QMultiFlex-400™

Satellite Geographical Redundancy

Maximize Network Availability Over Multiple Teleports

TELEDYNE
PARADISE DATACOM
Everywhereyoulook™

Overview

The term resilience has become something of a buzzword in the Satcoms industry and no more so than in the world of defence and secure communications. But what does resilience mean when it comes to these satellite networks? One description could include building networks that are resilient to extreme weather events, conflicts, and accidents. To achieve network resilience, a satellite dependant organisation may not want to rely on a single satellite connection.

When it comes to building a resilient network, a multi-layered approach is key. Here at **Teledyne Paradise Datacom**, we are acutely aware that many of our customers across defence, government and enterprise are relying on our satellite modem products to provide critical communications and to withstand and recover from disruptions of service.

One feature we have created to build resilience into our satellite modem products is geographic redundancy. Building a geographically diverse network provides resiliency against natural disasters, catastrophic events or inclement weather that can cause network outages. Hot standby or 1:N redundancy is certainly appealing and protects traffic in the event of a single point of failure but does not protect the network when the whole earth station goes down.

Geo-Redundant distributed systems tackle the core issue by providing another diverse hub that simultaneously operates with the same functionality, ready to take over. Geo-Redundancy is a flexible fail safe that can be configured to monitor multiple failure modes.

Paradise modems are used wherever secure satellite links are essential. In addition to the capabilities described here, we provide encrypted and WGS modems trusted by the most demanding military and security-conscious customers worldwide. Our solutions include point-to-point, point-to-multipoint and mesh modems, and we provide solutions for rackmount and small form-factor mobile/airborne applications.Geo redundancy is available as an option on **QMultiFlex-400** modems.

QMultiFlex-400 Satellite Modem/Hub

The **QMultiFlex-400** satellite modem/hub offers an affordable solution for point-to-multipoint satellite communications. The hub supports a highly-efficient DVB-S2/X shared outbound along with up to 16 DVB-S2/X returns.

In addition, the **QMultiFlex-400** supports an embedded Hub Canceller utilising the powerful DVB-S2 and DVB-S2X waveforms, allowing satellite carriers in a point-to-multipoint system to operate within the same satellite bandwidth, therefore potentially saving up to 50% on satellite bandwidth and associated operational expenditure.

Additional receive-only **QMultiFlex-400** units can be cascaded with the hub unit to share an outbound carrier between up to 128 remote sites in a typical Star network.

The **QMultiFlex-400** Hub Modem is based on our **QFlex-400** series of software-defined satellite modems, which are our most innovative and flexible satellite modems to date, all supporting data rates to 345Mbps outbound and 338Mbps aggregate inbound. Unlike some competing manufacturers, both outbound and inbound carriers support the powerful DVB-S2 and DVB-S2X specification, where DVB-S2X supports higher modulation orders with finer granularity FEC rates, again potentially saving in the order of 50% bandwidth over the DVB-S2 specification.

This series of modems are ideal when hub-based, supporting a versatile point-to-multipoint network, or simply point-to-point. Up to 16 inbound carriers may be supported by a single **QMultiFlex-400** modem/hub, allowing network scalability as demand grows. The modems are fully compatible with our **Q-NET** satellite network solution and are drop-in replacements for the **QFlex-400** and **Q-Lite** satellite modems.

Built-In Redundancy Controller

Each hub modem has a built-in redundancy controller that connects to the other modem within the 1:1 pair via a 9-way D-type male connector. In essence, a 1:1 redundancy system requires two modems, a 1:1 control cable between the two redundancy connectors, and passive splitters and combiners for the IF ports. Customers' IP data is presented to the modems via a switch.

Both modems operate normally with respect to incoming data and IF signals, but only the online modem enables its satellite and terrestrial outputs at any point in time. The Geographical Hub redundancy builds on this capability.

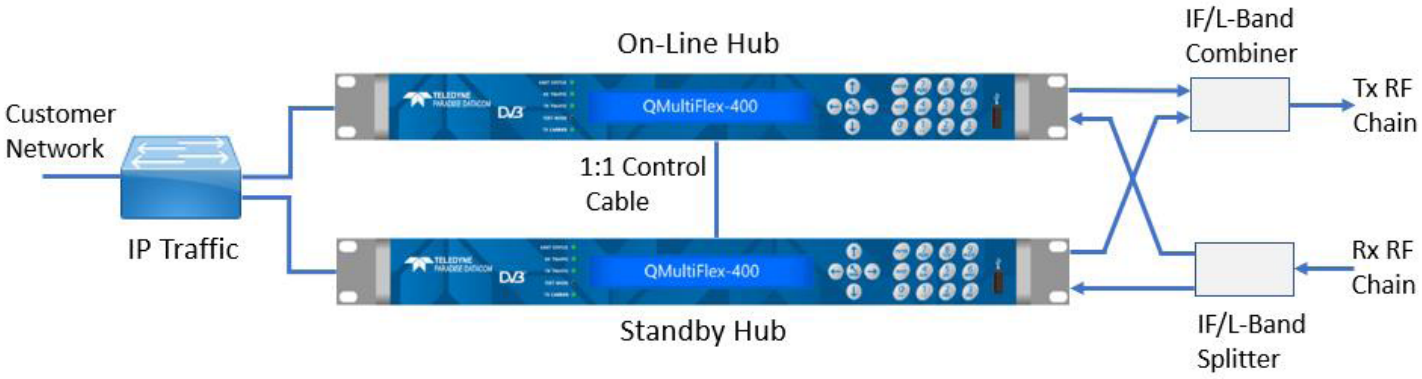
The M&C IP address and the traffic IP address should be on different subnets. The modem defines one default gateway. If the second subnet also requires a gateway then a static route should be added that defines a gateway for that subnet.

On the Standby modem, the carrier is muted, as is the satellite receive port (in order to ensure that no received data is passed out of the terrestrial port).

The M&C port and the terrestrial IP traffic port are not muted. If a switchover occurs when in bridging mode, the Standby modem will automatically learn to bridge the traffic as necessary, once it comes online.

If dynamic routing is being used when a switchover occurs, the route through the newly online modem will be learned automatically.

If static routing is being used, the M&C system will need to detect that a switchover has occurred and update the routes accordingly for the new IP address associated with the online modem. Some network devices support route failover, which automates this process. In this case, the M&C system router that supports route failover should be configured to include another route in the routing table with a higher administrative distance for the route that uses the Standby modem's IP traffic address. The switchover to using the Standby modem will then be automatic when it detects the path through the primary modem is no longer available.



Geographical Redundancy System

In a geographical redundancy system comprising two hubs, both teleports must include identical equipment, with the same software and hardware features, and which are connected together via an Ethernet and RF monitoring process.

In the event of a failure at one teleport, if the problem cannot be fixed at the main hub level, then the geographical redundant teleport takes over.

The **QMultiFlex-400** Hub equipment is connected to the customer's Ethernet switch and router, which will allow both sites to receive and transmit traffic and M&C data via a common Ethernet backbone. Alternately, a dedicated fiber link between hub sites could be used for geographical redundancy control, with converters to Ethernet at each site. When in bridging mode, the standby modem automatically bridges the traffic as necessary, once it comes on-line.

The M&C IP addressing uses unique IP addresses. The Ethernet connectivity / IP addressing for the M&C ports between the two hub sites requires a multicast to all modems M&C addresses.

The hub sites uses one of the multi demodulators to allow the Tx outbound carrier for either site to be monitored. This requires all equipment operated over the satellite link to be able to monitor the Tx signal at the other hub.

The standby site disables its packet output and traffic port IP addresses.

In addition, if desired, the **QMultiFlex-400** unit at each hub site may also be operated in 1:1 mode, allowing local hardware failures on the main traffic modem to be recovered by switching to the associated local standby modem.

Geographic site redundancy is provided by each hub site monitoring the Ethernet connectivity, modem status and RF output of the other sites. In this system, the concept of main and standby is achieved via a token sharing system. Each site reports its status and, if needed, switches over and become the active (main) site, muting the RF outputs at the geographical hubs.

The standby site operates with its hub modem receive paths locked to the incoming carriers, but the modem disables its packet output and traffic IP addresses.

Examples of Hub Failures

Consider the following six failure modes:

Failure Mode 1: No HUB Transmit

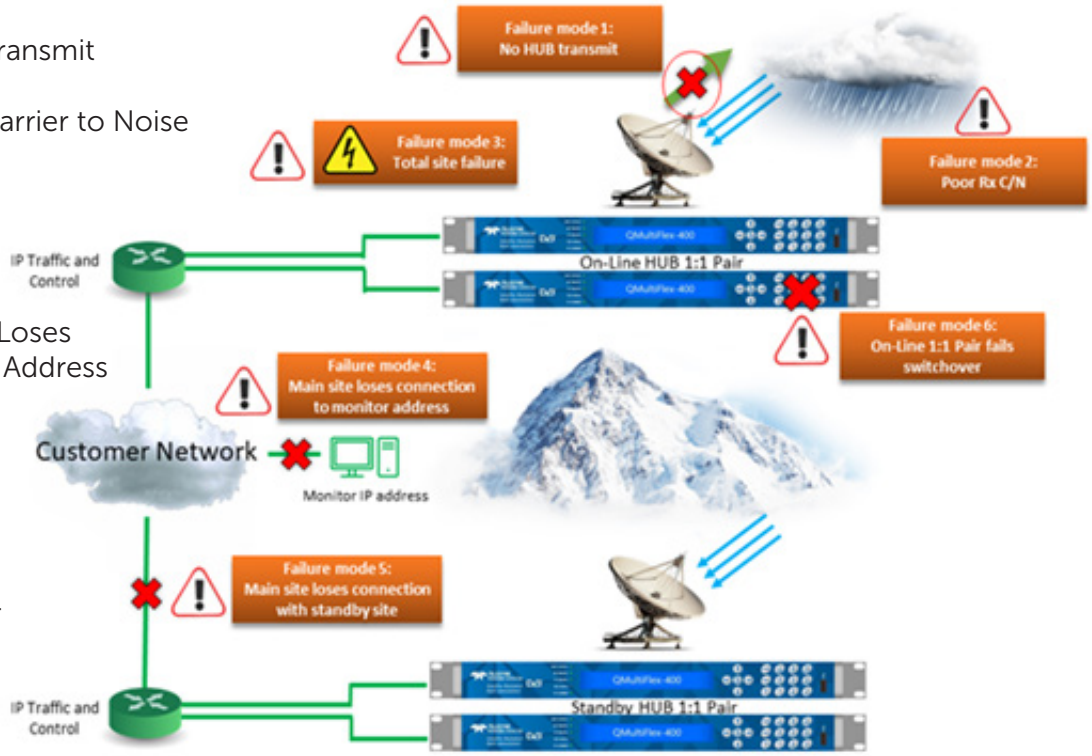
Failure Mode 2: Poor Rx Carrier to Noise Ratio

Failure Mode 3: Total Site Failure

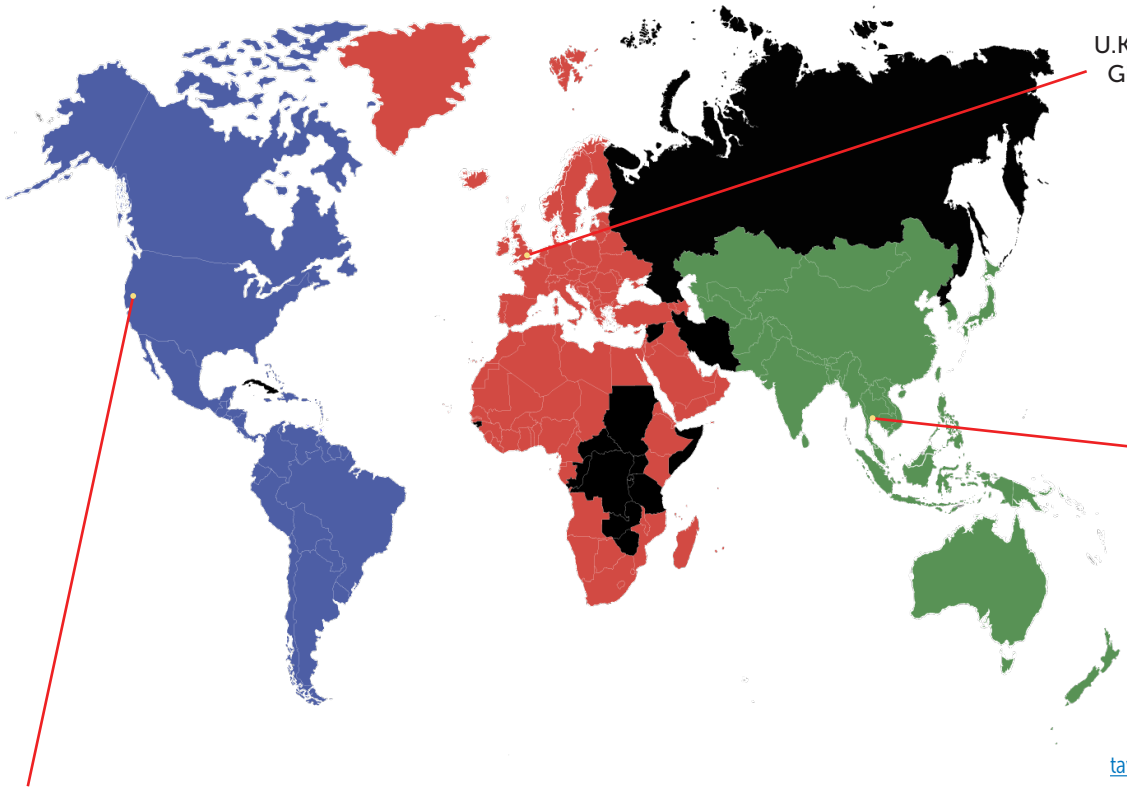
Failure Mode 4: Main Site Loses Connection to Monitor Address

Failure Mode 5: Main Site Loses Connection with Standby Site

Failure Mode 6: On-line 1:1 Pair Fails Switchover



Global Sales Offices



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