Leveraging artificial intelligence and machine learning

Hughes is an international leader in high-speed satellite data networks. As data becomes increasingly relevant to the fabric of our lives and businesses, artificial intelligence and machine learning are being leveraged by innovative market leaders to fill the gaps in these systems, and Hughes is no different. We asked Senior Vice President of Enterprise Dan Rasmussen to discuss how Hughes is staying ahead, particularly with their cutting-edge AI Ops feature.

Dan Rasmussen, Senior Vice President of Enterprise, Hughes

Laurence Russell, News & Social Editor, Satellite Evolution Group

Question: What impact has the age of big data and machine learning had on the demand for sophisticated networks and administration tools?

Dan Rasmussen: If I had to sum up where we are today in how businesses are leveraging increasingly sophisticated networks, I would say that we've seen a shift from using data for status to using data for *action*. Take package tracking as an example. A consumer today can place an order online and then watch the data as the order gets processed and travels from depot to vehicle until it reaches their house. I can literally watch the UPS truck from the time it leaves the depot, through my neighbourhood until it stops to deliver a package to my front door. That visibility into the data has set the bar for enterprise network users using data for status. They fully expect that the network administrator, the solution provider, and the network access providers are able to tell them what's going on with their network at any point in time, anywhere on the network.

What's changing is the need to use that data, not just for status, but to take action. Using our package example, I not only watch the package as it moves from point A to point B, I could reroute it along the way. If I have to be away

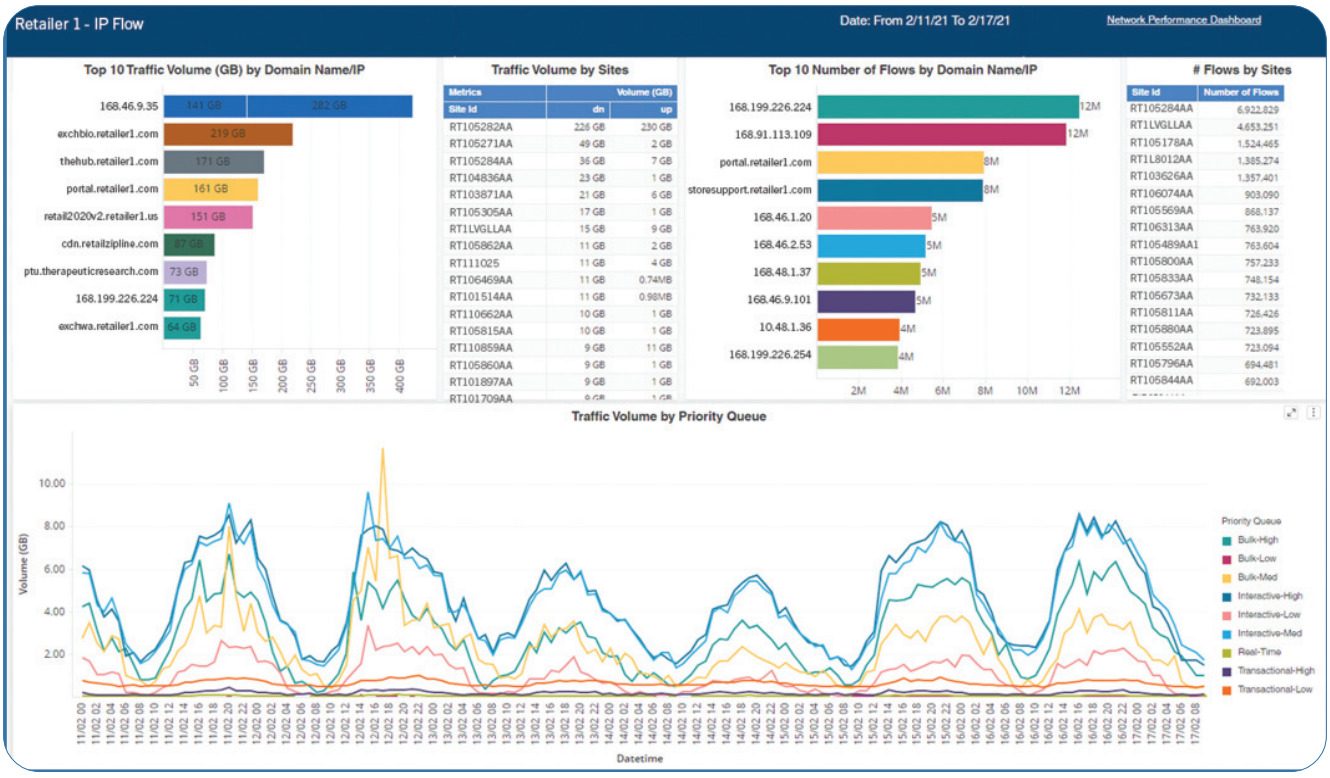


Photo courtesy of Hughes

from my house the day the package is due to arrive, for instance, I can change the delivery address to a neighbour's house.

This is the kind of demand we see in enterprise data networking. It's the unprecedented flexibility for the user to react to traffic and modify parameters in motion to ensure the best performance and precision in meeting specific network demands. And with the advent of AI and ML, it is automating that fine tuning of the network, so the customer or service provider doesn't have to continually make those adjustments directly.

Question: How are network developers keeping up with these demands and incorporating new industry trends?

Dan Rasmussen: To keep up with demand and maximize innovations, we're chiefly looking at patterns within the data. The amount of information generated by the number of devices in use across our networks is staggering. Where, historically, a business had a router bouncing data off a satellite back down to a hub, today a single enterprise site might have a router plus a firewall, and SD-WAN platform, access points, and various types of transport. There are now so many different devices and users and applications that new trends like AI and ML are the only way to make any sense out of it.

The key thing that we're working on in development is how we use data science to find the underpinning patterns. That means processing historic data that we've stored for years to recognise these patterns across huge timescales. We held onto this data with the exact anticipation that teachable insights were within them – we just needed the tools and context of the modern world to substantiate their value.

This helps us recognise when and how things go wrong so that we can better flag those behaviours and, more importantly, predict them before they impact network performance, all to better act on them in the right ways. Predictive and proactive methods of data management are our priorities today.

Question: What's the state of artificial intelligence on network management?

Dan Rasmussen: If you look back over the years, we've been using data science for some time – whether we used the AI/ML acronym or not. For example, I can go back eight or nine years ago to when our business used algorithms to find satellite sites that were gradually getting miss pointed. If bolts weren't tightened down enough, antennas would slowly drift out of alignment in such a way that a human wouldn't notice.

Day to day, it just wasn't that big of a change. However, the algorithms could flag the change over time and alert us if a site was drifting out. We didn't use the words "machine learning" for that; it was just a way of using our signal data to improve customer results.

Today, we use the same types of tools and systems and, rather than just flagging when a problem requires human intervention, we're advancing our artificial intelligence application to the next logical step: creating a self-healing system that corrects its own infrastructure.

As an example, we've been able to identify certain firewall states that develop two to three weeks before a piece of equipment is likely to fail. After categorizing these key indicators, we trained our algorithms to identify them and then reach out and reset the equipment or change configurations automatically. This way, our self-healing AIOps feature predicts and pre-empts equipment outages.

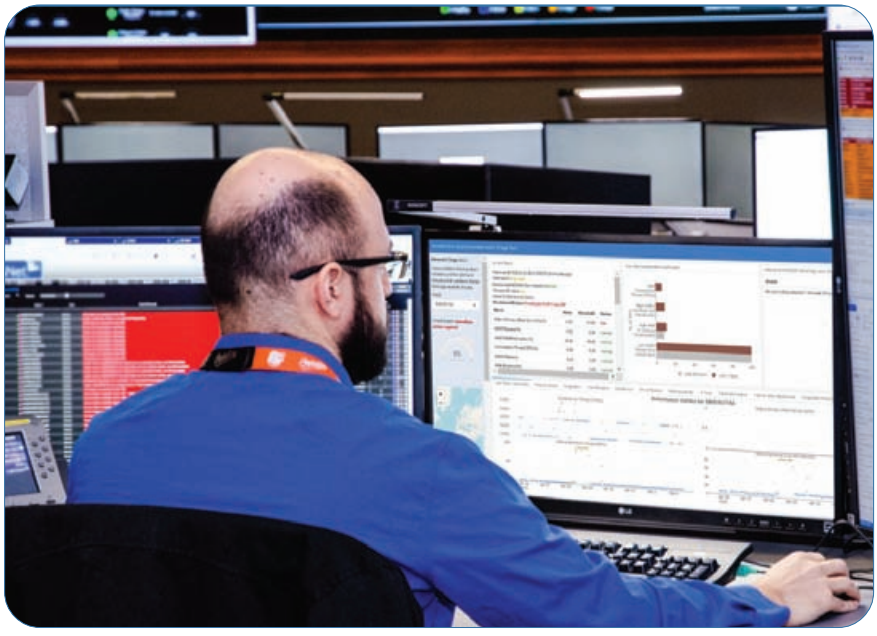
I think that's an application that is on the rise in artificial intelligence. The question will be, how far do you let the AI go in making proactive changes before you involve the human element?

Question: We've also seen a rise in the popularity of multi-transport networks and SD-WAN. How has Hughes responded?

Dan Rasmussen: We've been doing multiple transports since 2005 by combining satellite and wireline connectivity. Today, we work with over 400 different network access providers in the US alone, including fibre, cable, LTE, DSL, and satellite providers. As we continue to offer enterprises – and eventually consumers – the opportunity to have multiple transports, the artificial intelligence side of it becomes more and more important.

The objective with multi-transport is to optimise that traffic, not only based on network performance but in consideration of the application and costs. Let's say that an enterprise site has both DSL and LTE transport available. At a pure network characterization level, LTE may look better, with more bandwidth and potentially lower latency. But it doesn't make financial sense to only use the LTE transport since it is usage sensitive in pricing. It makes sense to send the bulk data transmissions on DSL and move only the high priority traffic over to LTE.

The algorithms are getting better and better at understanding how to mix and match multiple variables to get the best performance and cost out of the multi-transport network.



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Question: What can you tell us about Hughes' new AI Ops feature?

Dan Rasmussen: We put our self-healing WAN edge AIOps feature in place about twelve months ago to offer self-healing at the network edge for all of our enterprise customers using our HR or Fortinet platforms.

The feature watches for a set of characteristics that suggest the equipment at the customer site is headed towards a performance issue. In this instance, the algorithm runs completely on its own, observing (predicting) the edge devices on the network and correcting (self-healing) any issues.

The system effectively generates a report that tells us: "at 2 am last night, local time, I reset this equipment." The algorithm then watches to see if that box re-enters that state; if it does it two or three times, we treat it as a chronic site and proactively investigate with a human.

Based on our 2020 results, over 97 percent of the sites that we self-heal continue for months and months without any recurrence of the issue. If you assume that each incident averted would have caused the customer a three- to four-hour outage, that's a significant amount of downtime that we've been able to avoid for our customers.

Question: How can AI Ops benefit satellite networks and transport?

Dan Rasmussen: For satellite in particular, I think it's going to become much more relevant as the new generation systems come online. In the historic satellite world, the networks were generally "hub and spoke," so you might only use AI to prioritise or train application performance between a remote and hub. If you look at the architecture behind the LEO systems, the MEO systems and even our next-generation GEO, there are exponentially more uplinks. That means dramatically more complexity. AI and ML allow the network operator to step back and let the technology help guide the optimal performance characteristics. Our HughesNet system in the Americas is a great example of the complexity with more than 40 uplink locations and 1.5 million remote terminals.

If a hub is going into rain fade, for example, AI can shift that traffic to another gateway facility and then back again when the conditions clear. That kind of complexity creates change so fast that no human could move the switches quickly enough to ensure a seamless customer experience for all of the users on the network. AI and ML in the satellite world will become increasingly more important to the process of running the networks themselves.

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Question: What are your expectations for AI Ops going forward, and what can we expect from Hughes in the frontier of artificial intelligence and machine learning?

Dan Rasmussen: We will continue to evolve our AIOps capabilities and apply both AI and ML to our own as well as our customers' increasingly complex and sophisticated networks. For example, in our own consumer network, we are using AI to triage home Wi-Fi issues. Instead of needing to have the customer supply information on their Wi-Fi status, we can use an AI feature on the network to identify if the issue is with one of their connected devices, the access point or the satellite.

We believe that over the next several years, the competitive edge in network management will come from a differentiated user experience brought about by a more sophisticated network management interface and overall customer experience.

It's not enough to just move bits and bytes; we're working to understand and connect with each and every user on our networks and make their experience better for them. More and more users, consumers or enterprise – whether in their home at work or on a mobile device– expect an increasingly seamless high-performing network experience, and AI/ML is an essential ingredient to meeting – and exceeding – that expectation. ■