

Q-NET DynAMo™ Technology Briefing

Q-NET DynAMo™ (which stands for Dynamically Assigned Modulation) is our innovative dynamic SCPC technology that automatically allocates bandwidth on demand in response to changing network traffic patterns.

It is a novel form of dynamic bandwidth management that is radical in every respect, from completely revising the satellite link budget process to a revolutionary new method of bandwidth assignment, unleashing unparalleled network responsiveness and efficiency.

OVERVIEW

‘Traditional satellite link budgets waste resources and ACM is not the solution’

It can be difficult to summarise revolutionary technology succinctly. Instead, we prefer to make some (hopefully) thought-provoking statements that challenge prevailing views in the industry and show that an entirely different approach is both feasible and desirable.

In developing Q-NET DynAMo™, which aims to make the best possible use of transponder resources, it became apparent that these resources are wasted in a number of different ways.

One example is the rain-fade margin, which is extra power added to ensure that the link remains stable even when rain attenuates the received signal. It has long been recognized that this power is wasted all of the time except when it is raining. The industry’s response to this was to introduce ACM, a feature that converts any unused power into additional data throughput. ACM was and is a great advance – at least in principle, but perhaps not always in practice.

ACM has an obvious weakness – the link data rate is determined entirely by the weather! Whereas we would like the prevailing data rate to dynamically match user requirements. Are users expected to send more data just because it is sunny or less data when it rains? Bandwidth may be available when it isn’t required and not available when it is required! **Our solution is to use the rain fade margins as a purely central network resource that can be used much more efficiently, countering individual rain fades when required but being used to allocate bandwidth system wide at all other times.**

‘With Q-NET DynAMo™ our objective was to create network technology that instantly reallocates bandwidth to where it is required the most, giving the highest possible overall network throughput at all times, resulting in the best possible user experience.’

Colin Mackay,
Director of Engineering

‘Traditional bandwidth-on-demand systems use a dedicated signaling channel to control bandwidth allocation – this is pure overhead and is totally unnecessary’

Satellite bandwidth on demand has its origins, at least in part, in the assigning of telephone circuits for the duration of user calls and then returning the channels to a central pool to await reassignment to another user.

This required a control system had to be overlaid on the network in order to control the allocation of satellite bandwidth. This consisted of a dedicated signaling channel that existed in parallel with the data channels as a fixed overhead. The use of signaling channels is still prevalent today and represents an overhead that can account for up to 20% of the overall system bandwidth.

However, the situation today is very different to the legacy scenario. **‘Always on’ connectivity is now a user lifestyle expectation!** Users want bandwidth to be a ‘given’ and not something that is made available only when the system decides to do so.

This has surprising benefits. If some bandwidth is always available to the user then they see an instant response from the moment of their first request, creating a favourable user experience. Also, TCP/IP networks work far better if they are permanently connected over satellite (due to background protocols running all the time, such as network discovery). If there is no permanent satellite link then the network takes time to adapt and will not be nearly as responsive. **And if remote sites always have bandwidth then there is no need for a separate signaling channel! The benefit? Control overhead in Q-NET DynAMo™ is less than 0.001% of the system bandwidth, the lowest in the industry!**



‘Switching carriers in a dynamic SCPC system creates downtime. That is why we use dual modulators to make changes in carrier operation truly hitless’

Q-NET DynAMo™ uses a variety of bandwidth allocation techniques and changing carrier allocations is only one of them. It is a technique that is used sparingly and is often not actually necessary, even when considerable additional bandwidth is required.

An innovation that we have introduced is the use of dual digital modulators to ensure hitless carrier operations, meaning that a remote terminal can perform a variety of carrier operations involving the assignment of different carriers without losing any packets. (Incidentally, we make sure that multi-carrier back-off is **not** an issue!)

In fact, all Paradise modems have supported dual digital modulators as standard for years, even though this may not be apparent to most of our users. So no extra cost or complexity is involved!

SUMMARY

The Q-NET™ satellite network platform is our scalable satellite communications system supporting highly-efficient bandwidth technology and sophisticated carrier and traffic management for point-to-point and point-to-multipoint networks.

Q-NET DynA^MMo™ offers flexible bandwidth on demand, dynamically switching bandwidth to where it is required in the network in response to changing user demands.

Q-NET DynA^MMo™ is based on new technology and ideas that provide a radical paradigm shift in comparison to alternatives. The many innovations include the lowest control overheads in the industry, a revised link budget process that entirely eliminates wastage of transponder resources and the use of dual modulators for truly hitless SCPC operation.

However, the features described just scratch the surface. What we are proudest of is the incredibly elegant and transparent way in which transponder management occurs. The system is designed to be both conceptually and actually simple to understand, set up and use. Why? Because it is very easy to make costly mistakes on the transponder that cause unintended interference to services or that do not use resources efficiently. Have you considered how you would even start to diagnose a degraded service if bandwidth allocations were to constantly change in an apparently random fashion? With Q-NET DynA^MMo™, viewed from the transponder, all dynamic operations are completely transparent, allowing operators to confidently monitor service performance and instantly diagnose problems.

Please contact us for further details of Q-NET™ and Q-NET DynA^MMo™.

HIGHLIGHTS

- ▶ Simple, safe & user-friendly form of dynamic bandwidth assignment
- ▶ Significantly improves bandwidth efficiency compared to fixed SCPC carriers
- ▶ Eliminates wastage of transponder resources commonly found in satellite link budgets
- ▶ Low overhead: < 0.001% of bandwidth
- ▶ Dual modulator operation for hitless SCPC operation
- ▶ Fast carrier switching
- ▶ Management of multi satellite/transponder bandwidth & power pools for traditional and high-throughput (HTS) satellites
- ▶ Multi-operator client-server control application
- ▶ Real-time and historic throughput bandwidth metrics and reports
- ▶ Secure network communications
- ▶ Uniquely, no hub reconfiguration is ever required (either by the operator or 'under the hood') regardless of what bandwidth is dynamically allocated to remote sites
- ▶ Backup Q-NET DynA^MMo™ controller function (can be in any location)
- ▶ Compatible with all Q Series modems (Q-Flex™, Q-MultiFlex™, QFlex-400™, Q-Lite™, etc.)