Smartlabs

SmartTUBE
Service Delivery Platform and Apps

Functionality Overview

Contents

1. Introduction

SmartTUBE is a complex solution that enables operators to deliver both OTT and IPTV services to subscribers. Its primary objective is to offer a range of subscriber-level services, including:

- Live TV, Catch-up, nPVR and other related services
- VoD content watching and purchase directly in the app
- High quality content playback on end-user devices of various types
- Access services and watch content on multiple devices at the same time
- Fast and convenient search for TV channels, programs and VoD content

The **SmartTUBE** comprises the **SmartTUBE Service Delivery Platform (SDP)** and **SmartTUBE Applications** tailored for different end-user devices such as STB, mobile, tablet, Smart TV, media players, and PC.

SmartTUBE SDP is the core component of the SmartTUBE, responsible for managing services, users, content, pricing, metadata, end-user device provisioning, and dynamic ad insertion. It provides seamless interaction with billing systems, payment gateways, and third-party information systems installed on the operator's side. All features and capabilities of the SmartTUBE SDP can be managed through a single web-based **SmartTUBE Admin Console**.
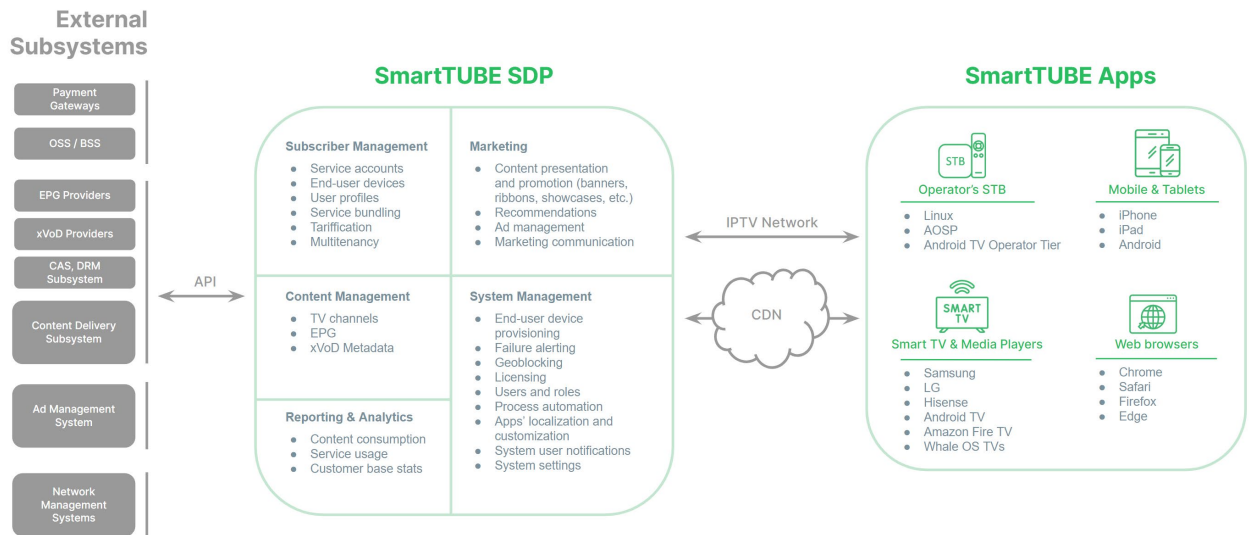
SmartTUBE architecture

The SmartTUBE SDP architecture integrates 5 functional modules:

- Subscriber Management: Enables operators to oversee service accounts, end-user devices, profiles, service bundling, tariff plans, and multiple tenant configurations. A comprehensive and time-tested API provides seamless integration and interaction with OSS/BSS systems and payment gateways. Learn more...

- Content Management: Offers comprehensive support for both TV-related services and xVoD services:

    o Enables operator to manage TV services, including control over channel streaming and encryption settings, channel bundling and regional availability, EPG import from external providers, support for nPVR and Catch-up service assurance subsystems, and other functionalities. Learn more...

    o SmartTUBE SDP supports all models of Video on Demand (VoD) content, enabling operators to manage the movie and series library from both local operator's sources and external content providers. The SmartTUBE SDP empowers operators to oversee content metadata, regional accessibility, pricing policies, and other key features of the VoD service. Learn more...

- Marketing: Offers operators various tools and opportunities to promote content and services to subscribers, such as banners, custom content rails, automatic content recommendations, marketing notifications, and dynamic ad insertion management with an option to integrate with external ad management system. Learn more...

- Reporting & Analytics: Provides operator with current statistics on content consumption, subscriber demand for specific services, and customer base analytics, enabling timely business decisions. Learn more...

- System Management: Ensures the operation of the platform as a whole, allowing operators to manage system settings, automate system processes, control access for platform users, alert for failures, provision end-user devices, localize and customize the SmartTUBE Apps, and more...

SmartTUBE Apps are a range of user-friendly and highly customizable applications compliant with the most current streaming industry standards. Tailored for popular device platforms, these applications seamlessly integrate established user interaction patterns to offer a superior viewing and application experience. Users have access to a diverse content selection, including live TV, video-on-demand, catch-up TV, nPVR, and shared TV recordings, all enriched with advanced features of cutting-edge streaming applications. Learn more...
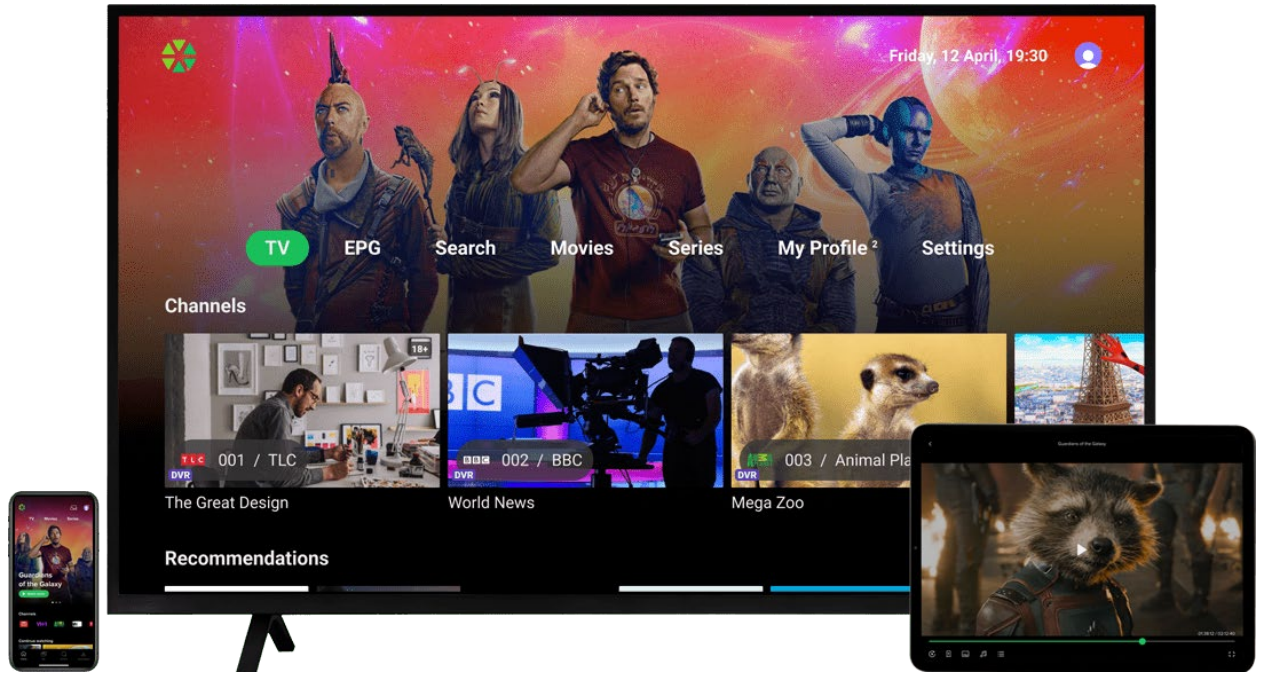
SmartTUBE Applications

2. Subscriber Management

Subscriber Management Entities

SmartTUBE SDP offers the Sales Department of an operator with all the capabilities for managing customer base. Its efficiency and simplicity lies in the management of the following entities:

- Service Account

- Device

- User Profile

- Service Bundle

- Pricing Plan

- Price List

- Discount

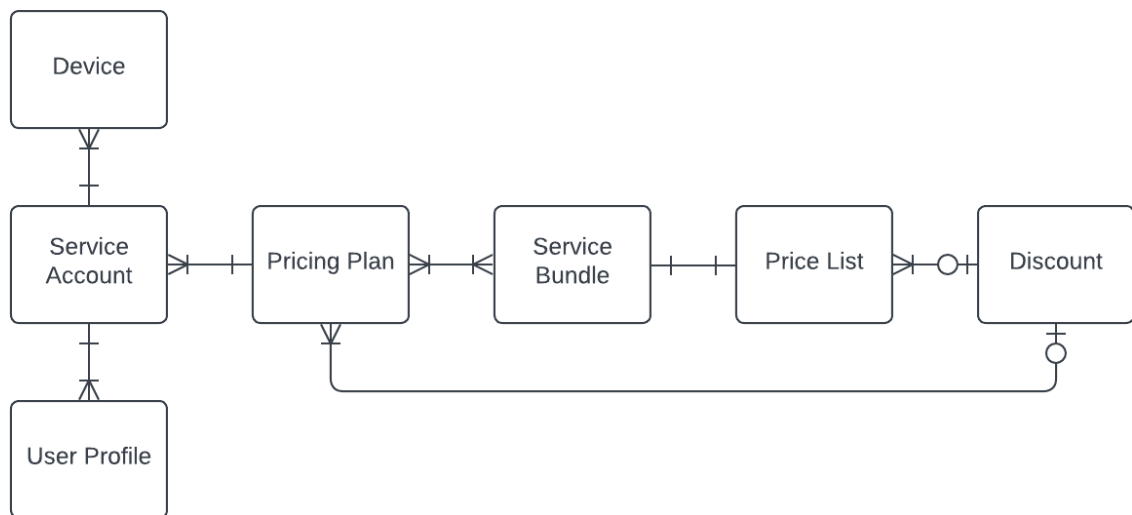The diagram below demonstrates the relationship of these entities:

Diagram 1. Relationship of SmartTUBE SDP subscriber management entities

Service Account

Service Account contains information about a subscriber and uniquely identifies it on the platform. It is characterized by a unique identifier, status (active, blocked, etc.), and login/password common for all subscriber's devices (used for device authenticating).

The following operations can be performed on Service Accounts:

- Multiple **Devices** can be linked to a Service Account for using them in parallel by a subscriber.
- The set of services available to the subscriber is determined by the **Pricing plan** assigned to the Service Account. Only one Pricing Plan can be assigned to a Service Account.
- Multiple **User Profiles** containing personalized content consumption restrictions and settings can be assigned to the Service Account.
- Operator can specify the trial period for the account and manage its duration, along with setting the account status after the trial period expires.
- Management and synchronization of the linked SmartTUBE SDP and OSS/BSS accounts are performed via SmartTUBE API. Subscriber's personal data is stored on the OSS/BSS side only.

Device

Device uniquely identifies subscriber's device on the platform. Each Device can only be linked to a single **Service Account** and characterizes by

- Unique identifier (UID)
- Device Type: Determines the device functionality when interacting with the platform. For example, use different TV streams on devices of different type, use different banners or channel logos, etc.
- Individual login/password used for authenticating device on the platform.

Operator can perform the following actions with Devices:

- Limit the number of Devices that can be linked to the same Service Account (with differentiation by device type) and/or simultaneously consuming services. Subscribers can exceed the set limits by purchasing a corresponding Service Bundle.

- Link Devices to a specific region, allowing for the management of regional streaming.

- Enable/disable DVB-T input, unprotected analog outputs, and HDCP protection of HDMI outputs on STBs that support this functionality.

- Factory reset and reboot on STBs

- Create an SSH tunnel to Devices (if it is technically possible)

- Manage firmware and installed apps on Linux and Android-based STBs, as well as configuration parameters on all types of IPTV/OTT devices including mobile and Smart TV platforms. These actions are performed with **SmartTUBE Device Manager**.

User Profile

User Profile contains individual age restrictions for viewing/purchasing content and TV channel sorting settings. Each User Profile also stores individual viewing history, lists of favorite channels, movies, reminders, recordings, and purchased movies. Multiple User Profiles can be linked to the Service Account, meaning they can be shared across all Devices linked to the Service Account.

Profiles have the following set of parameters:

- Nickname

- Collection of Profile Icons to choose from

- PIN code: Used to secure the profile from unauthorized access and editing, and to prevent unauthorized purchases of content and subscriptions to services.

- **Default Access Level:** The highest age rating of content that a user can view without entering a PIN. Content with a higher age rating is considered adult content.

- **Maximum access level:** The highest age rating of content to be displayed in the TV channel list and VoD library. Content rated above this level is hidden from the app's UI.

Pricing Plan

Pricing Plan is a collection of multiple **Service Bundles** and **Discounts** that enable operator to manage the service provisioning rules for subscribers. For this purpose, the Pricing Plan is assigned to the subscribers' **Service Accounts**. Only one Pricing Plan can be assigned to the same Service Account. Each Pricing Plan can be shared across multiple Service Accounts.

Pricing Plan allows to control the following provisioning conditions of each Service Bundle and Discount:

- Validity period of the bundle/discount within the Pricing Plan

- Type of devices to which the bundle/discount to be applied

- Bundle/discount status at the time the Pricing Plan is applied. Can be Active, Not active or Invisible (the bundle/discount is disabled and hidden for subscribers).

- Duration following the Pricing Plan activation, after which the bundle/discount becomes inactive.

The Pricing Plan also enables to conduct the following operations on Service Bundles and Discounts:

- Allow subscribers to enable/disable the bundle/discount in the app

- Hide the bundle/discount from subscribers within the app. This way, the bundle/discount can only be activated by the operator or through subscription to other dependent bundles/discounts.

- Hide the bundle/discount after unsubscribing and set the corresponding Service Account state accordingly

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Service Bundle

Service Bundle is a collection of content or services offered to subscribers for a fee or at no cost. For the Service Bundle to be available to subscribers, it must be included into the **Pricing Plan**. Multiple Service Bundles can be included into multiple Pricing Plans.

The cost of a Service Bundle for a subscriber is determined by the **Price Lists**.

SmartTUBE supports the following types of Service Bundles:

- **TV Channel Bundle:** A collection of channels provided to subscribers within the bundle.

- **DVR Bundle:** A set of TV channel with Catch-up services enabled. It offers control over archive storage depth, as well as the provision of TSTV and/or Pause Live services for each channel individually.

- **VoD Bundle:** Outlines the pricing model (TVoD, SVoD, AVoD, FVoD) for the movies/series within the bundle, their linkage to the operator's local movie/series library or external content providers, offline movie viewing capabilities, and connection to a VAST server for AVoD content.

- **nPVR Bundle:** A collection of channels eligible for nPVR services. It allows to manage the following bundle attributes:

  - *Recording Time Quota:* Maximum duration of all subscriber recordings.

  - *Recording Storage Quota:* Storage duration of subscriber recordings.

  - *Notification Quota Level:* Threshold at which the subscriber is notified about approaching to the Recording Time Quota.

  - *Quota Overspending Limit:* Maximum amount a user can go over their Recording Time Quota. If the quota is exceeded, the user must delete the extra recordings before scheduling more.

  - *Restriction to record the ongoing or finished TV programs*

o *nPVR Duration:* Period within which the recording of finished TV programs is allowed.

- PPV Bundle: Sets the pricing rules for pay-per-view TV programs. The operator can choose to charge a fixed price for the whole program or charge based on the minutes watched.

- Device / Session Limit as a Bundle: Allows subscribers to increase the number of devices linked to the Service Account and/or Devices simultaneously consuming services beyond the limit set by the operator.

Price List

Price List determines the cost and provision conditions of the **Service Bundle**. Price Lists can be of two provision types:

- One-time Purchase: Involves a single payment for the Service Bundle for a specific rental period (such as a day, month, year, or lifetime). Payment is handled by OSS/BSS through an integration API.

- Subscription: The Service Bundle is provided for a certain period of time and involves periodic payment. The subscription charges and payment frequency are handled by OSS/BSS through an integration API.

Multiple Price Lists of the same provision type but with different prices and non-overlapping validity periods can be assigned to the same Service Bundle. That is, at any given time, a Service Bundle can have only one active Price List of a certain provision type.

For the TVoD content, it is also possible to set different prices and rental periods for each type of movie assets (e.g. SD and HD). Additionally, the asset price may vary depending on the Service Bundle or content provider.

Discounts

Price List can be optionally adjusted with **Discount** of the following types:

- Overriding discount: Overwrites the cost of the Price List with its own.
- Percentage discount: Specifies the percentage of discount applied to the cost of Price List.

The Discount is applied to the **Pricing Plan**. Thus it overlaps all Price Lists of all **Service Bundles** included in the Pricing Plan.

The provision conditions of Discount (validity period, device type dependence, etc.) are managed by the Pricing Plan.

The Price List and Pricing Plan can only have one active Discount at any given time, but one Discount can be applied to multiple Price Lists and Pricing Plans.

Subscriber Registration and Sign-In Options

SmartTUBE SDP offers various options for registering and signing in subscribers on the platform:

- *Sign-in by Login and Password:* These credentials can be set for the entire Service Account or a specific Device.
- *Passwordless Sign-in:* Operators can register devices on the platform without requiring login credentials if they manage the customer's home network and know their IP address.
- *Trial Sign-in:* Operators can set a trial period for subscribers and specify what types of devices they can use during this period.

Multiple Tenancy Configurations

Multitenancy allows the creation of several virtual operators sharing a single SmartTUBE SDP platform. For example, one global IPTV/OTT operator may have several regional divisions. The audience of these divisions may differ geographically, culturally, socially, etc. So may the content.

The multitenant configuration allows the following resources and features to be individualized for each tenant:

- Service Accounts and Devices
- Service Bundles and pricing rules
- Access rights to SmartTUBE Admin Console for tenant employees
- Statistical reports
- Apps' UI customization
- Subscriber notifications
- Licensing calculations

At the same time, each tenant may utilize shared content (TV channels, EPG, VOD library) and metadata sets.

Platform administrators have full access to all platform resources.

3. Content Management

SmartTUBE SDP provides a suite of tools designed for Content Management Departments to control TV-related content and VoD movie/series library. The platform also supports the import and management of multilingual Electronic Program Guide (EPG) and VoD-related metadata.

TV-related Content

SmartTUBE SDP capabilities enable operators to manage TV content distributed over IPTV, OTT, and DVB-T/T2/C networks and provided with the following TV services:

- Live TV: Real-time television streaming.
- Catch-up: Services allowing subscribers to watch TV programs for a period after they have aired. Recording of the source streams is done on the operator's equipment using hardware or software (e.g. SmartMEDIA Content Delivery Subsystem). Services include:
  - Pause Live (Restart TV): Allows to pause, rewind, and fast-forward within the ongoing TV program.
  - Start Over: Allows to start watching the ongoing TV program from the beginning.
  - Time Shift (TSTV): Allows to play, pause, rewind, and fast-forward completed TV programs within a time frame determined by the operator.
  - Catch-up Content Library : Enables access to selected TV programs recorded by operator and provided to subscribers via content rails on the SmartTUBE Apps' Home screen.
- nPVR: Cloud recording of completed, ongoing, and upcoming TV programs initiated by a subscriber.

Management of TV-related content

- Channel Management
  - Channel Metadata: Provides control over the channel title, description, number in the channel list, and topics. The channel can have a single logo for display on all device types or multiple logos optimized for each one.
  - Streaming Settings: Allow to configure channel streaming sources, URLs for multicast or unicast outgoing streams, URLs of DVR and nPVR servers, define encryption types for different device types, set regional restrictions or block the channel broadcast immediately.
  - Age Restrictions: Each channel is assigned an age access level, dictating its visibility in apps and user access with or without a PIN code. For more details, check User Profile.
  - Channel Sorting: Operator can control channel sorting in apps by combining sorting by channel number and fixed channel position.
- Program Management
  - Program Metadata: Provides control over original and custom program titles, serialized TV show attributes, release country and year, poster, age rating, genre, personalities, awards, and so on.
  - Automatic EPG Import: Supports *XMLTV*, a widely used standard for describing TV listings, and *SmartLabs EPG XML*, a simplified XML format developed by SmartLabs and detailing all EPG metadata processed by the SmartTUBE SDP.
  - Catch-up Options: Allows to manage the availability of the program for catch-up services and the duration of availability.
  - Blackout: Operator is able to block broadcasting of certain programs by replacing the video stream with a predetermined image.
  - Restriction for nPVR Recording for Certain Device Types
  - Additional Program Logo Overlay: Overlaying additional logo on top of the video stream of a specific TV program. Implemented in conjunction with the SmartMEDIA Content Delivery System.

- Closed Caption (CC) Management: Allows to manage the selection of CC tracks present in the original channel stream and available to subscribers.

Video on Demand (xVoD)

SmartTUBE SDP supports all models of the Video on Demand (VoD) content providing, allowing operators to manage the movie and series library from both local storage and external content providers:

- TVoD (Transactional Video on Demand): Allows a user to access a movie/series by making a one-time payment. After the purchase, the user has a limited time to watch the movie.

- SVoD (Subscription Video on Demand): Provides a user with long term access to a range of movies/series by subscribing either through a single payment or periodic charges.

- AVoD (Advertising Video on Demand): Offers a user free content access supported by ads that are displayed before (pre-roll), after (post-roll), or during (mid-roll) video playback.

Management of xVoD Library

- Content Metadata: Operator can manage a wide range of content metadata including original and custom titles, release country and year, posters and screenshots, distribution period, age rating, genre, personalities, awards, and so on.

- Content Assets: Enables operator to manage assets for movies, series episodes and their trailers. Each movie and episode can have several asset versions (e.g. SD, HD, UHD) for different device types, encryption options, content providers, pricing and bundling rules. Assets can be individually enabled for offline viewing by subscribers within the SmartTUBE Apps.

- Regional Restrictions: Regional restrictions can be applied at the movie and series level.

- Integration with VoD Content Providers: SmartTUBE offers streamlined integration schemes with a number of content providers.

Radio Stations

SmartTUBE SDP provides features for managing radio station broadcasting with configuration options similar to those available for TV-related content.

Content Protection

SmartTUBE supports content protection for IPTV/OTT services on various levels:

- DRM Protection: Offers support for the Google Widevine and Apple FairPlay DRM systems. SmartTUBE SDP can also be integrated with SmartLabs UDRM, allowing these DRM systems to be used in parallel.

- Token-based Stream Access Restriction: This security feature, integrated with the SmartMEDIA Content Delivery System, utilizes JWT tokens to prevent unauthorized access to the OTT TV channel streams.

- Copy Protection on Physical Outputs: Allows to control recording on analog and digital outputs of set-top boxes that support such functionality. HDCP and CGMS-A / WSS technologies are supported.

- Watermark messaging: Operators can prevent or complicate unauthorized copying of content on devices by sending messages that overlay text with identifying subscriber data on top of the TV channel stream. The feature allows to set the text transparency, position on the screen, display duration, and TV channel.

4. Marketing

The SmartTUBE solution provides Marketing Departments with a variety of tools to promote content and services within the SmartTUBE Apps:

- Banners
- Content Rails
- Content Recommendation Engine
- Ad Insertion Management
- Marketing Messaging

Banners

The banner carousel is located at the top of the Home screen of all SmartTUBE Apps. Each banner may have individual images for end-user devices of different types and can lead to the TV channel, program, xVoD content, genre, service, or external URL. Operators can manage the following banner attributes and options:

- Display Options of Banner Carousel:
  - Regular Banners: Regular opaque banners with a clear bottom edge, not overlapped by any other UI elements.
  - Faded Banners: Banners with a faded bottom edge typically overlapped by the Main menu and first Content rail.
  - Banners with Auto-play Trailers: Faded banners of the movie or series that starts playing the trailer automatically when it's in focus after a set time.
- Display frequency in the carousel: Allows to set each banner to high, medium and low priority for display in the carousel.
- Time frame and duration to display
- Display only for certain Device types and Pricing plans

Content Rails

Operators have the ability to populate the content pages (Home, Movies, TV Series, and My Profile) with an unlimited number of predefined and custom Content rails:

- Manually recommended content: Curated xVoD content or TV programs manually selected by the operator.

- Auto recommended content: Automatically generated xVoD content based on user viewing history, leveraging the SmartTUBE Recommender module.

- TV Channels: Display of TV channels presented as posters of currently streaming programs. User-favorited channels are prioritized, followed by operator-sorted channels.

- Top 10 TV programs: Compilation of the most popular TV programs viewed by all subscribers.

- Applications: List of integrated applications defined by the operator. Available only for the Android TV / STB devices, if the SmartTUBE App is a launcher.

- Continue watching: List of xVoD content and TV programs that the user has not finished watching.

- Watch history: Chronological listing of xVoD content and TV programs watched by the user.

- Favorite channels: Channels and movies marked as favorites by the user.

- Favorite movies: Movies marked as favorites by the user.

- Personal recordings: Recordings of TV programs initiated by the user within the nPVR service.

- Reminders: Alerts for upcoming TV programs set by the user.

- Purchased movies: List of xVoD content purchased by the subscriber.

- Custom rails: Operator-filtered xVoD content or TV programs based on various content and subscriber's account attributes (for example, French comedies of 80-

th, Modern Bollywood movies, Jackie Chan action movies, etc.). The filtered TV programs and xVoD content can be sorted by various attributes.

Content Recommendation Engine

SmartTUBE SDP features an integrated module for the automatic generation of xVoD content recommendations called **SmartTUBE Recommender**. This module periodically analyzes subscriber views of content, content characteristics (such as genres, countries, descriptions, etc.), and optionally, user characteristics (such as gender, age, geolocation). It then generates ordered sets of xVoD content recommendations for each user and sets of similar movies/series for each user.

SmartTUBE Recommender provides two types of recommendations:

- User-based: Calculated based on the user profile settings, the user's viewing preferences and their similarity to other subscribers, and so on. This type of recommendation is only available in conjunction with the SmartCARE (SmartLabs analytics software for IPTV/OTT networks).
- Context-aware: Calculated based on the similarity of movie metadata (description, genres, cast, etc.)

The generated recommendations can be displayed in SmartTUBE Apps on content rails, in movie detail cards, and in the player.

Ad Insertion Management

SmartTUBE is an integral component of **SmartLabs Dynamic Ad Insertion (DAI)** solution that enables operators to dynamically insert or replace ad blocks in live video streams, pre-recorded, and xVoD content. Thanks to VAST protocol support, operator can partner with third-parties or create its own campaigns within SmartTUBE SDP without relying on external ad services.

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

- **SmartTUBE Advertising Decision System (ADS):** Carries information about advertisers, ad campaigns, ad creatives, placement dates and duration, types, target devices, target content, and other parameters. Using this data, ADS can make a decision which ad fits a specific insertion opportunity. The ADS also provides campaign performance reports highlighting key metrics. Implemented as a component of SmartTUBE SDP.

- **Server-side Ad Insertion Module:** Implemented as a component of SmartMEDIA Content Delivery System

- **Client-side Ad Insertion Module:** Implemented as a component of SmartTUBE Apps The Server-side and Client-side ad insertion modules request 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.

There are 2 use cases for using the SmartTUBE DAI:

- **Ad insertion into HLS / DASH streams for OTT subscribers:** Involves inserting ad blocks on the SmartTUBE App side and getting data on them within the stream playlists/manifests. The preparation of playlists/manifests and ad creatives to be

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sent to the device is performed on the SmartMEDIA side.
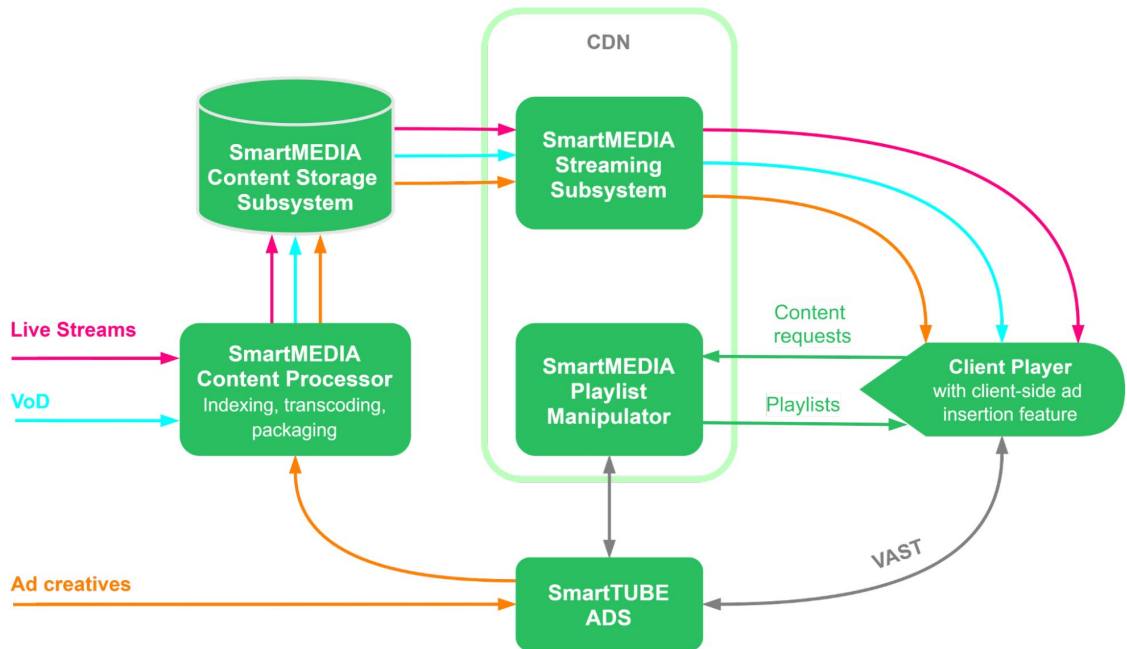
- Ad insertion into linear TS streams: Involves inserting ad blocks directly into the source TS streams using SmartMEDIA components. The resulting TS output can be distributed over IPTV networks, or pushed to satellite or DVB-C head-ends:

Marketing Messaging

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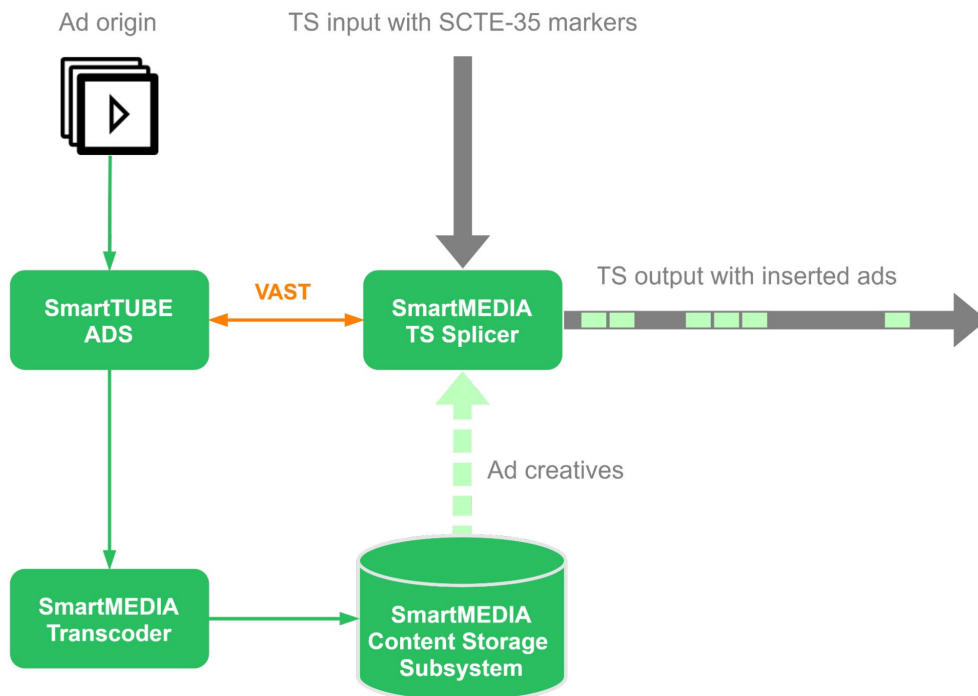
SmartTUBE allows to send messages to the end-user devices via **SmartTUBE Admin Console** or OSS/BSS API. It can be used for notification about new services, promotions, technical works, etc. The messaging can be performed either individually to a specific subscriber or massively using filters on the subscriber base.

Message sending can be scheduled with filtering recipients by user identifier, pricing plan, and tenant. Additionally, messages can be sent automatically for events like first authorization, account creation, service subscription/unsubscription, and pricing plan changes.

Operator can manage the following message attributes:

- Message text: Allows to insert such user-identifying variables as user ID, device ID, and service account number.
- Expiration period
- Display duration
- Number of message reminders and their display duration
- Tenant relation
- Appearing animation: Slide-down or pop-up
- Image, icon, and URL of a video to be attached to the message
- Message opacity
- Link to the service bundle, xVoD content, TV channel
- Delivery type:
  - Long Polling: Messages are sent using Long Polling mechanism and displayed as a modal window in the SmartTUBE App only after it is launched.
  - Push: Messages are sent using the Apple APN and Google GCM services and displayed additionally in the notification shade regardless of whether the SmartTUBE App is running or not.

Message recipients can be specified by a list of device IDs or selected based on the following criteria:

- Account login, number, name, status

- Account creation date

- Pricing plan

- Service bundle presence in the Pricing plan

- Status of the service bundle

- Device type

- App version

- STB UID

- IP address

- Date of linking the device to the account

- Last stored device location

- Last device authorization date

5. Reporting & Analytics

The SmartTUBE reporting system offers Marketing, Sales, and Content Management Departments with real-time and historical statistics of content consumption and specific resource/service demand among subscribers.

SmartTUBE SDP offers a range of historical reports that are generated for a user-defined timeframe:

- **Service accounts and devices:**

  - Created/deleted accounts report: Number of accounts added/deleted for the period.

  - Service accounts not authorized till now: List of accounts without authorizations for the period until today.

  - Service accounts without new connections: List of accounts without new device connections for the period until today.

  - Individual service account reports: History of service bundle subscriptions, status changes, nPVR usage stats and errors, accepted text offers, and pricing plan changes.

  - Number of pricing plan changes: Number of pricing plan shifts for the period with specifying the previous/new plan.

  - Percentage of accounts by state: Number and percentage of accounts by status on the day specified.

  - Percentage of users by pricing plan: Number and percentage of accounts by pricing plan on the day specified.

  - Devices: Detailed info on the devices authorized during the period with filtering by the service account, as well as device name, UID, and type.

  - Device UID changes: Change history of the unique identifier of each registered device.

- **Service and content consumption:**

- o **Service consumption:** Number of service accounts subscribed to specific service bundles during the period.

- o **Service consumption in detail:** Details on subscriptions to service bundles during the period with details on accounts and pricing plans.

- o **Purchased TVoD movies:** Brief report on TVoD content purchases during the period.

- o **Purchased TVoD movies in detail:** Detailed report on TVoD content purchases during the period.

- o **SVoD metacontent view count:** Report on SVoD content views during the period with filtering by service bundles and content providers.

- o **Detailed report by SVoD:** Detailed report on SVoD content subscriptions during the period with filtering by service bundles and content providers.

- o **VoD view statistics:** General report on the number and duration of xVoD content views with grouping of results by periods (hour, day, etc.) and filtering by viewing duration of each movie/episode.

- o **Channel coverage:** Details on TV channel audience and viewing duration in live and catch-up modes with grouping of results by periods (day, month) and filtering by channel, device type, pricing plan and viewing duration.

- o **Channel viewing statistics:** Number and duration of the channel views in live and catch-up modes with grouping of results by periods (5 min, hour, day, etc.) and filtering by channel, device type, and viewing duration.

- o **TOP 10 most viewed TV programs:** Number of viewers of the 10 most popular TV programs for the period with filtering by channel.

The following reports provide a real-time view of the devices and apps used by subscribers:

- **Service account w/o devices:** List of accounts with no devices connected or devices with no UID.

- **Device combinations on service accounts:** All unique combinations of devices linked to accounts, itemized by state and number of accounts, as well as by number of devices.

- **Statistics by device types:** Number of devices of different types currently registered on the platform.

- **Statistics by app versions:** Number of devices of different SmartTUBE app versions with filtering by device type, device model, and app version.

6. System Management

The majority of SmartTUBE system functions are accessed and controlled through the web-based SmartTUBE Admin Console. Fine-tuning of platform functionality is carried out through configuration files of SmartTUBE SDP components. Together, these management tools provides System Administration Departments with complete control over platform aspects and features described below:

- End-user Device Provisioning: SmartTUBE SDP includes SmartTUBE Device Manager, a service with the web console for managing firmware, apps and configurations on all types of IPTV/OTT devices including Linux and Android STBs, mobile and Smart TV platforms. This console enables software artefacts management (STB Linux and Android firmware, private app repository for AOSP, configuration files), device grouping (production, staging, etc.), HTTP and Multicast firmware distribution, software version tracking, update strategies management (soft update, force update, minimal allowed version), etc.

- Process Automation: Various service tasks (e.g. EPG import, cache data reload, etc.) can be performed automatically at set schedule.

- Admin Console Access: Operators can manage users with specific access roles like Administrator, Content Manager, Business Manager, Technical Support Specialist, and Analyst. Multiple roles can be assigned to a user, defining access to different features within the console.

- Failure Alerts: Provides email alerts for failures related to OSS integration, EPG and VoD metadata import, database connection limits, and SmartMEDIA warnings.

- Device Geolocation: To manage access to content based on IP address range, operators can assign IPTV devices to specific subnets or utilize data from third-party services like Maxmind (under a separate contract) to determine the geo or network location of OTT devices. Operators can also restrict access to services for mobile devices when transitioning between network connections (e.g., from home network to cellular one).

- License usage statistics: Provides detailed information about installed licenses, including their types, number of service accounts and active devices used.

- **License features:** Operators can manage the availability of features that depend on the license type.
- **Rebooting STBs:** Enables remote reboot of STBs by a list of UIDs or by matching conditions.
- **Cache Server Data Reload:** Allows to manually update metadata and system settings on cache servers to quickly pass changes to devices.

- **Data Export:** SmartTUBE Admin Console allows to export any data stored in the SmartTUBE SDP database to CSV format.

Apps Localization and Customization

SmartTUBE provides a comprehensive toolkit for localizing and customizing SmartTUBE Apps' UI and UX. This process occurs in two stages:

- **Initial:** Performed by SmartLabs specialists at the stage of system commissioning.
- **Operational:** Performed by the operator during the system operation.

Initial customization allows to adjust the UI within the existing structure (layout of the main components, animation logic, etc.) and includes the following possibilities:

- **Interface Localization:** SmartTUBE provides the ability to localize the interface to the operator's language by the operator. English is supported by default. Localization in languages using fonts containing hieroglyphs, arabic script and other specific alphabets, is discussed separately.
- **Operator Logo:** Can be placed in the various parts of UI (upper left corner, placeholders, splash screen, etc.);
- **Color of Selected Elements**
- **Animation of Waiting States**

Operational customization allows the operator to change the representation of the Home screen and Movies/Series sections by uploading the corresponding configuration files to devices via SmartTUBE Device Manager, a service for managing firmware and apps on all types of IPTV/OTT devices.

Security Mechanisms

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

- Device activation and user authorization: Each time a device attempts to connect to the SmartTUBE SDP, the system compares its device ID and serial number with the values stored in the DB when the device was activated. If the device ID and serial number do not match, the device is not allowed to access services.

- Connection sessions management: SmartTUBE SDP uses special identifiers to manage each connection session with devices. Each connection session lives for a limited period, after which the session closes and SmartTUBE SDP stops the information delivery to the device. This also avoids the memory shortage and related security issues on STB devices.

- Token-based authorization: SmartTUBE SDP issues a unique token to each device upon authorization on the platform. This token is then passed by the device in all requests to the platform and SmartMEDIA streaming servers for the OTT TV channel streams. This process ensures that only authorized devices can access the SmartTUBE platform and view content securely.

- Secure access to SmartTUBE Admin Console: Provided by the authorization mechanism with the login and password issued by the system administrator.

- OSS/BSS API Access: Interaction with SmartTUBE SDP from the OSS/BSS side via API can be protected with login and password.

- Network-level security: The HTTPS protocol with SSL certificate management is used for interactions between devices, external systems, and SmartTUBE SDP. Session control is used for interactions between platform nodes and the database.

- Protection against STB duplication: STB has built-in protection against duplication, which prevents the possible device counterfeiting.

Licensing

The SmartTUBE licensing policy offers two license types, **SmartTUBE Basic** and **SmartTUBE Ultra**, providing operators with different levels of features and functionality to choose from.

	SmartTUBE Basic	SmartTUBE Ultra	Notes
SmartTUBE SDP			
Multitenancy support **Multitenancy** is a software architecture in which a single instance of software runs on a server and serves multiple tenants. Systems designed in such manner are "shared". A tenant is a group of users who share a common access with specific privileges to the software instance. For example, one global IPTV/OTT operator may have several regional divisions. The audience of these divisions may differ geographically, culturally, socially, etc. So may the content. For this case, SmartTUBE Service Delivery Platform (SDP) provides 2 options for multitenant architecture implementation. More...	✖	✔	
Widevine Security Policies support Google's Widevine DRM technology offers three distinct security levels — L1, L2, and L3 — each designed to cater to different requirements of content protection. These levels are critical in determining the quality of content that can be securely streamed and accessed on various devices. • L1 represents the highest level of security provided by Widevine. It mandates that devices meet specific L1 security criteria to stream High Definition (HD) content. • L2 involves content decoding and rendering through a secure hardware component or a protected co-processor. • L3 is a software-only security solution, providing the lowest tier of Widevine's DRM security.	✖	✔	

Discounts and promo codes support
 	
SmartTUBE provides two types of discounts that can be applied to service packages:
 	
    • *Overriding discounts* — rewrites the price lists of the service packages with its own
    • *Percentage discounts* — allows to specify the percentage of discount applied to the service packages
	✘	✔

System health monitor	✘	✔
SmartTUBE Apps for all supported platforms		
Catch-up Content Library *Catch-up Content Library* is a SmartTUBE feature that allows operator to record selected TV programs and provide them to subscribers as a separate VoD-like catalog or content rails.	✘	✔ To be implemented in 3 phases in versions 9.1–9.3

Kids profile
 	
Kids profile allows the operator and subscribers to set:
 	
    • The maximum age level for showing only children's TV channels and VOD content
    • The viewing period (for example, from 8:00 to 21:00)
    • The viewing time limit (for example, no more than 2 hours per day)
    • The child-styled UI design
	✘	✔ To be implemented in version 9.2

Open movies/series by actors/director An option to open a movie catalog by the actor or director, when the user selects a person in the VoD detail card.	✘	✔ To be implemented in version 9.2
SmartTUBE Apps for Android TV, LG & Samsung Smart TV, Web Browser		
AVoD support AVoD (Advertising Video on Demand) — a service to provide access to movies/series is provided with an advertising which is periodically shown in video	✘	✔
Vertical main menu (configurable)	✘	✔

Below is an example of the vertical menu. The final implementation may differ from the one shown.
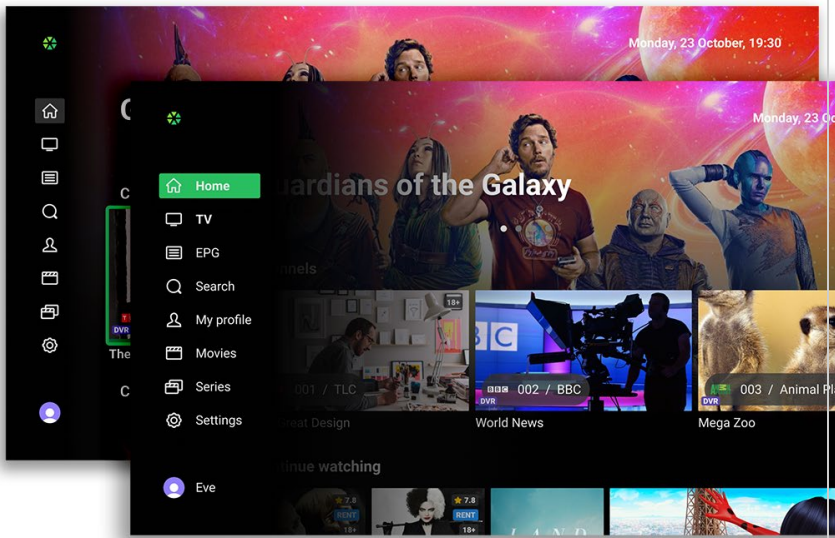
instead of icons (configurable)

Below is an example of the text menu. The final implementation may differ from the one shown.

✕   ✔
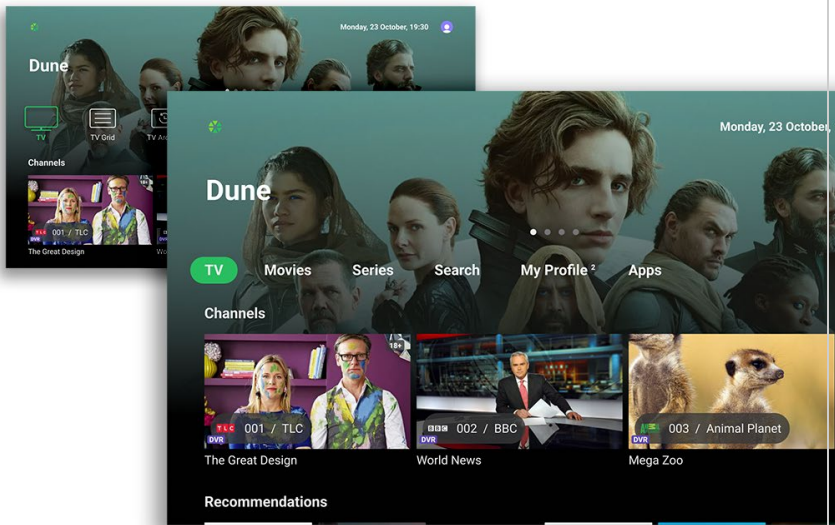
'TV Channels' rail with program posters instead of channel logos

✕   ✔

Below is an example of a rail. The final implementation may slightly differ from
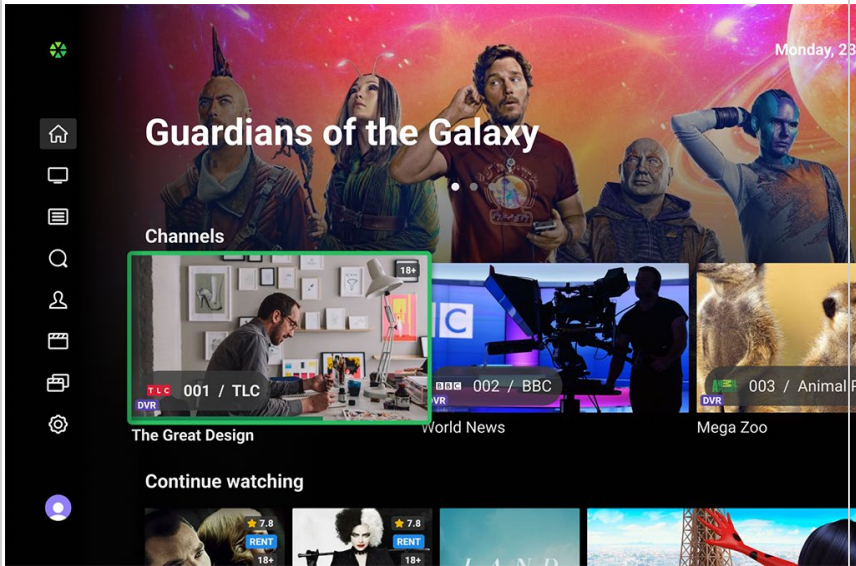
the one shown.

Faded top banner with trailer playback	✘	✔

Easy access to profile selection on Home Screen

Below is an example of UI. The final implementation may slightly differ from the one shown.

	✔	✔
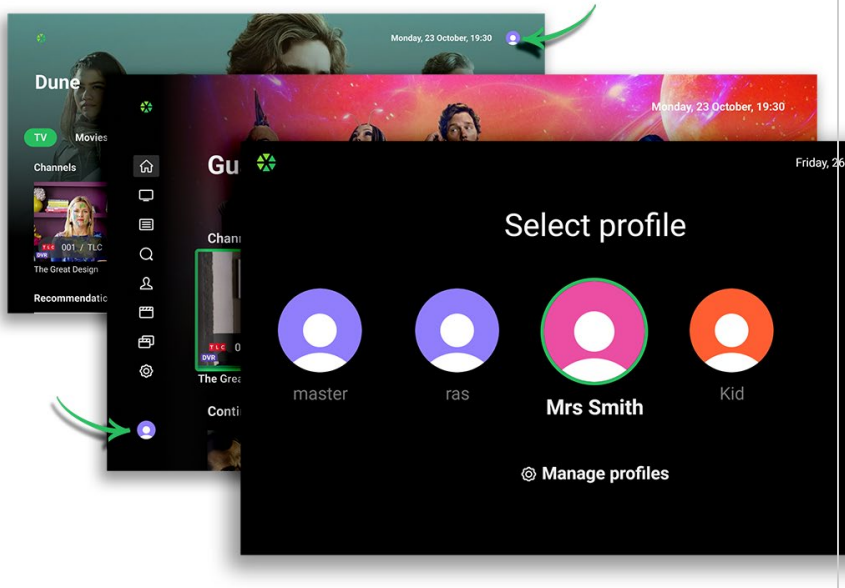
QR code login	✘	✔	To be implemented in version 9.2
This feature is indented to streamline the authentication process for large-screen applications, eliminating the need for users to manually input login			

credentials using a virtual keyboard.

Upon accessing the login screen, users encounter the traditional login and password fields, along with a QR code, explanatory text, and a 4-6 digit verification code.

User is able to add the new device using SmartTUBE mobile app. There are two options

1. Scan QR code with mobile device and confirm using confirmation dialog
2. Manually open SmartTUBE app device adding screen and enter verification code in SmartTUBE app

Auto-play of program/movie on poster rails when they are focused on Home Screen	✕	✔	To be implemented in 2 phases in versions 9.1–9.2
SmartTUBE App for iOS			
Push notifications support	✕	✔	
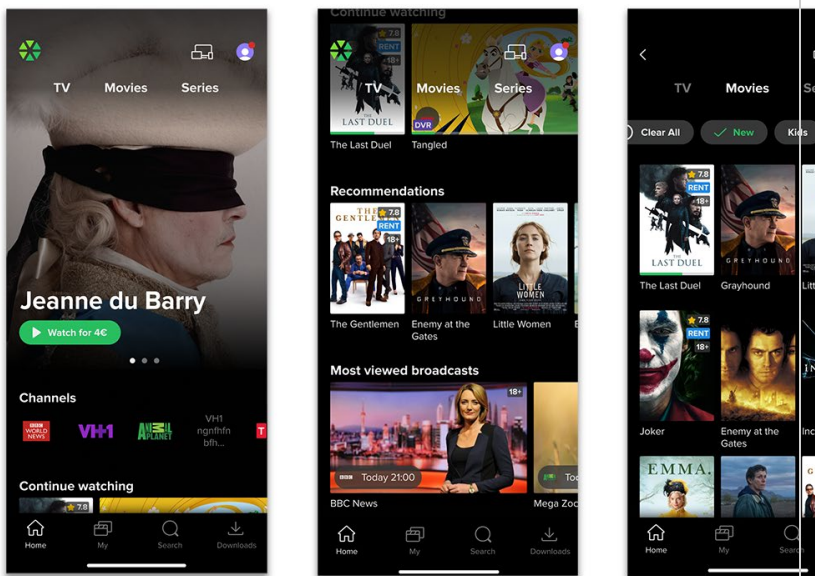
Totally redesigned app (version 8+)

Below is an example of UI. The final implementation may slightly differ from the one shown.

✕   ✔

Legacy app (version 5.x)	✔	✘

Download content for watching in offline mode

This feature allows subscribers to download movies and series to mobile devices for later viewing in the SmartTUBE application in offline mode. In this case, time limits apply to protected content. For example, offline viewing will be possible for a week, after which a user will need to connect to the Internet to update the DRM keys (the user will not need to download the movie again).	✘	✔

'HLS + FairPlay' streams support	✔	✔

Chromecast support

This feature enables Screen Sharing from SmartTUBE Mobile Apps to Chromecast devices and TVs with built-in Chromecast using Google Chromecast technology.	✘	✔	To be implemented in version 9.2

SmartTUBE App for Android Mobile

Push notifications support	✘	✔

Totally redesigned app (version 8+)

Below is an example of UI. The final implementation may slightly differ from the one shown.	✘	✔

Legacy app (version 5.x)	✔	✖	
Download content for watching in offline mode			
This feature allows subscribers to download movies and series to mobile devices for later viewing in the SmartTUBE application in offline mode. In this case, time limits apply to protected content. For example, offline viewing will be possible for a week, after which a user will need to connect to the Internet to update the DRM keys (the user will not need to download the movie again).	✖	✔	To be implemented in version 9.2
Chromecast support			
This feature enables Screen Sharing from SmartTUBE Mobile Apps to Chromecast devices and TVs with built-in Chromecast using Google Chromecast technology.	✖	✔	To be implemented in version 9.2
Hisense Smart TV support	✖	✔	
Amazon Fire TV support	✖	✔	
Legacy Linux STBs (Albis/SML/MAG/Motorola) support	✔	✔	

How many licenses do I need?

SmartTUBE is licensed according to the number of service accounts and active devices. You can purchase one or more simultaneously active licenses of the following subtypes:

- *License by accounts:* This method considers only *active service accounts* — accounts with the status other then *Suspended*, *Trial closed*, *Closed*, *Deleted*, regardless of whether the subscriber uses the services or not.

  Suspended status: A new service account with a predefined connection to an end-user device. After the SmartTUBE app has loaded on the predefined device, the service account status changes to ACTIVE without the need to enter a login / password.

  Trial closed status: The trial period for the account has expired, the SmartTUBE app does not start.

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> **Closed** status: The contract with the subscriber is terminated, service delivery is permanently stopped, SmartTUBE app does not start.
>
> **Deleted** status: Service account was deleted, service delivery is permanently stopped, the SmartTUBE app does not start.

- *License by devices:* This method considers only *active devices* — devices with a non-empty UID and linked to the active account, which were authorized at least once and (optional) with the date of the last authorization is no more than N days ago. Operator can specify which device types will be considered by this license.

> UID is an unique identifier of an end-user device within the system:

  - *Linux based STB* — unique MAC address of the STB
  - *Android STB* — unique serial number of the device
  - *Android mobile application* — unique deviceID of the device
  - *iOS mobile application* — unique UID automatically generated at the moment of the app installation/re-installation
  - *Smart TV* — unique UID automatically generated at the moment of the app installation/re-installation
  - *Web application* — unique UID automatically generated at the moment of the app installation/re-installation (stored in the web-browser cookie). If the cookie has been deleted, the UID will be regenerated.

- *License by service account with devices:* This method considers only active service accounts to which only the specified types of devices can be linked. The operator should specify the number of active devices licensed under one license.

7. SmartTUBE Apps

SmartTUBE Apps are a range of user-friendly and highly customizable applications compliant with the most current streaming industry standards. Tailored for popular device platforms, these applications seamlessly integrate established user interaction patterns to offer a superior viewing and application experience. Users have access to a diverse content selection, including live TV, video-on-demand, catch-up TV, nPVR, and shared TV recordings.

> As we continually enhance the UI and UX of SmartTUBE Apps, please note that the screenshots below might not reflect the latest versions.

Home Screen

The Home screen is the first screen the user sees after loading the app or hitting the 'Home' button. Operators can customize it's layout by managing Top banner, Main menu, and a set of Content rails.

Top Banner

Operator can choose one of the following options to display the Top banner:

- Regular banner: A regular opaque banner with a clear bottom edge, not overlapped by any other UI elements.
- Faded banner: An opaque banner with a faded bottom edge typically overlapped by the main menu and first content rail. Optionally, the faded banner can automatically play the movie trailer after a set amount of time when it is in focus.
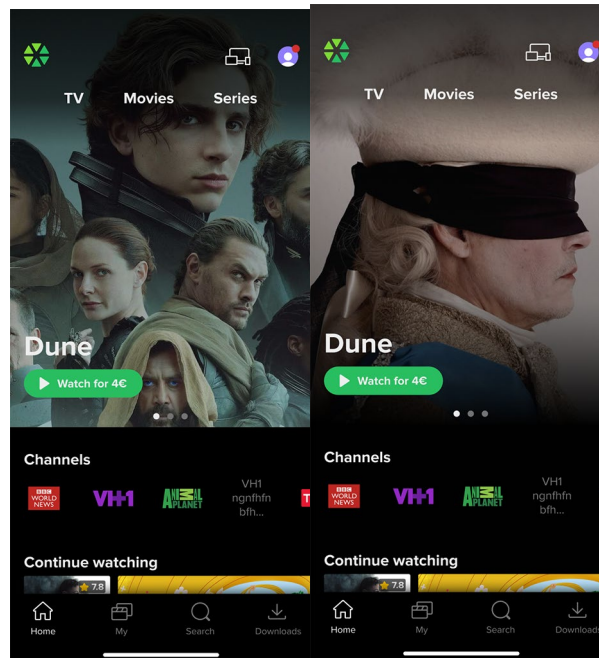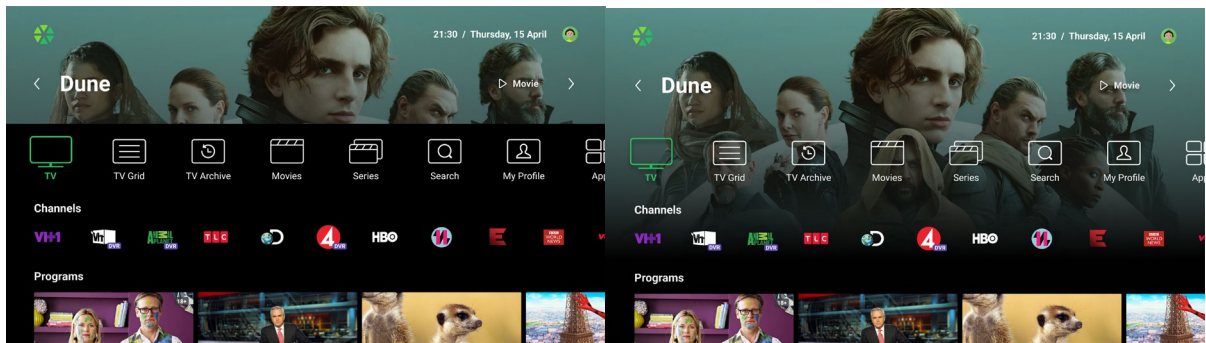
Main Menu

The Main menu on large-screen devices can be displayed in either a vertical or horizontal arrangement. For horizontal layouts, menu items can be enhanced with icons or presented as plain text. The Main menu may include the following items:

- TV: Displays channels and programs as a vertical scrollable list for easy navigation. Includes detailed information about current broadcasts, channel guides, and completed/upcoming programs with description and screenshot.

- EPG: Displays a classic EPG grid showcasing TV programs' durations on a horizontal timeline. Users can to select a program for additional information and functions, with a window displaying the current broadcast.

- **Search:** Allows to search through all types of content, displaying TV programs and VoD content on one screen.

- **Movies:** Displays the movie library with posters and titles in a mosaic view or as a list of content rails.

- **TV Series:** Displays the series library featuring posters and titles presented in either a mosaic view or themed rails list. Each poster serves as a visual representation of a series, enabling users to delve into a series card. From there, subscribers can choose the desired season and episode for viewing.

- **Radio:** Opens the list of IP radio stations available for listening.

- **My [operator name]:** Allows a subscriber to access personalized content such as watch history, favorite channels and movies, personal recordings, reminders, and purchased movies.

- **Applications:** Provides access to the library of Android apps available on Android TV / Android STB devices, if the SmartTUBE App acts as a launcher.

- **Settings:** Provides access to the user profile settings and system settings (time zone, network settings, video output modes, etc.).
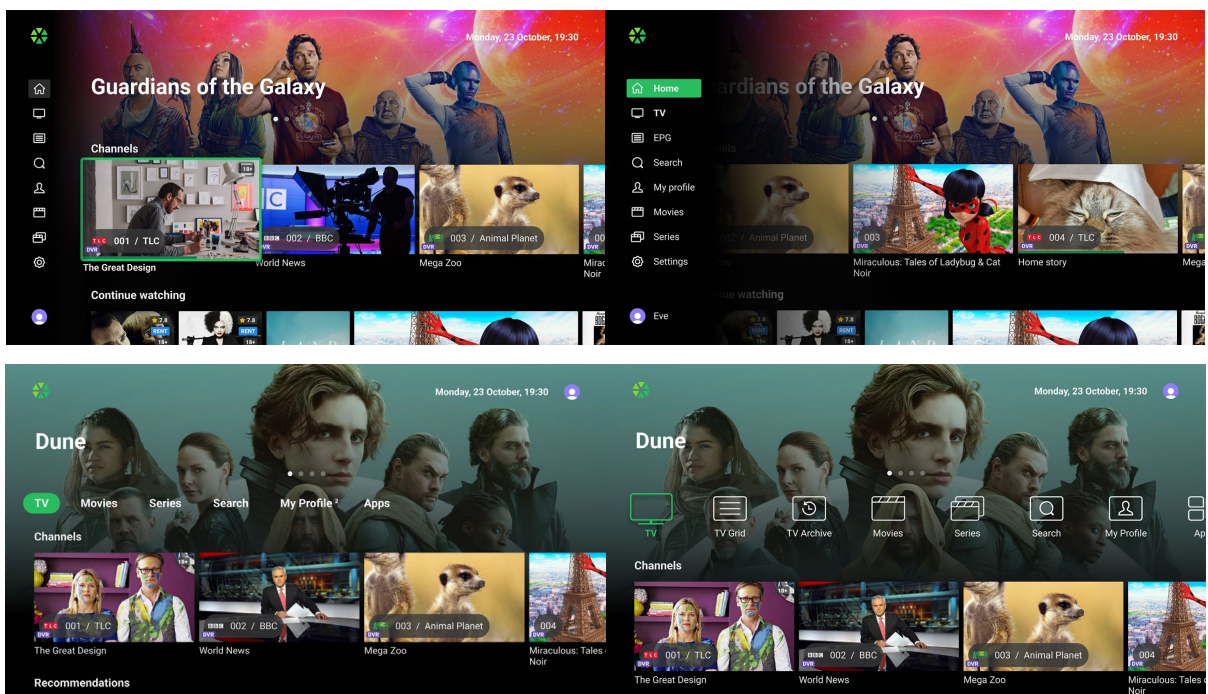
The main menu on mobile devices typically includes the following items: Home, My, Search, and Downloads. The Downloads section allows users to access content that has been downloaded for offline viewing. Additionally, users can navigate to the TV, Movies, and Series pages using the top menu located on the Home screen.
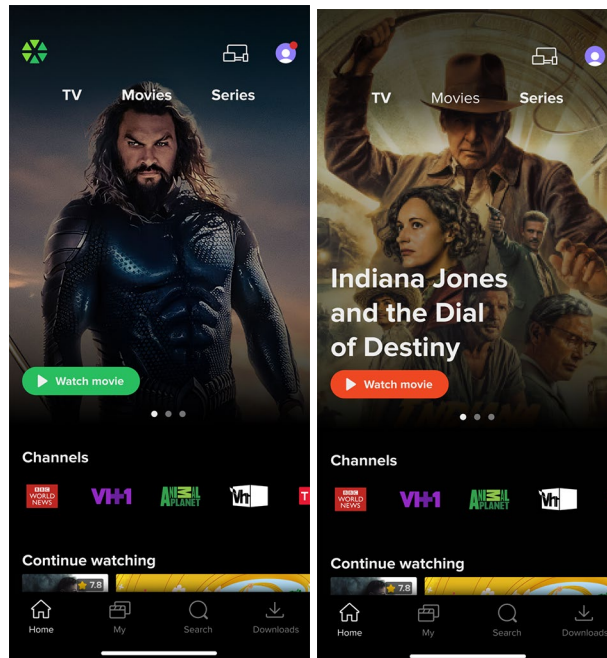
Content Rails

Operators have the ability to populate the content pages (Home, Movies, Series, and My Profile) with an unlimited number of predefined and custom Content rails:

- TV Channels: Display of TV channels presented as posters of currently streaming programs. User-favorited channels are prioritized, followed by operator-sorted channels.
- Manually recommended content: Curated xVoD content or TV programs manually selected by the operator.
- Auto recommended content: Automatically generated xVoD content based on user viewing history, leveraging the SmartTUBE Recommender module.
- Top 10 TV programs: Compilation of the most popular TV programs viewed by all subscribers.

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- **Applications:** List of integrated applications defined by the operator. Available only for the Android TV / STB devices, if the SmartTUBE App is a launcher.

- **Continue watching:** List of xVoD content and TV programs that the user has not finished watching.

- **Watch history:** Chronological listing of xVoD content and TV programs watched by the user.

- **Favorite channels:** Channels marked as favorites by the user.

- **Favorite movies:** Movies marked as favorites by the user.

- **Personal recordings:** Recordings of TV programs initiated by the user within the nPVR service.

- **Reminders:** Alerts for upcoming TV programs set by the user.

- **Purchased movies:** List of xVoD content purchased by the subscriber.

- **Custom rails:** Operator-filtered xVoD content or TV programs based on various content and subscriber's account attributes (for example, French comedies of 80-th, Modern Bollywood movies, Jackie Chan action movies, etc.). The filtered TV programs and xVoD content can be sorted by various attributes.
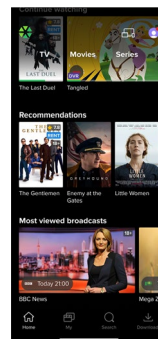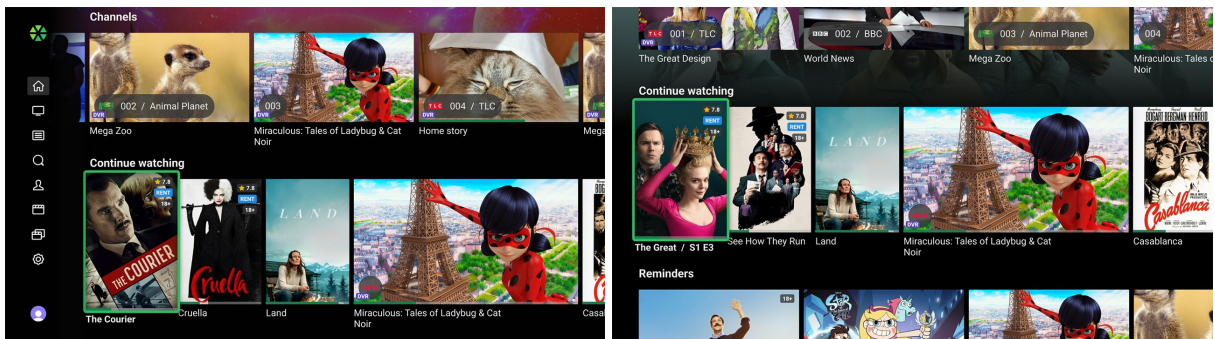
TV-related Content

SmartTUBE Apps provide users with access to the comprehensive functionalities offered by the SmartTUBE solution for TV-related services:
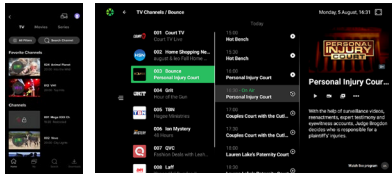
 Channel List with Program Guide: Displays channels and programs in a vertical scrollable list for easy navigation. Includes detailed information about current broadcasts, channel guides, and completed/upcoming programs with description and screenshot.
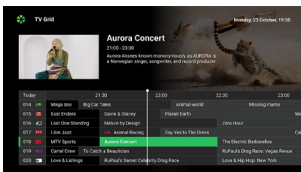
 EPG Grid: A classic Electronic Program Guide available for large-screen devices. TV programs are displayed horizontally with durations on a timeline. User can select a program for more info and functions, with a window showing the current broadcast.
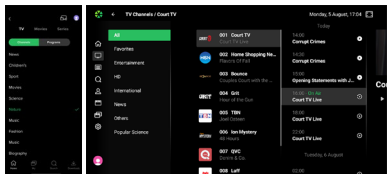
 Theme-Based Channel Filtering: User can filter channels by themes (such as sports, news, entertainment) or genres of currently airing programs (if the genres are provided by the EPG provider) by opening a filtering panel.
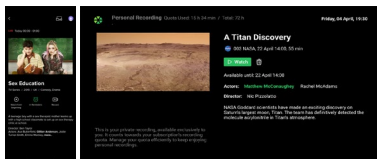
 Detailed TV Program Information: Provides in-depth details about TV programs in full-screen view, including extended description, cast, recording quota used, availability period of recorded programs, and other relevant data.
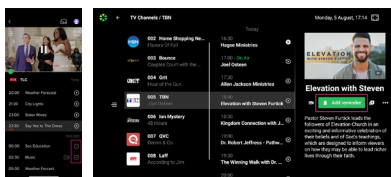
 Reminders: Set alerts for upcoming TV programs with a pop-up before the show starts. All reminders are displayed in a

dedicated menu.

Upcoming Broadcasts Recording: Allows users to schedule recordings of individual programs or entire series episodes for viewing at a later time. The list of all recordings can be found in a dedicated menu.

Favorite Channels: User can mark preferred channels for quick access. The favorite channels appear first on the Home screen and in the channel filtering section.

Watch History: The list of recently viewed programs, with the option to resume from where the user left off. Users can also choose to clear their entire watch history or remove individual items.

The full-screen player in SmartTUBE Apps for large-screen devices supports the following features:

Playing live streams and rewinding, fast forwarding, and pausing catch-up content.

Revealing the program guide rail for the current channel, enabling setting reminders or recordings for upcoming programs. Available for the large-screen apps only.

Adjusting the stream's aspect ratio, selecting the audio/video/subtitle track, viewing the program details, and

checking the stream technical information.
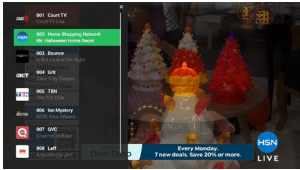
Quick channel selection panel allowing to switch channels visually without leaving full screen mode.

The full-screen player in SmartTUBE Apps for mobile iOS / Android devices supports the following features:
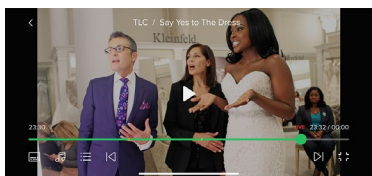
Playing live streams and rewinding, fast forwarding, pausing catch-up content, as well as selecting audio/video/subtitle tracks.
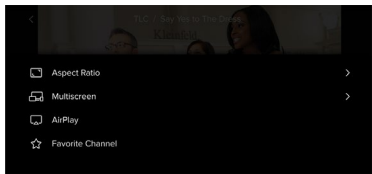
Adjusting the stream's aspect ratio, sharing the stream across other subscribers' devices, and exploring additional functions.

The full-screen player in SmartTUBE Apps for mobile iOS / Android devices can be controlled by tapping, swiping, and sliding:

- **Short tap:** Opens playback controls and settings menu, which disappear after 3 seconds of no user activity.

- **Double tap in the center:** Switches between full-screen and portrait mode.

- **Double tap on the left/right area:** Rewinds backward/forward for 10 seconds.

- **Swipe left/right:** Switches channels.

- **Slide by the left/right area:** Controls the brightness and volume, respectively:

VoD Content

SmartTUBE Apps offer fast navigation and search within the VoD content library, payment options, a recommendation tool that suggests relevant content based on subscriber preferences, and other helpful features:
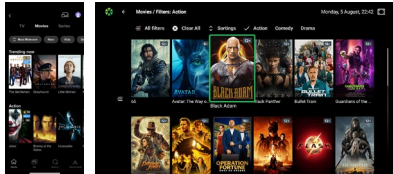
 VoD Content Catalog: Displays available content with posters and titles in a mosaic view or as a list of themed rails.
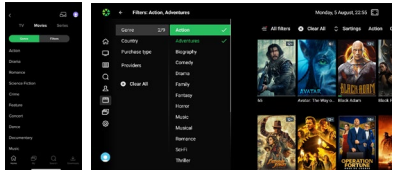
 Content Filtering: Users can filter content by type (movies, series, for kids), genre (adventure, comedy, detectives, etc.), production year, country, and other criteria.
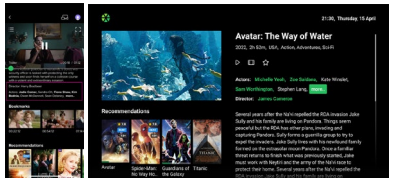
 Detailed Content Description: Provides information on the movie description, directors, actors, ratings, age restrictions, release year, screenshots, etc. for selected content.
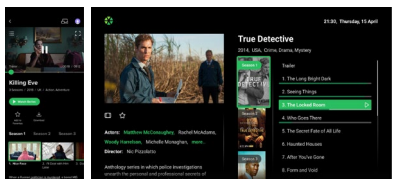
 Detailed Series Description: In addition to the information described above, this feature offers a convenient way to select from the various seasons and episodes of a series.
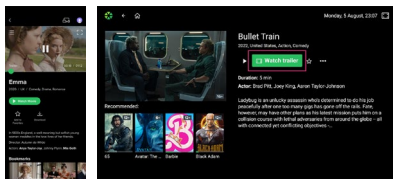
 Trailer Viewing: Users can watch trailers within the movie card if available.
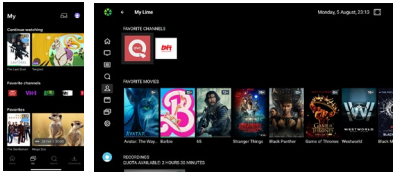
List of Favorites: Allows users to save their preferred movies for convenient access and later viewing.
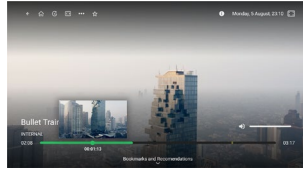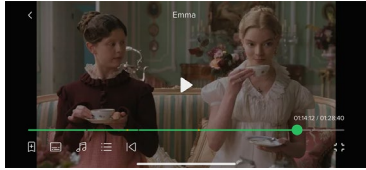
Full-Screen Player: Content is played in full-screen mode with playback controls, video quality and aspect ratio options, audio track and subtitle selection, content recommendations (in the large-screen apps), adding to favorites, and technical information about the stream (in the large-screen apps).
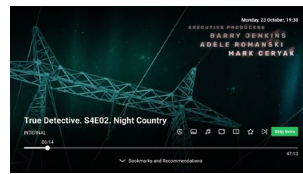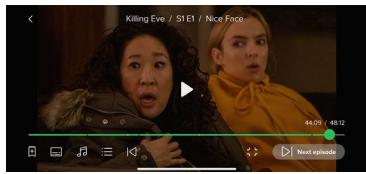
Skip Opening and Credits: The full-screen player allows users to skip the movie's opening credits and jump straight into the action. At the end of a series episode, users can bypass the final credits and start the next episode immediately. This feature includes a timer for auto-skipping the opening and automatically starting the next episode, with progress displayed on the button.
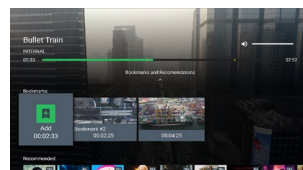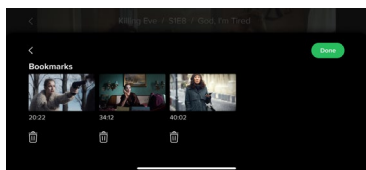
Content Bookmarks: Users can add bookmarks to specific movie moments. A single movie can have multiple bookmarks.

Radio Stations

SmartTUBE Apps for STB and Smart TV support the radio station broadcasting:
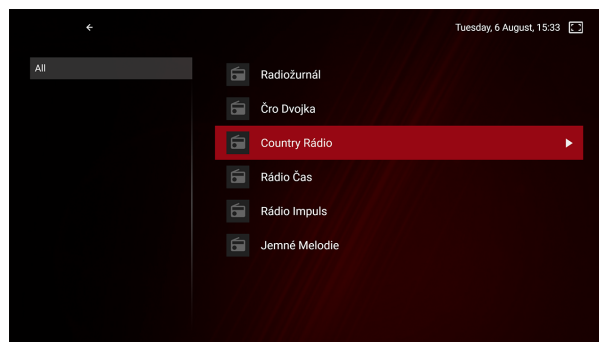
Media Player

The Media player integrated into SmartTUBE Apps offers all the essential features for a seamless and enjoyable content-watching experience. It may support different audio/video codecs and streaming protocols, such as MPEG-DASH and/or HLS, depending on the device.
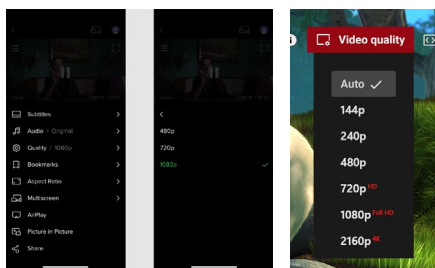
Adaptive Streaming Support: Automatically switches between bitrates within the media stream based on network bandwidth. This prevents playback from stopping when bandwidth decreases; instead, it shifts to a lower quality stream. When bandwidth improves, video quality is restored.

Stream Quality Options: In addition to automatic adaptive switching between stream bitrates, users can also manually select their preferred stream quality.
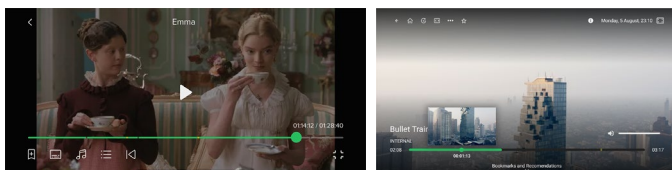
Playback Control: Lets users rewind, fast forward, and pause catch-up and xVoD content. When a video is rewound or paused, thumbnails appear above the progress bar.
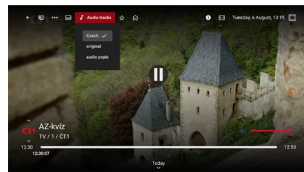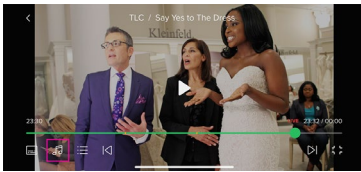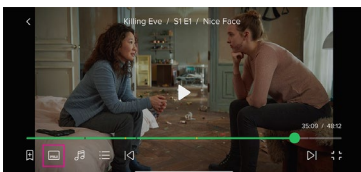
**Audio Track Selection:** Users can choose from multiple audio tracks available within the stream.
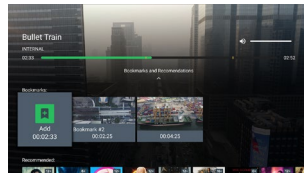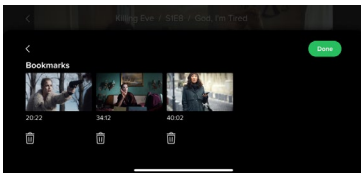
Content Bookmarks: Users can add bookmarks to specific movie moments. A single movie can have multiple bookmarks.
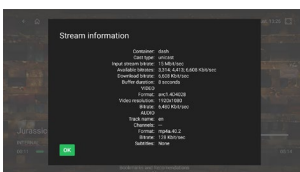

Subtitles and Teletext Display: Apps can display subtitles and teletext in various formats, including DVD, DVB, SSA/ASS, SRT, WebVTT, CEA-608/708 Closed Captions, SMPTE-TT, and Teletext. Supported formats may vary by device.
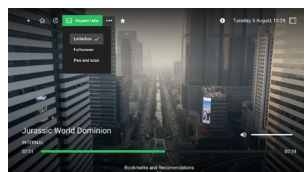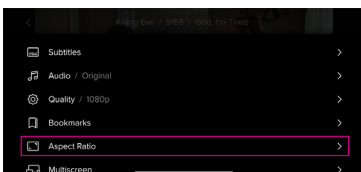

Aspect Ratio Options: Enables users to align the content frame's aspect ratio with their device's screen.


Stream Details: Depending on the stream type, users can view information such as the current bitrate, the number of decoding errors, and other relevant details that may be helpful for troubleshooting and contacting technical support. Available for the large-screen apps only.
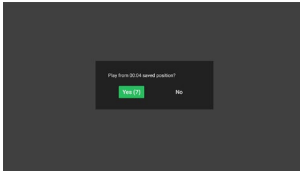
Playback from a Saved Position: Apps remember where a user stopped watching a movie or program and provide the option to resume from that point or start over.
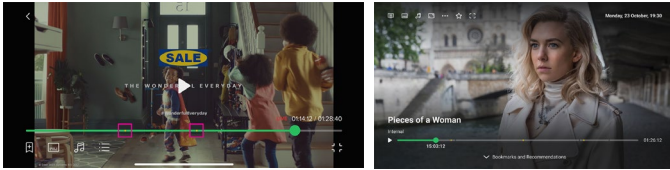
Processing of Ad Inserts: The app for large-screen devices can detect the start/end marks of ad inserts within the stream. It can handle these ads in different ways, such as preventing users from rewinding during catch-up playback. Additionally, the media player can work with VAST servers within the AVoD service.

Content Purchase and Subscriptions

SmartTUBE Apps offers users a range of features to manage service subscriptions, purchase content, and stay updated on options that enhance their service experience:

- Service Management Menu: Users can view and manage available services, including adding or canceling subscriptions, along with detailed information about offered content and terms.
- Subscription Recommendations: The app highlights both current and additional subscription options, with non-subscribed channels clearly marked and easily accessible for purchase.
- Content Purchase Options: Movie/series costs and purchasing options are displayed on detailed information cards.
- Purchase History: Subscribers can track their transactions in the 'Settings' menu.

Screen Sharing

The Screen Sharing feature allows users to effortlessly transfer their streaming session between devices, such as from a mobile device to a Smart TV or STB, and vice versa. The

SmartTUBE platform supports the following technologies to implement the Screen Sharing feature:

- **Apple AirPlay:** Enables screen sharing from SmartTUBE iOS Mobile App to other devices that support AirPlay 2 technology.

- **Google Chromecast:** Enables screen sharing from SmartTUBE iOS/Android Mobile App to the Google Chromecast devices and TVs with built-in Chromecast support.

- **SmartLabs Screen Sharing:** A proprietary technology enabling user to transfer streaming between devices using SmartTUBE Apps. Users can continue watching a movie or TV channel on a mobile device or move content from a mobile device to a large screen while maintaining the current position. After transferring, playback can be controlled remotely from the mobile device.

Content Search Screen

SmartTUBE Apps allow users to search through all content types, including TV programs, movies, and external services like YouTube. The search is performed by title (in the current app's UI language and original title) and description, with suggestions appearing as user type. The Apps support multilingual keyboards and shows structured results for various content types on the same screen.
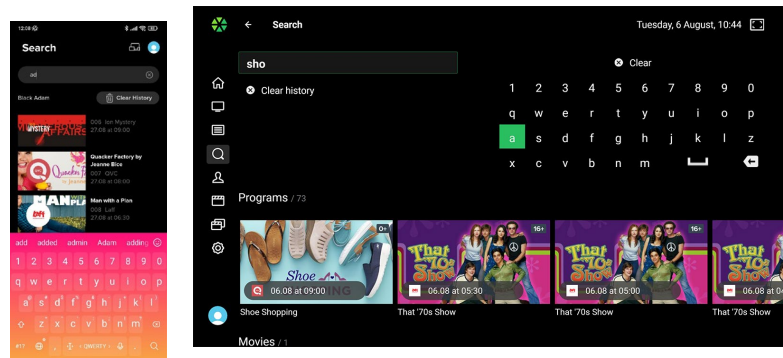

Displaying Operator Messages

The operator can send subscribers messages that they may open immediately or later in the message history. The message can contain both text and images. Urgent messages are displayed as a full screen window. Watermark messages are overlaid on top of the video stream.

Logging In

Depending on the operator's settings, subscribers can access services by logging in with or without username and password entry. New users may also be offered a trial period to explore the services and app features.
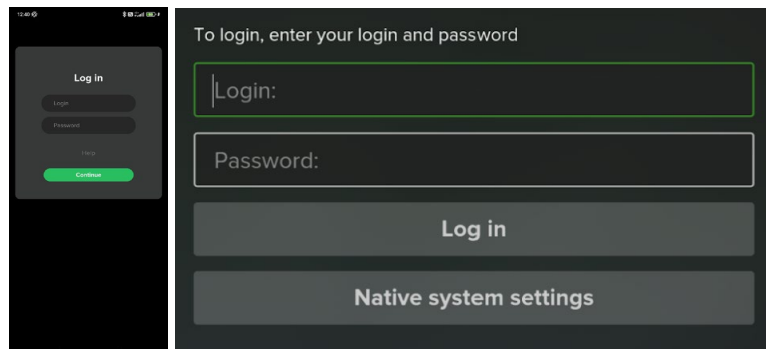
User Profiles

If multiple users share an account, they can create personal Profiles to customize settings like parental controls, channel sorting, and content restrictions. Profiles are shared across all devices and can be PIN protected. The master Profile can manage other profiles. This helps prevent unauthorized access to paid or adult content by minors and provides personalized content recommendations.
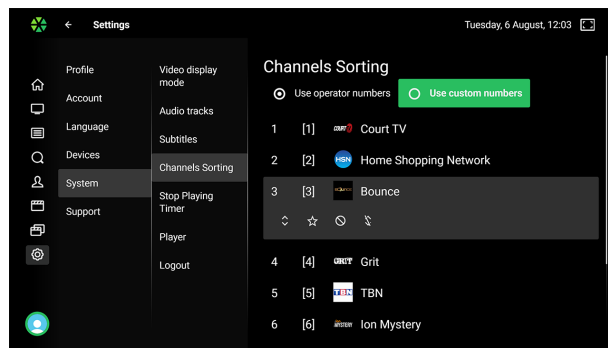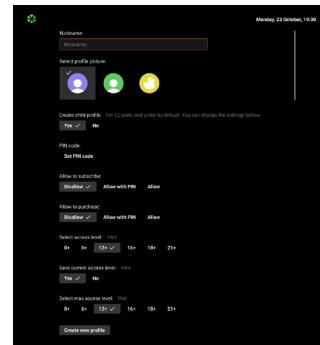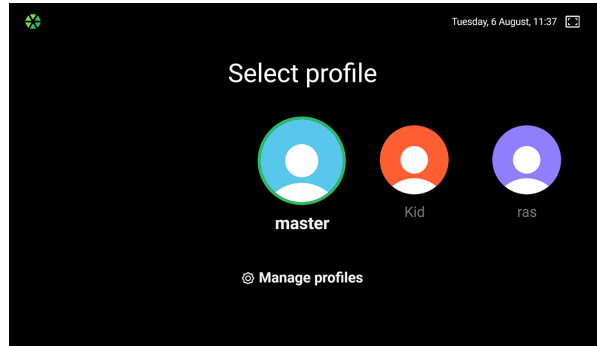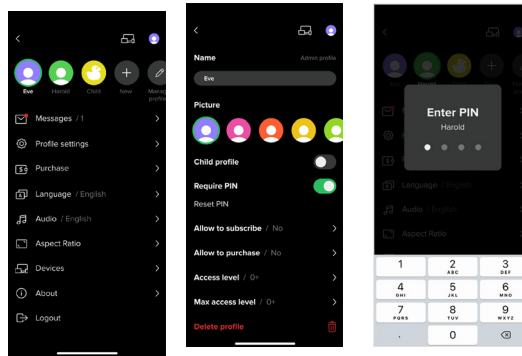
Profile general settings

Kids profile gives parents control over their children's viewing experience. In addition to the maximum age level for TV channels and VOD content, the Kids profile allows to manage the downtime interval and the daily viewing limit.
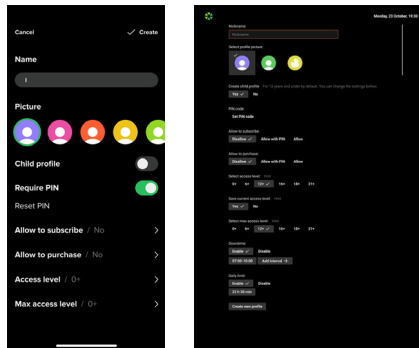
Kids profile settings

System Settings

Users can access various system settings, including time-zone correction, UI language, audio/subtitle language prioritization, timer to stop playback when idle, video aspect ratio, and player menu auto-hide timeout. Support page provides information for contacting operator and sending reports for technical analysis.
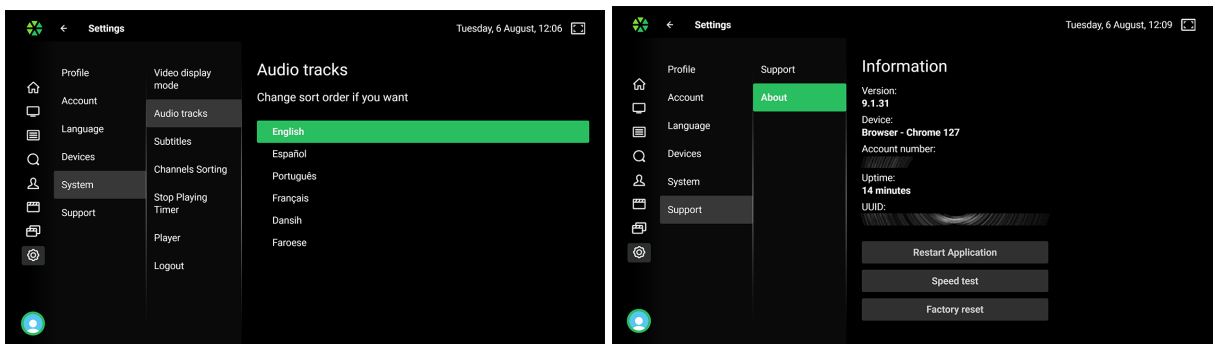
STB users have additional options:

- Reset to factory settings

- Firmware update

- Standby timer

- Video/audio output format

- Network settings

Supported Devices

SmartTUBE solution supports a wide range of devices, allowing IPTV / OTT operators to reach a larger audience. The list of supported devices can be expanded through integration work. Below are the device requirements. 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.

Linux based STB

To run SmartTUBE App 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

Web Browsers

Web Browser	OS	Minimal version supported by the app	Minimal version supported by the app with Widevine DRM playback
Google Chrome	Windows / Linux / MacOS	⩾ 69	⩾ 128
Mozilla Firefox	Windows / Linux / MacOS	⩾ 100	⩾ 100
Microsoft Edge	Windows	all	⩾ 88
Apple Safari	MacOS	⩾ 11	Safari does not support Widevine DRM

We strongly recommend using installations with Widevine DRM enabled.

Support for other web browsers is on request.

Smart TV

- LG with WebOS 4.0 and later

  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 with Tizen OS

  SmartTUBE App support all model years available for publishing at the Samsung app store portal

- Hisense (VIDAA OS)

- Whale OS (https://www.zeasn.com/) — an operating system for Smart TV, which is now integrated into the products of many world-famous 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. See also the requirements for AOSP STBs.

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

- SmartTUBE App on AOSP devices can be installed as a Launcher.

Amazon Fire TV

- Amazon Fire TV Stick Lite

- Amazon Fire TV Stick

- Amazon Fire TV Stick 4K

- Amazon Fire TV Stick 4K Max

- Amazon Fire TV Cube

Support for Device Features

	Linux STB	Android STB	iOS	Android 5.0 and later	Samsung SmartTV (Tizen)	LG Smart TV (WebOS)
Multicast	Yes	Yes	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 Sender	No	No	Yes	Yes	No	No
Android/iOS native PiP	No	No	Yes*	Yes	No	No
Offline content	No	No	Yes	Roadmap	No	No

The PiP feature is available on iOS devices for HLS streams only.

Support for Content Delivery Protocols and DRM Systems

Device model / Technology	Widevine / DASH	PlayReady / DASH	FairPlay / HLS
Samsung Legacy (2012–2015 models)	No	No	No
Samsung Tizen (2015 and 2016 models without software updates installed)	No	Yes	No
Samsung Tizen (2016 models with software updates installed)	Yes	Yes	No
Samsung Tizen (2017 models and later)	Yes	Yes	No
LG NetCast (models until 2014)	No	No	No
LG WebOS 2.x (models until 2016)	No	No	No
LG WebOS 3.5 and later (2017 models and later)	Yes	Yes	No
SmartLabs STB, Android 5.0 and later	Yes	No	No
iOS 11 and later	Not recommended	No	Yes