Across the Skyline

Daisy-Chaining Your Network With Raveon's Wireless Technology

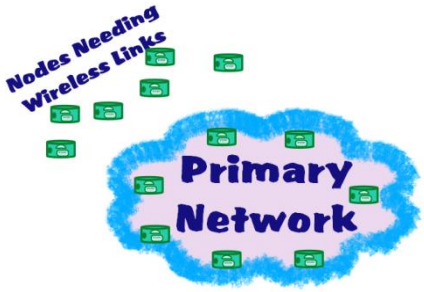
Using Raveon's secure Daisy radio modems and Skyline System to access your data from around the world, build your Internet of Things (IOT), or perform Machine-To-Machine (M2M) communications.

Last Few Mile Solutions

When machines/devices/vehicles/meters are miles from your *Primary Network*, the Skyline long-range wireless is your solution.

- Daisy-chain your Primary Network out to remote areas.
- Low-cost LoRa radio modems have unprecedented performance and coverage.
- Raveon has many solutions to cover 100s of miles.
- Use these secure wireless devices if your data is important.
- Choose products based on range, speed, power, and reliability.
- Communicate using IP connections or serial.
- Wireless gateways can make your communications easier than wired.
- Optional GPS and 3-access accelerometer.

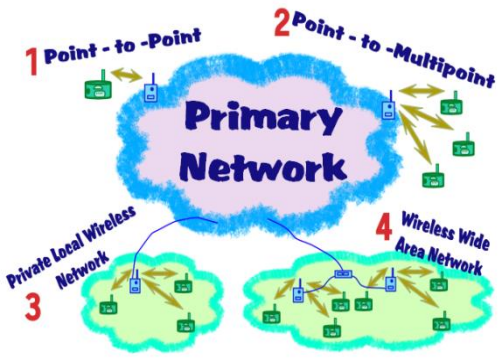
RV-M50-EC



There are many ways to wirelessly daisy-chain your *Primary Network* out to remote devices.

Raveon offers long-range wireless solutions operating in both public and private frequency spectrum.

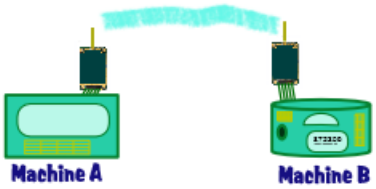
1. **Point-to-Point**
   - Raveon's M7, Tech21, or M50 Daisy modems.
2. **Point-to-Multipoint**
   - Raveon's M7, Tech21, or M50 Daisy modems.
3. **Private Local Wireless Network**
   - Cigorn or DART controller
   - Skyline system with Daisy ISM modems or Tech Series
4. **Wide Area Wireless**
   - Cover cities or nations with DART network technology.
   - Use a Cigorn gateway with dozens of base stations.



Raveon Technologies Corporation
2320 Cousteau Court
Vista, CA 92081
Phone: +1-760-444-5995
Fax: +1-760-444-5997
Email: sales@raveon.com

Point – To - Point

Often there is a need to wirelessly connect one device to another. In this type of Point-To-Point system, Raveon has more wireless data options for wide-area coverage than any other company.



10 – 1000 square km

RV-M50 Daisy series modem in 915MHz unlicensed ISM band.

50 – 10,000 square km

RV-M7 series in licensed VHF band.

40 – 4,000 square km

RV-M7 series in licensed UHF band

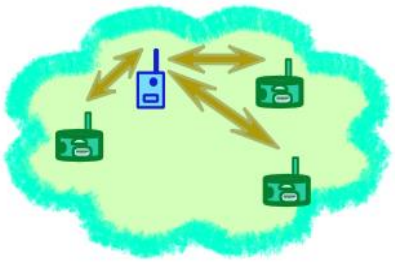
20 – 10,000 square km

RV-M8 series OEM modules in licensed VHF, UHF, and 220MHz bands.

All of the above models can be configured for point-to-point communications. Use licensed UHF or VHF when you have a dedicated radio channel for your use. Use the RV-M50 Daisy modem for use on license-free ISM channels in the 902-928MHz range.

Point – To - Multipoint

Often there is a need to wirelessly connect one device to many other devices, such as SCADA systems, remote controls and GPS tracking. All Raveon data radio modems that work in Point-To-Point mode will also work in a Point-To-Multipoint mode.



The flexible addressing scheme built into every radio allows sending and receiving data to/from individual devices, or broadcast to groups or all devices.

A Raveon Skyline system using the RV-M50 Daisy Modems have long range easily (1-20km), and are very low cost and low power so it is more practical to use an M50 to link multiple devices than it is to wire them up. With 100 times the communication range or Wi-Fi or Bluetooth, Daisy Modems are the reliable solution for the last-mile link for GPS tracking, smart-grid applications, remote control of power, gas, and water, and industrial M2M applications.

With the trend towards real-time connectivity and access to all machines and data, you can Daisy-Chain your multipoint network with the secure RV-M50 Daisy Modems to create your own private Internet of Things across any Skyline.

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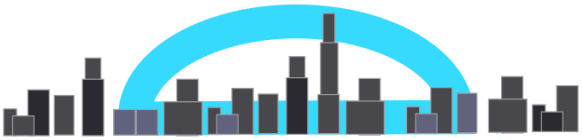
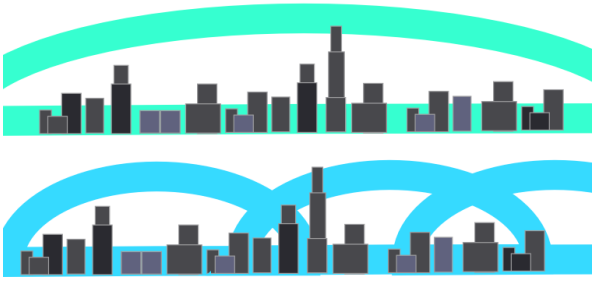
Skyline Wireless Coverage

Cover 10s to 100s of square kilometers with Raveon's Skyline system and Daisy radio modems. Raveon uses LoRa technology from Semtec to get this outstanding coverage at very low costs.



For even wider area coverage, use high-power licensed VHF/UHF band radio modems to cover a whole city.



Or install many Skyline Wireless Hubs around the area to get the coverage your system needs. Put as many hubs in the area to get the coverage you need and increase reliability.

Challenges Going the Last Few Miles

Most public wireless technologies such as WiFi, Bluetooth, Zigbee, Zeewave,… operate on public license-free radio channels. Many companies have learned the hard way that these frequencies have some insurmountable challenges:

A. Short Range. These ISM band products designed with 20+ year old wireless technology have very limited communication range. Usually only hundreds of meters.

B. Interference. With millions of spread-spectrum devices operating within miles, mesh networks often break and wireless links come and go.

Using wireless modems on licensed frequencies allows radio modems to use more power, have less interference, and dedicated channels.

With great RF system design, powerful base-band processing, and an efficient over-the-air protocol, Raven makes low-power radio modems to work many miles.

A. RF System Design. The modulation, base-band DSP, filtering, RF front-end, power amplifiers, oscillators, and link can all be optimized.

B. Range vs Data Rates. The biggest challenge all radio systems face. 10X faster data will always have 1/10th the power-per-bit and half the range. M2M communications use so much less data than consumer apps, so a dedicated wireless data network for M2M communications can have outstanding radio coverage.

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Daisy Overview

Daisy Modems are inexpensive but still long-range wireless links.

Raveon produces many industrial radio modems with 2-5 watts of transmit power, and frequencies in the 100MHz to 500MHz licensed frequency range. These lower frequencies and high power enable these radios to reliably cover 100-1000 square miles. See our data radio products at http://www.raveon.com/products

When an application only needs a wireless link that works a few miles, Daisy Modems in a Skyline system will get the job done at a much lower cost. Our Daisy modems use very sensitive long-range LoRa transceivers. How do they get such amazing rang?

A. They use 900MHz RF instead of 2.4GHz. Link margin is 1/F so the lower the frequency, the better the range.

B. Advanced modulation techniques enabled almost 10X better receiver sensitivity.

C. Low bit-rates for M2M increase the signal/noise ratio by 10 to 100 times.

D. Powerful forward-error-correction repairs corrupted data bits

Add all of the above up, and you can see how our Daisy radio modems can wirelessly extend your network out many miles.

And because our Daisy modems are highly integrated, they are small and very inexpensive. Small saves money, power, and makes them easy to integrate into OEM products, meters, and other devices.

Each Daisy Modem is assigned an IPV6 address, has multiple levels of security and encryption, and a very flexible I/O for connection with most any type of machine.

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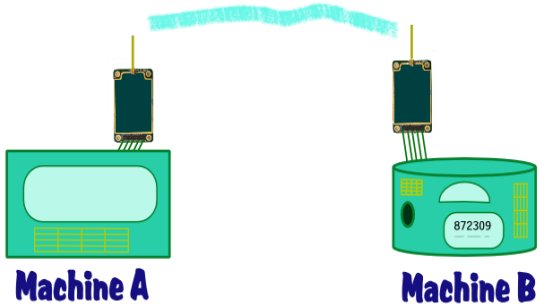
Daisy Network Options

Point-to-Point

Two or more Daisy Modems can be configured to communicate with each other in a traditional radio modem way. Each is assigned a unique ID, and using the IDs, messages can be sent from one



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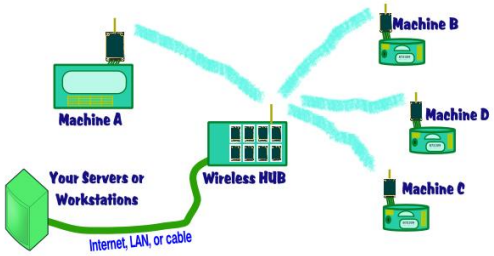
Daisy Modem to one or more other Daisy Modems.

If the GPS tracking feature is ordered with the Daisy Modem, then the Daisy Modem can be used as a GPS transponder. Any other Daisy Modem within radio range can track it (assuming the security credentials are configured on all transponders).

Point-to-point networks require no other infrastructure. No base station, no internet connection, no router, no other hardware is needed to make a local wireless network. To connect a machine to the internet, or some other network or device, all that is needed is the appropriate I/O interface on one of the Daisy Modems.

All modems communicate through their serial interfaces as RS232/422/485/USB. Device addressing is built into the products, and may be configured by the user. The RV-M50 Daisy modem uses a digital serial interface for easy integration into your products. It is also available in the Tech Series enclosure with its RS232, RS422, RS485, USB, and digital interface options. There is also an embedded Arduino CPU option with this enclosure. See www.raveon.com/tech-series/ for more information about this versatile enclosure.

Point-to-Multipoint with Wireless Condenser



Dozens to thousands of Daisy Modems can be used in a point-to-multipoint configuration with the use of one or more Wireless Hubs or a Wireless Condenser. We call this system the Skyline system. Each Daisy Modem comes assigned a unique IP6 address, and using the IDs, messages can be sent from one Daisy Modem to one or more other Daisy Modems. Raveon offers two different types of Skyline base stations for the radios to communicate with.

1. **Wireless Condenser** for simple single base station networks.
2. **Managed Wireless Hubs** that mesh together to form as large of a network as you wish.

The managed Skyline Wireless Hub in a Daisy network is a very powerful computer that makes wireless connectivity to your end devices easy, reliable, and secure.

Skyline Wireless Hub Functions:

A. **Device authentication**. Ensures the devices on your point-to multipoint system are only the devices you authorized to be on your system.

B. **Data routing.** Transfers data between wireless devices, or between your servers and the wireless devices.

C. **Manages Security.** Depending upon the security level you choose, the Wireless Hub manages security and encryption protocols and authenticates devices.

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Expandable Wide Area

Dozens to millions of Daisy Modems can be used in a wide-area point-to-multipoint with many Wireless Hubs used to expand system coverage as needed. The Wireless Hubs in a wide-area Daisy network communicate amongst themselves to form a huge wireless network. 1 to 50 hubs may be used on a single Expandable Wide Area network.

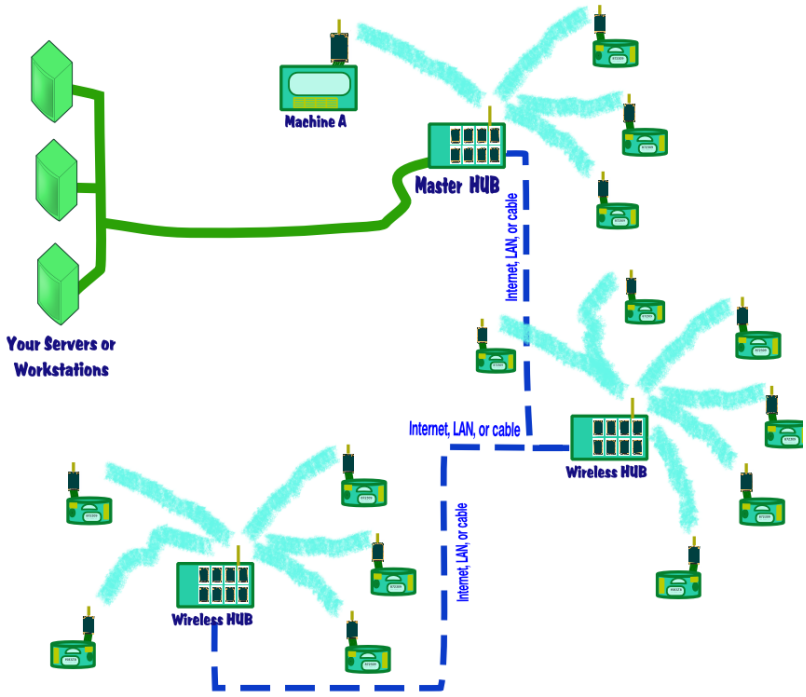
Your servers/workstations that need access to any or all of the devices connected to the Daisy Modems need only access one of the one Master Hub to send and receive data. Data may be communicated in/out of the wide area network using:

A. IPV6 packets

B. Telnet sockets

C. SSH connections

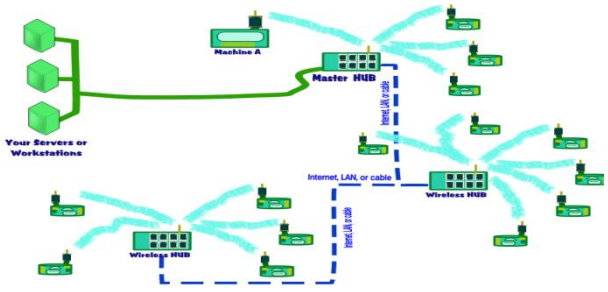
D. WMX packets



Need more coverage? Just install more Skyline Wireless Hubs. Raveon's Wireless Hubs are very economical, and each one will add miles of coverage. The Wireless Hubs automatically communicate between themselves to pass data, hand-off Daisy Modems, authenticate users, and keep the network secure.

Commercial Networks

If you want to cover millions of miles, billions of end-points, and have thousands of customers, then a DART network with Daisy Modems as endpoints is a very economical solution. See www.raveon.com/dart for more information about Raveon's wide-area DART technology.



Simple local networks

Platform Options

M2M communications and the Internet of Things (IoT) often benefit from utilizing a gateway platform with built-in applications. You can operate Daisy Modem without any platform because their interfaces are so versatile, but Raveon also has a number of platform options.

Wireless Condenser. A Raveon Wireless Condenser model RV-R48 can communicate with 1 to thousands of Daisy radio modems and GPS trackers. Locate a Condenser at your network site, and any Daisy Radio within range will be able to send and receive data to/from the Condenser. The Condenser authenticates your radios and gives you easy data communications with your radio modems and GPS transponders.

Managed Wireless Hubs. As the hubs in a Skyline wireless system, it is a Linux computer, and Raveon can assist you with implementing your apps on the Wireless Hub. Locate a Wireless Hub at your network site, and any Daisy Radio within range will be able to send and receive data to/from the Hub. The HUB gives you IP access, serial access, and telnet access to your devices that have incorporated Daisy Modems. The Wireless Hub also authenticates the Daisy Modems and securely encrypts the communications so that you private data stays private. Your private Skyline system will have most of the features of a public IP network – and more security.

Cigorn Gateway. (www.cigorn.com) Cigorn is an open-source wireless router designed for SCADA and wide-area data routing from multiple base stations.

DART. Raveon has developed a server and protocol technology called DART (Dynamic Automatic Radio Transmissions). Daisy Radio modems any some other of Raveon's radio modems support the DART protocol, so one network built with DART Wireless Hubs and a DART Master Gateway can support thousands of Hubs and billions of Daisy Radio nodes. See www.raveon.com/dart for more information.

DART Gate. An application by Raveon used to manage a wide-area wireless network. It lets users monitor and manage their network, and link databases to each device for GPS tracking and inventory management.

Tracking Things

Daisy Modems with their GPS option are outstanding GPS transponders. Because they are low-cost, low-power, and

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long-range. Daisy Modems can be used for location-based inventory control, theft detection, and traditional AVL.

The RV-M50 Daisy Radio GPS transponder is also available in a weatherproof enclosure with built-in battery and antennas for personal and asset tracking. It is model number RV-V50.

RV-V50-EC

All Daisy Networks support GPS tracking applications. Raveon has a *RavTrack PC* program for GPS tracking, and many other software apps are available to track Daisy Transponders.

Great Coverage with No Monthly Fees.

Using a Skyline wireless data system, Daisy GPS transponders can be tracked from many miles away. That may not be enough for your needs, so simply add more Wireless Hubs to expand your coverage to as large of an area as you wish. For example, if you were a automobile dealer wanting to track your inventory, or a school district wanting to track school busses, put a Wireless Hub at one facility to track every vehicle within miles of that location.

Skyline systems allow you to add as many Wireless Hubs as you need to cover your area. Raveon's Wireless Hubs have an automatic Mesh capability so that they act like on big Hub instead of many diverse networks. Login into the master Wireless Hub on your network and it will give you access to all devices within range of all of your Wireless Hubs.

Track your vehicles on-site or within miles of your location

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Vista, CA 92081
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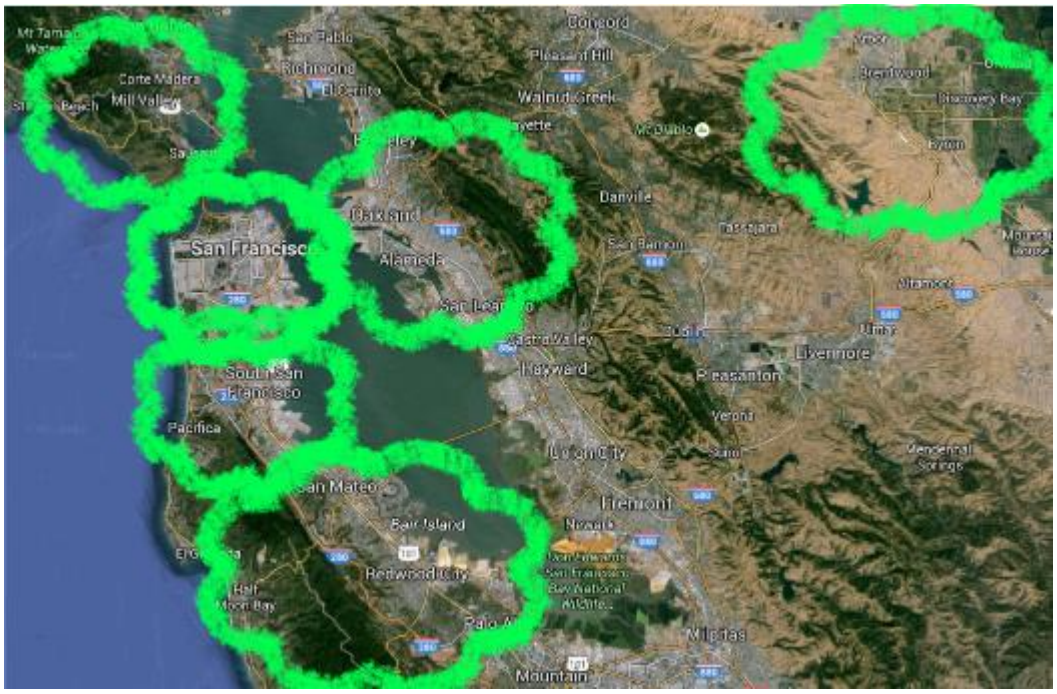
Add a Wireless Hub at your Other locations to expand Coverage

The Wireless Hubs do not have to be within radio range of each other. Spread them around the city, the state, or the country to expand your coverage.



Tracking in the Cloud or a Personal Cloud

Daisy GPS trackers with their expandable coverage and no monthly fees are the most economical way to GPS track vehicles, busses, assets, rental equipment, or almost anything. Use a server in the cloud or your own private cloud to access your information.

Raveon offer cloud-base GPS tracking if you want to use our service, or purchase a ***Dart Gate*** server application to host your own GPS tracking server. The Daisy Hub provides secure access to your GPR tracking data, so you can utilize your own GPS tracking applications, or use Raveon's options, or many other company's software.

Raveon's Dart Gate web platform has unique features that let you customize the user-interface and the data that is displayed related to the things you are tracking. Access your things location information using a web browser, Android tablet, or any mobile device. And your users can also access the customized information you stored for the things you are tracking. For example, an automobile dealer can also store their car's color, VIN number, price, year, model, options, and lots of other data for each car. A school district can also store the driver's name, bus model, maintenance information, route number, and child count in Dart Gate. When this type of information is stored in Dart Gate, users can sort and view their things by any or all of the fields. For example, an auto dealer can get a list of all red cars with a price less than $25,000, and then display them on a map.

Why host your own tracking server?

1. **Security.** You control and limit access your information.
2. **Cost.** Dart Gate server is easy to host, and for medium sized systems, a hosting company may not be needed.
3. **Customization.** Raveon offer's custom server support, so if you have special database or information needs, we can customize Dart Gate for your needs.

Conclusion

Outside of cellular networks, few companies other than Raveon can offer complete solutions to meet the performance and security demands of the new wireless world. The internet of things runs on a global network, but it can easily be extended anywhere by daisy-chaining it with long-range wireless.

About Raveon Technologies

Raveon offers a large variety of wireless solutions to build complete wireless networks or extend the area of an existing network. With a large portfolio of long-range wireless solutions, innovative Daisy radios, and dedicated technical support personnel, choose Raveon as your wireless partner and your network will work better than expected, cover huge areas, and be very economical.

For more information about these or any other Raveon product, see www.raveon.com or in the U.S.A. call
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