

How to Apply Network Testing Practices to CCTV System Installations

Introduction

Testing and documentation of low voltage and fibre optic communications cabling has been standard practice since the introduction of multi-function LAN cable certifiers in the early 1990's. The same has not been true of CCTV installations.

LAN cable certifiers perform a variety of tests that ensure the installed systems meet industry standards and generate detailed reports that serve multiple purposes. Test reports provide assurance to the network owner that their new network infrastructure provides the performance for which they paid. Reports can be submitted to the manufacturer of the cabling system to activate warranty programs that cover material and labour defects. Furthermore, the reports protect the installation contractor by providing proof of 'as-built' performance meaning call-backs can be billed as service calls instead of free warranty work.

The concept of testing and documenting CCTV installations to provide the same level of protection to CCTV integrators and installers is very new. Until recently, test tools that allow professional reporting of CCTV installations did not exist, meaning that installers are routinely called back to troubleshoot problems that may be caused by the customer's network and not the CCTV system. For this reason there is clear benefit to applying well-established network testing and documentation practices when installing IP CCTV systems.

The challenges of IP CCTV

Virtually all new CCTV systems are digital/IP, running over Ethernet cabling. Generally, these IP CCTV systems have many advantages over analogue/coaxial systems, but there is one potential disadvantage - the video quality of IP CCTV is affected by network performance.

Due to this, ideally an IP CCTV system should be on its own network that is separate from an organisation's business systems network. However, in reality many businesses choose to run CCTV and business systems on the same network in order keep costs down. The result of this is that network congestion and bandwidth limitations may result in poor CCTV performance.

Common symptoms that can arise with IP CCTV in this scenario include reduced video frame rates, which can lead to 'choppy' video where moving objects appear to jump across the screen, and higher video compression, resulting in reduced image clarity and a high pixilation of the video. Network buffering can also occur, where the video pauses and hesitates, then catches up and hesitates again in a continuously repeating cycle.

When any of the above symptoms occur, the client will often assume the fault is with the CCTV system. This puts the systems integrator in a position where they either need to troubleshoot the network, or try to prove that the CCTV system is being affected by external conditions.

What to test

Whereas a cable certifier would be used to test and document a data cable or network installation, the equipment used to test and document a CCTV system differs because different measurements need to be captured. Instead of measuring the characteristics of the cabling, a CCTV test tool captures network and video information to provide a snapshot of each camera's configuration.

A CCTV test report can capture a wide range of information, such as the camera IP address which is programmed during installation and shows the network address of the camera and whether this is fixed (static) or assigned by the network (dynamic).

The report also captures network details, which encompasses the complete network configuration of the camera including gateway, DNS, subnet information, and more to ensure the camera is connected to the intended network. The camera MAC address, which is the unique, unalterable hardware ID of the camera, can also be captured.

The IP CCTV testing process will also show where the camera is installed and what it is aimed at, along with a screen capture to show what the camera is monitoring. This is key because it shows the camera's field of view and that it is properly focused. Reports should allow multiple images to demonstrate both day and night image quality.

To prove the camera is recording at the resolution required by the client, the resolution of the video stream can be tested. The report can also show the frame rate, which is the number of images captured per second (fps). Most cameras will allow up to 25-30 fps for smooth video, but the frame rate can be reduced to lessen the impact on network bandwidth.

Bandwidth should also be tested in the report, to show the average amount of data streaming from the camera in the current video configuration settings, measured in megabits per second (Mb/s).

Bandwidth is not only a function of resolution and frame rate, but also of CODEC. Video CODEC is the type of compression used to stream the video and the type used affects video quality and bandwidth. Test reports can show the type of CODEC, which are commonly H.264 or MJPG.

The benefits of documented installation

Documenting the CCTV system, in the same way as a network, is one infallible way of demonstrating proof of performance to the customer and confirming that the cameras are performing as expected at the point of installation or integration.

However, the benefits of installation documentation reach beyond closing out a project with test reports. If a camera needs to be replaced at a later time, the replacement should be configured just like the failed camera to ensure the system can be returned to normal operation as quickly as possible.

For example, if a customer reports that the camera overlooking the front of their building is down, the report for the failed camera can be retrieved in the office and used as a template for the replacement camera. The report contains the camera brand and model allowing the correct replacement to be pulled from inventory. While at the office, the new camera can be programmed with the network settings, location, description and video settings that were captured on the original report.

A technician can then take the pre-configured camera to the customer site, swap it out and use the field tester to create a new report. The updated report can be compared to the original to verify that the field of view and video setting are the same as the original. Time on site and labour costs for service calls can be significantly reduced when technicians and service engineers are armed with the information and tools to maximise efficiency.

SecuriTEST IP Test Report			
Job/Project name : Lake Ridge		Operator : J. Smith	
Ticket/Ref /Job No. : QR127A		Company : City Wide CCTV	
Building No. : LRP472		Street : 1300 N. Industrial Blvd	
Street : River Run St		City : San Jose, CA	
City : Tega Cay		ZIP : 92100	
State : SC		Country : USA	
ZIP : 29777		Tel. : 888-555-1295	
Country : USA		Email : contactus@ideanetworks.net	
Tester Info			
Tester Name : SecuriTEST IP		Test Time/Date : 2017-10-09 12:32:37	
Serial No. : 2017072000010810		Time zone : EST	
Hardware Version : 1.3-1.3		Firmware Version : 1.7.1.1.4	
Main SW version : V1.1.0		System SW version : IN-K2-X7V1.0.0-1.0.0-7114G	
Device Info			
Camera name : IPCAM06		Camera Model : DS-2DE2202-DE3W	
Camera time : 2017-10-9 13:0:36		Camera Maker : HIKVISION	
Camera Firmware Ver : V5.3.9 build 151223		ONVIF version : 2.40	
Network Status Info			
Ethernet port speed : 100Mb/s		Duplexity : Full	
PoE :		Camera IP address : 192.168.1.64	
Camera IP Mode : dynamic		Camera subnet mask : 255.255.255.0	
Gateway : 192.168.1.1		Camera MAC add : bc:ad:28:c8:6d:0e	
DNS : 8.8.8.8			
Image Info			
Resolution : 1920x1080		Encoding format : H264	
Frame Rate (fps) : 25		Bit Rate Max (kbps) : 3072	
photo :			

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Beyond documentation

The right multi-function CCTV testers also provide field technicians with the tools they need to troubleshoot cable and network problems, test PoE (Power over Ethernet), test video monitors and much more.

While IP CCTV systems are becoming more commonplace, the installed base of analogue cameras, as well as new HD coax systems, must also be supported. Having a CCTV tester that supports IP, analogue and HD coax cameras, plus cable and network troubleshooting, is the most effective way to minimise the equipment that technicians need to carry in the field. A multi-function tester, such as TREND Networks' SecuriTEST IP, also means it is no longer necessary to bring a laptop or PoE injector to the site. Not only can these devices be cumbersome to carry from site to site, but they can also be difficult, or even dangerous, to use while on a ladder or a lift.

Conclusion

The new generation of CCTV testers available in the market improve productivity, profitability and safety while making it easy for technicians to migrate from analogue to network/IP installations.

SecuriTEST IP from TREND Networks enables technicians to install, test, troubleshoot and document IP/digital, HD coax and analogue CCTV camera systems with a single tester. Its 7-inch, hi-res touchscreen and simple to use functions ensure just one tester is needed, even on complex installations.

