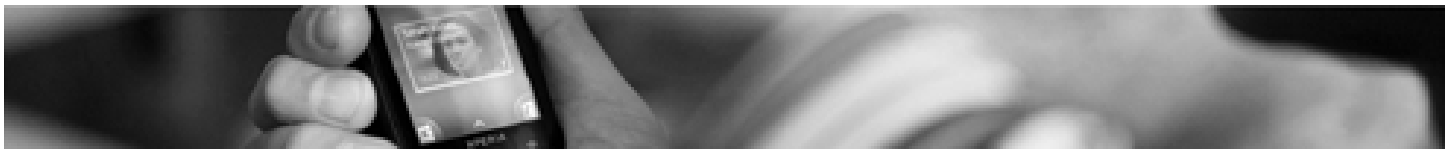
WHY YOUR WIFI DOESN'T DELIVER

LiveQoS



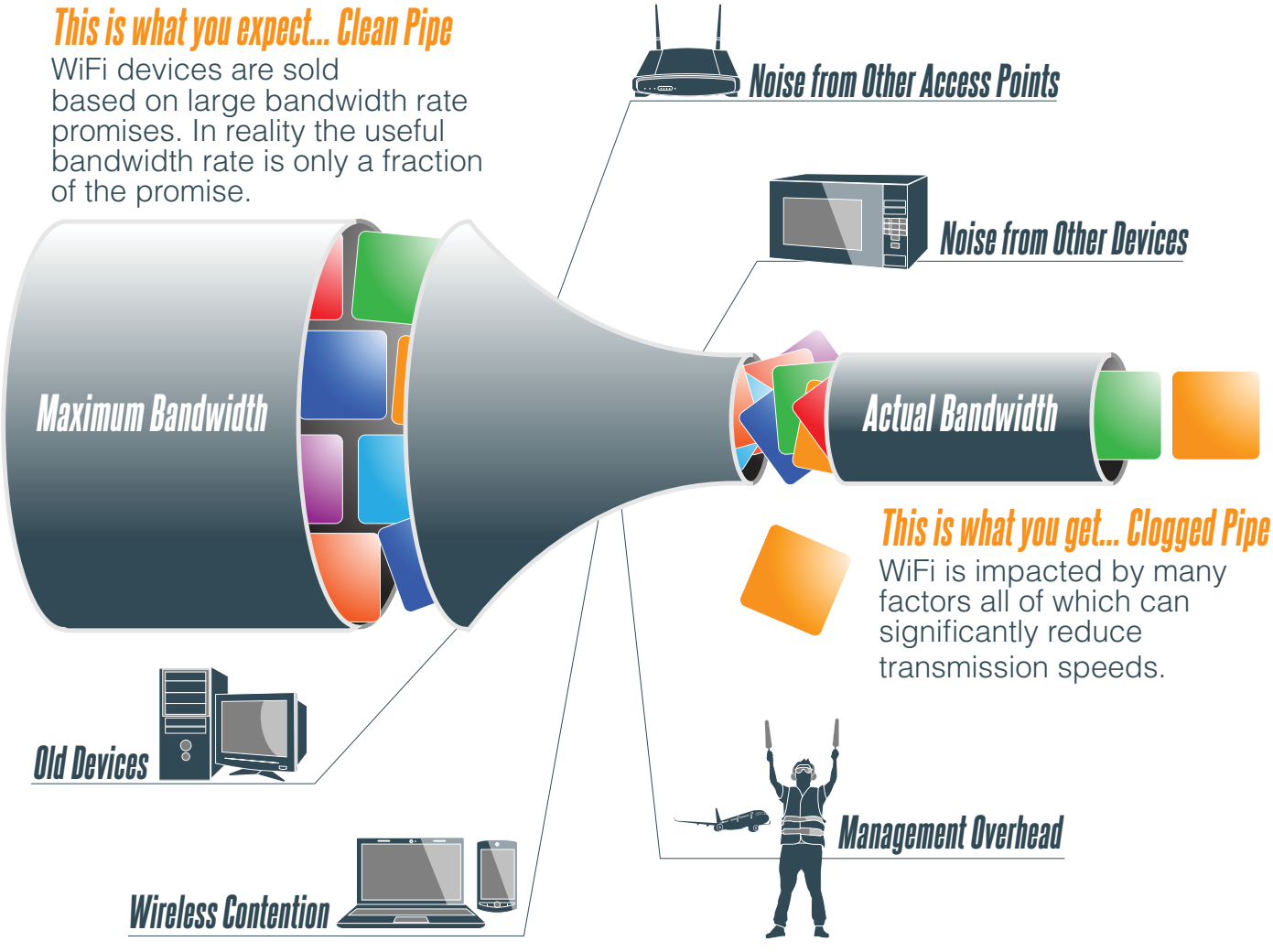
Ever wonder why it takes forever to download a video via Facebook when you're using the free WiFi at your local coffee shop?

The widespread use of WiFi gives us the freedom to work and network from any location whether it's from home, from the office boardroom, a hotel room or from the local Starbucks. But the flexibility of that wireless connection comes at a cost — significantly reduced transmission speed.

Sloooow WiFi Got You Down?

This is what you expect... Clean Pipe

WiFi devices are sold based on large bandwidth rate promises. In reality the useful bandwidth rate is only a fraction of the promise.



This is what you get... Clogged Pipe

WiFi is impacted by many factors all of which can significantly reduce transmission speeds.

The fact is that WiFi in its native form is just not up to the job of providing fast and high capacity connections. There are many reasons for this which we'll explore in this post.

WiFi has Limited Capacity - High-end consumer grade WiFi devices advertise that they are capable of speeds of 300 Mbps or even 450 Mbps, but these are the maximum radio speeds, not usable bandwidth rates. In reality, you will never see anywhere close to these advertised data rates because the speed you see is dependent on too many variables. Some of these factors include:

- **Distance (signal strength)** - the further away you are from the access point (AP) the lower your signal strength will be, which in turn lowers your effective throughput.

- **Noise from Other Devices** - The most common frequency used for WiFi is the 2.4GHz band, but unfortunately it is also used for household devices, such as cordless phones, baby monitors and microwave ovens. If any of these devices are used within range of your WiFi network it will degrade throughput.

- **Noise from Other APs** - There are only three non-overlapping channels that can be used by 2.4GHz WiFi. This means that in areas with a high density of access points, such as a neighborhood or an office tower, it is likely that there will be several other networks using the same channel which will degrade your speed.

- **Old devices** - If you have the newest 802.11n AP and you connect an older device that only supports 802.11b, then the AP has to drop the supported speeds for everyone while the 802.11b device is operating. This will significantly drop the throughput that your 802.11n devices can achieve.

- **Management overhead** - WiFi networks have a significant amount of management overhead. APs advertise that they are present and wireless clients must regularly probe the AP to let it know that it is still there. When you have a large number of WiFi devices, say at a coffee shop or airport, this management overhead can grow to be very large.

- **Acknowledgments** - All WiFi packets need to be acknowledged by the receiver to ensure successful delivery. These acknowledgement packets are sent by a WiFi device every time it receives a packet. When combined with the overhead of protocols like TCP, this can mean that 3 out of every 4 WiFi packets are overhead, with only 1 out of 4 packets containing "useful" data.

- **Retransmissions** - Not all WiFi packets are successfully received the first time that they are sent. A client may not see a packet due to collisions or insufficient power. As well, a single bit error in a packet will mean that the entire WiFi packet needs to be retransmitted. These retransmissions can happen over and over again for the same WiFi packet.

- **WiFi is Half Duplex** - A wired Ethernet network is full duplex, meaning a device can send and receive, or upload and download, simultaneously. WiFi is half duplex, so if a client is sending data to the AP, the AP can not also send data to the same or any other client at the same time. For two-way communication, which includes most applications people typically use over the Internet, such as video or voice chat, this essentially halves your throughput when compared to a full duplex technology, such as a wired Ethernet connection.

- **Wireless Contention** - If a client wants to send it must wait if the channel is currently occupied or collisions will occur and the data will be corrupted. Once the channel clears, it must wait even longer before it can attempt to send. Similar to trying to cross a single-lane bridge, if there are cars wanting to cross from both directions, everyone must wait their turn and there is uncertainty about who's turn is next. If a user on your wireless network is doing something that utilizes a lot of bandwidth, such as watching YouTube or downloading a file, it will be more difficult and take longer for your device to send, even if you are trying to do something that requires very little data, such as checking your email.

So, what is a user to do when they up against the fundamental limitations of WiFi. Wait it out? Go seek out an Ethernet connection? Or is there a better way?