



SmartTUBE 5. Solution overview

About this document

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This document contains a general overview of SmartTUBE 5, the multi-screen solution for delivering interactive TV services in IPTV, OTT and hybrid networks.

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1 Glossary

Term	Definition
IPTV	Internet Protocol television – Digital interactive television in IP data networks
OTT (Over-the-Top)	Way of delivering BTV and VoD in a public IP network (the Internet); good quality of video signal delivery is not guaranteed
Subscriber (or user) device	Device that provides a subscriber with access to IPTV/OTT service, for example an OTT STB, IPTV STB, web browser, TV receiver, SmartTV, iOS or Android tablet
STB	Set Top Box, TV receiver
Subscriber	User of IPTV/OTT services
Operator	Owner of the IPTV/OTT system, IPTV/OTT service provider
API	Application Programming Interface
GUI	Graphical User Interface
Meta data	Description of content, pricing plans, and service packages; information about accounts and system resource stored in the database of the IPTV/OTT system
Stream	Digital stream of video or audio for playback on an STB
Media content	A content unit, for example a movie, a music track, a TV channel or an image that is delivered to the subscriber within the IPTV/OTT service
VoD	Video on Demand, a service of delivering video content on demand
PVR	Personal Video Recorder (Classic) – the service of recording TV programs to a subscriber device for delayed playback. A subscriber creates a recording schedule based on EPG. A subscriber device must have a hard drive installed
nPVR	Networked Public Video Recorder (“network video recorder”) – TV program recording service through video servers (without saving of the content on the STB hard drive)
BTV	Broadcast Television
EPG	Electronic Program Guide

CAS	Conditional Access System – protection of content by requiring certain criteria to be met before granting access to this content
DRM	Digital Rights Management – access control technologies that are used to restrict usage of proprietary hardware and copyrighted works
OSS/BSS	Operation Support System/Business Support System – systems that are used to support a range of telecommunication services; provide full or partial automation of operations associated with delivery of such services
HeadEnd	A master facility for receiving television signals (DVB-S and analog TV broadcast) for processing and multicast distribution

2 Purpose

SmartTUBE 5 is a system that delivers and provides access to digital media content, i.e. Internet Protocol Television (IPTV) and Over-The-Top (OTT) services. SmartTUBE 5 allows operators to control access to services; it does not store any personal data or perform any functions of a payment system. SmartTUBE 5 is not a source of content broadcasting; other specialized hardware-software appliances are used for broadcasting TV channels and movies. The broadcasting technology in such appliances depends on the technology used by a certain subscriber device.

SmartTUBE 5 allows you to do the following:

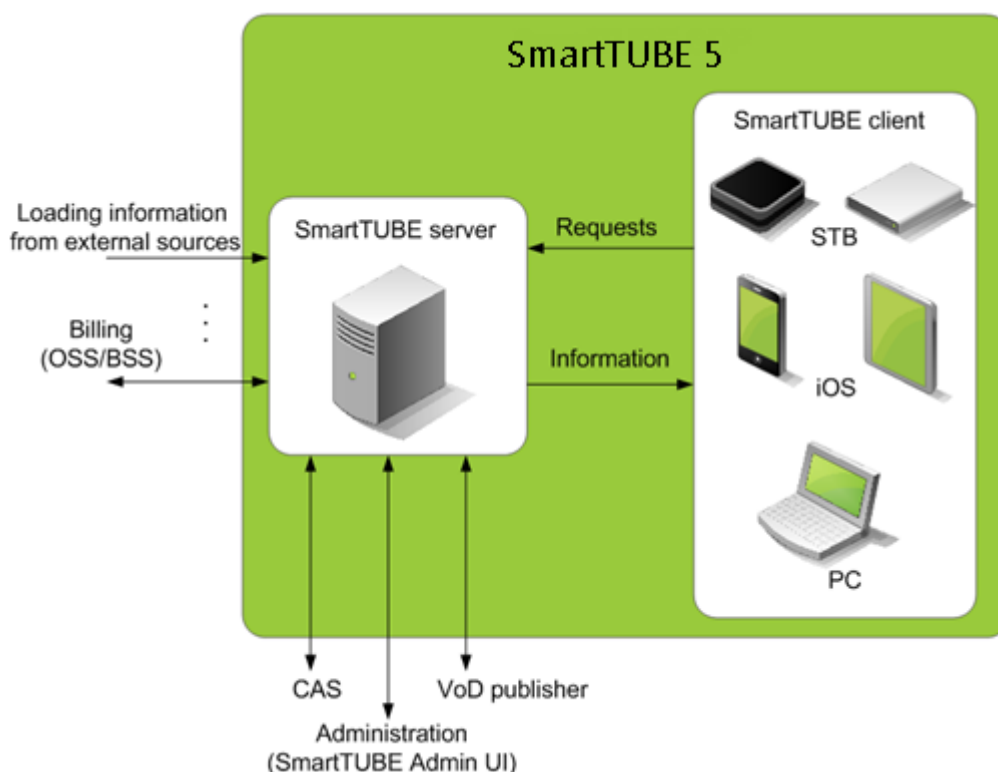
- ▶ catalog the digital content (TV channels, movies, TV shows, music, and more),
- ▶ create pricing policies and service packages,
- ▶ connect subscriber devices to the system according to your business requirements.

The system allows the operator to control subscribers' access to various services, keep a history of service consumption, and generate corresponding reports.

Service pricing is possible due to the special program interfaces (APIs) that ensure integration with telecommunications billing systems (TBS) and subscriber awareness systems. SmartTUBE 5 includes the database and the application server that communicate with compatible client applications for accessing the services. Service management on a client device does not depend on the technology used for delivering content to the subscriber device (convergency).

3 SmartTUBE 5 architecture

SmartTUBE 5 has a client-server architecture.



The system's backend (the SmartTUBE server in the figure) manages subscriber accounts, content and service packages description, pricing, i.e. implements the basic logic of service delivery. Client applications serve as a subscriber's interface for working with the IPTV/OTT system.

A subscriber uses client applications (the Client SmartTUBE in the figure) to send requests to the SmartTUBE server and get services. SmartTUBE 5 supports several types of client applications intended for various subscriber devices (for details see the section Subscriber Devices).

The SmartTUBE Server not only communicates with client applications, but also collects and processes data obtained from all system components. The server gets notifications about content publication, communicates with a billing subsystem, manages the conditional access system, loads information from external sources in order to provide information services.

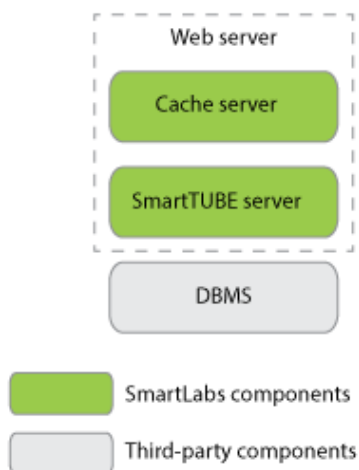
You can manage the SmartTUBE Server from SmartTUBE Admin UI, the web UI application.

The server uses the DBMS for storing data; this system is an integrated component of the core, though it is developed by a third-party software developer. For this reason the DBMS will be regarded as an external component of the IPTV system.

3.1 Server

The SmartTUBE Server has a three-tier architecture:

- ▶ Cache server. Responsible for caching the static data and creating responses with dynamic data.
- ▶ Middleware, the business logic level (application server).
- ▶ Database level (DBMS).



The web server performs a bulk processing of requests from subscriber devices and thus protects the application server from overloading. It can be a scalable cluster of web servers. A web server caches data of SmartTUBE system (channels, movies, services, EPG, etc.) that are sent to client applications on request; it creates responses to such requests dynamically taking into account the requested parameters (filters).

Static data change rarely. Such data include:

- ▶ Clip art (channel logos, movie posters, icons for weather and other services).
- ▶ Files of the SmartTUBE management interface Admin UI (cached optionally).

Dynamic data are updated frequently. They include:

- ▶ Electronic program guide (EPG).
- ▶ The contents of channel and VoD packages.
- ▶ News, weather forecast, exchange rates and other information services.

Software for the web servers is provided by third-party suppliers.

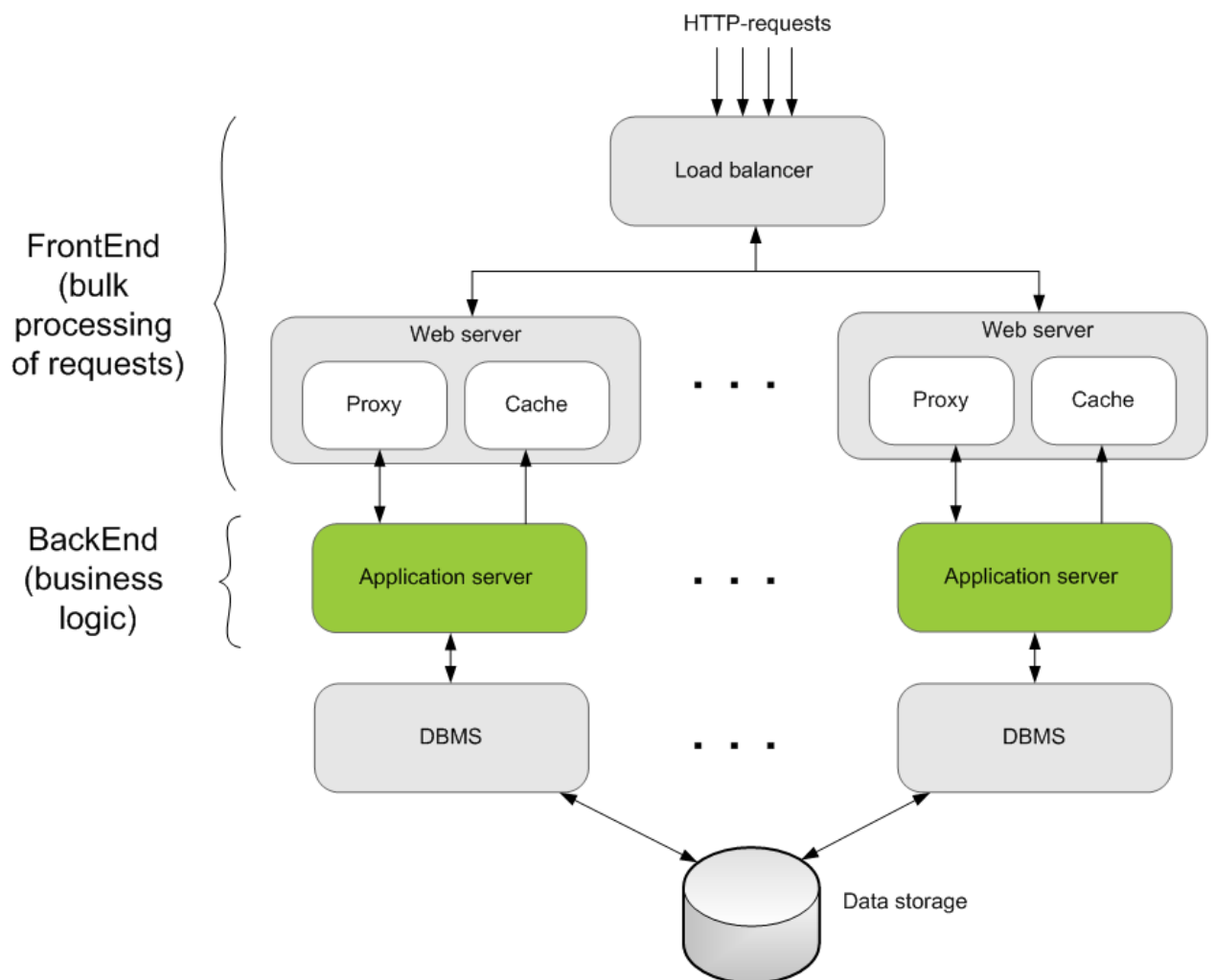
The application server implements the business logic of service delivery, management of resources and subscriber accounts in the IPTV/OTT system. The application server processes and loads the data received from SmartTUBE clients and external subsystems to the database; it also controls access to services. The application server periodically copies the data from the database to the system's cache servers, in order to

provide SmartTUBE customers with rapid access to the data. Business logic application (Middleware) is developed by SmartLabs.

The database server belongs to external subsystems and is provided by third-party software developers (PostgreSQL / Oracle). However, since it is closely linked with the application server, it can be considered as an element of the SmartTUBE server architecture.

A special component called a load balancer is used in a full-redundancy system for even distribution of load between two or more web servers. The balancer receives HTTP requests and distributes them between SmartTUBE 5 web servers.

Platform meta data is stored on the disk array (“Data storage” on the diagram).



Server components are installed on one or more physical servers. Although the system architecture is rigorously defined, installing the server part of Smart TUBE 5 system can vary in each specific case depending on the features of operator’s network infrastructure, its requirements to the price of the solution and other conditions.

You can manage the SmartTUBE server from the SmartTUBE Admin UI web application. It allows you to view resources of the SmartTUBE 5 system, create and manage accounts, work with pricing plans, etc.

3.2 Client

SmartTUBE Client has a three-tier architecture:

- ▶ Application Layer
 - Visualization Layer (GUI)
 - Data Layer
 - Player
- ▶ Hardware Abstraction Layer (the level of abstraction from the hardware)
- ▶ Hardware Layer

The application level is the highest implementation level, on which SmartTUBE client applications are developed. Client functionality is implemented on the application level, including the graphical interface, access to services, data exchange with the SmartTUBE server.

SmartLabs is responsible for client implementation on the application layer.

On the next level, base class libraries work closely with each other. These libraries are used in client applications development.

Client implementation on the hardware level depends on the hardware manufacturer (OEM – Original Equipment Manufacturer). STB API ensures interaction with an STB on the hardware level; the API is provided by device manufacturers. At the hardware level technical characteristics of the STB are defined, including interfaces, video processing capabilities, support for QoS, etc.

Schemes of SmartTUBE client architecture are provided for each device type in [Supplement 1](#).

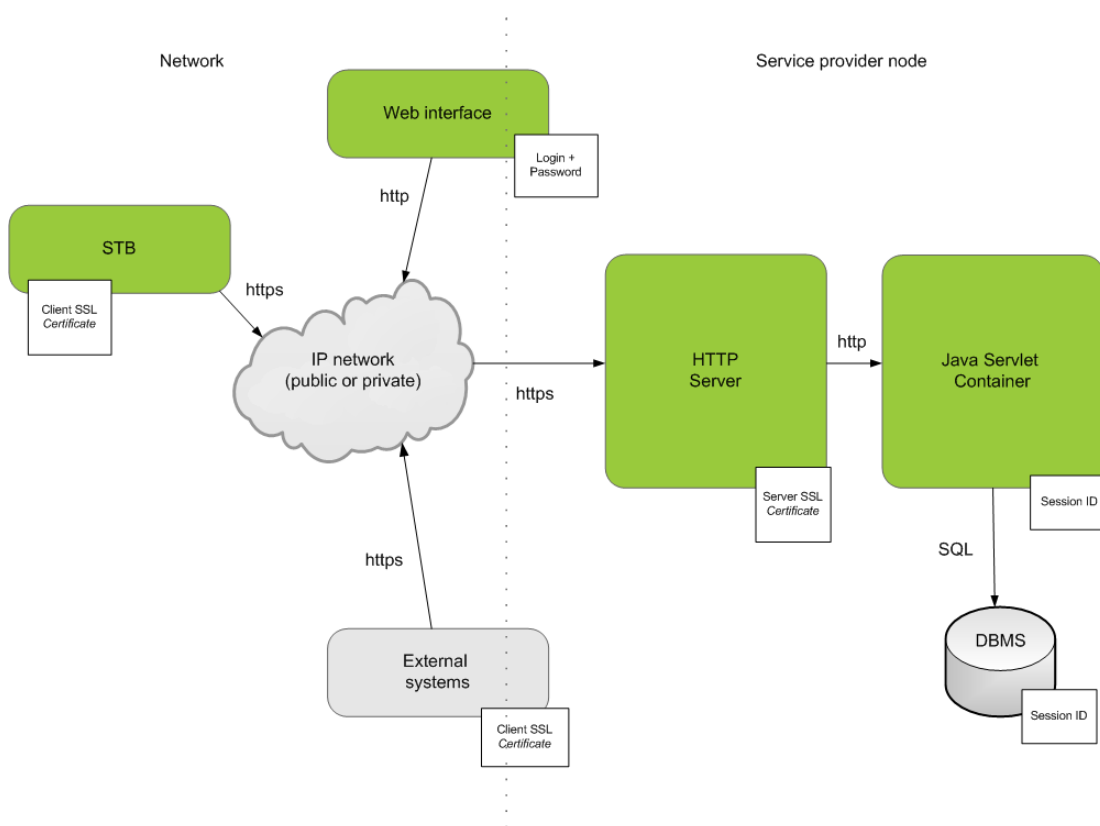
4 Security mechanisms

SmartTUBE 5 protects IPTV/OTT services and confidential information against unauthorized access at various levels:

- ▶ subscriber devices
- ▶ network
- ▶ access from the SmartTUBE Admin UI management application.

The following figure illustrates how all these mechanisms interact to ensure a high level of platform protection.


Session ID is a special ID that allows you to control SSL certificates that allow you to transmit data over HTTPS.



4.1 Protection of subscriber devices

To increase the security level of communication with subscriber devices, the following mechanisms are implemented in the SmartTUBE 5 system:

- ▶ **Device activation and user authorization.** Every time a subscriber device tries to connect to the SmartTUBE server, the system compares the device's MAC address and serial number to the values that were saved in the database at its activation. If the MAC address and serial number do not match, the device is prohibited to access the services.
- ▶ **Connection sessions management.** SmartTUBE 5 system uses special IDs for each session of connection to a user's device. Each connection session



lasts for a certain period of time, after which the session is closed and the SmartTUBE 5 system stops delivering information to a device. Such measures prevent lack of memory issues in STB devices.

- ▶ **Protection from duplication of STB.** STBs have a built-in protection against duplication, which prevents a possible forgery of these devices.

4.2 Secure access to SmartTUBE Admin UI

Secure access to the system management interface is ensured by the **Authorization** mechanism. To log on the SmartTUBE Admin UI application, you must enter the username and password. If the credentials are entered correctly, you get access to the services. Otherwise, access is prohibited.

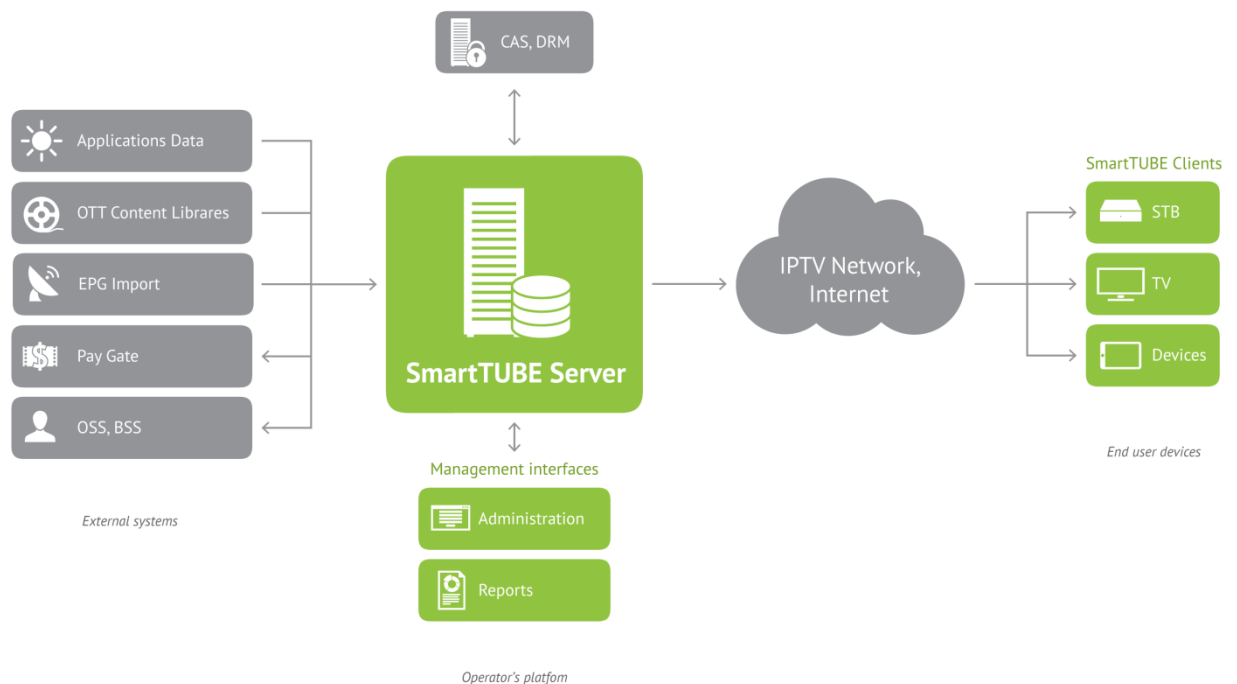
5 Geofiltering

The SmartTUBE 5 system allows you to bind system objects to a region. Thanks to this feature, you can meet the requirements of content providers to the distribution of their product in a particular region. In addition, regional binding enables you to determine whether or not some content (for example, a multicast stream with the specified TV channel) must be accessible in a given region.

6 Typical solution based on SmartTUBE 5

In a typical scheme of access to digital content (see figure), SmartTUBE 5 serves as the core that coordinates interactions between all the basic components of the IPTV/OTT system:

- ▶ source of streaming live content (HeadEnd)
- ▶ system for providing content on demand (CoD)
- ▶ conditional access system (CAS), which encrypts all content types
- ▶ automated billing system and subsystems OSS/BSS
- ▶ subscriber devices.

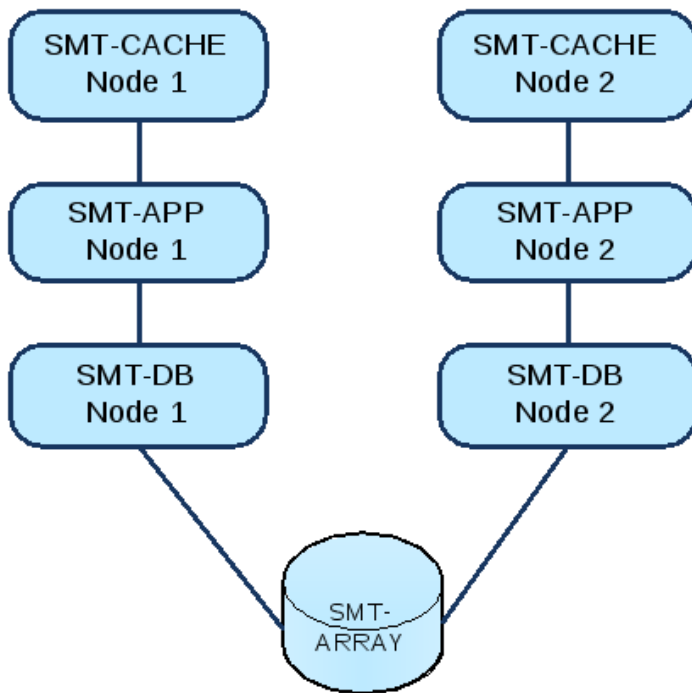


7 Hardware and software

In this section, you will find hardware requirements to the SmartTUBE 5 server and subscriber devices.

7.1 Server components

The figure shows a cluster-based (**Oracle 10G**) deployment of SmartTUBE 5 components. Hardware that meets maximum requirements can serve up to 200 thousand users.



Requirements to the technical characteristics of the system are subject to the following observations:

- ▶ It is assumed that a fully redundant system is being built.
- ▶ Hardware requirements are defined assuming that **Oracle 10G** software will be used.
- ▶ All servers must be running a 64-bit version of Red Hat Linux Enterprise 5.xx or CentOS 5.xx.
- ▶ If there are up to 5,000 subscribers, you can install the application server (SMT-APP) on one machine with the database server (SMT-DB).

Hardware of the characteristics given below is required to deploy the system that supports a certain number of subscribers, excluding redundancy components. Requirements to HP hardware are given as an example; you may use other equipment with similar configuration in your system.

7.1.1 Specifications in brief

SMT-CACHE: HP DL180, CPU QuadCore, RAM 8GB, HDD 2x300GB, 4x1Gb Eth

SMT-APP: HP DL180, CPU 2xQuadCore, RAM 12GB, HDD 4x300GB, 4x1Gb Eth

SMT-DB: HP DL180, CPU 2xQuadCore, RAM 12GB, HDD 4x300GB, 4x1Gb Eth

SMT-ARRAY: HP StorageWorks P2000, 12x146GB

7.2 Subscriber devices

You may use a wide variety of devices to access interactive television services via SmartTUBE 5 provided that the devices are manufactured according to international standards supported by the SmartTUBE 5 server. Your device may use IPTV, DVB or OTT technology for TV signal reception. For the services to be delivered to a device that you connect to SmartTUBE 5, the special client application should be installed on the device. The Operator's administrator can use SmartTUBE Admin UI administration web interface to view user profiles data and manage application settings.

SmartTUBE 5 delivers services via special client applications for:

- ▶ television set-top boxes (STB) Linux and Android
- ▶ desktops (Windows, macOS)
- ▶ iOS and Android mobile devices
- ▶ television receivers SmartTV.

The SmartLabs company has developed a client application SmartTUBE UI for all the devices listed above. All client applications by SmartLabs share common interface style, can be changed to match a different brand style or a corporate style of the operator.

Additionally, third-party client applications can be integrated with the SmartTUBE 5, for example, in order to provide services over the Internet (OTT):

- ▶ Third-party applications for mobile devices (iOS, Android).
- ▶ Third-party applications for SmartTV receivers.
- ▶ Third-party applications for web browsers.

Supplement 1. SmartTUBE UI architecture

