




# Remote Video Quality Box

A solution for analyzing quality of video  
seen on TV



Sudesh Sawant | Delivery Manager | [Sudesh.Sawant@LnTTechServices.com](mailto:Sudesh.Sawant@LnTTechServices.com)  
Varun Chavre | Project Manager | [Varun.Chavre@LnTTechServices.com](mailto:Varun.Chavre@LnTTechServices.com)  
Amarjit Prasad | Project Lead | [Amarjit.Prasad@LnTTechServices.com](mailto:Amarjit.Prasad@LnTTechServices.com)  
Pawan Kumar Dubey | Senior Engineer | [PawanKumar.Dubey@LnTTechServices.com](mailto:PawanKumar.Dubey@LnTTechServices.com)  
Kiran Mule | Senior Engineer | [Kiran.Mule@LnTTechServices.com](mailto:Kiran.Mule@LnTTechServices.com)  
Arjun Katyal | Senior Engineer | [Arjun.Katyal@LnTTechServices.com](mailto:Arjun.Katyal@LnTTechServices.com)



## Table of Contents

<b>Abstract</b>	03
<b>Keywords</b>	03
<b>Literature Overview</b>	04
<b>An Industry Perspective</b>	05
<b>Introduction to VAB &amp; VCB system</b>	06
<b>Video Capture Box (VCB)</b>	07
<b>Video Analysis Box (VAB)</b>	08
<b>Challenges</b>	08
<b>VCB &amp; VAB System flow diagram and Components</b>	10
<b>Results</b>	15
<b>Conclusion</b>	20
<b>Future Scope</b>	20
<b>Reference</b>	20
<b>About L&amp;T Technology Services</b>	21

## Abstract

This document presents a study on the L&T Technology Services' proprietary tool called "Remote Video Quality Box", a solution comprising of Video Capture Box (VCB) & Video Analysis Box (VAB) for effectively testing & analyzing video quality received on customer's TV which is routed via Multi-System Operators (MSO) like Comcast, Cox or Channel Broadcasters (CB) like STAR, FOX.

Video quality received on end customer's TV becomes important for MSOs and CBs to remain competitive in TV broadcasting industry, for channel TRP and to avoid lawsuits in consumer court for bad TV reception. Currently there are no effective ways to remotely test the video quality seen at end user TV and using our solution will avoid unnecessary visits at customer place to test video quality.

There are standalone video capture boxes available in market, but they are used mainly for recording games and movies and must be operated manually. They lack technology and features to be controlled remotely using automation and so are not very effective for our use case of helping MSOs and CBs monitor video quality seen on various channels at different time, in number of video capture boxes installed at select customer locations.

Our solution offers a lot many features like controlling the Linux based VCB from a remote location over cellular or Wi-Fi network which can receive and process capture request, an IR based communication between VCB and Set Top Box (STB) for changing channel, tapping video between STB and TV, uploading captured video on Azure cloud, statistical analysis of video captured from different VCB's and for different channels through VAB, generating detailed reports in WebUI and PDF formats.

Our system offers lot of scope for MSOs and CBs to implement new features based on their specific requirement and needs. The VCB easily integrate with market available STBs and communicate over cellular/Wi-Fi, hence making no difference to end customer experience while watching TV.

Our solution shall help global leaders in channel broadcasting business, multi-system operators, internet service providers as well as network infrastructure providers who are actively involved in providing digital content on TV like Comcast, Cox, Fox, Star, Cisco, Microsoft, Motorola, DirectTV, etc.

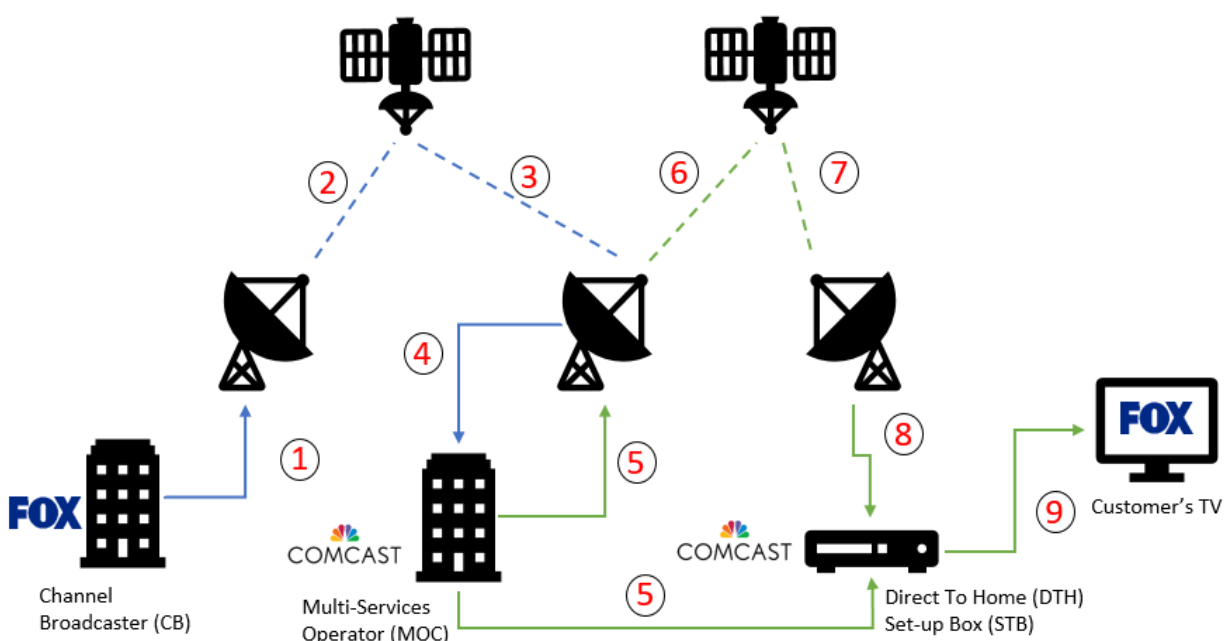
## Keywords

VCB	:	Video Capture Box
TV	:	Television
DTH	:	Direct-to-Home
STB	:	Set top box
VAB	:	Video Analyzer Box
MSO	:	Multi-System Operator
CB	:	Channel broadcaster
TRP	:	Target rating point
FTA	:	Free to Air
IR	:	Infra-Red
SBC	:	Single board component
C&S	:	Cable & Satellite

## Literature Overview

When it comes to channel broadcasting techniques/networks, we hear of Terrestrial networks and C&S (Cable & Satellite) networks. Terrestrial networks also known as Free to Air (FTA) broadcasts can be received by any simple TV antenna. On the other hand, broadcasting video from source to end customer's TV in C&S network is more complex as explained below [6].

A TV channel broadcaster in C&S network, transmits video signal to a satellite which then transmits it to a Multi-System Operator (MSO). All the channels broadcasted are encoded and can be decoded by MSO only. This is how payed channels are distinguished from free to view channels as free to view channels are not encoded, so anyone can receive it through common antenna. For payed channels, the signal are encoded and are decoded by MSO for further distribution via STB (Set top box) or local cable operators.



\* Logo of Comcast and Fox are trademarks of respective companies and are used here for illustration purpose only.

1. Channel Broadcasting house (CBs) records or stores video content which are connected to powerful transmitters via physical cables.
2. Video content from CBs are broadcasted to Satellites via powerful antenna over wireless transmission.
3. Video content transmitted from CBs are received by powerful receivers.
4. Received video content is sent to Multi-System Operators (MSOs) over wired channel.
5. Video contents is encrypted/modified by MSOs and are sent to STBs either by Cable or DTH.
6. Modified video content is sent to Satellite from powerful transmitters of MSOs.
7. DTH antennas receive the video content and send them to STBs.
8. Encrypted video content is received by STBs via wired connection and are decrypted to be sent to customer's TV.
9. Video content is sent to Customer's TV via HDMI cable or A/V serial cable.

## An Industry Perspective

MSOs, CBs, network infrastructure providers like Comcast [3], Time Warner [1], Showtime [2], DirectTV [4], Cisco, Motorola, Star channel and many more who provide on-demand movies & shows, paid streaming live games, HD content, DVR library, etc have lost millions of dollars in lawsuits for showing bad video quality, buffering and poor resolution on end customer's TV. Since there are so many nodes involved in transmitting video content from source to customers TV, it becomes very difficult to find the source (faulty component). CBs and MSOs blame each other for poor video seen by customers on their TV.

Conventional STB has either A/V ports or HDMI port. HDMI port has their own data encryption techniques and so it becomes difficult to tap audio/video from HDMI port and analyse it. Although there are tools available which can tap HDMI port to record videos and then softwares to analyze video quality, integrating them in a system which would enable client to remotely capture and analyse the video quality from remote location and to have a dashboard of such data from 100s VCB requires a lot of hardware and software changes.

To overcome this challenge and enable remote testing of video quality received on TV, L&T Technology Services have come up with a system mainly comprising of "Video Capture Box (VCB)" and "Video Analysis Box (VAB)". The VCB can not only tap HDMI to capture video, it also has a cellular modem or connectivity to WiFi making it remote operable. The solution will mainly help identify the probable cause which is hampering video/audio quality in the entire eco-system and will help to detect video loss at various hops. Getting the hardware placed at end customer locations with cloud interface will avoid frequent visit to customer's place.

Problems related to outage can be examined and solved more efficiently with our system in place [5]. Below screenshot was taken from [istheservicedown.com](http://istheservicedown.com), which has reports on outage on various satellite service providers in US. This report is generated based on user reports about outage from across the country. If we consider DirectTV as our client then, our system once installed in select customer's place can easily feedback Admin at DirectTV about the how worse is the video quality and help find the source of fault.

### DirecTV problems in the last 24 hours

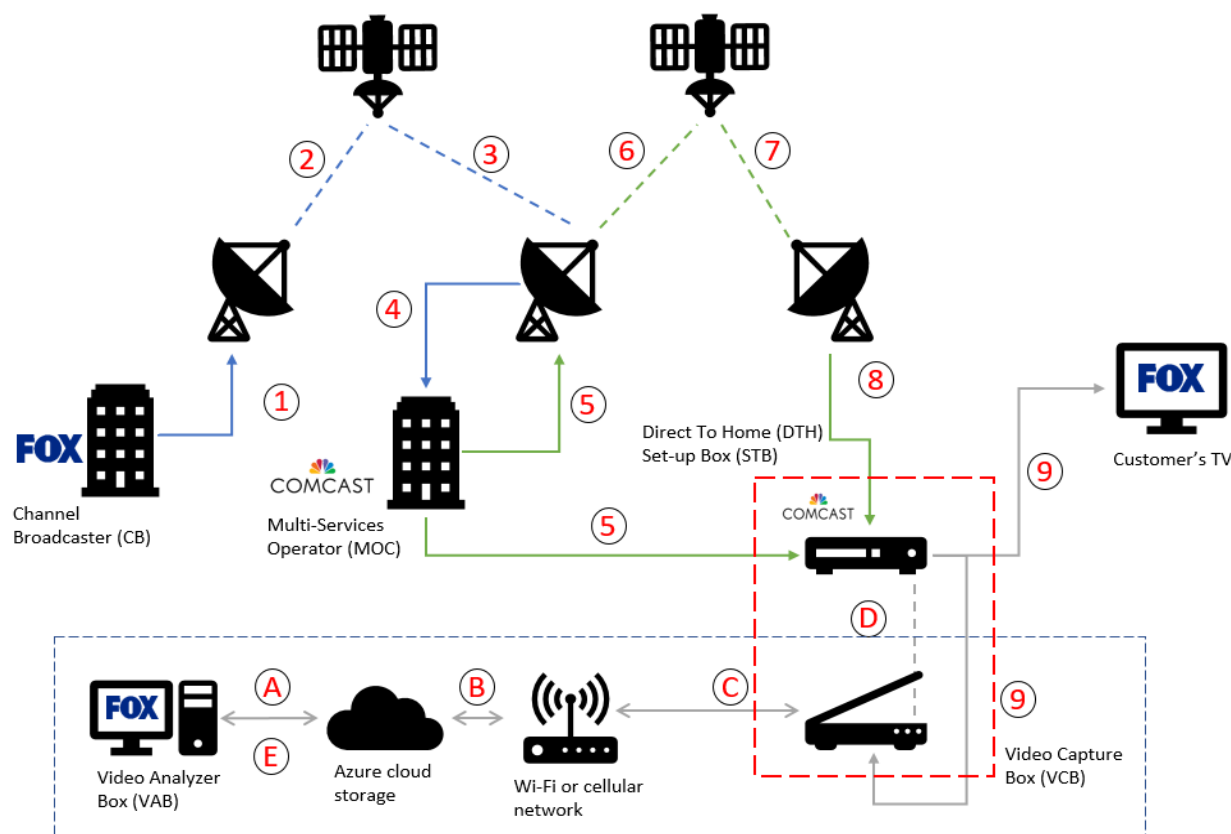


\* Image taken from <https://istheservicedown.com/problems/directv> for illustration purpose only.

## Introduction to VAB & VCB system

The system developed by L&T Technology Services integrates well with STB with only one additional box (VCB) to be installed at customer's place. VCB captures video samples of a channel by tapping the link between STB and TV. Video frames captured by VCB will be encrypted and then uploaded to Azure cloud server for analysis and quality rating.

Video Analysis box will be available at L&T's site or MSO/CB's preferred location which will download the videos available on Azure server. An automated script will decrypt the encrypted video frame and compare various properties of video quality based on threshold values set by MSO/CBs. The threshold of various quality parameters shall be easily modified based on source video quality broadcasted by MSO/CBs.



\* Logo of Comcast and Fox are trademarks of respective companies and are used here for illustration purpose only.

- Video Analyzer Box (VAB) at either L&T Technology Services facility or at MOC's location is used to send command (configuration file) with information on which channel to tap and how much duration of video to capture.
- The configuration file is matched to a VCB available in Azure cloud database and is sent to VCB over secure line.
- VCB upon receiving the command decodes the configuration file and executes it.
- Information on which channel to tune is sent to STB via IR blaster on VCB. After the channel is tuned, VCB captures the video for defined period of time and uploads the video on Azure cloud server via secure link.
- VAB will then download the captured video, decode it and analyze it for quality reporting.

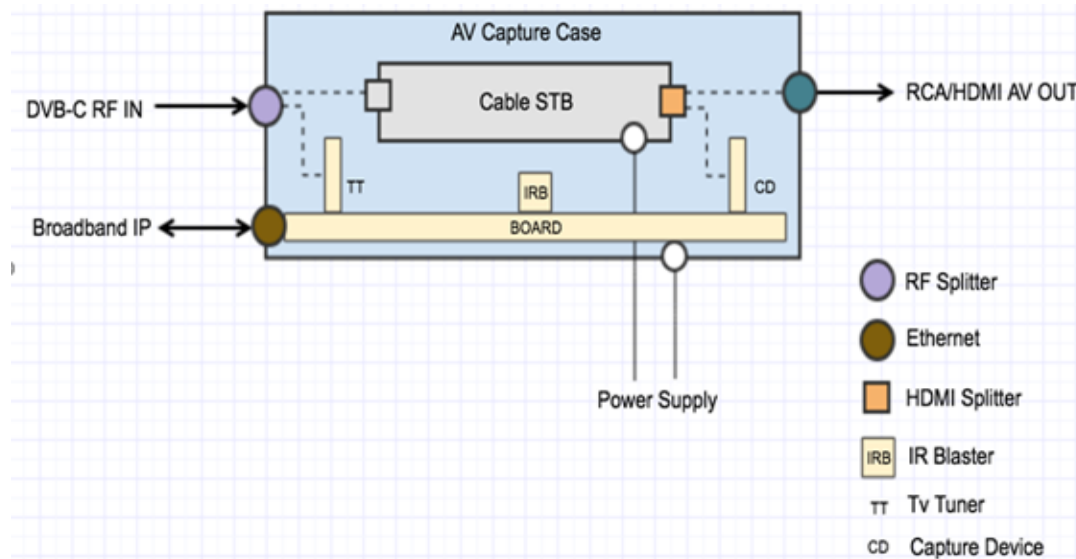
Some highlighted features of the system are listed below,

- Video Quality Testing solution is a Box that is deployed at end user location.
- Solution tests video quality from video output of STB devices.
- Test time selection has less interruption to the user.
- The solution Box is controlled remotely for tuning STB to required channel and record the video file.
- The offline quality analysis is done remotely.
- Dashboard summary provides quality score for each Box and each channel.
- MIS reports are published periodically.

The box will collect the video/audio data from DVB-C RF input to the STB and HDMI will video output from the STB. The same HDMI will to be sent to the customer TV connectivity as well. Data collected will be sent to the cloud and analyzed using L&T Technology Service's VAB.

## Video Capture Box (VCB)

Below block diagram shows as how Video Capture Box will be integrated with STB/Cable available at customer's place. VCB shall have a TV tuner, IR blaster, capture device, HDMI splitter, RF splitter and ethernet port / Wi-Fi / Cellular modem.



Following are the VCB components from hardware perspective,

- HDMI Capture box for tapping signals from STB. HDB-301L: USB 2.0 Video/Audio Capture Box with One Channel HDMI Input and One Channel HDMI Bypass Output, 1920x1080@30p, and H.264 Hardware Encoder
- IR Blaster for relaying commands from STB to TV via VCB. IR Blaster from Red Rat / IR Trans / Local IR Blaster
- SBC (Single Board Computer): CPU: Intel Core2 Duo or greater, RAM: 2GB or More, Flash: 32GB or more  
Wi-Fi support along with Ethernet, OS: Linux Ubuntu 16.04 or higher
- Data communication Modem / Module: Data only SIM (3G / 4G Data SIM) from local MSO.

## Video Analysis Box (VAB)

VAB will be available with Admin either at client location or L&T Technology Services place. It will have a Web based GUI from where Admin can control and maintain all the VCBs installed in field. On hardware front, VAB will have Linux based PC which will host video quality analyzing software module from Dektec.

Following are the hardware components on VAB (Video alalyzer box),

- LTTS Application Server  
Windows Server, CPU: Intel i7, RAM: 8GB, HDD: Min 512 GB SSD, OS: Windows 7 / 2008
- Audio – Video Quality Analysis tool: Qualess from Dektec
- LTTS FTP Server: LTTS FTP Server required for storing files copied from VCB.

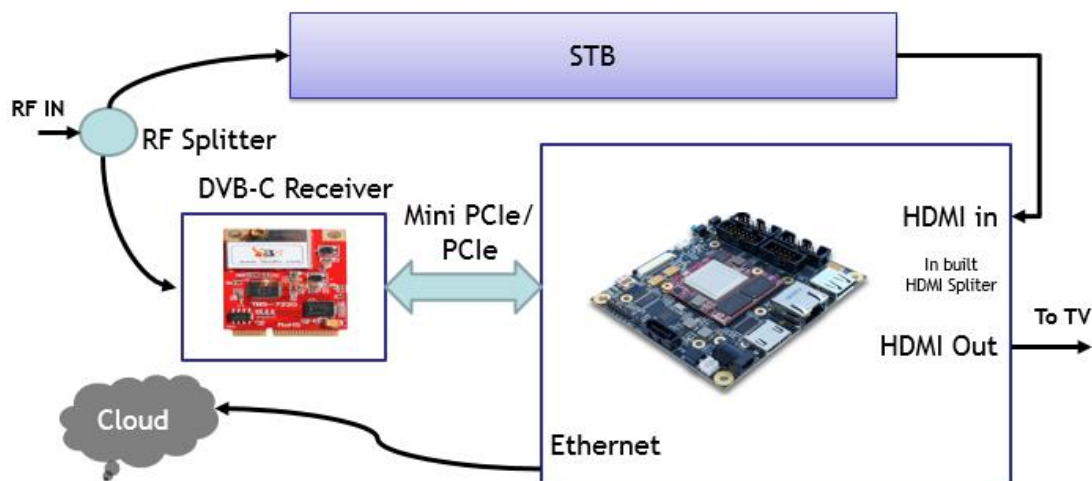
Following are the software components on VAB side,

- Web application to send test commands to any BOX in the field to start the test.
- Application to read files on LTTS FTP server for each BOX periodically or on request.
- Application to Analyze the video stream file for Video quality parameters for each BOX sequentially and generate summary based on quality score for each video file.
- Web application having dashboard to show status for each BOX and for each Channel to highlight three types of results Good / Average / Bad.
- Application to publish MIS report over email, periodically or on request.

## Challenges

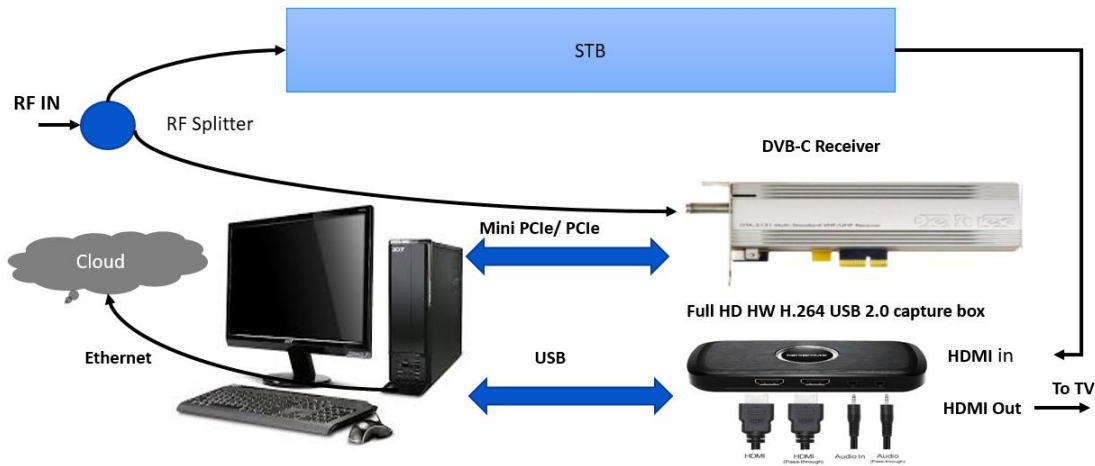
One of the major challenge was to design a new IR blaster hardware which will be used for relaying channel change request from VCB to STB. Other challenges included designing the single board component (SBC) and a PC based solution to implement the system at customer's place. Below are the block diagrams for SBC and PC based approach we are using for implementation.

**SBC Approach (iMX6 TinyRex):**



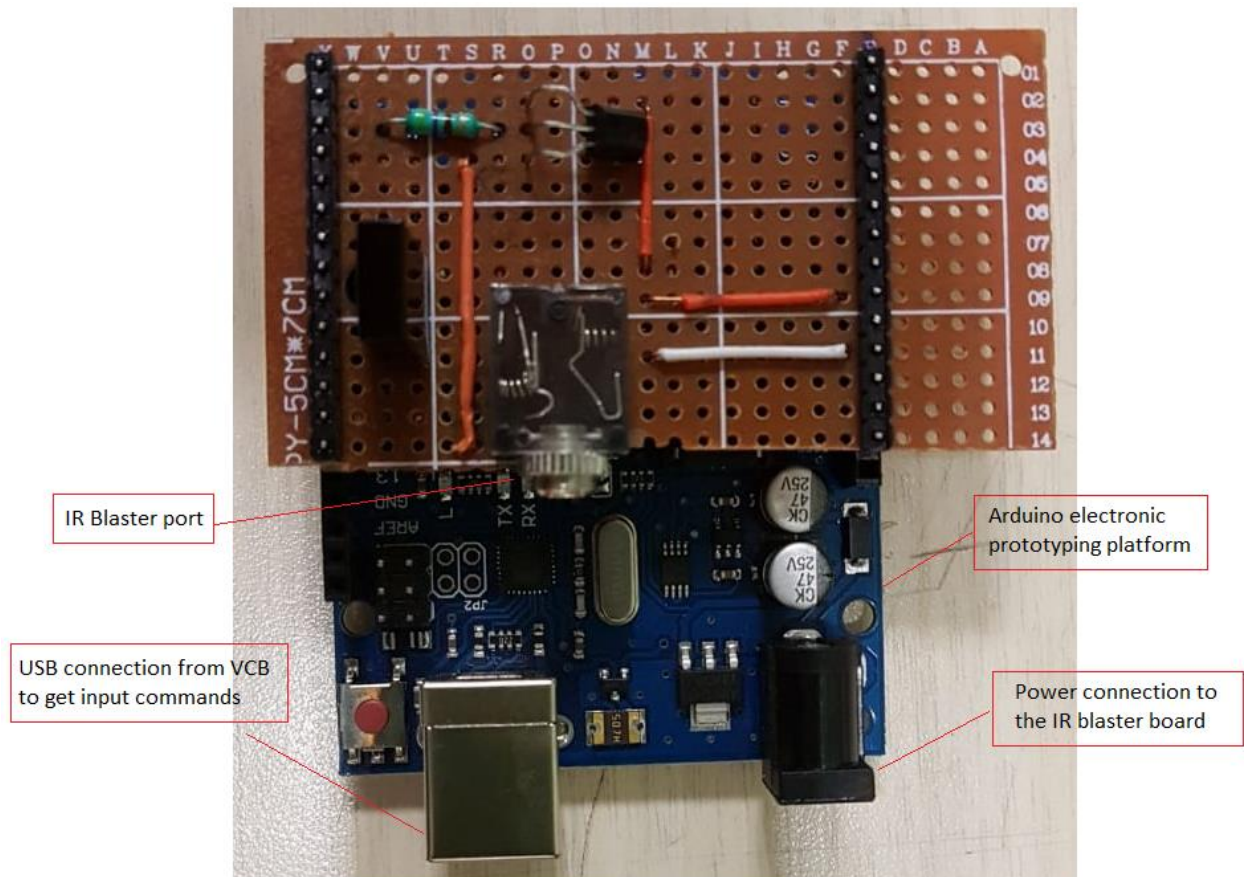


### PC based Approach:



### IR Blaster:

The IR Blaster module is an inhouse developed hardware which is used for relaying channel info from VCB to STB. Below is the HW prototype developed by L&T Technology Services,



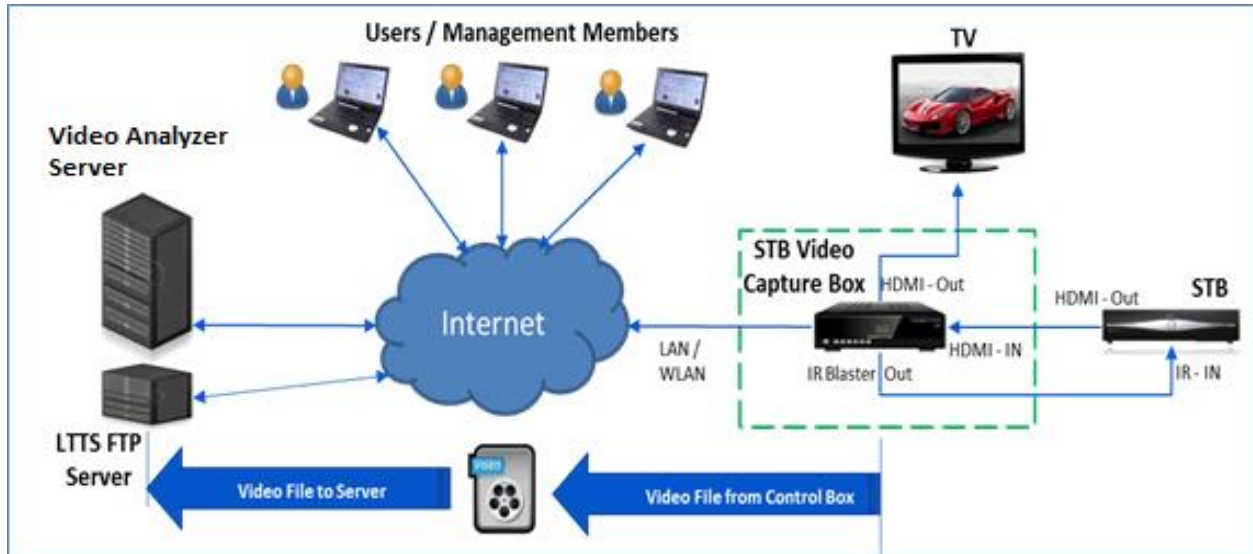
On Software front, it mainly consists of 2 main parts:

1. Remote control mapping of remote keys to their hex code in JSON dictionary format
2. Sending of hex-codes corresponding to the requested channel number to the STB for tuning

## VCB & VAB System flow diagram and Components

The system's control flow is as described below

- A box with HDMI input and output captures Video stream from STB HDMI output
- Box connected to Data Network to push captured video stream file to LTTS FTP Server
- VAB server to fetch video from FTP server for further analysis.
- VAB server will process the captured video files for AV quality Analysis and publish MIS report to MSO/CBs



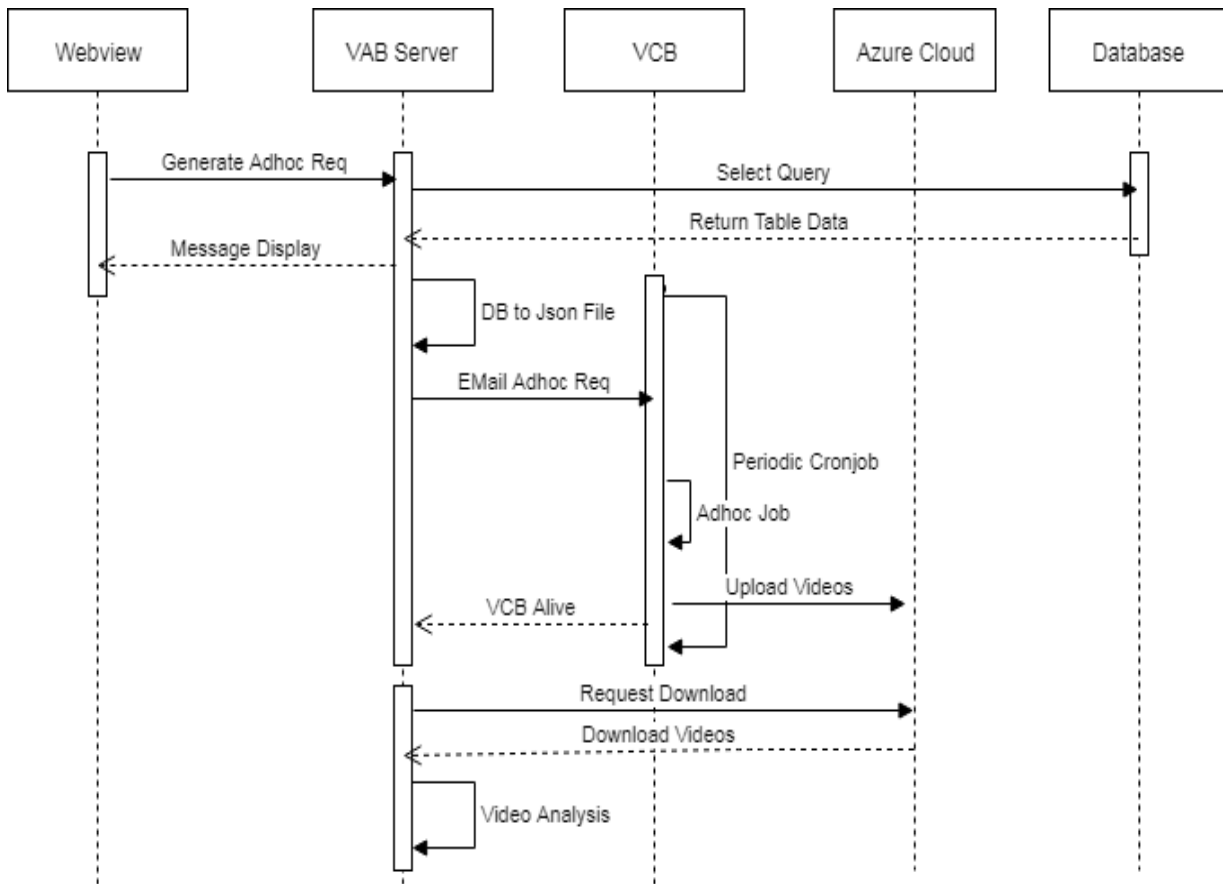
Complete system is controlled and monitored over secure link and VCB integrates well in the system by having its own modem for cellular/WiFi. System administrators or MSO/CBs needs to send command to VCB over secure link with information on channel, capture duration, format, Audio/video to be captures in short a "Config file". The VCB extracts the parameters from the email sent. Cron job scheduling checks for the presence of new scheduled requests at an interval of 2 minutes and at the time scheduled executes the job requested. The Arduino module (IR Blaster) uses the channel number from the argument, extracts the hex-codes for each digit in the channel number specified from a JSON database and tunes the STB to the requested channel.

This system maintains a database of channels with preferred configurations from CBs and MSO, which enables Admin to initiate record requests quickly. New channels with their configurations can easily be added in database via web based graphical interface developed on VAB.

The System supports various types of record request execution process,

1. Adhoc request : Record requests which Admin can initiate at any time.
2. Periodic requests : These requests are executed periodically once initiated.

Below is the flow diagram for an Adhoc request sent by Admin (L&T Technology Services or MSOs or CBs) with a config file to tune TV to a particular channel and record video/audio for a period.



Database unit maintains channels records with mappings to different STBs. The entries can be modified and if required new channels can be added in database as well. Storing such information in database helps to send record request in a faster way.

**L&T Technology Services**  
**VAB Web Admin** WELCOME, 298610. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home · Mainapp · Channel\_Details

Select channel\_ details to change Add new channel in database

Search:  Search

Action:  Go 0 of 4 selected

CHANNEL ID	CHANNEL LOGO	CHANNEL NAME	VIDEOCON	TATASKY
11114	viva	viva	0	0
11113	STAR_SPORTS	Star Sports	102	202
11112	STAR_NEWS	Star News	101	201
11111	STAR_PRAVAAH	Star Pravaah	100	200

4 Channel\_Details

**FILTER**

By channel logo

- All
- STAR\_NEWS
- STAR\_PRAVAAH
- STAR\_SPORTS
- viva

By channel name

- All
- Star News
- Star Pravaah
- Star Sports
- viva

By videocon

In this flow, Admin will have access to “WebUI” from where Adhoc request are generated for a VCB. The record request is sent to VAB database to get the mapped VCB device ID/address to which Adhoc request must be sent.

**L&T Technology Services**  
VAB Web Admin

WELCOME, 298610. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home > Mainapp > VCB\_Execution\_Details

Select vc b\_ execution\_ details to change

ADD VC B\_ EXECUTION\_ DETAILS +

Q [ ] Search

Action: **VCB ADHOC REQ** Go 9 of 9 selected

BOX ID	CHANNEL ID	RECORD TIME	DELAY	VIDEO FORMAT	EXEC TIME
VCB_002	11113 Star Sports	55	54	.mpeg	12:05:48
VCB_003	11113 Star Sports	11	3	.avi	10:51:31
VCB_003	11111 Star Pravaah	13	5	.mp4	13:25:31
VCB_003	11112 Star News	18	3	.mpeg	16:04:33
VCB_003	11111 Star Pravaah	15	3	.avi	17:42:11
VCB_001	11113 Star Sports	19	1	.avi	14:27:39
VCB_001	11112 Star News	16	2	.avi	11:13:55
VCB_001	11111 Star Pravaah	5	7	.mpeg	17:24:00
VCB_002	11112 Star News	12	2	.mpeg	12:01:19

9 VCB\_Execution\_Details Save

**FILTER**

- By channel id
  - All
  - 11111 Star Pravaah
  - 11112 Star News
  - 11113 Star Sports
  - 11114 viva
- By box id
  - All
  - VCB\_001
  - VCB\_002
  - VCB\_003
- By record time
  - All
  - 5
  - 11
  - 12
  - 13
  - 15
  - 16
  - 18
  - 19
  - 55
- By delay

VAB then sends the configuration file as an email attachment to the identified VCB. The VCB will process the configuration file and will send tune command to STB via IR blaster for tuning to requested channel and record for the said period. Recorded video is then uploaded to Azure via either inbuilt cellular connectivity or WiFi/Ethernet.

Focused Other Filter

Next: No events for the next two days. Agenda

VCB\_001 VCB\_ADHOC\_REQ 11:09 AM

Tet Automation 11:08 AM

Tet Automation 11:08 AM

Tet Automation 11:04 AM

**VCB\_001 VCB\_ADHOC\_REQ**

TA Tet Automation  
Wed 6/27/2018 11:09 AM  
To: Tet Automation

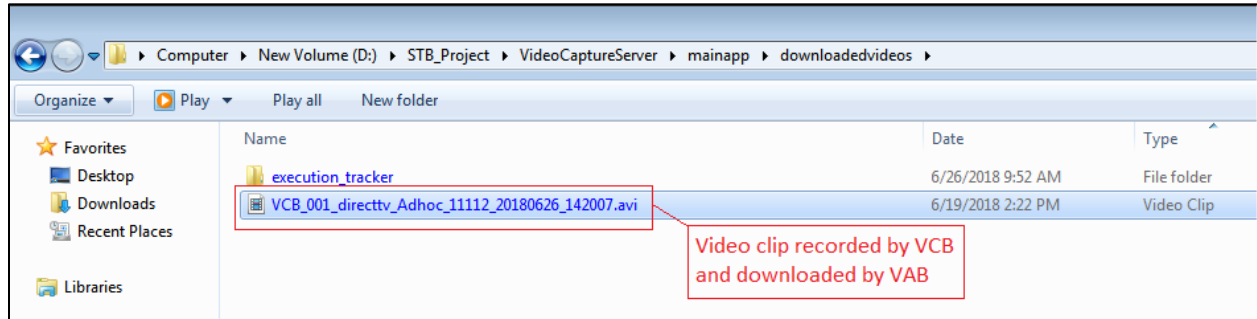
VCB\_001\_VCB\_ADHOC\_REQ... 630 bytes

Download

Hello,Thanks and regards,Automation Team, L&T Technology Services, This is Auto generated mail .. Please do not reply

Configuration file for Adhoc request received by VCB as email attachment

Once the record request is executed, VAB can request for downloading the video from Azure server. The downloaded video will be analyzed at VAB for quality ratings based on various video parameter threshold values set by MSO/CBs.



VCB can also be set to record video frames periodically, preferably at night time so user experience is not hampered. The periodic record request flow diagram is very similar to the Adhoc request we saw above. The advantage of having periodic request is that admin can set these requests to run overnight and next day can download all videos for quality rating.

Now coming to the report generation algorithm, VAB will tag events for various parameters while analyzing video based on threshold defined by MOS in the system. Below is an example of such configuration file which can easily be modified in VAB.

```
##### LOGGING_EVENT #####
LOGGING_EVENT/QUALIFY_VIDEO_PARAMETER_BLACK           : >,50
LOGGING_EVENT/QUALIFY_VIDEO_PARAMETER_FREEZE         : >,70
LOGGING_EVENT/QUALIFY_VIDEO_PARAMETER_BLOCKING       : >,60
LOGGING_EVENT/QUALIFY_VIDEO_PARAMETER_BLURRING      : >,60
LOGGING_EVENT/QUALIFY_VIDEO_PARAMETER_BRIGHTNESS    : >,85,AND,>,70
LOGGING_EVENT/QUALIFY_VIDEO_PARAMETER_CONTRAST      : <,70,OR,>,60

##### WARNING_EVENT #####
WARNING_EVENT/QUALIFY_VIDEO_PARAMETER_VIDEO_LEVEL_MIN : >,80
WARNING_EVENT/QUALIFY_VIDEO_PARAMETER_VIDEO_LEVEL_MAX : >,75
WARNING_EVENT/QUALIFY_VIDEO_PARAMETER_SUPER_CHROMA   : >,80
WARNING_EVENT/QUALIFY_VIDEO_PARAMETER_BRIGHTNESS    : >,80
WARNING_EVENT/QUALIFY_VIDEO_PARAMETER_CONTRAST      : >,75
WARNING_EVENT/QUALIFY_VIDEO_PARAMETER_VIDEO_QUALITY : <,75

##### ALARM_EVENT #####
ALARM_EVENT/QUALIFY_VIDEO_PARAMETER_BLACK           : >,90
ALARM_EVENT/QUALIFY_VIDEO_PARAMETER_BLOCKING       : >,90
ALARM_EVENT/QUALIFY_VIDEO_PARAMETER_BLURRING      : >,90
ALARM_EVENT/QUALIFY_VIDEO_PARAMETER_BRIGHTNESS    : >,90
ALARM_EVENT/QUALIFY_VIDEO_PARAMETER_CONTRAST      : >,90
ALARM_EVENT/QUALIFY_VIDEO_PARAMETER_VIDEO_QUALITY : <,90
```

For analyzing the video and generating reports, VAB will look for specific parameters from analyzer tool. These parameters shall be recommended by MSOs/CBs based on their quality standards. Below is an example of such configuration file which lists the video and audio parameters used by VAB.

```
#####
# Decoding Settings
# This is a file containing input parameters for the Qualify Analyzer.
#####

performance_priority      : 1      # Performance Settings
analysis_interval         : 0      # ALL_FRAMES = 0: analyse every frame,
                                # KEY_FRAMES_ONLY = 1: analyse key frames only
analysis_line_offset     : 0      # analysis starts from this line number and ends at (total_lines -
                                analysis_line_offset)

#####
# Video Analysis Parameter
#####

QUALIFY_VIDEO_PARAMETER_PIC_CODING_TYPE      : 1
QUALIFY_VIDEO_PARAMETER_IS_KEYFRAME         : 1
QUALIFY_VIDEO_PARAMETER_BYTES_PER_FRAME     : 1
QUALIFY_VIDEO_PARAMETER_BLACK               : 1
QUALIFY_VIDEO_PARAMETER_FREEZE              : 1
QUALIFY_VIDEO_PARAMETER_BLOCKING            : 1
QUALIFY_VIDEO_PARAMETER_BLURRING            : 1
QUALIFY_VIDEO_PARAMETER_DIGIBETA_ERR        : 1
QUALIFY_VIDEO_PARAMETER_DV_ERR              : 1
QUALIFY_VIDEO_PARAMETER_LINE_ERR            : 1
QUALIFY_VIDEO_PARAMETER_VIDEO_LEVEL_MIN     : 1
QUALIFY_VIDEO_PARAMETER_VIDEO_LEVEL_MAX     : 1
QUALIFY_VIDEO_PARAMETER_CHROMA_LEVEL        : 1
QUALIFY_VIDEO_PARAMETER_LINE_ERR_CHROMA     : 1
QUALIFY_VIDEO_PARAMETER_INTERLACE_ARTIFACTS : 1
QUALIFY_VIDEO_PARAMETER_BRIGHTNESS          : 1
QUALIFY_VIDEO_PARAMETER_CONTRAST            : 1
QUALIFY_VIDEO_PARAMETER_SUPER_BLACK         : 0
QUALIFY_VIDEO_PARAMETER_SUPER_WHITE         : 0
QUALIFY_VIDEO_PARAMETER_SUPER_CHROMA       : 0
QUALIFY_VIDEO_PARAMETER_FIELD_ORDER         : 1
QUALIFY_VIDEO_PARAMETER_FRAME_FIELD_ERROR   : 1
QUALIFY_VIDEO_PARAMETER_FLASH_STROBE_ERROR  : 1
QUALIFY_VIDEO_PARAMETER_VIDEO_QUALITY       : 1

#####
# Audio Analysis Settings
#####

audio_integration_time    : 10 # integration time in ms
QUALIFY_AUDIO_PARAMETER_LEVEL_DBFS : 0
QUALIFY_AUDIO_PARAMETER_MUTE       : 0
QUALIFY_AUDIO_PARAMETER_NO_AUDIO   : 0
QUALIFY_AUDIO_PARAMETER_FRAME_CLIPPING : 0
QUALIFY_AUDIO_PARAMETER_SAMPLE_CLIPPING : 0
QUALIFY_AUDIO_PARAMETER_CHANNEL_SELECT : 0
```

## Results

VAB, after analyzing the video clip will generate a web-based report comprising of summary report and a detailed report. The summary report will have info on Average quality index and number of events triggered while analyzing the video. Detailed report will have values of each parameter analyzed in the video along with warning/alarm events.

Based on client requirement this dashboard can be modified to present comparison graphs of video quality for a channel seen on various STBs. There is no limit in representing the data once it is available from video analyzer.

### Dashboard with jobs scheduled:

Below is the dashboard for when the jobs are not executed. The list updates as the state of job execution changes from Not Ready to Not Yet Executed to show the results. Reports can be filtered based on date, Box ID, Result, MSO ID and type of request (Periodic/Adhoc).

**L&T Technology Services**

### Execution Report on VAB Server

Below report contains all the execution information available on VAB Server and existing media streams on Cloud which are yet to be processed for media quality analysis

[Home](#)

Adhoc Request  Periodic Request

Date Range : 07/05/2018 - 07/05/2018

Search Reports

Search in results...

BOX ID	MSO ID	Type of Request	MSO ID	Time	Result	Detailed Report
VCB_002	directv	Adhoc	11112	2018-07-05 11:03:41	Not Ready	Not Ready
VCB_001	directv	Adhoc	11111	2018-07-05 17:42:11	Not Ready	Not Ready
VCB_002	directv	Adhoc	11113	2018-07-07 14:27:39	Not Ready	Not Ready
VCB_001	directv	Periodic	11113	2018-07-07 14:27:39	Not Yet Executed	Not Ready
VCB_001	directv	Periodic	11112	2018-07-07 16:04:33	Not Yet Executed	Not Ready
VCB_003	sky	Periodic	11112	2018-07-07 16:04:33	Not Yet Executed	Not Ready
VCB_001	directv	Periodic	11111	2018-07-07 17:24:00	Not Yet Executed	Not Ready


## Dashboard with jobs executed:

Below dashboard shows jobs already executed and gives a comparative view where results from other VCB are also listed.

Report shall show data based on Web UI selection:-

1. Executed data present on VAB server.
2. Media files available on Azure but not yet processed.
3. Future execution files (Auto sense upcoming media stream up to one week from current date).

The dashboard indicates with color coding if result of video analysis was acceptable or not. Admin can then further look for detailed report which will have actual stats for number of warning/alarm/logging events reported.



### Execution Report on VAB Server

Below report contains all the execution information available on VAB Server and existing media streams on Cloud which are yet to be processed for media quality analysis

[Home](#)

Adhoc Request  Periodic Request

Date Range :

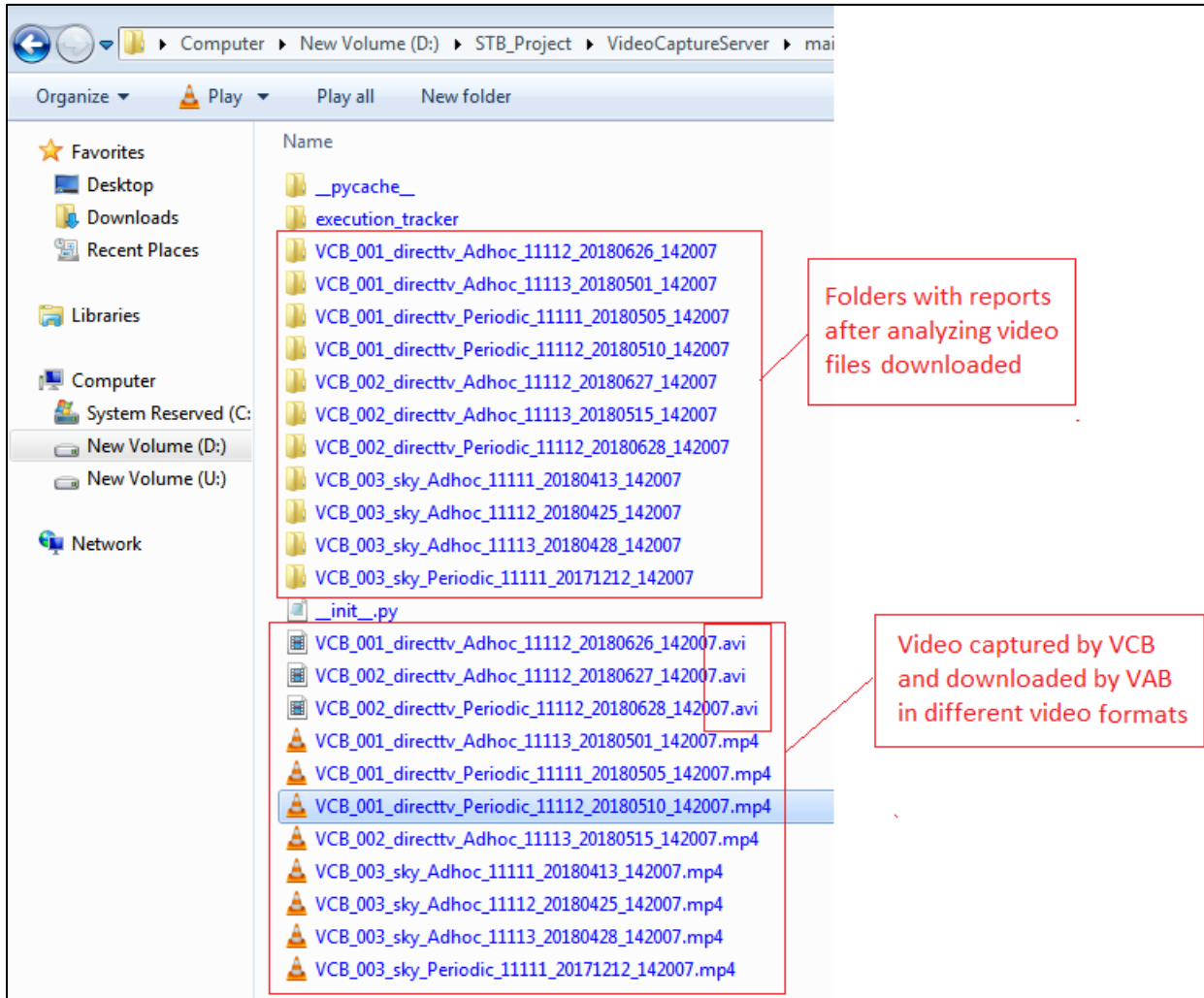
[Search Reports](#)

Search in results...



BOX ID	MSO ID	Execution Type	Channel ID	Execution Date Time	Result	Detailed Report
VCB_003	sky	Periodic	11111	2017-12-12 14:20:07	Good Quality	<a href="#">Detailed Report</a>
VCB_003	sky	Adhoc	11112	2018-04-25 14:20:07	Poor Quality	<a href="#">Detailed Report</a>
VCB_003	sky	Adhoc	11111	2018-04-13 14:20:07	Poor Quality	<a href="#">Detailed Report</a>
VCB_002	directtv	Periodic	11112	2018-06-28 14:20:07	Good Quality	<a href="#">Detailed Report</a>
VCB_002	directtv	Adhoc	11113	2018-05-15 14:20:07	Good Quality	<a href="#">Detailed Report</a>
VCB_002	directtv	Adhoc	11112	2018-06-27 14:20:07	Poor Quality	<a href="#">Detailed Report</a>
VCB_001	directtv	Periodic	11112	2018-05-10 14:20:07	Average Quality	<a href="#">Detailed Report</a>
VCB_001	directtv	Periodic	11111	2018-05-05 14:20:07	Poor Quality	<a href="#">Detailed Report</a>
VCB_001	directtv	Adhoc	11113	2018-05-01 14:20:07	Poor Quality	<a href="#">Detailed Report</a>
VCB_001	directtv	Adhoc	11112	2018-06-26 14:20:07	Average Quality	<a href="#">Detailed Report</a>
VCB_003	sky	Adhoc	11113	2018-04-28 14:20:07	Good Quality	<a href="#">Detailed Report</a>
VCB_002	directtv	Periodic	11112	2018-07-09 12:01:19	Media Capture Missed	Not Applicable



**Video downloaded and the analyzed video folders:**



**Detailed report template:**

Date:	07/20/18 17:48:56
Project:	VCB_001_directtv_Adhoc_11112_20180626_142007
Filename:	VCB_001_directtv_Adhoc_11112_20180626_142007.avi
Path:	VAB_Source:\VCB_001_directtv_Adhoc_11112_20180626_142007.avi
Time of Analysis:	00:00:08
Version:	QScan 3.1.0.0   AS11 1.0.2   PSE 1.1.0

Status: analyzed		
28(50)	2(302)	0(0)

PASS WITH WARNING

Based on Events generated mainly Warning and Critical, VAB decides if the video quality was acceptable or was very poor. Below report gives a summary of the thresholds set by MSOs or CBs for analyzing the video seen on TV. Stream information in the report generated summarizes number of logging, warning or critical events hit during analysis. Report is generated on Web UI in HTML format and can be downloaded in PDF format for sharing.

File Info										
Container	File Size	Format Profile	Format Version	Timecode						
avi	4 MB (3890394 B)			00:00:00:000	0	0	0			
Program 1										
Status										
analyzed										0 0 0
Stream 1										
Codec Name	Duration	Resolution	Frame Rate	Bit Rate	Display Aspect Ratio	Coded Aspect Ratio	Pixel Format			
Windows Media Video 7	00:00:10	640x480	(30.00:1)	2992417	0:1(0.00:1)	0:1(0.00:1)	yuv420p	0	0	0
Ch. 0			28(50)		2(302)		0(0)			
Loudness Audio Grouping ( Loudness I: )										
Syntax Errors										
			0(0)		0(0)		0(0)			
Analysis thresholds										
logging	Highest Chroma Level between of 449 (10-bit scale) and 493 (10-bit scale)							-		
logging	Lowest Luminance Level between of 56 (10-bit scale) and 64 (10-bit scale)							-		
logging	Highest Luminance Level between of 941 (10-bit scale) and 967 (10-bit scale)							50 frames in 28 events		
warning	Lowest Luminance Level between of 4 (10-bit scale) and 56 (10-bit scale)							301 frames in an event		
warning	Highest Chroma Level between of 493 (10-bit scale) and 508 (10-bit scale)							-		
warning	Highest Luminance Level between of 967 (10-bit scale) and 1020 (10-bit scale)							A frame in an event		
critical	Highest Chroma Level greater than 508 (10-bit scale)							-		
critical	Highest Luminance Level greater than 1020 (10-bit scale)							-		
critical	Lowest Luminance Level lower than 4 (10-bit scale)							-		

More detailed report with info on each frame analyzed is also available on selecting the Macro program option in the Web UI report. Below is a sample report which shows the frames in which warning are generated when the measured parameter crossed the threshold defined in VAB.

Logs are also generated for debugging and are stored in a folder where the video is stored.

Macros	
Program 1	
Severity	Description
Logging	<p>Highest Luminance Level between of 941 (10-bit scale) and 967 (10-bit scale)</p> <p>Start TC: 00:00:00:000 (0)</p> <p>Duration: 00:00:00:066 (2 frames)</p>
Warning	<p>Lowest Luminance Level between of 4 (10-bit scale) and 56 (10-bit scale)</p> <p>Start TC: 00:00:00:000 (0)</p> <p>Duration: 00:00:10:033 (301 frames)</p>
Logging	<p>Highest Luminance Level between of 941 (10-bit scale) and 967 (10-bit scale)</p> <p>Start TC: 00:00:00:133 (4)</p> <p>Duration: 00:00:00:033 (1 frame)</p>
Logging	<p>Highest Luminance Level between of 941 (10-bit scale) and 967 (10-bit scale)</p> <p>Start TC: 00:00:00:333 (10)</p> <p>Duration: 00:00:00:066 (2 frames)</p>
Logging	<p>Highest Luminance Level between of 941 (10-bit scale) and 967 (10-bit scale)</p> <p>Start TC: 00:00:00:666 (20)</p> <p>Duration: 00:00:00:100 (3 frames)</p>
Logging	<p>Highest Luminance Level between of 941 (10-bit scale) and 967 (10-bit scale)</p> <p>Start TC: 00:00:01:666 (50)</p> <p>Duration: 00:00:00:033 (1 frame)</p>
Logging	<p>Highest Luminance Level between of 941 (10-bit scale) and 967 (10-bit scale)</p> <p>Start TC: 00:00:01:733 (52)</p> <p>Duration: 00:00:00:033 (1 frame)</p>
Logging	<p>Highest Luminance Level between of 941 (10-bit scale) and 967 (10-bit scale)</p> <p>Start TC: 00:00:01:800 (54)</p> <p>Duration: 00:00:00:133 (4 frames)</p>

File Name	Date/Time	File Type	Size
89a2d556-e2ce-40a1-98c2-0c6ffec48c9b_alarm.log	7/10/2018 2:05 AM	Text Document	10 KB
89a2d556-e2ce-40a1-98c2-0c6ffec48c9b_logging.log	7/10/2018 2:05 AM	Text Document	33 KB
89a2d556-e2ce-40a1-98c2-0c6ffec48c9b_summary.log	7/10/2018 2:05 AM	Text Document	1 KB
89a2d556-e2ce-40a1-98c2-0c6ffec48c9b_video.bin	7/10/2018 2:05 AM	BIN File	113 KB
89a2d556-e2ce-40a1-98c2-0c6ffec48c9b_video.log	7/10/2018 2:05 AM	Text Document	20 KB
89a2d556-e2ce-40a1-98c2-0c6ffec48c9b_warning.log	7/10/2018 2:05 AM	Text Document	33 KB
analysis_settings.cfg	7/10/2018 2:05 AM	CFG File	3 KB
threshold_settings.cfg	7/10/2018 2:05 AM	CFG File	4 KB
VCB_001_directtv_Adhoc_11112_20180626_142007.avi	7/10/2018 2:05 AM	AVI File	3,800 KB
VCB_001_directtv_Adhoc_11112_20180626_142007.bat	7/10/2018 2:05 AM	Windows Batch File	1 KB
VCB_001_directtv_Adhoc_11112_20180626_142007_summary.html	7/10/2018 2:05 AM	Chrome HTML Docu...	2 KB
VCB_001_directtv_Adhoc_11112_20180626_142007_video.bat	7/10/2018 2:05 AM	Windows Batch File	1 KB
VCB_001_directtv_Adhoc_11112_20180626_142007_video_res.bat	7/10/2018 2:05 AM	Windows Batch File	1 KB
yourGUID0_format.bin	7/10/2018 2:05 AM	BIN File	2 KB
yourGUID0_format.log	7/10/2018 2:05 AM	Text Document	1 KB
yourGUID0_project.bin	7/10/2018 2:05 AM	BIN File	152 KB

## Conclusion

Our system shall effectively enable MSOs and CBs to remotely measure quality of service they provide to end customers and help to find & solve issues in their system. MSOs or CBs shall install this solution at select customer location to have a statistical data over the quality they offer in their services.

Painful way of frequently visiting customers place for validating video quality shall be replaced by just one box solution – VCB and video quality can be validated from a remote location via VAB.

// A Channel Broadcaster (CB) like FOX shall use this tool to check the quality of its video broadcasted via different MSOs like Comcast, Cox, etc.

// A Multi-System Operator (MSO) shall compare the quality of video it broadcasts for various channels.

If there are any issues with video quality on end customers TV, with our system in place it will be very easy to pin point the bug which can lie with CB's systems, MSO's systems or customer's TV.

## Future Scope

There is scope of further development in the system by adding new features like,

1. Firmware upgrade OTA
2. Remote debugging and monitoring of the devices
3. Control of devices from different geography

The framework is made flexible and scalable to cater to future video quality test requirements. The framework will not only test video audio quality from STB devices but also cater to same requirement from any entertainment device such as Hand-held cell phones, Tablets, OTT devices and HMI too.

Our system can be modified based on regional broadcasting technologies and specifications [7] making it an ideal solution for MSOs and CBs who are looking for delivering quality services to their customers around the globe.

## References

[1] Lawsuit against Time Warner Cable:

<http://nymag.com/selectall/2017/02/time-warner-cable-lawsuit-says-twc-lied-about-internet-speed.html>

[2] Lawsuit against Showtime:

<http://www.nydailynews.com/sports/more-sports/showtime-sued-poor-quality-mayweather-mcgregor-streams-article-1.3450081>

[3] Poor on-demand content on Comcast:

<http://forums.xfinity.com/t5/TV-Archive/Poor-on-demand-movie-streaming-Quality/td-p/2776136>

[4] Poor video quality on DirectTV:

<https://tvanswerman.com/2017/02/24/has-directv-now-reduced-the-picture-quality/>

[5] Service outage reports in the US: <https://istheservicedown.com/problems/directv>

[6] Techniques of TV broadcasting: <http://mib.gov.in/frequently-asked-questions-cas#q1>

[7] Broadcasting systems around the globe:

[https://en.wikipedia.org/wiki/Broadcast\\_television\\_systems#Digital\\_television\\_systems](https://en.wikipedia.org/wiki/Broadcast_television_systems#Digital_television_systems)



For more information visit us at [www.LntTechservices.com](http://www.LntTechservices.com)

Reach us at [info@LntTechservices.com](mailto:info@LntTechservices.com)



#### **ABOUT L&T TECHNOLOGY SERVICES**

L&T Technology Services Limited is a subsidiary of Larsen & Toubro Limited with a focus in the engineering services space, partnering with over 50 Fortune 500 companies. A leading pure-play Engineering, Research and Development services company, we offer design and development solutions through the entire product development chain, across various industries such as Industrial Products, Medical Devices, Transportation, Telecom & Hi-tech, and the Process Industry. We also offer solutions in the areas of Mechanical Engineering Services, Embedded Systems & Applications, Engineering Process Services, Product Lifecycle Management, Engineering Analytics, Power Electronics, Machine-to-Machine (M2M), and the Internet-of-Things (IoT).