Modeled of Traffic Generated by the Live Videostreaming Service on Mobile Networks LTE with QoE

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Agenda

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Introduction

Total global monthly data and voice traffic from Q2 2010 to Q4 2015
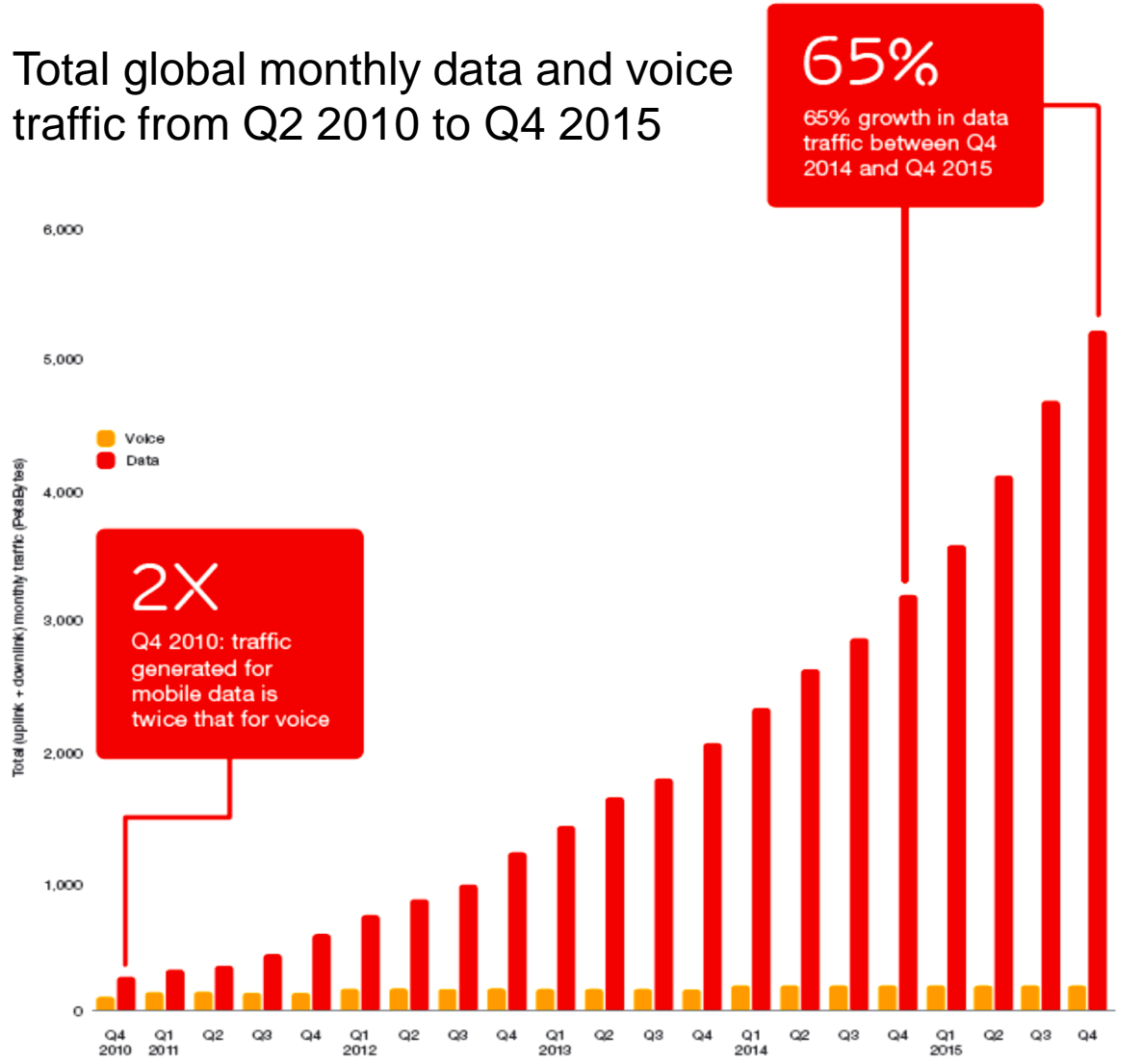
[Ericsson, 2016]

Introduction

Mobile subscription essentials	2015	2021 forecast	Unit
Worldwide mobile subscriptions	7,300	9,100	million
> Smartphone subscriptions	3,400	6,400	million
> 5G subscriptions	0	150	million
> Mobile PC, tablet and mobile router subscriptions	250	350	million
> Mobile broadband subscriptions	3,600	7,700	million
> Mobile subscriptions, GSM/EDGE-only	3,600	1,300	million
> Mobile subscriptions, WCDMA/HSPA	2,200	3,200	million
> Mobile subscriptions, LTE	1,000	4,100	million

Accumulated mobile data traffic	2010–2015	2016–2021 forecast	Unit
> Total	120	1,600	ExaByte
> Video	50	1,000	ExaByte
> Social networking	15	180	ExaByte

[Ericsson, 2016]

Introduction

Mobile data traffic by application type (monthly ExaBytes)
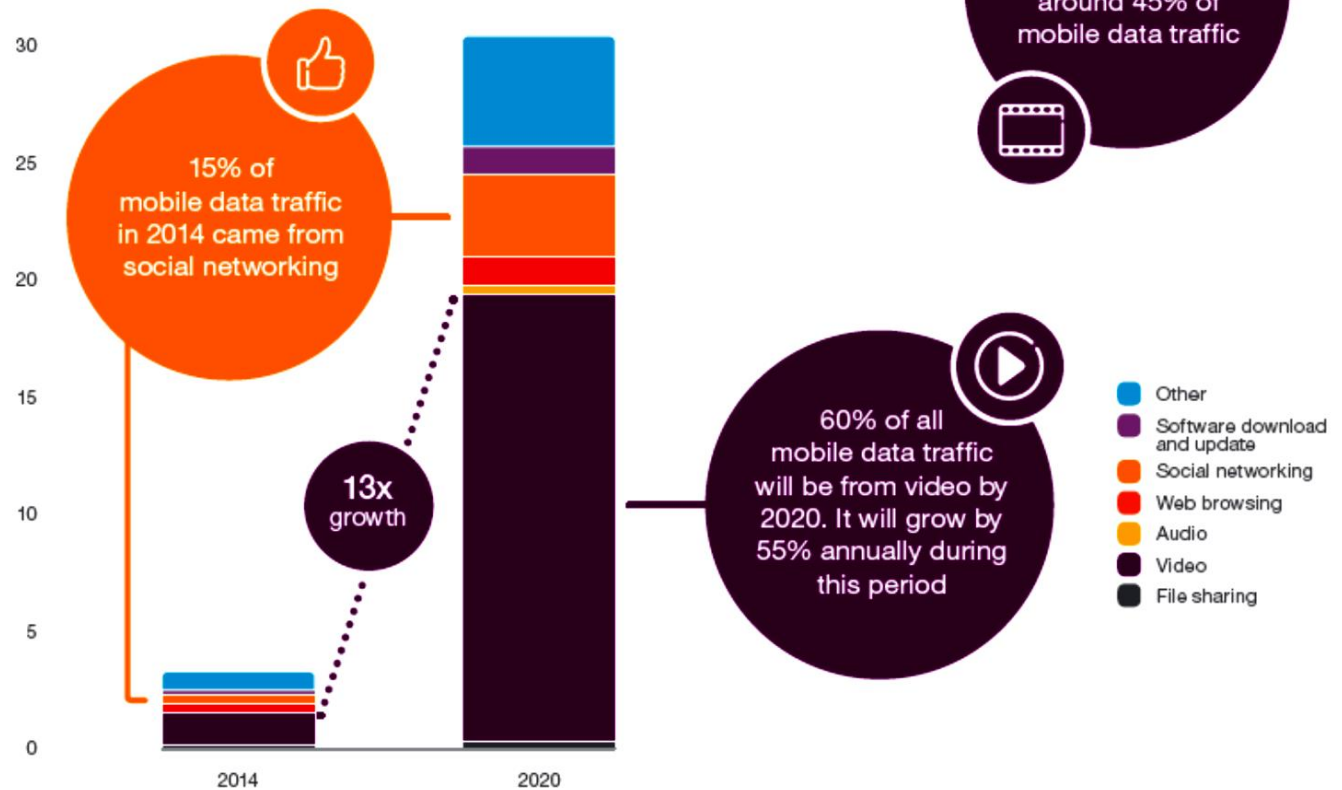
[Ericsson, 2015]

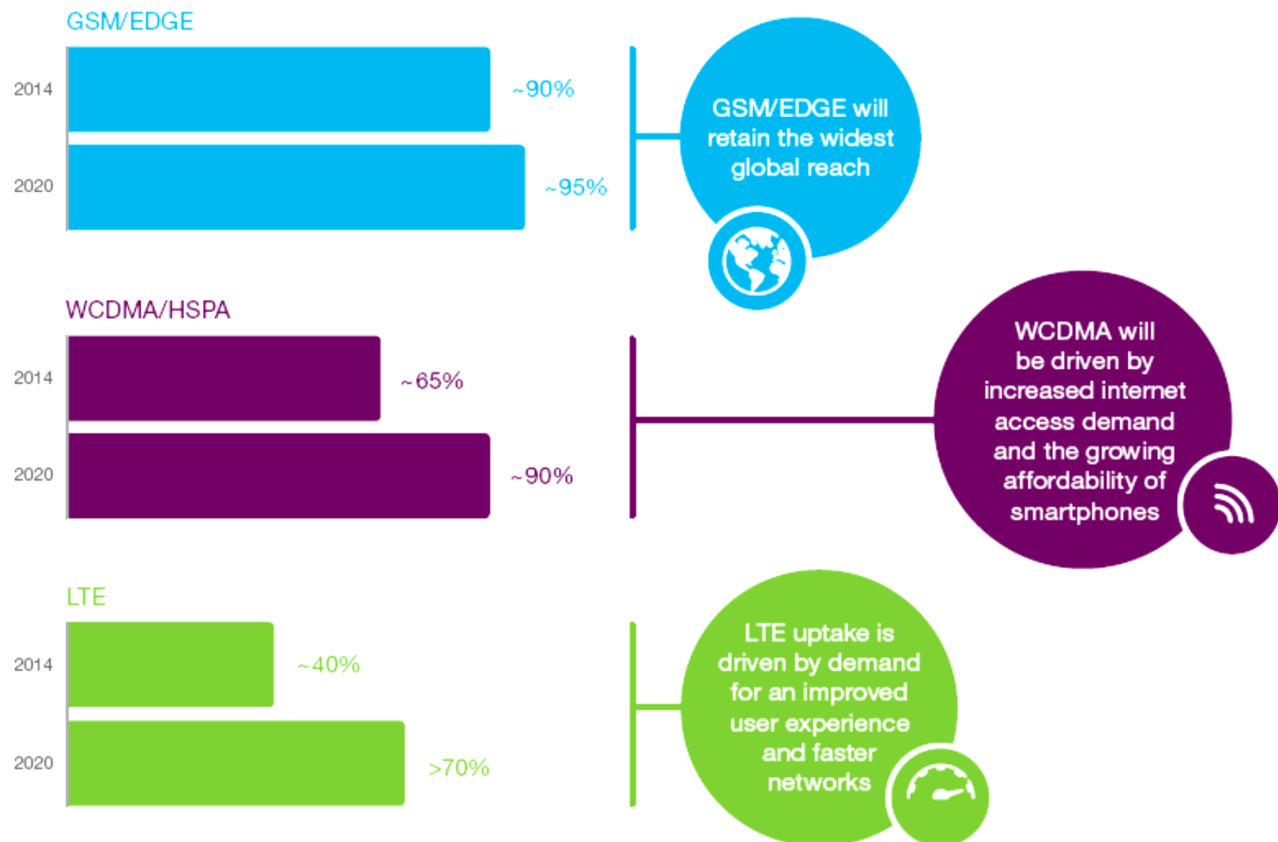# Introduction

[Ericsson, 2016]

Relevant Concepts.
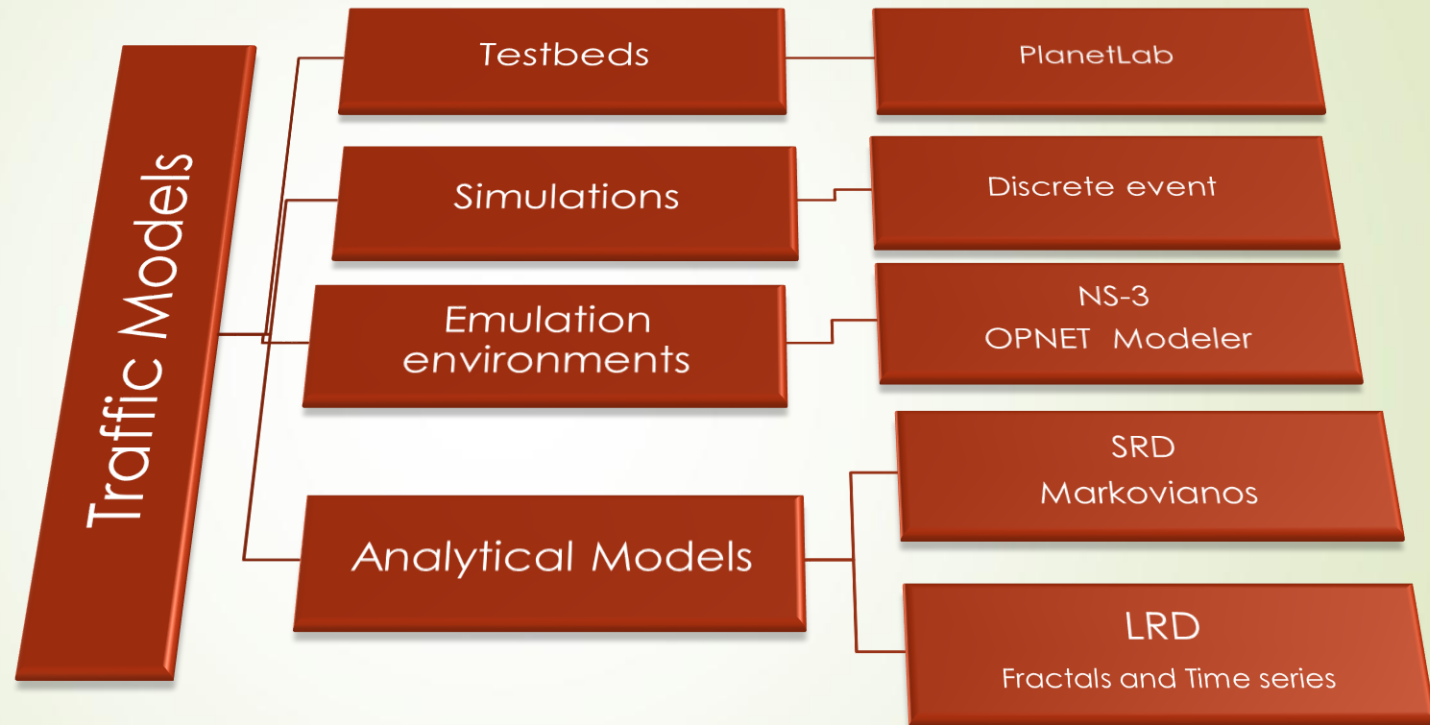
Traffic modeling approaches[Yin et al (2011)]

Relevant Concepts.

Videostreaming

RTSP/RTP
Descarga Progresiva

VoD

LVS

It is a service that allows users to access multimedia content at the exact moment you want
[Held et al (2007)].

Service that allows users to view and deliver videos over the Internet with real-time transmission on a cell phone, camera or computer.
[Díaz (2014)]

Management tasks:
VQA
QoS, QoE

Relevant Concepts.

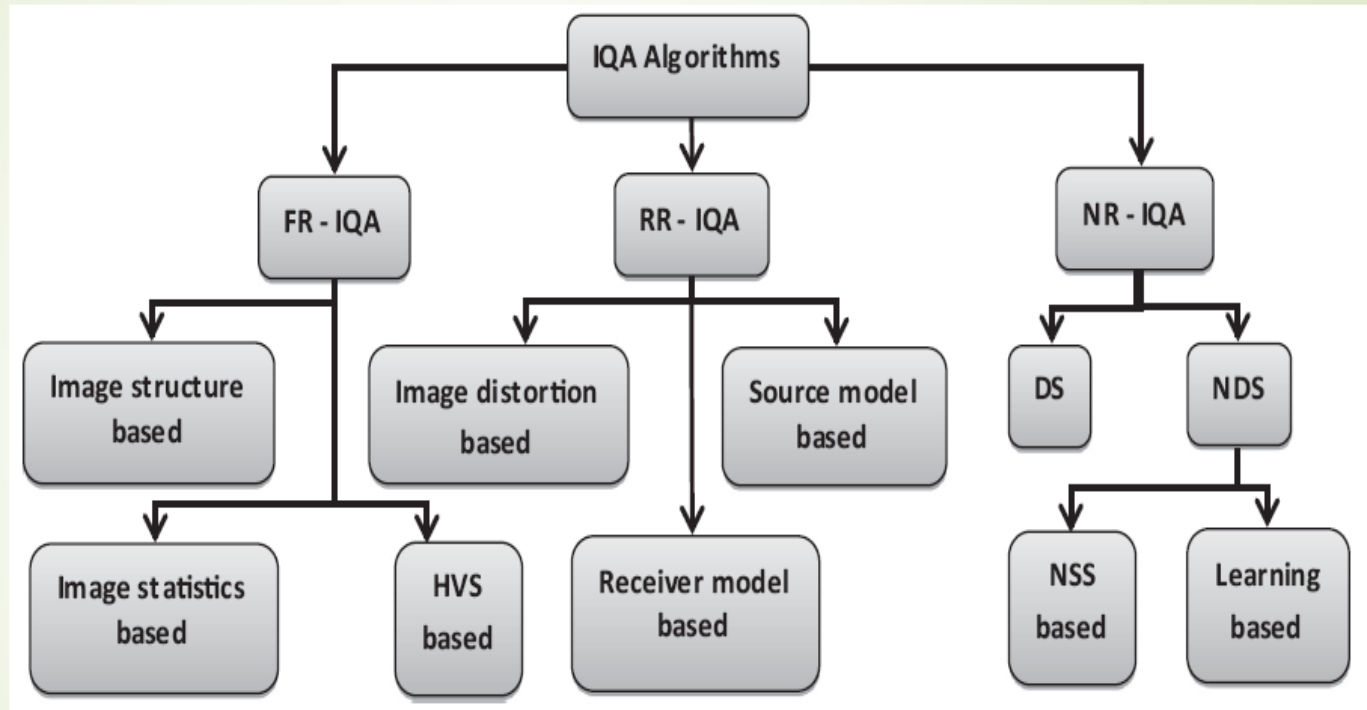General classification of IQA algorithms [Manap(2015)]
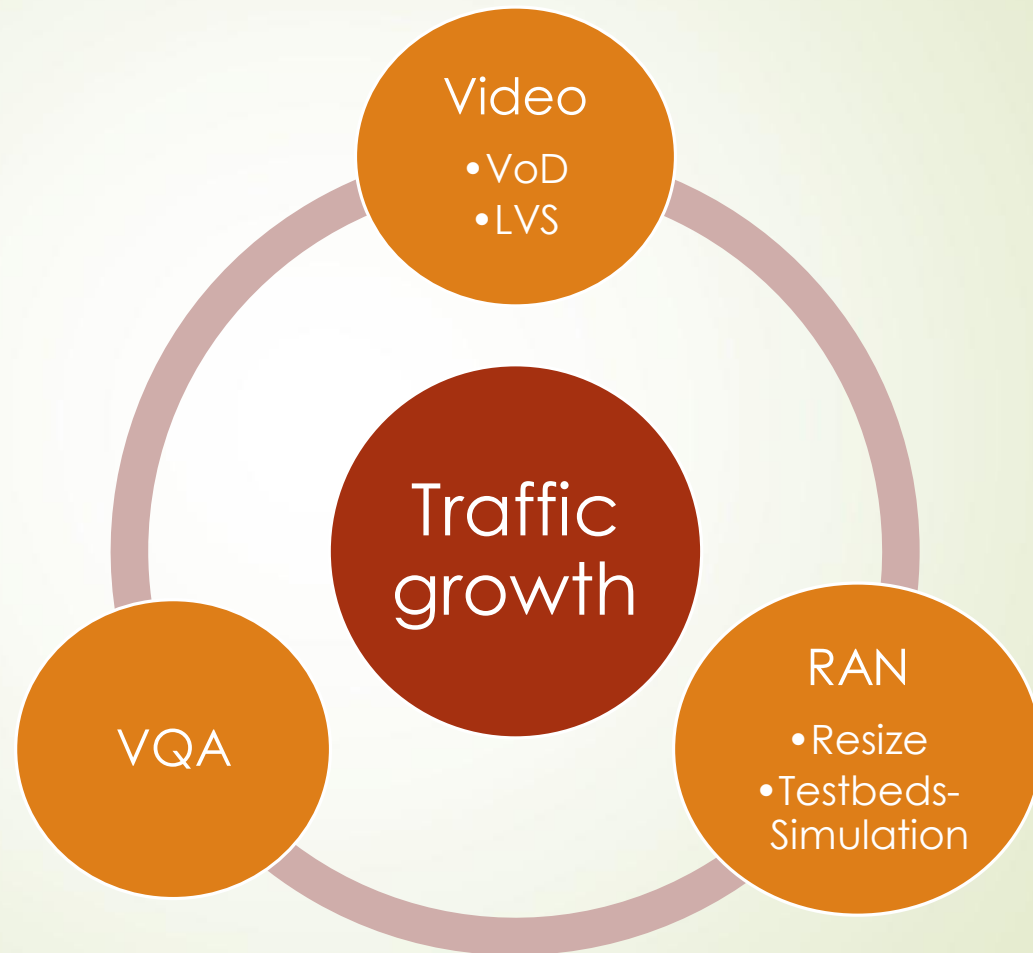
Statement of the problem.

Statement of the problem.

▶ Video LVS Problems:

Problem	Alternative	Description
Bandwidth efficiency	Dynamic Adaptive streaming	DASH [3GPP(2012)]
Traffic efficiency	Adaptation to the properties of CDN	LTE-A [3GPP(2012)]
The stress of streaming delays	QoE	Temporary interruptions, due to mobility, reconnection and connections to particular networks

Statement of the problem.

➡ RAN Problems:

Problem	Alternative	Description
Implementation of new services	Testbeds	Deployment scenarios and setting up
Developing Technology	Opportunities for new developments	

Statement of the problem.

▶ VQA Problems:

Problem	Alternative	Description
Undefined metrics	LTE Video Adopting metrics other scenario (IPTV)	[3GPP(2012)]
QoE measure	Relationship between QoS and QoE	Hypothesis IQX Goran [(2014)] Partial differential equations Fiedler[(2011)]

Statement of the problem.

Related works: VQA

Work	Contributions/weaknesses
The Evolution of Video Quality Measurement: From PSNR to Hybrid Metrics. Winkler, et al (2008)	Development of measurement techniques quality video. Hybrid metrics: Factor V.
Clasificación y Análisis de Métodos para medir Calidad de la Experiencia del Servicio de Televisión sobre Protocolo IP (IPTV). Cuellar, et al (2014)	Methods for measuring QoE for the television service over the IP protocol (IPTV).
Quality of Experience of VoIP Service: A Survey of Assessment Approaches and Open Issues. Jelassi, et al (2012)	
Objective Video Quality Assessment Methods: A Classification, Review, and Performance Comparison. Chikkerur (2011)	Objective methods for video quality measurement.
A concise review of the quality of experience assessment for video streaming. Maia, et al (2015)	

Statement of the problem.

▶ Related works: VQA

Work	Contributions/weaknesses
Evaluation of Video Quality of Service in 3G/UMTS Wireless Networks as Succor for B3G/4G Wireless Network. Al, et al (2010)	Techniques for evaluating the QoS. packet loss, delay, throughput and jitter.
Quality of Consumer Experience Data Mining for Mobile Multimedia Communication Networks: Learning from Measurements Campaign. Charalampos, et al (2014)	Key Perfomance Indicator-KPI's for QoS in GSM, UMTS and LTE networks
Quality of Experience-Related Differential Equations and Provisioning-Delivery Hysteresis. Fiedler, et al. (2010)	Math ratioship between QoS y QoE. It is adjust to LVS.
Towards a QoE-Driven Resource Control in LTE and LTE-A Networks. Gómez, et al (2013)	Architecture for resource control, present the KPIs. It does not focus on services
Adaptive neuro-fuzzy inference models for speech and video quality prediction in real-world mobile communication networks. Pitas, et al (2013)	KPIs identified for RAN, estimated QoE from fuzzy techniques.

Statement of the problem.

▶ Related works: LVS

Work	Contributions/weaknesses
Dynamic adaptive streaming over HTTP: standards and design principles. Stockhammer (2011)	General concepts of DASH
Optimization of fairness for HTTP adaptive streaming with network assistance in LTE mobile systems. Wang, et al (2014)	General concepts of DASH and application in LTE
Performance analysis of dynamic adaptive video streaming over mobile content delivery networks. Munaretto (2014)	Introduces the concept of the LTE architecture CDN and use of DASH
3GPP Release 8 – 13 [2008-2015]	General concepts, specifications and evolution of LTE
Modelo de Tráfico para Servicios Interactivos de una Comunidad Académica Virtual, con contenidos de Audio y Video de Alta Calidad. Campo (2014)	How to make a traffic model. Other networks and other services.
Evaluation and prospects from a masurement campaign on real multimedia traffic in LTE vs. UMTS. Fowler, et al (2014)	Methodology for characterizing traffic, LTE weaknesses. It focuses on VoIP

Statement of the problem.

■ Related works: RAN- Emulation

Work	Contributions/weaknesses
Real time emulation of an LTE network using NS-3. Molloy, et al (2015)	Methodology to extend NS3 simulations to emulation in real time on the LTE module.
LENA : **L**TE-**E**PC **N**etwork simul**A**tor. LENA(2016)	LENA is an open source product-oriented LTE/EPC Network Simulator that allows LTE small/macro cell vendors to design and test Self Organized Network (SON) algorithms and solutions

Statement of the problem.

- Gaps.

- No service LVS based on DASH applied to wireless networks found.

- No clear metrics in measuring QoE for service LVS.

- QoE measuring from QoS parameters is not obvious.

- No evidence of emulation environments for service LVS.

- No traffic modeling studies for LVS service are evident in wireless network.

Statement of the problem.

▶ Research question.

What is the traffic model that characterizes the behavior of Live Videostreaming service, applied to the LTE technology as radio access network under QoE parameters?

Statement of the problem.

➥Hypothesis.

Traffic modeling Live Videostreaming service supported by the wireless mobile network with technology LTE, will allow network designers and planners have an emulation tool for predicting the behavior of the service LVS.

Objectives

➡ **General Objective**

Obtain the traffic modeling of Live Videostreaming service that permit evaluation their performance in a wireless mobile communications networks with LTE technology under QoE parameters.

➡ **Specific Objectives**

1. Build a testbed to emulate a LTE network.

2. Determine the different parameters that define a LVS-DASH service supported by LTE networks with QoE parameters.

3. Characterize traffic for Live Videostreaming service supported by LTE networks with QoE parameters.

4. Develop and validate a basic model from real traffic traces for live videostreaming service over a LTE network.

5. Build test scenarios to assess the performance of the LTE network with LVS service under QoE parameters.

Progress.

➤ Paper evaluation:

Estado del Arte de los Métodos de Evaluación de QoE y Entornos de Emulación para el Servicio de Video en Redes LTE

QoE Assessment and Emulation Environments for Video Service Networks LTE: Review

H. F. Bermúdez, J. L. Arciniegas, E. Astaiza.

Resumen—Este artículo presenta una revisión de los métodos utilizados actualmente para medir la Calidad de la Experiencia - QoE y Calidad de Servicio – QoS para servicio de video usando técnicas de videostreaming a través de un proveedor de servicio de internet, se enuncian las principales diferencias entre las métricas objetivas y subjetivas, escenarios de uso y los inconvenientes presentados en un ambiente inalámbrico. Además, se presenta la tecnología de acceso de radio – RAN Long Term Evolution - LTE como la tecnología inalámbrica con mayor probabilidad de utilización en los próximos años,   para lo cual se comparan las herramientas de desarrollo para el manejo de plataformas de emulación para sistemas LTE. Adicionalmente el artículo describe los retos y brechas de investigación en la evaluación y medición de la calidad de la experiencia para servicios de video soportados por tecnologías inalámbricas.

Palabras clave— Emulación, LTE, Modelado, QoS, QoE, Tráfico, Video.

Abstract—This article presents a review of the methods currently used to measure Quality of Experience - QoE and Quality of Service - QoS for video service using techniques of streaming video through an Internet service provider, the main differences are enunciated between objective and subjective metrics, use scenarios and disadvantages presented in a wireless environment. In addition, the radio access technology – RAN Long Term Evolution – LTE as the radio access technology and wireless technology most likely to use in

mercado y consumo electrónico tenga una nueva dinámica [1]. La gran variedad de dispositivos móviles tales como: notebooks, tablets, smartphones iPhone, iPad, etc. soportan múltiples servicios multimedia, como aplicaciones de streaming de video en tiempo real (Live Video Streaming - LVS) o bajo demanda - VoD, Televisión Digital Terrestre - TDT y servicios de audio y video en tiempo real a través de internet [2]. Lo anterior ha generado que el tráfico de datos en el entorno móvil haya presentado un incremento asombroso; según estadísticas presentadas por [3] y [4] a principios del 2015 el número total de suscripciones móviles superó la población mundial, producto de un crecimiento sostenido del 7% anual, con 108 millones de adiciones registradas netas en tan solo el primer trimestre de 2015. El porcentaje de tráfico de video con respecto al tráfico total de datos móviles fue del 53% en el 2013 y se espera supere el 69% para el año 2018, exigiendo un mayor uso del limitado ancho de banda de los canales inalámbricos [3]. Ante la situación anterior surge la pregunta: ¿Qué tecnología de red de acceso de radio (RAN) en entornos móviles soportará los mencionados volúmenes de tráfico?

Dos décadas atrás, las redes GSM (Global System for Mobile Communication) fueron desarrolladas inicialmente para proveer servicios de telefonía móvil, mediante algunas mejoras tales como GPRS (General Packet Radio System) y EDGE

Progress.

➥ Automation of the process generated by a lexical analyzer (AWK programming language) for traffic analysis.

Progress.

AWK

Tramas I–P-B Entrelazada

Tiempo	Resta	Longitud
0.000000	0.000000	54830
1.943.972	1.943.972	50846
3.163.703	1.219.731	61865
3.527.894	0.364191	63274
3.946.042	0.418148	63294
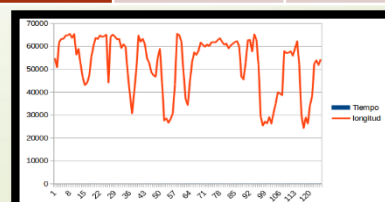
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Any Questions…
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