

Tsunami™ Wireless Networking Backgrounder:

Things you wanted to know about wireless networking but were afraid to ask

Considering wireless solutions for wide area networking (WAN) deployments may raise some questions for those unfamiliar with wireless networking technology. This Technology Overview addresses some basic concerns that one might have about wireless technology in a WAN environment.

Does weather affect Tsunami Wireless Ethernet Bridges? Should I worry about rain, fog or snow?

Rain, fog and snow have a negligible impact on system performance for wireless systems operating below 11 GHz. Since most Tsunami products operate at 2.4, 5.3 and 5.8 GHz, such environmental factors have an insignificant effect on Tsunami performance. Systems functioning above 11 GHz are referred to as millimeter-wave systems, and one does need to take weather into consideration when engineering such systems.

Most satellite TV systems function above 11 GHz, and consequently are impacted by weather. The size of the RF signal carrying direct-to-home television happens to be about the size of the average raindrop. When the weather is clear, the RF signal can reach the satellite TV dish with a minimum of degradation. However, when it starts to rain, some of the signal gets absorbed by rain and, therefore, less of it reaches the dish on the roof. Very heavy rain can entirely eliminate the signal.

Wireless systems operating above 11 GHz should be engineered with particular consideration to environments subject to rain, fog and snow with added care taken when areas are subject to cloud cover and temperature variations or over-water links. For example, systems operating at frequencies such as 18, 23 and 38 GHz can be severely impacted by dense rainfall. There are mathematic prediction models that will account for climate conditions at all frequencies, and the system can be designed to provide the link reliability even in the face of adverse weather conditions. Western Multiplex Tsunami Licensed products can reliably span distances of up to 5 miles, even in adverse weather conditions.

Weather may also have an impact on antennas. Snow and ice can accumulate on uncovered antennas and change the performance of the antenna. Installing a cover, called a radome, can mitigate the potential for weather-related damage or performance degradation. In some extreme cases, heated radomes may be necessary to maintain antenna integrity in adverse conditions. Such measures are especially useful if the antenna location cannot be maintained regularly or reached easily in harsh weather conditions.

Do Tsunami Bridges emit unsafe amounts of radiation?

Tsunami Wireless Ethernet Bridges adhere to all applicable Federal Communications Commission rules and equivalent rules outside of the US that pertain to radio frequency (RF) emissions. Such rules are based on the scientific evidence presently available and incorporate significant margins of safety to ensure the health of the general public. As a point of reference, the below table provides data on the transmission energy emitted by various devices:

Device	Transmitter Output Power	Notes
Microwave Oven	5 milliwatts	per cm ² at 2 inches outside oven
Tsunami Bridge	10-500 milliwatts	Directional energy in one direction
Cellphone (Nokia 6160)	600 milliwatts	Omnidirectional energy in every direction
Tsunami 5.3GHz 45Mbps Bridge w/antenna	1 watt (from antenna)	Directional energy emanating from antenna

The risk of harmful exposure to any radiated energy is a function of the frequency of the radiation, the power of the energy, the proximity and the length of time of exposure. For example, solar radiation can cause sunburn and potentially lead to skin cancer if one spends enough time in direct sunlight. Similarly, medical X-Rays, in small exposures over long intervals, are shown to have minimal safety risk to patients. Tsunami antennas are typically installed on rooftops, not only with the bulk of the RF energy pointed away from where people spend any significant time, but also shielded by roofing materials and considerable distance between the location of the antennas and where people may likely spend significant time.

Note that radio waves should not be confused with X-Rays, which are much more powerful and have different effects on the human body.

Does Tsunami wireless technology offer intermittent availability similar to my cellular telephone?

While both Tsunami and cellular telephones do use Radio Frequency (RF) technology, the Tsunami links can be engineered to offer greater than 99.999% uptime, which translates into only five minutes of unplanned downtime per year. Cellular telephone technology is designed to function at "threshold" using the minimum necessary signal to maintain a connection. As a result of this design, cell phones are susceptible to lost connections. Tsunami wireless Ethernet bridges provide 100 to 1000 times the minimum signal and have a considerable "fade margin" enabling the technology to provide connection even in adverse circumstances.

Does performance degrade as you extend the distance between Tsunami bridges?

Tsunami bridges are able to offer maximum throughput at maximum distance. The results of recent "Up To Spec" test performed by The Tolly Group (www.tollygroup.com) showed that the Tsunami 10 provided 10 Mbps full duplex, the Tsunami 45 provided 45 Mbps full duplex, and the Tsunami 100 provided 100 Mbps full duplex at maximum distance.

The Tsunami performance characteristics differ considerably from Wireless LAN technologies that typically operate at half duplex speed and whose performance degrades as distance grows. For instance, a Network Computing review of wireless networking equipment¹ showed that while the Tsunami 10BaseT bridge provided its stated maximum throughput of 10 Mbps, products from other vendors advertised 11 Mbps radios but offered 4-5.5 Mbps actual throughput.

Do Tsunami bridges breach security since anyone can listen to the network traffic?

Because Tsunami fixed wireless bridges transmit signals into the "air," the perception can be that anyone could receive and possibly "steal" a user's data. Tsunami wireless Ethernet bridges provide exceptional throughput while minimizing the possibility of security breaches through a variety of measures including up to 2⁴⁸ data encoding, multiple levels of password protection, and the ability to support enhanced security products from third parties. Tsunami bridges are focused on providing point-to-point connectivity and use different technology than Wireless LAN products using IEEE 802.11 technology. A Western Multiplex Technology Overview titled "Tsunami™ Doesn't Talk To Strangers" provides further details on the Tsunami security features.

Will interference cause problems with a Tsunami wireless link?

Western Multiplex has successfully installed more than 45,000 nodes worldwide. Many Western Multiplex customers select wireless, license-exempt systems so that they may deploy them quickly and inexpensively without compromising reliability. A Western Multiplex Technology Overview titled "Tsunami™ Wireless Ethernet Bridges: Understanding & Overcoming Radio Interference" provides details on interference as well as licensed and license-exempt wireless technology.

1 "Wireless Bridges Span the Divide", Network Computing Magazine May 1, 2000.



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