

Intelligent Monitoring of Virtualized Services

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OUTLINE



Introduction

- Interactive TV services
- Virtualized Resources



The Proposed Framework

- High Level Description
- Intelligent Monitoring



Implementation

- Setup
- Key Performance Indicators



Evaluation & Conclusion

- Description of outcomes



Introduction

- Future networks are expected to involve numerous heterogeneous devices
- Interactive TV (iTV) applications are of great importance
- Such applications are characterized by increased traffic and continuous changes in the service demand

Intelligence

Intelligent approaches should be investigated to improve efficiency

ENFORCE

It offers a monitoring module for detecting changes in demand and performance of iTV services

Virtualization

Reconfiguration, Virtualized Network Functions (VNFs) processing and proactive response

Contribution

The provision of an extension of the SoftFIRE platform (monitoring of iTV services demand) that will issue the adaptation on demand changes through the adoption of forecasting techniques

ENFORCE simulates iTV services demand and test the performance of the platform

ENFORCE provides experimentation for two parts of a virtual Set top Box (vSTB), i.e., the vPVR (virtual Personal Video Recorder) and the aggregation of video streams defined in multiple formats

Architecture

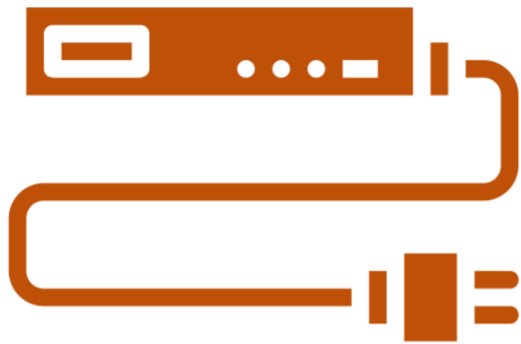
ENFORCE provides the definition of virtualized STB functions for supporting iTV services

ENFORCE implements a part of a vSTB which relies on open technologies



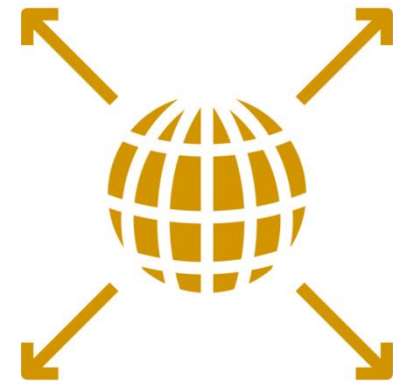
We deploy a monitoring mechanism that oversees the demand for the provided services

We trigger the re-configuration process of the services in the form of scaling up / down the available resources



ENFORCE provides VNFs and service function chains required to support two parts of a vSTB

- the vPVR (virtual Personal Video Recorder) and
- the aggregation of video streams defined in multiple formats



The Monitoring Mechanism

The monitoring mechanism amounts to a set of performance metrics

The contextual information, aggregated and stored by ENFORCE, forms the pattern behavior of a VNF

ENFORCE further provides efficient mechanisms for supporting intelligent analytics tasks, such as statistical queries over the performance metrics

The module enables ENFORCE to monitor a large number of iTV services and trigger the appropriate modules to take actions related to the services life cycle

A scaling action is initiated when:

- (a) the system deduces that the application requirements require higher or lower service performance levels compared to the current setting, or
- (b) the system observes the performance of services and decides when the application requirements are not fulfilled

Implementation

The setup of the experiment is centered on a client-server scheme

We adopt Topology and Orchestration Specification for Cloud Applications (TOSCA) files which are uploaded directly to the SoftFIRE reservation system

We deploy a client and a server VM which are able to communicate with each other exchange information such as vSTBs requests and video streams

We use a custom NFV which houses the client-server connection and we instantiate it by having a 16.04 Ubuntu-clean image installed

We specify the connection of those two services and we designate each one's flavor key template

Flavor key templates are predetermined hardware profiles loaded to the VM during the reservation stage

Implementation

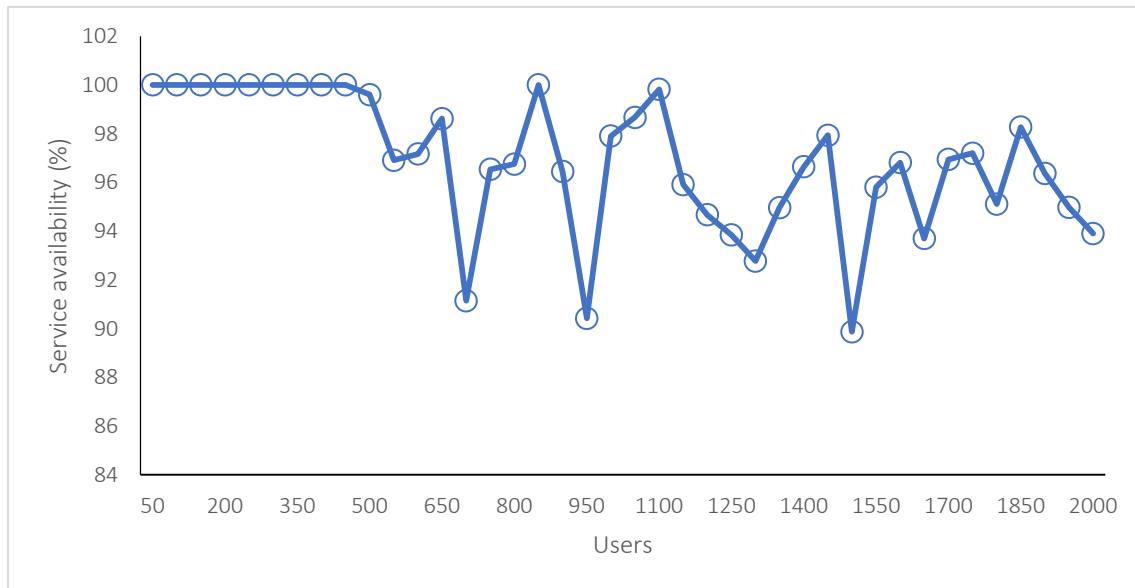
The performance of the platform is evaluated based on three KPIs:

- **Latency.** This KPI aims to provide insights on the latency of invoking the iTV services. Our aim is to maintain the latency values below a pre-defined threshold.
- **Service availability.** This KPI deals with the availability of the implemented services. Services should be always available to the requests for iTV functionalities.
- **Storage demand fulfillment.** This KPI deals with the fulfillment percentage of the requests concerning the storage requirements (for streams that are not recorded) as users demand.

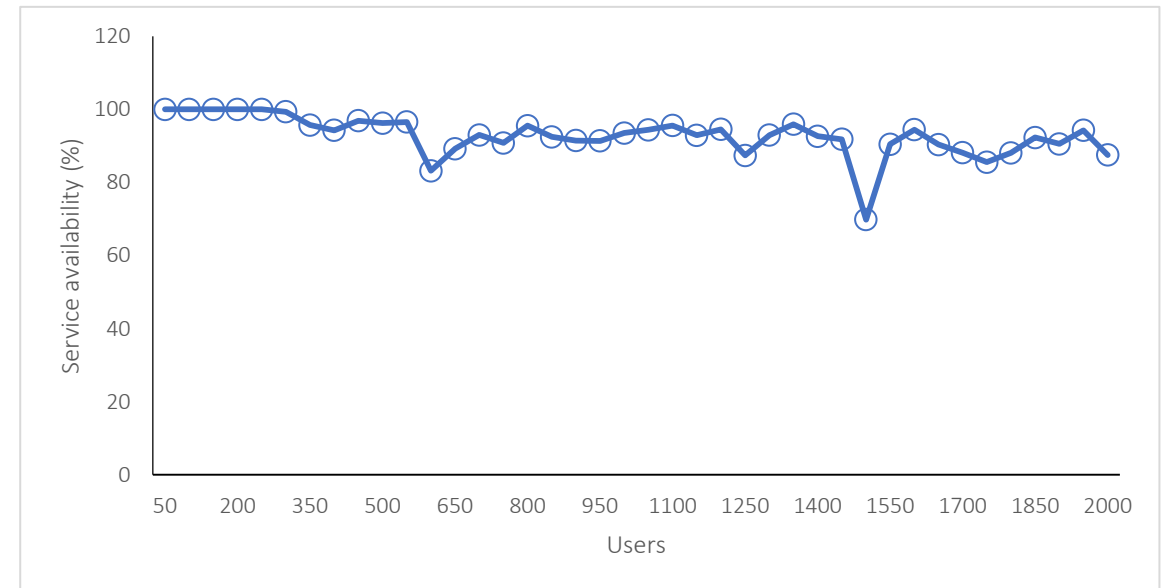
Evaluation

We conducted a large set of experiments to depict the realizations of the discussed KPIs

	Service availability (%)	Latency (msec)	Storage demand fulfillment (%)
Small Flavor	96.89	150.62	86.41
Medium Flavor	92.55	46.80	95.68



Service availability for the small flavor instance



Service availability for the medium flavor instance

Lessons Learnt

The SoftFIRE platform provided us with features and functionalities which were vital to our success

The resource reservation process is simple and the GUI provided is user friendly

The virtual network functions the SoftFIRE implements well manage to hide the inner complexity of the underlying processes

VMs can easily host ubuntu images which provide the various functionalities of a Linux operating system and the customization the user wants on demand

During high traffic periods of time, such as when multiple experimenters were logged in the system, there were connectivity and latency issues

The image is a composite graphic. It features a background photograph of a coastal city scene. On the left, a tall, yellow, cylindrical building with a domed roof and multiple windows stands out. In front of it, several white motorboats are docked in the blue water. To the right, more buildings and palm trees are visible along the waterfront. In the background, a steep, green hill rises. A large, semi-transparent red rectangle is overlaid in the center of the image. Within this red area, the words "THANK YOU" are written in a large, white, bold, sans-serif font. Above this text, in a much smaller font, is the phrase "HAYRULLAH MEGANİS".

HAYRULLAH MEGANİS

THANK YOU