

Hybrid Fiber Coax Network in Croatia

Yesterday, **Today, Tomorrow**

Potential for reaching Digital Agenda goals



Presentation will take no more than **18** minutes

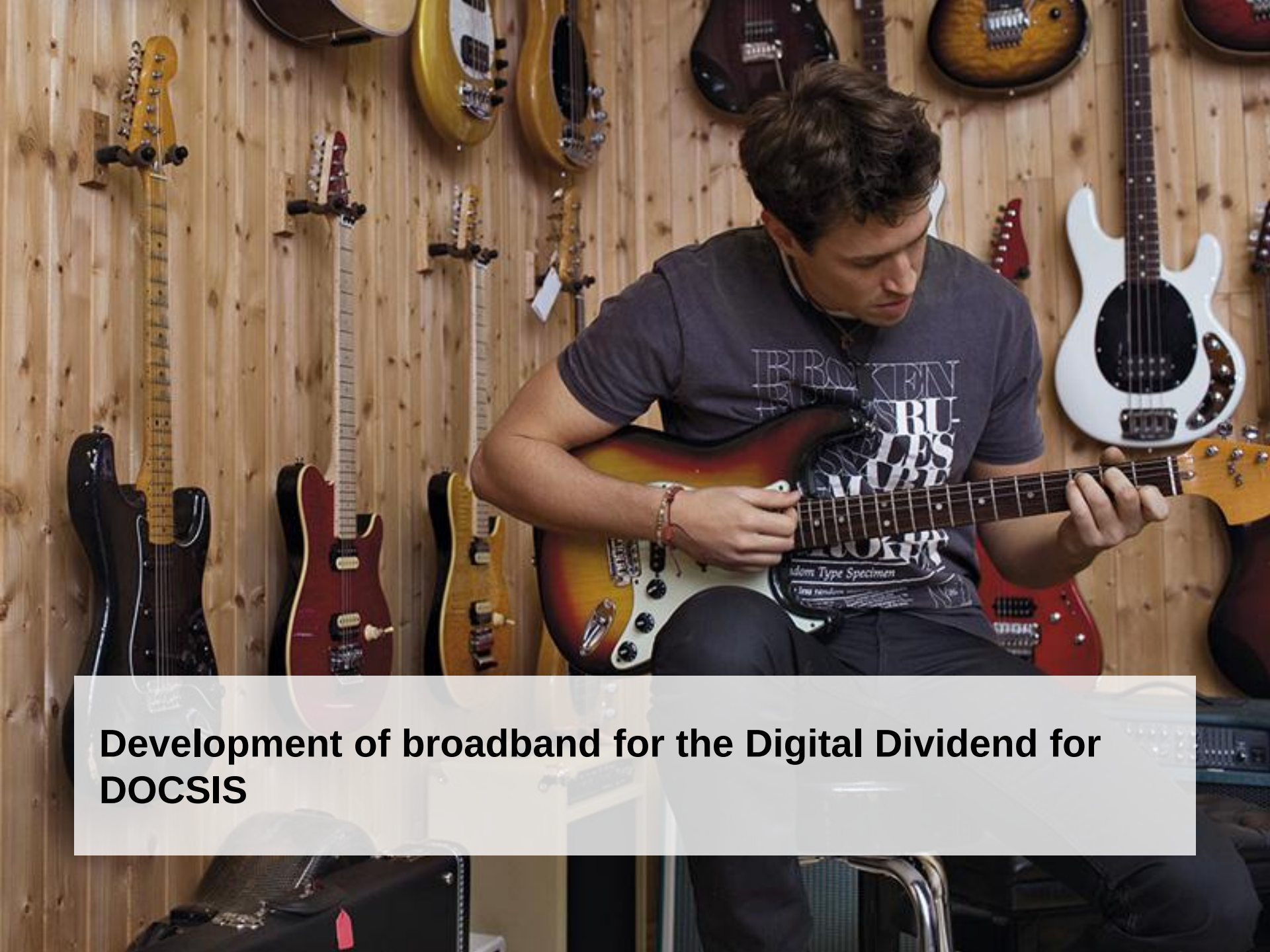


The Future is bright For us and for our Customers

- > This presentation will show you that we are today ready for achievement Digital Agenda goals for 2020
 - > Fast broadband> 30 Mbps to all residents of the EU
 - > Ultra-fast broadband> 100 Mbps for 50% of EU households

- > HFC - New technologies in development
 - > DOCSIS 3.1
 - > Target speed 10Gbps/1Gbps
 - > Over existing HFC infrastructure
 - > Q4/2013. expected finalized standard

- > Essence

A man with dark, curly hair is seated and playing a sunburst electric guitar. He is wearing a dark grey t-shirt with a graphic that includes the words 'BROKEN RULES' and 'WORE'. He is also wearing a red beaded bracelet on his right wrist. The background is a wall made of vertical wooden planks, densely decorated with various electric guitars hanging on the wall. The guitars include a black one on the left, a red one, a yellow one, and a white one on the right. The lighting is warm and focused on the man.

Development of broadband for the Digital Dividend for DOCSIS

DIGITAL AGENDA for EUROPE

The European Commission adopted in March 2010th a 10-year strategy called "Europe 2020,,

Objectives:

- 2013: basic broadband available to all residents of EU
- 2020:
 - Fast broadband > 30 Mbps to all residents of the EU
 - Ultra-fast broadband > 100 Mbps for 50% of EU households
- Today's average broadband speed in EU is 20 Mbps
- Today's average / maximum broadband speed in Croatia
 - **Copper - 3,8 Mbps / 24 Mbps (copper)**
 - **HFC (cable) - 11,73 Mbps / 60 Mbps (HFC)**
- We are ready for Digital Agenda 2020

Digital Agenda

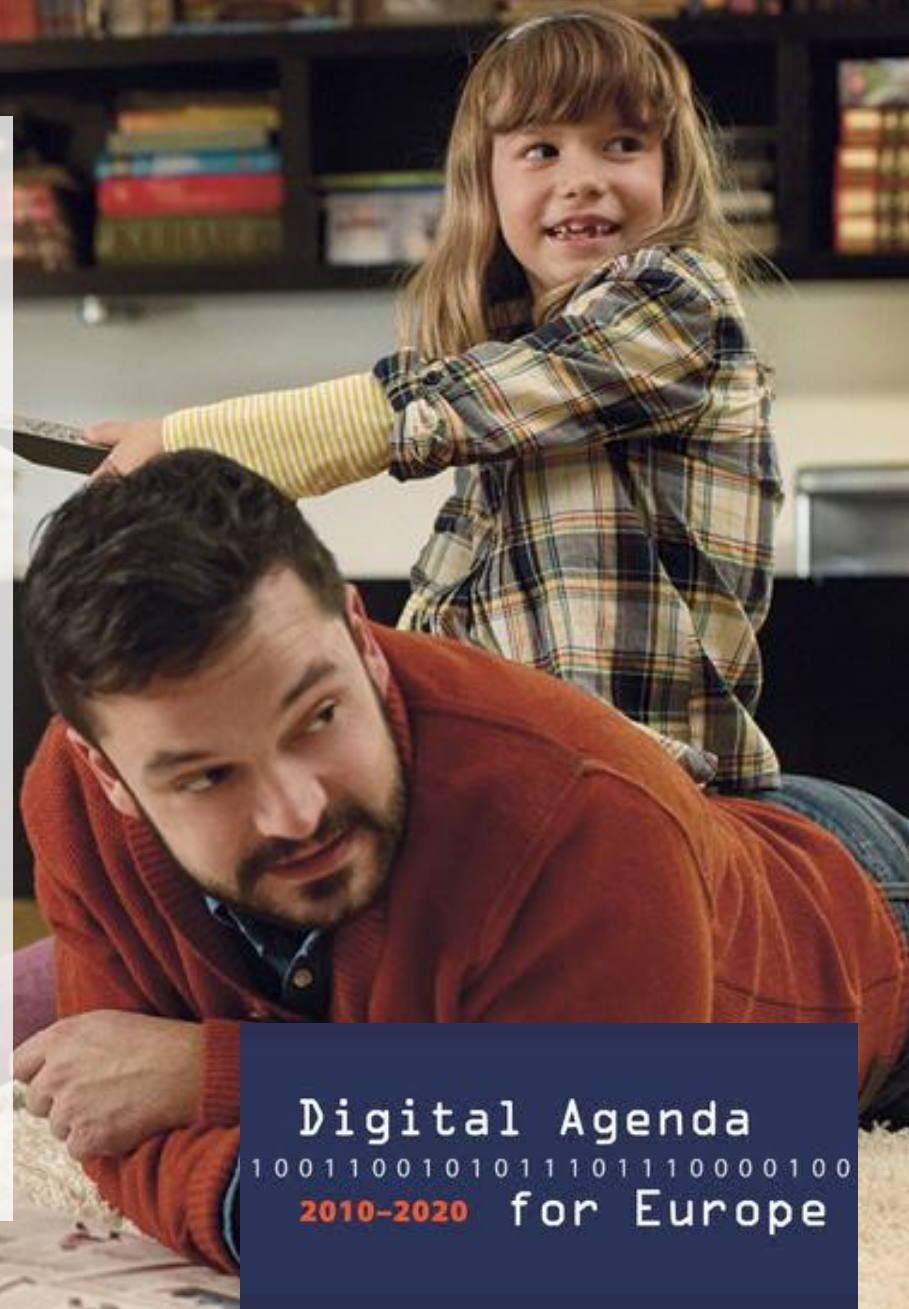
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2010-2020 for Europe

DIGITAL AGENDA for CROATIA

The documents and regulations of the Ministry of Maritime Affairs, Transport and Infrastructure does not deal with specific technologies.

- What we are planning to achieve amounts to access speed
- Objectives and strategies of broadband access are:
 - High-speed Internet access - at least 30 Mbps
 - Ultrafast Internet access - at least 100 Mbps
- Same goals confirms EU Guideline where explicitly stated "DOCSIS 3.0 cable modem standard,,
- Vipnet/B.net
 - Covered more than 300.000 households / 1/4 inhabitants
 - Commercial offer today up to 60 Mbps
 - Can offer up to 444 Mbps
 - Speed enabled by using a cable modem available on the market
 - All regulations are technologically neutral
 - HFC, LTE, FTTH
 - Vipnet has all of them

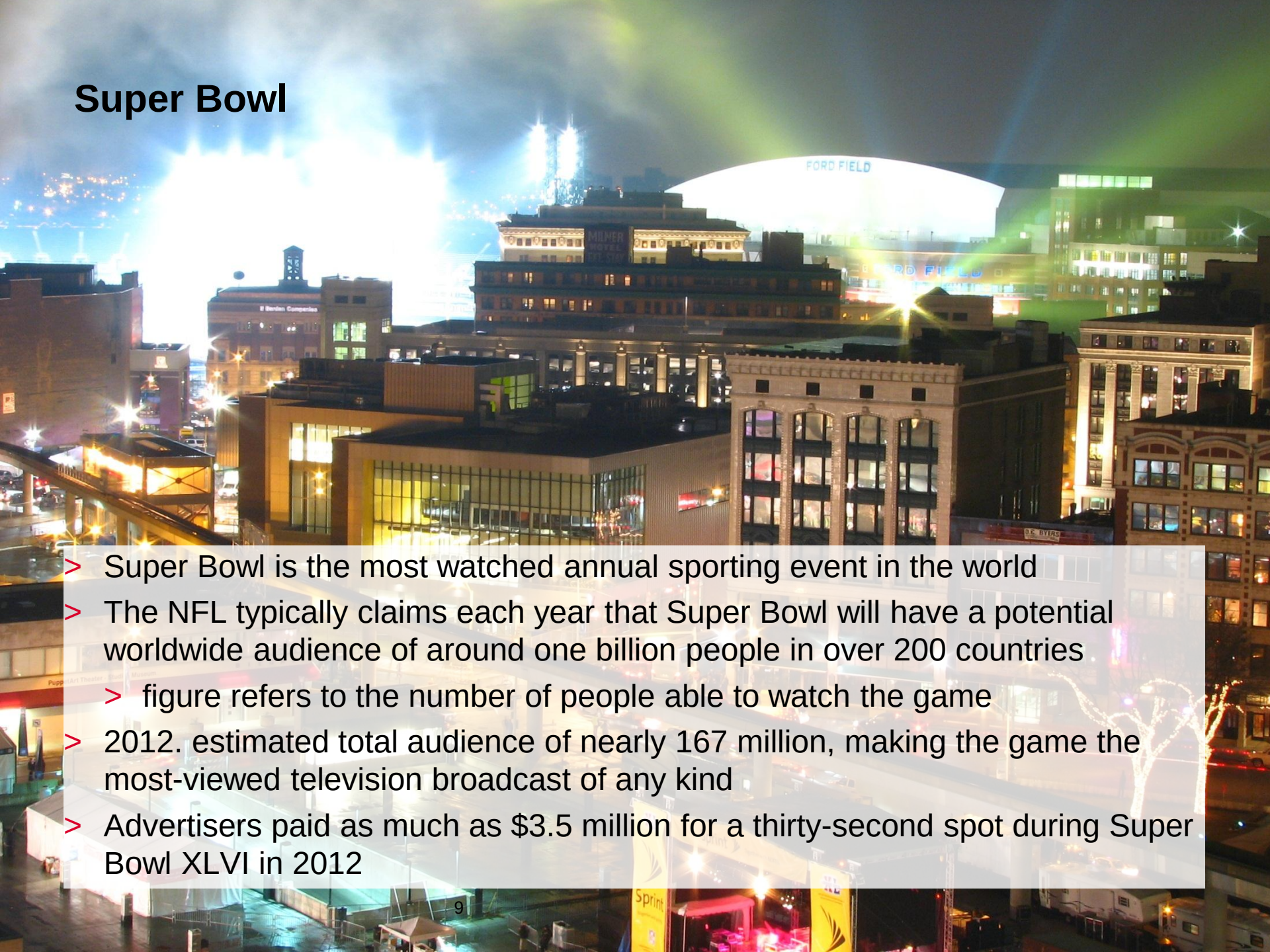


Digital Agenda
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2010-2020 for Europe





Super Bowl

- 
- A nighttime photograph of a city skyline, likely Detroit, featuring the Ford Field stadium with its illuminated white dome. The stadium is surrounded by various city buildings, some with lit-up windows and signs. In the foreground, there are more buildings and a street with some lights. The overall scene is vibrant with city lights and the stadium's glow.
- > Super Bowl is the most watched annual sporting event in the world
 - > The NFL typically claims each year that Super Bowl will have a potential worldwide audience of around one billion people in over 200 countries
 - > figure refers to the number of people able to watch the game
 - > 2012. estimated total audience of nearly 167 million, making the game the most-viewed television broadcast of any kind
 - > Advertisers paid as much as \$3.5 million for a thirty-second spot during Super Bowl XLVI in 2012

Year 2011

- > Two American guys came to Croatia, on business trip during Super Bowl time
- > Turned on TV in the hotel. Without possibilities to see the Game
- > Analog TV only with few local TV channels and up to 20 SatTV channels
- > Without possibilities Internet Access
- > Old long copper wires
- > TV only



After 2001

- > Investment funds coming to Croatia
- > Buying smaller operators
 - > Founded DCM
 - > Merging CATV-JOŽA, Elektromodul Osijek, KTV Špansko, Kod prvi
 - > Covering Zagreb, Osijek, Zadar, Split
 - > Founded Adriatic Cable
 - > Merging of Sys Elektronika, Leo trgovina, Automat, Kabelnet, Electronic CATV, IVB
 - > Covering Zagreb, Split, Rijeka
- > Multiple small cable TV operators
- > Multiple HE for one City per operator (usually one HE per neighborhood)
- > Single play service (only TV)
- > No Pay TV (HBO, Sport Channels etc.)
- > Internet only over modems on PSTN line or ISDN with one or two channel's
 - Slow unreliable connection

Year 2007

- DCM Telephone over Cable starts at the end of year 2007
- > DCM and Adriatic Cable merged
- > Changing name to B.net Hrvatska
- > Building strong brand
- > **Fastest and only Triple Play service at the time**
- > **Internet Speeds up to 16 Mbps on DOCSIS 2.0**
- > Started offering Digital TV
- > Covering
 - > Zagreb
 - > Rijeka
 - > Osijek
 - > Velika Gorica
 - > Zadar
 - > Split
 - > Stobreč
 - > Solin

Year 2011

- > DOCSIS 3.0 was implemented on whole network with speeds possible up to 444Mbps
 - > We are ready for Digital Agenda 2020
- > Vipnet recognized opportunity and acquired B.net Hrvatska
 - > B.net Hrvatska had around 250.000 HP



Today

Broadband Internet Access

A photograph of two men in a professional setting. The man on the right, with a beard and wearing a light blue button-down shirt, is looking towards the camera and gesturing with his right hand. The man on the left is seen in profile, looking towards the first man. The background is a blurred office environment.

Breaking the world record in DOCSIS data transfer



The world record

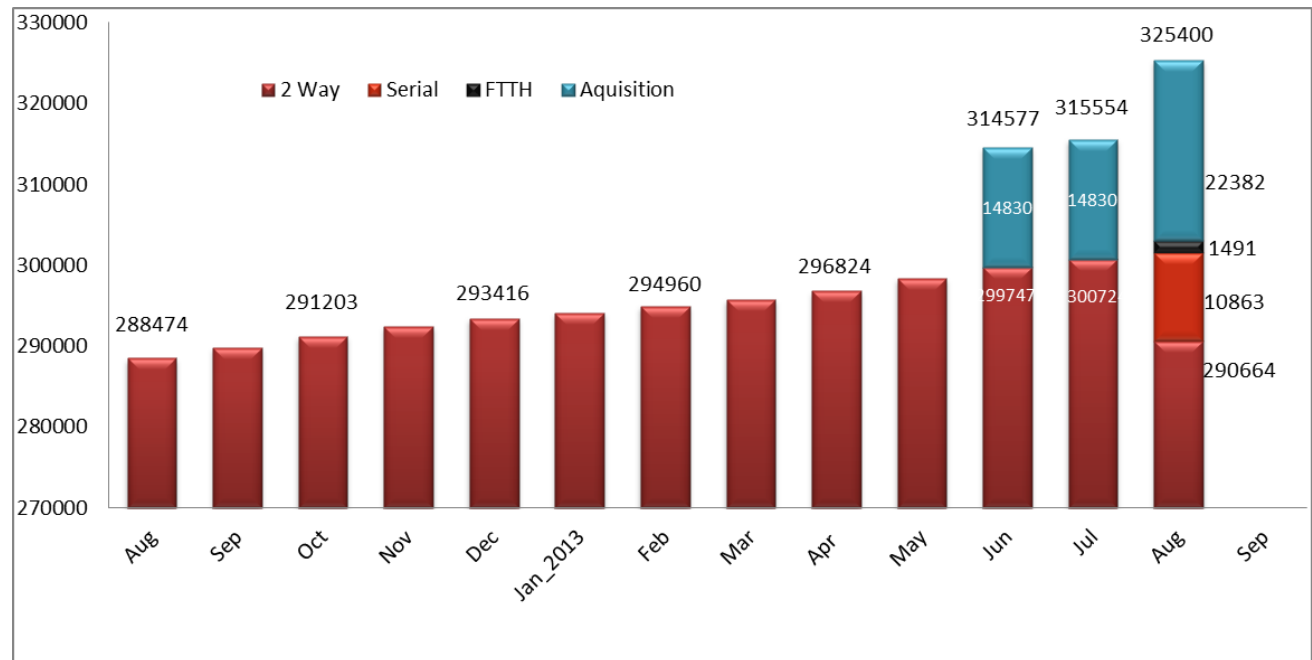
Realized 5Gbps between two computers

- Over classic HFC – Coax
- frequency range of 110-1000 MHz
- 111 EURODOCSIS channels
 - 8 MHz channel width
 - 256 QAM modulation
- 17 cable modem using DOCSIS 3.0 standards
- Method of testing
 - Iperf open source applications
 - Operating system Linux
 - CISCO UBR CMTS platform 10k
 - CISCO 3750 switch for pooling data
 - Used 6xGigaEth network cards per computer

2013. - Year of big expansion

- > Vipnet acquires small cable TV operators across the country
- > New network types acquired – FTTH, VipSat
- > More than 300.000 HP
- > Satellite TV and mobile network covering complete country
- > Now offering cable TV over HFC in

- > Zagreb
- > Rijeka
- > Osijek
- > Velika Gorica
- > Zadar
- > Split
- > Samobor
- > Stobreč
- > Solin
- > Sesvete
- > Pula
- > Zaprešić
- > Šibenik
- > Dubrovnik



A man with a beard, wearing a green sweater over a light blue shirt and a striped tie, is sitting in a grey office chair. He is holding a black mobile phone to his ear with his right hand. In front of him is a white desk with a laptop, a white mug, and some papers. In the background, there is a white shelving unit with various colorful folders (yellow, red, blue) and a white wall.

Development strategy of Cable TV network

2013-2020



HFC Network development

- > Always use new DOCSIS standards
 - > DOCSIS 1.0 (1997)
 - > DOCSIS 1.1 (1999) speed up to 50 Mbps/10 Mbps
 - > DOCSIS 2.0 (2001) speed up to 50 Mbps/30 Mbps
 - > DOCSIS 3.0 (Today) speed up to 444 Mbps/108 Mbps
 - > Supports IPv6
 - > Ready for Digital Agenda 2020
 - > DOCSIS 3.1 (Tomorrow) – speed up to 10 Gbps / 1 Gbps
 - > Standard expected Q4/13
- > Continuously decreasing average number of HPs per node (fiber pair)
 - > 1.200 HP/node (2003)
 - > Today average 650 HP/node (2013)
 - > In process towards 250 HP/node

The Future is bright

For us and for our Customers

- HFC – New technologies in development
 - DOCSIS 3.1
 - Target speed 10Gbps/1Gbps
 - Ready for Digital Agenda 2020 even today with DOCSIS 3.0
 - Over existing HFC infrastructure
 - Q4/2013. expected time of finished standard for DOCSIS 3.1
 - DOCSIS 3.1 backwards compatible with DOCSIS 3.0 and 2.0
 - 256 QAM is typically today
 - 1024 QAM and 4096 QAM in both the downstream and the upstream in the future
 - Expanding network capacity up to 1.2 GHz



Recapitulation

- Several TV channels - No Super Bowl
- No internet on cable network
- Internet via copper twisted pair up to 64 kbps
- 2001. started consolidation of smaller cable operators
- Building reliable HFC network
- Expansion into new areas and new towns continuously
- Digital Agenda
 - Today's average broadband speed in EU is 20 Mbps
 - Today's average broadband speed in Croatia is 3,8 Mbps and maximum 24 Mbps (copper)
 - EU Guideline explicitly stated "DOCSIS 3.0 cable modem standard,,
- Vipnet
 - Covered more than 300.000 households / more than 1/4 Croatian citizens
 - Commercial offer today up to 60 Mbps
 - Realized 5Gbps between two computers through HFC



Future is Today

We are ready for challenges that future brings

Zagrli život

Thank you for your time

Hvala

