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An Interview with Andy Lucas, Comtech EF Data Sr. V.P.... For Cruise and Trunking: Load Balancing for Ultra High Bandwidth

In markets such as cruise and IP Trunking, the demand for data and video transmission is soaring, stressing the single link capabilities of even the most advanced modems.

To achieve the extreme levels of bandwidth required to provide cruise passengers with an at-home connectivity experience, Load Balancing offers the capability to vastly increase the amount of bandwidth available from a single modem link.

To find out more about how this technology can be deployed, we sought out Andy Lucas, Sr. V.P. Satellite Operations and Mobility, for Comtech EF Data, a company that has developed a series of products and a Load Balancer designed specifically for data transmission over satellite.

SMW: I understand that Comtech EF Data has developed an innovative Load Balancing solution. Could you explain what the current bandwidth limitations are using a single link,

and how speeds can be increased through deployment of your Load Balancer?

Andy Lucas: In simplest terms, Load Balancing aggregates multiple satellite links to reach levels of performance far beyond the capability of a single link.

For example, in a single link scenario, our CDM-760, which is a dedicated SCPC modem, can be used to achieve an impressive aggregate throughput of around 1.4 Gbps. However, achieving this level of performance stretches the capability of the antenna and amplifier and may be beyond the capabilities of all but the most powerful satellites, and the practical considerations - such as radome size and weight - limit any opportunity to upgrade the antenna and amplifier. Load Balancing steps around these limitations by spreading the transmission over multiple links.

In our model, the signal is spread across up to eight satellite links and using CDM-760

modems with our Load Balancer, it would be possible to achieve up to 3.5 Gbps.

In another example, our network capable, Heights Pro Modem which facilitates the automatic beam switching can achieve speeds of 250 X 200 Mbps on a single link. Without Load Balancing, the link is limited to these speeds. With it, the throughput could be significantly higher.

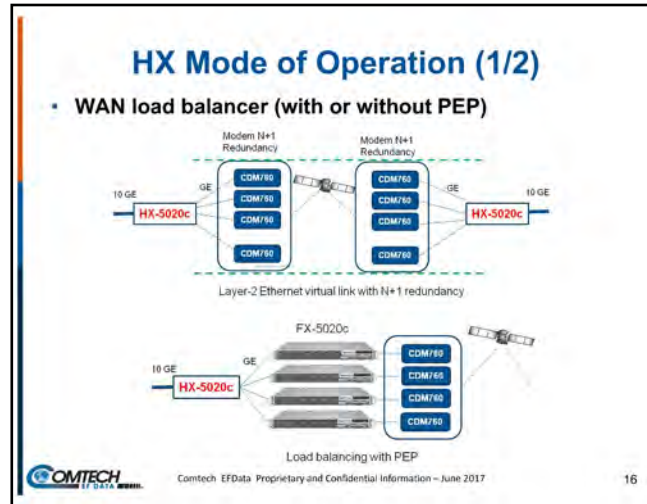
While both modems could be used independently, the products are complimentary.

As the CDM-760 is a dedicated point-to-point SCPC modem, it is most suited when ultra high capacity is required and a

vessel sails under one satellite i.e. if a vessel's itinerary is confined to an area like the Caribbean.

In cases where a vessel transitions across multiple satellite as in a Transatlantic voyage, the H-Pro Heights Remote Gateway with automatic beam switching would be the more appropriate solution. However, both modems could be used in combination.

In that scenario, when an SCPC link was not available for the CDM-760, the Heights Pro would provide the connectivity, and in a situation where both the SCPC link and other satellite links could be accessed, very high bandwidth could be achieved using both modems simultaneously.



In this use case, up to eight modems, CDM 760 and Heights Pro modems, could be used in combination and the available capacity aggregated by a single Load Balancer thereby bi-passing the limited capacity of a single modem.

SMW: In addition to increasing bandwidth capacity, are there any other advantages to Load Balancing?

Andy Lucas: The primary advantage over a single link is that you are limited to one beam and one satellite. With Load Balancing, you can now access multiple beams and multiple satellites. Not only does this result in improved throughput but improves reliability.

When transmission is confined to a single link, weather or blockages from ship infrastructure could interrupt the connection. With Load Balancing, the transmission is spread over multiple links and

multiple satellites. So, an outage affecting a single link does not bring down the connection.

Since most cruise ships have multiple antennas, all of the antennas can become

primary antennas rather than have a collection of primary and backup antennas. The antennas can be pointed at different transponders and maybe even different satellites. So all assets are deployed concurrently resulting in higher speeds, greater passenger satisfaction and higher ROI on antenna investment.

SMW: Can you give us an idea of the hardware requirements needed to employ Load Balancing and what are the limitations?

How well does this approach scale in terms of bandwidth capacity? Can you combine an unlimited number of carriers?

Andy Lucas: You need a modem per connection and theoretically you could do

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up to eight connections on a single antenna. However, since the amount of power applied to a single antenna is limited by the laws of Physics, it's not likely that a single antenna would have enough power to support so many links. You would most likely need to use multiple antennas. On a cruise vessel this makes sense because you usually have multiple antennas.

SMW: Does the technology work on both HTS and conventional wide beam satellites and on both Ku and Ka-Band? Is it frequency agnostic?

Andy Lucas: Yes. Load Balancing is frequency agnostic. You could load balance over C, Ku and Ka Band simultaneously. Obviously, that would give you a very wide choice of satellites that you could access.

SMW: What is the difference between your CDM 760 your H-Pro Heights Remote Gateway?

Andy Lucas: To recap, The CDM-760 is a dedicated point-to-point SCPC modem

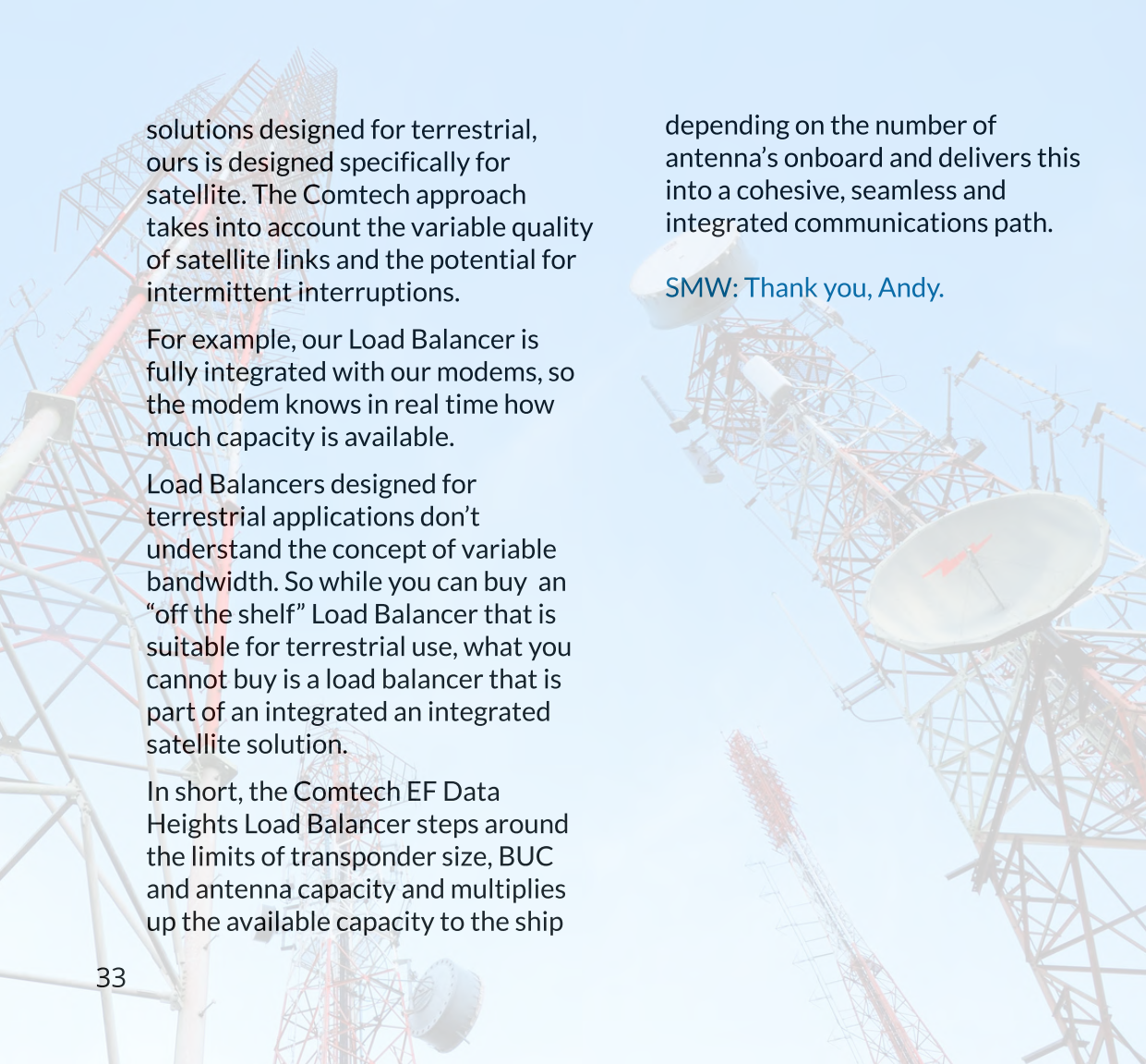
capable of transmission rates up to 1.4 Gbps. It is the modem of choice when you have to have the highest possible throughput, and a high powered, HTS satellite is available.

In contrast, the H-Pro Heights Remote Gateway utilizes H-DNA or dynamic SCPC. It sets up a dynamic SCPC link that adjusts to the capacity required– an approach that is more efficient than TDMA technology, and it can achieve speeds up to 250 X 200 Mbps. It's also a network product and can also do Point-to- Multi-Point and beam switching.

So, in sum, while the CDM-760 would be deployed when you need to achieve the maximum transmission rate possible, the H-Pro Heights Remote Gateway is a product designed for the mobility environment where you need to roam automatically from beam to beam.

SMW: Is this solution proprietary to Comtech EF Data?

Andy Lucas: There are other solutions out there. However, unlike Load Balancing



solutions designed for terrestrial, ours is designed specifically for satellite. The Comtech approach takes into account the variable quality of satellite links and the potential for intermittent interruptions.

For example, our Load Balancer is fully integrated with our modems, so the modem knows in real time how much capacity is available.

Load Balancers designed for terrestrial applications don't understand the concept of variable bandwidth. So while you can buy an "off the shelf" Load Balancer that is suitable for terrestrial use, what you cannot buy is a load balancer that is part of an integrated satellite solution.

In short, the Comtech EF Data Heights Load Balancer steps around the limits of transponder size, BUC and antenna capacity and multiplies up the available capacity to the ship

depending on the number of antenna's onboard and delivers this into a cohesive, seamless and integrated communications path.

SMW: Thank you, Andy.



About Andrew Lucas:

Andrew Lucas is Senior Vice President, Satellite Operators and Mobility for Comtech EF Data. In this role, he leads the market development and direction of the Comtech EF Data product line for Satellite Operators and the Mobility market. By leveraging market insight, he directs long-term strategic