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# Satellite *TECH*Briefs

**Mx-DMA<sub>MRC</sub>**

## Mx-DMA MRC for All Applications

# No Compromises: Mx-DMA Multi-Resolution Coding (MRC) for All Applications

by Elisabeth Tweedie

**S**calability: a few terminals to many thousands of terminals; flexibility: a few bits per second (bps) to hundreds of megabits (Mbps) AND dynamic, rapid response times. This is what to expect from recent innovations in Mx-DMA return technology from ST Engineering iDirect. No more trade-offs, you can have efficiency and scalability.

Introducing Mx-DMA Multi-Resolution Coding (MRC)--simply the most powerful, efficient, dynamic, flexible and cost-effective return technology available today.

## 2021 Mx-DMA MRC: No More Trade-offs

As would be expected from ST Engineering iDirect, continuous innovation is the modus operandi; so, having invented a revolutionary return technology, Mx-DMA High Resolution Coding (HRC) in 2014, that gave users and service providers alike, more flexibility, greater efficiency, and significant cost savings, the company wasn't content to rest on its laurels. Instead, it spent four years developing the upgraded and improved version: Mx-DMA MRC. Research and Development (R&D) is in ST Engineering iDirect's DNA. Mx-DMA MRC marks the end of

trade-offs between efficiency, scalability and agility.

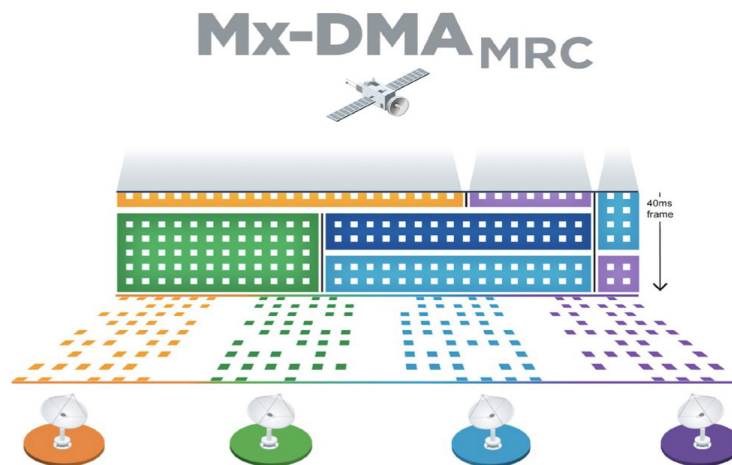
Mx-DMA MRC unites Mx-DMA HRC efficiency with MF-TDMA scalability into a single return technology. Building on Mx-DMA HRC technology Mx-DMA now offers unprecedented service agility, extending the use of Mx-DMA to very large networks

and launched early in 2021 Mx-DMA MRC is available as a software upgrade for all Dialog hubs and modems now.

## Versatile yet Simple

Mx-DMA MRC adjusts the frequency plan, symbol rate modulation, transmission length, code block size and power in real-time for every terminal in the network, based on return traffic demand, QoS settings and link conditions. But, designing an Mx-DMA MRC link does not require precise knowledge of the traffic and terminal mix, as the link self-optimizes in real-time, providing a far simpler way to manage complex traffic demands. This also eliminates the need for the cumbersome trade-offs needed when predefining return carrier plans for a mix of terminal and service types as required.

As a result, Mx-DMA MRC is able to support the delivery of a mix of different traffic profiles using a shared return capacity. If a terminal has a steady traffic demand, it will be assigned continuous capacity and will operate in an SCPC like link with slowly changing transmission



with thousands of terminals, and expanding the applicability and use of the technology to support a full spectrum of service types. Depending on the model, a Newtec Dialog<sup>®</sup> hub can handle over ten networks. Mx-DMA MRC supports larger-scale deployment of terminals, 25 times faster bandwidth allocation, and adaptive payload lengths to achieve important efficiency gains across all application traffic profiles.

First revealed at Satellite 2020,



parameters, depending on link conditions. It will however, share capacity with highly overbooked terminals carrying bursty traffic. For the network operator, this means that activities such as uploading of high resolution images will happen at SCPC-like speeds, therefore increasing user satisfaction, but without a noticeable impact on capacity. The wide carrier is only there when needed. Not only does this give network operators and service providers the scale and agility to manage current customers more simply and efficiently, it also facilitates new business, by permitting them to offer new services across all markets, with the lowest total cost of ownership for a multi-service platform.

Mx-DMA MRC supports high speed returns of up to 100Mbps with initial symbol rates of 25Msps and modulations up to 64APSK with 34 MODCODs variations. MRC and HRC are not mutually exclusive, both can be supported on the same network, using the same hub infrastructure, so for applications needing return rates over 25 Msps per site HRC can be utilized. However, planned enhancements for MRC will support 100 Msps on the return; which is significantly faster than currently achievable with HRC.

## Innovations over HRC

Scalable Demodulator Technology. Unlike HRC where each terminal is assigned its own carrier, with MRC, terminals not transmitting traffic, will seamlessly log-off and automatically restart transmission when needed. This means that there is no idle capacity consumption, enabling the technology to support a wide mix of traffic profiles in a shared

return capacity. Mx-DMA MRC supports a minimum transmit length of 5ms, allowing up to 5,000 active terminals with a single multi-carrier demodulator; meaning that less hardware is needed at the hub, resulting in significant capex savings.

High Resolution Bandwidth Allocation. Mx-DMA MRC re-distributes the available spectral resources 25 times per second, allowing it to seamlessly adapt to changing traffic demand and link conditions. Industry leading granularity in bandwidth assignment, lowest latency and jitter and highest efficiency for any traffic profile are made possible by a minimum transmission length of 5ms tied to a symbol rate of 100ksps and a 5% roll-off.

Adaptive Payload Length. Mx-DMA MRC adapts the payload length in real time, versus using the industry norm of pre-coded static payload length. By using adaptive code lengths, MRC optimizes

## Key Benefits of Mx-DMA MRC:

More Choices--Mx-DMA MRC marks the end of trade offs in network design, supporting a mix of services with common hardware in a shared return capacity.

More Efficiency--Defy efficiency limitations. With the most efficient dynamic return technology, Mx-DMA MRC offers the highest level of intelligent, real-time bandwidth allocation at SCPC-like efficiencies.

More Scalability--Mx-DMA MRC brings the high performance and efficiency to thousands of terminals for the widest mix of applications and network requirements.

Greater Service Flexibility--Mx-DMA MRC offers a simpler way to manage complex traffic demand all on a single return link. With optimal bandwidth utilization, confidently deliver the best Quality of Experience.

Higher Profitability with Lower Total Cost of Ownership (TCO)--Mx-DMA MRC offers the scale and agility to deliver services in a more cost-efficient way and build new business across all markets with the lowest TCO for a multi-service platform.

efficiencies based on transmission length, resulting in reduced jitter. This also provides important efficiency gains for bursty traffic patterns, such as those associated with voice, Internet of Things (IoT) and Supervisory Control and Data Acquisition (SCADA) applications.

Automatic Regrowth Control. Ensures that the BUC always operates at its most efficient operations point, so reducing BUC cost and allowing GAN.

## Applications

This is where Mx-DMA really shines. Due to its efficiency, flexibility and scalability, the patented technology behind Mx-DMA MRC ensures the highest traffic efficiency for any type of application. It can easily support a wide range of applications in the one network. From very bursty low data rate traffic, with a high degree of overbooking, such as

# Evolution of a Ground-Breaking Technology

Historically, service providers had to choose between the efficiency of SCPC, with its fixed channel and fixed bandwidth per terminal, and the flexibility and scalability of MF-TDMA with on-demand, variable bandwidth for the return channel for each terminal. This changed in 2014 when Newtec (now part of ST Engineering iDirect), introduced its patented technology Mx-DMA HRC, also known as Cross Dimensional Multiple Access, High Resolution Coding. This technology combined the best of SCPC and MF-TDMA, giving network operators and service providers the best of both worlds.

With Mx-DMA HRC each terminal is assigned its own unique carrier, so achieving SCPC-like maximum return efficiencies. Bandwidth, however, is allocated dynamically based on real-time demand from each terminal and QoS profiles, thus providing the flexibility of MF-TDMA, but at far greater speed, as it happens on-the-fly without operator intervention, once the network parameters have been established. Mx-DMA HRC optimizes network traffic, and avoids latency over satellite by using short block codes, making it ideal for voice traffic and video streaming.

For the service provider this was a significant leap forward. Not only did this enable them to share bandwidth more efficiently over multiple users, it also enabled them to provide a more flexible and dynamic service. With a 5% roll-off factor it provides a 35% gain in bandwidth efficiency compared to SCPC fixed rate links and 50% compared to MF-TDMA links. Obviously, these significant bandwidth savings translate into cost savings for the operators and service providers alike.

When it was released in 2014 Mx-DMA had a symbol rate of 5Msps making it ideally suitable for low to medium-rate applications between 32kbps and 70Mbps, enterprise, broadcast and government for example.

So, at that time, each Dialog Hub provided three return technologies:

- SCPC, best suited for very large telco trunking applications with dedicated links.
- MF-TDMA ideal for very large networks, scaling from hundreds to many thousands of terminals.
- Mx-DMA ideally suited for the large numbers of networks falling in the middle ground between SCPC and MF-TDMA.

Mx-DMA was considered to be such a technology advancement that it received the prestigious “Best Ground Segment Technology” Stellar award at VSAT Global in 2016.

Also in 2016, the technology was further enhanced with

the addition of HRC Doppler compensation: Skew. When objects such as planes, maritime vessels and tanks move, there is an apparent change in frequency caused by the relative motion of the object relative to the receiver. Legacy VSAT systems need extra margin to counter the Doppler effect. By incorporating enhanced and dynamic Doppler compensation into Mx-DMA, the frequency signal is dynamically offset during transmission, to ensure that the hub receives a constant signal. This means that the satellite link performance can be maintained regardless of the terminal's relative position.

Mx-DMA gained further recognition in 2017 when Newtec and its customer Liquid Telecom were awarded the “Global Telecoms Business Innovation Award for Enterprise Service Innovation.” This important award was conferred for introduction of Mx-DMA into Africa. The two companies worked with VBN an enterprise service provider in Africa to install the technology on the network

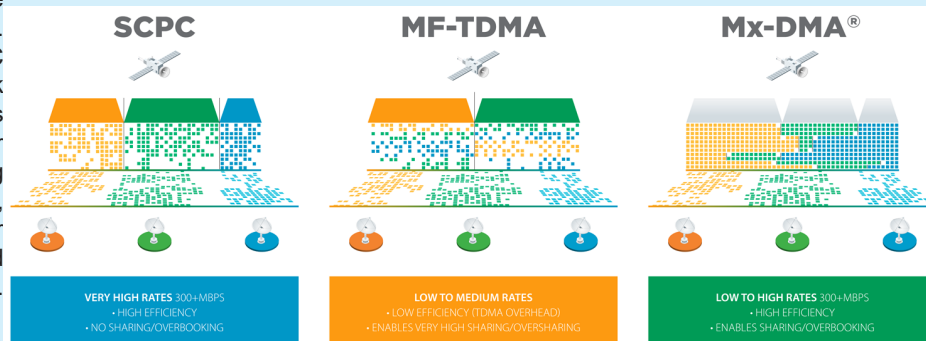
of the Botswana Mining Company. Stuart Brown, CEO of VBN, said “With the unique Mx-DMA technology, Liquid Telecom and Newtec have developed and deployed a genuinely innovative technology which results in immediate benefits – both for end-users and system integrators like

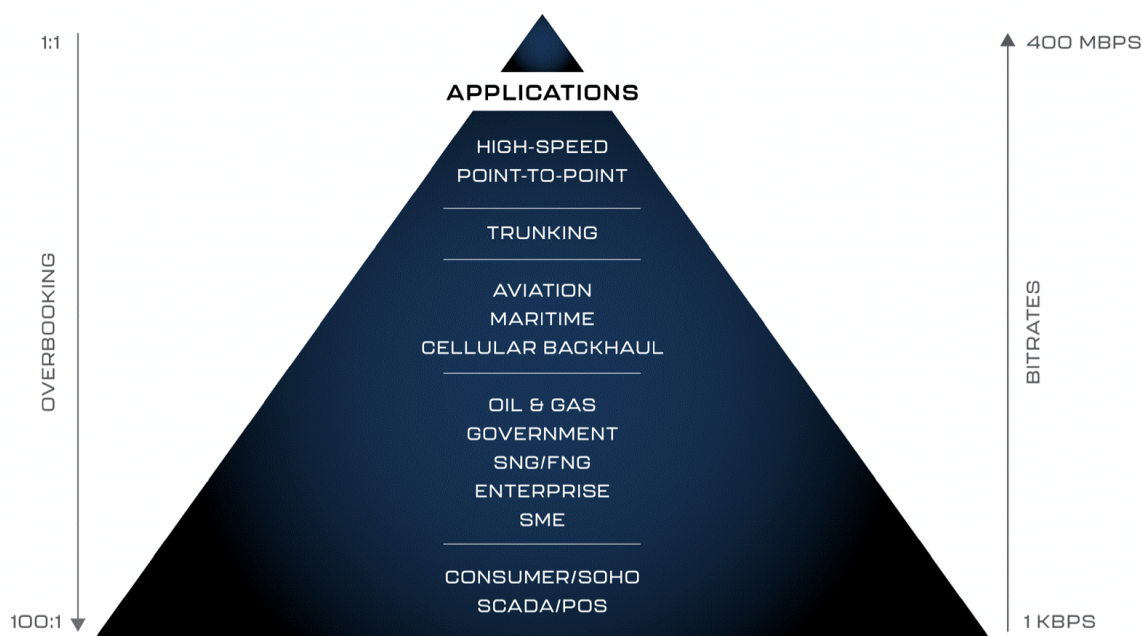
ourselves. “We’ve been waiting for this in Africa. Thanks to Mx-DMA, companies here can now have full duplex over satellite with minimal latency; a service which provides the capacity, speeds and quality needed for corporate data and voice services.”

In March 2020, Dialog was named Teleport Technology of the Year, by the World Teleport Association. Mx-DMA is the key to Dialog's versatility.

At the end of 2020 ST Engineering iDirect introduced a significant enhancement to Mx-DMA increasing the symbol rate from 20Msps to 68Msps thus allowing for up to 200Mbps on the return link. A speed that previously was simply unattainable on any shared bandwidth system, as Bart Van Poucke, Vice-President of Product Management, ST Engineering iDirect, explained: “This is of huge significance, especially for the maritime and cell backhaul markets where demand for throughput and performance is increasing exponentially. With the need for very high speeds on the inbound, we pushed the boundaries of our Mx-DMA return technology to break the speed limit while increasing the flexibility and operational efficiencies that our customers depend on. This breakthrough will deliver the highest quality connectivity experience for users and enable our customers to offer the widest range of applications to expand their market share.”

Building on the success of this return technology, in 2021 the company introduced Mx-DMA MRC: a highly significant innovation leap, creating the most efficient, dynamic and seamless return technology available today.





## Mx-DMA MRC Applications

is typically found in SCADA, PoS and consumer or SOHO broadband, all the way to the higher fixed bit rate applications needed for cellular backhaul and maritime applications. Between the two, are applications requiring higher bandwidth and less sharing than the very bursty applications at the bottom of the applications pyramid, Satellite News Gathering (SNG), Government, Enterprise and Small- and Medium-sized Enterprises (SME), for example. Mx-DMA MRC will seamlessly handle all of these.

“Service providers can now cover a myriad of use cases in a single return link, from cruise ships and large enterprise customers to SCADA and broadband access, sharing satellite capacity more efficiently over a group of satellite terminals and applications achieving the lowest Total Cost of Ownership (TCO),” said Bart Van Poucke, Vice-President of Product Management at ST Engineering iDirect.

“Consider a network with a

mix of different services such as an enterprise connectivity deployment (a large network of low-rate, highly overbooked terminals) and a mobile backhaul deployment (a small network of high rate high availability terminals), in the same footprint. Both networks have very different service requirements, and very different link budgets. Before introduction of Mx-DMA MRC, given the requirements of both services, Mx-DMA HRC for mobile backhaul and MF-TDMA for enterprise were the designated return technologies and would operate in separate static return capacity. Mx-DMA MRC is suited to both types of services, allowing both services to share

one chunk of return capacity, improving efficiency and statistical multiplexing,” Van Poucke added.

Merging the best of SCPC efficiency and MF-TDMA flexibility and scalability into a single waveform, minimizing operational complexity and maximizing statistical multiplexing, makes an investment in Mx-DMA MRC infrastructure simply the best way to future-proof your network.

Ground-breaking efficiency, scaled for thousands of terminals, total flexibility; the widest mix of applications and network types-- All in one package: Mx-DMA MRC. 📡



**Elisabeth Tweedie** is Associate Editor of the Satellite Executive Briefing has over 20 years experience at the cutting edge of new communications entertainment technologies. She is the founder and President of Definitive Direction ([www.definitivedirection.com](http://www.definitivedirection.com)), a consultancy that focuses on researching and evaluating the long-term potential for new ventures, initiating their development, and identifying and developing appropriate alliances. She can be reached at: [etweedie@definitivedirection.com](mailto:etweedie@definitivedirection.com)



## Bart Van Poucke, VP-Product Management ST Engineering iDirect

**You have recently built upon your award-winning Mx-DMA® HRC technology with Mx-DMA MRC. What are the key features of MRC technology and what benefits would these provide your current and potential customers?**

The successful introduction of Mx-DMA in 2014 enabled us to answer the MF-TDMA versus SCPC dilemma that many of our customers faced, and this was a milestone for the market. Now, with the added dimensions and scalability of MRC we are unlocking tremendous flexibility and scale so our customers can deliver a broader range of service levels at a lower cost structure without compromise.

The introduction of Mx-DMA MRC answers the market's call for unprecedented service agility and extends the availability of Mx-DMA to very large networks, expanding the applicability and use of the technology to include a full spectrum of use cases.

Mx-DMA scales in MHz independent of the number of terminals so customers can be served with a single return link for the majority of their use cases, minimizing operational complexity and maximizing statistic multiplexing. Mx-DMA MRC delivers these benefits by maintaining the industry-leading spectral efficiency of Mx-DMA HRC while drastically improving the agility, scalability and fill efficiency. Designing an Mx-DMA MRC link does not require precise knowledge of the traffic and terminal mix as the link self-optimizes in real time. Moreover, the high efficiency enables bandwidth savings, higher throughput, better network availability and substantial terminal cost savings.

**What impact will Mx-DMA MRC technology have on overall Quality of Experience and its ability to serve many different markets and applications?**

Through Mx-DMA MRC, customers can experience SCPC-like performance at very high

throughput. For example, if you are uploading picture to Facebook, this won't result in a big impact on the capacity requirement because MRC's agility means that a wide carrier would only be assigned when needed and can then shift back to smaller, more agile carriers. Mx-DMA functionality uses real-time demand, link condition reports,



**Bart Van Poucke**

optimization performance metrics and QoS profiles to maintain optimal bandwidth utilization at all times.

**What markets and applications will Mx-DMA MRC serve?**

Service providers can now cover a myriad of use cases in a single return link, from cruise ships and large enterprise customers to SCADA and broadband access, sharing satellite capacity more efficiently over a group of satellite terminals and applications achieving the lowest Total Cost of Ownership (TCO).

Successful business models are based on fitting smaller customers with high value customers where the smaller customers are not burdening the high value customers. Both networks have very different service requirements, and very different link budgets. Before introduction of Mx-DMA MRC, given the requirements of both services, Mx-DMA HRC for mobile backhaul and MF-TDMA for enterprise were the designated return technologies and would operate in separate static return capacity. Mx-DMA MRC is suited to both types of services, allowing both services to share one chunk of return capacity, improving efficiency and statistical multiplexing.

**How has the initial reaction been to MRC technology from your customers? Can you share some results of trials or beta tests that you have done or initial implementation of the technology?**


Initial reaction to Mx-DMA MRC has been extremely positive and we have had great feedback from the market already in terms of results. One of our earliest adopters, Ningbo BIRDSAT, a Chinese service provider that serves coastal fishing vessels, has told us that they have noted a significant increase in bandwidth efficiency. In turn, this has helped to decrease the cost per satellite transponder, and the service quality has also been further improved enabling it to provide even better services to its customers. The return channel efficiency is superior and there is no packet loss. It has also allowed them to be more flexible in their service offering and to prioritize different services for different users. They are already planning to deploy new satellite networks in the coming months that are based on Mx-DMA MRC technology.

**How integral is Research and Development (R&D) to ST Engineering iDirect and the development of Mx-DMA MRC?**

Our R&D team is integral to our progress and the instigator for our innovations. We are an R&D driven company and innovation has always been in our DNA. With Mx-DMA MRC, we have built upon previous innovation and we've also drawn upon our experiences with our large installed base

***“...The introduction of Mx-DMA MRC answers the market’s call for unprecedented service agility and extends the availability of Mx-DMA to very large networks, expanding the applicability and use of the technology to include a full spectrum of use cases...”***

and large networks. Our previous work constantly informs us on our future work. With MRC we quite literally took a big leap forward. We took the best of what we had in Mx-DMA and then added a further dimension pushing the limits of efficiency in a shared bandwidth network yet again!

I think it's important to note that, as a forward-thinking team we are fully aware that the focus of innovation varies over time. Things change. But it's very important that we employ cross-layer thinking in what we do which will lay the foundation for future innovations in new ground capabilities that are needed to keep pace with the developments in New Space across our industry. 



**Learn more from product experts Bart Van Poucke and Bart Baekelandt on how Mx-DMA MRC works in a webinar on “Expect a Greater Return with Mx-DMA MRC” on April 14, 2021 at 9.30 am US EDT. [Click here to register.](#)**

# BIRDSAT: Netting the Benefits of Mx-DMA MRC

## The Challenge

According to the UN Food and Agriculture Organization, the Chinese fishing industry accounts for 15% of the world's catch each year and is a highly competitive sector. For fishermen, life at sea can be challenging, with many spending extended periods away from home, often over 200 days a year. The experience can be isolating for fishermen, especially if there is no provision for internet connectivity so that they can keep in close contact with family, friends, customers and vendors and to keep in touch with government updates.

Ningbo BIRDSAT is one of the largest private satellite communication companies in China. Its business scope includes the design and development of satellite communication systems as well as the manufacture of VSAT equipment and its operation in the field. The fishing market forms BIRDSAT's core business with Chinese coastal fishermen the main users of the company's products and solutions.

BIRDSAT identified a requirement in the sector for the provision of satellite connectivity for fishing vessels to meet the rising demand for mobile connectivity at sea. With fishermen wishing to utilize their mobile devices whilst at work as they do anywhere else, access to satellite communications is a true differentiator and today forms an important part of an employee's decision-making process in terms of which vessel to work on.

The addition of VSAT connectivity to a vessel enables fishermen to access communications for morale, welfare and recreational purposes, as well as for general daily operational needs such as reporting catch and to access governmental information.

## The Solution

ST Engineering iDirect provided BIRDSAT with its Newtec Dialog® multiservice platform featuring Mx-DMA MRC return technology. Mx-DMA MRC is an efficient, dynamic new technology designed to



**Ningbo BIRDSAT is one of the largest private satellite communication companies in China. The fishing market is BIRDSAT's core business with Chinese coastal fishermen the main users of the company's products and solutions.**

seamlessly adapt to changing network traffic and link conditions. One of its self-organizing aspects is that it can optimize for jitter delay based on the type of traffic, such as voice, and maximize the utilization of available bandwidth resources. It supports the deployment of large amounts of fixed and mobile terminals with mixed service types, operating industry-leading efficiencies at the lowest possible cost.

BIRDSAT was drawn to the platform particularly because of its flexibility and high-level of integration but also because of the bandwidth efficiency and flexibility in the return technology. This allows services with continuously changing rates (from a few kbps up to 200 Mbps) to run



as they would with MF-TDMA, but at SCPC efficiency.

## Results

The newly implemented Dialog system has been deployed across 500 vessels so far and is being used for a variety of popular applications including instant messaging and video streaming such as WeChat, Tiktok, VoIP services and mobile TV services.

In upgrading to Mx-DMA MRC, BIRDSAT has noted a significant increase in bandwidth efficiency. In turn, this has helped to decrease the satellite bandwidth cost and the time required to operate the system, thus reducing Opex. The overall service quality has also been further improved.

From a perspective of efficiency, BIRDSAT has found that the Mx-DMA technology has resulted in higher efficiency that is superior to other available offerings. For multicast services, BIRDSAT experienced high-quality video during high throughput (10Mbps) transmissions.

The combination of flexibility and highly efficient return technology has enabled BIRDSAT to fulfil market requirements as well as achieving better Return on Investment (RoI) due to reduced Opex and satellite bandwidth savings.


## The Future: more choice, more flexibility

Through the adoption of Mx-DMA MRC, BIRDSAT can be more flexible in its service offering and plans to deploy new satellite networks based on the return technology. At the same time, it will work to enhance its products and services in order to explore new business models, exploiting the different service prioritization for different users, and to develop new services with high-bandwidth and high-reliability for users with



**ST Engineering iDirect provided BIRDSAT with its Newtec Dialog® multiservice platform featuring Mx-DMA MRC return technology for its maritime VSAT network. The addition of VSAT connectivity to a vessel enables fishermen to access communications for morale, welfare and recreational purposes, as well as for general daily operational needs such as reporting catch and to access governmental information.** (Photo inset: BIRDSAT maritime satellite antenna with cover).



specialized demands. The company views Mx-DMA MRC as a differentiator that will enable it to provide more choice both today and in the future. 



# INTRODUCING Mx-DMA<sub>MRC</sub>

A dynamic return technology that ends the tradeoffs for your network. Don't choose between efficiency and scalability. Give your network the most powerful and flexible return for all of your markets at a lower total cost to your business. All while managing complex traffic demands in real time to confidently deliver the best Quality of Experience.

**APRIL 14 9:30AM EDT**

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