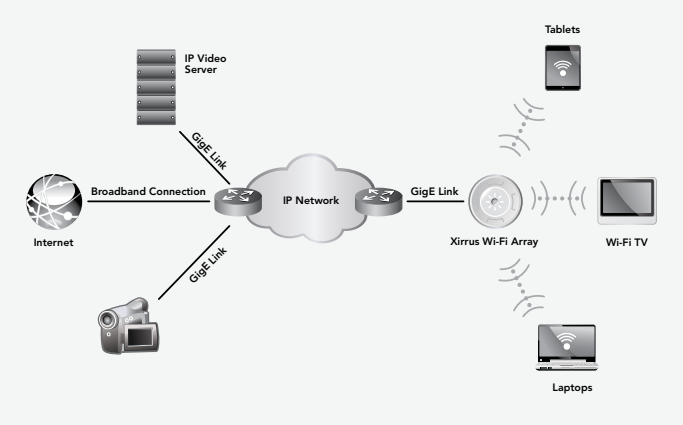
WIRELESS SOLUTIONS FOR

Video over wireless

XIRRUS®
High Performance Wireless Networks

High-performance wireless alleviates video traffic congestion.

In just the last few years, video application usage has increased significantly and is comprising a greater portion of Internet traffic every day. Rich-media-hungry smartphones and tablets have flooded the marketplace and more applications that drive video usage continue to arrive on the market. Today's wireless networks must be designed from the start with the capacity to handle bandwidth-eating video traffic.



Video over wireless applications

Video comes in many different formats and today's wireless networks must be capable of handling all of them. For example, watching a YouTube video may consumes 500 Kbps of bandwidth while a high-definition video may require ten times this bandwidth for acceptable quality.

The table below illustrates some of the most popular types of video applications and the different wireless bandwidth requirements for each of them.

In order to provide acceptable service in general for video applications, wireless networks must be appropriately designed and configured to handle this full range of video applications.

How to make video seamlessly stream over wireless

Providing high-quality video over wireless poses challenges above and beyond sheer bandwidth requirements. For starters, video traffic has very low tolerance for packet loss in the transport network from video server to video client. High or variable latency can also cause issues for streaming video applications. Wireless networks must take these factors into consideration during the design phase.

Video over wireless becomes even more challenging in high-density, high-usage scenarios such as classrooms or training rooms where dozens of users may be simultaneously accessing a single video source. Worst-case scenarios must be considered when designing wireless networks that will be used for such applications.

APPLICATION	USE CASE / EXAMPLE	BANDWIDTH REQUIREMENTS
Video conferencing	Apple FaceTime, Skype video	1 Mbps/channel
Live video streaming	Sports events, concerts	1–3 Mbps/channel
Video on demand	Entertainment, remote learning	2–10 Mbps/channel
Video surveillance	Security, theft prevention	<1 Mbps/channel
Cable TV	Entertainment	2 Mbps/channel
Video sharing	YouTube	<1 Mbps

In order to provide a high-quality video streaming experience for users over a wide range of applications, wireless networks must provide the following essential elements:

1. Sufficient wireless signal
2. Sufficient wireless bandwidth
3. Quality of service (QoS)
4. Multicast optimization

Sufficient wireless signal

When designing any wireless network, it is imperative that proper wireless signal required for the applications to be run and the devices to be used is provided in all areas where users are expected to operate. Sufficient signal level is necessary to ensure the wireless connection can be maintained at or near its peak rate and function reliably. Low signal levels will result in intermittent network operation causing packet loss and network delay, which will wreak havoc on video.

Xirrus promotes active site surveys for all wireless deployments that use the actual equipment to be deployed to get the design right and ensure proper signal levels. Active site surveys enable network designers to place equipment exactly where it needs to be to deliver optimal performance.

Sufficient wireless bandwidth

A key to delivering high-quality video over wireless is sufficient bandwidth capacity of the wireless network and its ability to deliver high throughput in actual operation. Video operates at a constant bit rate so it becomes a math problem to determine the overall capacity required of the network based on maximum number of expected users and the bandwidth required by the highest rate applications. Video is frequently the highest bandwidth application expected on most networks.

Xirrus Wireless Arrays are designed with 4 to 16 radios in each device, providing significantly more bandwidth than traditional two radio APs making them ideal for the high-bandwidth requirements of video. More radios means more wireless bandwidth which ultimately enables the highest density of video users.

The 802.11 wireless standards support operation in the 2.4GHz and 5GHz unlicensed frequency bands. However the 2.4GHz band is limited in bandwidth with only three operational channels while the 5GHz band supports 21 channels or seven times the bandwidth. With 2.4GHz additionally prone to interference from many common sources such as Bluetooth, cordless phones, and microwave ovens, the 5GHz band is much more suitable for video streaming applications. Xirrus Arrays support 2.4GHz or 5GHz operation on each radio, unlike traditional Aps, which typically are fixed to one in each band. The Array allows wireless networks to be designed for maximum capacity based on the users and applications.

Quality of service (QoS)

Beyond pure bandwidth, wireless networks need a means of appropriately prioritizing video traffic over other traffic on the network as necessary to provide an acceptable quality of experience to users. Priority queuing can be used by the wireless infrastructure to assign higher priority levels to expedite real-time traffic such as video while providing lower priority to applications such as web browsing or email. Xirrus Arrays support wireless multimedia (WMM) derived from the 802.11e standard to appropriately prioritize video over wireless. This prioritization maps to the Array's wired network uplinks via 802.1p or Diffserv.

Multicast optimization

Video applications often use multicast (1-to-N) communications when many users are watching the same video, for example a live sporting event. With multicast video, a single video stream is sent from the source with users desiring to watch the stream subscribing to it. This reduces bandwidth consumption on the network since a separate stream does not need to be established and maintained between the video source and each individual station.

This works well for wired networks; however in wireless, multicast packets are retransmitted if packet loss is experienced—a common occurrence in wireless. If a multicast video packet is corrupted, all wireless users subscribed to that video will experience degraded quality.

Xirrus Arrays provide a multicast optimization feature that converts multicast packets to unicast packets as they are sent over the wireless network to the end user. This process minimizes the impact of any corrupted or lost video packets and provides the best quality video service.

Why Xirrus Arrays are better for video over wireless

The proliferation of smartphones, tablets, and other wireless devices has made video increasingly pervasive on enterprise networks today. To appropriately support video applications over wireless, the network must be designed from the start to handle the unique characteristics of video traffic.

The main enablers for high-performance video over wireless are:

- Active site survey
- 802.11n/5GHz support
- Quality of service mechanisms
- Multicast to unicast conversion support

CASE STUDY — PLANO SCHOOL DISTRICT

With 7,000 faculty and staff members serving 55,000 students, the Plano Independent School District (PISD) has achieved national recognition for its strength. PISD uses video streaming over wireless in over 65 schools for applications ranging from remote learning to live video streaming of educational cable TV programs. With a policy of one wireless computer per student and an average of 20+ students per classroom, the performance of PISD's wireless network cannot be compromised. All new PISD schools are built with an all-wireless infrastructure, significantly reducing wired network installation costs while delivering full user mobility.

Requirements

- Video streaming to all classrooms
- Stable and secure network to be primary connection for users
- Simultaneously support large number of students
- Provide high bandwidth for each user for online learning and testing
- Minimum devices with no increase to OPEX

Solution

- Fewer devices—saved over 4,000 APs, cables, and switch ports across the district by deploying Xirrus Arrays
- Faster deployment—Xirrus solution installed in one summer compared to one year time frame planned for AP solution
- Ubiquitous wireless coverage supporting video and educational applications

"Xirrus Arrays provide the radio capacity, coverage, density, and quality of service required to deliver high-performance video streaming over wireless throughout our entire school district"

MITCH MITCHELL — Director of IT, Plano Independent School District

Xirrus wireless solutions are ideal for handling video with an architecture designed to scale to meet the requirements of the most demanding video applications. The Xirrus Array architecture includes:

- Dense radios, 4 to 16 per device for the highest capacity
- Directional antennas for higher signal levels translating to greater throughput
- Integrated controller eliminating the chokepoint and latency of central controllers
- Modular, upgradeable hardware to scale to meet future performance requirements
- Multi-level resiliency to ensure network uptime
- Multicast optimization for optimized video quality

High-performance video streaming over wireless has arrived.

High-performance video streaming over wireless is not far off in the future. It is available right now at a price that your school, hospital, or enterprise can afford.

Discover more

For more details about how Xirrus can help you provide a high-performance wireless solution, visit us at www.xirrus.com or send us an email at info@xirrus.com.

About Xirrus

Xirrus provides unique, high-performance, array-based wireless solutions that perform under the most demanding conditions, while delivering wired-like reliability, superior security, and less infrastructure requirements. Xirrus is a privately held company headquartered in Thousand Oaks, CA.

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