



## ETV- Transmitters & Communications Serbia after DSO

Sladjan Stankovic, dipl.ing.  
[sladjan.stankovic@etv.rs](mailto:sladjan.stankovic@etv.rs)





## Content:

1. *ETV – transmitters&communications*
2. *Short review of DTT in Serbia - milestones*
3. *Achievements in numbers*
4. *Description of DVB-T2 system – Rules of operations*
5. *Plans for future*



## 1. ETV – transmitters&comunications

### Company profile:

- *Founded in 2009 by Government;*
- *Main aim: process of digitalization*
- *Formally started in 2011 as an independent state owned company;*
- *Before that, ETV was a part of RTS until the end of 2010.*
- *Headquarters in Belgrade;*
- *Human resources:*
  - *275 employees;*
  - *35% with university degrees*



## 1. ETV – transmitters&communications

### Company activities:

- *Management of the broadcasting infrastructure;*
- *Transmission and broadcasting TV and Radio Public Service programs (RTS, RTV);*
- *Providing broadcasting services to all other National, Regional and Local Radio and TV stations;*
- *Providing services to telecommunications operators and internet service providers;*
- *Design, consulting, testing, installation and maintenance of equipment, data, etc;*



## 2. Short review of DTT in Serbia - milestones




- 2002. started activities related to DTT
- 2005. DVB-T Pilot network launched
- 2008. first HD kanal started
- 2009. Strategy for DSO adopted by Serbian government – DVB-T2 standard
- 2010. EU Delegation adopted the project devoting 10.5 MoE (8MoE for equipment only) as IPA funds (the first phase in equipment procurement)



- 2012. Launched DVB-T2 pilot network
- 2013. Contribution of the Government in IPA project with 4 MoE for equipment (the second phase in equipment procurement)
- 2014. signed the loan agreement with the EBRD for purchasing necessary equipment (the third, final phase in equipment procurement)
- 2015. delivery and installation of the equipment.
- 2015. Serbia has completed the ASO process on June 7 and launched two multiplexes.

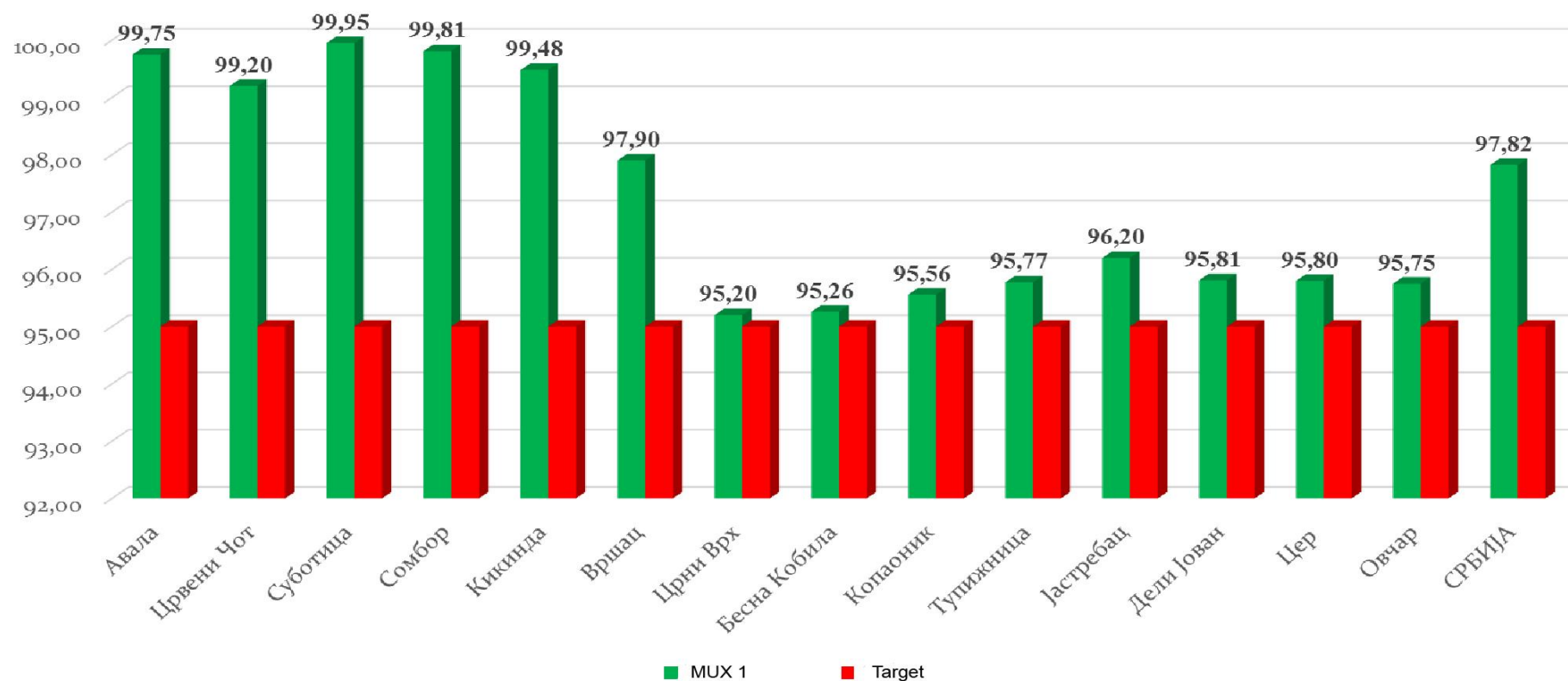


### 3. Achievements in figures

- ETV launched two MUX-es until 7<sup>th</sup> June 2015:
  - *The 1<sup>st</sup> MUX started on 202 sites on the very beginning.*
  - *97,82% covering population (target 95 %)*
  - *Until now, sites number increased to 226, 31 Tx sites, 195 GF sites.*
  - *Population covering reached 98,37 %.*
  - *MUX 1 Content:*
    - *National public services RTS-3 programs:* 
    - *Regional public services RTV-2 programs:* 
    - *National commercial TV stations - 4 programs:* 



- The MUX 1 covering per allotments:







- The 2<sup>nd</sup> MUX started on 88 sites on the very beginning.
- 96.77% covering population (target 90 %)
- Until now, sites number increased to 115, 31 Tx sites, 84 GF sites.
- Population covering reached 97,19 %.
- MUX 2 Content: more than 100 local and regional TV stations:

ВРШАЦ	1	ТВ БАНАТ	РУДНИК-ЦРНИ ВРХ	28	ТВ ПАЛМА ПЛУС	ДЕЛИ ЈОВАН	56	ТВ БЕСТ	ЦРВЕНИ ЧОК	82	ТВ СРЕМСКА
	2	ТВ ЛАВ		29	ТВ КАНАЛ 9		57	ТВ БОР		83	ТВ МОСТ
	3	ОК ТВ		30	ТВ КРАГУЈЕВАЦ		58	ТВ ИСТОК		84	ТВ ПАНОНИЈА
	4	ТЕЛЕВИЗИЈА СД		31	ТВ ЈАГОДИНА		59	ТВ СЕЗАМ		85	ТВ НОВОСАДСКА
	5	ТВ ВИМИНАЦИЈУМ		32	ТВ ЈАСЕНИЦА		60	ТВ КУЧЕВО		86	ТВ КАНАЛ 25
	6	ТВ ПАНЧЕВО		33	ТВ СУНЦЕ		61	ТВ ТРАНС		87	ТВ ПЕТРОВЕЦ
	7	ТВ ВИКТОРИЈА		34	ТВ БУПРИЈА		62	ТВ Ф КАНАЛ		88	ТВ ДЕЛТА
КОПАОНИК	8	РЕГИОНАЛНА ТВ	35	ТВ КАНАЛМ	63	ТВ КЛАДОВО	89	ТВ К9	ЦЕТ МАКЕН	91	ТВ ВУЛИЋ
	9	ТВ РАШКА	36	РЕГИОНАЛНА ТВ	64	ТВ МЛАВА	90	ТВ МОЗАИК		92	ТВ ШАБАЦ
	10	ТЕЛЕВИЗИЈА ПЛУС	37	ТВ КРАЉЕВО	65	ТВ 4С	93	ТВ АС		94	ВА ПЛУС
	11	ТВ ДИСКОС	38	ТЕЛЕВИЗИЈА ТЕЛЕМАРК	66	ТВ КРУШЕВАЦ	95	ТВ ЛОТЕЛ ПЛУС		96	ТВ ПОДРИЉЕ
	12	САНЦАК ТВ	39	ТВ ГАЛАКСИЈА 32	67	ТВ КРАЉЕВО	97	ТВ БУЈАНОВАЦ		98	ТВ ВРАЂЕ
	13	ТВ ЈЕФИМИЈА	40	ТВ МЕЛОС	68	НТВ НИШКА ТВ	99	ТВ РИТАМ		100	TV BELLE AMIE
	14	СПОРТСКА ТВ	41	ТВ ПОЖЕГА	69	ТВ КУРШУМЛИЈА	101	ТВ АДЛИ		102	ТВ ПРЕШЕВО
АВАЈА	15	ТВ ТУТИН	42	ТВ КЛИК	70	ТВ ЛЕСКОВАЦ	103	ТВ БОСИЛЕГРАД	СУБОТ.-СОМБОР	104	ТВ ПАНОН
	16	ТВ ЈЕДИНСТВО	43	ТВ ПРИМА	71	МОСТНЕТ	105	TV YU ESO		106	ТВ ПАНОНИЈА
	17	САТ ТВ	44	ТВ ПРИБОЈ	72	ТВ МЕЛОС	107	ТВ МОСТ			
	18	ТВ МАГ	45	ТЕЛЕВИЗИЈА 5 ПЛУС	73	ТВ ВРЊАЧКА БАЊА					
	19	ТВ КРГЛ	46	ТВ ЕНИГМА	74	TV K::CN					
	20	СТУДИО Б	47	ТВ ФОРУМ	75	ТВ ТРСТЕНИК					
	21	ТВ ГЕМ	48	КА ТВ	76	ТВ ЛАСЕР					
КЛИКНИЦА	22	ММОЈА ТВ	49	ТВ ГОЛИЈА	77	ТВ ЦАРИЧИНГРАД					
	23	ТВ ДУГА	50	ТВ ПИ КАНАЛ	78	TV BELLE AMIE					
	24	ТВ САНТОС	51	ТВ ПИРОТ	79	ТВ КЛИСУРА					
	25	ТВ РУБИН	52	ТВ БЕСТ	80	КА ТВ					
	26	КТВ ЗРЕЊАНИН	53	ТВ БОР	81	ТВ НИШАВА					
	27	ТВ ВК	54	ТВ ИСТОК							
			55	TV BELLE AMIE							

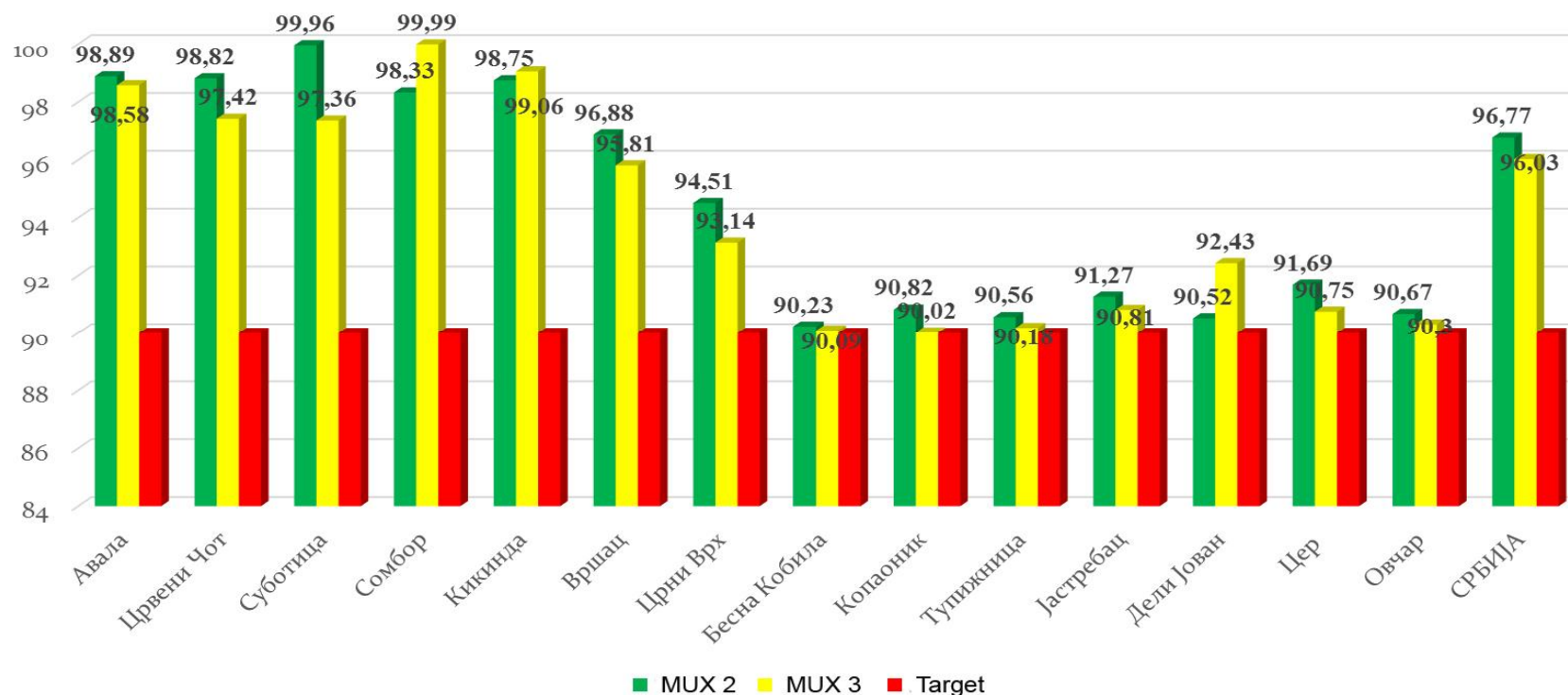


- The 3<sup>rd</sup> MUX started on 15. september 2016. as commercial pay TV servis „Antena PLUS“
- MUX 3 Content: 23 TV programs:



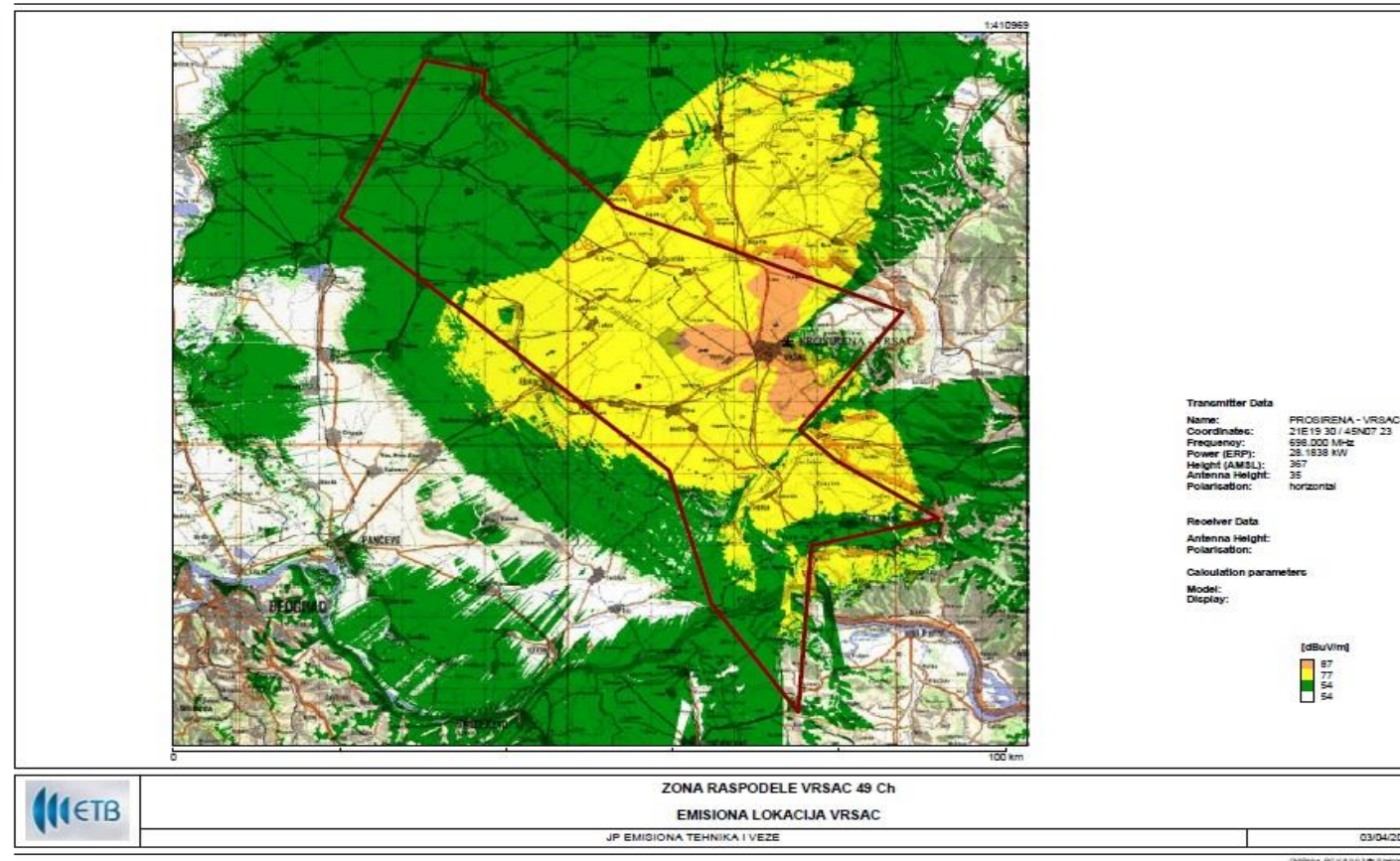


- The MUX 2 and 3 covering per allotments:





- Coverage plan and coverage percentages were calculated using a powerful software tool CHIRplus – LS Telcom:





- The results of coverage verified of measurements in the field using specialized measuring vehicles equipped with high-end instruments and accessories:
- Drive test –more than 80.000 km





- For delicate situations we used stationary measurement at different heights up to 10 meters:

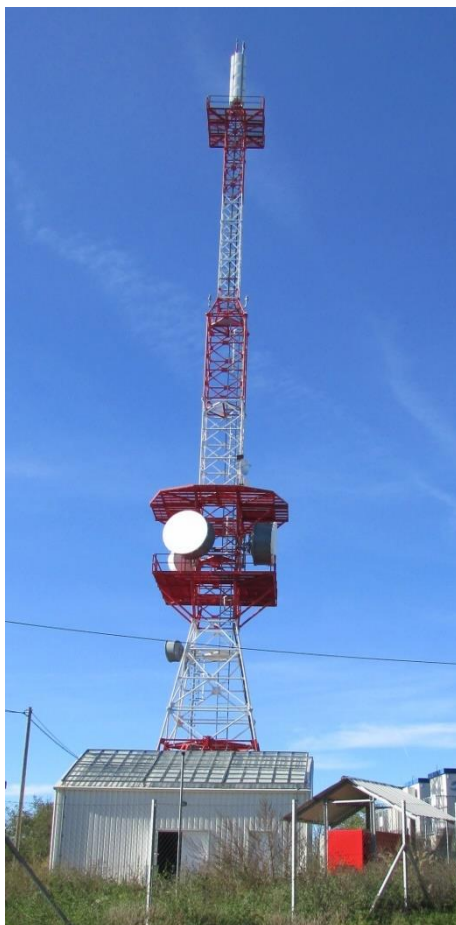




- **Since 2012 ETV has been working on rebuild infrastructure:**
  - 165 sites of a total 224 are rebuild:
    - *25 major sites have already been rebuild by Ministry of telecommunications,*
    - *50 sites also have already been rebuild by ETV.*
    - *88 sites already under final phase of reconstruction, financed by EBRD loan.*
    - *2 completely new big sites have been built: Sombor and Kiknda financed by EBRD loan.*
    - *28 the most important Tx sites equipped with UPS and diesel power generator*



## Examples of the renewed sites:







## Examples of the renewed sites:





Interesting pictures of the broadcast sites:





## 4. Description of DVB-T2 system – Rules of operations

- DVB-T2 modulation parameters:

### Network parameters:

- |     |                     |                    |
|-----|---------------------|--------------------|
| 1.  | Network type        | SFN/MFN            |
| 2.  | Antenna system      | SISO               |
| 3.  | PLP mode            | Single             |
| 4.  | FFT size            | 32k                |
| 5.  | Carrier mode        | Extended           |
| 6.  | Modulation          | 256QAM             |
| 7.  | Code rate           | 2/3                |
| 8.  | Guard interval (GI) | 1/16 (224 $\mu$ s) |
| 9.  | System bandwidth    | 8 MHz              |
| 10. | Signal bandwidth    | 7.77 MHz           |
| 11. | Scattered pp        | PP4                |
| 12. | Useful symbol time  | 3584 $\mu$ s       |
| 13. | Estimated bit rate  | 36.92Mbps          |

### Video coding:

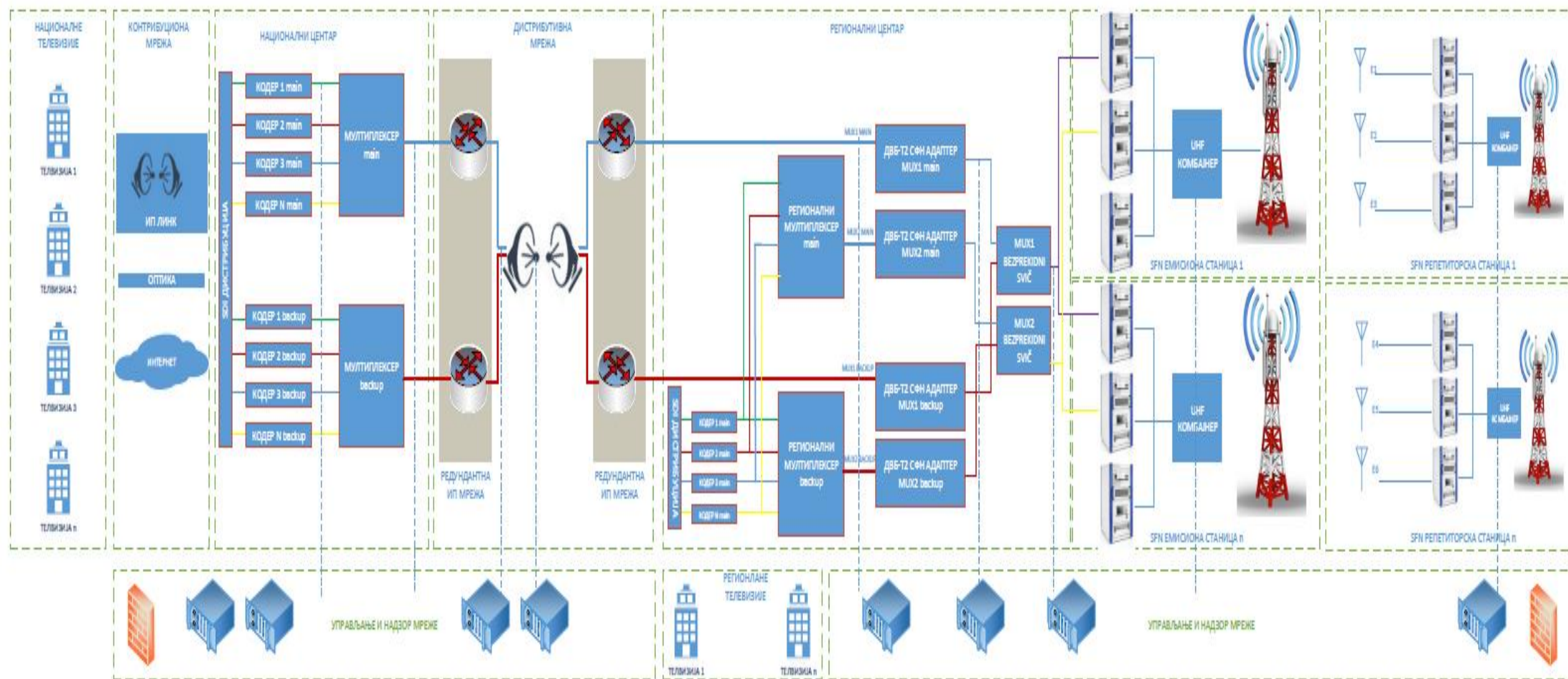
H.264 / MPEG-4 Part 10

### Audio coding:

MPEG-1 Audio Layer II  
(for SD programs)  
HE-AAC and Dolby Digital +  
(for HD program)



### DVBT-T2 Network - Logical scheme:





## 5. Plans for future

- Improving existing services (FM network, distribution of modulation signal through IP network, EPG, Audio description, include all sites in NMS,...)
- Hbb TV – Hybrid Broadcast and Broadband TV
- Subtitling (XML Subtitling, Live Subtitling)
- DAB/DAB+
- HEVC - High Efficiency Video Coding
- Migration from SD to HD or UHD
- DVB-T2 lite

***Thank you for your attention!***