



Smartlabs

SmartTUBE 7.4

Functionality Overview



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1. Introduction

SmartTUBE is a complex multiscreen solution for the interactive TV services provision in IPTV, OTT and hybrid networks. The platform includes hardware solutions (SmartLabs STBs), software for subscriber devices (iOS, Android, SmartTV) and operator level software.

SmartTUBE Client UI is a range of applications for the client devices supported by the SmartTUBE solution. Depending on the client platform, SmartLabs offers appropriate integrated applications, whose interfaces are almost identical. The differences of client applications interfaces and functionality are also described in this document.

SmartTUBE Server, in its turn, is the core of the solution responsible for managing services, users, content, pricing, metadata, client device provisioning and dynamic ad insertion. Provides interaction with billing systems, payment gateways and third-party information systems installed on the operator's side.

This document is a specification of the SmartTUBE platform and describes the full range of its capabilities.

2. Primary services

The main task of SmartTUBE platform is to provide the following primary subscriber level services:

- Subscribers access to LiveTV service, TV broadcast archives, PauseLive function ("Pause TV broadcast") and other related features;
- Subscribers access to VoD content and its purchase directly in the user interface;
- High quality content playback on various types of client devices;
- Simultaneous access to services and video viewing from several subscriber's devices;
- Management of the client application interface;
- Fast and convenient search for TV channels and VoD content by subscribers.

Detailed description of these services is provided below.

2.1. TV

SmartTUBE platform capabilities allows the operator to flexibly manage the LiveTV service and related functions. Full-featured management of TV channels, EPG import and editing, TV series recording, as well as recommendations for subscribers are performed in a single interface Admin Console or via provided automatic services.



Supported technologies

Depending on the available resources, territorial specifics and other factors, the operator can choose one or another technology for deploying the broadcast network: IP networks, terrestrial / cable or hybrid. SmartTUBE supports the following digital TV infrastructure technologies:

- *IPTV* — content delivery in IP networks controlled by the operator, using multicast or unicast technologies;
- *OTT* — content delivery in external IP networks using unicast technology;
- *DVB (T/T2/C)* — video, audio and additional information transmission via cable networks or terrestrial TV networks.

Supported functions

SmartTUBE supports the following options for access to TV content:

- *LiveTV* — access to broadcast TV channels;
- *TSTV* — access to the archive of recorded TV broadcasts. The recording is performed on the operator's server equipment using additional recording management software, such as SmartMEDIA. The archive storage duration can be specified in the service settings.
- *PauseLive (RestartTV)* — a subtype of the archive access service, the ability to playback the current broadcast from the beginning and pause, fast forward and rewind to the channel being viewed;
- *nPVR* — a subtype of the archive access service, the ability to record the current, past or future TV show into the subscriber's personal archive with further access in accordance with provided service settings (storage period, limitation of the recorded broadcasts in minutes).

SmartTUBE Client UI functions

Client software interface provides the subscriber access to all the possibilities provided by the SmartTUBE platform within the TV channels broadcasting service.

- *Full channel grid and program guide* — displays channels and programs as a horizontally scrollable list on one screen. Allows the subscriber to see the complete information about the current broadcasts for each channel, quickly move to the program guide of a particular channel and quickly scroll it to the past or future. Information about the selected broadcast with a description and screenshot displays immediately.
- *Channels filtering by themes* — moving to the left of the channel list opens a filtering panel. The interface allows subscribers to filter out the channels by themes (sports, news, entertainment) or by the genres of currently aired programs (if the genres are provided by the content provider).



- *iOS/Android channel mosaic* — for easy navigation on mobile devices the SmartTUBE Client UI provides the mosaic mode. The channels are displayed in this mode as a table of logos. Titles and current broadcasts are not visible. The mobile app interface for iOS/Android also supports the "Preview" mode, when the channel streaming is performed on not full screen.
- *TV program detailed information* — this option provides detailed information about TV program in full-screen form: extended description, characters cast / film directors and other information (if provided by the guide provider).
- *Full-screen player mode for STB and SmartTV devices* — by pressing the buttons ↑ ↓ ← → in this mode the subscriber gets access to the following functions most useful when watching TV broadcasts:
 - Pressing the "Down" button opens the Program Guide for the current channel with the ability to scroll through the program guide and select actions on the selected program: for the future programs — reminder, recording; for the current and past programs — playback from the beginning (if TSTV service is provided). Detailed information is available for all TV programs.
 - Pressing the "Up" button will open the Settings menu, where you can change the aspect ratio of the stream, select the audio track, move to the Quick channel selection list, etc.
 - With the "Left" and "Right" buttons the user can rewind the stream to the past or fast forward to the current broadcast moment, respectively.
 - The "Pause" function is activated by the "OK" button in the full-screen view mode.
 - Full-screen view mode menus are automatically hidden after 3 seconds, if the subscriber does not perform any actions.
- *Full-screen player mode for iOS/Android devices* — mobile iOS / Android apps support all the described functions, but control is performed by taps (touching the screen):
 - Additionally supported a feature allows the subscriber to continue viewing content on the STB. Long press on the player displays a list of STB devices (available within "Multiscreen" function) with the ability to "transfer" current channel broadcasting to the selected device.
 - Rewind is performed by moving the current position pointer on the timeline.
 - Switching between channels is possible by swipes (moving a finger from the left side of the screen to the right or vice versa) without moving to the channel list.
 - The "Pause" function is activated by double tap in the player window.
- *Quick channel selection list* — one of the most popular functions is opening a full list of channels without leaving the full-screen view and switching to another channel with the "Up" / "Down" buttons. This function is the first in the upper menu in the full-screen view mode (selected by default). It displays a list of channels with logos, titles and current TV programs on the left side of the screen without overlapping the current stream. Fast channel switching is also possible with the "Ch+" / "Ch-" buttons on the remote control.
- *Reminders* — this function allows the subscriber to set a reminder to the future TV program. After you set the reminder, a corresponding icon appears next to the program name (with the option to remove the reminder). Just before the beginning of the telecast, a



pop-up window appears with information about its imminent airing and a offer to go to viewing the program or refuse. The list of all set reminders is located in the "My" menu.

- *Future broadcasts recording* — if the nPVR service is activated, this function allows the subscriber to schedule a program record for later viewing. SmartTUBE supports the recording of both single programs and all episodes of the series as they are aired. The list of all recorded programs is located in the "My" menu.
- *Favorite channels* — this function allows the subscriber to mark certain channels as favorite. The marked channels in the list on the Home screen and in the channel filtering section are displayed first.
- *Watch history* — the list of last viewed programs with the ability to continue viewing from a saved position is located in the "My" → "History" menu. The subscriber can also clear the whole watch history or delete specific items.
- *EPG Grid* — SmartTUBE Client interface on STB devices also supports the display of a program guide as a classic EPG Grid. In this mode, the TV programs are displayed horizontally with their durations bounded to the timeline. When the subscriber select a specific TV program, all the same functions are available as in the horizontal list.

Location of above functions in the client interface is presented in [Appendix A](#).

SmartTUBE Server functions

Management of all TV services is performed in a single web interface that allows you to manage the TV channels settings, their availability and visual representation in client applications, service bundling and other functions.

- *Channel settings management* — SmartTUBE Server supports the ability to flexibly configure channel streaming sources. The administrator can specify the URLs for the multicast or unicast stream for each channel. Different URLs and types of encryption can be set for different types of devices. You can also specify the channel availability restrictions for the certain regions or block the channel's broadcast immediately (with the corresponding message displayed in Client UI).
- *Service bundling* — access to channels on devices is performed with "Channel Bundles" subscription (paid or free). Each channel must be included in one package at least.
- *Channel logos* — for correct channel logos display in client interfaces JPG or PNG files on a transparent or opaque background can be used. Image size should be 94×94 pixels at least (the proportions should be kept). You can specify one single logo for all types of client devices or individually for each. Logos look better fitted in a circle.
- *Additional program logo* — allows to overlay additional PNG logo on top of the video stream of a specific TV program. Implemented in conjunction with the Smartlabs SmartMEDIA media server.
- *Channel access levels (parental control)* — each channel must have a certain access level, which determines the channel visibility in the general list and open access for the subscriber (without entering the PIN code). For more information see the "[Profile Settings](#)" section.



- *Channel numbering and sorting* — SmartTUBE supports two options for channel numbering:
 - *Traditional numbering (from 0 to 999)* — channels are sorted by these numbers in the general list, EPG grid, etc.
 - *Operator numbering* — administrator can assign an additional sorting for a part of the channels, which will be used to prioritize the channels in the channel stripe on the client app home screen.
- *Recording of TV programs* — performed by integration with SmartMEDIA media server or any other similar service (optional).
 - The Admin Console allows to configure the list of channels on which recording is available, as well as to limit the volume and time of the programs recording in the service settings.
 - The operator can specify the time added to the beginning and end of the TV program set by the subscriber to record in advance (with the active service *nPVR*). Thus, in case of discrepancy between the actual start/end time of the program and its schedule in the EPG, the chances of recording the TV program in full are increased.
 - The ability of setting to nPVR recording over the set quota can be configured.
- *TV serial series recording* — this feature is available, if content provider provides a unique identifier for the series of serials in the metadata, and if the NPVR service is provided. If the subscriber has scheduled the record of the series, the server side will analyze the next day program schedule once a day. Then, in the automatic mode, commands for recording specific broadcasts are sent to the content recording subsystem. At the same time all necessary checks are performed (availability of the service, availability of quota, copyrights holder permission to record this broadcast) similar to the one when the subscriber scheduled the broadcast recording in the client interface. If recording of a particular TV program is impossible, an information message is sent to the subscriber.
- *Copy protection on physical outputs* — system administrative interface allows you to control the ability to record content from analog and digital outputs of set-top boxes. HDCP and CGMS-A / WSS technologies are supported.
- *Automatic program guide import* — the logic and file format to perform automatic program guide import are described in the "SmartTUBE. Administration Guide". Only HTTP is supported as the EPG delivery protocol.

Automatic dictionaries updating during import:

- *Metadata dictionaries* (countries, content genres, content categories, personalities) are added to the system automatically, if no such value has been added previously. The comparison is performed by the '*externalID*' field.
 - *Access levels dictionary* is not filled automatically. The system uses the values specified in SmartTUBE Server. If the import process failed to find the appropriate value, the minimum value (the first by sequence number) is used.
- *Recommendation subsystem* — detailed description of the automatic recommendation subsystem is presented in the document "[SmartTUBE Recommender](#)".



2.2. VoD

SmartTUBE platform supports all the models of VoD content providing, allowing you to flexibly manage the movie base from local and external content providers. System administrators have the ability to manage metadata, regional accessibility and price policy of VoD content, as well as integration with OSS / BSS systems. The client interface provides fast and convenient access to content.

Supported models of VoD content providing

Payment for VoD content by subscribers can be charged in several ways. The SmartTUBE platform supports the following VoD service models:

- *TVoD (Transactional Video on Demand)* — type of VoD, meaning access to the video with a single payment of a certain amount, while access to the video is limited to a time interval in which it can be viewed (e.g. the video must be viewed within 48 hours of purchase). Access to the video is closed at the end of this period.
- *SVoD (Subscription Video on Demand)* — type of VoD, meaning access to video with purchasing a subscription to a specific VoD content catalog. Subscription can be either a single payment or a periodic charge.
- *AVoD (Advertising Video on Demand)* — type of VoD, meaning free access to video, but along with advertising shown in a video with a certain periodicity. For details, please see the [Dynamic Ad Insertion](#) chapter.
- *EST (Electronic Sell-Through)* — subtype of TVoD, meaning access to the video with a single payment of a certain amount, while access to the video is not limited to a time interval in which it should be viewed (only temporary restrictions on the rental period of video rights holders are possible).

Supported VoD content types

The following options can be used as VoD content:

- Movies
- Series (seasons) and episodes
- TV programs (provided as an access to content catalogs)
- Local files (from USB media and DLNA compatible devices)
- External content services (YouTube, etc.)



SmartTUBE Client UI functions

SmartTUBE client software features fast navigation and search in the VoD content base, convenient payment options, recommendation tool that offers the relevant content based on subscriber preferences, and other useful functions:

- *VoD content catalog* — all available content is displayed as a mosaic with posters and titles.
- *Content filtering* — pressing ← button opens the filter panel allowing to filter the content by types (movies, series, kids, etc.), genre (adventure, comedy, detectives, etc.), years of production and country of production.
- *Content search* — user interface allows to perform a thorough search across all content groups (TV channels, movies, etc.).
- *Detailed description of content units* — after the content unit is selected, a card with detailed information opens (directors, actors, ratings, age restrictions, release year, screenshots, etc.). The appearance of the card for movies, series and TV programs has some differences.
- *Trailers viewing* — user can watch the trailer in the movie card (if the operator added it to the card).
- *Full-screen player* — content is played in full-screen mode. The player allows to control the playback (fast forward / rewind, pause), switch between content units and use additional functions (change the video quality and resolution, select an audio track, turn on/off subtitles, etc.).
- *Content bookmarks* — user can add bookmarks to specific movie moments. A single movie can have multiple bookmarks.
- *"Favorites" list* — user can add the movie in the "Favorites" list for later access and viewing from "My" menu.
- *Content purchasing* — operator can offer subscribers a choice of several options for the cost and timing of content purchase. Paid content units can be purchased separately or by subscription. After subscribing, the subscriber can watch all the content included in the purchased subscription.
- *List of purchased / available content* — viewing of purchased and available for viewing content is available in the menu "My" → "My purchases".
- *List of recommendations* — each content unit card contains a list of similar movies and series based on preferences of a target subscriber and similarity to other subscribers (collaborative filtering). Detailed description of the automatic recommendation subsystem is presented in the document "[SmartTUBE Recommender](#)".

Location of above functions in the client interface is presented in [Appendix A](#).



SmartTUBE Server functions

Administrator interface SmartTUBE Admin Console allows the operator to manage the VoD content base and related services:

- *Content base management*
The SmartTUBE Server administrator interface allows you to fill in the following content attributes:
 - *Basic metadata:*
 - Movie title — the movie title in the languages of service providing
 - Original title — the original movie title with the ability to search in online content libraries by title (IMDb, Kinopoisk, Google, Wikipedia)
 - Realise year
 - Start/end dates of the distribution period
 - Age rating
 - Movie realise country (dictionary)
 - Genres (dictionary)
 - Movie duration
 - Movie description
 - Trailer asset URL (unencrypted trailers are only supported in the current implementation)
 - Personalities (cast, directors, script writers, etc.)
 - Awards
 - *Posters and screenshots* — to correctly display the content in the user interface, the film must have a poster — JPG or PNG file of 296 × 450 pixels at least (the proportions must be preserved).
Additionally, screenshots from the movie can be specified — JPG or PNG files of 500 × 280 pixels at least (the proportions must be preserved).
 - *Age rating* — each channel must have a certain access level, which determines the channel visibility in the general list and open access for the subscriber (without entering the PIN code). For more information see the "[Profile Settings](#)" section.
 - *Movie asset URL* — SmartTUBE supports the ability to flexibly configure the URLs of the movie assets. Each movie can have several versions of the assets (e.g. SD / HD) for different device types and encryption options.
 - *Purchase rules and content bundling* — for each variant of the assets, the individual price and the purchase period can be set. Also, each film may have different costs in different service bundles or for different content providers.
- *Copy protection on physical outputs* — system administrative interface allows you to control the ability to record content from analog and digital outputs of set-top boxes. HDCP and CGMS-A / WSS technologies are supported.
- *Recommendation subsystem* — detailed description of the automatic recommendation subsystem is presented in the document "[SmartTUBE Recommender](#)".



External content providers

One of the effective ways of filling the VoD service with content is integration with external sources of legal content (online cinemas). SmartTUBE offers streamlined integration schemes with the following video services:

- Megogo
- IVI
- Go3

For more information on integration, please contact SmartLabs support.

2.3. Media player

Media player is one of the key elements of the client application in the process of consuming content by subscribers. Reliability and fast response of the media player integrated into SmartTUBE clients are supplemented with the optimal user settings set, adaptive streaming support and other useful functions.

- *Playback control*
 - Fast forward / rewind
 - Pause

The rewind depth depends on the set of connected services, as well as on the rules and restrictions that can be specified during content importing process. (For example, some of the TV programs may be unauthorized for viewing in the archive by the right holders. Such programs will be skipped and the rewind will continue on the next available TV program.) When the live broadcast moment is reached during fast forwarding, the media player will switch to live broadcasting mode (multicast mode if it specified in the channel settings). Also, when the subscriber rewinds or pauses a video, thumbnails (still frames) are displayed above the progress bar.

- *Aspect ratio selection* — the user interface provides the following options:
 - Fit an image into the screen with distorted proportions,
 - Fit an image into the screen with preserved proportions,
 - Proportionally zoom an image with the left and right sides partial loss,
 - Leave an image unchanged.
- *Adaptive streaming support* — automatic switching between available media streams with different bit rates depending on the bandwidth. So, reducing the bandwidth does not lead to stopping playback, but to switching to a stream with a lower bit rate and quality degradation. Once the transfer speed is restored, the video quality is restored too.
- *Stream quality options* — if streams with several bitrates are available, the subscriber can choose any of the stream quality options: high, medium or low. By default, the player uses automatic detection of the quality option.



- *Audio track selection* — client applications support the ability to change the audio tracks available in the stream.
- *Subtitles and teletext displaying* — client applications support the ability to display subtitles and teletext. Supported formats are:
 - DVD subtitles,
 - DVB subtitles,
 - SSA (SubStation Alpha),
 - subtitle ASS,
 - HDMV Presentation Graphic Stream subtitles,
 - SubRip subtitle (SRT),
 - WebVTT,
 - CEA-608 (analog) / CEA-708 (digital) closed captions,
 - SMPTE-TT (DASH),
 - Teletext (through the integrated application).

Supported formats may depend on device capabilities.

- *Stream detailed information* — depending on the stream type, the user can view information about the current bitrate, count of decoding errors and other information that can be useful in case of problems and contacting technical support.
- *Playback from a saved position* — client applications store the last position of the movie / program playback and suggest the subscriber to continue playback from the saved position or start from the beginning at the next content unit launch.
- *Processing of advertising inserts* — media player is able to detect the start/end marks of advertising inserts in the stream and apply different processing logic to them, for example, you can prevent the subscriber from rewinding advertising inserts during the nDVR content playback. Also the player supports interaction with VAST servers within the AVoD service.

Supported audio/video formats depend on the hardware platform of the client devices. For more details, please contact the SmartLabs representatives.

Location of above functions in the client interface is presented in [Appendix A](#).

2.4. Main screen

Main screen is the first thing the subscriber sees after authorization. Functional and informational content of the main screen plays a key role in user behavior controlling. The system administrator can significantly influence the subscribers' impression of the service and interest in purchasing new content by using the *"Recommendations"* tool. In turn, this gives subscribers a convenient tool for selecting the actual content available for viewing right now.



SmartTUBE Client UI functions

Main screen menu of the client application contains the following elements: navigation buttons to TV and VoD services, additional services, profile settings. Banners and recommended content stripes are also located on the main screen.

Main menu elements

- *My* — watch history, favorites, records, reminders, subscriptions information;
- *Search* — content search;
- *TV* — all TV channels and programs;
- *Movies* — full movie catalog;
- *Box sets* — series / seasons catalog;
- *Applications* — VK, YouTube and other services, as well as Google Maps and DLNA. The supported service set is determined at the stage of contract conclusion between the operator and SmartLabs;
- *USB* — video and music playback, and view photos from a USB device connected to the STB. The section does not appear in the menu if the USB device is not connected;
- *Settings* — profile settings, system and user settings (time zone, network settings, video output modes, etc.).

Recommendations on the home screen

Recommended content is divided into groups. The set of groups is defined by the operator. For example, groups may contain an editorial selection of content or recommendations generated automatically based on the subscriber's preferences:

- *Banner* — banners at the top of the screen. The list of banners recommended in the manual mode is set in the admin interface;
- *Recommended series and TV-programs* — new episodes of TV programs or serials watched by the subscriber. This section is filled automatically based on the history of subscriber's views (if SmartTUBE Recommender is installed in the system);
- *Channels* — TV channels list. The logic of list generation:
 - Channels added by the subscriber to *Favorites* (sorted by number) are displayed first;
 - The following channels are displayed for which the operator has set individual sorting in the "Number by order" field in the channel settings (may not be specified);
 - The following channels are displayed, sorted by the "Number" field;
- *What to see today?* — movies or serials recommended by the operator. The lists of content recommended in manual mode is specified in the admin interface;
- *Showcases* — themed lists of movies and serials recommended by the operator. Displayed on the home screen as poster stripes. Set manually in the admin interface.
- *Custom ribbons* — differ from Showcases by automatically filling the ribbons with content (movies, series, TV programs) filtered by operator specified criteria.



- *Top 10 TV programs* — list of most popular TV programs viewed in the archive by subscribers;
- *Applications* — applications most frequently used by the subscriber.

Location of above functions in the client interface is presented in [Appendix A](#).

SmartTUBE Server functions

One of the important elements of the home screen is the Recommendations panel (TV channels and VoD-content). The panel is managed in the admin interface:

- **Automatic Recommendations management**
 - *TOP 10 TV programs* — rating of TV programs is generated automatically based on the history of archive content viewing by all subscribers (if the operator provides the TSTV service). The rating of the most popular TV programs is calculated once a day.
 - *Personal content recommendations* — detailed description of the automatic recommendation subsystem is presented in the document "SmartTUBE Recommender".
- **Manual Recommendations management** (content promotion)
 - *Banners* — administrator can specify a list of banners to display on client devices. For the banner you specify a logo file — JPG or PNG with a size of 1280 × 480 pixels at least (proportions must be saved), the display time and object link (optional). As objects for transition from the banner can be specified:
 - Movies or TV programs,
 - Services,
 - External URLs (not supported by all STB devices).
 - *Recommended movies and series* — administrator can specify a list of content to promote, which will be displayed on client devices as a poster ribbon. For recommendations defined in manual mode, the display period and object link is specified. As objects for transition can be specified:
 - Movies or series.
 - *Showcases* — admin interface allows to create additional thematic lists of content displayed on the main screen as poster ribbons. These lists have an extended set of settings, including age restrictions, binding to content providers, output order, logo, etc. As objects for transition can be specified:
 - Movies or series.
 - *Custom ribbons* — admin interface allows to create custom filter presets to fill in the poster ribbons on the main screen. Genre, release years, country of production, etc. can be used as criteria for filtering content. As objects for transition can be specified:
 - Movies or series,



- TV programs.

2.5. Multiscreen / Multiroom

SmartTUBE platform allows the operator to provide the Multiscreen / Multiroom service, which allows subscribers to access IPTV / OTT services simultaneously from multiple devices within the same account. The subscriber can view the purchased content from all devices, as well as transfer the viewing from one device to another. The operator at the stage of preparing content for broadcasting (performed by third-party software, e.g. SmartMEDIA) can create multiple copies for each content unit, optimized for different types of subscriber devices. So the content will be broadcast on all subscriber devices with optimum quality.

SmartTUBE Client UI functions

- *Device linking* — all devices on the same account can get access to the "Multiscreen" service. Linking devices to the account is performed by entering the account login / password on the subscriber's devices (one or more, at the operator's choice). The login / password is displayed in the Settings menu and can either be defined by the operator using OSS / BSS API (at the account creation stage), or can be generated automatically by the system.
- *Content viewing transfer to another device* — client interface on mobile devices allows to continue viewing the selected movie or TV channel on the STB and, in the opposite direction, "take away" the content from the STB and watch it on mobile device from the current position.
- *Remote playback control* — after "transferring" content, for example, from a smartphone to STB, the subscriber can remotely control playback from a mobile device.
- *Limiting the number of devices* — admin interface allows to limit the number of devices that can be registered on the same account. The administrator can limit both the total number of all devices and a certain type of devices. For example, a subscriber can connect only 6 devices, but not more than two iPad / Android devices and not more than 3 STB.

Location of above functions in the client interface is presented in [Appendix A](#).

2.6. Content search

In addition to navigating through the catalog of TV channels, movies, TV series, etc., administrators and subscribers can search the entire database of LiveTV and VoD content. As the search phrase is typed, the list of relevant TV programs, movies, clips from external content services (e.g. YouTube) and other supported sources grouped by content type is displayed to the subscriber. In this case, the search is performed on various content attributes.



SmartTUBE Server functions

- The search is performed at the cache server level using the NoSQL Elastic database for the following content attributes:
 - *Title* (in the current interface language and the original title),
 - *Description*.

The objects to be searched are:

- EPG,
- Movies,
- Series / Seasons.

Additionally, it is possible to search for content in external systems:

- YouTube.

SmartTUBE Client UI functions

- *Multilingual keyboard support* — allows to search for content in different languages;
- *Structured search results displaying* — search results for different content types (TV, VoD, external services) are displayed on the same screen, divided by type.

Location of above functions in the client interface is presented in [Appendix A](#).

3. Service management

Subscribers access to the content and services can be performed both on a free and paid basis. SmartTUBE Server allows to manage billing plans, TV channel and VoD content bundles, as well as the charging types in a single admin interface. Integration with billing systems (OSS / BSS) is possible if needed.

3.1. Subscriptions (TV bundles, SVoD)

SmartTUBE Client UI functions

- *Service management menu* — the client application interface allows the subscriber to view the list of available services within the current billing plan, and add or cancel the subscription. Information about the content (channels or movies) included in the service, description of the subscription and its terms (price and expiration date) are displayed in the service management form. The offer text can be displayed before the subscription, if needed.



- *Service subscription recommendations* — the client applications display not only content already available to the subscriber, but also the content subscriber can subscribe to. Non-subscribed channels are marked with a special label. When the subscriber is trying to switch on non-subscribed channel the information about the service with the purchase possibility is displayed. Subscription to this service can be performed without going to the service management menu.

Location of above functions in the client interface is presented in [Appendix A](#).

SmartTUBE Server functions

- *Types of services* — SmartTUBE supports the following types of services:
 - *TV channel bundles* — specifies the group of channels included in the service;
 - *Archive access bundles (TSTV and Pause Live)* — specifies the group of channels, depth of archive storage, as well as availability of TSTV and / or Pause Live services for each channel included in the service;
 - *nPVR bundles* — specifies the group of channels, period of recorded broadcasts storage, subscribers recording quota in minutes (may not be limited), and quota upon reaching which the subscriber will be informed about the approach to the limit;
 - *VoD bundles* — specifies how the movies included in the package (TVoD or SVoD) are charged and the linking to the content provider (the operator's internal database or external providers).
 - *PPV bundles* — specifies the rules for charging channels and TV shows with pay-per-view.

Additional dependencies for each service can be specified:

- *Device functionality* — allows to limit the availability of services on devices that do not support certain features (for example, hide the subscription to UHD channels for a certain STB models);
- *Mutually exclusive services* — allows to specify a list of other services that can not be subscribed simultaneously with the selected one and will be unsubscribed if the selected service is subscribed;
- *Service dependencies* — allows to specify one or several services subscription to which will be activate the selected service automatically;
- *Dependent services* — allows to specify one or more services that will be automatically activated when the selected service is subscribed.

Additional IDs can be specified for each service if they are provided for mobile devices and SmartTV. These IDs are required for mapping to similar services in Apple, Google, or SmartTV stores.

- *Billing plans* — scope of the services available to the subscriber is determined by the billing plan. The billing plan may include both mandatory (provided by default) and optional services with activation by the subscriber or OSS/BSS. Also the plan determines the cost of



a particular service (for example, the same channel bundle in different plans may have different cost and type of billing).

- *Billing* — subscription fee is withdrawn on the OSS/BSS side. The subscription period may be limited (single subscription) or not limited (subscription with auto prolongation).

3.2. TVoD

SmartTUBE Client UI functions

- *Content purchase options* — client interface displays the cost of the content on the detailed information card. If several options for buying a particular movie are available the subscriber will see the option with minimum price, and when the subscriber tries to purchase a movie the selection form is displayed.
- *Purchase history* — located in the “My” menu.

SmartTUBE Server functions

- *Billing* — withdrawal fee for one-time access to the content is performed on the OSS/BSS side in accordance with the chosen purchase rule.

For more information on the billing API refer to the “SmartTUBE. Administration Guide”.

3.3. AVoD

SmartTUBE Server functions

- *SmartTUBE Ad Decision System (ADS)* — a VAST server with a separate web console for managing advertising campaigns in particular for the AVoD service. ADS carries information about ad campaigns, their ad creatives, duration, dates, types, target locations, target content and other parameters. Using this information, the SmartTUBE ADS makes a decision about which ad is the right one for insertion before the movie is played to the subscriber. Also, the ad can be shown during the movie playback or at the end of it.

For more details, please see the chapter below, “[SmartLabs DAI. Datasheet](#)” and “[SmartTUBE ADS. Admin Console User Guide](#)”.

4. Dynamic Ad Insertion (DAI)

SmartTUBE is a part of SmartLabs DAI solution that enables operators to dynamically insert ad units into video content. With our ad insertion technology, operators can add or replace ads in live video streams, pre-recorded, and xVoD content with little-to-no effort. Thanks to built-in VAST protocol



support, depending on your needs you can partner with third-parties or configure your own campaigns in SmartTUBE and become independent of any external advertising services.

The Smartlabs DAI solution is made up of three key modules:

- **SmartTUBE Advertising Decision System** module or ADS is implemented as an element of the SmartTUBE Server;
- **Server-side ad insertion module** — implemented as a part of the SmartMEDIA solution;
- **Client-side ad insertion module** — can be implemented as a component of the SmartTUBE Apps system.

Smartlabs DAI can be rolled out as a comprehensive package or you may choose one or two of its elements to be deployed and integrated with complementary third-party systems. So you can employ the configuration that fits your current needs in the best possible way.

SmartTUBE ADS is a system that carries information about advertisers, ad campaigns, ad creatives, placement dates and duration, types, target devices, target content, and other parameters. Using this data, an ADS can make a decision which ad fits a specific insertion opportunity.

The Server-side or Client-side ad insertion system requests an ad decision from the ADS via the VAST protocol. The ADS finds a matching set of ads based on the request targeting criteria and responds with a VAST response carrying the data about the ad to be inserted. The ADS also provides campaign performance reports highlighting key metrics.

There are 2 use cases for using the SmartTUBE ADS:

- **OTT ad insertion** for OTT HLS or DASH streams going to OTT subscribers.
- **Linear TS streams** that could be distributed on IPTV networks, or pushed to Satellite or DVB-C head ends.

For more details, please see the “[SmartLabs DAI. Datasheet](#)” and “[SmartTUBE ADS. Admin Console User Guide](#)”.

5. Authorization and registration of accounts and devices

Identification of subscribers in the SmartTUBE system is performed using unique client device IDs used to link devices to accounts. SmartTUBE Admin Console provides convenient management of subscriber accounts, including their creation, activation / deactivation, integration with billing systems, and management of the authorization screen on subscriber devices.

Supported registration options

- **Registration by login / password** — to register the client devices in the system operator can specify the registration data (login and password) at the account creation stage.



Registration data can be set for the entire account, as well as for a specific device when you create a connection for device (usually STB). If the device is not registered in the system yet (a unique UID is not registered on any connection), the client application will display the authorization form with the offer to enter the login and password. After successfully authorization by login and password the device is further authorized by its unique UID.

- *Automatic account creation* — SmartTUBE supports the automatic device registration with an account creation. To do this, the system administrator must configure the appropriate account creation templates and specify the device types with the auto-registration allowed. The default billing plan is set when you create a template. A template account for the new device will be created at the first device authorization with automatic account number generation and linking to the device UID (the login / password form will not displayed).
- *Login in demo mode* — you can specify the device types with registration in demo mode allowed during the automatic account creation templates configuration. In this case, at the first authorization, the client device will also display the login and password form, as well as the offer to use the demo mode. If the subscriber chooses the demo mode, automatic registration is performed according to the scenario described above. At the same time it is possible to link to another account by login and password.

UID generation rules

- *Linux based STB* — unique STB MAC address.
- *Android STB* — unique device serial number.
- *Android mobile application* — unique device *deviceId*.
- *iOS mobile application* — unique UID automatically generated during the first application install.
- *SmartTV* — unique TV serial number.
- *Web application* — unique UID automatically generated during the first application install (stored in the browser's cookie). The UID will be generated again when the application is uninstalled.

SmartTUBE Server functions

- *Account database management* — performed with the Admin Console or OSS/BSS API. SmartTUBE supports the following functions:
 - Account creating,
 - Account data editing,
 - Account status editing,
 - Add / delete connections for devices linked to the account.

For more information on the OSS BSS API refer to the “SmartTUBE. Administration Guide”.



SmartTUBE Client UI functions

- *Login / password form at the registration stage* — displayed if the device is not registered in the system yet. Allows to enter a login and password, select a demo mode (if configured) and change the interface language.
- *Behavior specifics in the blocking mode* — client applications support blocking mode. In case the subscriber's account is blocked (for financial or technical reasons) the application loading is allowed and the subscriber receives an information message about the reasons of blocking. Then the subscriber gets access to the previously purchased VoD-content and services marked in the settings as available in the blocking mode.
- *User agreement displaying* — client applications support the user agreement displaying for the confirmation by subscriber before registration. The text is displayed if the corresponding file is present on the SmartTUBE Server frontend.

For more information on the billing API refer to the “SmartTUBE. Administration Guide”.

6. Messages and notifications

SmartTUBE Admin Console provides a function allows you to send messages directly to subscriber devices. It can be used for timely subscribers notification about new services, promotions, technical works, ways to connect certain services and other information messages. The messaging can be performed either individually (to specific subscribers) or massively (using filters on the subscriber base).

Supported options

- *Push messages* — message sending using SmartTUBE internal functions based on Long Polling mechanism. The following types of messages are supported:
 - *Simple messages:*
Displayed in the client UI as a normal pop-up window with ability to add some identifying information into the message text: device MAC, serial number, or user ID;
 - *Watermark messages:*
Differs from “*Simple messages*” by the overlaying identifying subscriber data on top of the TV channel stream (not as a pop-up window) with the ability to set the text transparency, position on the screen, display duration, and TV channel;
 - *Urgent emergency messages;*
 - *System commands:*
 - STB reboot with filtering by MAC, service account ID, client version, etc.



- *Apple APN and Google GCM* — message sending to mobile devices using Apple and Google servers (in the RoadMap).

SmartTUBE Client UI functions

- *Incoming messages* — client interface displays the incoming messages as a notification at the top of the screen. The subscriber can open the message immediately or later in the *History*. The message can display both text and images.
Urgent messages are displayed as a full screen window.
Watermark messages are overlaid on top of the video stream.
- *Message history* — displayed in the “My” menu.

SmartTUBE Server functions

- *Messaging control* — administrator can specify the message type, expiration period, message text and upload the picture. Once sent the message delivery statistics are available.
- *Recipient filters* — message can be sent directly to a specific subscriber’s device and to the group of recipients. As a criterion for the filter can be used:
 - Account login;
 - Account number;
 - Corresponding or not corresponding the selected billing plan;
 - Client application version;
 - STB MAC address;
 - Account status;
 - Last stored device location;
 - Status of the current service;
 - Device type;
 - IP address;
 - Account creation date (before / after);
 - Last device authorization date (before / after).
- *Messaging from OSS/BSS* — SmartTUBE allows to send messages not only from the admin interface, but also using the OSS / BSS API.

7. User interface customization

SmartTUBE allows the IPTV / OTT operator to customize the user interface within the existing structure (layout of the main components, animation logic, etc.): add a logo, change the basic colors of the elements, fonts, etc. The interface templates for most supported devices are created in the QML format, which gives the operator wide opportunities for customization.



SmartTUBE Client UI functions

- Branding and interface customization
 - *Operator logo displaying* — the operator logo can be placed in the upper left corner of the screen.
 - *Interface customization* — key elements of the interface (font color and size, color of the selected elements) can be changed at the operator's request at the application customization stage.

SmartTUBE Server functions

- *Branding by operator* — SmartTUBE allows to make minor changes (logo, font color and size, color of selected items) by the operator independently using the admin interface.
- *Interface localization* — SmartTUBE provides the ability to localize the interface to the operator's language by the operator. Russian and English are supported by default. Localization in languages using fonts containing hieroglyphs, arabic script and other specific alphabets, is discussed separately.

8. Profile settings

SmartTUBE platform provides a wide range of software and hardware settings for subscriber devices, including interface language selection, parental control, STB firmware update, network settings, etc. The availability of such settings and parameters for subscribers are regulated by the system administrator in the Admin Console and interface templates.

SmartTUBE Client UI functions

User settings

- *Time-zone correction* — subscriber devices receive the time zone values automatically in the normal mode, but the user can change the value if necessary. The time zone value affects the correct display of the Program Guide, timing of content access, etc.
- *User interface language* — client applications support multilingual interface localization. The composition of the languages available for user selection is determined by the localization files filled and hosted on the operator's server.
- *User language prioritization* — corresponding setting in the client application allows the subscriber to set the order of languages that determines the selection of audio tracks and subtitles during content playback (i.e., regardless of the client UI language).
- *StandBy timer option* — for Linux based STB this function implemented next way:



- The “*Settings*” menu contains the “*StandBy timer*” option with some predefined values (for example, *Off*, *1h*, *3h*, *4h*, and etc.);
- List of available options and default value configurable by Operator;
- When the selected time has expired, STB goes to StandBy mode.
- *Profiles* — client applications support customization of individual profile settings, which include:
 - *Parental control (access levels)* — the interface allows to specify two basic parameters:
 - *Maximum access level* — determines the content visibility. Content with a higher level is not displayed;
 - *Current access level* — determines the availability of content. If the requested content has a higher level than the current one, a PIN code will be requested. It is possible to determine in the settings whether the current level will be saved or reset to the minimum when the STB reboots or the profile is selected.

Note: for iOS devices, content marked with the highest access level in the SmartTUBE dictionary (usually 18+) is not displayed (despite the permission in the profile settings) due to Apple’s rules and policies prohibiting the display of adult content.

- *Personal content sorting* — subscriber has the ability to sort the channels individually.
- *Content purchase restrictions* — subscriber can specify in the profile settings the need to enter a PIN code to confirm paid actions (movie purchases, subscription to services).

All profiles are common to all account devices. Only the master profile can manage other profiles (create, modify settings). So, each subscriber can make any necessary settings to prevent unauthorized access to paid or adult content by minor users. Profiles are used also to calculate individual recommendations.

System settings

- *Reset to STB factory settings*
- *STB firmware update*
- *Help and support* — in the case of problems the subscriber can obtain here the operator’s contact information. Also there is an opportunity to send a report for analysis by the technical support service.
- *Video output resolution settings* — subscriber can select one of the supported options depending on the STB type.
- *Audio output format settings* — subscriber can select one of the supported options depending on the STB type.
- *Network settings* — depending on the STB type and additional equipment availability, the subscriber can configure the connection to the network via



- Ethernet,
- Wi-Fi.

Location of above functions in the client interface is presented in [Appendix A](#).

9. Local content playback (USB)

With the STB hardware capabilities the SmartTUBE STB Client allows to play media files from connected USB storage devices, as well as DLNA-compatible devices located in the home network.

Location of above functions in the client interface is presented in [Appendix A](#).

10. Additional services

In addition to the main services directly related to the LiveTV and VoD content broadcast, the SmartTUBE platform provides additional features to subscribers, such as an integrated web browser, weather forecast, currency rates and others.

- *Weather forecast* — provided by the [Openweathermap](#) service.
The administrator can create a list of cities for which the weather forecast will be imported automatically and displayed in the STB interface.
- *Maps* — integration with the Google Maps and Yandex.Maps is supported (subject to the conclusion of the respective contract by the operator).
- *Currency rates* — exchange rates are displayed according to the configured *Directory*.
- *Built-in web browser* — a number of STB devices support the ability to navigate through external links in the built-in web browser (in the RoadMap).

Location of above functions in the client interface is presented in [Appendix A](#).

11. Geoblocking and regional restrictions

SmartTUBE allows to link content units filtering to the regional location of the subscriber. This ensures that the content distribution conditions in a given region are met with the content providers' legal requirements. In addition, the region linking allows to determine the physical content availability (for example, multicast stream with a specified TV channel) in a given region.

- *Geoblocking by IP address* — SmartTUBE supports integration with the external subscriber geolocation detection system. Integration is performed by comparing the regions present in SmartTUBE database with the regional IP address distribution database that can be used by the operator.



- *TV channel filtering* — depending on the location, the subscriber can only access TV channels allowed for the given location.
- *Network connection control* — the operator can restrict access to services for mobile devices when changing the network connection (for example, from a home Wi-Fi network to a cellular one).

12. Reports and statistics

The SmartTUBE reports and statistics system allows the different operator departments to get up-to-date statistics on the content consumption or a particular resource / service demand among subscribers and to make timely business decisions. In addition, the SmartCARE monitoring system (another yet SmartLabs product) provides the operators' platform administrators with all necessary information about the broadcast quality parameters and platform nodes' status in real time.

- *Created/deleted accounts report* — the number of accounts added / deleted during the specified period
- *Service accounts not authorized till now* — a list of accounts without any activity (authorizations) for the specified period until today
- *Service accounts without new connections* — a list of accounts without any activity (terminal connections) for the specified period until today
- *Service account w/o terminals* — a list of accounts that either do not have any terminals, or all terminals have no UID.
- *Number of pricing plan changes* — the number of pricing plan shifts for the period with details by plan names
- *Percentage of accounts by state* — the number and percentage of accounts by state on the specified day
- *Percentage of users by pricing plan* — the number and percentage of accounts by pricing plan for the period
- *Statistic by device types* — the number of terminals of different types
- *Statistics by app versions* — the number of terminals of different client app versions
- *Terminals* — detailed info on the terminals authorized during the specified period
- *Device online info* — info on terminals currently viewing content
- *Service consumption* — the number of accounts by consumed services (bundles)
- *Service consumption in detail* — info on the consumption of services, detailed by accounts
- *SVOD metacontent view count* — info on the SVoD content consumption, detailed by the movie/series name
- *Detailed report by SVOD* — detailed info on the SVoD content consumption
- *Channel viewing statistics* — the number and duration of the selected channel's views in Live / TSTV mode over the time interval.



- *Device combinations on service accounts* — all the unique combinations of devices connected to the accounts.
- *Subscribed services* — the number of service subscription facts in the specified time frame throughout the whole subscriber base.
- *Subscribed services detailed info* — the number of service subscription facts in the specified time frame with account detail.
- *Purchased TVOD movies* — the number of movie purchase facts in the specified time frame throughout the whole subscriber base.
- *Purchased TVOD movies detailed info* — the number of movie purchase facts in the specified time frame with account detail.
- *TOP 10 most viewed TV programs* — the number of TV program in-archive views for the specified time frame.

For more details about the SmartCARE monitoring system visit the [SmartLabs website](#).

13. Content protection (DRM)

TV streams and VoD content protection from improper viewing, recording and copying is an integral part of IPTV/OTT-services. Most copyright holders and content providers require operators to enforce a particular DRM system. SmartTUBE platform supports the most current and modern ways of content protecting, including interaction with DRM systems and preventing them from being circumvented by subscribers.

Supported DRM systems

- Widevine¹
- SmartLabs UDRM
- PlayReady
- Verimatrix
- Basic HTTPS authorization

Widevine Levels Compatibility

Widevine DRM is used by many streaming services and content providers. There are three security levels in Widevine: L3, L2, and L1. Here's a breakdown of each:

- **Widevine L3:** This is the lowest-supported option, where the DRM is entirely software-based. A device that only has Widevine L3 has no Trusted Execution Environment

¹ As of 11.06.2021, Widevine DRM decryption is supported by all current versions of all popular browsers: Chrome, Edge, Safari, Firefox, Opera.



(TEE) for DRM encryption to run in. In most cases, Widevine-protected content will only play in 480p.

- **Widevine L2:** Devices with L2 support have a Trusted Execution Environment (TEE), but video processing happens in software or separate video hardware. Most of the time, Widevine-protected content will play at a maximum resolution of 540p. In practice, this level is not actually used by devices.
- **Widevine L1:** This is the highest level of protection, where media is decrypted and processed entirely in the Trusted Execution Environment (TEE). Devices with L1 support can play Widevine-protected content at the highest possible resolution.

	Widevine L1 (More Secure)	Widevine L3 (Less Secure)
STBs		
Smartlabs Linux	✗	✓
Smartlabs Linux (SML-5442TW, SML-5041W)	✓	✓
3rd Party Linux STBs with Smartlabs Firmware	Depends on manufacturer	Depends on manufacturer
Smartlabs Android	✓	✓
ChromeCast	✓	✓
Nvidia Shield	✓	✓
3rd Party STBs based on Android	Depends on manufacturer	✓
Mobile Devices		
Android 4.4+	Depends on manufacturer	✓
iOS 9+	✓	✓
SmartTVs		
Samsung (Tizen) Models 2018+	✓	✓
Samsung (Tizen) Models 2015-2017	✓	✓
Samsung (Tizen & Orsay) Models 2010-2015	✗	✗
LG WebOS 3.0+	✓	✓
LG Netcast and WebOS 1/2	✗	✗
Smart TV Alliance (LG, PHILIPS, TOSHIBA, PANASONIC)	✓	✓
AndroidTV	Depends on manufacturer	✓
HTML5 browsers		



Chrome			
	Android	Supported since version 62	✓
	iOS/IPADOS 13.1+	✗	✗
	ChromeOS	Supported since version 62	✓
	MacOS	✗	✓
	Linux	✗	✓
	Windows	Should be supported in releases after Q3 2021 for Windows 10 only	✓
Firefox			
	iOS/IPADOS 13.1+	✗	✓
	MacOS	✗	✓
	Linux	✗	✓
	Windows	✗	✓
Opera			
	iOS/IPADOS 13.1+	✗	✓
	MacOS	✗	✓
	Linux	✗	✓
	Windows	✗	✓
Safari			
	iOS/IPADOS 13.1+	✗	✓
	MacOS	✗	✓

14. SmartTUBE Server additional functions

Additional functionality of SmartTUBE Server allows the administrator to flexibly manage the system: distribute user and group access rights to Admin Console, implement content licensing policies, manage interface localization and other services.

- *Admin Console user management* — administrator can create new users with the access roles assigned to them. Administrators can also monitor specific user actions in the administrative interface.
- *Admin Console access roles* — SmartTUBE provides a set of predefined access roles:
 - *Administrator* — access to all menus with a full set of rights,
 - *Content manager* — access to channels and movies management,



- *Business manager* — access to service and billing plans management,
- *Technical support specialist* — access to account management,
- *Analyst* — access to the report interface.

One or more roles can be assigned for each user. That roles define the set of available partitions and menu items.

- *Multilanguage support* — SmartTUBE allows to localize the client and administrative interfaces to different languages. The platform also allows to work with multilingual content, when a title, description and other attributes in several languages can be set for the same movie or TV program. In this case, the subscriber, first of all, will see the content in the language that was chosen as the interface language. If the content is not translated into the chosen language, the system displays the data in accordance with the operator's configured language priorities.
- *SmartTUBE licensing policy* — SmartTUBE is licensed according to the number of active, inactive and temporarily blocked service accounts. Closed and deleted accounts are not counted when calculating the number of licenses used. For more information about the licensing rules visit the [SmartLabs website](#) or contact our representatives.

15. Software and firmware update

Maintaining the software and hardware capabilities of the server and client equipment in an up-to-date state, as well as preventing potential failures, are realized by updating the devices firmware and SmartTUBE software in various ways.

- *Upgrade server* — update by multicasting the firmware file through the operator's network or via the HTTP protocol.
- *USB* — STB firmware can be updated for test purposes using a USB flash card. To update one insert the flash card with the firmware copied to the root catalog in the STB. Reboot the STB, the firmware should be updated automatically.
- *App Store* — iOS app is updated by publishing apps to the Apple store.
- *Google Play* — Android app is updated by publishing apps to the Google Play Market.
- *SmartTV stores* — SmartTV app is updated by the publishing apps in the respective SmartTV manufacturer's web store (LG, Samsung).

16. Supported devices

One of the key features of the SmartTUBE platform is the wide range of supported subscriber devices, which allows to implement the multiscreen concept of content delivery. So, the IPTV / OTT operator can significantly expand its audience, being not limited to only one type of



supported devices. Moreover, the fleet of supported client equipment can be expanded as part of additional integration work.

Below are the requirements for different types of devices. These requirements do not include restrictions related to the use of various protocols and formats of video delivery (HLS, DASH, etc.), CAS/DRM systems, and other restrictions related to the hardware and software implementation of the listed devices by their manufacturers, as well as manufacturers of content delivery systems and CAS/DRM systems.

Linux based STB

To run Smarttube Client UI on STB using a Linux kernel OS, you need to have SmartSDK. At the moment SmartSDK is supported on hardware platforms HiSilicon, STMicroelectronics, Amlogic, Broadcom, Sigma Designs from STB manufacturers such as SmartLabs, Albis, Arris, and others.

To clarify the list of supported hardware platforms and integration options, please contact SmartLabs representatives.

iOS

- iPad with iOS 11 or later
- iPhone with iOS 11 or later

Android

The devices must comply with the Android Compatibility Definition Document (CDD) requirements.

- Tablet PC with Android 5.0 Lollipop (API Level 21) or later
- Smartphones with Android 5.0 Lollipop (API Level 21) or later

PC (Browser)

- Microsoft Edge
- Chrome 69
- Safari 11

and later.

Support for other web browsers — on request.

Smart TV

- LG
 - WebOS (3.5 and later)

Note: support for Netcast and earlier versions of WebOS could be provided by



additional request and subject to technical feasibility (depends on used DRM, streaming protocol, and etc.).

- Samsung
 - Tizen (from 2017 year of production)
- Whale OS platform (<https://www.zeasn.com/>)

Whale OS — a revolutionary operating system for Smart TV as a core part of Whale Eco. Combining powerful IT Cloud services, innovative SaaS tools and smart connected devices, ZEASN corporation joins hands with content partners, technical services, Ad service providers and device manufacturers, bringing the unparalleled user experiences to audiences across the globe.

Whale Eco now works with many of the world's most recognizable brands, including Philips, TCL, Haier, AOC, Sharp, BenQ, Konka, Changhong, NovaTek, Amazon, Google, Alibaba, Huawei, DSP Group, and etc.

Android based STB and Android TV

- Supported OS Android Open Source Project (AOSP) and Android TV v9.0 or later.
- The devices must comply with the Android Compatibility Definition Document (CDD) requirements.
- SmartTUBE UI application on AOSP devices can be installed as a Launcher.

16.1. Client device features

	Linux STB	Android STB	iOS	Android 5.0 and newer	Samsung SmartTV (Tizen)	LG Smart TV (WebOS)
Widevine/DASH Support	Yes	Yes	Yes	Yes	Yes	Yes
Multicast	Yes	Yes (in Roadmap)	No	No	No	No
Voice search/input	Yes (using BT RCU)	Yes (using BT RCU)	Yes (Native)	Yes (Native)	Yes (Native)	Yes (Native)
External applications	Yes	Yes	No	No	No	No
AirPlay	No	No	Yes	No	No	No
Chromecast/Cast	No	Yes	No	Yes	No	No
Android/iOS native PiP	No	No	Yes	Yes	No	No
Offline content	No	No	Roadmap	Roadmap	No	No



16.2. Support for content delivery protocols and DRM systems by various devices

Model / Technology	Widevine / DASH	PlayReady / DASH	PlayReady / SmoothStreaming	Verimatrix
Samsung Legacy (2012–2015 models)	No	No	No official support	Yes
Samsung Tizen (2015 and 2016 models without software updates installed)	No	Yes	Yes	Yes
Samsung Tizen (2016 models with software updates installed)	Yes	Yes	Yes	Yes
Samsung Tizen (2017 models and newer)	Yes	Yes	Yes	Yes
LG NetCast (models until 2014)	No	No	No official support	No
LG WebOS 2.x (models until 2016)	No	No	No official support	No
LG WebOS 3.5 and newer (2017 models and newer)	Yes	Yes	No	No
SmartLabs STB, iOS 11 and later, Android 5.0 and later	Yes	No	No	Yes

16.3. Client device updating

The SmartTUBE solution includes the *SmartTUBE Device Manager* — a web console for managing firmware and applications on client devices installed (Linux and Android STBs, mobile and SmartTV platforms). This console has a number of features that greatly facilitate the administration of the operator's client device fleet:

- Software artefacts management (firmware, private app repository, configuration settings)
- Device grouping (production, staging, A&B, etc.)
- HTTP and Multicast firmware distribution
- Software version tracking and release notes
- Update strategies management (soft update, force update, minimal allowed version)
- Configuring the Home screen of Client UI

The look and feel of the SmartTUBE Device Manager interface is similar to the consoles of other SmartLabs products. It is simple and allows you to evaluate at a glance the firmware version and system apps installed on the client devices of a certain group (production, staging, test, etc.)



SmartTUBE Device Manager

admin

ver. 1.4

Home

Home

Firmwares

Android apps

Staging groups

Device models

	Production	Test group	Staging
SML-5010	Version: 9_PPW1_20200724.1004819 System apps: iFM (version: 1.5)		Version: 5010-1.4.2
SML-5442TW	Version: 2 System apps: iFM (version: 1.5)	Version: 3	
SML-5041	Version: 6.0.1_MO68AR_20200907.141645	Version: 5041-1.4.2.1	Version: 5041-2.3.4
SML-5051A	Version: hi3798-3.5.4 System apps: Angry birds (version: 1) Betacom (version: 5.25023.2766)		

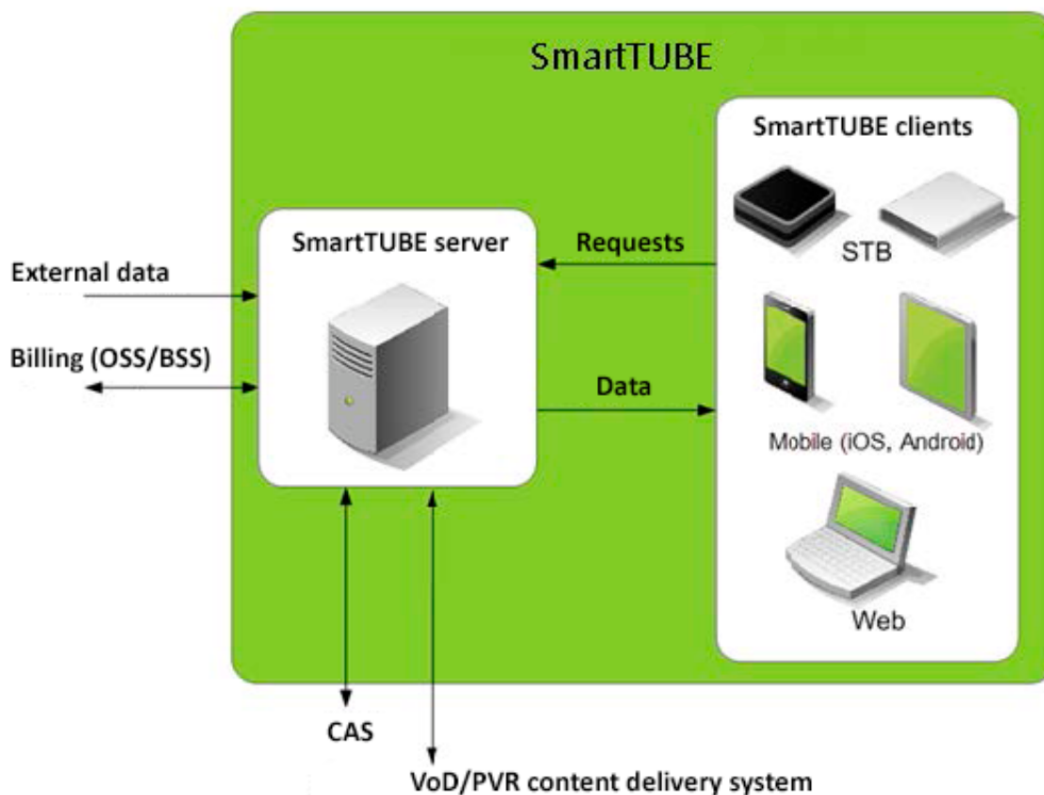
SmartTUBE Device Manager — Home page

The key advantage of SmartTUBE Device Manager is the control of firmware/application versions and their distribution to devices in a single interface. This greatly simplifies and speeds up the process of updating the client software. In addition to configuring the Home screen of SmartTUBE Client UI, the web-console also allows to edit other client device settings.



17. SmartTUBE system architecture

17.1. Overview



The server part of the solution ("SmartTUBE Server" on the diagram) manages the subscriber accounts, description of the provided content and service bundles, billing plans, i.e. performs the basic logic of service provision.

Client applications are the subscriber interface for working with the IPTV / OTT system. The subscriber performs requests to the SmartTUBE server and receives services with the help of client applications ("SmartTUBE Client" on the diagram). SmartTUBE supports several types of client applications for various subscriber devices.

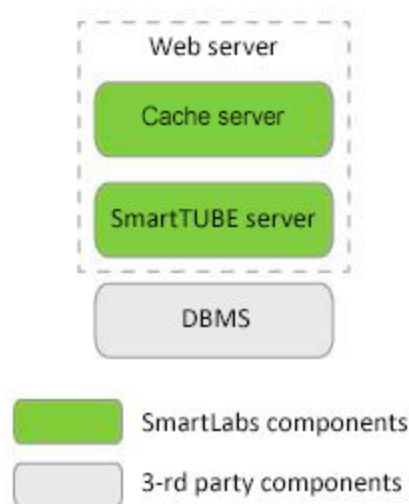
17.2. SmartTUBE Server

SmartTUBE Server architecture is represented by three levels:

- The level of static data caching and generating responses with dynamic data — cache server;



- Middleware business logic level — SmartTUBE server;
- Database level.



SmartTUBE Server

The business logic of service providing, resource management and subscriber accounts in the IPTV/OTT system is performed at the SmartTUBE Server level.

SmartTUBE Server processes and loads data received from SmartTUBE clients and external subsystems into the database and controls access to services. The server also interacts with the billing subsystem and manages the conditional content access system.

The application server periodically downloads a copy of the data from the database to the system's cache servers to provide quick access to the data for SmartTUBE clients. The business logic application (SmartTUBE Server) is developed by SmartLabs.

SmartTUBE Server has a graphical web interface (GUI), SmartTUBE Admin Console. SmartTUBE Server uses the DBMS to store data.

SmartTUBE Cache

Direct interaction of the SmartTUBE Server with clients is performed by SmartTUBE cache servers. Processing of mass requests between them is distributed by the load balancer. In addition, to accelerate the response of the operator platform and transfer data to clients, each web server includes a cache server that performs all the main server functions, including storing authorization data, a list of up-to-date services and copies of the most popular content. On top of that, the use of cache servers allows to simplify the logic of the client applications (and their development as a result), facilitates the introduction of changes and platform maintaining.



DBMS

SmartTUBE Server works with the following DBMS:

- Oracle 11
- PostgreSQL 9.6

17.3. Technology Matrix

Component	Programming language	3rd-party components, frameworks, etc
SmartTUBE Server	Java, Go, JavaScript/HTML	PostgreSQL, MongoDB, Elasticsearch
SmartTUBE Client STB	C/C++	QT
SmartTUBE Client Android	Kotlin	
SmartTUBE Client iOS	Swift	
SmartTUBE Client SmartTV/Web	JavaScript/HTML	Angular JS

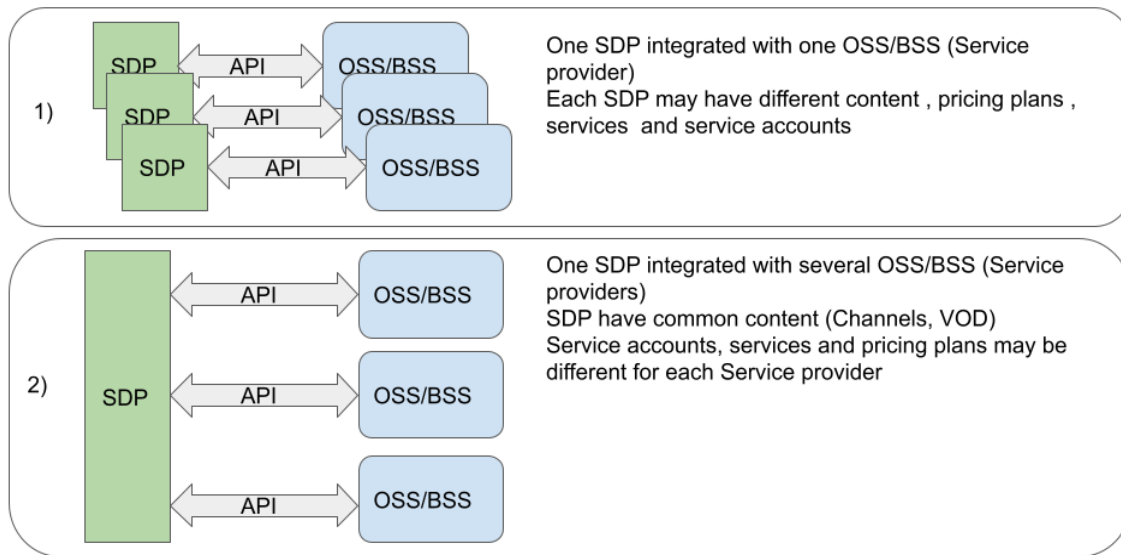
18. Multiple Tenant Architecture

SmartTUBE SDP supports 2 options for multitenant architecture implementation:

1. Independent SDP instance is used for each tenant
2. One SDP instance serves several tenants



OSS/BSS integration with multitenant architecture



The implementation of option 2 is described in detail below.

18.1. SmartTUBE SDP Multiple Tenant Features

1. SDP supports the tenant dictionary. Some special parameters can be configured for each tenant, such as:
 - a. Tenant name and description
 - b. OSS/BSS integration URL
 - c. Standard Tenant UI Customization parameters (detailed in point 7.)
2. Service accounts and terminals (devices) have to be linked to only one specific tenant.
3. Pricing rules for services (TV channel bundles (Live, Timeshift, Catch-up, etc.), SVOD/TVOD bundles) could be managed for each tenant separately, but some tenants could use the same services and pricing plans.
4. Users of SmartTUBE Admin Console could be configured to have access and management rights for one or several tenants, so employees of one tenant will not have rights for viewing and managing content, services, accounts, etc. from other tenants. Users with administration rights could manage all tenants.
5. All content (TV channels, VOD movies and serials) is common for all tenants. SDP allows to combine content into different services for each tenant, providing a flexible management tool to enable content from a common headend and VOD library to be presented to multiple tenants.

EPG is imported common for all channels and is available for all tenants.



6. All reports provide information for each tenant independently.
7. Client application UI customization could be implemented for each tenant based on [“SmartTUBE. Client UI Customisation Guide”](#) rules. Standard and Custom Tenant Customization are priced separately and on a per tenant basis.
 - a. Standard Tenant Customization — Logo, Active Selector, Background Tint.
 - b. Custom Tenant Customization — full customisation of elements described in line with UI Customization Guide.
8. Messaging system allows sending messages and notifications only to devices of a specific tenant.
9. Licensing calculation could be separate for each tenant, but administrators have access to full licensing information for the whole system.
10. Dictionaries (content genres, access levels, supported DRM types, languages, settings, and etc.) are common for all tenants and could be managed by system administrators only.

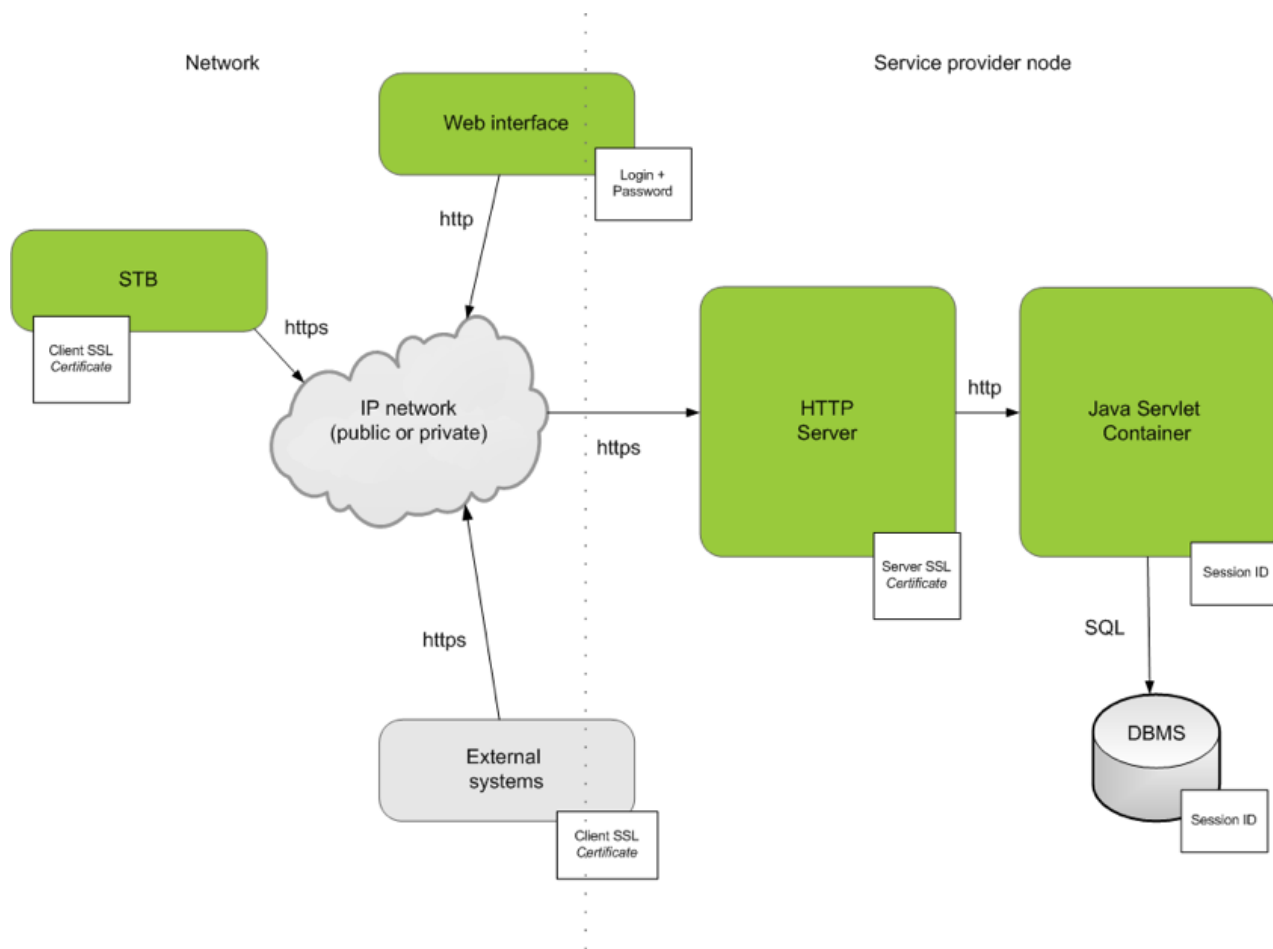
19. Security mechanisms

SmartTUBE system protects IPTV / OTT services and confidential information from unauthorized access at different levels:

- subscriber devices level;
- network level;
- access from the SmartTUBE Admin Console level.

The figure below shows how all these mechanisms interact to provide a high level of platform protection.

Session ID – a special identifier that allows to control SSL certificates (*SSL certificates*) used to transfer data over the HTTPS protocol.



SmartTUBE protection architecture

Subscriber devices protection

The following mechanisms are used to increase the level of protection when interacting with subscriber units in the SmartTUBE system:

- **Device activation and user authorization.** Each time the subscriber device attempts to connect to the SmartTUBE server, the system compares its MAC address and serial number with the values stored in the database when the device was activated. If the MAC address and serial number do not match, the device is not allowed to access the service.
- **Connection sessions management.** SmartTUBE uses special identifiers to manage each connection session with the subscriber unit. Each connection session lives for a limited period, after which the session closes and SmartTUBE stops the information delivery to the device. This avoids the memory shortage problems in STB devices.
- **Protection against STB duplication.** STB has built-in protection against duplication, which prevents the possible device counterfeiting.



Secure access to SmartTUBE Admin Console

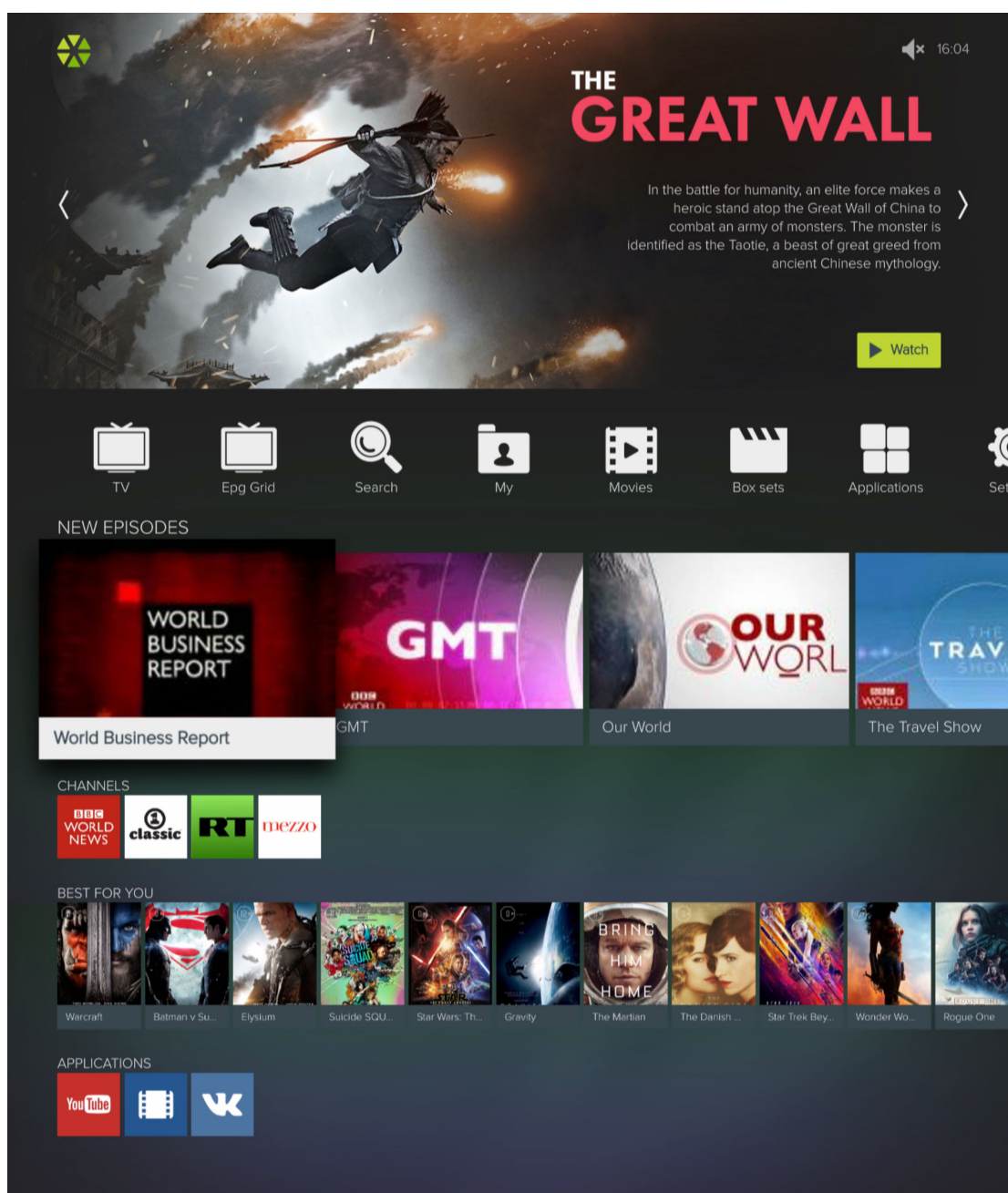
Secure access to the system administration interface is provided by the authorization mechanism. User must enter the login and password issued by the system administrator to log into the SmartTUBE Admin Console. If the authentication data is entered correctly, SmartTUBE provides access to the admin interface, otherwise it does not.



Appendix A

This appendix illustrates the location of all the SmartTUBE Client UI features and settings described in this document. Due to the specifics of a particular platform the functionality of client applications for different platforms has a number of minor differences. The screenshots of Smarttube STB Client application will be demonstrated below.

Home screen





Primary services

TV

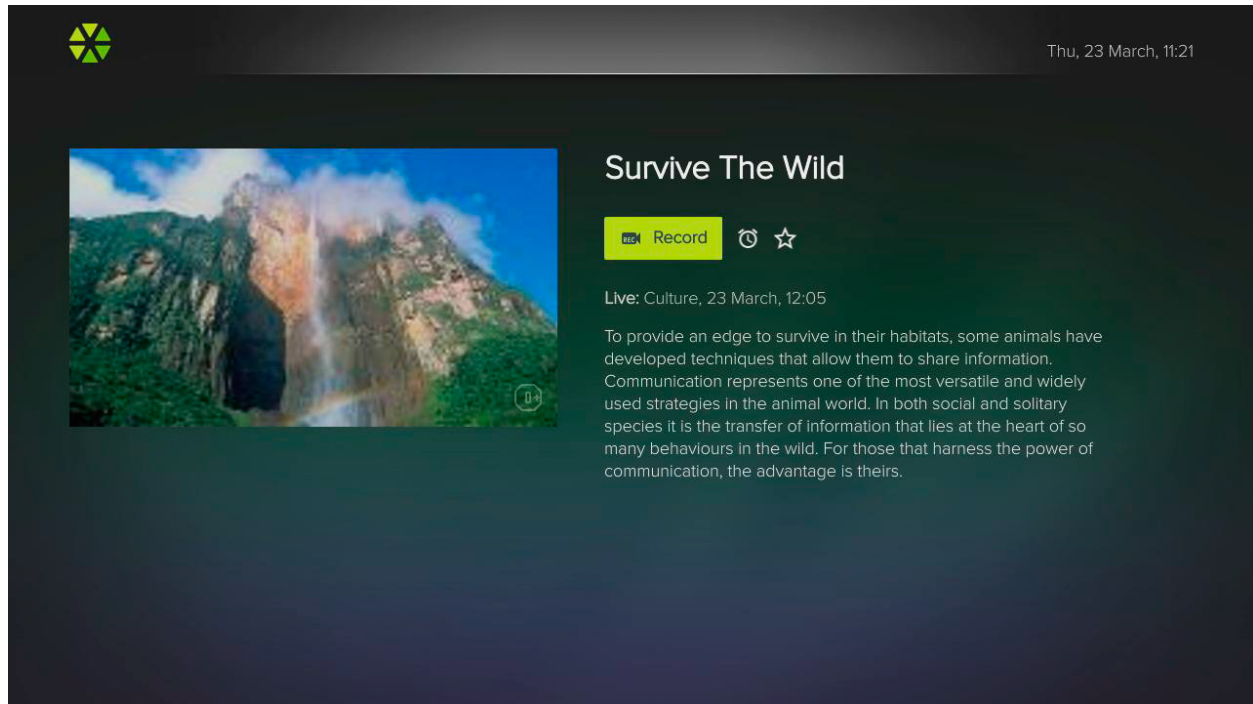
The screenshot displays the SmartTUBE TV interface. At the top, it shows 'TV channels / [DEMO] BBC World News' and the date 'Tue, 28 February, 15:12'. The main content area is divided into two sections: 'TODAY' and 'GMT'. The 'TODAY' section lists programs with their start times: 14:00 BBC World News, 14:30 World Business Report, 14:45 Sport Today, 15:00 GMT (highlighted in yellow), 15:30 GMT, 16:00 GMT, 16:30 World Business Report, and 16:45 Sport Today. The 'GMT' section features a large image of the GMT logo and a description: 'It's midday in London, evening in Asia Pacific and breakfast on America's east coast. GMT has the latest news developments, with updates on business and sport.' On the left, there are three channel icons: BBC World News (001), VH1 Classic (002), and Russia Today HD (003).

Full channel grid and program guide

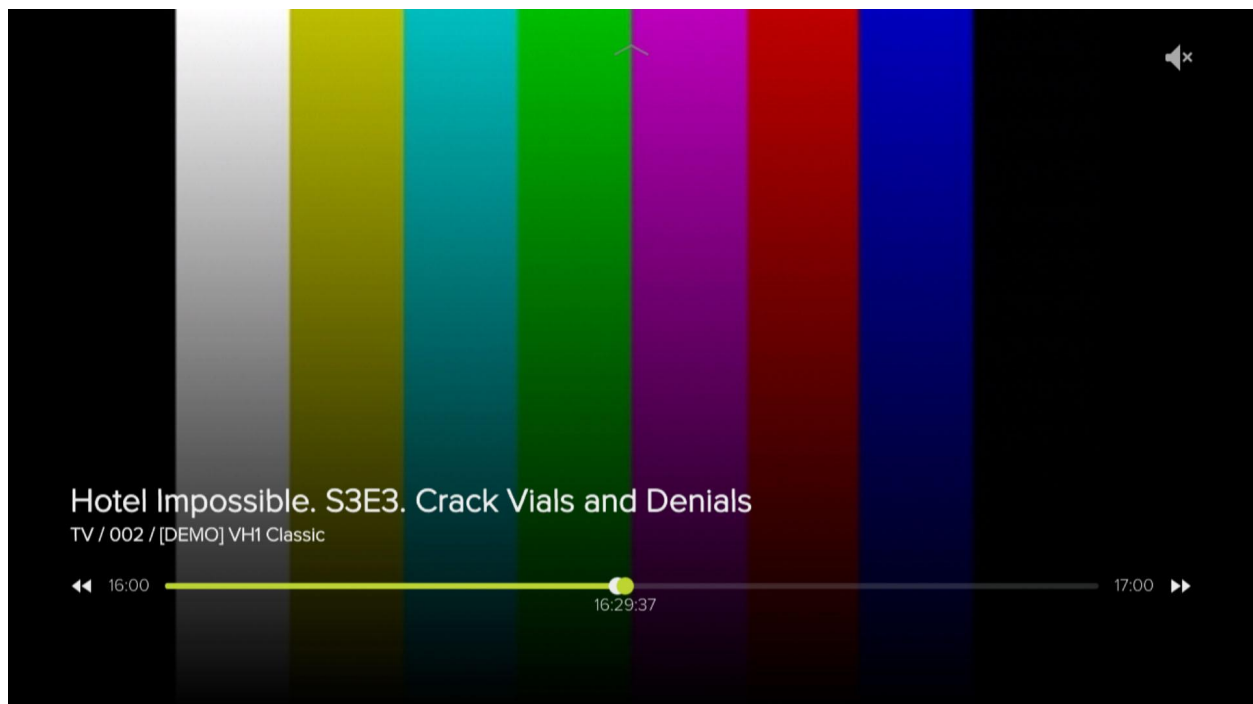
The screenshot displays the SmartTUBE TV interface with a different layout. On the left, there is a sidebar with 'Channels' and 'Programs' sections. The 'Programs' section is expanded, showing a list of categories: All, Documentary, News (highlighted in yellow), Adult, Entertainment, Music, and HD. The main content area shows a program guide for 'TODAY' with the following programs: 13:30 Horizons, 14:00 BBC World News, 14:30 World Business Report, 14:45 Sport Today (highlighted in yellow), 15:00 GMT, 15:30 GMT, 16:00 GMT, and 16:30 World Business Report. On the right, there is a 'Sport Today' section with a large image of a sports field and a 'Add reminder' button. The top of the interface shows 'TV channels / [DEMO] BBC World News' and the date 'Tue, 28 February, 15:06'.



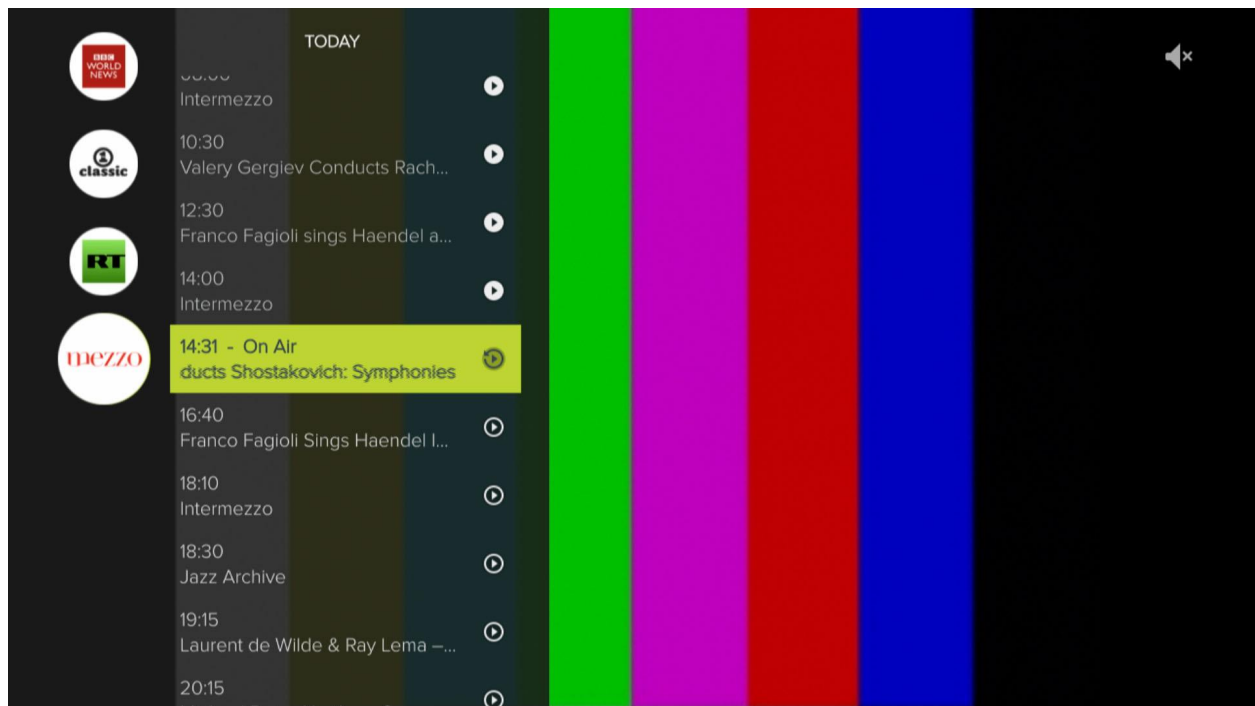
Channels filtering by themes



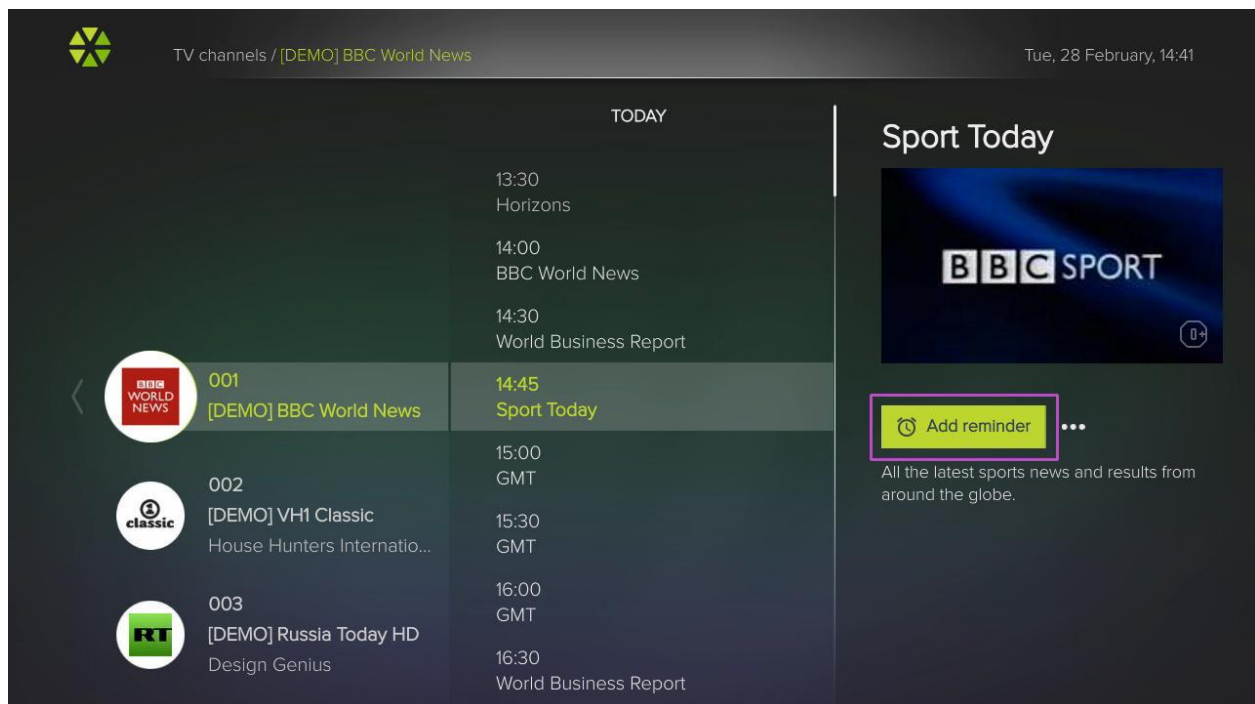
TV program detailed information

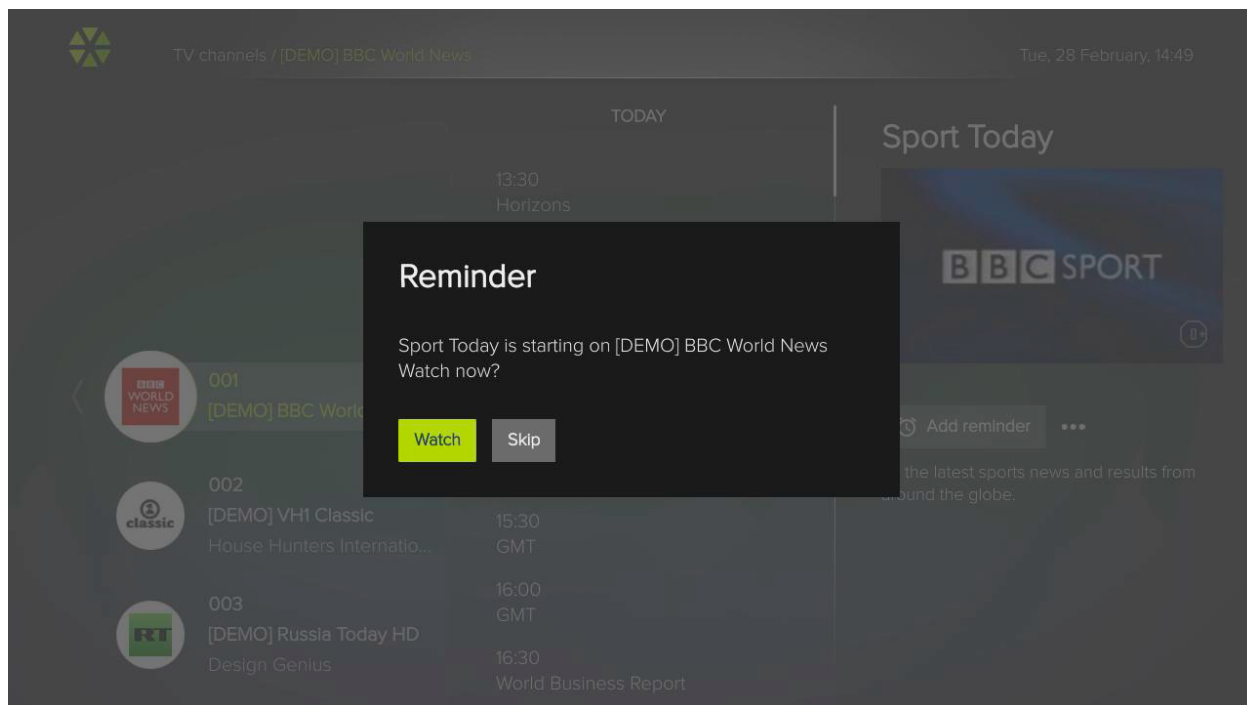


Full-screen player mode for STB and SmartTV devices

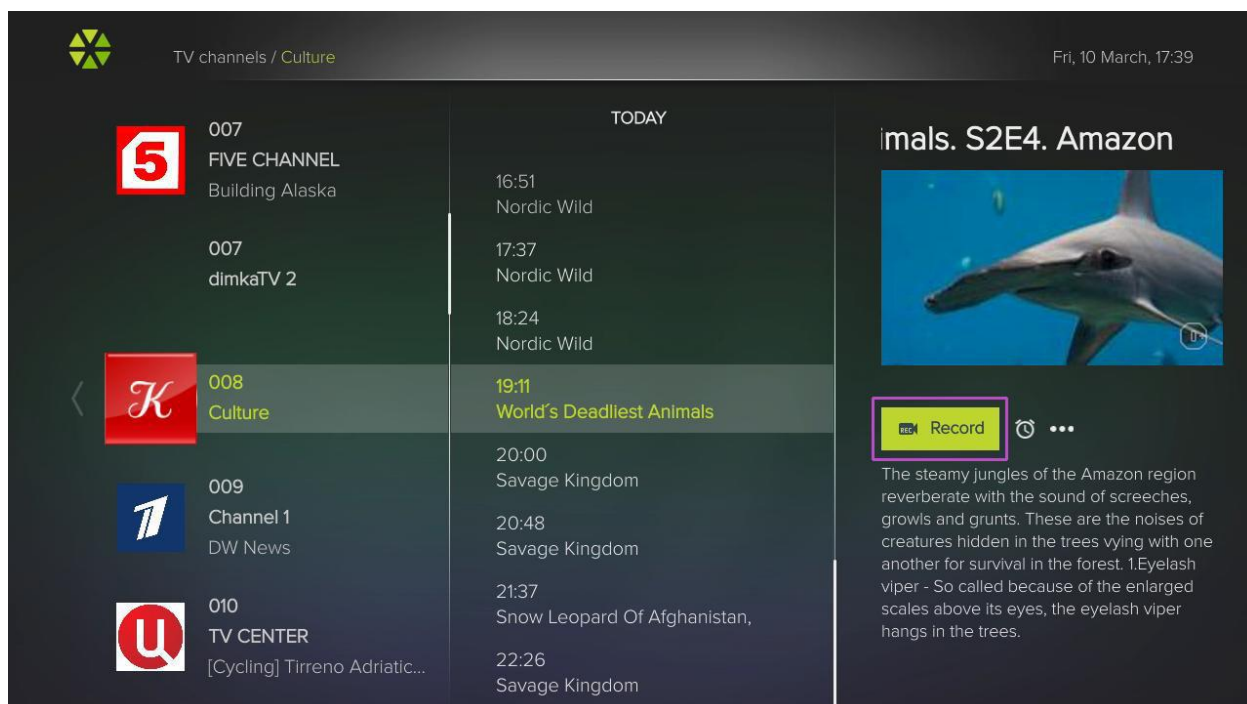


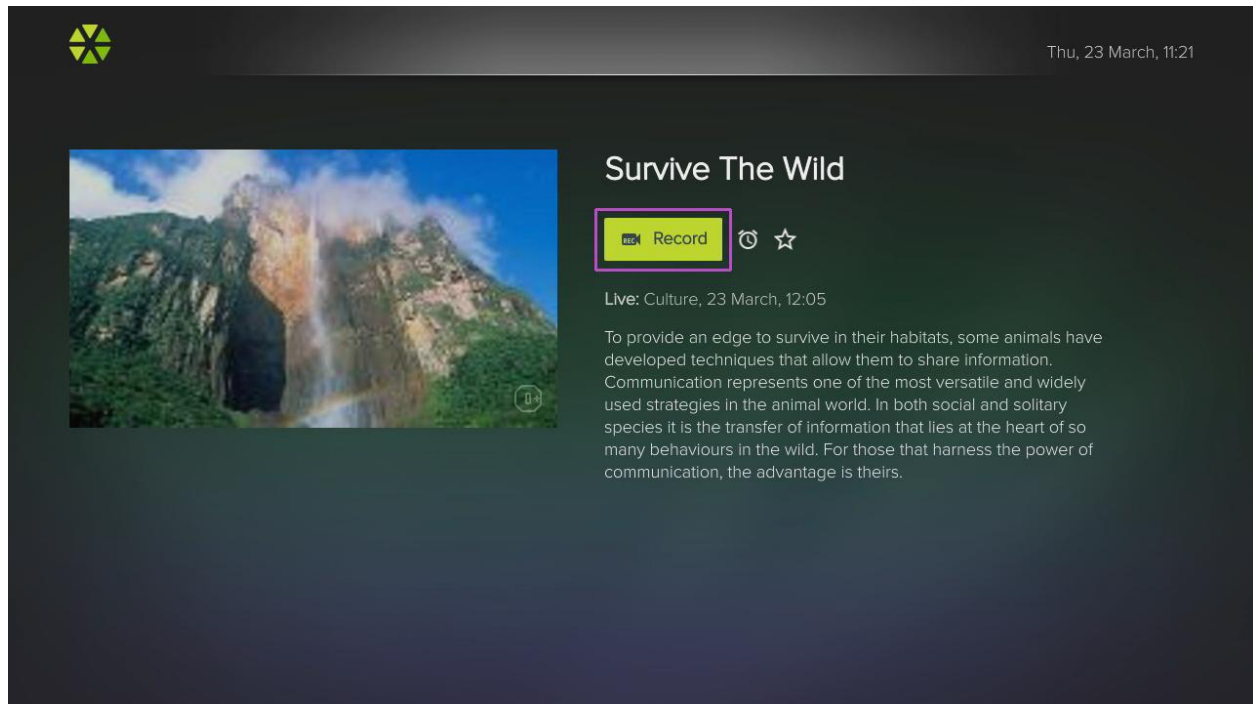
Quick channel selection list



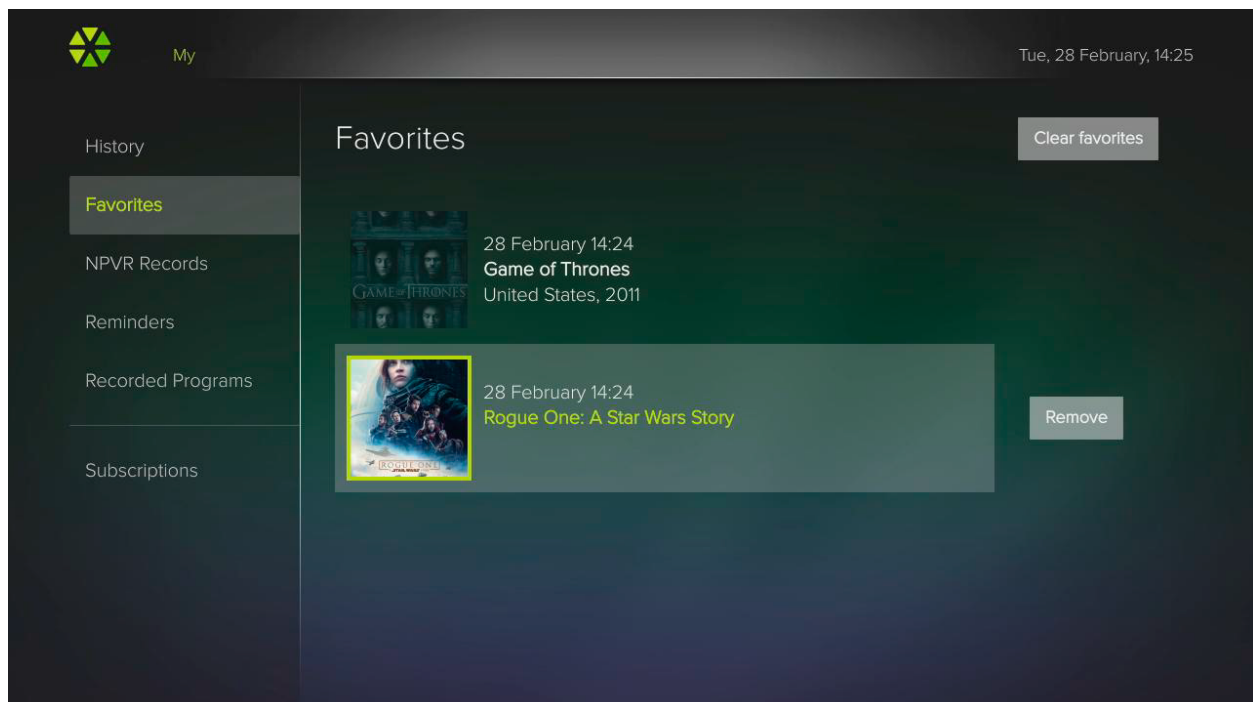


Reminders

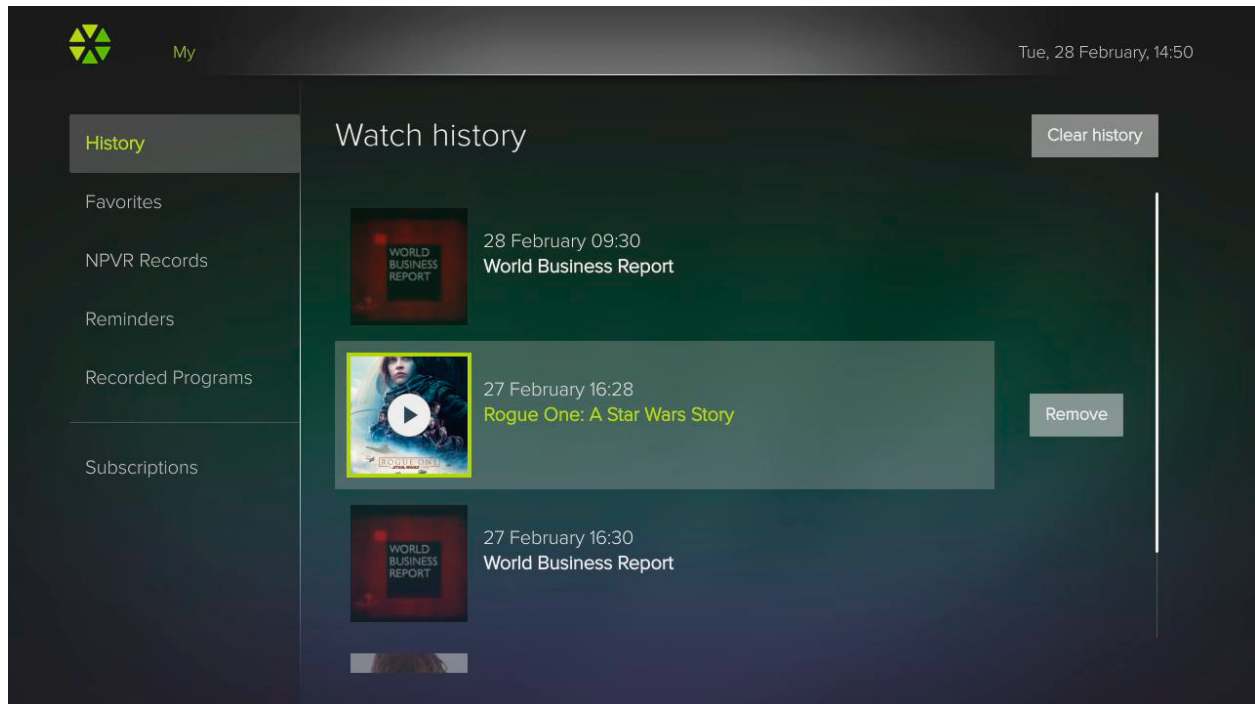
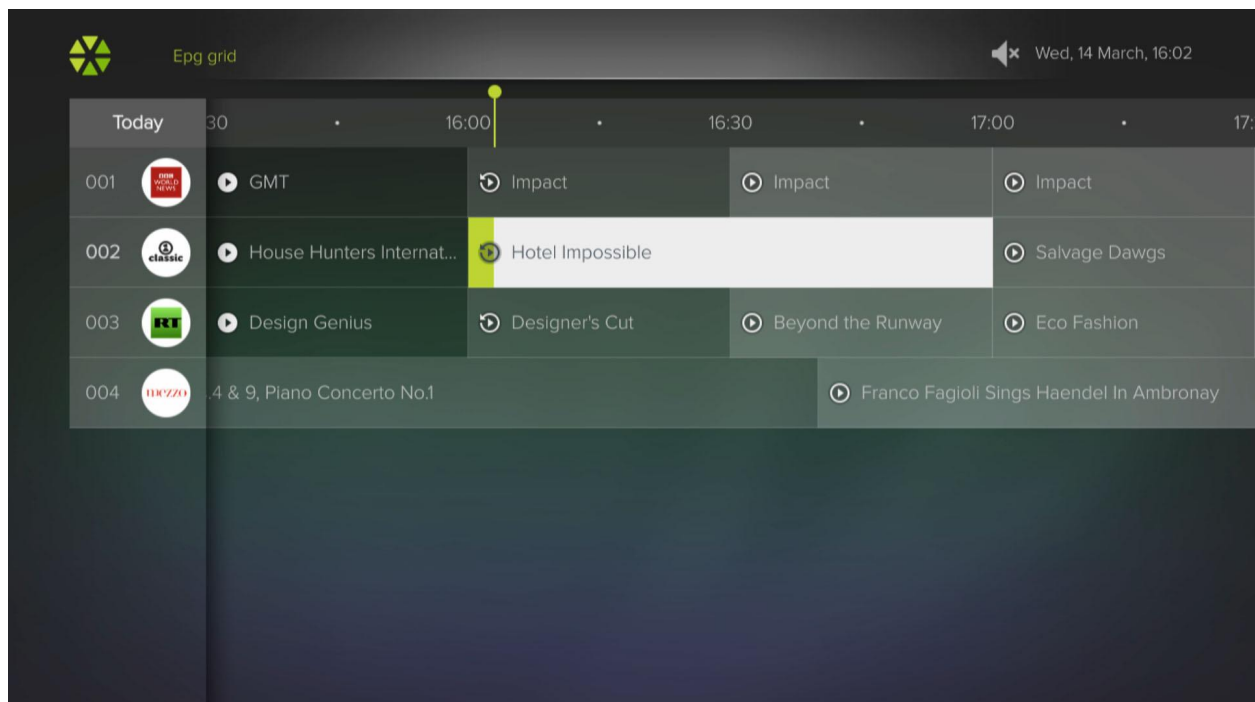




Future broadcasts recording

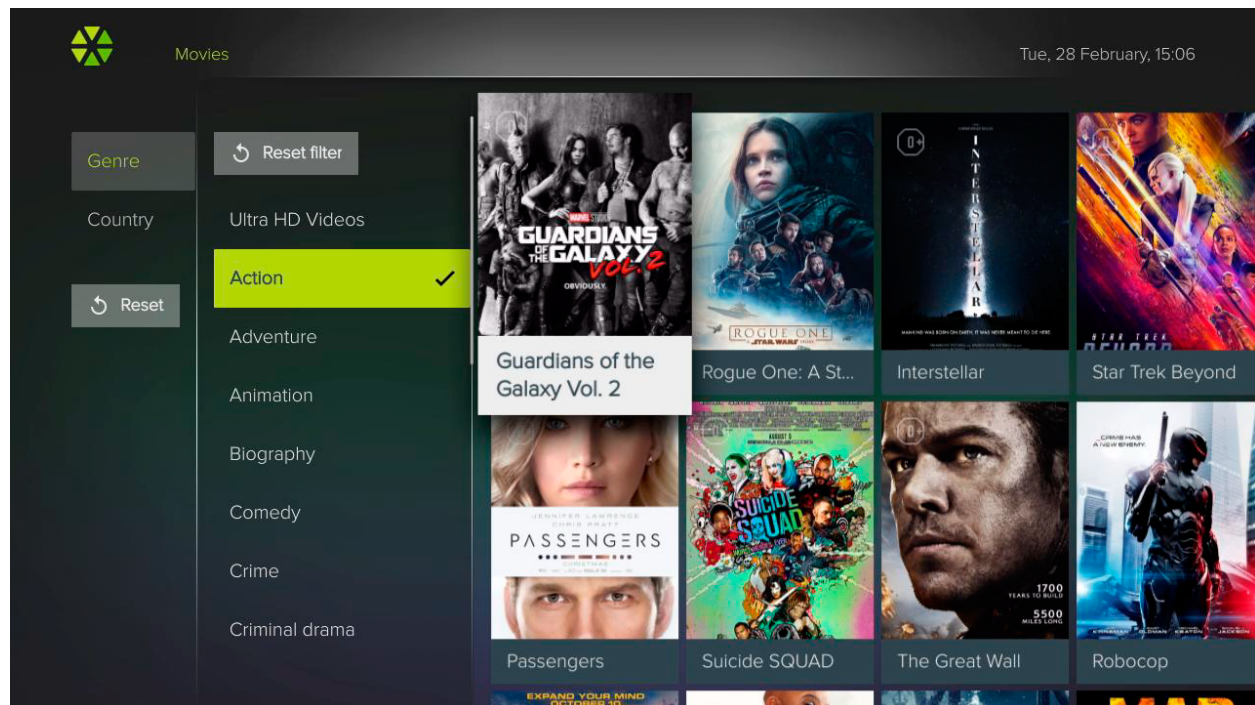


Favorite channels

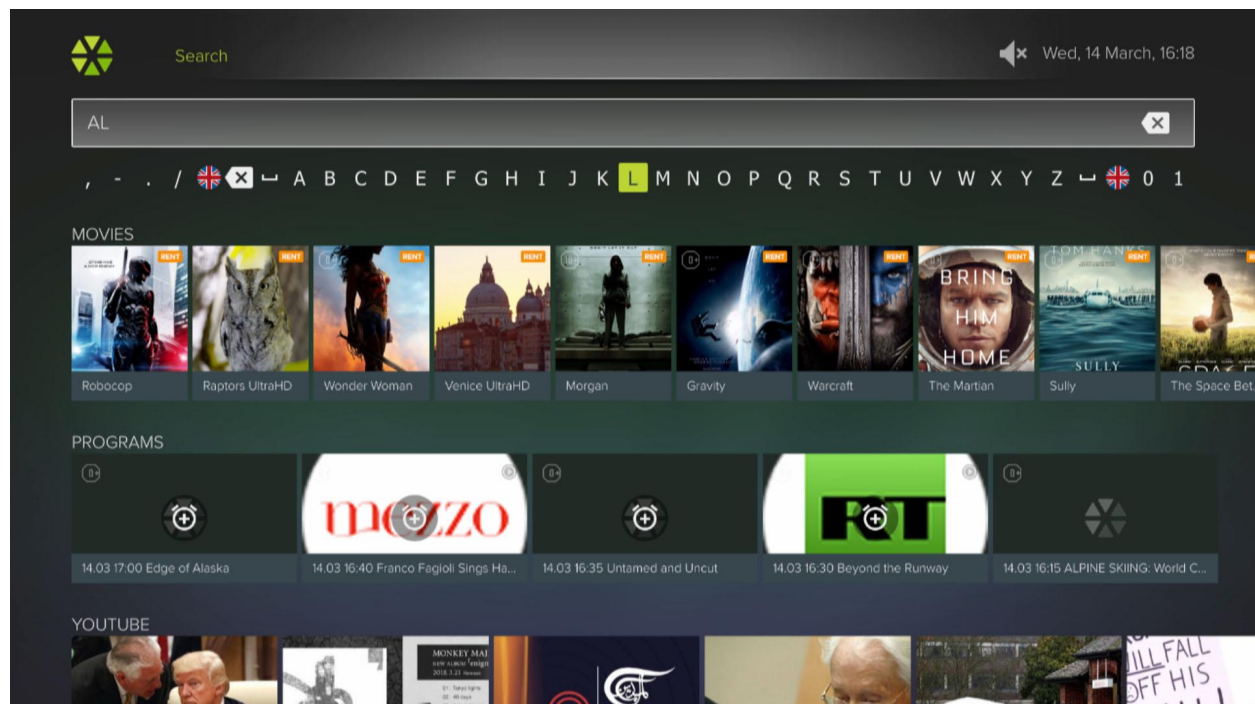
*Watch history**EPG Grid*



VoD



VoD content catalog with filtering by genres



Content search



Mon, 27 February, 16:26

Rogue One: A Star Wars Story

[▶ Watch movie](#) ☆ ...

Directors: Gareth Edwards

Actors: Felicity Jones, Diego Luna, Alan Tudyk, Donnie Yen, Wen Jiang, Ben Mendelsohn, Riz Ahmed, Mads Mikkelsen, Jimmy Smits, Alistair Petrie, Ben Daniels, Paul Kasey, Stephen Stanton, Ian McElhinney, Far...

Jyn Erso, a Rebellion soldier and criminal, is about to experience her biggest challenge yet when Mon Mothma sets her out on a mission to steal the plans for the Death Star. With help from the Rebels, a master swordsman, and non-allied forces, Jyn will be in for something bigger than she thinks.

RECOMMENDED:

Detailed description of content units — movie

Mon, 27 February, 16:28

Game of Thrones

Episodes

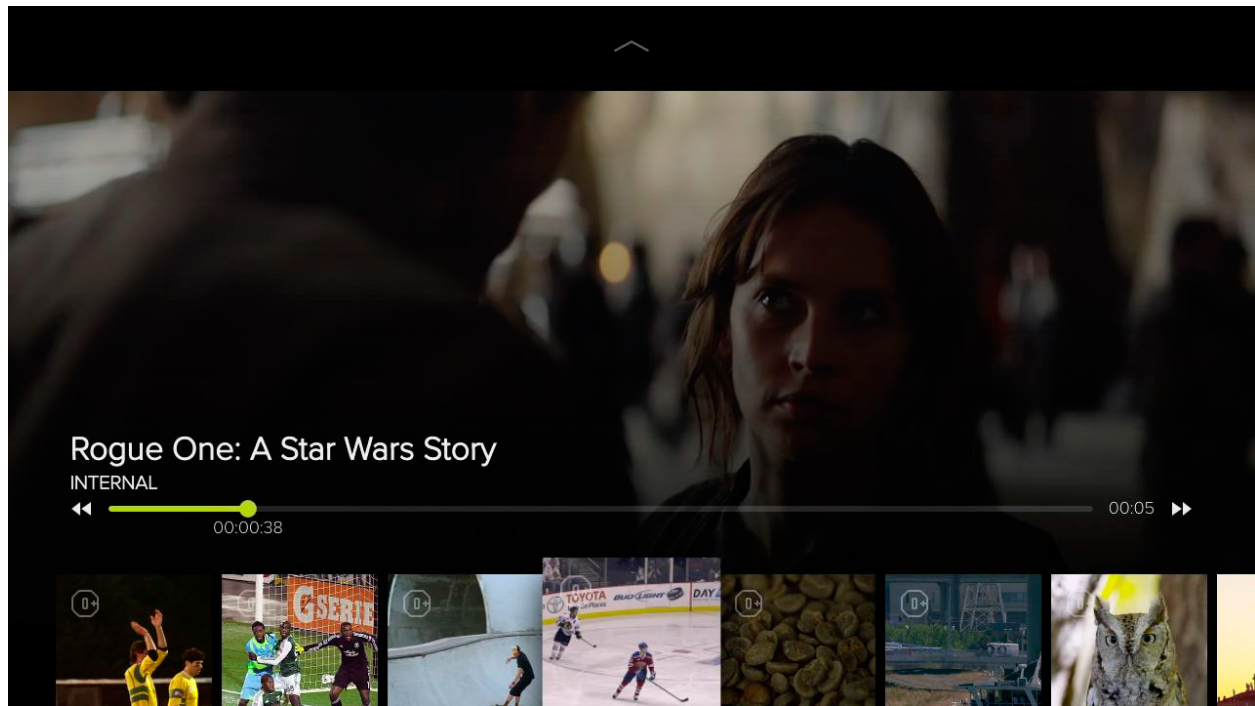
1. The North Remembers
2. The Night Lands
3. What Is Dead May Never Die
4. Garden of Bones
5. The Ghost of Harrenhal
6. The Old Gods and the New
7. A Man Without Honor
8. The Prince of Winterfell
9. Blackwater
10. Valar Morghulis

United States, 2011, Sci-fi

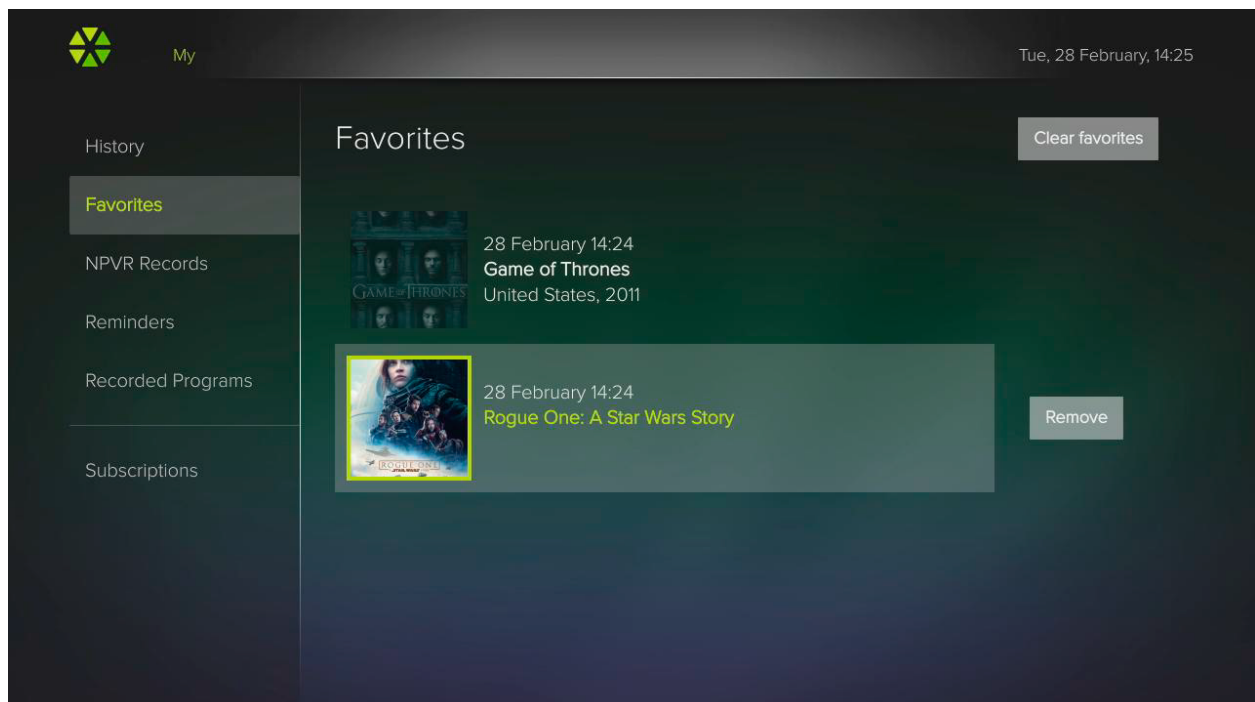
☆ Add to favorites

Ned Stark, Lord of Winterfell, becomes the Hand of the King after the former Hand, Jon Arryn, has passed away. But before Ned goes to the capital, King's Landing, a letter arrives from his wife's sister Lysa, who was the wife of Jon Arryn. There it says that her husband was murdered, and it is up to Ned to find out what's going on. But that isn't everything. The White Walkers have been seen, and they seem to go down south.

Detailed description of content units — series




Full-screen player with recommendation panel



"Favorites" list




Thu, 23 March, 10:59

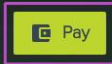


USA, 2017, Drama

RECOMMENDED:



Lion

 ☆ ...

Directors: Garth Davis

Actors: Dev Patel, Nicole Kidman, Rooney Mara, David Wenham, Sunny Pawar, Abhishek Bharate, Priyanka Bose, Khushi Solanki, Shankar Nisode, Tannishtha Chatterjee

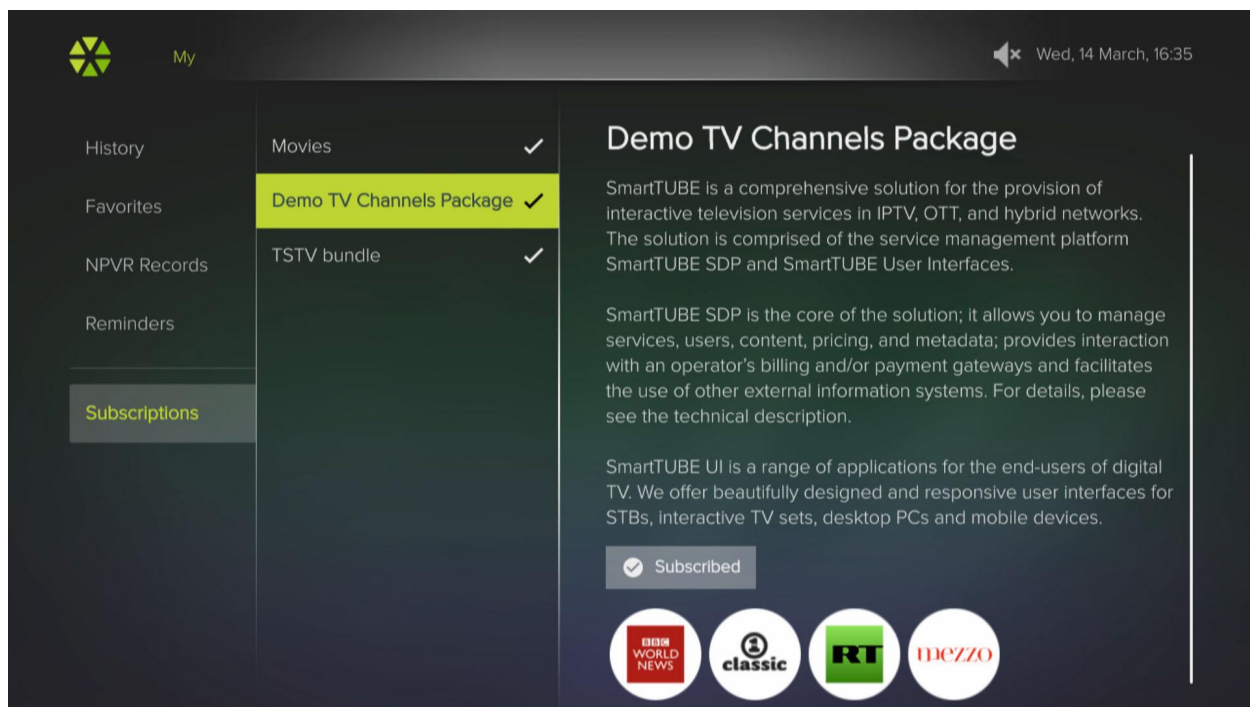
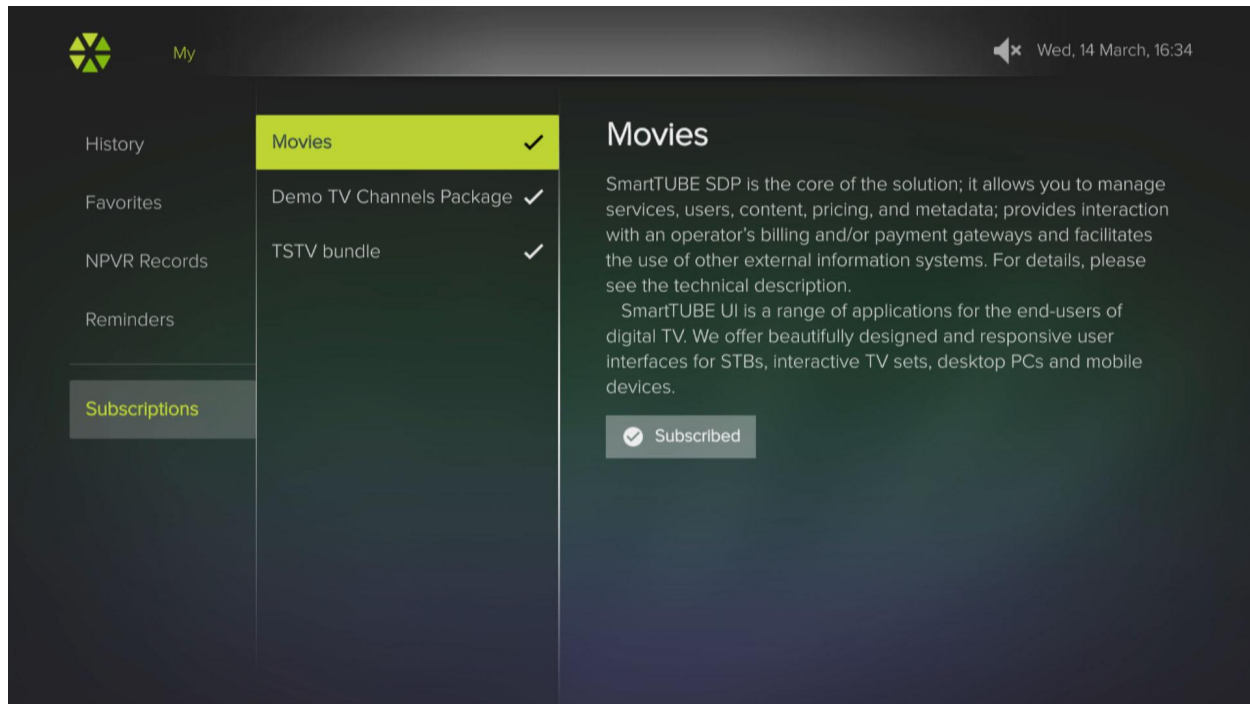
This is a touching story about a boy named Saroo from the Indian slums. At the age of 5 he got lost on the train. He survived and found a new family in Australia. 25 years later he realizes he must find his family and sets out in search of it.

Rent "Lion" on 7 days

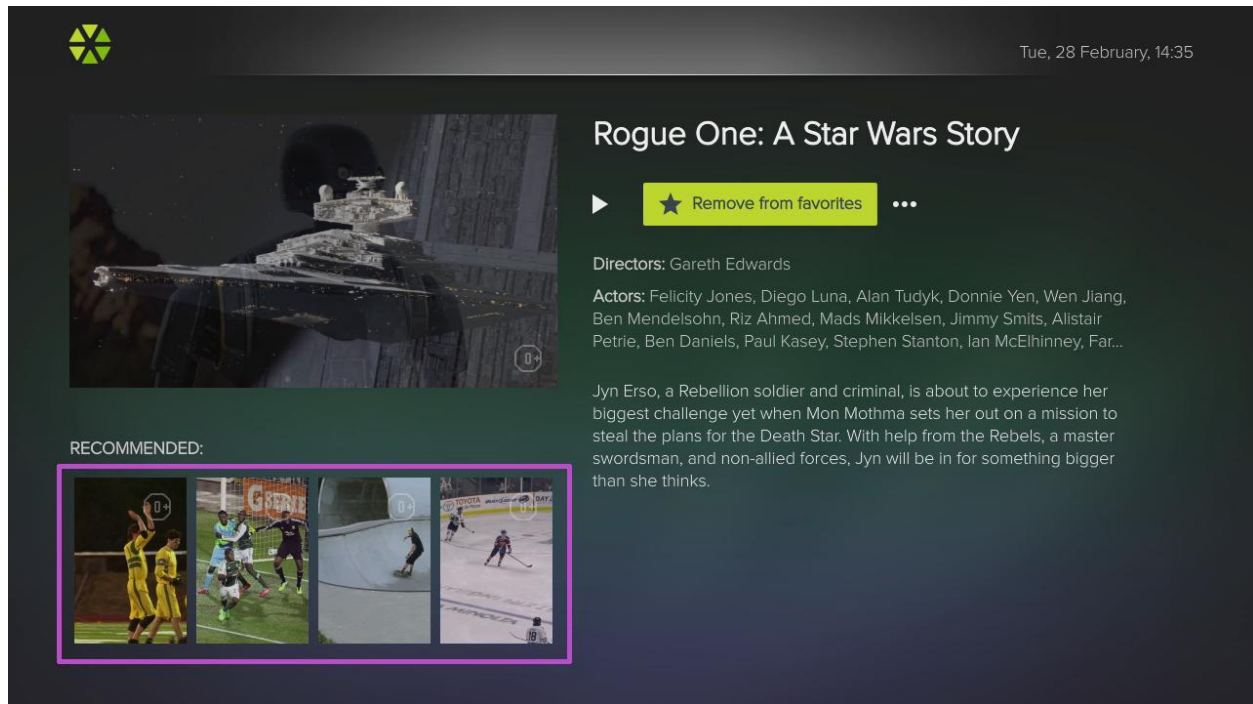
TVOD Megogo (SD) - 99 EUR

[More variants \(1\)](#) [Cancel](#)

Content purchasing

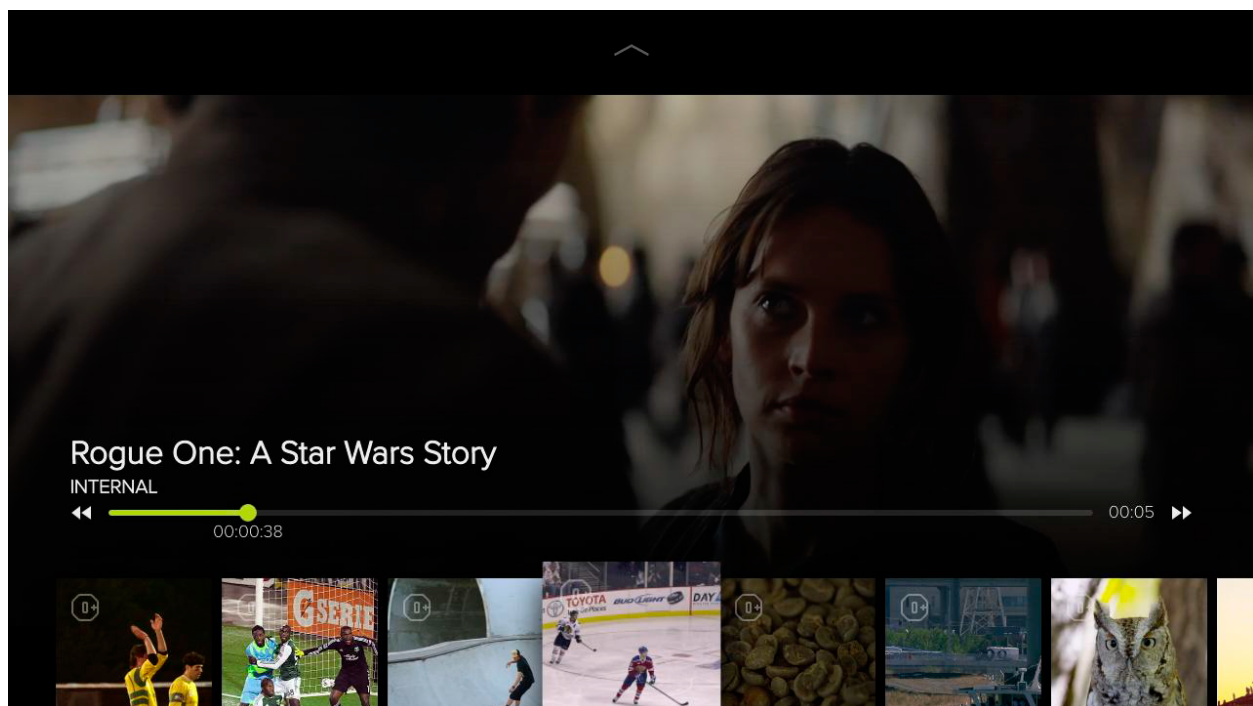


List of purchased / available content

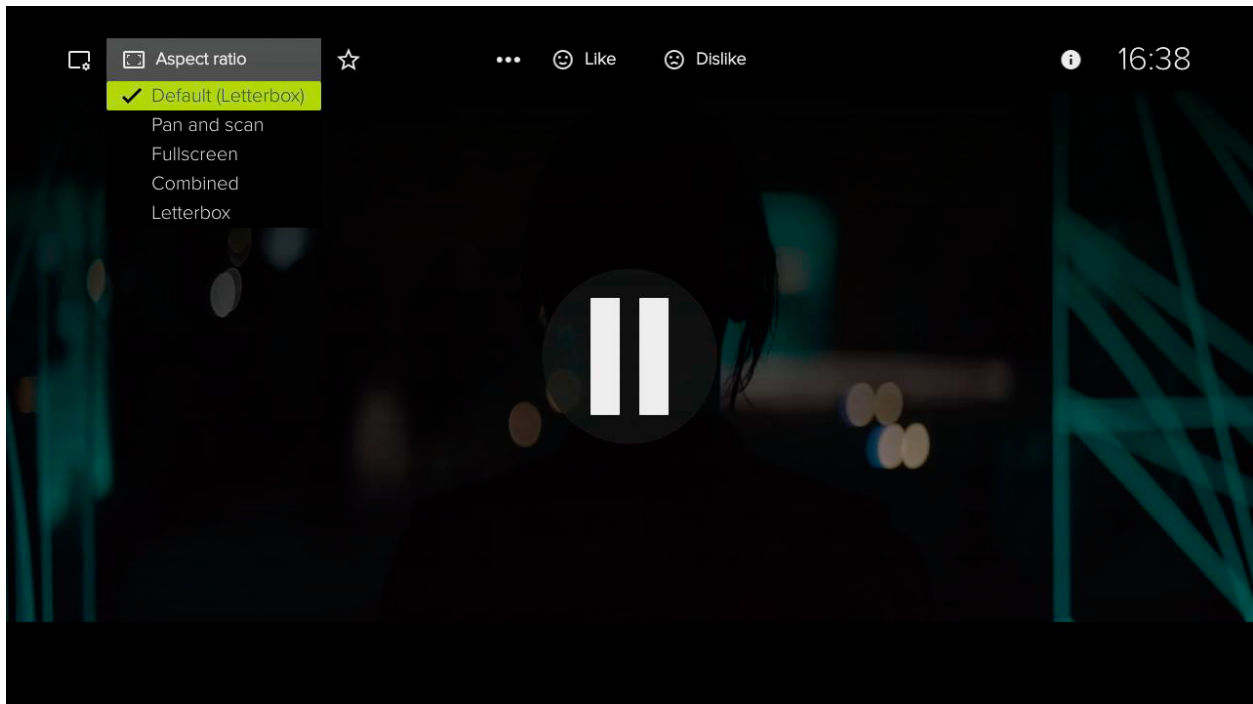


List of recommendations (similar movies and series)

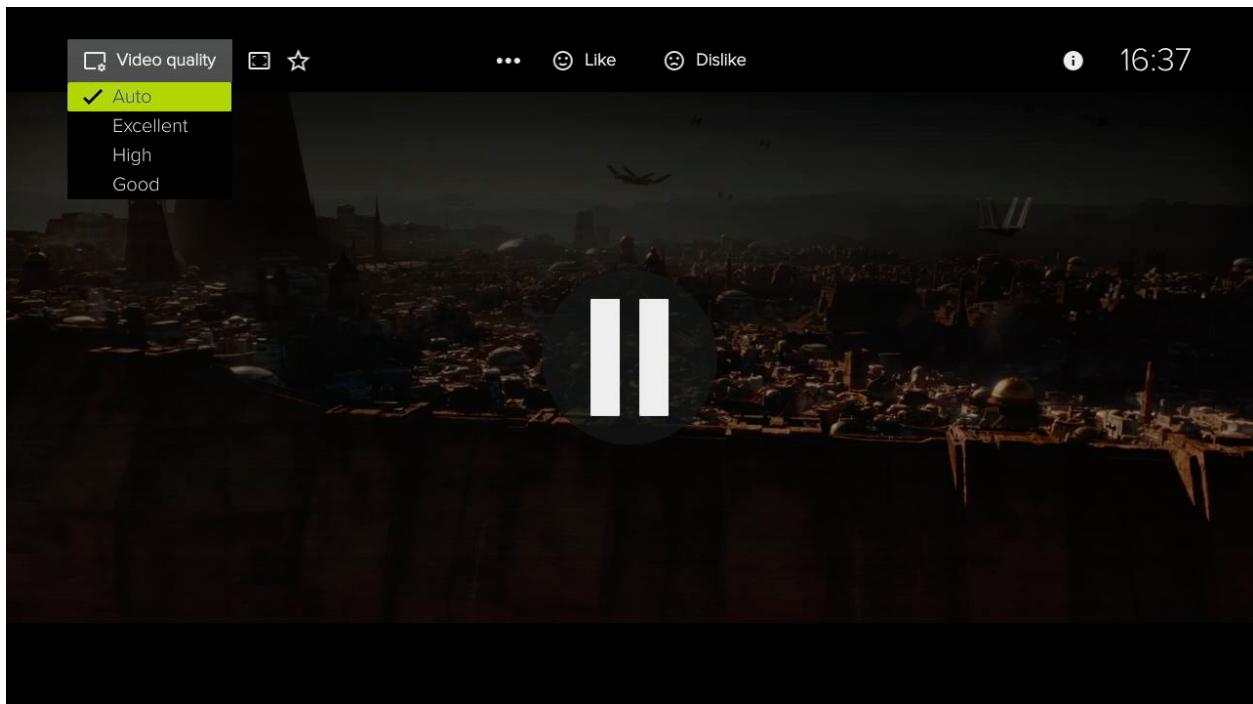
Media player



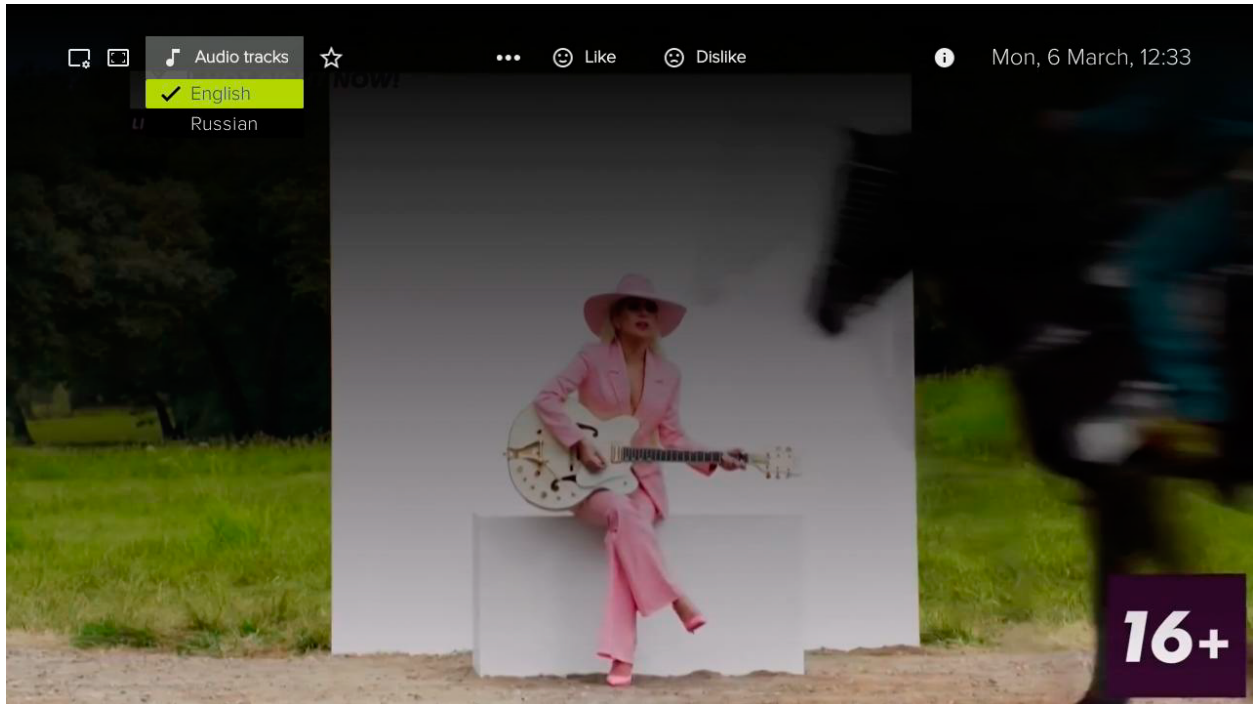
Playback control



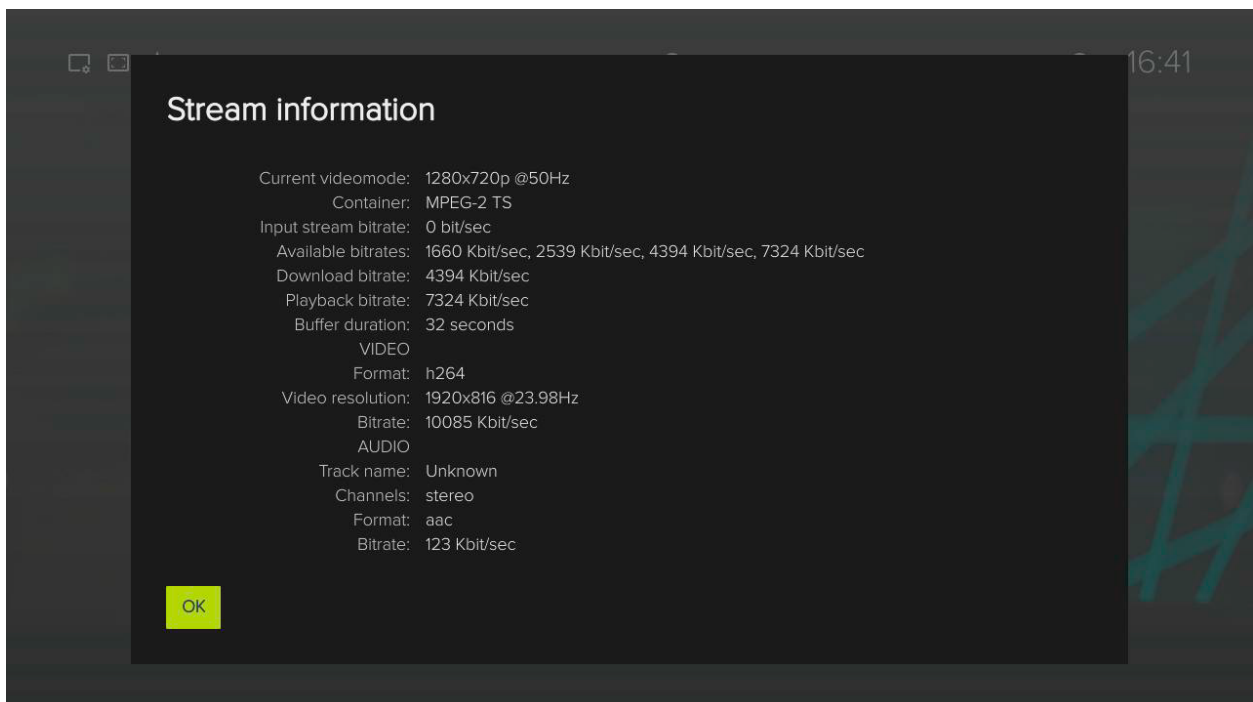
Aspect ratio selection



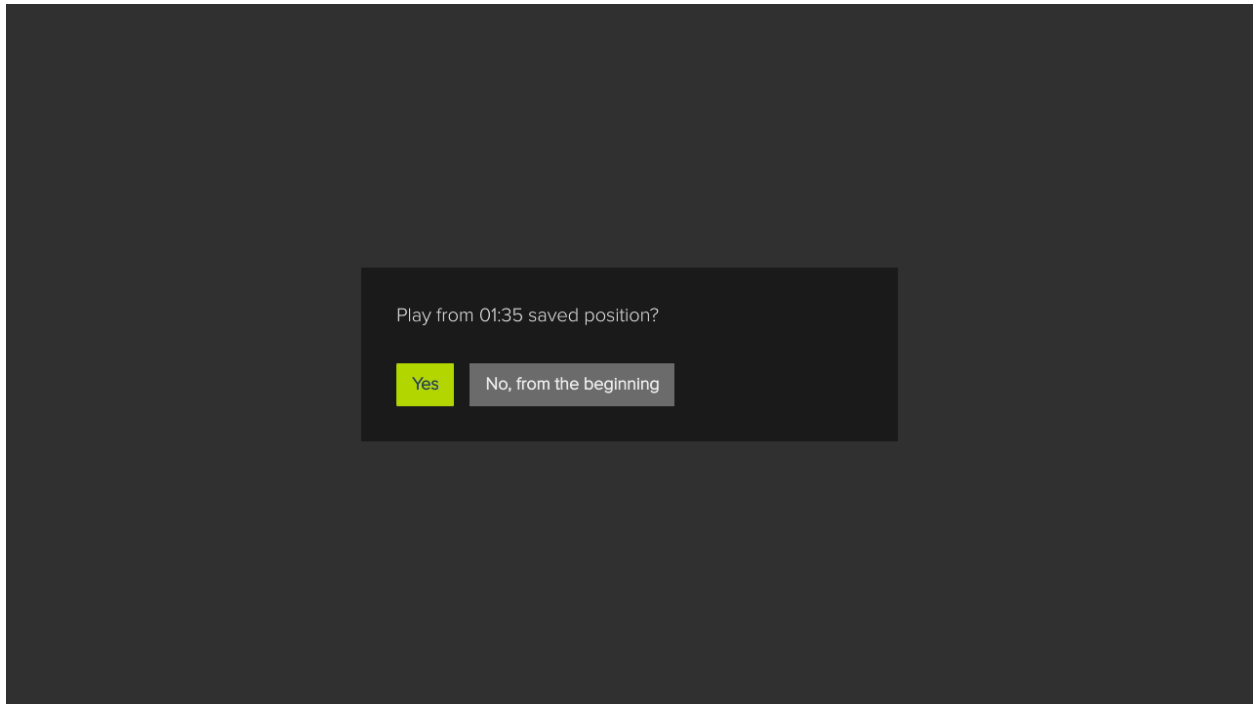
Stream quality options (adaptive streaming support)



Audio track selection

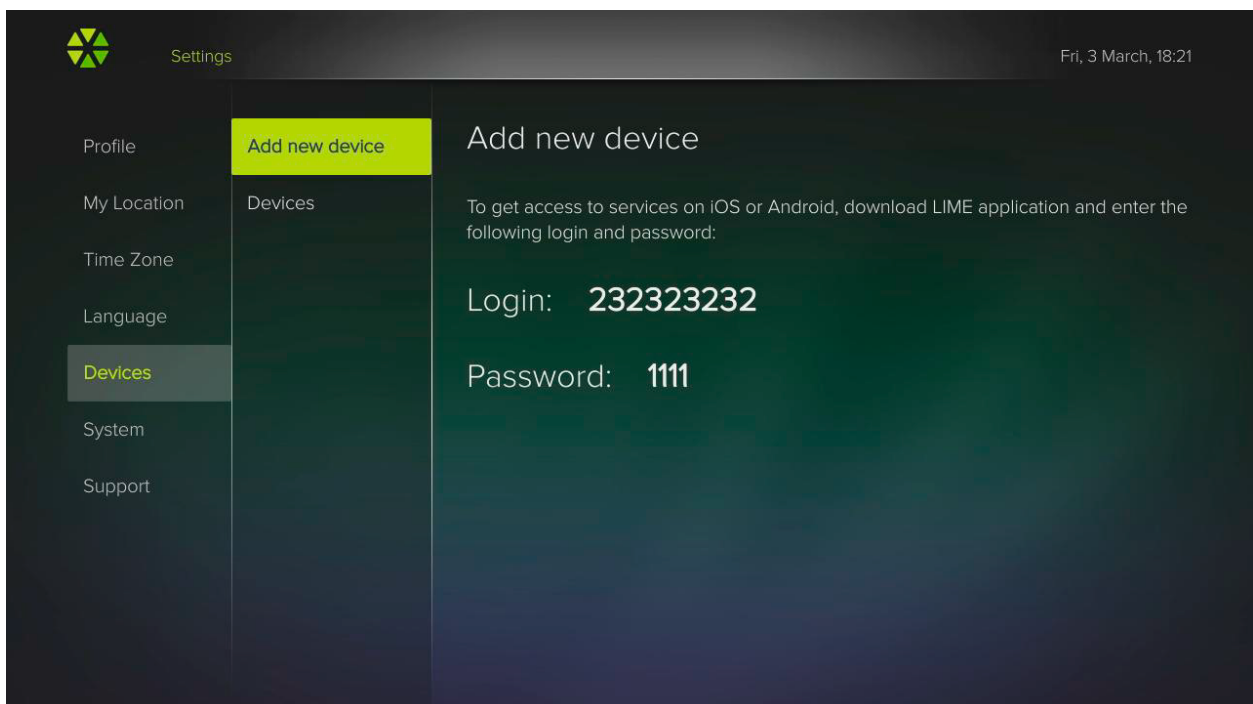


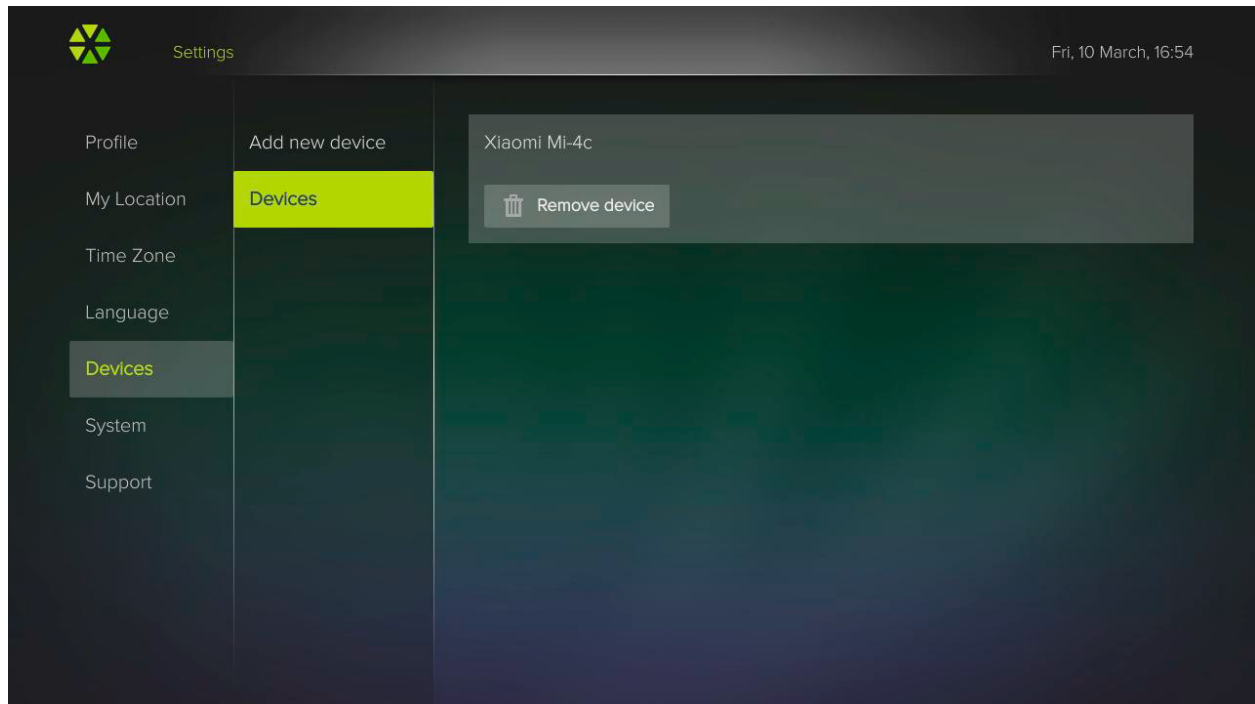
Stream detailed information



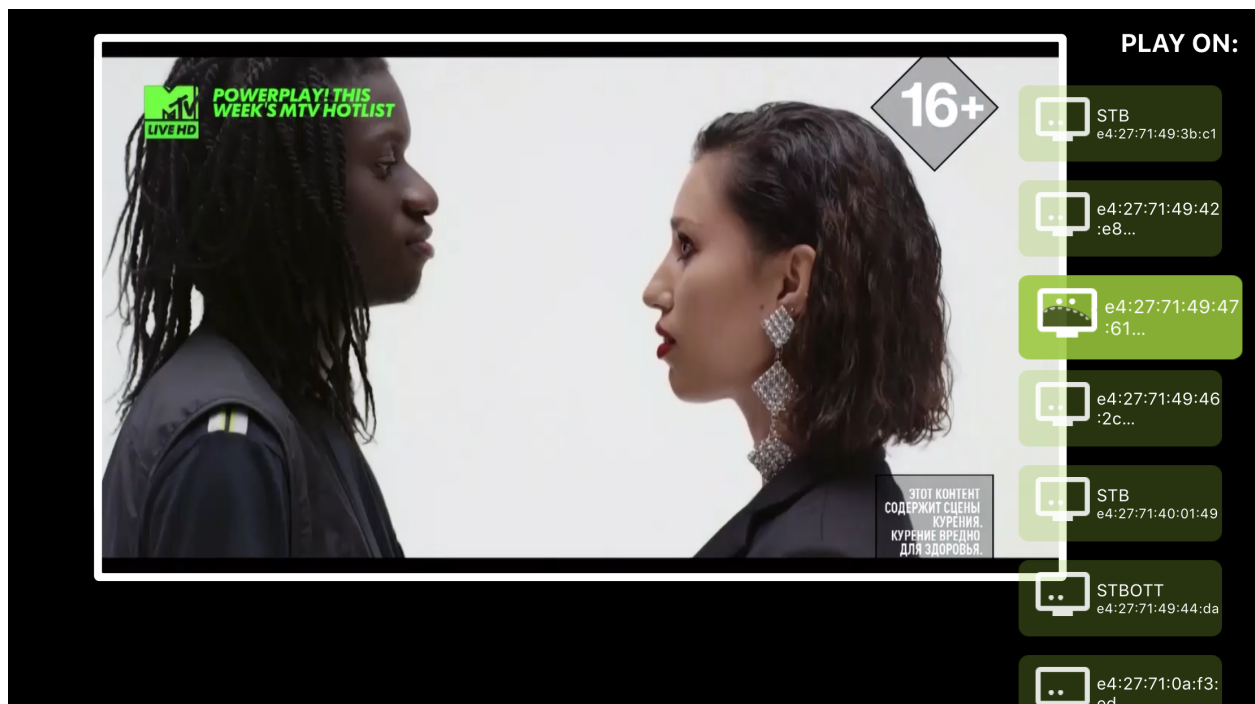
Playback from a saved position

Multiscreen

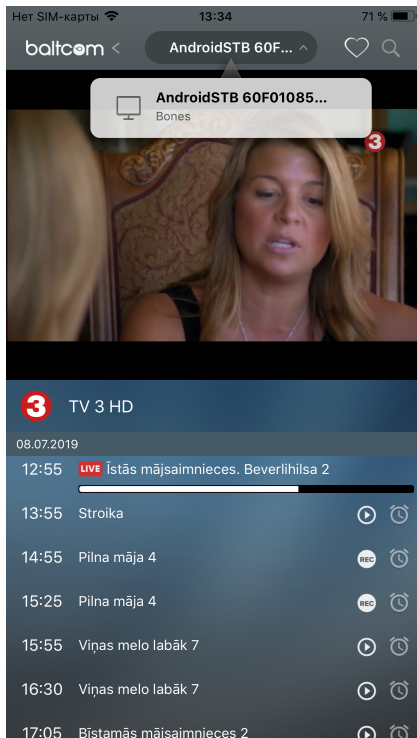




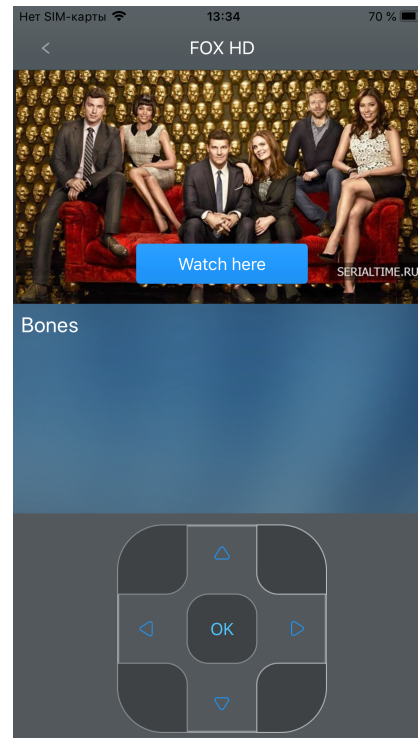
Mobile devices linking



Sending the current broadcast to another subscriber device (full-screen mode)

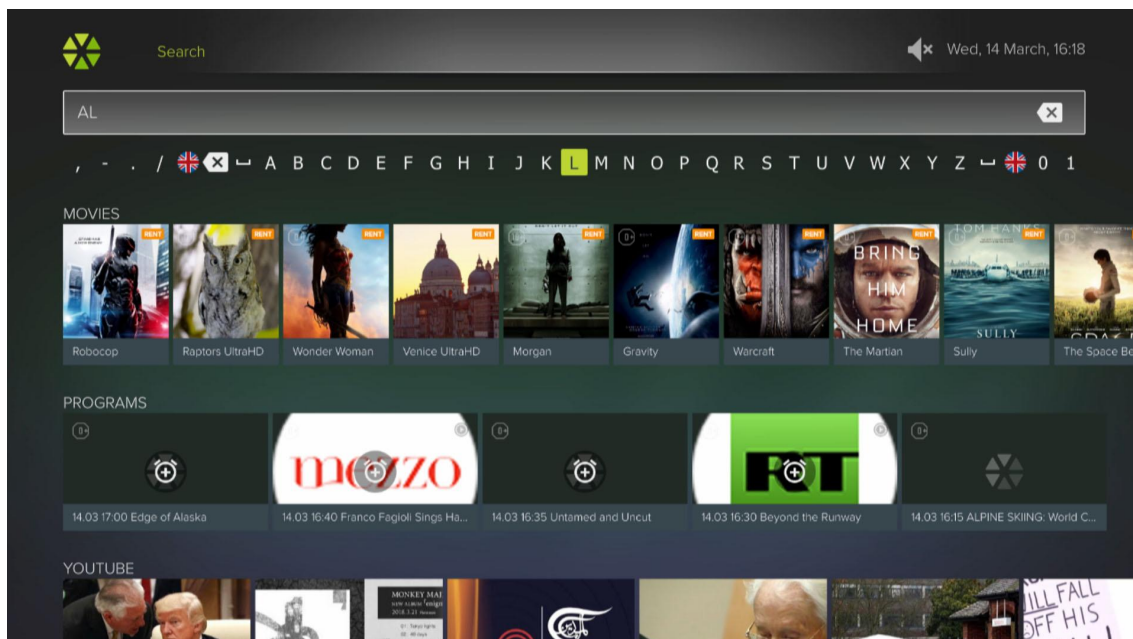


Sending the current broadcast to another subscriber device (preview mode)



Remote playback control on another subscriber device

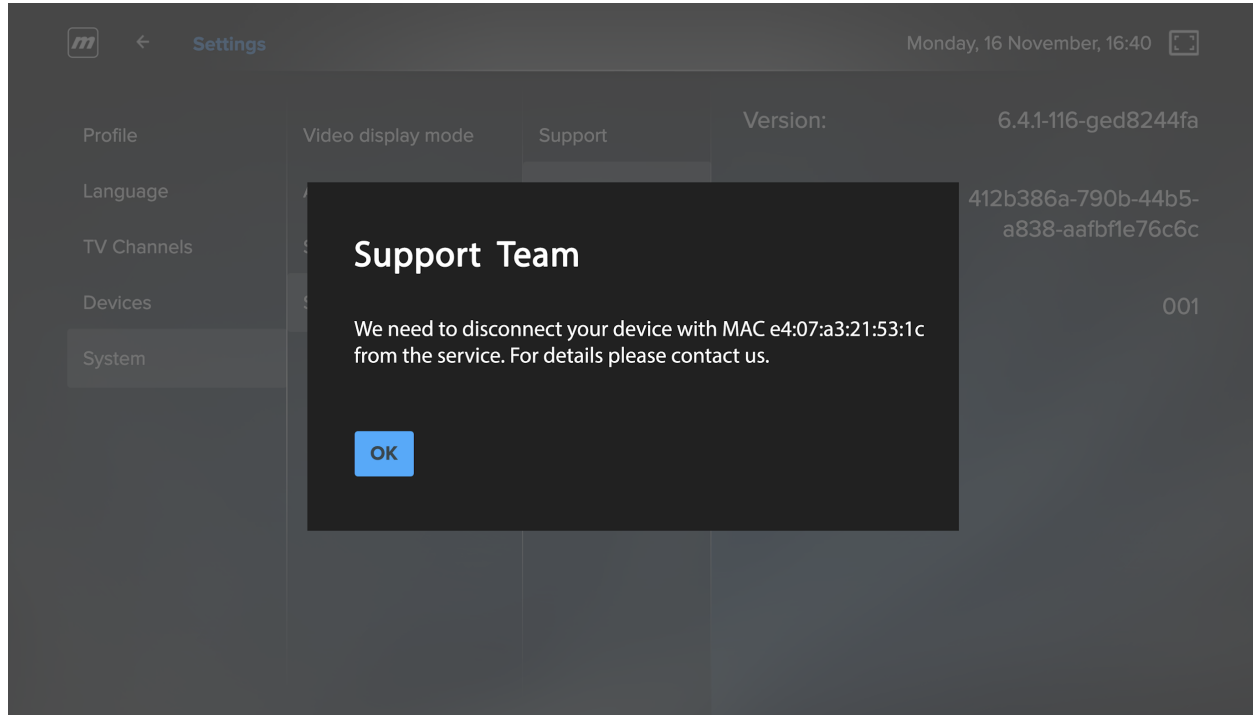
Content search





*Thorough search the entire content database
(TV programs, movies, series, etc.)*

Messages



Simple message with client device MAC in text

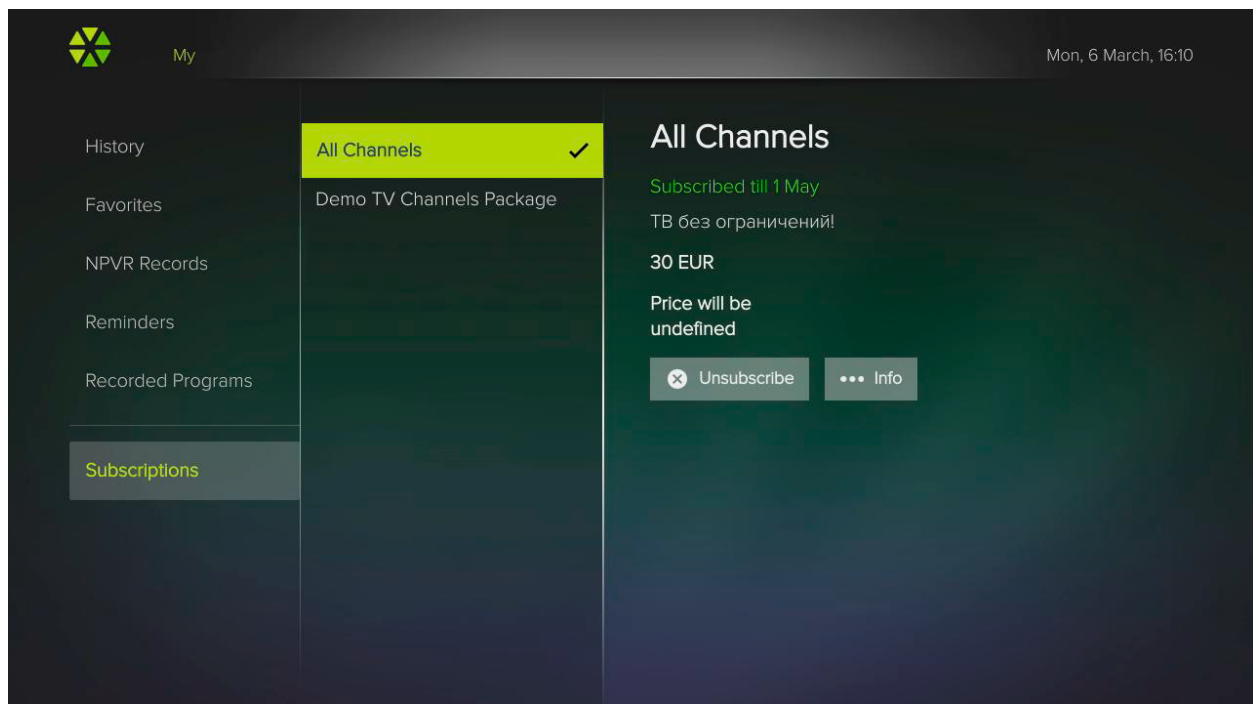
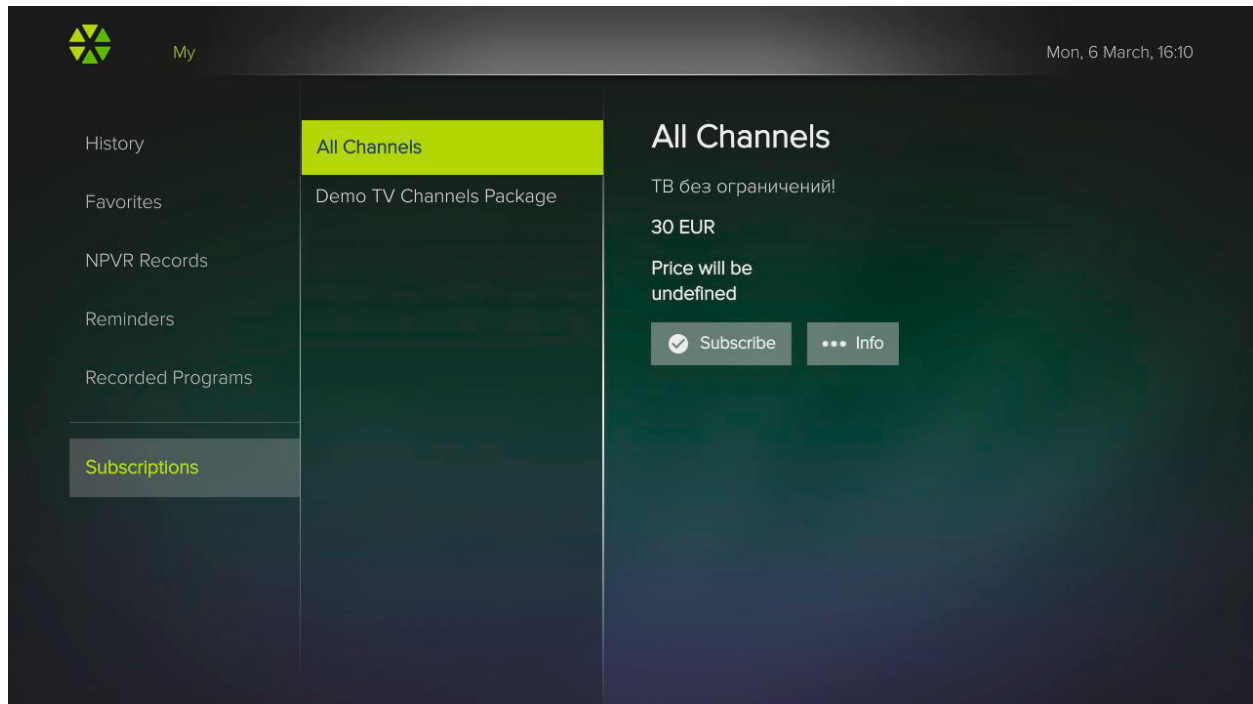


Watermark message with client device MAC displaying



Service management

Subscriptions (TV bundles, SVoD)



Service management menu




Profile settings







User settings

Edit profile

Nickname:

IROBO 

Select profile picture:



Define PIN-code:

•

•

•

•

Repeat

•

•

•

•

Disallow

Allow with PIN

Allow ✓

Select access level:

0+ ✓

3+


6+

12+

14+

16+

18+



Save current access level:

Yes ✓

No

Select max access level:

0+

3+


6+

12+

14+

16+

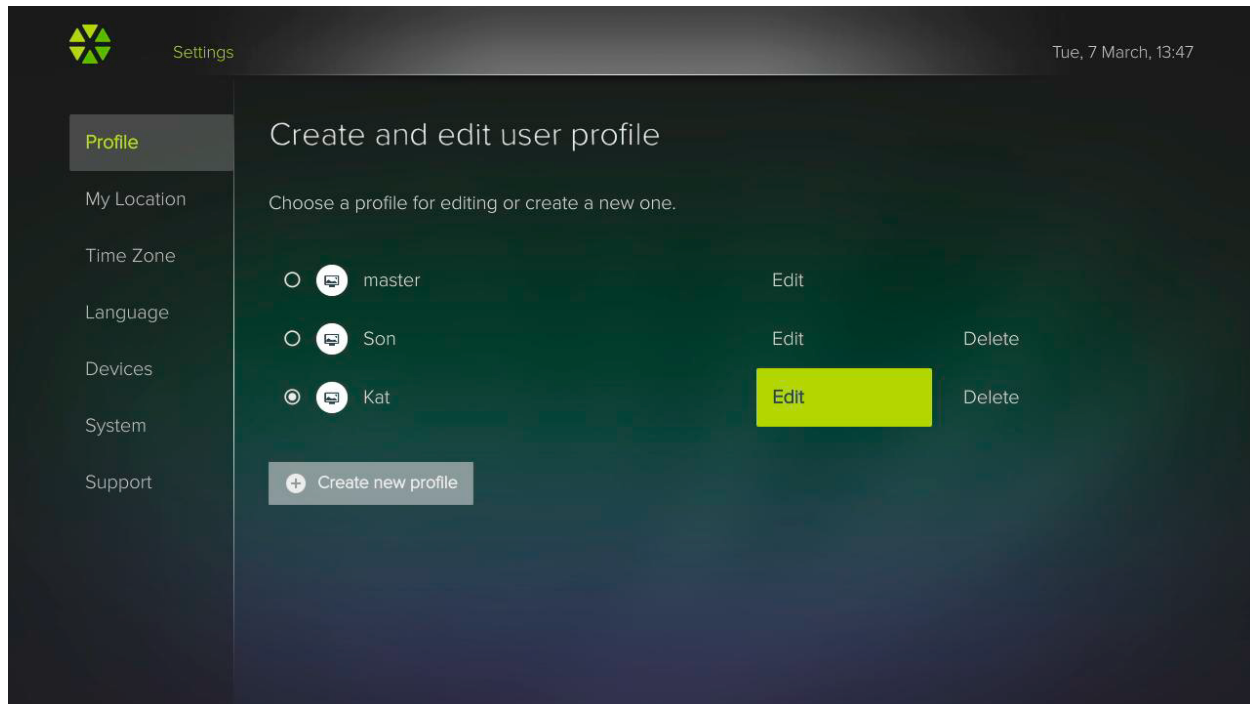
18+ ✓



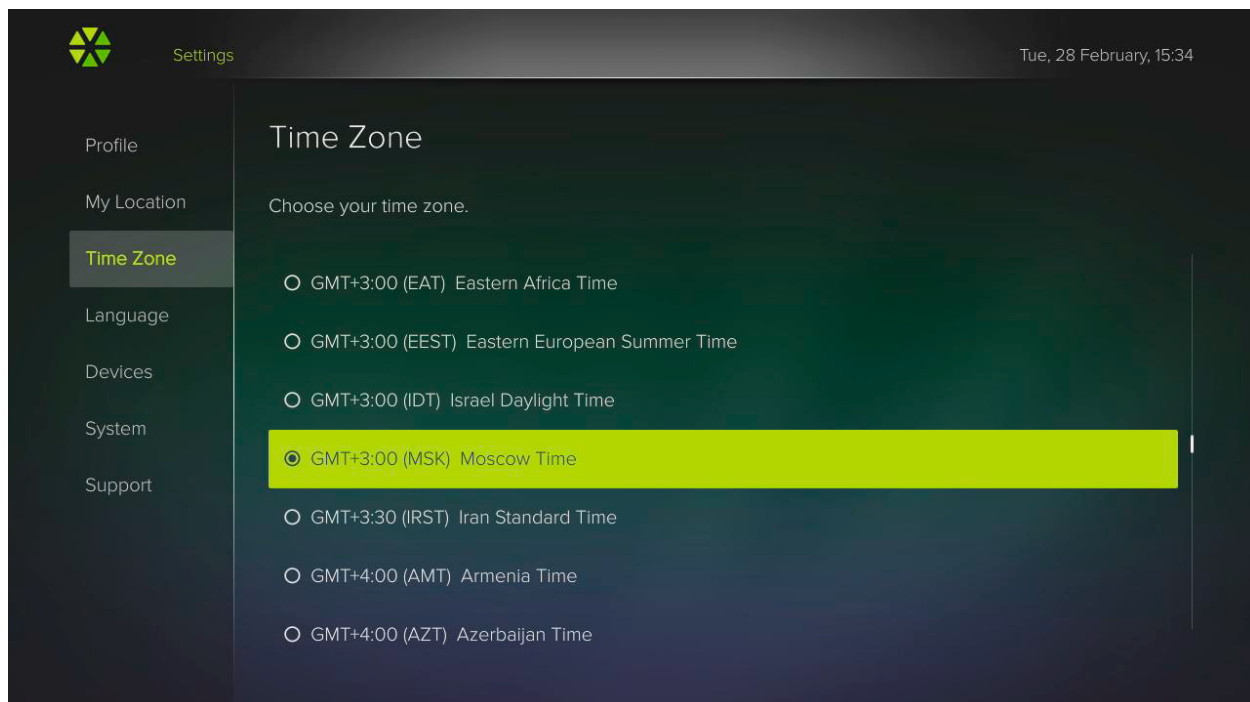
* Content with a higher access level will be unavailable

Apply

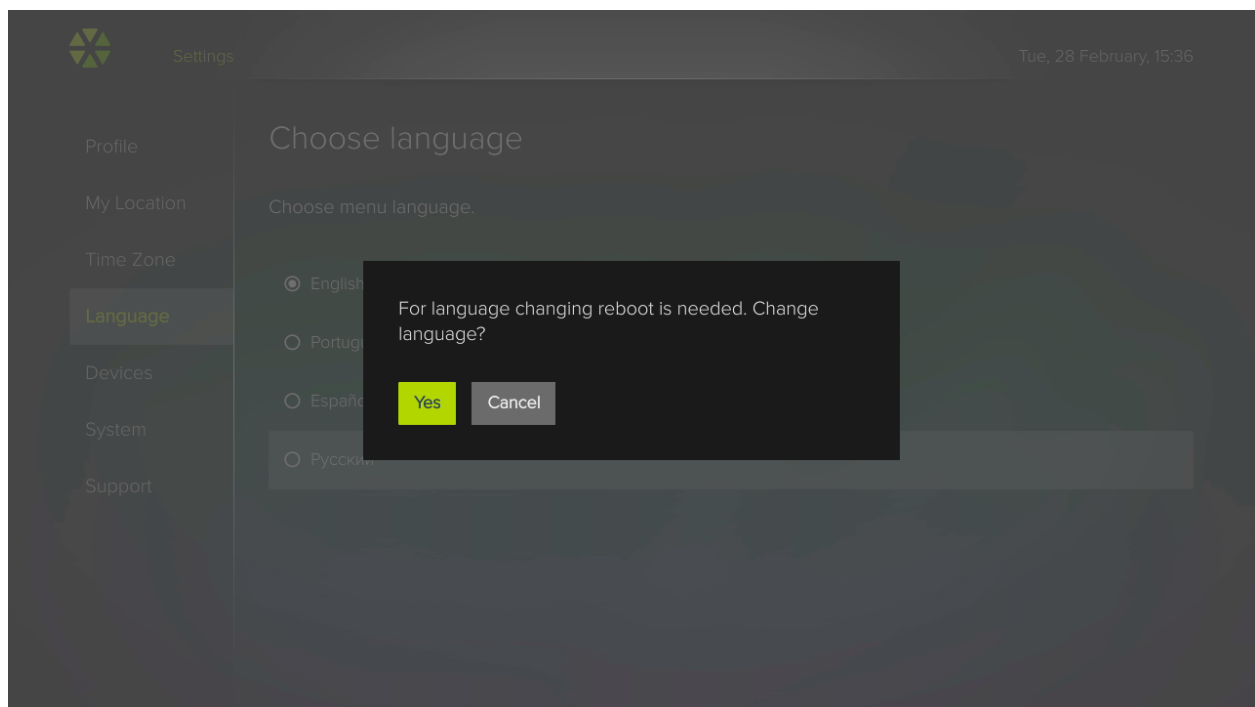
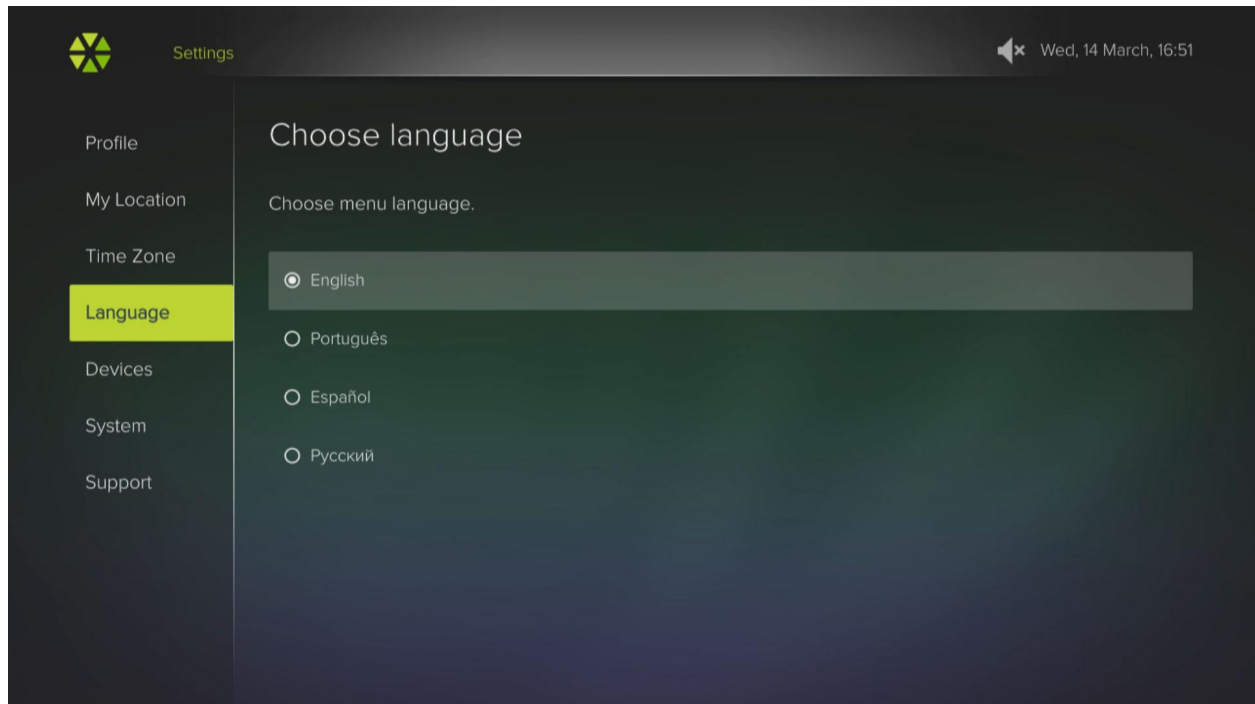
User profile creation



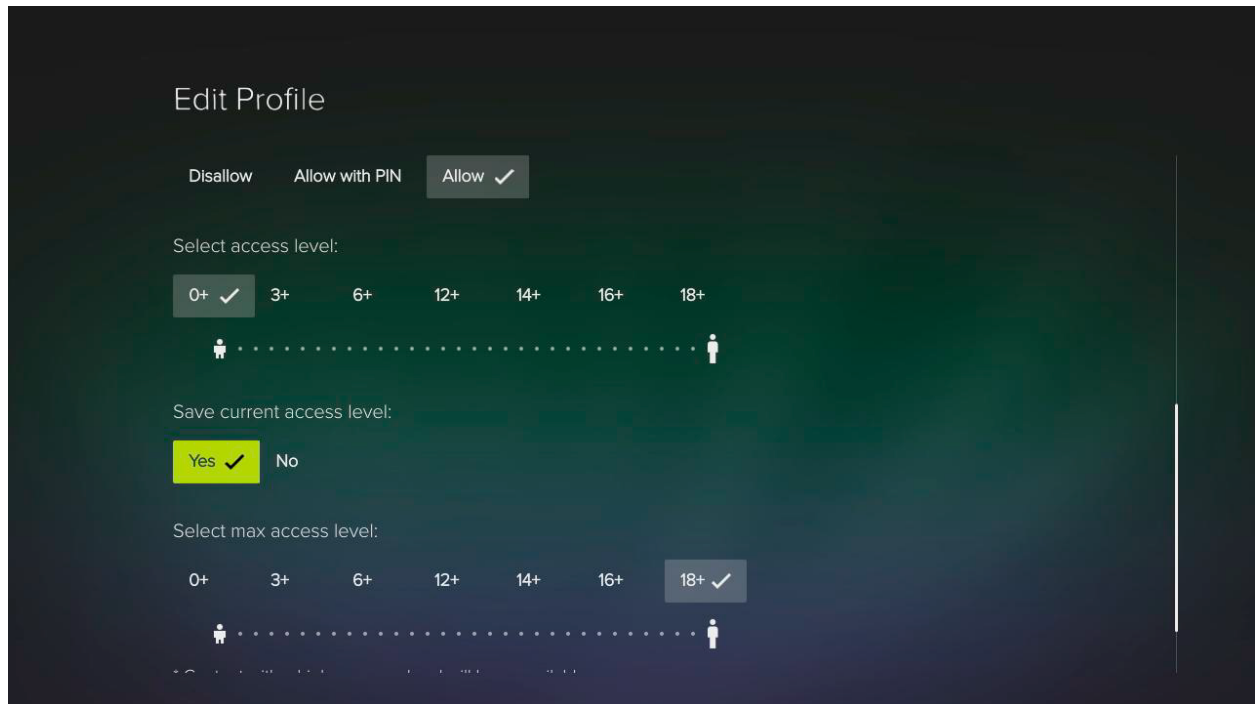
User profiles editing and deleting



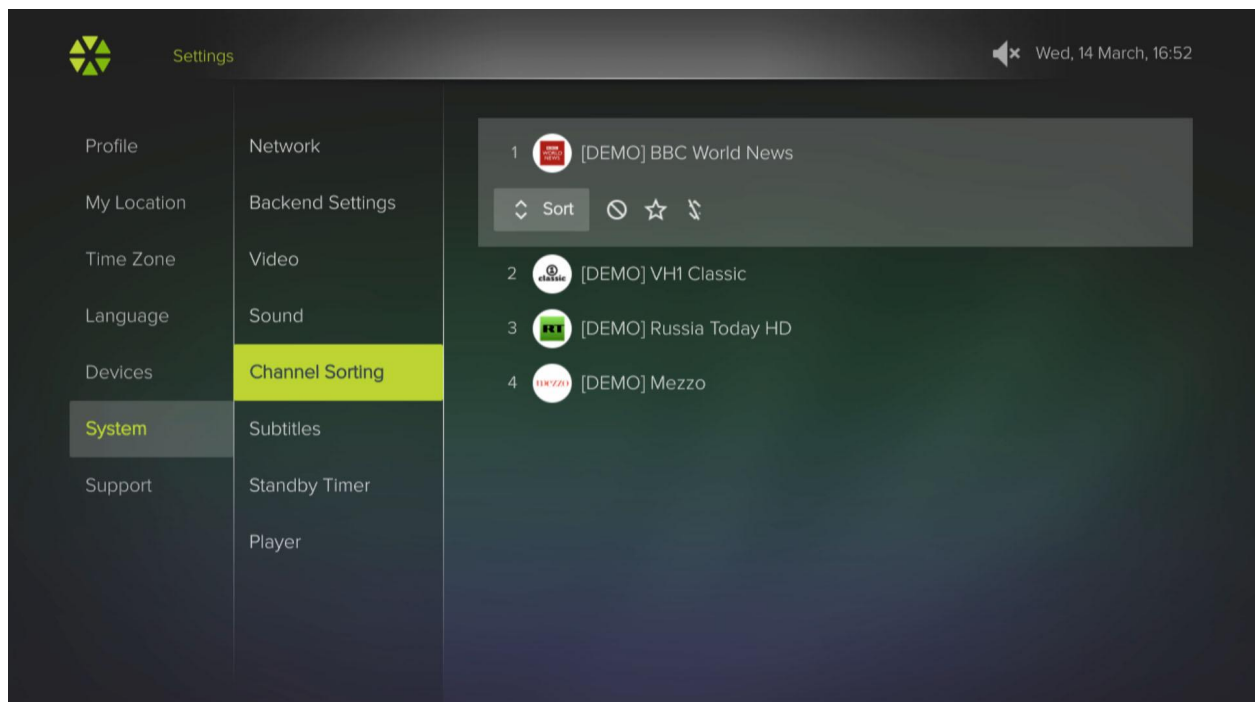
Time-zone correction



User interface language change



Parental control (access levels)



Personal TV programs sorting



Edit Profile

Or type your name here:

Define PIN-code:

Repeat

Require PIN code:


☒ Yes ☐ No

Allow to subscribe:

☐ Disallow ☐ Allow with PIN ☒ Allow

Content purchase restrictions

System settings

 Settings Fri, 10 March, 15:36

Profile

My Location

Time Zone

Language

Devices

System

Support

Support

About

Information

Version: 5.13.1069

Account number: 237165476

Uptime: 3 days 22 hours 58 minutes 39 seconds

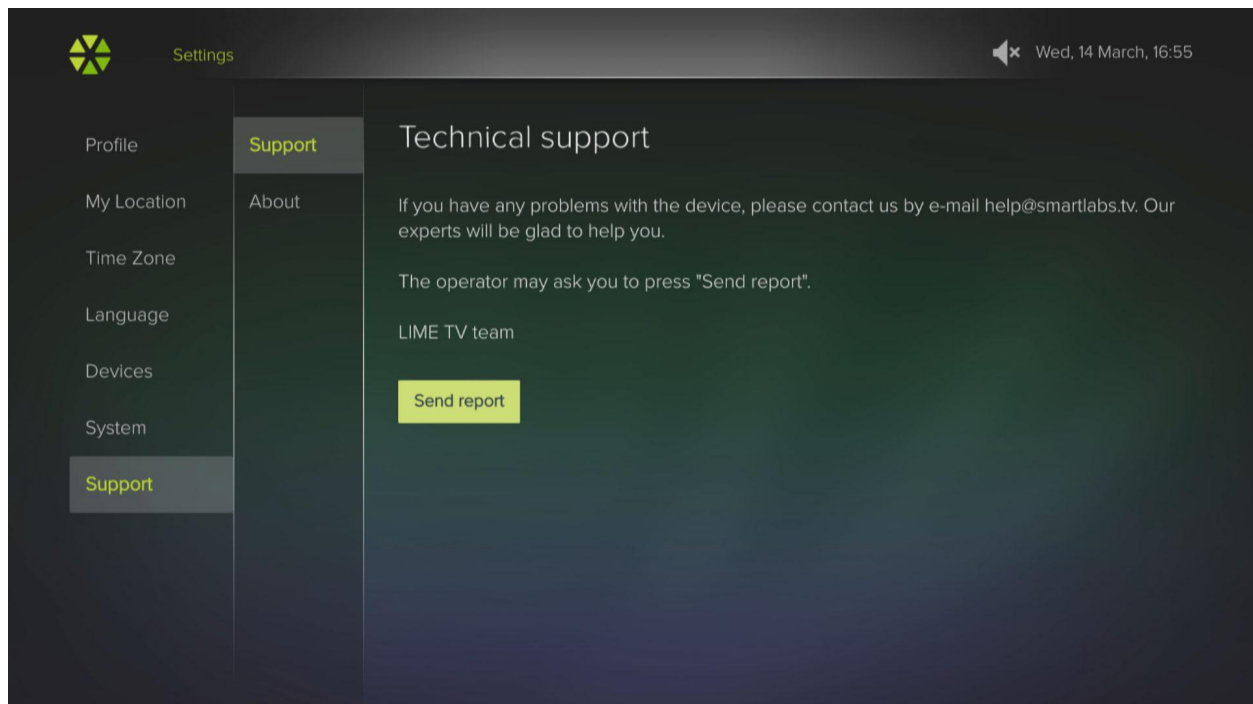
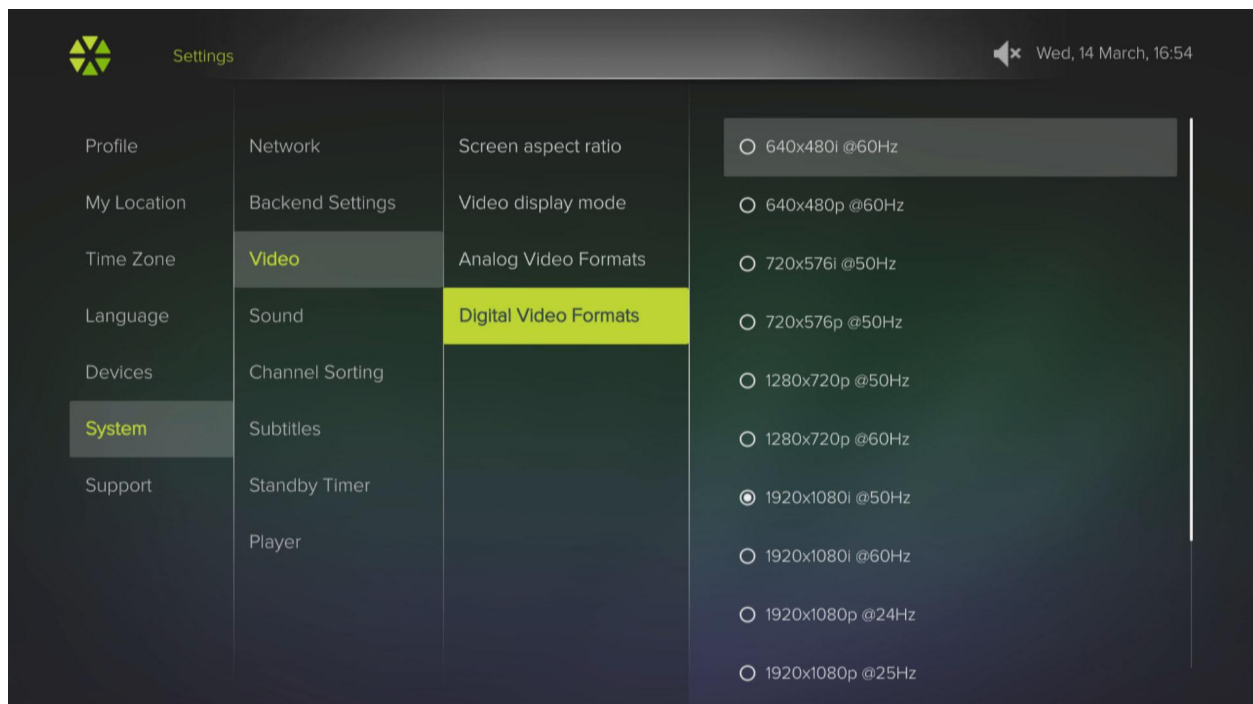
MAC address: e4:27:71:15:bd:e2

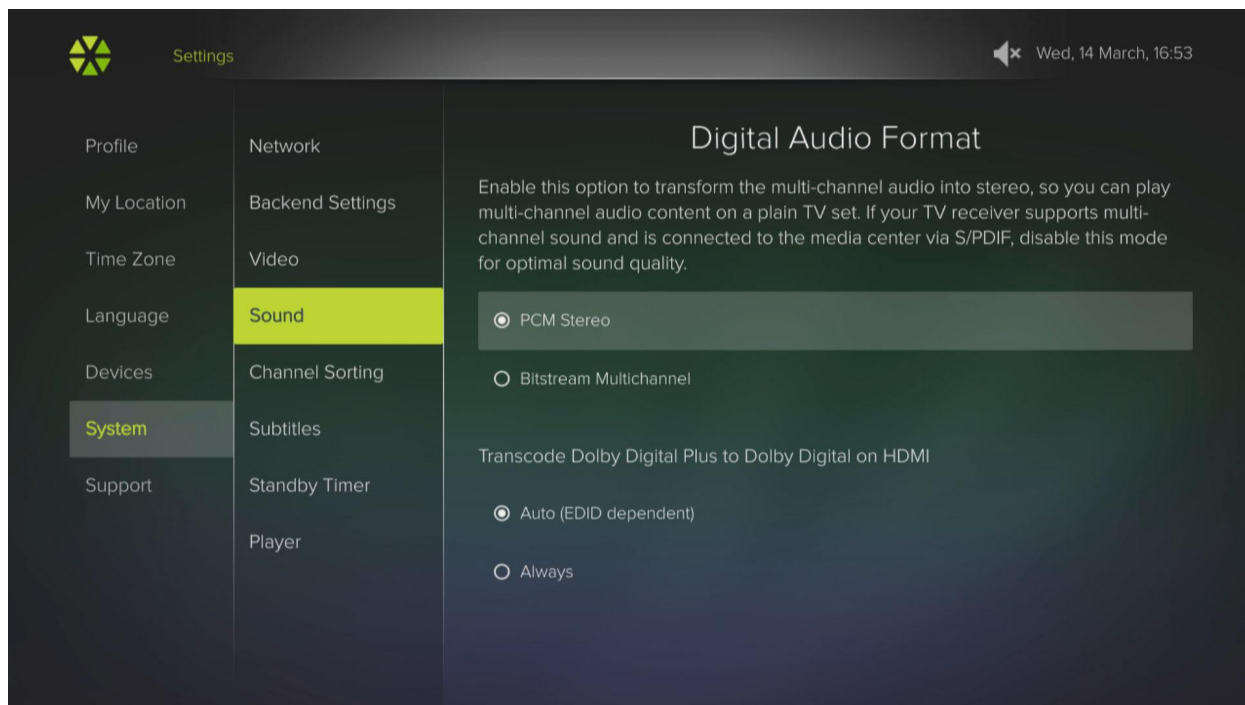
Check updates

Reset to factory settings

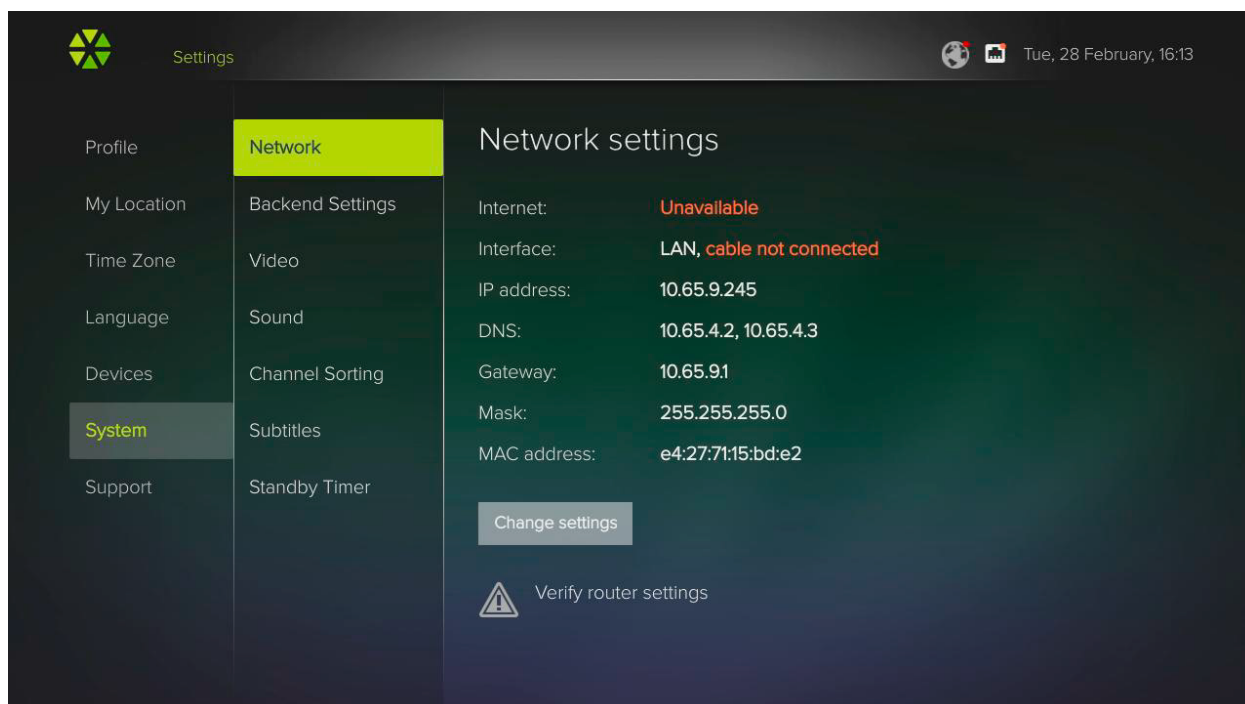
Reset to STB factory settings

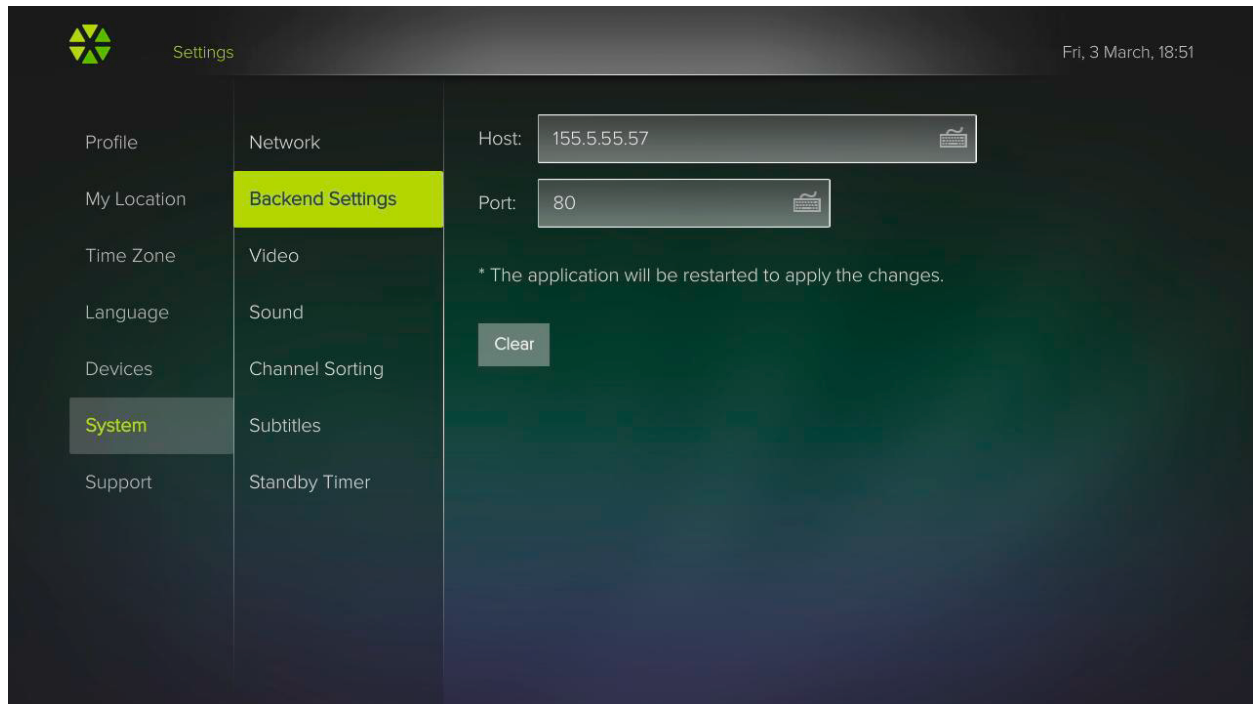
STB firmware update

*Help and support**Video output resolution settings*



Audio output format settings

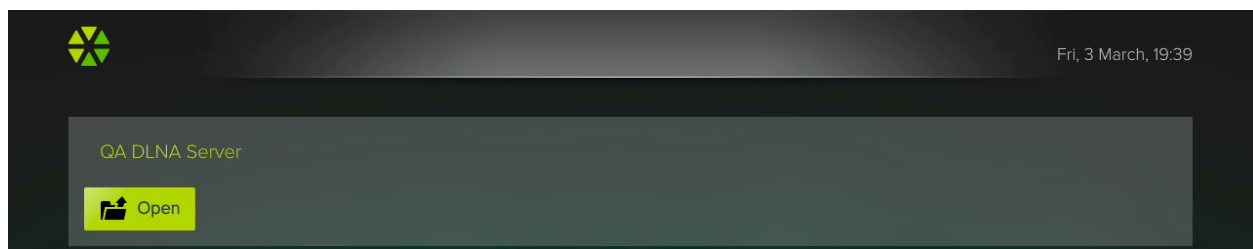
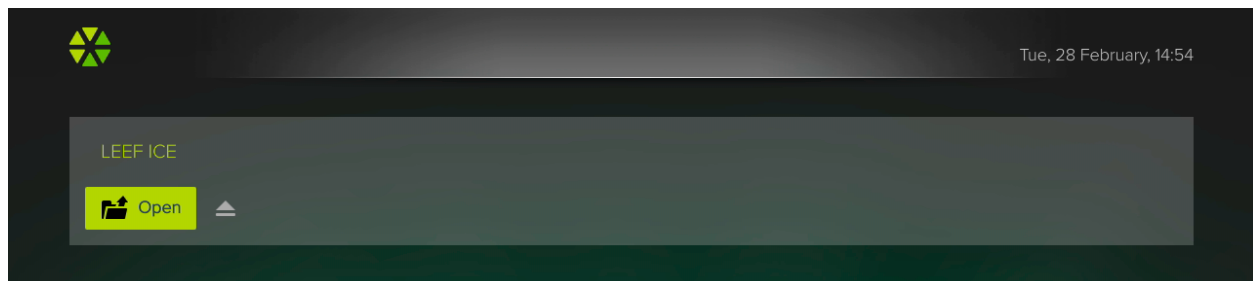


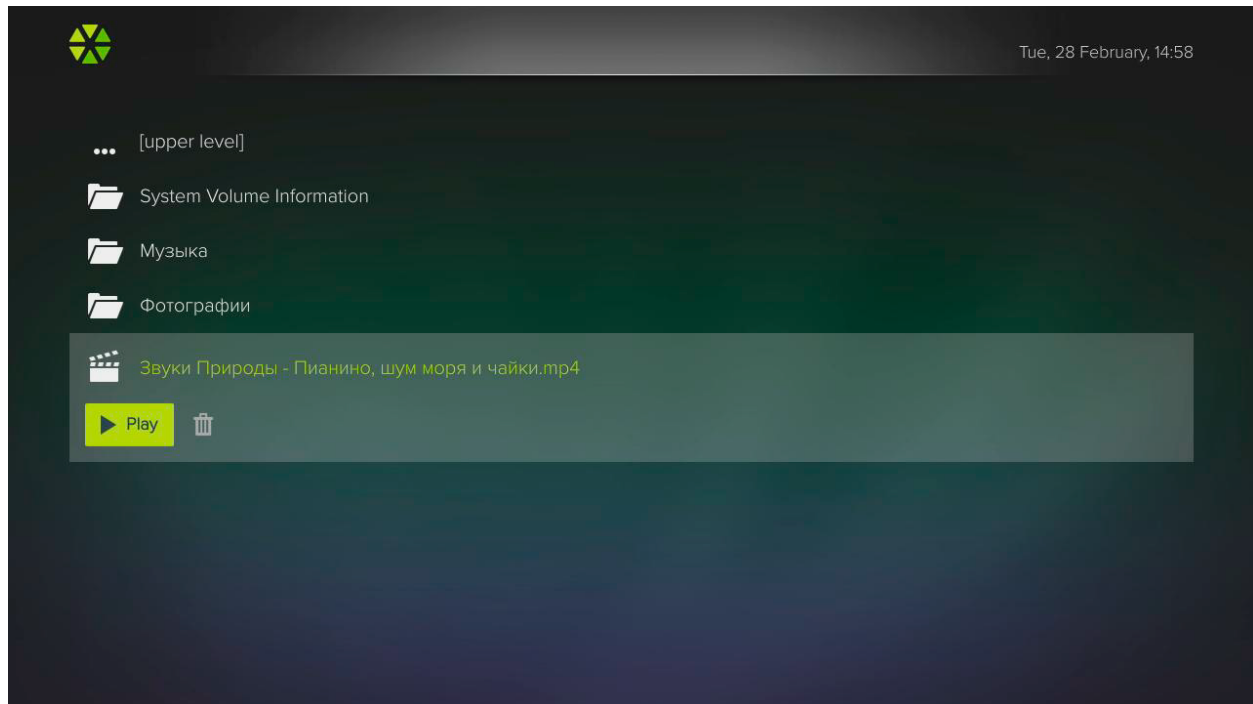


Network settings

Local content playback

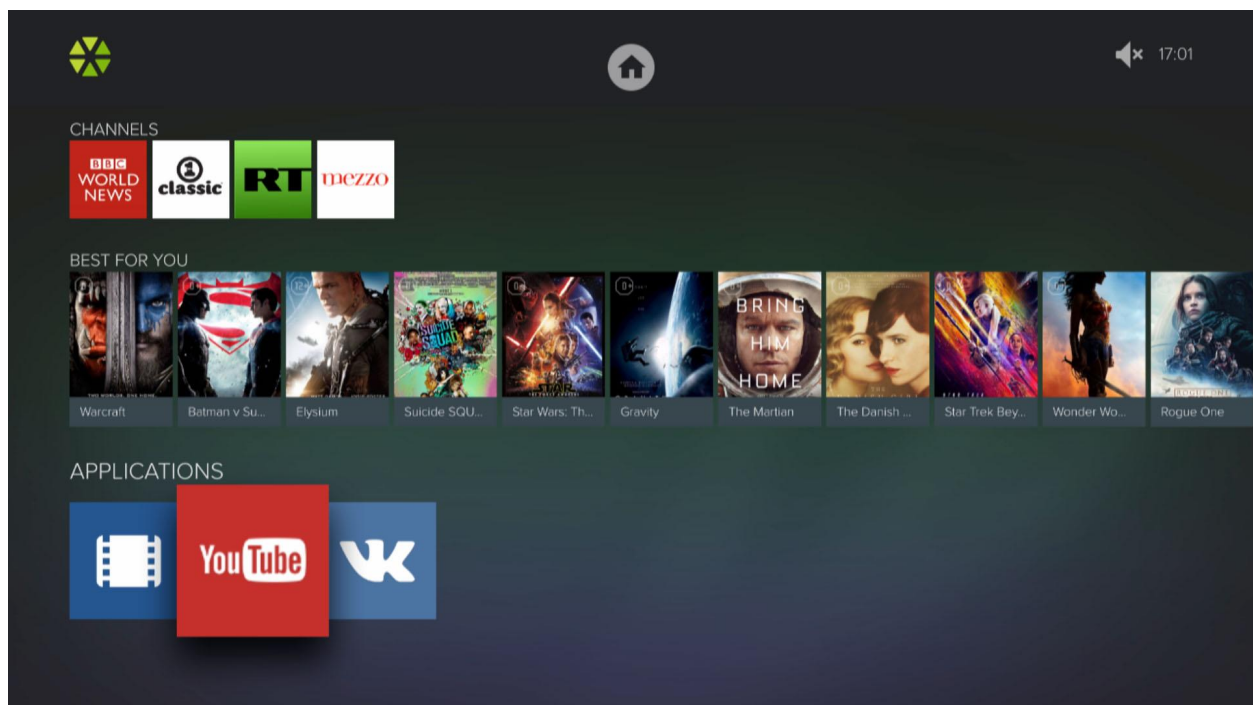
USB or DLNA



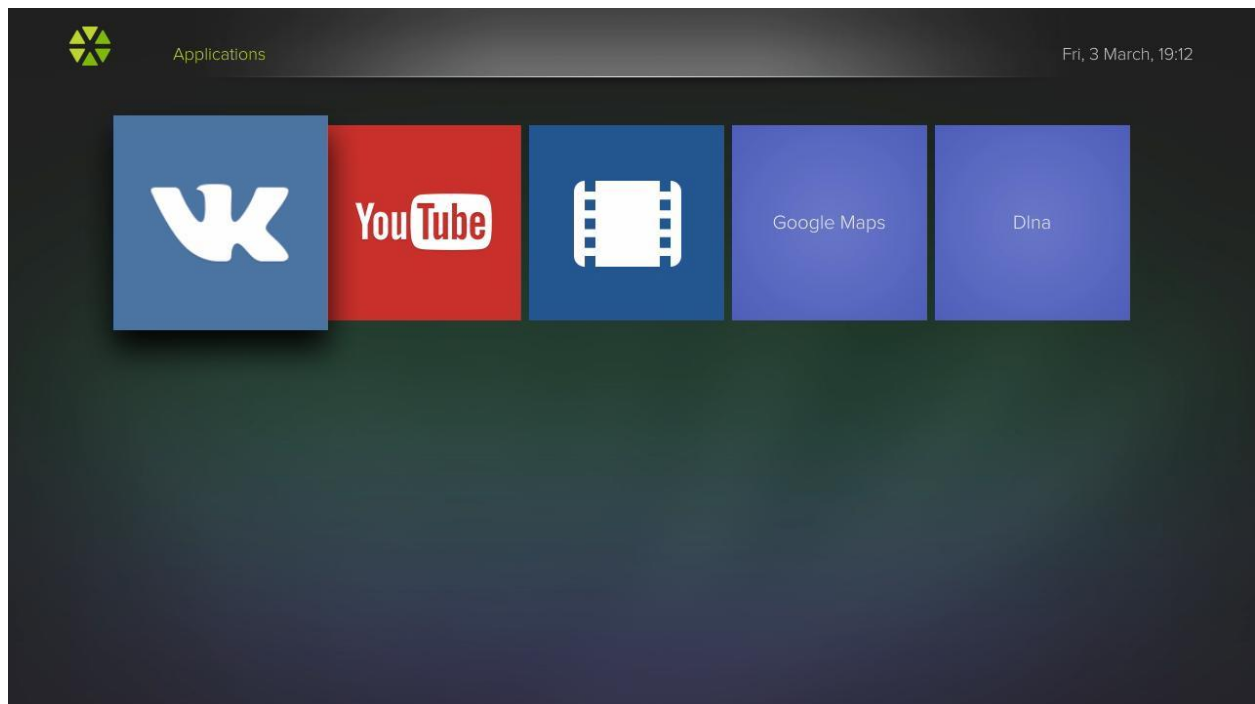


Additional services

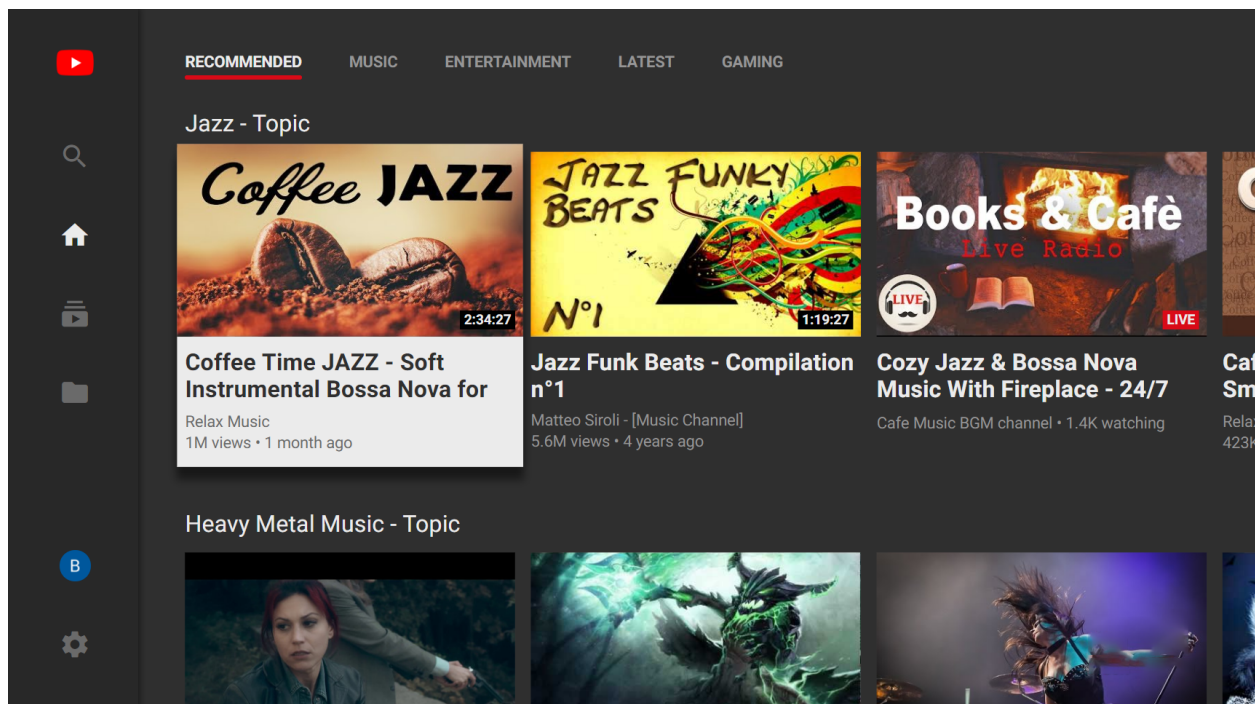
Applications



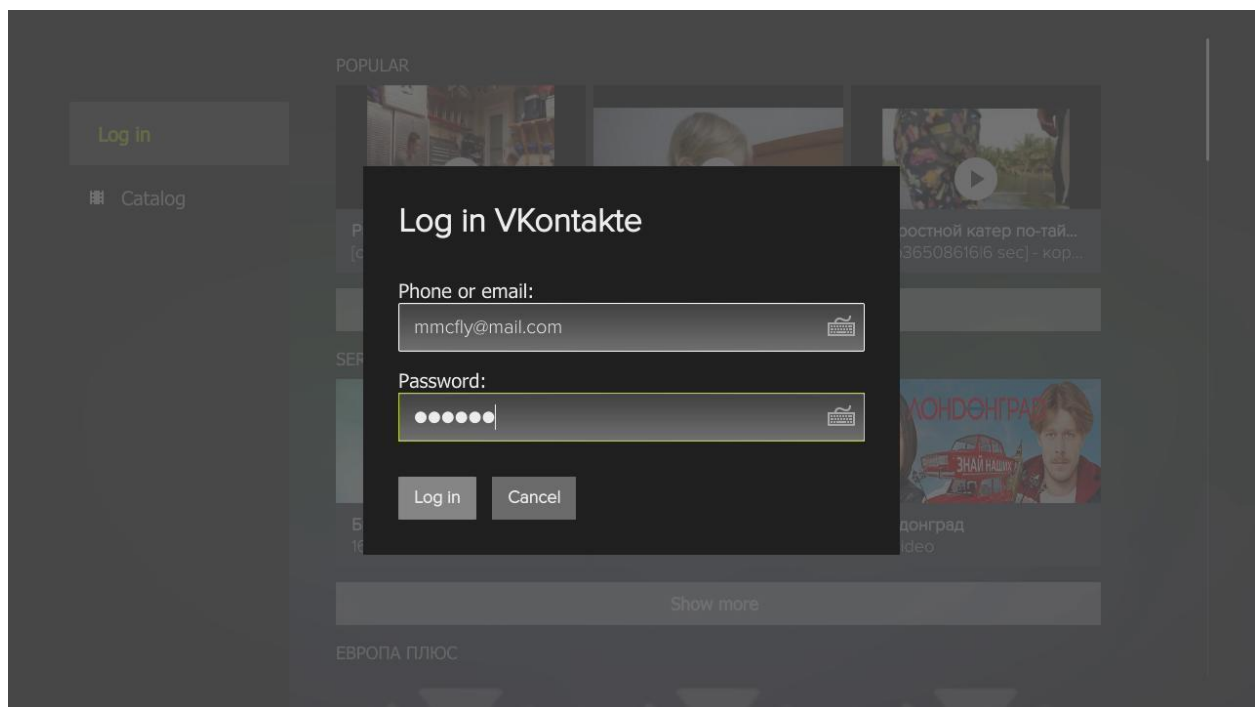
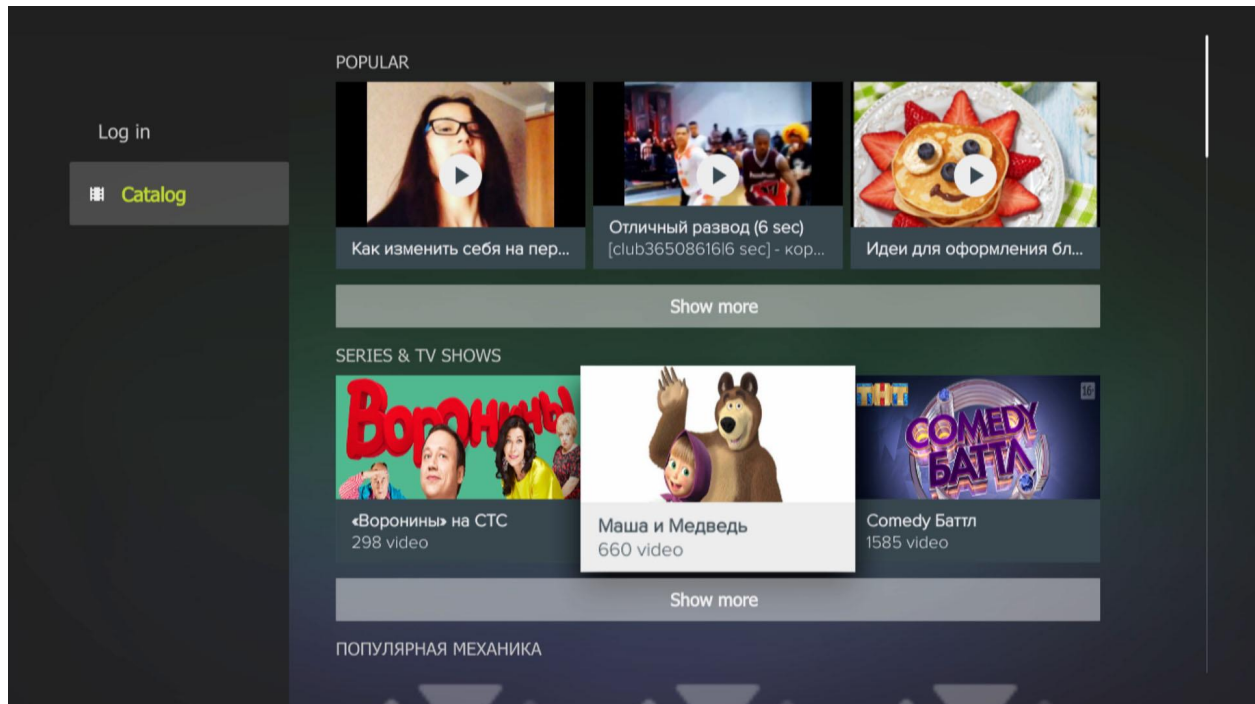
Applications stripe on the home screen

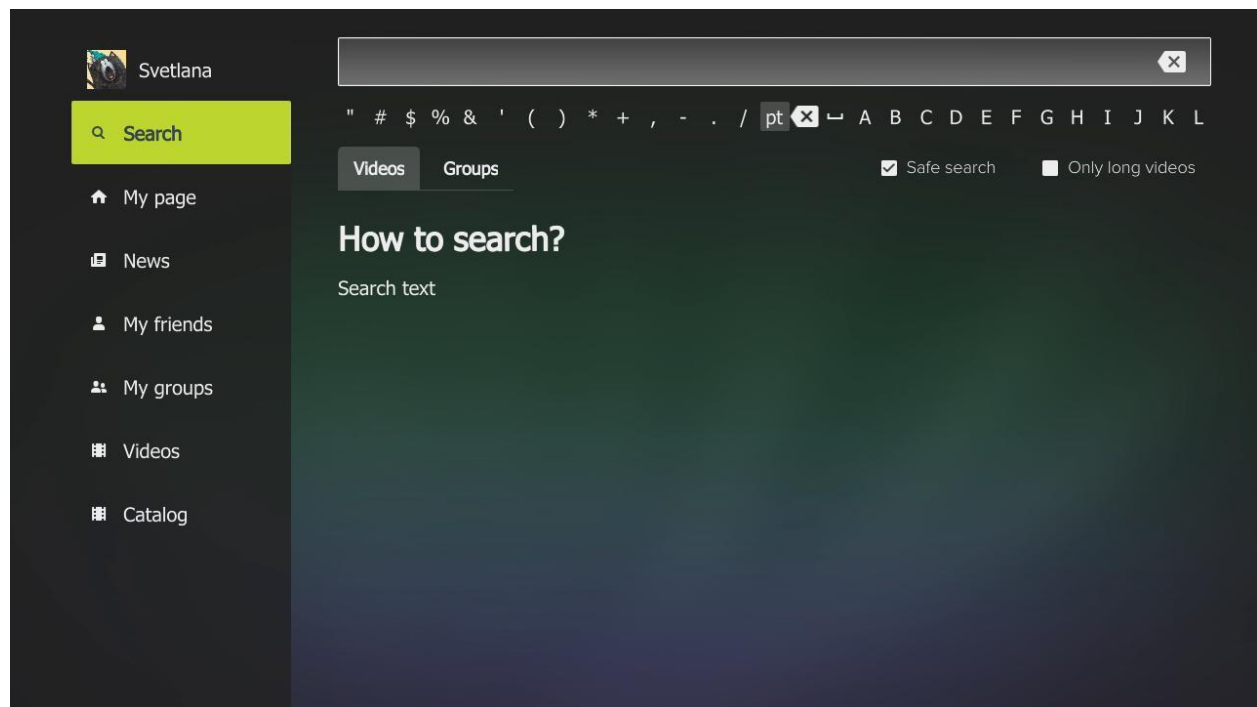


Application mosaic panel in the “Applications” menu



YouTube TV app



*VK app*