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Streaming Box

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MOI+

SPECIAL ENGLISH ISSUE

TBS MOI+ TEST REPORT

New model of device for streaming TV channels through network

In 3/2013 issue of SAT Kurier monthly magazine we reviewed an interesting and innovative device which changed the way of receiving and watching TV channels– TBS MOI DVB-S2 Streaming Box. We promised then that we will come back to the subject of streaming TV channels and now the time has come. Let us introduce a new model – **TBS MOI+ Streaming Box**.

INTRODUCTION

The device is produced by TBS (Tenow International Ltd.) a well-known DVB card producer, the company with great knowledge in the sector of devices produced for receiving digital channels. At present, the price for this device is 149,99 USD, supplied straight from China (without shipping costs nor additional taxes). Soon, the device should be on offer in many shops all over the world.

What is the purpose of TBS MOI+ Streaming Box? As the name suggests – it is used for streaming content received (this is its important part) from satellite, terrestrial transmitters or cable operators through the network. This is also the first important difference when comparing it to the previous model MOI (without

„+"), which was „a satellite device only". Practically, MOI+ is a very small, energy-saving, specialized computer with the aim to perform just one task – streaming TV and radio channels through the network to devices which are able to play multimedia streams. It is not classic digital receiver, so it cannot be connected straight to TV, it has no video nor audio connectors/outputs. And that's the point, because as we know now smartphones and tablets don't have such inputs. A traditional way of distributing audio and video is a barrier for watching anything on multiple devices. So why not try to use more and more common Wi-Fi instead of having entanglement of cables and limiting oneself just to watching anything on TV screen only?

DIFFERENCES IN COMPARSION TO MOI

There are much more differences between MOI+ and its older brother MOI. As we all know, electronic business is constantly developing and new possibilities appear almost every day, giving the chance to build more powerful hardware. The MOI+ has been improved and its hardware is now based on SoC Marvell 88F6282 clocked at 1,6 GHz, Sheeva CPU core V5TE ARM, 1 GB RAM DDR3 memory (twice as big as in MOI) and 512 MB NAND Flash (also doubled in amount when comparing to MOI).

More interesting changes can be seen in MOI+ equipment. Beside the classic cable Ethernet connection MOI+ also has Wi-Fi (TBS includes additional antenna which needs to be connected to

the back of the device). There is VFD display on the front panel, thanks to which the initial configuration of MOI+ is now much easier. There is also additional USB port instead of SD card reader which is now obsolete, as firmware upgrades are possible through the USB port.

In general, MOI+ is equipped with LAN connector, Wi-Fi antenna output (antenna included), 2 USB ports, UART connector for service purposes, 12 V, 2A power supply input (included), Reset button and signal inputs and finally CAM slots, depending

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POSSIBLE CONFIGURATIONS OF MOI+			
Type	Card Model	Tuners	CAM
Satellite (DVB-S/S2)	TBS6922SE	1	-
	TBS6925	1 (16/32APSK)	-
	TBS6982	2	-
	TBS6983	2 (16/32APSK)	-
	TBS6985	4	-
	TBS6928SE	1	1
	TBS6991SE	2	2*
Terrestrial (DVB-T/T2) Cable (DVB-C)	TBS6221	1	-
	TBS6281	2	-
	TBS6285	4	-
	TBS6290	2	2*
Cable (DVB-C)	TBS6618	1	1
	TBS6680	2	2*
*assigned to tuner			

on selected DVB card model. All that packed into a nice box with a short manual included.

All users interested in more professional deployment of MOI+ may now install the device in rack cabinets. Appropriate mounting can be obtained from TBS or anybody with little manual skills can make it themselves. MOI+ has holes for mounting screws on its side walls.

The changes can also be seen in software. TBS has developed its own simple application for mobile devices, which can automatically search for MOI+, MO-IPro or Matrix in the local network, get channel list and dispaly a TV channel. It is called TBS IPTV Live and we will look at it closer further in the text.

The last, but most important change is the way that MOI+ is equipped with tuners. Older MOI used to have special dedicated satellite tuners connected to USB ports on the mainboard. There were no terrestrial or cable modules, the device was offered with built-in satellite tuners and it was able to receive satellite channels only.

MOI+ has been built in completely different way. There is one PCI Express slot on the MOI+ mainboard - identical as in PCs'. And now it is able to support all PCI Express DVB cards from TBS. This makes it possible to get any configuration of tuners and CAM slots as TBS has all DVB cards for PCI Express on offer, even up to 4 tuners in one DVB card.

MOI+ can be equipped with a satellite card (DVB-S/S2) with a maximum of 4 tuners or 2 tuners and 2 CAM slots or with terrestrial-cable card (DVB-T/T2 and DVB-C) with a maximum of 4 tuners or 2 tuners and 2 CAM slots or with cable-only card with a maximum of 2 tuners and 2 CAM slots. Detailed possibilities and supported DVB card models can be found in table on the right.

Our staff could test MOI+ equipped with TBS 6991SE, which has 2 tuners and 2 CAM slots. It was connected to SMATV system based on multi-switch powered with the signal from two most popular satellite positions in Poland - 13°E and 19,2°E. It is the same installation as it was used back in 2013 for MOI tests.

DVB CARD INSTALLATION/ REPLACEMENT

In most cases when buying MOI+ a customer needs to select a matching DVB card (because without it the device will simply not work) and the selected DVB card will be installed by professional technicians. But if we decide to make any changes - there is such a possibility. You only need to buy one of the mentioned supported DVB cards from TBS and then install it inside MOI+.

DVB card installation is simple. You must remember to completely disconnect MOI+ from the power source. The next step is to unscrew the top part of housing (6 screws – 2 on every side and 2 on top). Next - unscrew a handle that locks DVB card (two screws at the back side on the left). Thanks to this it is possible to pull out old card from PCI Express sock and replace it with a new one. Installation is just the same as unscrewing the old one – screw on the card to locking handle and close housing. After replacing the DVB card you need to refresh configuration of MOI+ as this operation will change tuners that MOI+ recognizes.

A small tip: there are also USB and SATA connectors on MOI+ mainboard, which can give some additional „hidden" possibilities for all users interested in modifying the hardware. Cooling is passive with radiator being installed, so there is no noise heard from a fan during its work. Additionally, we need to mention here that it is recommended to put MOI+ in a place with good air circulation, to make sure that the device will not be overheated.

Also TBS 6991SE DVB card has something hidden on its mainboard - near CAM slots there are LED indicators that can give information about an operating

MOI+ hardware with TBS 6991SE DVB card installed

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status of CAM modules. Unfortunately (or – fortunately – if a user does not like additional lights) these LED indicators are invisible when MOI+ housing is closed.

FIRST START-UP

From the beginning it can be seen how helpful the display built in MOI+ is. All the time it shows what MOI+ is doing. The device start-up process lasts about 45 to 60 seconds and the display shows respectively two messages: „Welcome MOI+" and „Starting kernel". After completing the start-up procedure, the display shows interchangeably four messages. The first one is: „Hello MOI+" and the second line shows the assigned IP address, The second one displays the state of USB and SATA connectors (if there is anything connected or mounted), the third one shows the Wi-Fi connection and the date/time set on the device and finally the fourth one shows available tuners.

IP address on the first screen shows where we should find MOI+ web interface to be able to configure it from a PC. We just go to this IP address on the web browser connected to the same local network and we will see the configuration panel of TBS MOI+. In the older model – MOI – there was no display unit and thus to enable finding the device it had a static IP address assigned to the device with DHCP turned off. This could lead to some complications if the local network had other addressing than standard one or if there would be IP address conflict with the device. MOI+ has active DHCP and thanks to a built-in front panel display unit it is always possible to find the configuration web interface.

SYSTEM UPDATE

This is an important note here – before we start to configure MOI+ it is worth to check software/system version. It is reported in the web interface on its main page on the left, just right below „About" button. It is important to always use the latest version as it provides important corrections

and gives new functions. When the report has been released the latest version was 1.0.1 release of August 2014.

The updating is simple – you just need to download the software from http://www.tbsdtv.com (checking that files are for MOI+), extract archive contents to root catalogue on USB memory stick (recommended bigger than 1 GB, formatted with FAT/FAT32). The next step is to connect so prepared memory stick to the turned off MOI+ and plug the MOI+ in. MOI+ will recognize the memory stick, find updated files and perform updating. The device needs about 5 minutes for that. After updating is completed, there is no need to restart MOI+ – the device will itself turn on.

It is worth mentioning two issues here – firstly – updating files are of rather big size (nearly 300 MB) and second important thing – there are two versions of kernel for the device. Both are supporting satellite transmission (DVB-S/S2), so no matter which one we will load, if using satellite. But if we use terrestrial or cable transmission, we need to carefully check which version we are trying to load. One version is for DVB-S/S2 and DVB-T/T2 and

the second one is for DVB-S/S2 and DVB-C. There is no universal version.

MOI+ CONFIGURATION

Configuration web interface on 1.0.1 system version has 7 buttons on the left, which bring a user to various settings.

Network Settings is for configuration of the network connection. LAN is turned on by default, so the cable connection is active. DHCP is also turned on. Web interface shows IP addresses which are assigned for MOI+. It is possible to turn off DHCP and enter all data manually.

Here we can also switch to WLAN interface. When switched on, the web interface will show on the list all available Wi-Fi networks (don't forget to connect Wi-Fi antenna). To connect with the desired network we need to select it and if it is secured - enter the password. If everything is OK – all fields will be filled with IP addresses.

The tip about network connections – in theory it is possible to leave DHCP active, so IP address for MOI+ will be assigned automatically at the start-up, but this could lead to a situation

where MOI+ local IP address will change after its restart. This will be no problem for TBS IPTV Live app, which automatically detect MOI+ on the local network, no matter what IP address will be assigned, but VLC or XBMC/Kodi needs to have static IP address and its change will lead to the need for updating the configuration of a player or media centre. As XBMC/Kodi is likely to be used in most cases, we suggest to set static IP for MOI+ and turn off DHCP. It is always possible to reactivate DHCP in future, if needed.

Next settings category – Tuning Settings is very important for the device work. Here we can select whether MOI+ is to load streaming app at the start-up or we would like to manually use the advanced software. By default all applications are turned off. Older MOI offered only Tvheadend as streaming app. Now MOI+ also has a well- known for Linux users VDR software („classic" MOI can be updated to enable the use of VDR). The selection between Tvheadend and VDR is reduced to compare differences between these two solutions. Tvheadend gives better control of a channel list – its order and updating. Tvhe-
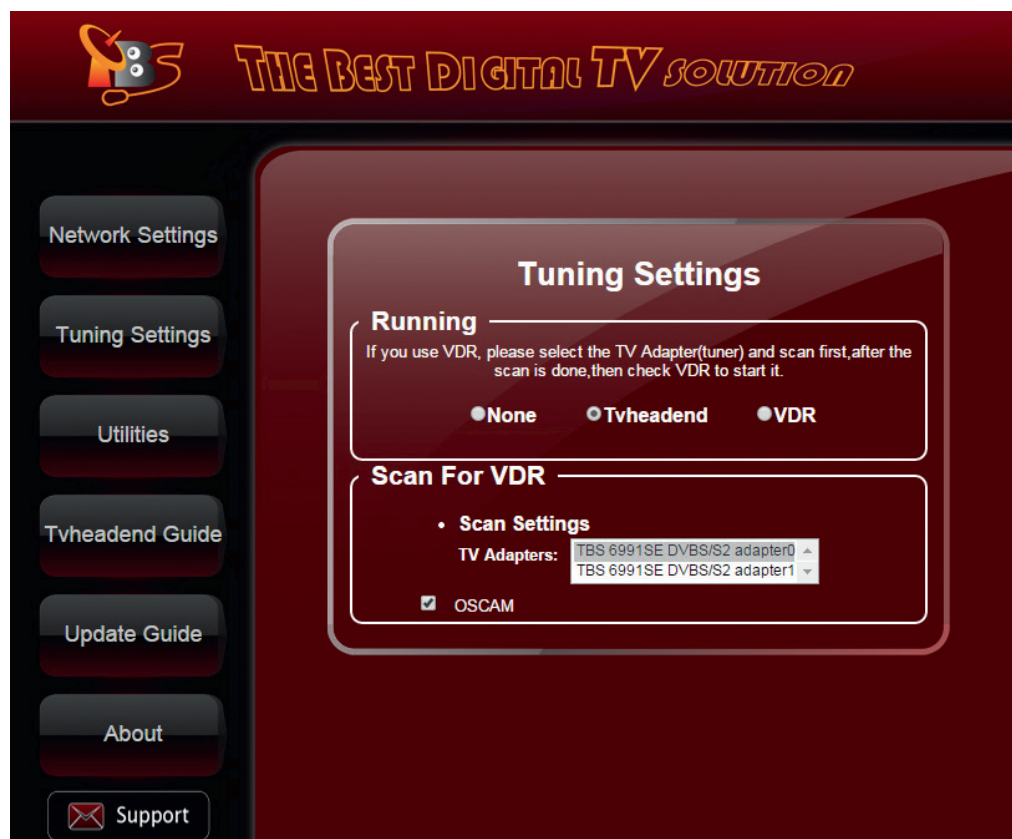
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adend configuration supports more types of satellite installations (e.g. Unicable support), but there is one drawback – there is no support of CAM modules (if the card has CAM slots), which is an advantage of VDR. If we choose VDR, before we start it, we must perform the channels scanning to build a channel list for it. We will describe that process later.

Additionally, even if we buy DVB card without CAM slots – we can still gain an access to Pay TV channels, if we have an conditional access card. MOI+ has **oscam** software card reader installed. Its configuration can be edited manually and it is saved in text files located in /usr/local/ etc catalogue (access with FTP, at the device IP address with login: „root" and password „tbs" or even with a system file explorer as MOI+ has active Samba client and thus it is visible in the local network). Oscam is able to support Phoenix connected to USB as universal card reader, e.g. TBS 3102, so even if we have DVB card without slots for CAM modules, we are still able to legally run our Pay TV subscription (if conditional access card is not paired with hardware).

There are of a lot of changes when we compare it with its „older brother" MOI, where oscam

originally was not available and Tvheadend didn't support CAM modules. This led to necessity of learning to use more advanced and less user friendly apps, like DVBlast. Of course now, thanks to the system updating, MOI is also provided with oscam access.

On the next configuration page – **Utilities** we will find settings for time zone, ping tool for checking the Internet connection and an option to restart MOI+. Default time settings need to be changed (the date somewhere near 2000 year). The current date and time can be entered manually. Saving is done by clicking the „Set Time & Zone" button. We recommend to input time/date and select time zone separately, because despite the button label which says that all data should be saved, when we tested MOI+ only time was saved at first approach. It is very important to set the correct date and time, because this „system" information is used further by all applications, for example to grabbing EPG data. Unfortunately MOI+ does not synchronize date/time online. If it is left unplugged, it will lose its synchronization. There is a way to add automatic online date/time synchronization with NTP servers with a simple script. The method was described by American MOI+

tester in his blog, where we can also find an extended MOI+ test report: **http://freetoairamerica. wordpress.com**

Next two options in MOI+ web interface give an access to the manuals in English. First you will find the description of **Tvheadend** configuration and followed by an instruction for MOI+ system update.

Finally, there is also „**About**" button, where we can find some information about the current MOI+ system version, an access to MOI+ by SSH or FTP, Samba client, UART port (special adapter is needed for Tera Term app), tips for using dvblast or mumudvb (to use SSH for this purpose) and a link to system updates and the Tvheadend manual

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on the TBS website. And below the „About" button there is a link to MOI+ support e-mail address (communication in English only).

STAGE I
PREPARING ACCESS TO CHANNELS

Before we start watching TV we need to prepare MOI+ for streaming. Providing access to the content is divided into two stages – the first one is to select and configure the solution used in MOI+ for streaming and the second one is to select the device and application which we will be used to watch the content.

MOI+, beside the mentioned Tvheadend and VDR has many more advanced applications installed, e.g.: **Mumudvb, DVBlast, szap, tzap, czap, dvbdate, dvbnet, dvbscan, dvbsnoop, dvbtraffic, scan-s2, szap-s2, dst_test**. They are of different purpose – streaming, channel scanning or stream analysing. But they all need advanced knowledge from user to be run. However, the producer has prepared Tvheadend and VDR for an easy MOI+ setup and we will describe the configuration of both of them, to show how to correctly operate the device.

Advanced users may have to try to configure and run other apps. Then you need to remember not to select Tvheadend or VDR in Tuning Settings in MOI+ web interface. The communication with MOI+ is then possible for example by telnet. This requires extensive knowledge about Linux, computers and DVB technology.

1) The choice between Tvheadend and VDR

A little bit earlier we noted that there are differences between Tvheadend and VDR. The choice which app should be the „heart" of MOI+ depends on these differences and the purposes for which we want to use MOI+. Tvheadend will handle more different satellite installation types, for example Unicable and (in theory) motorized systems. Tvheadend also has better possibilities of channel scanning and the tools for channel list edition. We have better control over the configuration details thanks to separated (second) web interface, dedicated just for Tvheadend configuration. Additionally TBS IPTV Live app for smartphones and tablets with Android OS, which can automatically find MOI+ and

download available channel list – works only with Tvheadend (but instead of it we can use XBMC/Kodi).

VDR main advantage over Tvheadend is the support of CAM modules, if we have a DVB card installed in MOI+, that are provided with CAM slots. On the other hand, the VDR is provided with no additional web interface for configuration, no tools for channel list edition nor updating channel parameters (scanning is done by separate app). Also with default settings VDR has problems with Polish characters in EPG (Electronic Program Guide).

Both Tvheadend and VDR are able to support TBS 3102 USB Phoenix card reader thanks to oscam.

We will further describe the configuration of both applications installed by default in MOI+.

2) Tvheadend configuration

Tvheadend is a very expanded and advanced app. Describing all options and possibilities of it is pointless and we would run out of space for that. Because of that we will focus on the best way to run the device and make channel streaming possible. Further perfecting the settings depends

on a user invention and knowledge. We need to mention here that MOI+ is a very advanced device and if we want to „squeeze" more from it – it is possible, but we need to have advanced knowledge about PC (especially Linux OS) and DVB technology. Good command of English is also helpful as Tvheadend web interface in MOI+ is in English only.

a) Dish setup

After we select Tvheadend field in Tuning Settings, Tvheadend web interface should automatically pop up in browser (if this won't happen – turn off pop up blocking for a minute or manually open **http://device_ip_address:9981/extjs.html**). If MOI+ is with 1.0.1 system version, then Tvheadend will be in version 3.9.636 and from our MOI test report of March 2013 a lot of changes have been introduced since then, especially when it comes to the dish setup. Unicable LNBs, DiSEqC 2/1 and 4/1 switches and morotized systems are now supported.
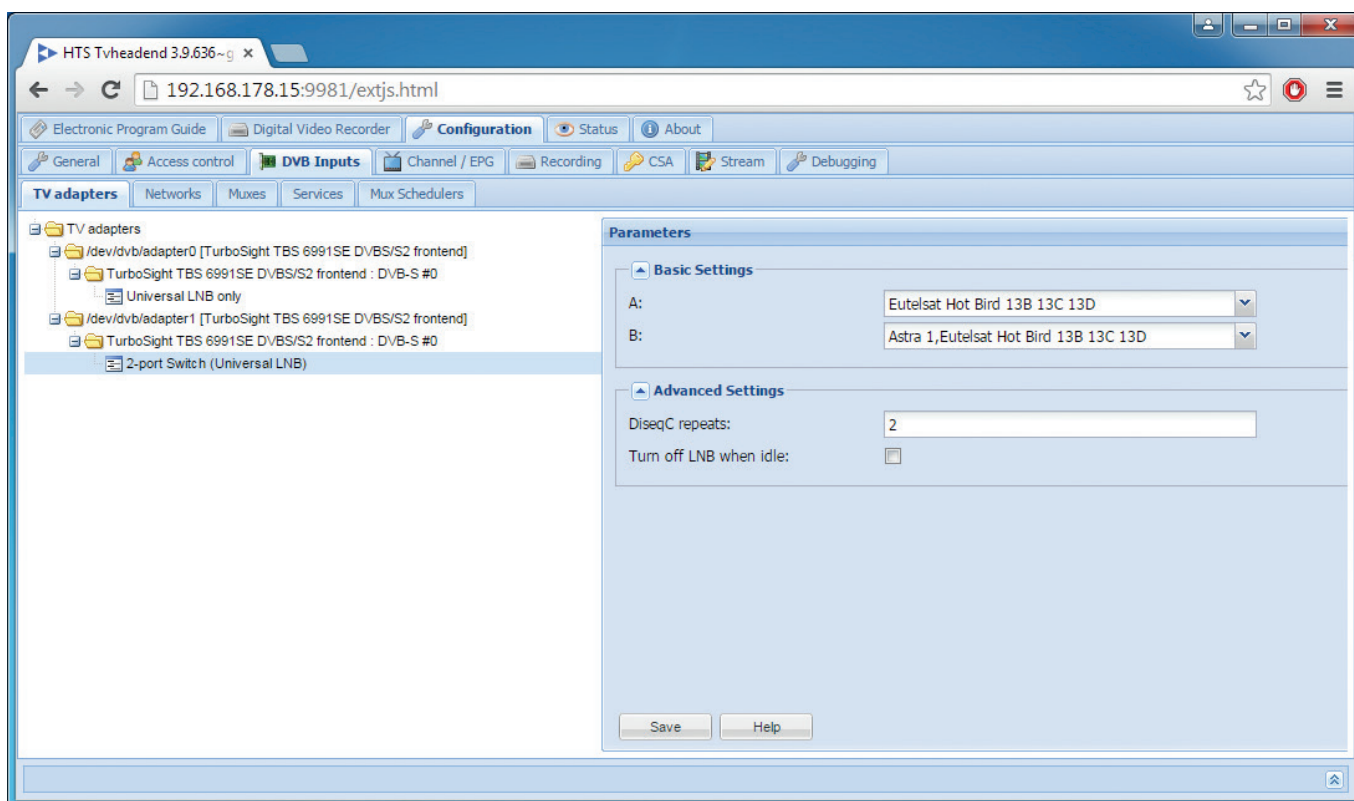
To get into the dish setup in Tvheadend you need to go to Configuration tab. A new row of tabs will be shown, where we select DVB Inputs and then another
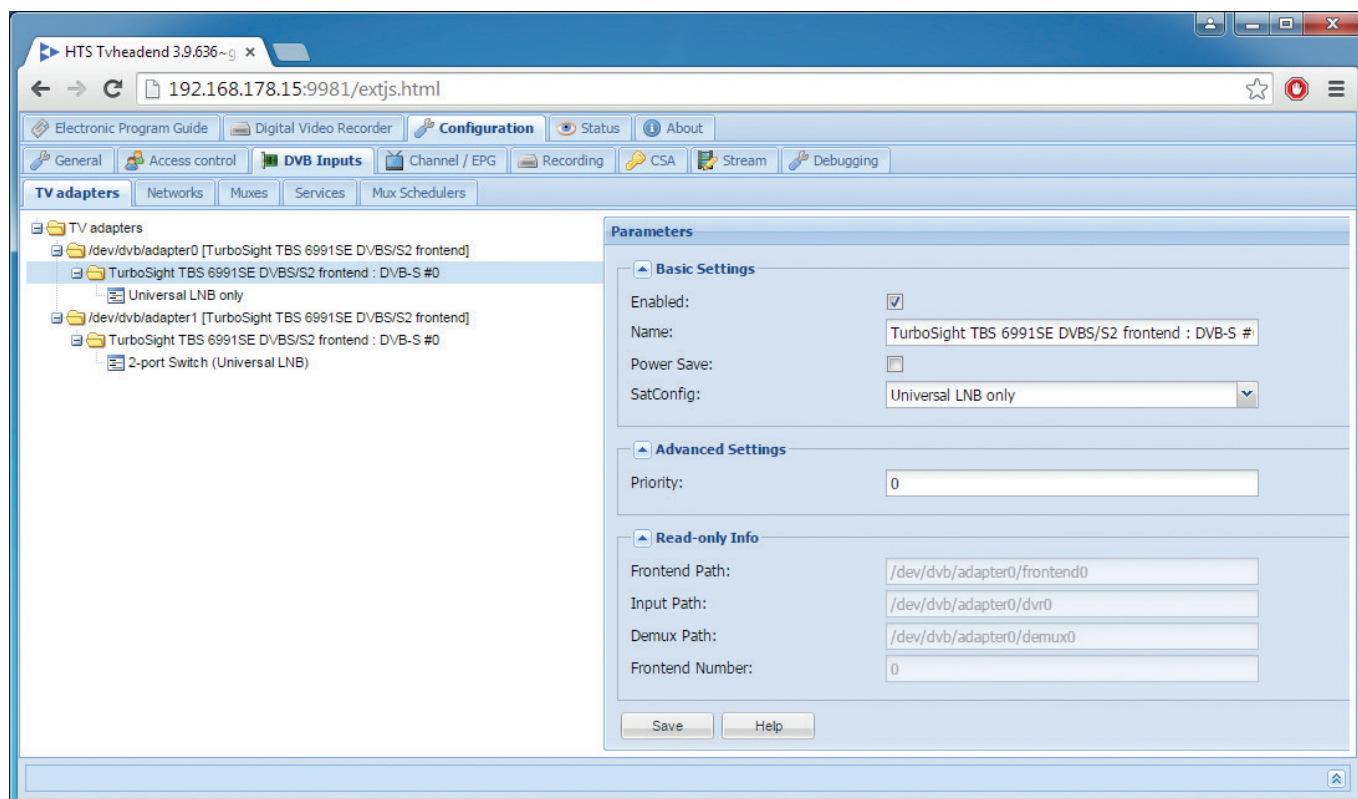
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tab row will be shown, where finally Networks tab shall be first checked. In this place we are adding signal sources – for example terrestrial TV or for the satellite signal source – different satellites. After clicking on „Add", a simple creator will be displayed. First, we need to select the type of source that we are going to add. We can choose from: IPTV, ATSC, DVB-S (satellite), DVB-C (cable operators) or DVB-T (terrestrial). Of course we need to select the type according to DVB card installed inside the MOI+. In our case (TBS 6991SE) it is DVB-S. Then, we will see another window, where we can input the network name (without any meaning) and select from Pre-defined Muxes list the correct satellite (this will give us a ready list of active frequencies/transponders).

We left all other settings untouched as there is no need to change them. There is also: **Network Discovery** option, which is an equivalent of network scanning in stand-alone digital receivers – Tvheadend will try to search DVB streams for data with other active frequencies, **Skip Initial Scan**, which will leave initial forced channel scanning, **Network ID**, which will limit Tvheadend channels scanning to

entered NID value (transponders with other values will be skipped) and **Character Set** – selection of charset encoding (e.g. for EPG).

It's worth to mention that satellite names in Pre-defined Muxes are up to date, the programmers took care about this. After filling all necessary data, click on „**Create**" to finalize the process. All these steps need to be repeated for all satellite positions that we have access to.

After completing this task we will see in **Muxes** tab, that we have transponders from selected satellite positions added. Although not all are added (in MOI+ system version 1.0.1 there were 66 frequencies from Hot Bird and 66 from Astra 1), but that is enough. We can add manually another ones, but active Network Discovery option will fill missing transponders.

So we have satellites and transponders, but we still need to configure DiSEqC and scan channels. For this purpose we switch to TV adapters tab. We should see there automatically detected DVB card installed in MOI+ (if it has 2 or 4 tuners they will be listed as separate positions). The next step is to expand a tree to show DVB card name and click on it. On the right we will see the

configuration of selected DVB card. We recommend not to select yet „Enabled" field. It is responsible for activating the tuner, but we don't have it configured yet. It is better to enable the tuner at the end. First, we select **Sat-Config** – type of connection – single LNB, system with 2/1 DiSEqC switch (correct also for mono-block LNBs), system with 4/1 DiSEqC switch, with **Unicable** LNB or „Advanced" for motorized dish (USALS or GOTOX), DiSEqC switches with more inputs or if we have LNB with other LOF than standard 9750/10600. To save changes we use „Save" in bottom part of window.

The list will be refreshed and depending on selected options we will be able to expand the next level of the tree below the DVB card name. When 1, 2 or 4 LNB setup is selected, we just need to select sources (Networks) created earlier for every LNB/DiSEqC port. It is also possible to set up repeating of DiSEqC commands if we suspect problems with switching between LNBs and to enable an option to turn off the selected tuner if it is not in use (we do not recommend to activate this as it can lead to limitations of the device possibilities in specific usage scenarios, only users

that are not afraid of using this in longer perspective may attempt to enable this).

If we choose the Unicable configuration type, then we need to select LNB channel, working frequency (outputs of Unicable/SatCR LNBs are mostly described) and select the position – A or B (simple 2 LNBs multifeed system for Unicable is supported, but a ready satellite dish installation and correct LNBs is needed).

The Advanced mode configuration is the most complex. Firstly, we need to select here to how much satellite positions we have an access. For a motorized dish, where we have a lot of accessible positions, we need to check the number and calculations must be made. After saving this value we will be able to expand another level of the tree with as many elements as we have defined before. Now we need to complete missing data – source name, network (satellite), LNB type (beside universal one there are also other types – standard, enhanced, C-Band, circular with LOF 10750 MHz, Ku 11300 MHz, DBS and DBS Bandstack, but they all have LOF values without ability to change them and these values are unknown, so we don't know what setting

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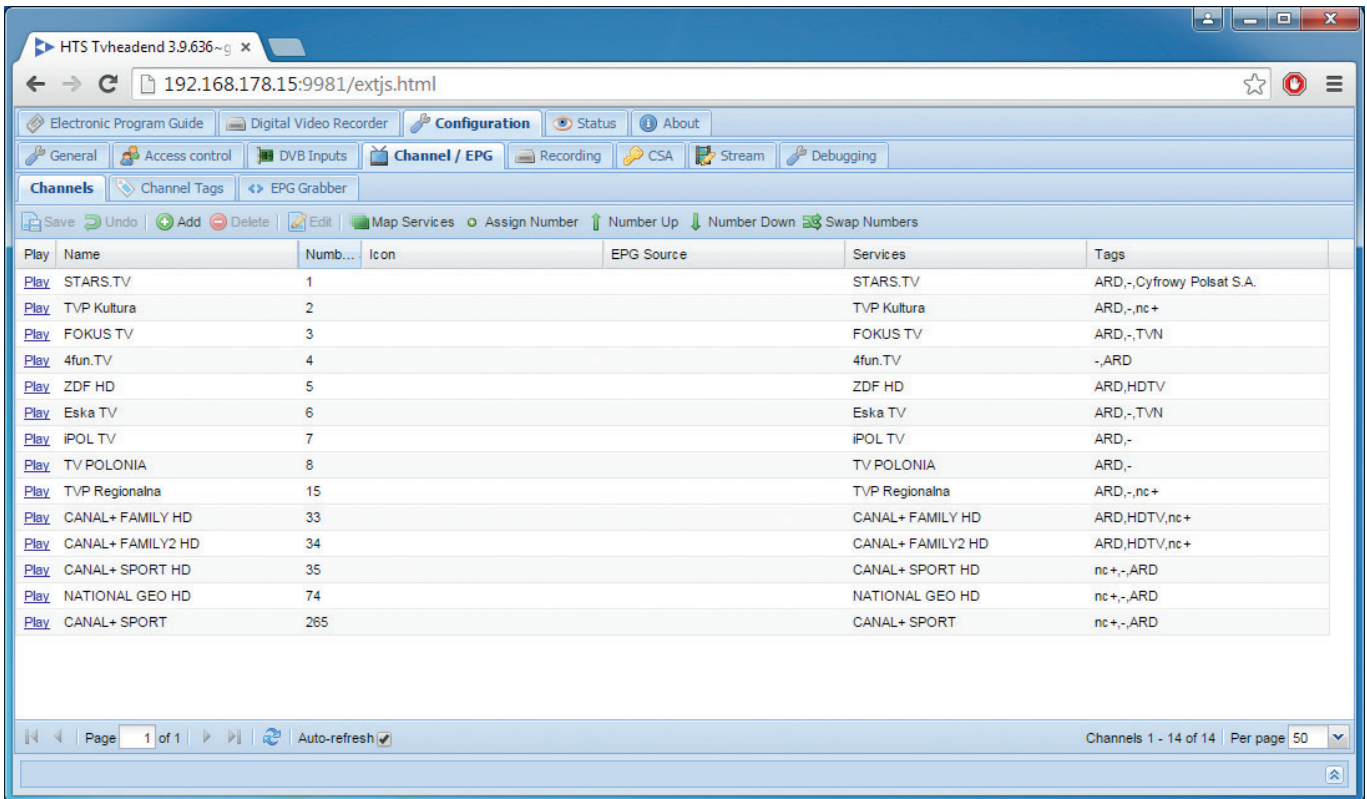
is for example for C-Band LNB), switch type (none or standard with additional configuration, including manual input for ports and cascades), motorized system type (USALS or GOTOX with additional configuration), Unicable (none or standard, settings for it are available after saving).

For all other dish setup types you just need to select the network (satellites) for each port in switch.

You need to remember to save all changes that we have made in the configuration with „Save" button in the bottom part of the window.

Finally, when we completed the configuration – we can select „Enabled" field in DVB card configuration (if we have more tuners – for each separately).

Almost instantly Tvheadend will start channel searching. The number of services and „muxes" (transponders) will be increasing on Networks tab. We suggest here to wait and let the device and Tvheadend do their work – scan all services. Duration of this process can vary, depending on DVB card model installed in MOI+, the number of configured satellite positions and detected muxes/frequencies during scanning. The channel searching will

be completed when services and muxes number will reach the actual value for configured satellites or when it stops to increase. For Hot Bird and Astra 1 satellites the number reaches above 2000. During our tests we reached the following results: 3075 services for Hot Bird satellite and 2973 for Astra 1 (including TV channels, radio stations and data services).

b) Creating channel list

It would be very hard to find the desired channel in so many available services, so it is possible to create the user's channel list at the level of Tvheadend. This channel list will be then received by a client's applications which include such functionality as, e.g. TBS IPTV Live app or XBMC/Kodi Media Center.

To create the channel list we need to switch to the Channels tab and then using for example the ability to sort services by muxes find the desired channels, select them and click on „Map Selected" from the toolbar above. Selected channels will be added to the list (the preview and numbering management is on Channel / EPG tab).

Initial configuration process can take some time, but thanks

to this MOI+ daily usage will be much easier. There is an alternative method of clicking the **Map All** without selecting any channel. This will add all services to the user's channel list, but then when watching TV, searching for the desired channels from hundreds of services will be harder and uncomfortable for daily usage. The choice is up to the user's needs...

When mapping channels (adding to the user's channel list) we need to be careful with encrypted stations. Tvheadend, as mentioned before, does not support CAM modules, so for DVB card with CI slots we will not be able to use them (we should configure VDR instead), but Tvheadend is able to support Camd additions, like oscam, which is installed in MOI+ (in /usr/local/etc path). If a user wants (and knows how) to use such method to legally access Pay TV services, one just needs to configure oscam and connect it with Tvheadend on Campt Connections tab in Configuration – CSA. In this case there it is useful to add encrypted services to the user channel list (after clicking on the Map Selected you need to select Include encrypted services option). In other scenarios adding encrypted services to user channel list is clearly point-

less and the best idea is to skip them (which is default Tvheadend action when mapping channels – encrypted services, even if selected, are skipped).

In general, it is useful to reasonably create channel list with mapped channels, because Tvheadend will be downloading EPG data for these services. If we map all stations, Tvheadend will be searching for EPG data even for crappy teleshopping channels, wasting the time and eventually also space in memory for useless data. We recommend to create good and reasonable channel list without too many services that we will never watch.

It is worth to mention here, that channel scanning in Tvheadend with the configuration we have described here is needed only once. After full, completed channel scanning MOI+ with Tvheadend will be scanning the services in the background, when tuners will not be in use. New channels will be added automatically and we will only need to eventually „map" new desired services to the channel list from time to time. In the same way MOI+ with Tvheadend downloading EPG data – only when the device is not in use.

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2) VDR configuration

Alternative for Tvheadend, which is preinstalled in MOI+, is VDR. Both apps cannot work simultaneously. The selection between these two solutions is made in MOI+ web interface. The most important advantage of VDR is the support of CAM modules – if we have a DVB card with CI slots and want to use them – it's a crucial feature and VDR has got it. In the case of TBS DVB cards with two CI slots (like 6991SE te-

sted with MOI+) it is important to remember that CI slots are tied with tuners. CI CAM module in „A" can decrypt channels received by tuner „A", but not by tuner „B". You need to be aware of it when planning satellite installation.

VDR hasn't got a separate web interface available for confi-guration purposes as in MOI+ it works in VNSI mode (VDR Ne-twork Streaming Interface). To work with VDR the user needs to do channel scanning first. Wi-zard for this is not very advanced.

Currently it won't help the users with motorized systems. VDR is able to move the dish, so that it is not VDR problem, but simply the lack of advanced configuration prevents the part of web interface dedicated to channels scanning for VDR. Motorized systems can be configured manually, with onli-ne guides for VDR and help from received from discussion boards.

If DVB card installed in MOI+ has more than one tuner, scanning needs to be done se-parately for every available tu-ner. The scanning can be done through simply scanning part of MOI+ web interface. To do this we need to go to Tuning Settings. First, we should check both Tvhe-adend and VDR are turned off. It is important as scanning needs an access to tuners and active Tvheadend or VDR would lock tuners, making scanning impos-sible. Then we only need to click „Scan for VDR".

After clicking on „Scan for VDR" we will see a new part of web interface with few options for scanning. We need to select the-re: satellite (or region for DVB-T), LNB type (with option to manually enter LOF frequencies and band switching frequency), DiSEqC port, DiSEqC version (1.0/2.0 or 1.1/2.1) and retry count for Di-SEqC commands. After we enter all necessary data – click on „Set DiSEqC" to apply these settings to tuner. There is no view to signal strength and quality bars, so we need to be sure that entered con-figuration is correct.

In next step we need to se-lect „AutoScan" option and click on „Scan Channels" button on the bottom of the screen (without „AutoScan" selection MOI+ would scan only one frequency with pa-rameters entered above, not who-

le satellite, by default that field is not selected). Scanning needs to be performed separately for every satellite position we have access to (by DiSEqC switch, multiswitch or monoblock LNB).

After scanning is started there is a message that we need to wait a few minutes. There is no information about scanning progress, but when it is com-pleted, another message will be displayed– „Scan completed", so we need to wait for it. Scanning of Hot Bird (13°E) satellite takes nearly 15 minutes.

After scanning is completed, we can go back to Tuning Settin-gs and activate VDR, so MOI+ will run this app.

3) Enabling card reader or CI slot

a) TBS 3102 card reader confi-guration (with oscam)

TBS 3102 Phoenix card re-ader, which is connected to MOI+ by USB, can be used by both – Tvheadend and VDR. After successful configuration Pay TV channels, for which we have ac-tive subscription, will be acces-sible from any applications on smartphones, tablets and PCs. MOI+ has oscam software card reader installed, which is almost ready to work. It can communica-te with TBS 3102 card reader, you just need to connect it to MOI+ by USB port (recommended bottom USB port) with correct setup of micro-switches on TBS 3102 front panel (for example for Seca cards correct settings are: 3.3V, Pho-enix mode and 3.579 MHz clock frequency).

The next step is to do small adjustments in oscam.server con-fig file. It can be found in **\share**

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usr\local\etc path. It is a normal text file, so it can be opened even with Notepad. From [reader] section delete „services" line and in „caid" line set correct CAID which matches available conditional access card. By default there is 0500 value, which means Viaccess. For Seca cards (e.g. nc+) the correct value is 0100, for Conax (e.g. Smart HD+) – 0B00, for Irdeto – 06xx (different values starting from „06", for Redlight HD erotic channels it can be 0604, 0624 or 0647, depending on a card type). After all editing is done – save file.

The third step is to put the card into TBS 3102 card reader (connectors to the bottom) and look into MOI+ web interface. In Tuning Settings we need to select **OSCAM** option (it looks like it is just for VDR, but that's not true).

If we are using VDR – that's all what we need to do. If the card reader is working, subscription is active, the card is not hardware paired and configuration is correct – Pay TV channels should work instantly, even if they were scanned before the card reader was connected, there is no need to rescan the channels. Tvhe-adend needs some more simple configuration.

In Tvheadend web interface we need to switch to „Configuration" tab, then „CSA" tab inside and finally to „Capmt Connections" tab. Then we click on „Add entry" button. The new line will be added to the table. We need to fill it - select „Enabled" field, double click in the „Mode" field and select „Recent OSCam" from the list and in „Camd.socket Filename" write the path manually: **/tmp/camd. socket**. Listenport field stay with „0" value. Double check all data entered into the line as one small mistake can prevent the connection between Tvheadend and the card reader. If everything is OK – use „Save changes" to save all modifications.

It is enough for Tvheadend and Pay TV channels should instantly work just like FTA-ones with any app, even simple TBS IPTV Live.

We must also note that presented oscam configuration is the simplest one. It is worth to search online for some instructions to configure oscam more effectively. Options from oscam config files: oscam.conf, oscam.server and oscam.user from **\share\usr\ local\etc** path can have critical impact on stability and speed of a card reader or can be important for forwarding the permissions to a card. Valuable help can be provided by users of satellite receivers with software based on Linux operating system as mostly they use the same solution for card readers, oscam is one of the most popular software card reader, used by users of Dreamboxes, Vu+ receivers and many more.

Additionally, if we are using Tvheadend - it can help if there are any problems with an access to Pay TV channels decrypted by oscam. If there are problems with decrypting channels, on Tvheadend bottom part of web interface window there is a status bar with arrows on the right. After clicking on the arrows, we will see an event log window, in which we can find more information about the cause of the problems. Also, Status tab in Tvheadend web interface can bring some help, as there we can find information about connected clients, tuners state and availability of signal.

b) Enabling CI slots (for DVB cards equipped with CI slots)

If we are going to use CAM modules, first we need to select correct TBS DVB card for MOI+, equipped with CI slots. A few models with different tuners type are available, count and hardware, but all with support only for CI, not CI+ standard. CI+ CAM modules will work only if they work in „legacy" mode with CI slots. For example in Poland the new Cyfrowy Polsat CI+ CAMs will be working, because it uses „legacy" mode, but UPC MediaModuł CI+ for Polish cable operator UPC won't work as they are CI+ only, without „legacy" mode.

TBS DVB cards can have one or two CAM slots, but in the second case as mentioned earlier – „A" slot is tied to tuner „A" and „B" slot is tied to tuner „B". It means that it is not possible to use one CAM, even if it is supporting decrypting of many PIDs simultaneously, to watch different Pay TV channels at the same time. Every tuner needs to have separate CAM. Only in some cases it is possible to split one card to two CAMs by a card splitter. The si-
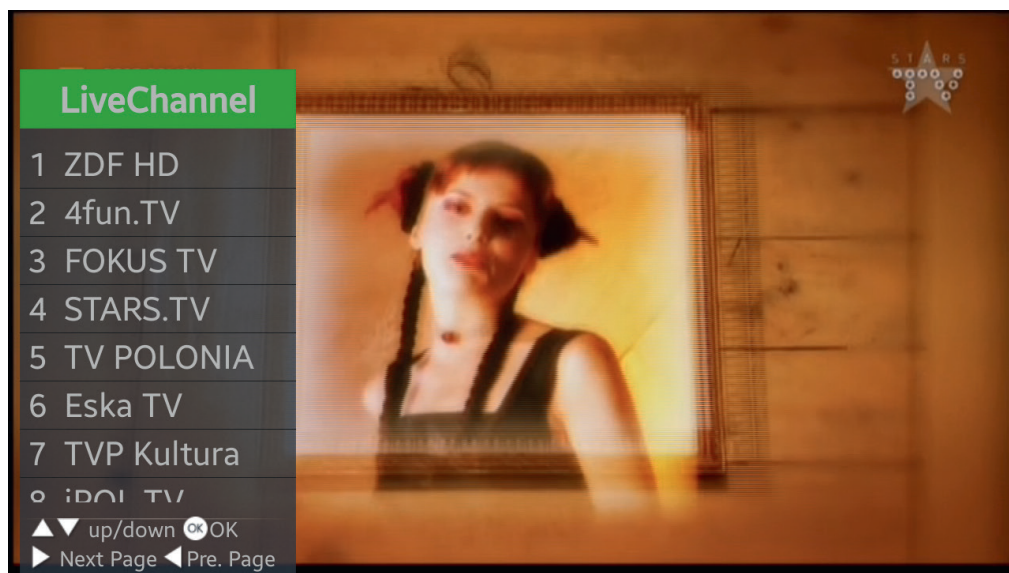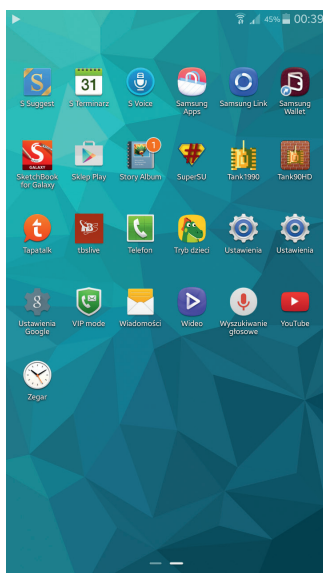

MOI+ „in action" with Phoenix card reader and RFLink card splitter (nc+ card)
Receiving of TVP Regionalna TV channel at Samsung Galaxy Note II phone (TBS IPTV Live app)

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tuation will be even more complicated if we would like to use two different CAM modules. They are working in VDR, which does not have a direct access to a channel editing functionality. When scanning the whole satellite we won't have any influence on the type of tuner VDR we would like to receive selected channel from. We have not tested such situation. Maybe it would be possible to manually edit a channel list, which is saved in channels.conf file, after complete channel scanning from all available tuners, for example with the help of cle4vdr tool – **http://cle4vdr.vdr-developer.org**. Channels, which should be decrypted with „A" CAM module should stay only on the channel list from tuner „A" and channels for CAM „B" should stay only on channel list for tuner „B".

Another advice for using CAM modules and VDR – during our tests we failed to run both CAM and the card reader with oscam. If oscam was active – CAM modules did not receive queries about permissions from VDR. It was easy to check with AstonCrypt v2.26 CAM and a card splitter with LED indicators. LED did not react to channel switching. So if we want to use CAM modules – oscam must be deactivated in MOI+ web interface in Tuning Settings.

We didn't find any solution that would enable us to run both CAM and card reader simultaneously, but maybe it is possible by introducing some changes in VDR configuration.

STAGE II
ACCESS TO CHANNELS

No matter which solution we have selected in MOI+ – Tvheadend or VDR – on the client side devices: smartphones, tablets or PC's in most cases we can use the same applications for receiving channels, introducing only slight changes in their configurations. The only exception is for **TBS IPTV Live** app for smartphones and tablets with Android OS, which can work only if MOI+ is streaming content with Tvheadend, not VDR.

If we use Tvheadend, probably the simplest way to start watching TV channels would be switching in web browser in Tvheadend web interface into „Services" tab and selecting „Play" button next to the desired channel name. Streams can be played for example in a very popular VLC Media Player. However it is not the most comfortable method and also we would like something that can work not only on our PC.

1) TBS IPTV Live (Tvheadend)

From „MOI times" TBS has made a lot of progress in ability to watch channels on mobile devices thanks to developing its own application – TBS IPTV Live (tests based on 1.0.0.2 version). It has been designed for smartphones and tablets with Android OS (currently no version for iOS and Windows Phone). An application is currently not available on Google Play store, so it needs to be

downloaded from TBS webpage and installed manually, for example by loading .apk file to the device memory and starting it (it may need to activate installation of applications from unknown sources in the device settings).

The application will be available on app list in the device as **tbslive**, with an icon with TBS logo. After the start it will scan local network for MOI+, download channel list from it and that's all – no additional configuration – we can watch channels instantly. The channel list is available on the left in floating panel which is showed after screen taping. Unfortunately, channel numbering from Tvheadend is not maintained, but if we don't add too many junk channels, we won't have problems with searching for desired stations.

The application has got only one configuration option – we can manually enter MOI+ IP address in case of fail of automatic MOI+ searching (you need to add port number, so „ip_address:9981"). We used to have such a situation just once at the beginning, but after MOI+ restart it was always discovered by TBS IPTV Live automatically. IP address from settings is not saved in current app version.

2) VLC (Tvheadend or VDR)

VLC Media Player (available from **http://www.videolan.org/vlc**) is easy and comfortable way for watching channels on PC. No matter what operating system we are using as VLC has versions for many platforms – Windows, Linux, Mac OS X, Unix.
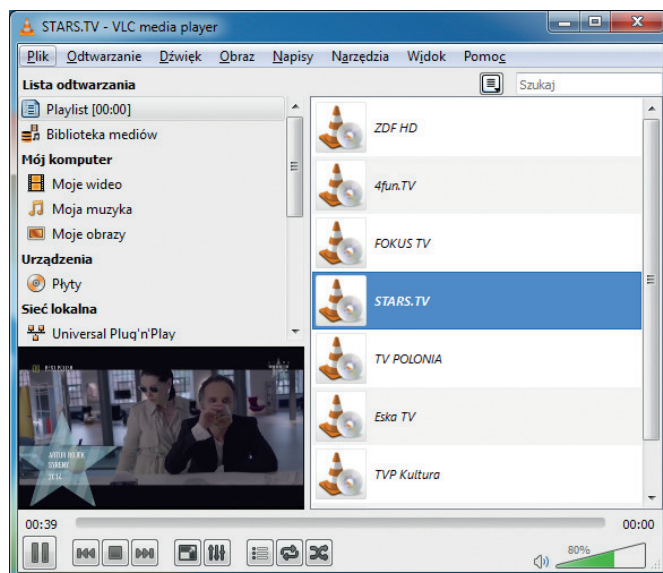
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With the help of Ctrl+N keystroke (or by File – Open network stream... menu) we gain access to a window which enables to open the stream. If we use Tvheadend as MOI+ engine, then we enter there: **http://ip_address:9981/playlist** and if we use VDR on MOI+, then: **http://ip_address:3000/channels.m3u**. This will load a channel list (again Tvheadend channel list numbering is not maintained). To show the channel list in VLC window it is possible to use Ctrl+L keystroke or from View – Playlist menu.

We recommend to use VLC 2.x releases. VLC is able to record the played content, so we can archive programmes that we have been watching. It is also possible to watch channels by playing direct links to them. It's easy to get them from Tvheadend web interface from Services tab. In that way we can gain an access to the channels that are not on our channel list (which we haven't mapped to it).

3) XBMC/Kodi (Tvheadend or VDR)

It would be more comfortable to use the software that is closer to **Media Center**. Old **XBMC**, which is now going through the name change to Kodi, comes here to the rescue. At the moment this test report is being written a stable version 13.2 was available as XBMC and 14.0 Alpha 4 release was available as Kodi. It is full-featured professional media center application. Beside an access to TV channels it is able to play media files and it can be used with remote control (details and tested remotes on **http://kodi.wiki** in Remote controls category).

XBMC/Kodi has an important advantage – beside computers (with different operating systems – Windows/Linux/OSX) it is also available for mobile devices with Android OS and even on Raspberry Pi. Configuration on all platforms is very similar. If we manage to configure XBMC/Kodi on PC, we will also have no problems to configure it on smartphone with Android. The only thing that needs to be kept in mind is that this application is still (same situation was back in March 2013) not available on Google Play store, which means that we need to download it from a website and install it manually, remembering to enable installation of applications from unknown sources.

Smartphones/tablets, which we are going to use to watch TV need to have good performance. We must remember that we have to deal with playing video, sometimes in High Definition (depends on a channel). Of course, watching TV on mobile devices reduces the operating time on battery – it is energy-intensive task.

When installing XBMC 13.2 on PC it is important remember to install also PVR Addons when choosing additional components. They should be selected by default, but it is worth to check it twice, because with them we gain access to TV channels streamed from MOI+ by Tvheadend or VDR.

After successful installation we can start XBMC. At first we can select a language version of user interface if we need to. To do that we can enter into the „System" tab from the main menu and then „Appearance" and „International". In „Language" field we can select the desired version.
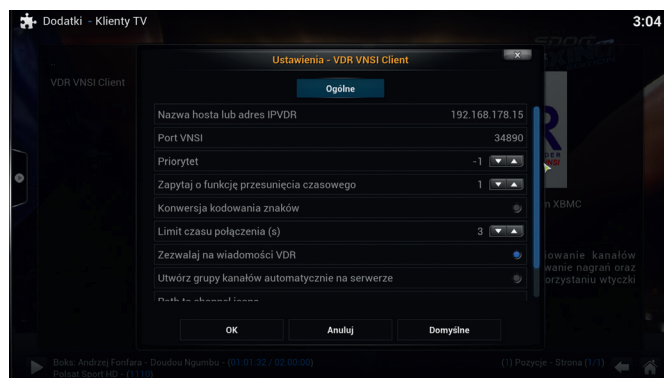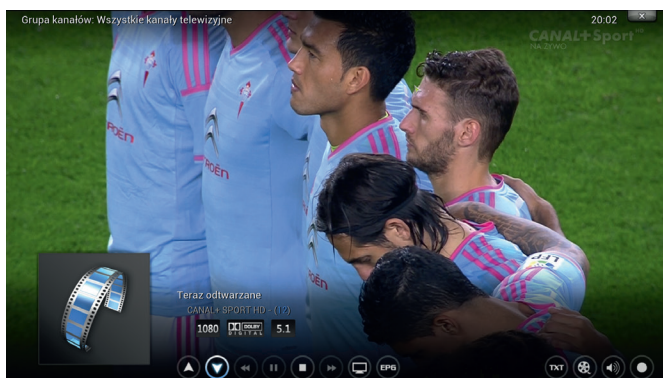
Next step is to gain an access to TV. We are going back to the „System" window, and choose **„Television"** there and „General". After selecting „Active" field we will get a message that we need to activate at least one client. After confirmation XBMC will take us into the place, where we can choose one. If we use Tvheadend as MOI+ engine, then we choose Tvheadend HTSP Client and if it is VDR, then we should select VDR VNSI Client.

No matter which client we will choose –we need to click on it after the selection and then select „Settings", where we will be able to manually enter MOI+ IP address. After confirmation we can enable the client. XBMC will instantly download a channel list (the more channels on list, the longer download will last). We can leave the configuration with help of „home" icon (bottom right corner) and from the main menu we choose „Television". We will see our channel list (this time if we use Tvheadend – with correct channel numbers) with EPG data (if MOI+ managed to download it already). We can start watching TV.

We give a spin for latest Kodi 14.0 test version and with it there also were no problems. Configuration was identical as in XBMC 13.2. At present in Kodi still Confluence is main skin for user interface, but new – re-Touched is on its way. At the time when we tested MOI+ it was present, but not active by default and not fully finished (lack of „Television" in main menu), so we stayed with Confluence.
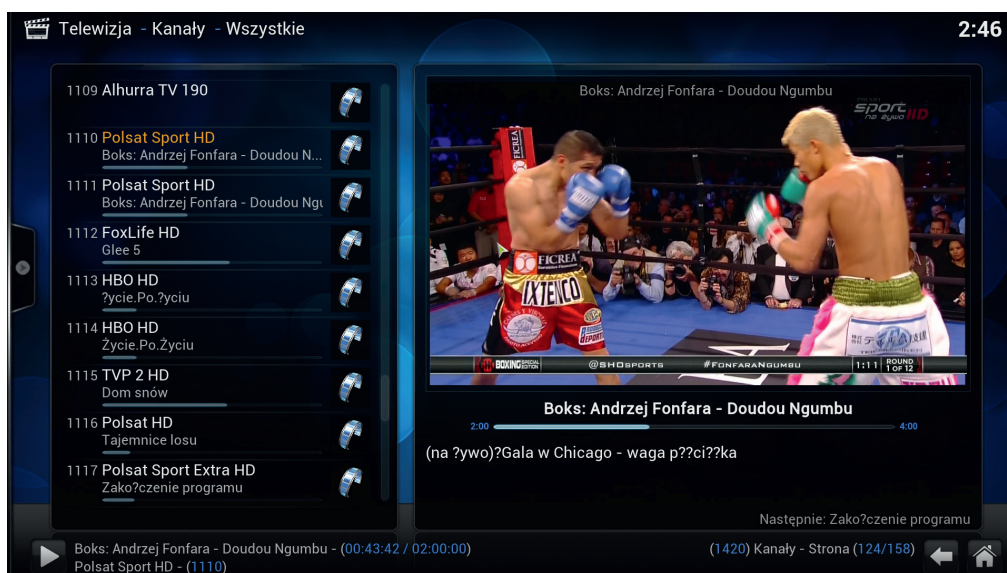
XBMC/Kodi has a lot of configuration options which makes it

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MOI+ with VDR as engine and Kodi as client. Polsat Sport HD is part of Cyfrowy Polsat digital platform, which is available only from their CAM modules. As You can see - CAM is working

possible to do many operations and adjust this application to personal needs. XBMC/Kodi is able to record content, edit channel list (with adding logotypes), it is supporting teletext (without Polish chars) and many more. It is worth to review possibilities of this software, as there is no way to describe all its options.

4) Watching TV on... TV

Technological progress makes it possible that we can now easily watch streamed TV channels on TV sets.

As we know most TV sets have no applications that are able to receive and play live streams from Tvheadend or VDR. But since March 2013, when we wrote about „older" MOI, the market has been flooded with a lot of miniature Android sticks with HDMI output. The choice of such hardware is now great. Having such device we will have no problems to install for example XBMC/Kodi on it or even simple TBS IPTV Live app. This will give us access to TV channels without additional wires and receivers through Wi-Fi with high quality picture. All with nice user interface and additional multimedia features.

Due to the fact that a lot of Android Mini PC sticks are now available and offer is often changing, we won't recommend any particular model. We can only suggest to avoid very cheap solutions, because this device must have good performance to show high quality video (HD up to 1080i), sometimes with high bitrates. Thus Smart TV dongles (as they are often called) must be efficient to ensure smooth and fast operation.

SUMMARY

The first version of this device – MOI – already changed the way of looking at access to TV. Now MOI+ extends this idea further with new possibilities. TBS from our last contact with this solution has managed to make a gigantic progress, improving everything – hardware, system, developed and updated available software and extended help (a lot of helpful advice can be found on TBS English discussion boards available from its website **tbsdtv. com**).

Now gaining access to channels is even simpler than before, on nearly every device, on which TV programmes can be displayed, from smartphones to TV LCD and PC. Thanks to Wi-Fi built in MOI+ another wire can be thrown out.

Hardware changes introduced in MOI+ open now new possibilities. Beside satellite television we can use it to watch terrestrial or cable TV channels, based on DVB card that we will select and install inside MOI+. The producer ensures that MOI+ can stream up to 20 HD or 80 SD channels simultaneously (but probably talking about Ethernet connection, keeping in mind tuner number limitation).

MOI+ is designed as nearly maintenance-free device following the rule: „connect and forget". It does not need to be set in visible place, only somewhere with good air circulation. We don't use it to daily watching TV, but from end devices: smartphones, PCs or TV sets, which are connected to it (wirelessly for example).

We need to look into MOI+ configuration only if we need for example to add a new channel to the list (in Tvheadend – map it from already scanned channels, in VDR by stopping it and scanning as in the beginning). We can forget that we use MOI+ over time as it works steadily.

We can watch TV channels on any device we want to and we are not interested in how it is done. Magic? No – it's future!

Konrad DĄBEK

- one MOI+ can give access to receiving channels on different devices, from smartphones to TV's
- fewer wires
- possible to use different PCI-e DVB card models from TBS – replacable tuners
- plenty of software installed into MOI+, including two preconfigured applications as „main MOI+ engines" (Tvheadend, VDR)
- freedom for applications used on client side at end device
- heaven for advanced users, because MOI+ is computer specialized for receiving and streaming of TV channels, it can be used for many different ways
- very good support

- required knowledge in the field of receiving TV and computers (Linux OS), advanced knowledge needed in some scenarios
- local network need to have good performance, especially when using Wi-Fi
- lack of easy control of signal receiving (eg. no signal level and quality bars when in dish setup)
- some problems with DiSEqC switching with multiswitch used in our editorial office
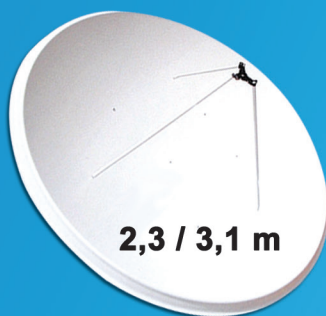
TECHNICAL PARAMETERS	
TUNERS	DVB-S/S2, DVB-T/T2 or DVB-C based on selected DVB card
COMMON INTERFACE	max 2, based on selected DVB card
SoC	Marvell 88F6282 1,6 GHz
CPU	Sheeva CPU core V5TE ARM
RAM	1 GB DDR3
FLASH	512 MB NAND Flash
OPERATING SYSTEM	Linux
ETHERNET	YES (1 Gbit/s)
WI-FI	YES (802.11n)
USB	YES (2x 2.0 on rear panel)
RS232C	YES (as UART)
DISPLAY	YES (VFD)
SOFTWARE/SYSTEM UPGRADE	USB
POWER SUPPLY	12 V, 2 A (AC: 85 ~ 265 V, 50/60 Hz 0,2 A)
CURRENT CONSUMPTION	24 W max.
SIZE	240 x 50 x 180 mm
WEIGHT	ok. 0,9 kg