

Satellite Network Solution

Secure, Resilient, Software Defined

OVERVIEW

Q-NET™ supports the creation of **secure, resilient, software-defined networks**.

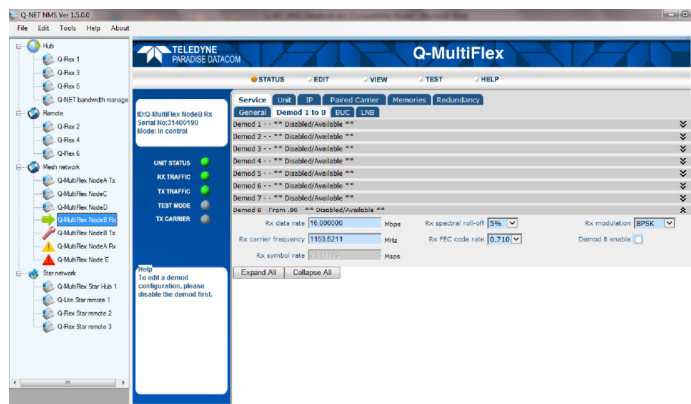
Q-NET™ is a scalable satellite communications that supports all types of networks including point-to-multipoint star, full/partial mesh, point-to-point and hybrids. No expensive hub; no double hops; fully-functional network control application included as standard.

Q-NET™ is available as a **full turnkey solution** consisting of fully wired, pre-configured rack systems (including modems, routers, switches, etc.).

SECURITY

Q-NET™'s AES-256 point-to-multipoint encryption supports a unique encryption key at every remote site. This is used to encrypt all packets to be sent to the remote via the hub shared outbound, ensuring each remote modem can access only its own traffic. This is crucial in situations where different groups of users or organisations share the same network infrastructure. The remote modem uses the same key to encrypt the data associated with its inbound carrier going back to the hub.

AES-256 is the strongest form of encryption available and is the de-facto standard for state-of-the-art encryption systems. When each link uses a unique key then encryption can be used to authenticate and validate the satellite link.



Q-NET™ Navigator provides simple and intuitive network control and monitoring.

RESILIENCE

Q-NET™ supports an ever-increasing number of features aimed at making satellite links resilient to all forms of interference, whether accidental or deliberate. Please contact us for details.

SOFTWARE DEFINED NETWORKS

Software defined networks solve a problem created by the changing ways in which people access and use data. In the past, networks were largely static and a user mainly interacted with a specific server. The advent of cloud computing and mobile computing has changed all this and requires a different approach.

A virtualisation layer within **Q-NET™** abstracts the hardware, making it easy to dynamically provision network resources as required (for example, the network could be dynamically changed from star to mesh operation or from point-to-point to point-to-multipoint. Explicit

SOFTWARE DEFINED NETWORKS (contd.)

support for SDN protocols (specifically SD-WAN) allow the satellite network to be managed and controlled using a common set of network management tools used for managing all of the provider's terrestrial and satellite networks.

This has the benefit of creating seamless user traffic management and delivery over both terrestrial and satellite assets from a centralized control system. **Q-NET™ is the first satellite network of its type in the industry to adopt a software defined networking approach – something that is now becoming commonplace in the wider IT world.**

In summary, it has been clear for some time that the idea of a fixed network is dead. Our software-defined modems embody a unique 'single building block for any type of network' approach. In addition, adopting a software defined network approach gives a standard way of controlling networks and therefore gives our users vendor independence by abstracting away any proprietary hardware.

BANDWIDTH EFFICIENCY

Q-NET™ uses the ultra-efficient **DVB-S2X** waveform for both the outbound carrier and inbound carriers. DVB-S2X is between 20% and 60% more bandwidth efficient than its predecessor, DVB-S2. The inbound carriers can be fixed or dynamic.

Q-NET™ DynAMo™ (Dynamically Assigned Modulation), which is described later, is our innovative dynamic SCPC technology that allocates bandwidth on demand in response to changing traffic patterns. Carriers are resized dynamically with no traffic loss.

FLEXIBILITY

Unlike any other satellite system, **Q-NET™** is based on a single, highly versatile satellite component, namely, the **Q-Flex™** modem, which provides modulator, demodulator and multi-demodulator functions, as well as being a single-box solution for all your advanced IP processing requirements such as traffic shaping, TCP acceleration and ACM.

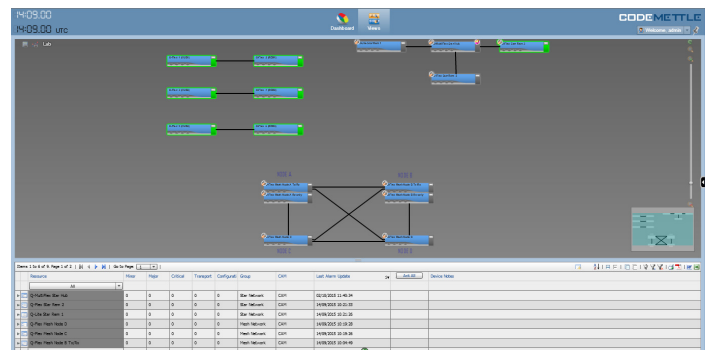
By using the same versatile satellite components at every site, **Q-NET™** is readily configurable to meet your network needs now and in the future.

SCALABILITY

Q-NET™ is a modular system that allows your network to grow in response to new network requirements.

Because there is no fixed-cost hub component, **Q-NET™** starts out as a low-cost system and can be readily expanded without breaking the bank.

Q-NET™ networks scale to any size. The traffic shaping feature supports 128 traffic streams, allowing up to 128 remote sites to receive a single outbound from the hub.



Q-NET™ Bandwidth Manager provides carrier planning and system monitoring functions. It also provides custom network status QoS reports (see graphs to left).

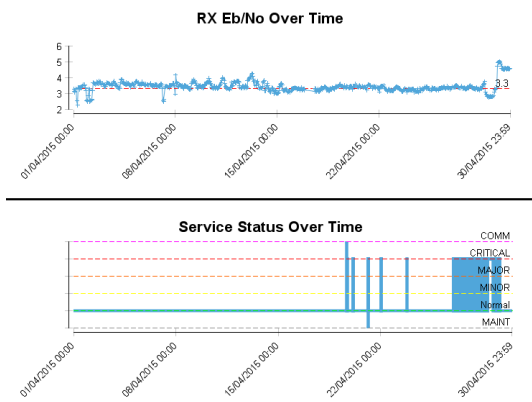
KEY COMPONENTS

Q-MultiFlex™, **Q-Flex™** and **Q-Lite™** satellite modems. These represent the state-of-the-art in terms of satellite modem technology, with support for the DVB-S2X standard and an advanced IP single-box solution.

The **Q-Flex™** is a software-defined IF/L-band modem that can be converted to a point-to-multipoint **Q-MultiFlex™** (modulator/multi-demodulator) with the addition of one or more add-on cards. The **Q-Lite™** is a compact form of the **Q-Flex™** ideal for comms-on-the-move.

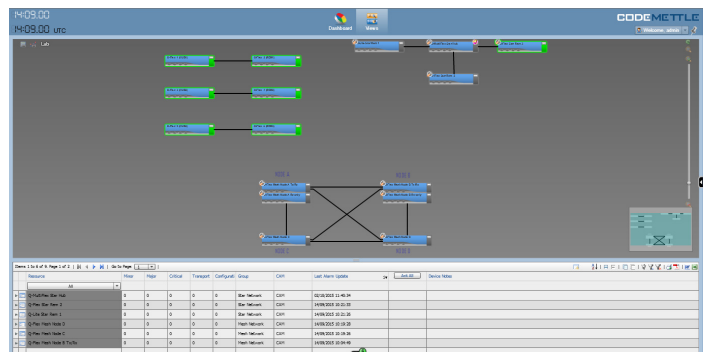
Q-NET™ Navigator allows all modems (and other network devices) in the system to be controlled through a single application. It provides control over all modem and multi-demodulator functions, using an easy-to-navigate site map, which also displays the real-time alarm status of each modem. Includes Virtual Network Operator (VNO) support.

Q-NET™ Bandwidth Manager provides multi-satellite/transponder carrier planning and high-level system control, monitoring, recording and quality-of-service reporting. It runs on standard network server hardware and is accessed via web browser client sessions. It complements the hands-on control provided by *Navigator* and the two applications can be used separately or in conjunction with each other.



BENEFITS

- ▶ **One system, boundless connectivity.** Uses a single building block for all types of networks, simplifying network expansion, operator training and logistics
- ▶ **Simple IP.** Single-box satellite modem solution for advanced IP, including traffic shaping, TCP acceleration, compression, VLANs and ACM. Software Defined Network support
- ▶ **Bandwidth efficiency.** Supports the highly-efficient DVB-S2X standard; low roll-offs on outbound and inbounds
- ▶ **Control at your finger-tips.** Includes *Navigator* network control application as standard (no annual support charge); optional *Bandwidth Manager* for multi-transponder carrier planning and control
- ▶ **Low cost.** No expensive hub installation. Scales from very small to very large networks with minimal box count
- ▶ **'Open' network.** Control apps can be readily used with other vendors' satellite equipment, keeping you in charge of your future network expansion options
- ▶ **LinkGuard™ interference detection.** Automatically detects interference underneath your carriers, 24x7, while passing traffic
- ▶ **QoS reports.** Generate QoS metrics reports that show system SLA performance
- ▶ **Contact us to 'try-before-you-buy'**



Q-NET™ Bandwidth Manager provides carrier planning and system monitoring functions. It also provides custom network status QoS reports (see graphs to left).

Q-MULTIFLEX™ ‘HUB-IN-A-BOX’

We refer to the **Q-MultiFlex™** as a ‘hub-in-a-box’. Why? Because it incorporates all of the following functions in a single 1RU unit that replaces a whole rack of traditional hub equipment:

- Modulator
- Multiple demodulators
- Ethernet managed switch
- Router
- IP bandwidth optimizer
- ACM controller
- Packet encapsulator/decapsulator
- Spectrum analyser
- Oscilloscope (constellation monitor)
- Interference detector
- Traffic generator/analyser
- PRBS BER tester
- Redundancy system controller

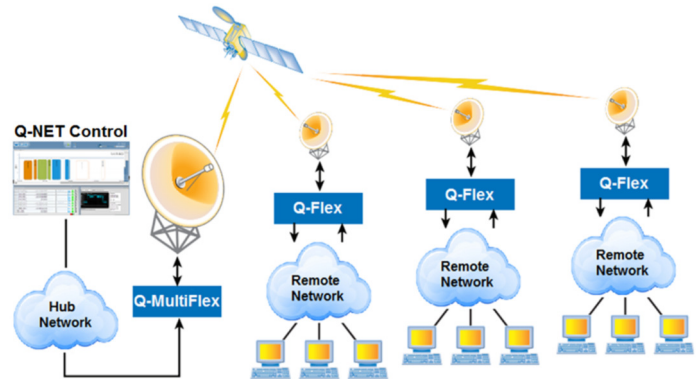
And the savings continue to accumulate when you consider the need for fewer spares, less training, fewer interconnect cables, less air-conditioned rack space, lower power consumption, etc.

Q-NET™ has redefined the entry-level for satellite network solutions, extending the reach of satellite to a new audience on a tight budget who were previously put off by the high cost and complexity of the solutions available.

NETWORK TOPOLOGIES

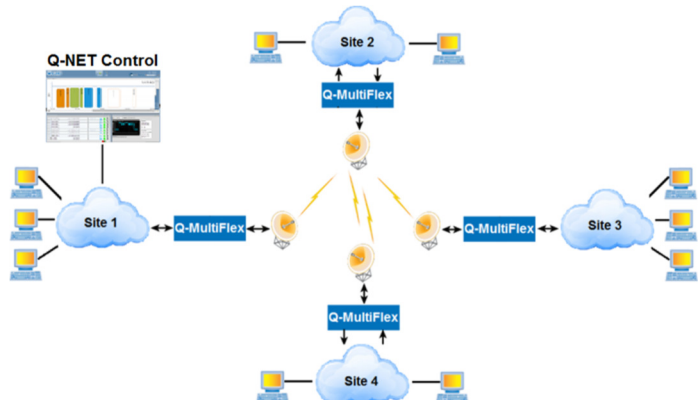
Q-NET™ supports all types of networks.

In a **star point-to-multipoint network** a **Q-MultiFlex™** generates a shared outbound from the hub to the remotes, which have **Q-Flex™** modems for receiving the outbound. They generate return carriers back to the hub, which are demodulated by the **Q-MultiFlex™**. The box count starts at literally one box at the hub and one at each site for the smallest network. Traffic shaping is used to control the content of the shared outbound. VLAN tagging is often used to keep traffic for each site separate.

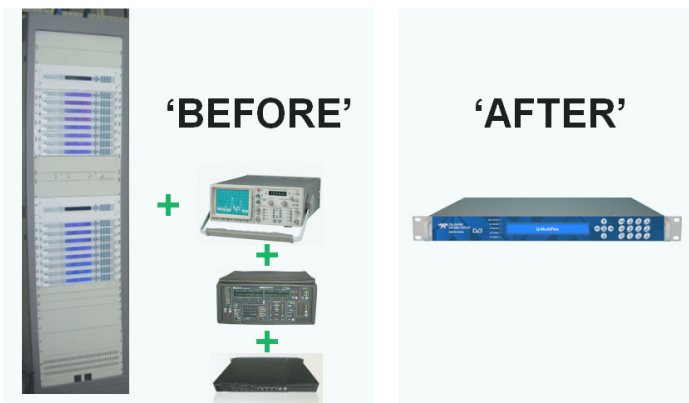


Q-NET™ point-to-multipoint star network.

In a **mesh network** there is no hub and therefore remote-to-remote comms are all single hop. Each site consists of literally, in the simplest case, a single **Q-MultiFlex™**. In a full mesh each site transmits an outbound to every site and receives a carrier from every other site.



Q-NET™ mesh network.





Q-NET™: One system, boundless connectivity.

Dynamic Bandwidth Allocation

Paradise has created **Q-NET™ DynAMo™** (Dynamically Assigned Modulation) - a completely new form of dynamic SCPC technology that shares bandwidth between remote modems simply and efficiently.

Our objective was to create network technology that instantly reallocates bandwidth to where it is needed most, giving the highest possible overall throughput for the network at all times, resulting in the best possible user experience.

Our dynamic SCPC technology is based on a number of true innovations, including the use of dual digital modulators (supported on all Paradise modems as standard) to ensure hitless carrier transitions. Supporting multiple bandwidth and transponder power pools, bandwidth allocations are completely transparent at all times, facilitating clear, meaningful and rapid link monitoring and diagnostics.

Contact us to learn more about how **Q-NET™ DynAMo™** extends the well known bandwidth efficiencies of SCPC to user applications that require dynamic sharing of bandwidth between competing remote satellite terminals.

How does Q-NET™ work in practice?

Q-NET™ can be best understood by explaining how to set up a point-to-multipoint network. Using the example of a full mesh:

- Each site generates a shared SCPC carrier that is received by all the other sites.
- Each site receives an SCPC carrier from every other site. Each **Q-MultiFlex™** has an optional modulator and up to 16 demodulators; all use the same FEC for transmit and receive. **Q-MultiFlex™** units are cascaded together in order to increase the number of remotes that share the outbound. There is no limit to how large the network can scale.
- Each demod is programmed to receive a different centre frequency. The outputs from the inbound carriers are multiplexed together and output to the local network.
- Packet management options include bridging (Layer 2) and routing (Layer 3). Typically, VLANs are used to separate traffic for each site and allow the outbound to be partitioned according to the needs of the remote sites. The remote sites filter on the VLANs of interest, untagging the VLAN traffic and passing the traffic on to the local network.
- No hub is required and there are no double satellite hops.

Markets and Applications

- ▶ VSAT
- ▶ Point-to-point/multipoint IP
- ▶ Star, mesh and hybrids
- ▶ Cellular backhaul
- ▶ Corporate networks
- ▶ ISPs/trunking
- ▶ Oil/gas
- ▶ Maritime/cruise
- ▶ Government



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