Wireless Video Surveillance

Video Transmission Over WiFi, Mesh and WiMAX Networks

Whitepaper

Wireless Video Transmission

The purpose of this paper is to demonstrate the capabilities of Tranzeo's WiFi, Mesh, and WiMAX equipment to wirelessly transfer multiple IP video streams simultaneously using March Network's Edge camera devices.

Frame rates and other Edge device settings were adjusted to achieve a steady stream of video with no jitter or latency. The amount of video that could be transmitted before reaching buffer overload was also determined.

The final settings in the Edge devices created a steady video flow of up to 20Mbps at the highest level of activity (defined as 4 people moving steadily in front of all cameras and data flowing in both directions) with a passive rate of 12.5Mbps produced from continuous recording with no activity.

Test Setup

All test scenarios were based on 70% pushed video (16.5Mbps max) to March Network's **VMS/Site Manager Server** on the other side of the wireless link and 30% pulled video (3.5Mbps max) from the 4416C DVR to a Laptop using the **Admin Console** on the same side as the cameras.

Four different scenarios were used during these tests. The following sections will discuss the different scenarios in more details.

Scenarios 1, 2, and 3

The hardware setup for Scenarios 1, 2, and 3 was the same. The following March Network's Edge devices were also common between all 3 scenarios:

1. VS-Edge1
2. VS-DomeMicro PTZ
3. VS-Edge1
4. VS-CamPX
5. VS-CamPX Dome (Analytics Licensed)
6. VS-MegaPX-1080P
7. VS-MegaPX-1080P

It was determined that 15 to 20% overhead should remain available for incidental traffic and for users that are unaware of the throughput capacities.

The following settings were reached to create a steady 12.5 Mbps passive Video flow with excellent clarity, and with no Jitter or Latency.

CAMERA	CODEC	FRAME RATE	RESOLUTION	QUALITY	BITRATE
1080p	H.264	12 IPS	1440x1080p (HD)	4096Kbps	CONSTANT
EDGE-1	H.264	10 IPS	720x480 (FULL D1)	1024Kbps	CONSTANT
CAMPX Dome	H.264	15 IPS	720x240 (1/2 D1)	2048Kbps	CONSTANT
CAMPX	H.264	15 IPS	720x240 (1/2 D1)	2048Kbps	CONSTANT
1080p	H.264	15 IPS	720x576P (D1)	4096Kbps	CONSTANT
PTZ Dome	H.264	15 IPS	720x480 (FULL D1)	2048Kbps	CONSTANT

NOTE: The CamPX Dome had WireCross analytics running when these final rates were reached.

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The first 4 Edge devices were powered from a Netgear 8 Port (4 POE) switch connected to the VMS Server through the Bridge radio.

The remaining 3 Edge devices were powered from a Trendnet 8 Port (4 POE) Switch connected to the VMS Server also through the Bridge radio.

The MicroDome PTZ camera was powered from the 12VDC adapter.

Both switches were on the Bridge (Ethernet) side of the Tranzeo radio transmitting to the Master (AP). Please refer to adjacent diagram for more details.

All Edge Devices were set at H.264 with maximum settings in Resolution, Quality, IPS and Bandwidth.

The VMS Server was connected to the Master radio through a Trendnet 5 Port switch.

The VMS Server acquired all Edge Devices through the Remote control Software.

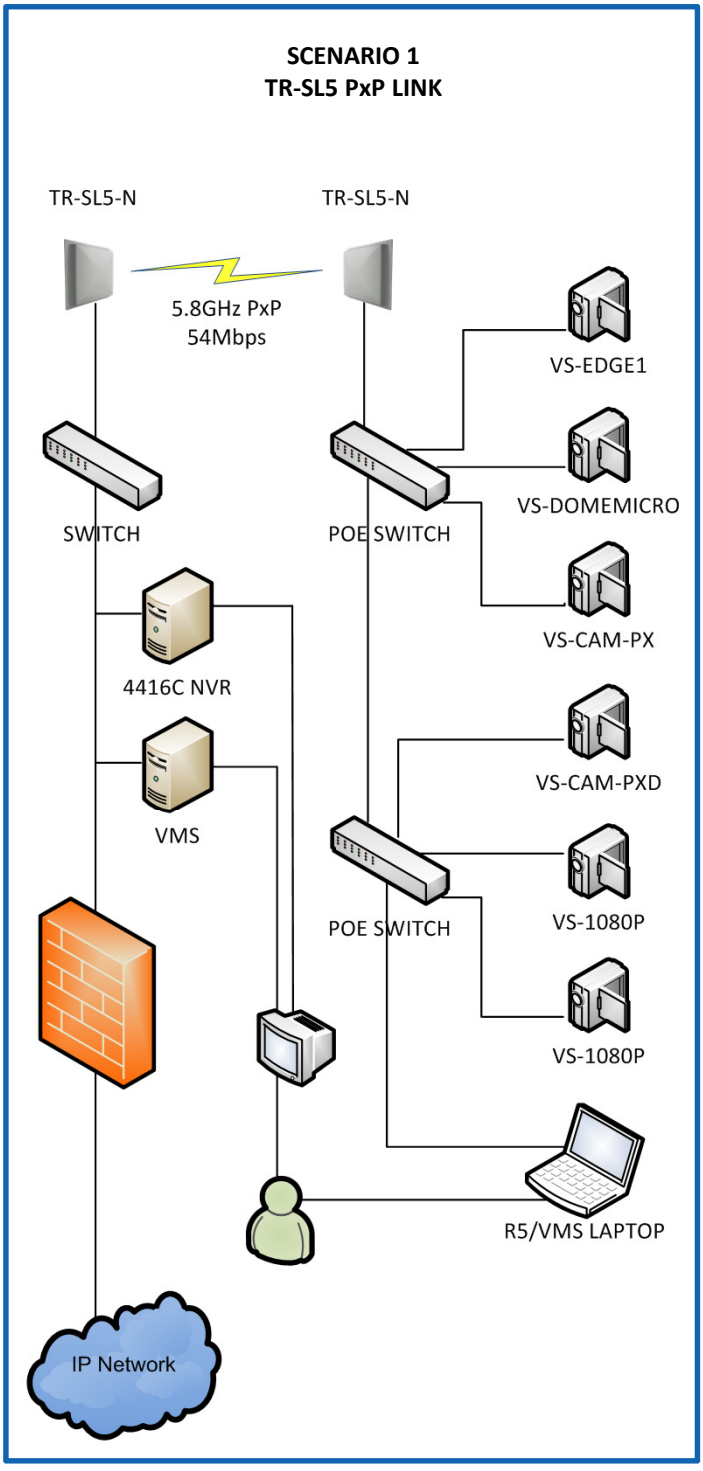
Buffer overload was reached almost immediately causing 1.5 to 3 second Latency in live view video and significant Jitter.

One VS-Edge1 was removed and all cameras cut in half for Resolution, Quality, IPS and Bandwidth resulting in the adjacent diagram.

Buffer overload was resolved.

Further adjustments were made to accomplish a clear video stream in live view with no Jitter or Latency in the remaining 6 Edge devices which were configured with the final settings on the previous page.

In Scenario 1, two Tranzeo TR-SL5 radios were configured as a point-to-point (PxP) bridge.



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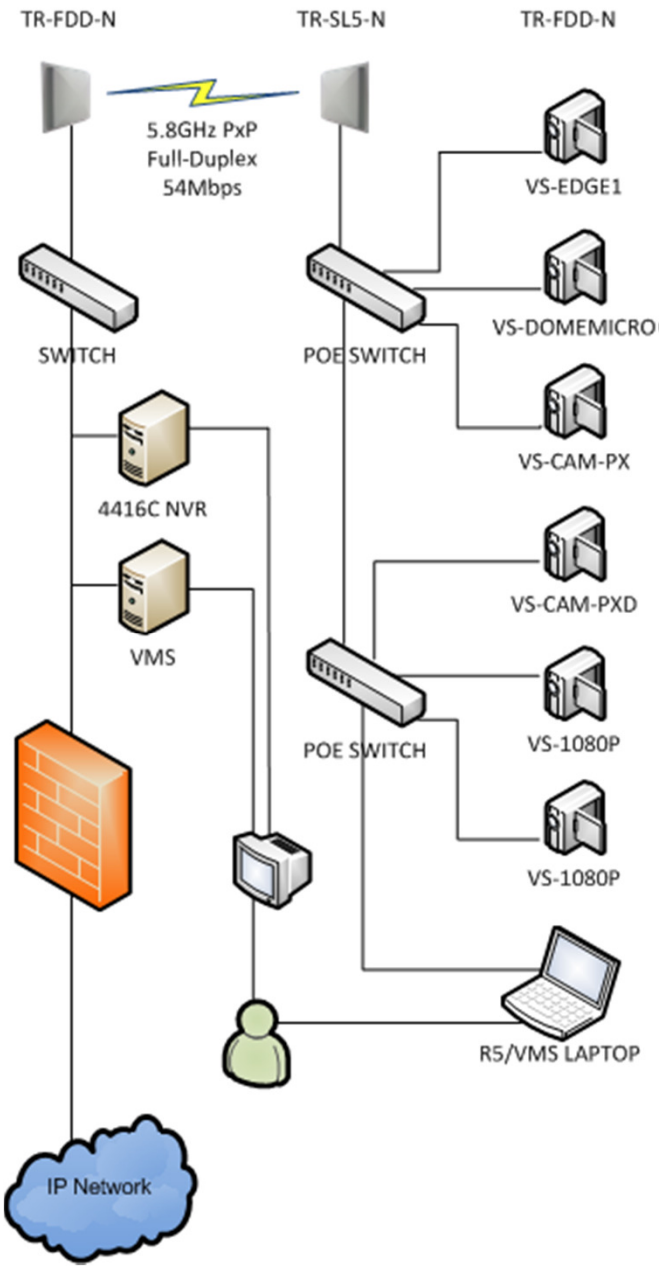
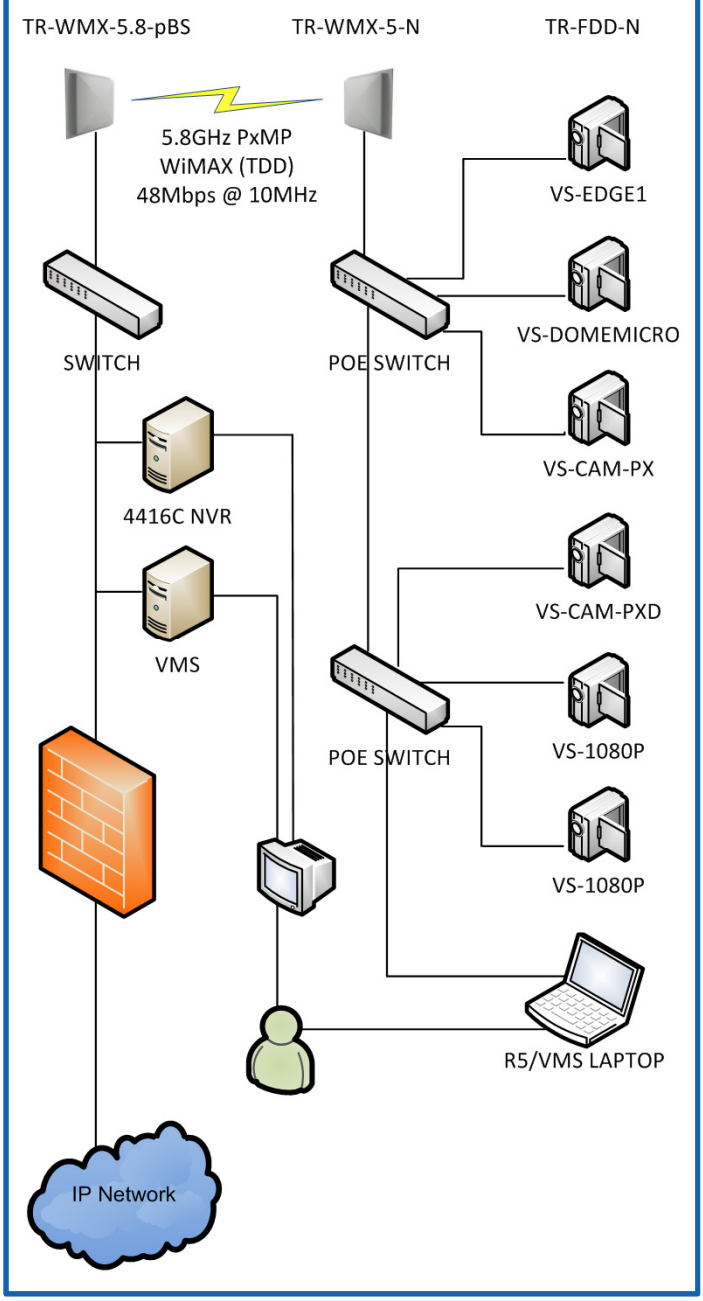
SCENARIO 2
TR-FDD PxP FULL-DUPLEX LINK



SCENARIO 3
WiMAX (TDD) PxMP LINK



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Scenario 4

Two Devices were powered from a Netgear 8 Port (4 POE) switch connected to the VMS Server through the Bridge radio.

Two Devices were powered from a Trendnet 8 Port (4 POE) Switch connected to the VMS Server through the Bridge radio.

Two Devices were powered from a Trendnet 8 Port (4 POE) Switch connected to the VMS Server through the Bridge radio.

The MicoDome PTZ camera was powered from the 12VDC adapter.

Each switch is attached to its own Mesh Repeater.

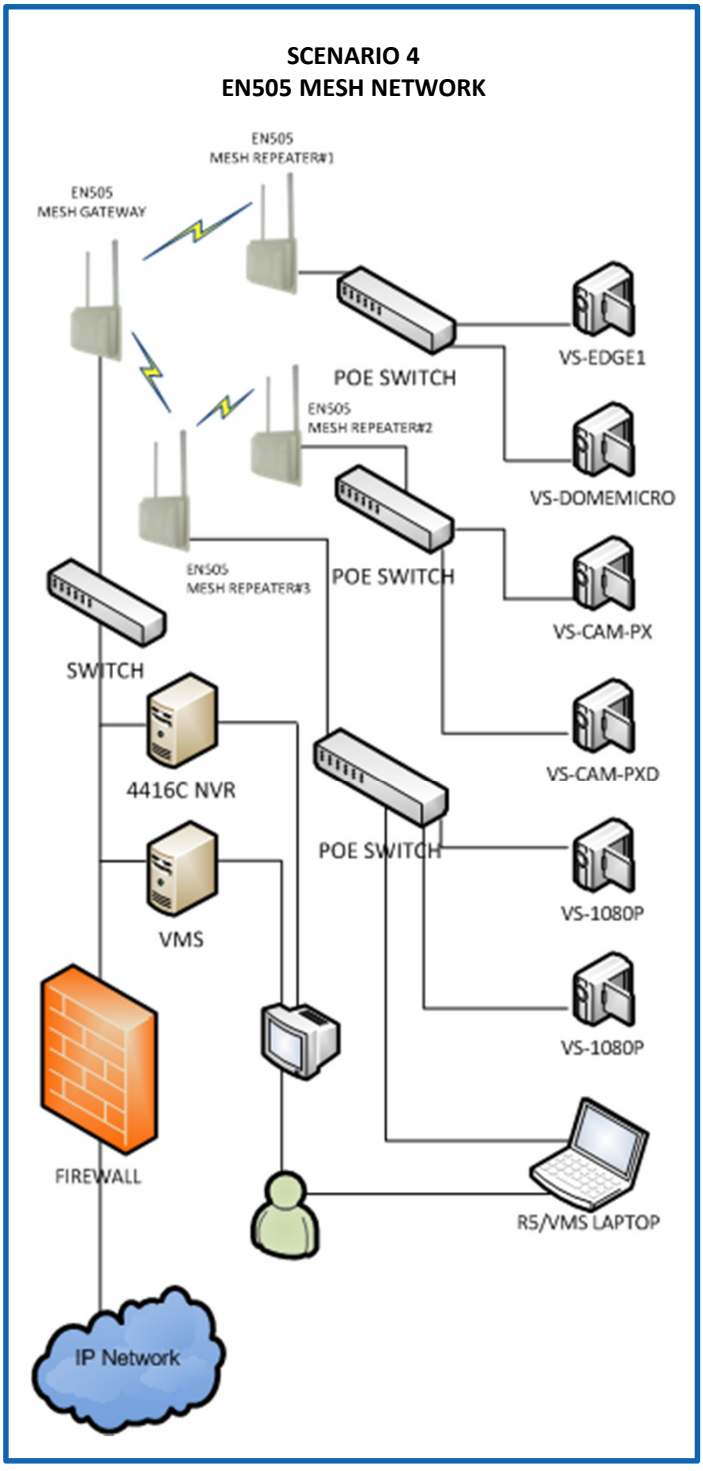
All Edge Devices were set at H.264 with the same settings as the above scenarios

The VMS Server was connected to the Master radio through a Trendnet 5 Port switch.

The VMS Server acquired all Edge Devices through the Remote control Software.

Conclusion

In all 4 scenarios, video streams from up to 6 March Networks Edge cameras were successfully transmitted and received over a high speed wireless data link using Tranzeo's broad spectrum of WiFi and WiMAX devices.



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Due to the purity of the "Lab" style testing, many normal calculations and variances for a standard wireless connection were not considered in these tests. Free-Space Path Loss (FSPL) and multipath interference may impact throughput and should be taken into account when designing a high speed wireless data link.

Free-Space Path Loss (FSPL)

In a line-of-sight radio system, losses are mainly due to free-space path loss (FSPL). FSPL is proportional to the square of the distance between the transmitter and receiver as well as the square of the frequency of the radio signal. In other words, free-space path loss increases significantly over distance and frequency.

FSPL (dB) = 36.58 + 20log ***f*** + 20log ***d***

Where ***f*** is frequency in MHz and ***d*** is distance in miles.

Multipath Interference

Multipath is a propagation phenomenon that results in two or more paths of a signal arriving at a receiving antenna at the same time or within nanoseconds of each other. Because of the natural broadening of the waves, the propagation behaviours of reflection, scattering, diffraction and refraction will occur differently in dissimilar environments. A signal may reflect off an object or scatter, refract, or diffract. These propagation behaviours can all result in multiple paths of the same signal, which may also results in attenuation of the original signal. Tranzeo equipment is designed to minimize the effects of multipath.

About Tranzeo Wireless™

Tranzeo Wireless Technologies Inc. (TSX:TZT) leads the wireless broadband industry as a premier manufacturer of high-performance wireless network equipment that allows communities and businesses to communicate without boundaries. Tranzeo's optimum cost effectiveness, premium quality and responsive support have attracted a growing and devoted worldwide following of more than 2,465 dealers and 16 distributors. Tranzeo's full spectrum of point-to-point and point-to-multipoint radios, WiMAX equipment, and mesh network solutions are designed for wireless internet service providers, governments, campuses, military, carriers, enterprise customers, and systems integrators around the globe. Headquartered in British Columbia, Canada, Tranzeo also has offices in San Diego, California, San Jose, California, and Shannon, Ireland.

Aperto Networks operates as a wholly owned subsidiary of Tranzeo. Aperto is a leading supplier of wireless broadband, mobile WiMAX and Enterprise VPN solutions using highly versatile and cost-effective carrier-grade WiMAX Forum Certified infrastructure equipment.

About March Networks

March Networks™ Corporation is a recognized innovator of networked digital video systems and software. Our video and networking expertise and our commitment to superior product engineering enable our customers to provide enhanced surveillance, monitoring and protection of people, property and assets. Our highly scalable digital video recorders (DVRs) serve the needs of banks, educational institutions, corporate and government facilities, first responders, retail chains and transportation authorities, enabling local and remote access to video over conventional and wireless networks, for both fixed and mobile applications. Research and Development teams at our headquarters in Ottawa, Canada, are engaged in developing next generation video applications to take advantage of expanding broadband networks.

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