

# SADRŽAJ / CONTENTS

Nedžad Rešidbegović

**Analyzing Big Data** ..... 2

---

Zijad Havić, Branko Mikac

**Cost Evaluation for FTTH Access Network**..... 4

---

M.Sc. Harun Mutapčić dipl.ing.saob. i kom.,

M.Sc. Enis Bašić,dipl.ing.el.

**Univerzalna usluga u komunikacijama i implementacija u Bosni i Hercegovini**  
***Universal Service in electronic communications and implementation in Bosnia and Herzegovina*** ..... 10

---

Jasmina Husić, dipl.ing.el.

**webRTC i nove OTT mogućnosti**

***webRTC and new OTT capabilities*** ..... 21

---

Alen Ramić

**Softverski Definisano Umrežavanje (SDN)**

***Software defined networking (SDN)***..... 28

---

Lejla Njemčević

**Telecom operatori & OTT igrači**

***Telecom Operators & OTT players***..... 39

---

UPUTSTVA AUTORIMA / AUTHOR'S GUIDELINES..... 50

Zijad Havić, Branko Mikac

## ***Cost Evaluation for FTTH Access Network***

### **Abstract**

Many telecom operators nowadays are gradually increasing their bandwidth offers, by either shortening the copper lengths to the user (e.g. to introduce VDSL) or by reducing the shared service areas for HFC (e.g. to adopt DOCSIS 2.0/3.0). This policy brings the fibre closer to the user, and it is one of the strategies taken by BH Telecom Sarajevo. However, there is an intention to perform the switchover to FTTH.

In the paper are evaluated rollout scenarios for FTTH in Bosnia & Herzegovina in rural, suburban and urban area. The intention is to determine the general feasibility of a nationwide FTTH rollout in Bosnia & Herzegovina together with a thorough comparison between the different areas. In addition an analysis and estimation are presented showing the influence and importance of parameters in the final evaluation of an FTTH rollout. Model proposed one can use in other countries, taking into account specific local conditions. In all analyses cost evaluation is carried out.

**Keyword:** FTTH;CapEx; P2P;P2MP

M.Sc. Harun Mutapčić dipl.ing.saob. i kom., M.Sc. Enis Bašić,dipl.ing.el.

## ***Univerzalna usluga u komunikacijama i implementacija u Bosni i Hercegovini***

### ***Universal Service in electronic communications and implementation in Bosnia and Herzegovina***

#### **Sažetak**

Univerzalna usluga je termin koji se odnosi na praksu pružanja osnovnog nivoa usluga svakom stanovniku države bez obzira na geografsku izoliranost, prihode ili neki drugi kriterij, po prihvatljivoj cijeni i to u slučaju kada samo tržište ne omogućava navedene usluge po komercijalnim uvjetima. U ovom radu predstavljeni su osnovni problemi u razvoju i implementaciji politike univerzalnosti odnosno univerzalne usluge i univerzalnog pristupa kao i njihovo legislativno određenje u Evropskoj uniji i Bosni i Hercegovini.

**Ključne riječi:** univerzalna usluga, liberalizacija, regulatorni okvir, direktiva

#### **Abstract**

Universal service is term that refers to the practice of providing a basic level of services to every citizen of the state, regardless of geographic isolation, income or other criteria, at an affordable price and in the case where the market alone does not provide these services on commercial terms. This paper presents the main problems in the development and implementation of universality policies, respectively universal service and universal access as well as their legislative determination in European Union and Bosnia and Herzegovina.

**Key words:** universal service, liberalization, regulatory framework, directive

Jasmina Husić, dipl.ing.el

## ***webRTC i nove OTT mogućnosti*** ***webRTC and new OTT capabilities***

#### **Sažetak**

webRTC kao skup definicija, industrijskih standarda i na njima baziranih API-ja u biti izlaže HTML5 baziran web model. Sa njim je po prvi put omogućena direktna razmjena multimedijalnih saržaja u realnom vremenu između dva

web preglednika bez plugina i dodatnih aplikacija, odnosno cilj standardizacije je web bazirano komuniciranje u realnom vremenu potpuno neovisno o vrsti uređaja, operativnom sistemu, tehnologiji pristupa internetu.

**Ključne riječi** webRTC, html5, OTT, UC usluge

#### **Abstract**

WebRTC as a set of definitions, industry standards and APIs based on them are exposing HTML5 based web model. They are enablers of direct exchange of multimedia content in real time between two web browsers without any plugin and additional applications. Goal of standardization is a web-based communication in real time completely independent of the type of device, operating system or Internet access technology.

**Keywords** webRTC, html5, OTT, UC services

Alen Ramić

## **Softverski Definisano Umrežavanje (SDN)**

### ***Software defined networking (SDN)***

#### **Sažetak**

Svakodnevni porast korisničkih i poslovnih potreba za mrežnim resursima dovodi do razvoja novih pravaca u arhitekturi mreže i umrežavanja čiji je cilj stvoriti fleksibilnu, agilnu i skalabilnu mrežu koja je prilagodljiva različitim zahtjevima u realnom vremenu. Softverski definisano umrežavanje (SDN) predstavlja arhitekturu koja se još uvijek razvija i koja je dinamična, upravljiva, isplativa i prilagodiva što je čini idealnom za današnje aplikacije koje su dinamične i koje zahtjevaju veliki propusni opseg. U ovom radu su nabrojani i analizirani uslovi koje mreža mora zadovoljiti kako bi se ispunio proces tranzicije iz tradicionalne u „mrežu budućnosti“. Pored toga u radu je opisan i temeljni princip na kojem se bazira SDN, a to je OpenFlow protokol čije razvoje podstiče ONF fondacija.

**Ključne riječi:** SDN, kontroler, OpenFlow

#### **Abstract**

The daily increase in consumer and business demand for network resources, leads to the development of new directions in network architecture and networking whose goal is to create flexible, agile and scalable network that is adaptable to different requirements in real time. Software-defined networking is an architecture that is still developing, it's dynamic, manageable, cost-effective and adaptable which makes it ideal for today's dynamic applications which they require a large extended bandwidth. In this work are listed and analyzed the conditions that must be satisfied in order to accomplish the transition from traditional to „the network of the future“. In addition, the paper describes the fundamental principle on which SDN is based, which is the OpenFlow protocol where ONF Foundations encourages the development of it.

**Key words:** SDN, controller, OpenFlow

Lejla Njemčević

## **Telecom operatori & OTT igrači**

### ***Telecom Operators & OTT players***

#### **Sažetak**

Evolucija mobilne telefonije i pisanih poruka sa operatorskih sistema do novih IP baziranih komunikacijskih usluga obilježava trenutni trend komunikacijskog tržišta širom svijeta. Novi, Internetom omogućeni OTT igrači su prvaci u novim tehnologijama komunikacije umjesto telecom operatora. Prepoznavši potencijal za jednostavnim, smišljenim aplikacijama na smartphone/pametnim uređajima, novi OTT igrači su za kratak vremenski period dostigli prestižnu nišu na tržištu mobilne komunikacije.

Dok se broj i popularnost OTT usluga povećava, istovremeno se povećava i operatorski pad prihoda prvenstveno od usluga kao što su govor i SMS. Revolucija OTT-a je također imala utjecaj na tržišnu snagu operatorskog brenda i općenito korisničku percepciju uloge mobilnih operatora. Operatori trenutno eksperimentišu sa novim poslovnim modelima i njihovo ponašanje prema sve prisutnijim OTT uslugama se mijenja u skladu sa novim inovativnijim modelima poslovanja. Danas, operatori se takmiče sa OTT igračima i pokušavaju nadomjestiti izgubljeni prihod kroz nove *pametne* ponude i kroz prilagođavnje postojeće strategije prema OTT-u.

**Ključne riječi:** OTT, trendovi telekomunikacijske industrije, Internet, operatorska strategija.

#### **Abstract**

The evolution of mobile telephony and messaging from operator networks to new IP based communication services marks the current trend in the communications industry worldwide. The new, Internet enabled OTT players represent new winners in using innovative communications technology in comparison to network operators. Recognizing the potential in simpler, smarter applications on smartphones, OTT players have reached a prestigious market niche within the mobile communications market, in an extremely short period of time.

While the number and popularity of OTT players rises, mobile operator profit is falling, predominantly within the services of talk and SMS. The revolution of OTT services has had an effect on mobile operator's brand perception as well as its overall role within the communications market. Currently, mobile operators are experimenting with diverse business models while their behavior towards OTT players is changing in accordance to more sophisticated business processes. Worldwide, operators are still competing with OTT players and trying to compensate their lost profits through new smarter services as well as by better adjusting their current strategy towards OTT.

**Key words:** OTT, telecommunication industry trends, Internet, operator strategy.