and security (FCAPS) are embodied in ISO Common Management Information Protocol (CMIP) and ITU TMN M.3010 and M.3400 recommendations. Network management based on relevant standards provides five nines availability and carrier grade reliability.
- Some of the key challenges in NFV over multi-clouds are as follows:
  - Absence of an FCAPS framework
  - Non-applicability of traditional techniques used in today's networks
  - Multiple layers of implementation: physical infrastructure, NFVI (Virtual Machines), Virtual Network Functions (VNF) and Virtual Network Services.
  - Massive distribution of network functions over disparate clouds
  - Multiple control centers: cloud management systems, operators' OSS/BSS and NFV-MANO

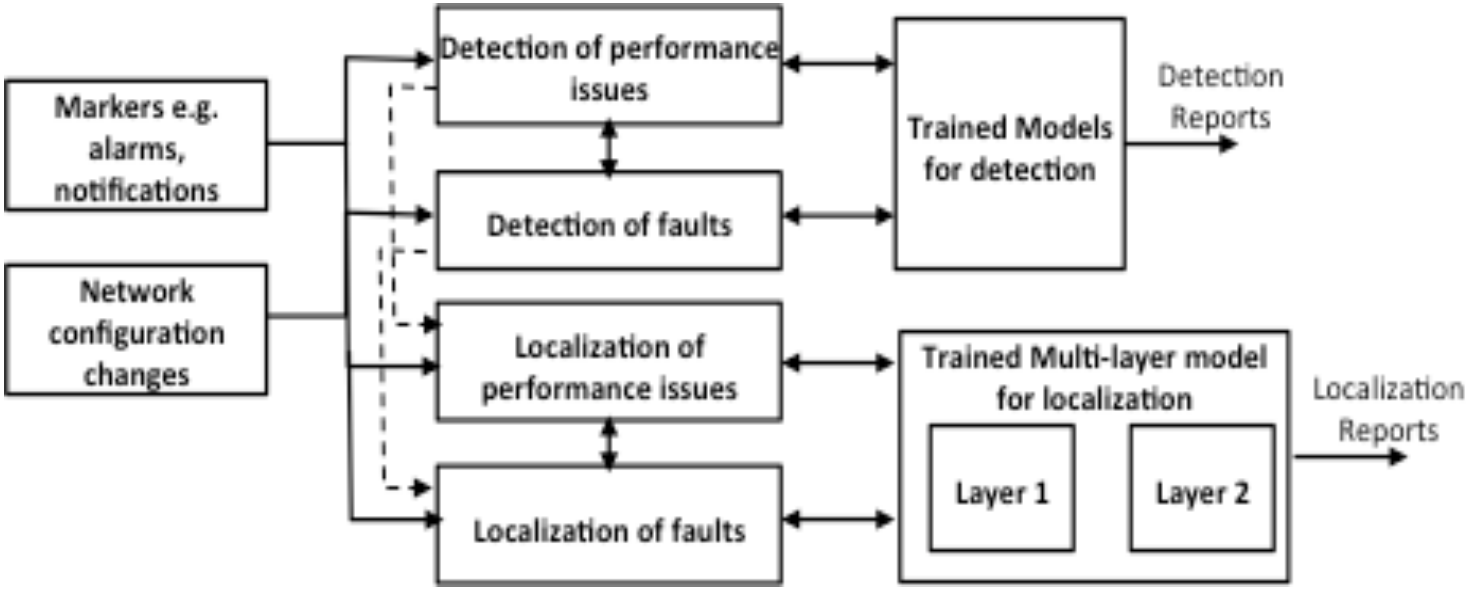
# FCP Framework

The FCP system should be able to identify potential performance hazards or may result in a fault that would require resources to rectify.

1. FCP detection - The goal of FCP detection would be to sense and notify impending or actual fault and performance issues.

2. FCP Identification and localization of manifest and impending faults – The goal would be to determine the root cause of the problem by identifying the resources that are malfunctioning or the severity with which they may malfunction in the future.

# The Proposed Model




1. The proposed model has predictive and deductive properties to meet the FCP requirements.
2. Decision about impending faults is taken using various markers and trained models.
3. Deeper structures are required to assess severity of the impending faults.

# Conclusion

- A standard framework is required akin to traditional networks.
- The proposed framework may be taken into account in the standardization work plan of future networks involving end-to-end management of cloud computing.
- After inclusion of the work item more details will be shared with the members which can be collaboratively elaborated.

# Thanks for your attention