Smartlabs

SmartCARE
Streaming Quality Analysis System

Functionality Overview

Contents

1. Introduction

What's SmartCARE for?

The quality of video content delivery services directly depends on the quality of hardware performance on the operator's side and the quality of the access network on the subscriber's side. Network-level problems and problems on the operator's platform affect the service quality and can lead to image freezing, reduced image quality, frame loss, and etc. Eventually, this has a bad impact on the user experience and may lead to the service cancellation. SmartCARE makes it possible for the operator to continuously analyze the quality of content delivery and quickly respond to emerging problems.

Advantages

Integrated Monitoring System for IPTV and OTT

SmartCARE supports collection and analysis of data for both of these delivery technologies: in managed networks (IPTV) as well as over the Internet (OTT). It enables an operator to use a unified solution for any service provision options.

Preventive Detection of Problems

A unique feature of SmartCARE is the ability to detect potential areas of concern in advance. Using mathematical clustering techniques and decision-making algorithms SmartCARE is capable of online identification of dependencies (access networks, type of equipment, versions of applications, currently viewed content and many other parameters) for subscribers facing difficulties in obtaining services. SmartCARE analyzes this data and determines which subscribers with similar parameters are at risk. This data can be used to inform subscribers on possible problems and the ways to resolve them.

The Use of All Information Obtained

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SmartCARE uses both real-time data and all stored statistics, aggregating the entire information in a particular way for further prompt access.

SmartCARE provides real-time monitoring of current customer sessions and service quality (real-time monitoring, tracking).

And also you can filter and analyze the history of system events. For example, you can identify the decline in service quality by the average number of bitrate switches over a specified period of time: the fewer bitrate switches — the higher the quality.

Advantages of SmartLabs Ecosystem

SmartCARE is pre-integrated with SmartLabs products — SmartTUBE Service Deliver Platform (Middleware), SmartMEDIA (recording and streaming server) and SmartTUBE Clients (for STBs, mobile devices, Smart TVs and PC/Mac). This allows you to reliably collect and analyze the entire range of data from all supported systems right out of the box. In addition, the technical support operators can see the middleware-related information (subscriber ID, tariff plan, territorial location, etc.) right on the SmartCARE dashboard, which reduces the time to process subscriber requests.

Convenient Set of Tools

SmartCARE system makes the work of operations departments easier. Convenient and functional SmartCARE interface, which can be used by departments of monitoring, technical support as well as the team of service managers, makes it possible to timely identify the emergence and development of critical situations in the network and take measures to maintain the high level of service quality. The analysis of parameter dependencies for subscribers experiencing a deterioration in the service quality allows you to identify and eliminate problems quicker. The obtained data can be exported to CSV and PDF files as diagrams and tables.

Open API

The open API allows to connect any 3rd-party end-user devices, players, media streamers and CDN components without the involvement of Smartlabs engineers, if needed.

Modularity and Scalability

The use of the latest advanced data storage and processing technologies makes it possible for SmartCARE to build up a customer information system by adding extra system modules and data storing hardware almost without limits.

Accuracy and Completeness of Data

SmartCARE collects the data from client devices, operator platforms (recording, streaming, storage servers), OSS/BSS, and edge routers. As a result, you receive more accurate and detailed information on the quality of the digital TV services you are providing.

Quick Data Presentation

The data you requested is displayed in the interface very quickly regardless of the length of the time period you indicated in the filter. This is possible due to preliminary data aggregation by the SmartCARE system.

Key Features

- Working in IPTV / OTT networks
- Supporting SmartLabs infrastructure and capable of integrating in the outside infrastructure
- Supporting most customer premises devices
- Analyzing data collected from client devices, operator platform (recording, streaming, storage servers), OSS/BSS, and edge routers
- Analytics, monitoring, reporting tools
- Real-time monitoring

- Filtering events with accuracy to a specific subscriber

- Filtering data by time interval

- Setting up time interval for data aggregation

- Monitoring the quality of DASH, HLS, MSS streaming

- Creating custom dashboards

- Includes all key metrics for quality assessment (the list of metrics is continuously expanded)

- Timely and preventive notification on changes or problems in the system with the help of mathematical algorithms used for system behavior analysis

- Exporting data to CSV and PDF as diagrams and tables

- Creating reports on service consumption

- Role model of system users

Supported End-User Devices

SmartCARE can analyze data received from:

## Devices with SmartTUBE app Installed

- SmartLabs STBs & 3rd-party STBs

- Android / iOS mobile devices

- Smart TV (Samsung, LG, Hisense, etc.)

- Android TV devices

- PC / Mac

Other Devices

Any 3rd-party devices supporting the SmartCARE End-User Device API.

2. How does it Work?

SmartCARE system has a client-server architecture. The basic analytics data are collected from client devices and live streaming servers and forwarded to the SmartCARE server for processing. Based on the incoming data, the server controls the quality of the provided services and identifies errors that can cause complete image loss, its distortion, rippling or freezing.
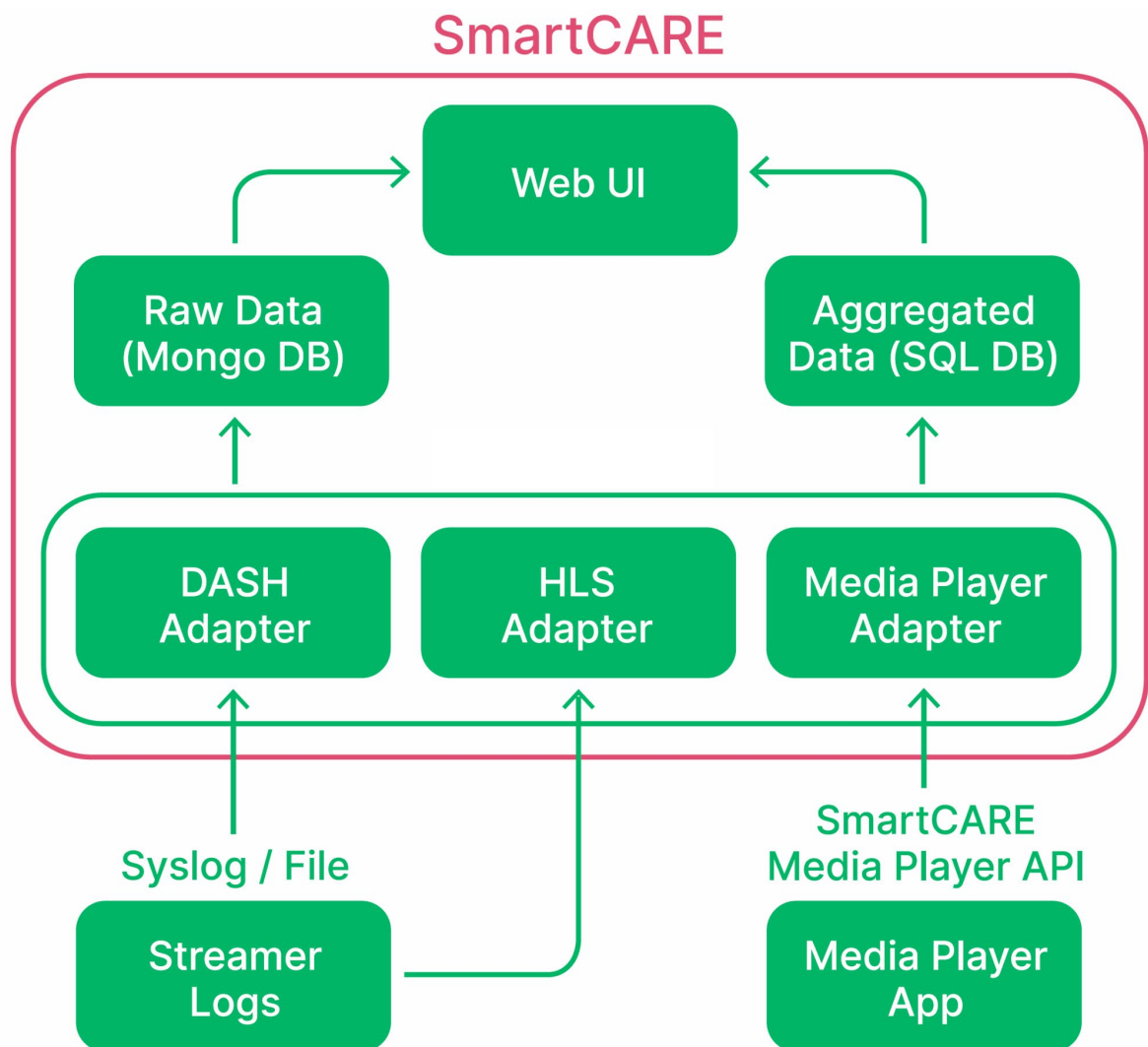
Methods of data collection by the SmartCARE system:

- API for client applications;
- Streaming servers' syslog data, transmitted via UDP;

- Data from Zabbix agents on the recording & streaming servers installed.

List of Metrics

The below metrics can be used for monitoring, analysis and reporting.

Monitoring client sessions

- Number of bitrate switches on client devices

- Maximum number of simultaneously active client sessions

- CPU and memory utilization on client devices (real-time and average)

- Number of content switches on client devices

- Number of client device authorizations

- Number of metadata loading errors on client devices (for example, errors when loading playlists)

- Number of chunk loading errors on client devices

- Average bitrate of content watching on client devices

Monitoring live streaming servers

- Average bitrate of incoming / outgoing streams with filtering by server's network interface

- Usage of server's network interfaces, i.e. average load on the interface (%) when processing incoming / outgoing traffic

- Average value of IOWait system parameter

Monitoring recording servers

- Number of errors in the source streams delivery with filtering by the recording server / channel and detailing each error

- Average bitrate of the source streams with filtering by the recording server / channel

Real time indicators

- Unicast & multicast session quality in real time

- Current number of unicast & multicast sessions

Abnormalities

- Summary of anomalies grouped by their probable causes

- Detailed list of subscribers with low average session quality

- Detailed list of errors related to the recording of source streams

Statistical Reports

- Number and duration of channel views in Live & TSTV modes

- Number of unique subscribers who watched a TV channel in Live & TSTV modes with detailed viewing duration

- Number of successful & failed authorizations of client devices

- Channel viewing statistics, detailed by unique client devices and the duration of viewing in Live & TSTV modes

Analyzed Events

Events from Client Applications

- Subscriber authorization attempt (successful and failed)

- Beginning of content viewing (channel, recorded show, movie)

- "Keep alive" event during content viewing (every 2–5 minutes, configurable)

- Start, stop, rewind, pause during content viewing

- Critical low memory

- Finishing of content viewing

- Changing the bitrate during content viewing

- Delay between the request for content and the beginning of its playback

- Start and end of stream buffering

- TV programs change

- Abnormal change in the CPU and memory load

- Abnormal change in the WiFi signal level

- Switch to / from standby mode (for STB)

- Internet connection loss

- Transition to the key Client UI sections (the amount of information on these events depends on the set detalization level of analyzing user's activity). For example:

    - main menu,

    - transition to the channel details (specifying the transfer point: from the channel list, recommendations, etc.),

    - transition to the movie details,

    - transition to the full screen viewing mode,

    - transition to the service management section,

    - transition to the settings section, etc.

Analysis of Streaming Server Logs

- Starting a stream playback

- Switching to another stream

- Bitrate switching (video / audio quality changing)

- Playlist uploading error

- Chunks uploading error

Analysis of Source Stream Recording Server Logs

- Source stream recording errors

Analyzed Parameters

Parameters within the Client Application Events

- Content ID (channel, program, movie, local file, external VoD content)

- URL of the external VoD content

- Type of content viewed (Live, nDVR, VoD)

- Number of frames with playback and decoding errors

- Event type and its time on the client application

- Frame rate

- Number of frames played

- Number of RAM page access errors

- Number of load buffer underrun events

- Content view start/end time

- Join time (the time between the content request and the content begins to play)

- Duration of the stream buffering

- Rewind start time, duration and direction (backward / forward) — for TSTV-programs

- Time of TV program change

- Stream bitrate

- Content viewing mode (online / offline)

- Result of content launching (successful or failed)

- Device ID (UID)

- Subscriber ID (SmartTUBE SDP account number)

- Device type (STB, iPad, Android, etc.)

- IP address of the subscriber device

- Version of the client application

- Geo ID received during the authorization (region ID in the middleware dictionary or from the geolocation system)

- Load buffer filling level

- Wi-Fi signal strength (for STB with Wi-Fi module)

- CPU and memory usage (for STB)

- Duration of Internet connection absence

- Amount of free space in critical directories

- Custom fields (up to 10, for optional parameters transmitting)

Parameters within the Streaming Server Logs Events

- Content ID

- URL of the content requested (playlist /chunk)

- Content request result (error or success)

- Amount of information sent to the client application

- Time the event was logged

- Stream bitrate

- Device ID (UID) — if it was sent in the HTTP request

- Subscriber ID (SmartTUBE SDP account number) — if it was sent in the HTTP request

- Full text of the client application User Agent string. Includes the following parameters:

- version of the client application,

- type of the subscriber device.

- IP address of the subscriber device

Parameters within the Recording Server Logs Events

- Hostname of the incoming streams recording server

- Recorded channel

- Recording error sign

- Full text of the log entry

- Bitrate of the recorded channels

Parameters from Zabbix Agents

- Average CPU IOWait of the monitored server (streaming, recording, storage, etc.)

- Incoming / outgoing bitrate of the monitored server network interfaces

- Inbound / outbound utilization of monitored server network interfaces

Parameters from Edge Routers

- Autonomous system IDs on the network section between the streaming server and the subscriber device

- Data route change time

Parameters from OSS/BSS Systems

- Subscriber ID in OSS / BSS

- Subscriber connection address
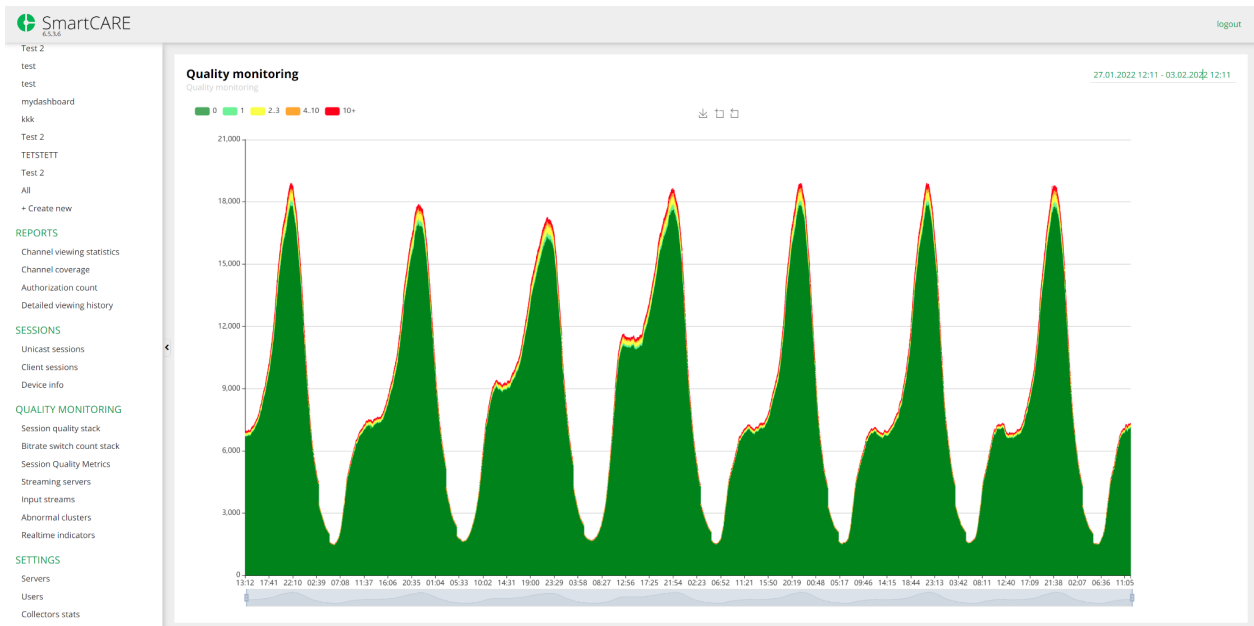
- Subscriber device type

3. SmartCARE UI

SmartCARE user interface is a dashboard that makes it possible to:

- View detailed statistics by subscribers, detailing up to the end user or group of users for any time period — from one minute to several months.

- Highlight problems reducing the service quality, with the information on problem scale and consequences.

- Set up a personal dashboard for monitoring service quality — collect the necessary set of diagrams and reports on a single page and preserve the established filters and dates.
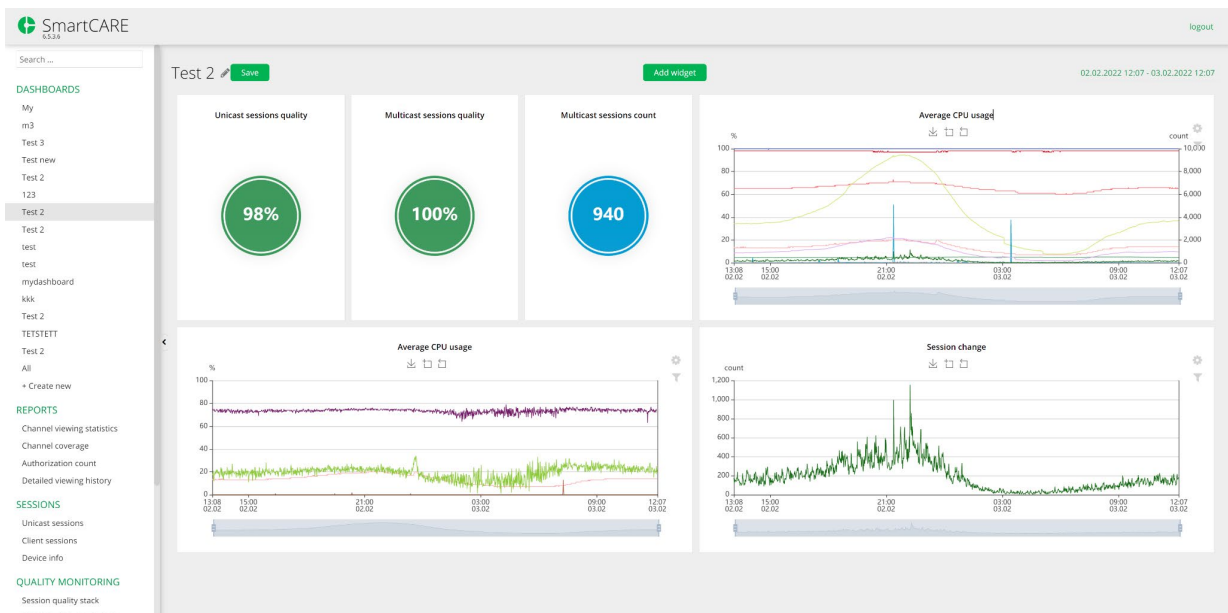
- Export data to CSV and PDF files as diagrams and tables.

- Apply a role model to distinguish SmartCARE users' access to data.