SATCOM + 5G: Resilient Communications Services to Save Lives in Disaster Zones

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Terrestrial networks are often destroyed or severely damaged during natural disasters, or the disaster location is so remote that the connectivity simply doesn't exist in the neighborhood. Consequently, the first responders and rescue agencies that put boots on the ground are severely restricted in their ability to perform their duties and save lives. In such situations, SATCOM has been the preferred choice for critical comms but has traditionally required expensive specialist equipment with limited features, making it prohibitive for widespread use. Looking beyond natural disasters, there are several remote businesses that face a similar challenge. For example, oil rigs operating in deep seas or container ships carrying valuable cargo are today limited to SATCOM-only connectivity.

Private 5G Could be the Answer

The rapid maturity of mobile private networks, first with 4G and more recently with 5G technology, has unlocked a whole raft of market opportunities to address use cases that have traditionally relied on wired and Wi-Fi connectivity. Aided by the 'cloudification' of several components of the mobile network, most notably the mobile core, it is now possible to quickly spin up a dedicated mobile network to serve a specific set of use cases, devices, and users. This includes locations such as a mine, university campus, port, or in this case, a natural disaster site.

A rugged private 5G network (including a cell-on-wheels radio and 5G cloud core) drop-shipped to a natural disaster site can provide the short-range critical comms capability for the rescue staff on the ground. It can also enable advanced use cases, such as drone-based surveillance, by providing reliable, low latency communications, thereby boosting the overall capabilities and efficiency of the rescue operations onsite.

SATCOM + Private 5G

Interconnecting the private 5G bubble at the disaster location with SATCOM provides critical, long-range backhaul connectivity to internet and a comms link to the outside world, including cloud and other applications. One could think of a whole variety of use cases this would enable, including live video streaming from the disaster site for further analysis, potentially powered by AI, facilitating remote medical care and more. At a minimum, the local first responder teams can take advantage of the SATCOM connectivity to communicate with a central command center overseeing the rescue mission for better coordination of the overall operations.
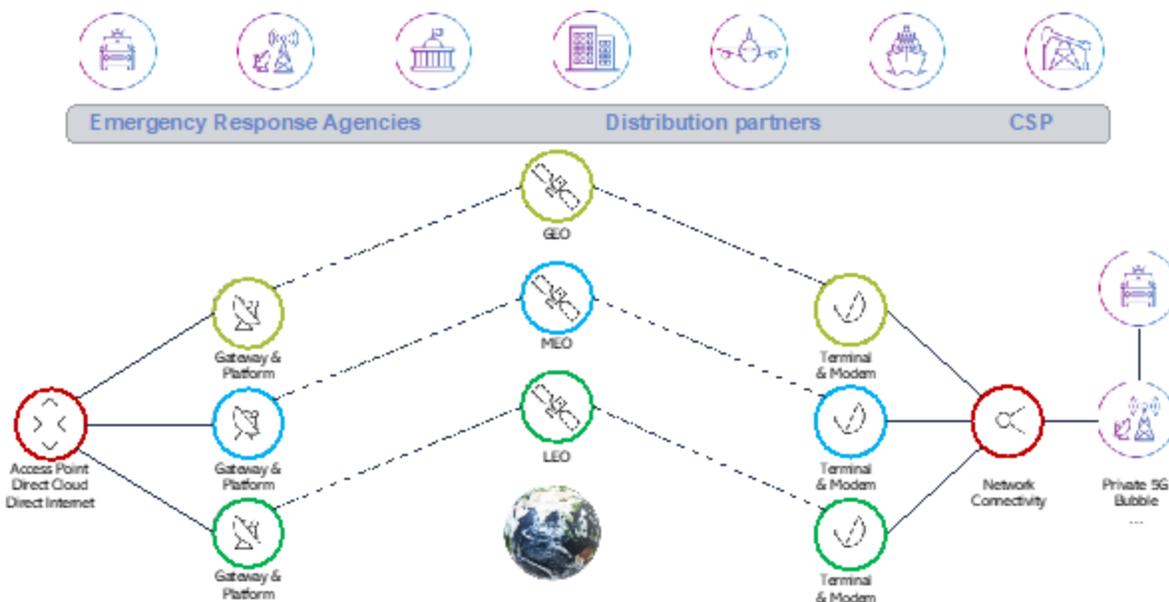

Figure 1 - SATCOM + 5G Network

The portable nature of the private 5G network, combined with the ubiquitous nature of SATCOM, makes the SATCOM + Private 5G combination highly attractive as a rapid deployment option for similar humanitarian, governmental, and commercial use cases that need resilient communications. SATCOM operators are already trialing SATCOM + 5G network solutions with customers. For example, SES has worked with the Taiwanese government to develop a solution to restore cloud services in a disaster scenario. In another instance, SES demonstrated a Digital Twin use case based on IoT telemetry data transmitted from remote maritime vessels and oil rigs.A reference depiction of a SATCOM + 5G network is shown above (Figure 1).

Showcasing the Art of Possible — the "SATCOM+5G Anywhere" Catalyst Project

While these examples demonstrate the increasing relevance and appetite for SATCOM + 5G based connectivity solutions, they also speak to some interesting customer experience and operational challenges for operators and solution providers. For example, consider a natural disaster scenario where relief agencies and government departments must rapidly deploy first responders to the impacted location. The sooner the agencies can put boots on the ground, the quicker they can begin rescue operations and potentially save lives.

It is essential to achieve the speed, coordination, and simplicity to fulfil the time-sensitive need for emergency service deployment. Customers shouldn't be concerned about designing these

complex services and initiating separate individual orders from separate providers with a swivel chair approach. Service providers must find a simple, elegant, and agile way to empower these agencies to order, deploy, provision, and configure SATCOM + 5G services in time for the rescue staff to use when they arrive.

The alternative would be to pre-order and pre-provision the service. In other words, the operator must reserve the SATCOM capacity, 5G network resources, and the physical components such as the cell on wheels, waiting to be deployed as soon as a disaster strikes. However, it would be impossible to predict how much capacity and other resources are to be reserved ahead of time. Instead, these decisions would depend on the scope and scale of the impacted location, number of devices, bandwidth and latency needs, and more. Nevertheless, government regulations may mandate operators to reserve some level of basic services for emergency use such as natural disasters and, to be fair, in the absence of a viable agile and on-demand alternative, it may be the only practical way of delivering critical comms services in disaster zones. However, this could all be about to change.

At the recently concluded Digital Transformation World (DTW) conference in Copenhagen, an innovation project titled 'SATCOM+5G Anywhere' set out to showcase how customers can browse, order, and provision SATCOM+5G offers at the click of a button through a simple and frictionless self-service interface. The project team consisted of key operators and vendors in the SATCOM and Telco industry who laid out the objectives stated below.

David Villegas, Director of Digital Architecture at SES, said, "The combination of SATCOM and 5G presents a game changing opportunity for the industry to deliver new revenue stream but more importantly it enables us to make a meaningful impact to human lives. In this catalyst, we wanted to show how we can enable organizations providing emergency response to natural disasters to get the deployed teams connected anywhere and anytime with standard 5G devices at speed through an AI enabled Marketplace, without having to bother about the technicalities of Satellite Communications and 5G".

Dr. Amina Boubendir, Head of Research and Standardisation at Airbus Defense and Space, stated she wanted the project to "demonstrate the value of convergent SATCOM and 5G solutions for global coverage and reliability using TMF ODA-based IT management leveraging intelligent intent- and catalog-driven marketplaces and automated multi-technology orchestration systems."

Walter Mellett, Director, Technology Services Delivery, wanted the project to "showcase seamless decomposition of a unified intent enabled product offer that orchestrates provisioning and activation across non-terrestrial and terrestrial networks using TMF APIs. This would be an essential enabler of customer experience required for success in the marketplace." CSPs such as Bell Canada can play an important role as a partner in bringing this solution to market, especially as a provider of the Private 5G network, including the cell on wheels.

From these project objectives, a few common themes emerged:

- Simplify how SATCOM + 5G products are packaged and offered to customers.
- Offer a catalog-driven marketplace-based fully digital order to provisioning experience.

- Perform intent-based provisioning and multi-domain orchestration across SATCOM and 5G domains.
- Use TMF ODA standards to achieve interoperability and solution scale.
- Enable relief organizations to focus more on rescue operations and not worry about designing and ordering connectivity.

To that end, the project team built a fully functional, intent-to-order-to-activate IT stack to satisfy these objectives. With the digital marketplace front-end, non-tech savvy relief agency or government personnel can specify response requirements through a natural language interface. The marketplace front end interface then produces a list of relevant, matching product recommendations along with their associated prices for selection. Once a product or product suite is chosen, the disaster response customer can go on to place the order, triggering the order and service orchestration workflow.

From a functional architecture perspective, the key components used in the solution are Marketplace, Product Lifecycle and Order Orchestrator, Customer Order Orchestrator, Product Catalog and Product inventory, Multi-domain Service Orchestrator (across terrestrial and non-terrestrial domains), Service Catalog and Service Inventory, 5G Service Activator and SATCOM Service Activator.

From a functional integration perspective, it was vital to avoid non-standard custom integrations to enable within the SATCOM IT stack the ability for companies to achieve business scale and efficiently satisfy the demand for complex, mission-critical services.

As someone who witnessed first-hand the devastating human cost of natural disasters, Mohamed Ben Ayad, the Chairman of LPTIC, provided a perspective on how such a solution could positively impact societies during natural disasters, such as the devastating floods of 2023 in Libya. He said, "The integration of Satcom and 5G technology is a ground-breaking development for the Telco Industry. In the face of our ongoing challenges, particularly in disaster-stricken areas, this solution offers a vital lifeline. With Satcom plus 5G, we can ensure reliable connectivity even in the most remote and devastated regions, providing crucial support for humanitarian efforts. Moreover, the broader application of Satcom plus 5G extends beyond emergency response. It paves the way for enhanced communication infrastructure across Libya, fostering economic development and social inclusion. At LPTIC, we are committed to leveraging such innovative solutions to build a more connected and resilient future for our nation."

Key Takeaways

Research data shows that, in 2023, there were roughly 95,000 reported fatalities caused by natural disaster events worldwide. This was the highest figure on record since 2010. The total economic losses due to natural disaster events worldwide amounted to about $380 billion that year. If reliable communications can impact even 10 percent of disaster victims, it could mean tens of thousands of lives saved just in one year.

The 'SATCOM + 5G Anywhere' project set out to show how the combination of terrestrial and non-terrestrial networks can be used to empower first responders and rescue agencies to save lives with resilient short-range and long-range communications services during natural disasters. By making use of TMF best practices and standards, the catalyst demonstrated a seminal

approach to standardize modeling of composite terrestrial and non-terrestrial products and the associated business processes, such as the order to activation workflows. This provided an IT architecture blueprint to operationalize SATCOM and 5G composite services. The catalyst project was a winner in two separate award categories at the DTW conference: Innovative & Futuristic and Tech for Good.

SATCOM companies have invested billions of dollars in satellite infrastructure, both in space and on the ground, and they are executing a strategy to monetize those investments through diverse SATCOM based solutions. The industry is looking at all possible avenues, including B2C, B2B, and B2B2C business models, to provide for consumer, business, and IoT services.

SATCOM + 5G presents a key area of business opportunity for a wide range of commercial, governmental, and humanitarian use cases with potential to significantly increase top line. However, to achieve these ambitious goals, SATCOM companies must transform their systems, processes, and customer experience to become more digital and automated. With the intent-to-order-to-activate IT stack and solution proposed in this catalyst, SATCOM companies (and, where relevant, even CSPs), now have a potential prototype for a desired end state of their digital transformation.