

# 4G Wireless Wide Area Network

## Keywords, Glossary & Links

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### Keywords

4G, appliance, antenna, automatic failover, bandwave systems, bandwidth aggregation, best effort, business continuity, coax, blackbox, BYOB, bring your own bandwidth, coaxial cable, copper pair, CoS, class of service, CPE, customer premise device, DSL, digital subscriber line, DHCP, Distributed Enterprise, dome antenna, dynamic host configuration protocol, edge device, End-Point, EoC, Ethernet over Copper, fiber, firewall, fixed wireless, hotspot, IAD, integrated access device, internet bonding, LAN, latency, load balancing, local area network, M2M, machine to machine, managed router, managed service, microwave, MiFi, mobile WiFi, modem, MPLS, multilocation business, multiprotocol label switching, Mushroom Networks, network acceleration, omnidirectional antenna, oversubscription, packet compression, paddle antenna, panel antenna, Peplink, QoS, quality of service, paddle antenna, Riverbed, Silver Peak, SIP, Session Initiation Protocol, SLA, service level agreement, speed test, switch, Talari, TDM, time division multiplexing, traffic shaping, truck roll, VAR, value added reseller, VoIP, voice over Internet protocol, VPN, virtual private network, WAN, WAN optimization, WCS, Wholesale Carrier Networks, wide area network, XRoads Networks, Yagi directional antenna,



**Bandwave Systems**  
**Multilocation**  
**4G Wireless**  
**Aggregation**

### Glossary:

**4G Carriers** - The following carriers provide national or regional 4G data networks for business customers.

#### National

**AT&T** <http://www.att.com/maps/wireless-coverage.html>

**Sprint** <http://coverage.sprint.com/IMPACT.jsp>

**T-Mobile** <http://www.t-mobile.com/coverage.html>

**Verizon** <http://www.verizonwireless.com/wcms/consumer/4g-lte.html>

#### Regional

**Metro PCS** <http://www.metropcs.com/metro/maps/coverage-map.jsp>

**U.S. Cellular** <http://www.uscellular.com/coverage-map/coverage-indicator.html>

## Antenna Types

**Dome** - An **indoor** omni-directional antenna that goes on a central ceiling location to provide wireless cell coverage for a full floor

**Omni Directional** - an **outdoor** antenna that provides coverage in all directions so it does not have to be pointed at a cell tower but the range is shorter than a directional Yagi antenna

**Paddle** - An **indoor** antenna that connects directly to a 4G amplifier. ([See this video](#))

**Panel** - An **indoor** directional antenna that would be mounted on a far wall of a rectangular space to provide coverage on a single floor or at the high point (pointed down) to provide coverage to several floors

**Yagi** - Named after [a Japanese engineer](#), a Yagi is a directional **outdoor** antenna (as opposed to an omni-directional antenna) that receives and sends a 4G wireless signal and feeds it to an amplifier. A Yagi antenna is pointed at the specific wireless cell tower to be boosted. [UberSignal](#)

**Appliance** - A computer “appliance” is generally a separate and discrete hardware device with integrated software (**firmware**), specifically designed to provide a specific computing resource. These devices became known as “appliances” because of their similarity to **home appliances**, which are generally “closed and sealed” – not serviceable by the owner. The hardware and software are pre-integrated and pre-configured before delivery to customer, to provide a “turn-key” solution to a particular problem. Unlike general purpose **computers**, appliances are generally not designed to allow the customers to change the software (including the underlying **operating system**), or to flexibly reconfigure the hardware. [WikiPedia](#)

**Automatic Failover** - Refers to a network connectivity redundancy strategy where a network router has access to different Internet connections so that if one carrier’s Internet connection goes down for a business the businesses data network will automatically route data traffic over another carrier’s “backup” Internet connection.

**Bandwidth Management** - Refers to the large group of hardware, software and network solutions which all strive to deliver the greatest possible “uptime” (the network is always connected to everything) at the least possible cost (as measured by carrier invoices, equipment costs and internal IT headcount required to manage bandwidth). The following terms all fall under the “bandwidth management” umbrella. Some terms kind of mean the same thing (bonding vs. aggregation), other terms describe completely different strategies (aggregation vs. acceleration) while still other terms seem to combine individual strategies. Salespeople at telecom conference cocktail parties confuse these terms all the time.

**Bandwidth Aggregation** - This refers to the “single invoice” solution desired by distributed enterprises that do not want to pay hundreds of individual bandwidth invoices because their data network contains bandwidth connections from hundreds of different bandwidth service providers. Bandwidth aggregators combine all the bills in one comprehensive managed invoice and often provide a single project management desk for implementation as well as a single help desk for after-installation support and customer service.

**Internet Bonding** - An idea where the total bandwidth available to a business is equal to the some of the individual bandwidth pipes. An old example is where a phone company would “bond together” two expensive 1.5 Meg T-1 circuits to provide the customer a 3.0 Meg Internet price (usually at twice the cost of a single T-1). A modern example is where a business attempts to bond a 3/1.5

meg DSL connection with a 10/2 meg coax cable connection and also a 3/1 3G/4G wireless connection in an effort to get a combined 16/4.5 meg connection.

**Load Balancing** - An idea where a network will properly route data packets over the least expensive or most efficient data transmission channel without adversely affecting the productivity of or even raising the notice of the data user

**Network Acceleration** - This is an idea championed by the expensive MPLS network carriers that suggests that “bonding” extra cheap Internet connections to an expensive (but slow) MPLS data network is a bad idea. The “good” idea is to make a 1.5 meg MPLS network seem like a 10 meg network by employing compression software or equipment within the network. When network acceleration works it’s a bonus to the customer because they get higher speeds without losing QoS. The downside to compression is that it increases speed but not redundancy.

**Packet Compression** - is how “network acceleration” works. just like what happens when “Zip” a large file before emailing it to someone, packet compression uses an algorithm to remove all the empty spaces in a packet before sending it through a WAN connection where the same algorithm will re-insert the spaces after arrival at the packet’s destination.

**Traffic Shaping** - See “load balancing”

**WAN Optimization** - is a catch-all term that bandwidth management vendors use to suggest that their solution is the best for a customer. Start with these vendors and then compare others to them.

**Reference Vendors** - The following vendors establish a good benchmark for various bandwidth management strategies.

**Acceleration** - Riverbed, Silver Peak

**Aggregation** - [Bandwave Systems](#), WCS/Wholesale Carrier Services

**Balancing & Bonding** - Mushroom Networks, Peplink, Talari, XRoads Networks,

**Best Effort** - describes a network service in which the network does not provide any guarantees that data is delivered or that a user is given a guaranteed [quality of service](#) level or a certain priority. In a best-effort network all users obtain best-effort service, meaning that they obtain unspecified variable bit rate and delivery time, depending on the current traffic load. [Wikipedia](#)

**Black Box** - See “edge device” and “appliance”

**Business Continuity** - See “automatic failover”

**BYOB** - “Bring your own bandwidth” refers to business phone service provider’s policy of whether or not the service provider will use the business phone customer’s existing Internet connection to provision VoIP phone service. “Lower end” VoIP providers will allow this with the understanding that they will use their “best effort” to provide phone service clear of static, echo, or other problems. “Higher end” VoIP providers do not allow this because of the labor involved in troubleshooting voice quality problems resulting from not controlling the entire connection used for an end-to-end VoIP phone call. (Invariably a BYOB VoIP phone service provider will tell a business phone customer that the source of the quality problem is the customer’s Internet

connection or LAN.)

**Copper Pair** - Refers to the two pieces of copper wire which was the original way that an analogue voice phone call was transmitted over long distances (before the advent of VoIP) using TDM (time division multiplexing) transmission technology. The original “Ma Bell” “POTS” (plain old telephone service) phone network was all copper pairs and is over 100 years old. The high cost of maintaining this old decaying infrastructure is what has caused the “monopoly phone carriers” (AT&T, Verizon & CenturyLink) to petition the US government to allow them to phase out their responsibility for offering copper pair phone service. Because copper phone service transmits using analogue TDM technology it is a very high quality medium for older types of phone services like fax, alarm lines, modems, etc.

**CoS** - “Class of Service” is a parameter used in data and voice [protocols](#) to differentiate the types of payloads contained in the [packet](#) being transmitted. The objective of such differentiation is generally associated with assigning priorities to the data payload or access levels to the telephone call. [Wikipedia](#)

**CPE** - A “customer premise device” is a term that usually describes a piece of networking equipment that is on the customer’s premise which is required to make a network solution work. In the past, network carriers would always tell a customer that their CPE was not working correctly which is why the carrier’s network was not delivering what the customer wanted. In today’s “managed services” environment, a carrier will try to convince a customer to use carrier provided CPE to ensure a “single source” for all the piece-parts required to make a network solution work.

Carriers like to provide CPE whenever possible because it allows them to raise the monthly cost of a carrier provided network solution. Customers often begrudgingly accept these “managed solutions” only because they know that paying their own IT person once or twice to troubleshoot a customer CPE problem is often more expensive than simply paying more per month over the life of the carrier contract for the carrier provided CPE.

**Distributed Enterprise** - Another name for “multilocation business”, “distributed enterprise” is a term used to describe a business that has multiple locations that are geographically separate from one another that need to have their computers and other “end-points” networked together in some secure manner to transmit electronic information back and forth. Unlike large “single site” businesses (manufacturer) or “local campus” businesses (hospital or university) that can have all their computers connected over a local area network (LAN), distributed enterprises must connect the computers of their far-flung locations using the data networks of one or more public data carriers (phone companies, cable companies, private data carriers, etc.)

**DHCP** - The “Dynamic Host Configuration Protocol” is a standardized networking protocol used on Internet Protocol networks for dynamically distributing network configuration parameters, such as IP addresses for interfaces and services. [Wikipedia](#)

**Edge Device** - A devices that provide entry points into enterprise or service provider core networks. Examples include [routers](#), routing switches, [integrated access devices](#) (IADs), multiplexers, and a variety of [metropolitan area network](#) (MAN) and [wide area network](#) (WAN) access devices. Edge devices also provide connections into carrier and service provider networks. [Wikipedia](#)

Unlike endpoints that connect users to networks, edge devices generally connect a carrier’s public WAN to a customer’s private LAN. “Smart” edge devices (ones that do more than pass “ones and zeros” back and forth AKA a “blackbox”) are critical for distributed networks to help localize trouble to either a carrier’s network or a customer’s network. Different edge devices may include the

following functions (some of which can be combined in a single blackbox):

**Firewall** - is a software or hardware-based network security system that controls the incoming and outgoing network traffic by analyzing the data packets and determining whether they should be allowed through or not, based on applied rule set. Firewalls can be defined in many ways according to your level of understanding. A firewall establishes a barrier between a trusted, secure internal network and another network (e.g., the Internet) that is not assumed to be secure and trusted.

[Wikipedia](#)

**Switch** - (sometimes known as a *switching hub*) is a [computer networking device](#) that is used to connect devices together on a [computer network](#). A switch is considered more advanced than a [hub](#) because a switch will only send a message to the device that needs or requests it, rather than broadcasting the same message out of each of its ports. [Wikipedia](#)

**Router** - a device that forwards [data packets](#) between [computer networks](#), creating an overlay [internetwork](#). A router is connected to two or more data lines from different networks. When a data packet comes in one of the lines, the router reads the address information in the packet to determine its ultimate destination. Then, using information in its [routing table](#) or [routing policy](#), it directs the packet to the next network on its journey. Routers perform the "traffic directing" functions on the [Internet](#). A data packet is typically forwarded from one router to another through the networks that constitute the internetwork until it reaches its destination node. [Wikipedia](#)

**IAD** - An "integrated access device" is a [customer premise device](#) that provides access to [wide area networks](#) and the [Internet](#). Specifically, it aggregates multiple channels of information including voice and data across a single shared access link to a carrier or service provider [PoP](#) (Point of Presence). The access link may be a [T1](#) line, a [DSL](#) connection, a cable ([CATV](#)) network, a broadband wireless link, or a [metro-Ethernet](#) connection. [Wikipedia](#)

IADs are most often provided by phone companies to small, single-location businesses with older analogue or digital phone systems. The IAD allows the phone company to provide Internet access to the small businesses LAN as well as analogue dial tone to the businesses old phone system over a single "data pipe". This saves both parties money so the phone company does not have to bother maintaining old copper phone lines to bring in the analogue dial tone.

Any "blackbox like" piece of equipment that allows a business to connect any sort of analogue device (old single-line phone, fax, security alarm, credit card machine, etc.) directly to an Internet connection is performing an IAD or "modem" function.

**Endpoint** - A term used to describe some piece of equipment at the "edge" of a computer network that allows a network user (human or machine) to interact with the network. Endpoint examples include: telephone (desk or mobile), computer (wired or wireless), fax machine, credit card swiper, cash register, video camera, refrigerator, car tire, etc. - basically anything that converts the "ones and zeros" of a network data stream to some other form of information (spoken words, typed numbers, temperature, air pressure, etc.) and vice versa.

**Hotspot** - Term used for wireless Internet access that can be used to transmit data by smart phones or laptop computers. Most 4G smart phones and create a password protected 4G hotspot that will enable friends of the smart phone's owner to use the smart phone's data connection. One downside of turning one's

smartphone into a hotspot is that the hotspot and the phone's voice calling feature can not be used at the same time. People who need to use a 4G signal for data and voice simultaneously will need to secure a separate "MiFi" unit which creates a 4G hotspot separate from a smart phone.

**Integrator** - See "VAR"

**Internet Connection Hierarchy (ICH)** - This phrase refers to the "speed divided by price" ranked order that most business Internet customers will choose available non-QoS Internet connections. (Where customers need expensive QoS to support voice or video traffic they'll often buy only what they need and offload the rest of their Internet traffic to whatever cheap connection is available to them from the following Internet connection hierarchy.) The following list is generally ranked "most desired" to "least desired" based solely on speed/price. The order would change slightly when other factors (as described below) are considered.

**Fiber** - Fiber refers to a terrestrial business Internet connection that is always synchronous (the upload speed equals the download speed) and almost always the choice for business Internet over DSL or coax where it's available due to the high bandwidth and low cost. Many independent phone companies with necessary right-of-ways are installing their own Internet fiber to local business parks. The best way to find local fiber is to ask a local business tenant who they use or query [an online "fiber finder" search tool](#) provided by a professional telecom agent.

**Coax** - Coaxial cable here refers to a terrestrial (in the ground) Internet connection provided by a local cable company (Comcast, Time Warner, Cox, etc.). Coax is viewed by many businesses as the best "speed divided by cost" Internet connection. The three main downsides to coax are 1) lack of QoS, 2) it often requires construction to get installed to a business not in an existing business district, and 3) asynchronous speeds meaning the upload speed is always much slower than the download speed.

**4G** - Short for "fourth generation", 4G is the fourth generation of mobile or wireless non-terrestrial telecommunications technology succeeding 3G. A 4G system, in addition to usual voice and other services of 3G system, provides mobile ultra-broadband Internet access, for example to laptops with USB wireless modems, to smartphones, and to other mobile devices. [Wikipedia](#)

**Fixed Wireless** - Also known as "microwave", fixed wireless is a non-terrestrial Internet connection that requires a directional antenna on a business customer's building pointed at a service provider's antenna. The pros of fixed wireless is quick installation times and high synchronous bandwidths at low price. The cons are that fixed wireless requires building owner approval of mounting of the microwave dish and fixed wireless "footprints" (where the service is available) tend to be fairly small and available only to businesses with a clear "line of sight" (meaning you can stand on your roof and see the service provider's microwave tower with binoculars). By contrast "omnidirectional" 4G wireless service provided by the cell phone companies does not require line of sight so the added benefit is that 4G can be "mobile" (the equipment can move around without losing the signal) whereas fixed wireless is "fixed" in that the equipment can't move and maintain the Internet connection. (Pretty clever naming convention, huh?)

**EoC**- Ethernet over Copper is basically "super DSL" in that it's terrestrial and it rides over the phone company's copper lines but the better "black boxes" used tend to supercharge the speeds available.

**DSL** - Digital subscriber line is an older type of Internet connection provided to businesses over a local copper phone line from the local phone company. Speeds are usually asynchronous like coax.

The main benefit is that DSL is almost always available to any business within a main business district meaning “construction” is almost never an issue like it is with coax. The main downside to DSL is that it is “distance sensitive” meaning that data transmission speeds decrease the further away a business is located from a local telephone company “central office”. Coax is generally replacing DSL by providing greater bandwidth and reliability at an equivalent or lower cost.

**Satellite** - Like 4G or fixed wireless, satellite provides a non-terrestrial Internet or data connection that is not susceptible to interruption due to “fiber cuts” or other mishaps that can affect terrestrial Internet connections. Unlike 4G and fixed wireless though, satellite is considered the most resilient of all the wireless data connections as it’s not generally susceptible to interruption due to weather events like hurricanes. For business locations that absolutely have to have a connection all the time (like hospitals, banks or fuel depots, etc.) satellite is a required backup connection. For many ultra remote business sites like oil derricks or logging camps, a satellite connection is often the only connection available. The downside to satellite is cost and latency - cost because a rocket is required to get the satellite into space and latency because even though the data packets travel at the speed of light, a 50,000 mile round trip to a satellite is not instantaneous.

**LAN** - A local area network or “LAN” describes the computer network that connects computers to one another within a closed business geography.

**Latency** - The measure of time in milliseconds (“ms”) it takes a data packet to get to where it needs to be to prevent degrading the quality of a voice phone call. When latency is under 50 ms the human ear distinguishes very little voice quality degradation. When latency exceeds 150 ms, the human ear and brain can get very tired trying to communicate over what is perceived as very degraded phone quality.

**M2M** - “Machine to machine” refers a networking solution that permits “the robots to talk to one another” to that a human does not have to be involved. Examples of M2M include a refrigerator in a restaurant that generate a trouble desk repair ticket if the refrigerator temperature rises above a certain point.

**Managed Service** - Refers to any of the multitude of services (not including the actual voice or data transport connection) that a business customer would contract for from a network services carrier or network services “VAR” (value added reseller). The “managed service” generally is the labor that a person will do with the network connection including: installing, monitoring, placing trouble tickets, equipment acquisition/maintenance, report/alert generation, etc. By contracting for these managed services from a carrier or consultant a business owner avoids the overhead of having an in-house employee do the same job.

**MiFi** - Short for “mobile WiFi”, MiFi is a small wireless router that creates a WiFi “hotspot” using a 4G wireless carrier’s network.

**MPLS VPN** - A family of methods for harnessing the power of [multiprotocol label switching](#) (MPLS) to create [virtual private networks](#) (VPNs). MPLS VPN gives network engineers the flexibility to transport and route several types of network traffic using the technologies of a MPLS backbone. [Wikipedia](#)

**MultiLocation Business** - See “distributed enterprise”

**Oversubscription** - When a 4G carrier signs up too many customers for a cell tower or network and individual customers feel crowded by all the other users. This was a much bigger problem when all 4G carriers allowed unlimited data to all their customers. Now that most business customers face usage charges if they use too much data it’s easier for quality 4G carriers to prevent oversubscription problems.

**QoS** - "Quality of Service" is the overall performance of a telephony or computer network, particularly the performance seen by the users of the network. To quantitatively measure quality of service several related aspects of the network service are often considered, such as error rates, bandwidth, throughput, transmission delay, availability, jitter, etc. Quality of service is particularly important for the transport of traffic with special requirements. In particular, much technology has been developed to allow computer networks to become as useful as telephone networks for audio conversations, as well as supporting new applications with even stricter service demands. [Wikipedia](#)

**SIP** - Session Initiation Protocol. See "VoIP"

**SLA** - "Service Level Agreement" is a part of a [service contract](#)*[disambiguation needed]* where a service is formally defined. In practice, the term *SLA* is sometimes used to refer to the contracted delivery time (of the service or performance). As an example, [Internet service providers](#) and [telcos](#) will commonly include service level agreements within the terms of their contracts with customers to define the level(s) of service being sold in plain language terms. In this case the SLA will typically have a technical definition in terms of *mean time between failures* (MTBF), *mean time to repair* or *mean time to recovery* (MTTR); various data rates; throughput; *jitter*; or similar measurable details. [Wikipedia](#)

**Speed Test** - An online website that allows a business to test the quality of a particular "BYOB (bring your own bandwidth)" Internet connection to see if it will support the transmission of a voice phone call. Important components of a speed test (in addition to transmission speed) are latency, packet loss and jitter. Try one of the following 3 tests for free:

<http://voiptest.8x8.com/>,

<http://www.ringcentral.com/support/qos.html>,

<http://www.megapath.com/speedtestplus/>

**TDM** - "Time Division Multiplexing" refers to a voice phone call analogue transmission technology that delivers near perfect phone call quality over copper phone lines. Because of the high cost associated with maintaining copper phone lines, TDM phone service is being phased out in favor of VoIP phone technology.

**Truck Roll** - A "truck roll" is what everyone wants but no one wants to pay for. It refers to the phone or computer repair technician that physically gets into a truck loaded with all sorts of repair gear and "rolls" over to a business customer's worksite to fix a reported network problem. Since repair technicians are humans on company payroll with benefit packages and administrative overhead, truck rolls are very expensive and have to be paid for in some fashion - usually through higher monthly network service costs or the direct billing of a customer at over \$100 per hour plus the costs of repair materials used.

**VAR** - Also known as an "integrator", a value added reseller refers to an "expert middleman" that can take a "black box" (any piece of technology equipment - also known as an "appliance") connect it to a carrier's voice or data network connection (coax, fiber, DSL, etc) and properly program the equipment's software to then provide a unique and useful business task, function or application that an end-user company pays for to the VAR. This is often referred to as "white labeling" as the VAR is usually not the manufacturer of any of the components he or she is adding value to. The VAR adds "value" by integrating the building blocks of other companies into a business solution and then writing the VAR's own name on the "white label". Inherent to the value proposition of a VAR is the idea that the value is based on a "proprietary-like" mix of special "know-how" which generally boils down to labor savings in that the VAR has figured out how to do something

cheaper and quicker than what it would take a business end-user to figure out how to do it themselves.

**VoIP** - "Voice over Internet Protocol" refers to the transmission of a voice phone call over a data or internet connection as opposed to a separate copper phone line. SIP or "session initiation protocol" is a term that is often used interchangeably with VoIP when describing an "advanced phone system" that can save a business customer money by eliminating the need for separate phone lines. The "big savings" may business customers seek through the conversion to a VoIP phone system is the ability to eliminate phone lines by transmitting phone calls over a business customer's existing data network because "voice is just one more network application". The sensitivity of the human ear to even the most minimal voice phone call quality degradation however prevents most businesses from embracing all but the most high quality VoIP solutions.

**VPN** - A virtual private Network extends a [private network](#) across a [public network](#), such as the [Internet](#). It enables a computer to send and receive data across shared or public networks as if it were directly connected to the private network, while benefiting from the functionality, security and management policies of the private network.<sup>[1]</sup> This is done by establishing a virtual [point-to-point](#) connection through the use of dedicated connections, encryption, or a combination of the two. [Wikipedia](#)

**WAN** - A **wide area network** is a network that covers a broad area (i.e., any [telecommunications network](#) that links across metropolitan, regional, or national boundaries) using private or [public network](#) transports. Business and government entities utilize WANs to relay data among employees, clients, buyers, and suppliers from various geographical locations. In essence, this mode of telecommunication allows a business to effectively carry out its daily function regardless of location. The Internet can be considered a WAN as well, and is used by businesses, governments, organizations, and individuals for almost any purpose imaginable. [Wikipedia](#)

**White Label** - The mechanism by which a VAR can integrate or combine the piece-part products of other companies, add some intrinsic "value" (labor or special know-how) and then call the "solution" their own by writing the VAR's name on the new solution's "white label". An important distinction with white labeling is the fact that the white labeler is the only entity which bills the company for the solution. This billing requirement creates accounting and tax ramifications that preclude many consultants from becoming VARS. Many solution consultants can tell a customer how to create the same solution a VAR can sell a customer but the customer must take the consultant's directions and then assemble the solution in-house. Many VARs will white label a solution to prevent erosion of profit from customers wanting to "do it themselves" once they figure out what the "solution recipe" is after a customer contracts with a consultant.

**Links** Different resources that were discovered while researching this document.

[Cell Phone Booster Store](#) - Get an antennae to boost a 4G signal inside your business

[A Detailed Look at Wilson Electronics 4G LTE Amplifier and Compatible Antennas](#) - a detailed article by a dedicated do-it-yourselfer

[Buyer's Guide to Cell Phone Signal Boosters](#) - A quick review of the different parts of a cell boosting solution

[4G LTE Amplifier and Paddle Antenna Video](#) - A YouTube video showing a paddle antenna directly connected to a 4G amplifier

[OpenSignal](#) - A carrier independent organization that measures wireless carrier signal strength through user Android and iPhone apps. Their stated goal is to “become the global authority on wireless networks”.

**Distributors** Different providers for signal boosting gear

[3G Store](#) -

[Cell Phone Booster Store](#) -

[UberSignal](#) -

**Subject Matter Experts** I spoke to or referenced the work of the following people while writing this document. Feel free to contact them through their hyperlinked LinkedIn page.

[Greg Smith](#) - CradlePoint, Clearwire, T-Mobile

**News Articles** Interesting 4G analysis & opinions

[3G/4G wireless network latency: How do Verizon, AT&T, Sprint and T-Mobile compare?](#) Included useful comparison of wireless carrier latency which is of critical importance of your wireless data network will be transmitting voice phone calls. FierceWireless 2/20/14

[The Real Price of Wireless Data](#) Forbes September 2013

[Who has the most 4G coverage? A deceptively simple question with no simple answer](#) Includes useful comparison of LTE vs. HSPA transmission technology. NetworkWorld 11/19/12

[HSPA+ vs LTE: Which one is better?](#) Android Authority May 2012