Development of Image Comparison on PRISM Tracing Applications

Akshay T N

PG Student, Department of MCA, RV College of Engineering, Bengaluru, India
akshaytn.mca20@rvce.edu.in
Corresponding Author: Mr. Sharath Kumar J M,SQA Manager, TELESTREAM, Mission Road,
Bengaluru,India, sharath.jm@telestream.net

Abstract - *PRISM is a real time IP/SDI monitoring and analysis platform used in Live, Pre and Postproduction and It is mainly used in movie industry and supports the different SDI inputs and can access the PRISM remotely with the help of unique IP address and VPN perimeter therefore remote production is fully supported for PRISM. It supports customizable interface like 4 tiles and 8 tiles on the extended desktop and facility of dual screen, PRISM is a complete touchscreen enabled and user friendly provides an error detection. The PRISM product is sold at a competitive price which will be very helpful to the movie industry peoples with lots of apps supported, each app has its unique features and options in it, finally PRISM has many licenses if use wants specific apps,it supports two license – basic license and full (PROD) license with its unique software key.It provides high security for PRISM can be accessed only by the unique IP address of the device and a password and it will protect data against attacks and The PRISM product can be easily used by the customers and it's a user friendly, and the system can be easily operated with basic knowledge of the product. The accuracy of the bitmap comparison is 0.95 and it seems to be good, it will run easily on the chrome browser without any issues, and it can be easily remotely accessed and finally, the performance of the PRISM product is fast because when the user request something or done any operation on it will give the result in a fraction of minutes or even in some seconds.*
***Keywords****: PRISM, VPN Perimeter, Golden image, Threshold, Bitmap Comparison, PROD License.*

I. INTRODUCTION

It is a process of creating and implementing a test strategy and algorithm to test the stability and maintainability on daily basis of PRISM (Media analysis tool) by taking its screenshots and comparing them with reference golden images for a given threshold value and asserting the results in production environment.The tracing applications like Lightning, Vector, CIE, Stop Display and Diamond, Waveform app are the tracing applications in PRISM Device [14]. It is having Audio will be analyzed and supports the Dolby metadata which audio contains like speakers and headphones option.To understanding the working of waveform monitors and signal generators and the requirements to run the production environment, understand of the python test framework pytest and different types of software testing algorithms like unit testing, automation tests and manual tests, capture screenshots of real time feed on PRISM device using API and convert the image in appropriate format and dimensions to be ready for comparison, compare the captured screenshot with reference golden image using various python libraries like PIL, matplotlib and scikit learn and to determine the result of the tests by the output of the comparison based on given threshold, Run the tests in production environment on daily basis and varied parameters as defined on PRISM product and provide a stability report [2]. Whereas functional requirement will be like A PRISM, TG Signal generator, test environment, golden images and python libraries and similarly nonfunctional requirement is a valid and acceptable comparison threshold (90%), varied picture parameters to generate test cases will be done. Coming to the setup process of PRISM, SPG will be done then takes the screenshot with API and convert into an PNG format by cropping the dimensions also converting golden images to vector with calculating the threshold value by checking it is above 90% or below 90% and giving the test result and changing the formats of PRISM [8].
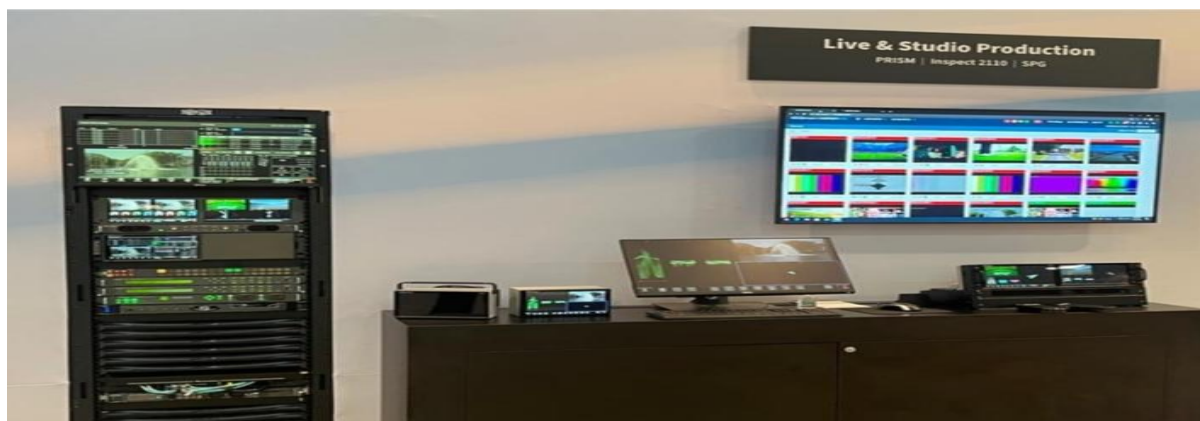
Figure 1: PRISM Device

Figure 1 is a PRISM device which is completely used in live and studio production purpose in a movie industry, which consists of 24 applications in it each applications has unique features and functions, and the cost of the PRISM will be sold at a very competitive price all over the world. Supports up to 8k resolutions and some still work is going on for improving furthermore on resolution aspect [2].

II. LITERATURE REVIEW

PRISM is one of the trending products in all over the world for movie industry because of its user-friendly nature and fast postproduction can be done in a simplified manner, it supports 4k and 8k resolutions it is one of the moving and trending resolutions for clarity aspect[1].

In image Comparison SSIM screencaps will be compared with the actual threshold value and asserting the result by comparing it for the result, Saving the golden image on failure, can get rid of this if it clutters saving screenshot will be used for this situation [2].

V Garousi et al. found that major commercial or open-source software nowadays includes automated test suites to verify its functionality. This is specially the case for software projects which evolve through many versions since automated testing pays off the most in the case ofregression and repetitive testing[5].

Eler et al. [11] proposed a method to visually analyze image collections. Their visualization method allows feature-based grouping and classification of images, but does not provide means to further inspect individual features.

Existing approaches for 2D comparative image visualization Eler et al. [11] proposed a method to visually analyze image collections. Their visualization method allows feature-based grouping and classification of images, but does not provide means to further inspect individual features.

Existing approaches for 2D comparative image visualization Eler et al. [11] proposed a method to visually analyze image collections. Their visualization method allows feature-based grouping and classification of images, but does not provide means to further inspect individual features Eler et al. Proposed a method to visually analyse image collections, their visualization method allows feature-based grouping and classification of images but does not provide means to further inspect individual features [6].

III. FUNCTIONALITIES OF THE TRACING APPLICATIONS

Lightning application: It displays the traces of lightning where it contains 3D LUT with disable and enable of the Line select feature for the app.Like bar targets, rec.709 and 2020 and different line selects, Some functionalities of the lightning app –

- Different bar targets 75% and 100%.
- 3D LUT on and off.
- Line selects to isolate and individual line within the image.
- Update/ change horizontal and vertical positions.
- Vertical var enable on and off.
- Gain and MAG adjustment function.

CIE application: The CIE display Contains the color space like 1931 or 1976 CIE.This indicator is used to check the chromaticity of the video signal and determine compliance with standard color space boundaries.To use the complete feature of CIE PROD license must be installed, Some functionalities of the CIE app –

- Different gamut mode.
- Different Trace appearance.
- Line selects for CIE application.

- Update/Change Colour space.
- Setting the basic formats [15].

Vector application: It displays and allows the user to adjust the Saturation and Hue of the colour components with adjustment of Gain, Different line selects can be enabled or disabled depending upon the requirement. Like different v gain and h gain with many options, Some functionalities of the Vector app -

- Setting 2110 IP Formats.
- 3D LUT on and off.
- Different bar targets 75 % and 100%.
- Setting the basic formats from TG8000.
- Setting 2110 IP Formats.

TG8000: It is a signal generator to the PRISM device where input format and resolution will be received to the applications, some functionalities of the TG8000 –

- Reference test signal generation.
- Setting structure and different Timing.
- Enabling and disabling the video.
- Signal Generation platform to the apps.
- Setting the signal and formats and sync pulse and timecode generation [1,3].

IV. PROCESS OF IMAGE COMPARISON ON TRACING APPLICATIONS

1. Importing the necessary python libraries
2. Creating the dictionary of golden images to the application
3. Defining the python fixtures to the application [11].
4. Defining the fixture for DUT, SDI router and for the generator, configuring the switches
5. Creating functions for comparing and creating the golden bitmaps
6. Adding python script for the functionalities or options of Tracing applications
7. Backup and PNG folder creation to save the screenshot of the tracing will be -

capture.save(current_working_dir + '/CIE/png/' + filename, 'png')
capture.save(current_working_dir + '/CIE/backup/' + filename, 'png'
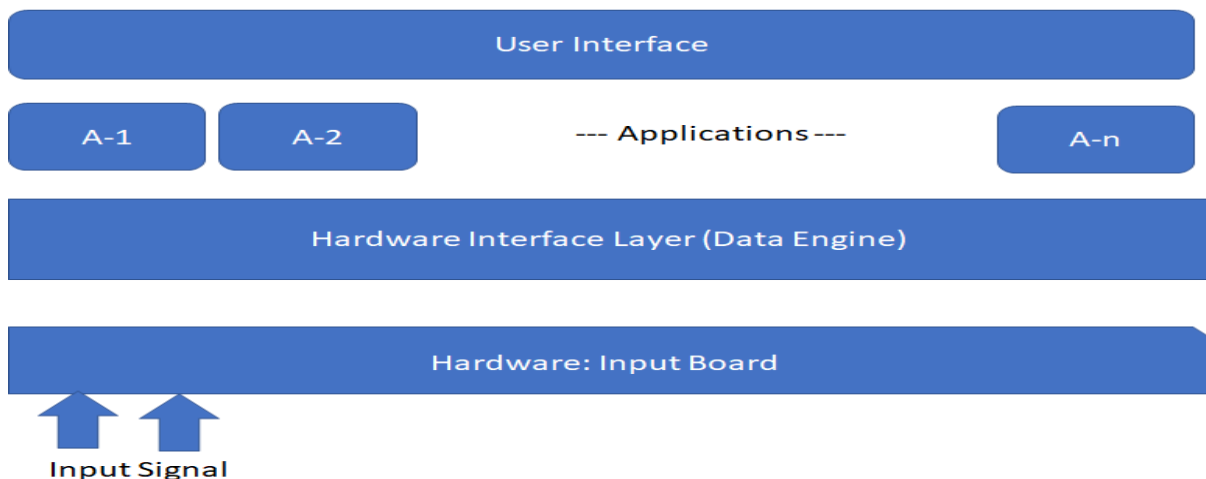
V. ARCHITECTURE DIAGRAM FOR SOFTWARE SIDE

Figure2: PRISM Architecture Diagram Software Side

Figure 2 is working of product it shows the high-level architecture diagramof a complete course of projects and processes andshows the overall architecture of the built system. the input signal will be given to the hardware board to receive the signal to the Prism applications, data engine will be the hardware interface layer and connected to an all 24 applications in PRISM device, finally at the highest layer user can directly interact with the device [8,9].
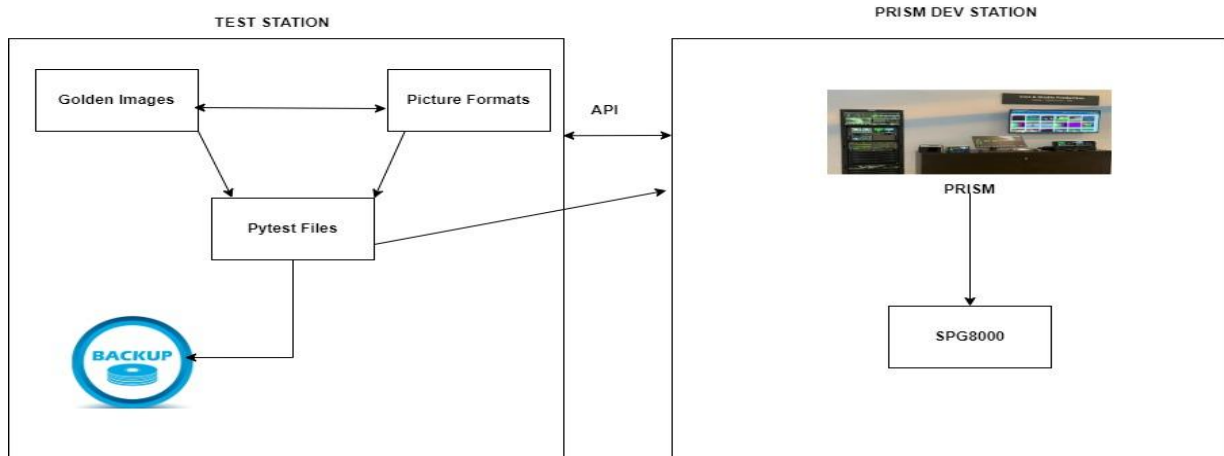
ARCHITECTURE DIAGRAM FOR IMAGE COMPARISON

Figure3: PRISM Image Comparison Architecture Diagram

Figure 3 shows the workingof test station and PRISM dev station where test station contains golden images, picture formats, pytest file and with the backup folder. Similarly, PRISM dev station contains PRISM and SPG8000. Backup folder comes to the picture when failure in the test that application PNG file will be stored in the backup folder and pytest files has a direct access to the backup folder. SPG8000 is used for video signal generator purpose which is used to send the signal, framerates, and structure to the PRISM device for different SDI inputs, golden images are the standard images were created at the starting of the script to compare with the result PNG images will use the create and compare bitmap function for this constraint [5]. Picture formats are directly sent to the pytest files depending upon the requirement of the picture formats that format will be applied in the SPG8000. The PRISM applications also contain an internal SDI generator to a particular single SDI input. In the image comparison user can set the picture format to the PRISM and PRISM has the option to set the format and frame rates, initially setup the PRISM and setup TG or SPG including the API take the screenshot and convert that screenshot into an PNG format, apply the bitmap comparison function for convert and compare with the vectors and finally generate the output based on the comparison. If the threshold is above 90% keep it and below 90% need to test again and report failure will be generated and if it is passed ready for next test, but SPG8000 can set only picture format to the device [2].

Table – 1: Supported Formats for PRISM Applications

Link	Format	Structure	Bits	Rate	Option
SD-SDI	525i	4:2:2 YCbCr	10b	59.94i	Base Instrument
	625i	4:2:2 YCbCr	10b	50i	Base Instrument
HD-SDI 23.98/24/25/ 29.97/30p, and psF	1920x1080	4:2:2 YCbCr	10b	50/59.94/60i,	Base Instrument
12800x720 29.97/30/50/ 59.94/60p		4:2:2 YCbCr	10b	23.98/24/25/	Base Instrument
3G-SDI Level A	1920x1080	4:2:2 YCbCr	10b	50/59.94/60p	Base Instrument
1980x1080		4:4:4 RGB	10/12b	23.98/24/25/ 29.97/30p	MPSDP-PROD
1920x1080 29.97/30p		4:4:4 YCbCr	10/12b	23.98/24/25	MPSDP-PROD
3G-SDI Level B	1920x1080	4:2:2 YCbCr	10b	50/59.94/60p	Base Instrument
1980x1080		4:4:4 RGB	10/12b	23.98/24/25/	MPSDP-PROD

29.97/30p

|						
Quad Link HD-SDI Square Devision29.97/30pand psF	3840x2160	4:2:2	YCbCr	10b	23.98/24/25/	MPSDP-FMT-4K
Quad Link 3G-SDI	3840x2160	4:2:2	YCbCr	10b	50/59.94/60p	MPSDP-FMT-4K
Level A,Square Devision29.97/30p	3840x2160 and MSDP-PROD	4:4:4	RGB	10/12b	23.98/24/25	MPSDP-FMT-4K

VI.   METHODOLOGY ADOPTED AND HARDWARE LIMITATIONS

- The scrum technique was used for the project since it is efficient and quick. At first, the module will be created in a more straightforward manner [3]. In the early stages, how the module needs to look and what needs to be built can be done, followed by the implementation of the application modules, and once review can be done and if everything is okay, deployment can be done. It will provide good value to the individuals throughout the completion/development of the entire project. The sprint cycle concept is used by And Complete. Several hardware restrictions include -
- Only SDI Port 1 can be used for the Eye and Jitter app.
- Only 10G of IP video can be supported by MMC-10 cards [1,9].

VII.   EXPERIMENT AND RESULT
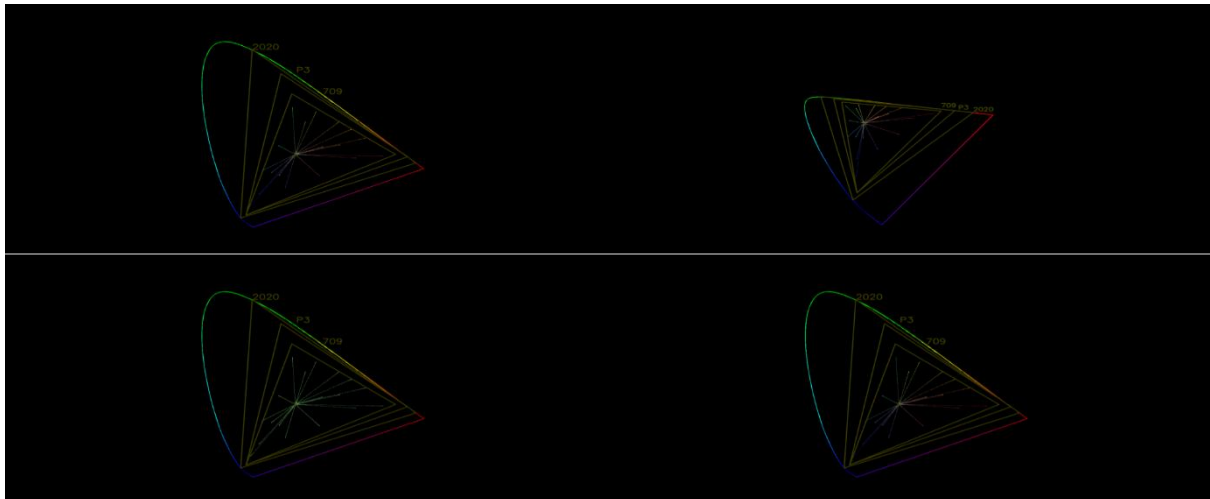
Figure4: CIE Color space and Color Trace
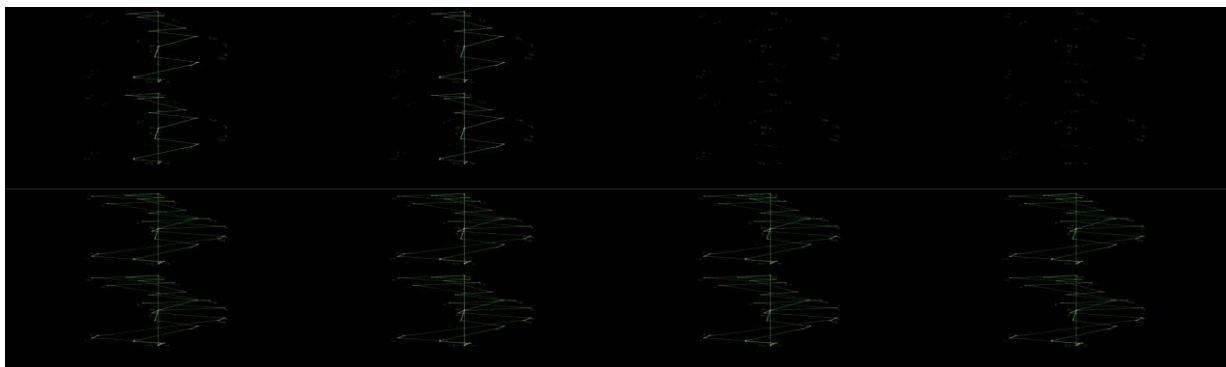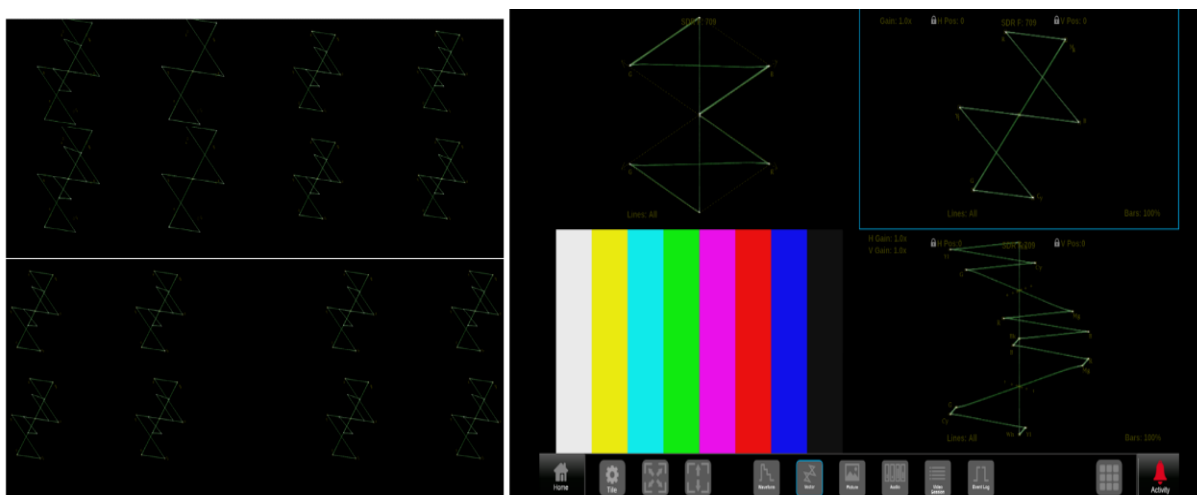

Figure 5: Lightning Lines and VAR enable off – on

Figure 6: Vector measure bar target and position left-right and PRISM tracing applications with tile 3 picture app
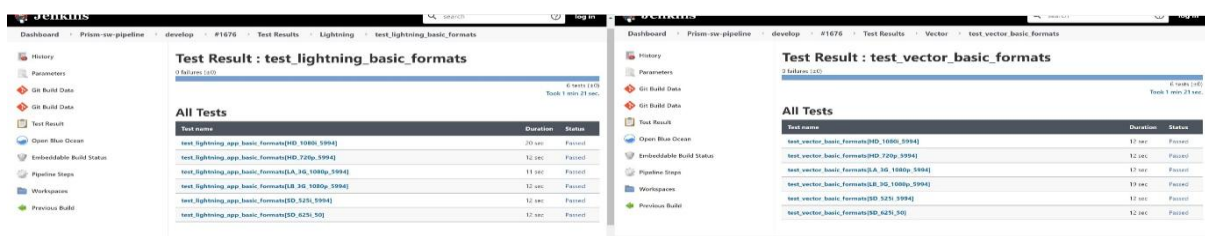

Figure 7:Result in Jenkins

• Above is the result, it is passed because the threshold value meets the condition, and the PNG images are generated to the tracing apps.

• Results are executed in the test station in the latest build and asserting the result in the production environment will be done, if it fails it leads to misbehave in Prism apps.

• The test is conducted in production station with the latest build if the test is failed it will store in backup. PNG Images can also be verified with the standard(Original) image for cross verification manually if required.

• The latest picture feed is compared with the reference golden image and tested for similarity. If the outcome is positive, can say the prism is working properly and similarly, If the outcome is negative, the screenshot is saved in a backup folder for future reference to check where the failure happened. This helps in further testing.

• Each Bit is compared of the two images and uses a bitmap comparison function and doing this on daily basis helps to maintain the stability and readiness of production systems in prism.

VIII. CONCLUSION

In this concept bitmap comparison function is used for creating and comparing the images of the tracing applications. In every situation two folders will be created PNG and backup folder where backup folder contains failed images and PNG contains pass images and every application is tested on all the 8 tiles in PRISM with 2110 IP generator for every tracing app. The test is run on daily basis and picture parameters are changed, based on threshold test results are generated and it helps in maintaining the stability of the prism. Image Comparison will check with the golden image (standard image) that threshold value is 90% and above then it is optimal.Understanding the working of waveform monitors and signal generators and the requirement to run the production environment and to understand the python test framework pytest and different types of software testing algorithms like unit testing, automation and manual tests will be done for image comparison. Finally, doing this on the daily basis helps to maintain the stability and readiness of production systems in PRISM product.

References

[1]. SPG8000 – Product Overview. [Online]. Available: http://www.tek.com.
[2] TG8000 - Multiformat Test Signal Generator User Manual. [Online]. Available: https://www.teletream.net.
[2]. Jones, E., Oliphant, T. E., Peterson, P., et al, SciPy: Open source scientific tools for Python Nov.2018.
[3]. Heidilyn V. Gamido, Marlon V. Gamido, Comparative review of the features of automated software testing

[4].   tools, International Journal of Electrical and Computer Engineering (IJECE) Vol. 9, pp. 4473~4478, ISSN: 2088-8708, 2019.

[5].   K Shaukat, "Taxonomy of automated software testing tool", International Journal of Computerscience and innovation," vol. 2015, pp. 7-18, 2020.

[6]   Tektronix - SPG8000 Master Sync. [Online]. Available: https://www.testequipmentdepot.com.

[7].   API Reference – pytest documentation. [Online]. Available: https://docs.pytest.org.

[8].   Things to know - More details about cables and SFPs. [Online]. Available: http://library.netapp.com.

[9].   K Shaukat, "Taxonomy of automated software testing tool", International Journal of Computer science and innovation," vol. 2015, pp. 7-18, 2020.

[10].   Python 3 Documentation. [Online]. Available: https://docs.python.org/3/.

[11].   SMPTE The home. [Online]. Available: https://www.smpte.org/.

[12].   Pytest Documentation. [Online]. Available: https://docs.pytest.org/en/7.1.x/.

[13].   Dolby- Digital. [Online]. Available: https://www.dolby.com/en-in/#gref.

[14].   Color Gamut website. [Online]. Available: https://www.viewsonic.com/library/photography/what-is-color-gamut/.

[15].   VNC viewer – Remote access. [Online]. Available: https://www.realvnc.com/en/.