The MOBiLE Wireless Router
The Attributes of a Mobile Wireless Router

When most people think of a wireless mobile router, they think “MiFi” which is a term coined by Verizon for their version of an 802.11 Access Point with Internet backhaul connectivity over a cellular data network like LTE, EVDO or UMTS. This is fine if the objective of your router is to only do one thing: connect to the Internet and let others share that connection using 802.11 WiFi. This is only one narrow application.

When police and fire departments, ambulance, taxi cabs, fleet vehicles, buses, trains, and light rail start looking for a mobile wireless router, their requirements may extend well beyond the simple MiFi model supported by almost all vendors. Not one solution has fit all requirements, up to now.

There are a number of different use cases for mobile wireless routers, and we will describe them here for clarification:

**Cellular Router With 802.11 Access Point Function**

This is the “MiFi” router described above. Basically the router connects to a cellular carrier’s network and is assigned a dynamic (or sometimes static if you pay for it) IP address. The router then uses session based Network Address Translation (NAT) to share a local network which it creates on its 802.11 Access Point interface. Any device which connects to the Access Point will gain Internet access using the shared cellular connection.

The typical use case for this type of router is to have a laptop or tablet computer in a vehicle connected via Ethernet at a docking station. When the user leaves the vehicle he would undock his computer and switch to using 802.11 WiFi. Untethered from the vehicle he would then be free to roam around the vehicle while maintaining Internet connectivity.

This is also the type of system used to provide public access to 802.11 WiFi offered to riders on buses and trains.

This configuration provides “always on” network connectivity to the Internet, but this comes at a price. Cellular carriers can be expensive and also impose transfer limits on the amount of data sent. It is important to try to minimize the amount of data sent over these types of connections to the bare minimum.

Data sent over the 802.11 WiFi connection can be very fast and there is no metering charge or limitations on transfer. But this is only to the vehicle, not to the Internet.

**Cellular Router With Mesh Function**

In this case the router is designed to connect to the cellular network, but then can also connect to other routers over 802.11 WiFi, allowing the network to expand its coverage area and for vehicles to share data seamlessly with each other.

The typical use case for this type of router configuration would be for emergency first responders arriving on scene and needing to have the laptop computers and cameras in their vehicles linked together for local communications. A major benefit of Mesh is that it will still function even if the cellular network is down.

Interconnections between Mesh vehicles can be very fast (up to 120Mbps), so large amounts of information can be rapidly transferred between vehicles. For instance, to share evidence, grade high definition video between vehicles, a Mesh would be the right solution.
Cellular Router With Client Bridge

In this case the cellular connection is used for Internet connectivity, devices in the vehicle are connected using Ethernet, and the 802.11 WiFi interface is used as a Client Bridge to connect to an Access Point, allowing the devices in the vehicle to connect to the network provided by the Access Point.

With more advanced configuration, it would even be possible to connect the Client Bridge to the cellular interface, and using a VPN, allow remote operators over the Internet to connect to the network served by the Access Point.

Typical use cases for this would be for "store and forward" types of applications such as where there is a Network Video Recorder (NVR) in the vehicle which is recording video and other data throughout the day as the vehicle runs its route. At the end of the day, when the vehicle returns to its home location (police station, firehouse, bus depot, maintenance yard) the router would connect to an Access Point router on the building, and would then have a fast connection over which to upload the days collection of video. The speed of this type of connection could be up to 120Mbps.

Another use case would be for "roam up download" connectivity. For instance, if a store owner has a Video Management System (VMS) with an 802.11 WiFi Access Point on the side of his building, and he has pre-arranged for access for police or security guard services by sharing with them his pass phrase (WPA2 keys) to his network, the police or guard could drive up and connect to the network, access the VMS and view video before entering the building to investigate a crime. This is a great safety feature and a way to reduce police incident response costs.

Finally, this configuration can be used to reduce the cost of Internet access as a "nomadic WiFi client". The router could be configured to connect to 802.11 WiFi Internet connections at coffee shops, restaurants, libraries and even around parks and municipal facilities. When the router sees the SSID or network identifier of a known Internet access WiFi network, it could shift from using cellular to using WiFi. Batch file transfers could be scheduled at these times, significantly reducing cellular data traffic.

Client Bridge Only

In this usage scenario, there is no cellular modem connection. The router is configured to only use the 802.11 WiFi interface as a Client Bridge to connect to an Access Point, allowing the devices in the vehicle to connect to the network provided by the Access Point.

This configuration can be used for all of the same functions described above for the Cellular Router with Client Bridge such as "store and forward" transfers, "roam up" downloads, and "nomadic WiFi client". The only disadvantage to this configuration is that the vehicle will not have any connectivity once it drives away from an Access Point with Internet connection. But for many applications this is all that is required and it completely eliminates cellular operating costs.

The amount of time that a vehicle goes without wireless connectivity can be reduced by placing Access Points along the vehicle route or at key locations throughout a service area. This may not always be practical, and there are real limits to these types of deployments both in reliability and maintenance costs. But it is always an option.
Non Mobile Uses For Mobile Wireless Routers
Many of the uses described above apply to fixed wireless applications as well. Mobile Wireless Routers are typically small in size, durable, have low power consumption, and have an array of antenna options which make them easy to use in applications such as:

- "Pole Cameras" where a camera and router are mounted on a streetlight or utility pole
- Solar powered remote cameras where size, durability, and power consumption are important
- Fenced line cameras or sensors where IP systems are mounted along perimeter fencing
- Coastal surveillance and sensor network
- Border surveillance and sensor networks
- And many others...

Common Problems Found In Typical Mobile Wireless Routers

Disconnects When Roaming—Your router may lose connection when you switch cell towers, when your cell tower gets congested, or when you lose signal. The router may reconnect, but it may take some time, it may not happen automatically, and it may disrupt your communications.

Dynamic Addressing—Most cellular carriers use some type of dynamic IP address assignment for all devices on the network. This means that if you need to make a connection into your router from the Internet, you will not be able to do so, because you will not know the dynamically assigned address. Modern LTE networks use Mobile IP to allow users to have static addresses which are reachable. The problem with Mobile IP is that it is a new technology and has not been fully deployed throughout all carrier networks so it may not always work.

Security—Many MiFi routers do not support VPN tunnelling, authentication and encryption. This needs to happen on both the cellular and 802.11 WiFi interfaces. The router needs to encrypt both ends of the connection. If it doesn’t, it leaves you open to attack.

Intrusion Detection—An advanced function of a wireless router is the detection of intruders to your 802.11 WiFi network and the elimination of “jamming” attacks. Without this capability, your router is vulnerable to attacks from hackers or people who otherwise want to disrupt your communications.

Range—Most mobile wireless routers are designed for short range. Their transmit gain, receive sensitivity, and ability to discern client devices in heavily congested environments are limited to less than 100 feet, and many can only go 30 or 40 feet.

Configurability—Most mobile wireless routers are designed for a single purpose and do not have the ability for the user to change the function of the router, the frequencies of the interfaces, the channel width, the modulation scheme, or the topology of the wireless connection. You may need multiple devices in order to meet your needs.

Intelligence—This really goes with configurability. If the router has a CPU and the ability to be programmed or scripted to respond to changes in the environment, then you will have the flexibility to reconfigure your router on the fly. Most typical mobile wireless routers lack this capability.

Routing—Typical mobile wireless routers are capable of only one type of routing: Network Address Translation. In order to support a broad range of capabilities like fail over between cellular to 802.11 WiFi or other bands, or between cellular carriers, your router should support protocols such as OSPF, RIP, OLSR, BATMAN, and others. These protocols make your router a general purpose connectivity solution, and not just a “MiFi” router.

Power—Vehicle and solar power can be erratic. Your router needs to be able to take in a broad range of power sources. For instance most cars and trucks use 12VDC, while many buses use 24VDC. Voltage may fluctuate and you may have power surges during start up. Also, you may want power to the router to remain on even after vehicle accessory power has been turned off. This is especially true for store and forward applications where you may have several Gigabytes of data to transfer which could take minutes or even hours. A DC to DC UPS (uninterruptable power supply) should be considered.

Cost—Of course equipment purchase cost is one consideration, but you should also look at Mean Time Between Failures (MTBF). Replacing a failed unit could mean taking a vehicle out of service for a day or more. You also need to weigh the cost of recurring operations using cellular (monthly subscription costs, data transfer costs, etc.) against the cost of installing your own private 802.11 WiFi network.

Frequency—Today, 802.11 unlicensed devices operate in the congested 2.4 or 5GHz bands. These bands are only becoming more congested. There are other frequencies that you may want to consider including the 3.65GHz ULS band, the 900MHz ISM band, the 5GHz transportation band, the 4.9GHz public safety band, the 6.4GHz law enforcement band and others. Most mobile wireless routers only operate in the 802.11 bands and cannot easily use other bands.

Bonding/Load Balancing—There are several “routers” on the market today that claim to support USB cellular modem bonding. This capability can be implemented in several ways. The most basic uses per session load balancing where each time an end user device makes a connection to a different Internet destination the router sends the traffic out over a different modem. More advanced systems may try to use a proprietary VPN system to create a tunnel which spans data across multiple modems. Generally most of these systems break down when the bandwidth available on each modem varies widely. Some require using the same carrier for every modem, defeating the reliability through diversity capability. Often these load balancing systems break when modems roam between towers.
Introducing HauteMOBiLE™

The Ideal Mobile Wireless Router

The HauteSpot Networks HauteMOBiLE™ mobile wireless router delivers all of the functionality described above and resolves all of the issues typically found in consumer grade mobile wireless routers.

The HauteMOBiLE can support all variants of cellular USB modems including LTE, EVDO, UMTS, HSPDA+, and GSM EDGE. Just plug the modem supplied by your carrier into the HauteMOBiLE, attach an appropriate antenna, and you are ready to get connected!

The powerful and flexible integrated 802.11a/b/g/n MIMO radio module delivers superior range (up to 1500 feet with a typical vehicle mount antenna to laptop) at speeds of up to 120Mbps (that is real TCP throughput, not theoretical speeds which can never be achieved outdoors). The compact, durable design of the HauteMOBiLE eliminates connectors by consolidating power and Ethernet into a simple to install harness that easily connects to your vehicle power system. The completely solid state structure of the HauteMOBiLE is shock and vibration resistant and has a wide operating temperature, suitable for the harshest environments. Rugged RPTNC type antenna fittings eliminate cross threading errors and assure a reliable and low loss connection to your antennas.

But the real magic of the HauteMOBiLE is its intelligent configurability. Through the intuitive web interface or client/server configuration utility, you can make quick changes to software which can change the operating mode (access point, client station, client bridge, mesh node), the frequency, the channel width, the modulation, and how the interfaces (cellular modem, WiFi interface, and Ethernet) are connected. The HauteMOBiLE comes with a set of powerful scripting and configuration management tools including access control lists, connect lists, and the ability to completely reconfigure your system on the fly.

Automatic Configuration

For example, when the HauteMOBiLE is in the headquarters parking lot, you can have it scan for its home SSID. When it sees it, the router will change to Client Bridge mode and connect to its home network, allowing store and forward applications to transfer their data. After a period of time with no data transfer, your router shut down.

Later, after the vehicle is restarted and the HauteMOBiLE powers on, it could download the logs and instructions for the driver for the day. Then when the vehicle leaves the parking lot, the HauteMOBiLE changes mode to Access Point and turns on its cellular network failure condition and reconnect you.

As the vehicle drives along its route, any known access points that are listed in the connect list will be detected. When found, the HauteMOBiLE changes mode to Client Bridge and connects.

Cellular connections can be enabled or disabled as required in order to save on data transfer costs.

Persistence Is A Virtue

Cellular networks will drop calls. They will change IP addresses. They will hand off calls between towers. Your mobile wireless router needs to cope with this. The HauteMOBiLE router can be custom configured to monitor the status of your cellular data connection and reinitiate connections when needed. A watcher script can be custom written (or copied from our existing library of scripts) to handle almost any cellular network failure condition and reconnect you.

Combine this with the HauteMOBiLEs support for a wide variety of VPN (virtual private network) tunnelling protocols which will maintain a consistent route-able IP address for your connection through any disconnections or interruptions and you have a solution that is very persistent.

Security

Security in wireless networking means being able to detect problems and react. Whether the problem is a hacker trying to crack your WPA2 keys, a toaster oven that is creating interference or a terrorist using a jamming system, your HauteMOBiLE router can respond. It will change your frequency, change your channel width, change your security keys, reboot, run a spectrum scan to find open frequencies, and take other evasive actions to assure your system remains operational.

Economical For The Long Run

The HauteMOBiLE not only is value priced, but it is backed by HauteSpot Networks’ technical support team. If you have a system outage, we are here to support you in getting the system back on line in the shortest possible time.

Every one of our routers is assembled in the USA and is thoroughly tested in our lab where we stress every element of the system. HauteSpot Support programs include regular software upgrades and patches which are easily installed in the field. And our web site is packed with training and knowledge tools to help you better utilize your HauteSpot technology.

Every one of our routers supports comprehensive network management capabilities including SNMP, SSH remote console, our HS Configurator, SYSLOGD remote logging, and our HauteSpot Network Manager which allows you to proactively scan all of your devices and report on their status. All of these tools are free and included in the system.

Load ‘em Up

The HauteMOBiLE router has the ability to support a variety of load balancing protocols, each appropriate for different applications. If you have many user devices using your HauteMOBiLE as a gateway router then per session load balancing is available. If you want to create a transparent tunnel where all of the traffic is aggregated between your router and a single destination, the HauteMOBiLE does it. If you fail over support where the system routes between different modems in order of preference, the HauteMOBiLE does that. And if you want to roam between carriers, between WiFi, and even between satellite*** in order to reduce connection costs and to provide high reliability, the HauteMOBiLE does it.

**Note that programming of router requires some programming knowledge or can be contracted to HauteSpot Networks for development

*** Satellite requires 3rd party hardware
Complete Solution

HauteSpot Networks offer a complete range of accessories and products to complete your solution. We can recommend and supply the ideal antenna, cable system, UPS system, solar system, and even VMS software and cameras to meet your mobile application needs.

Our Mobile Video Vault™ (MVV™) VMS solution is the comprehensive answer for mobile and fixed video resource management. It runs on our microNVR™ platforms to capture, live stream, batch transfer, store, and make searchable all of your video, not only from your vehicles, but also from your other VMS systems. HauteSpot even offers long term off line storage technologies to complete your system.

When you are looking for a mobile wireless router, don’t settle for any router, choose HauteMOBiLE™ – The Ideal Mobile Wireless Router.

The HauteMOBiLE Beats The Competition

- Remains Connected while roaming across cellular networks
- Provides static address connectivity through advanced VPN and Dynamic DNS support
- Highly Secure and uses state of the art encryption and intrusion detection technologies
- Superior range with the highest legally available transmit power and receive sensitivity
- Fully configurable to operate in many different modes
- Intelligent with full scripting and programmability
- Full feature router supporting advanced routing protocols and capabilities
- The lowest power consuming wireless router on the market
- Frequency flexibility with standard support for all unlicensed bands and can be ordered with custom bands
- Supports advanced load balancing and bonding
- Cost competitive

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