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CONTAINER MANAGEMENT

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**5G can open ports' eyes to opportunities**

# The glue that holds it all together

With more ports growing their digital footprint, 5G is becoming a favoured option to support networks, Lacey Jones reports

While technology and digitalisation were once an enigma to most ports and terminals, it is now almost unheard of for a port to be “off-the-grid”. Today there is container monitoring, autonomous vehicles, predictive maintenance, electronic bill of lading, remote cranes and so on. With so much reliant on being ‘live’ for a port to function, the network it utilises has become vital.

Adam Schipper, director of transportation and ports at Ericsson, told **CM**: “Ports are going through a digital transformation – and you hear that buzz word a lot. But everything that encompasses that digital transformation, as the applications get better suited to addressing these needs, needs the bandwidth from the network to be able to accommodate that and they need low latency meaning it’s got to be up. It’s got to be running. It’s got to be consistent.”

Although 5G is turning out to be a favourable option for many ports and terminals, Schipper explained that what a port needs is a “complete solution” which blends 5G with Wi-Fi, Bluetooth and so on. “Anything that’s moving, like an autonomous vehicle, is a perfect example of something that is going to be better suited for 5G as opposed to Wi-Fi because it’s constantly moving,” he added.

Compared to Wi-Fi, cellular 5G is much more reliable according to Schipper. This is especially important within a port environment that is almost always running 24/7 where any unplanned downtime could cause a domino effect across all operations. Additionally, cellular networks offer a much wider coverage utilising less infrastructure.

A few years ago, in one of Ericsson’s first port projects at DP World’s Rotterdam Gateway, the company replaced around

50 Wi-Fi access points with just two radios and two antenna masts. Though in this case it was 4G rather than 5G, the situation is reflective across most cellular network projects.

“These advantages of cellular technology are not new, but it’s the spectrum that’s now available, that is new,” Schipper explained. “Now we’re treating ports as enterprise customers and having all the options available for them because the expectations of their customers or tenants are higher.”

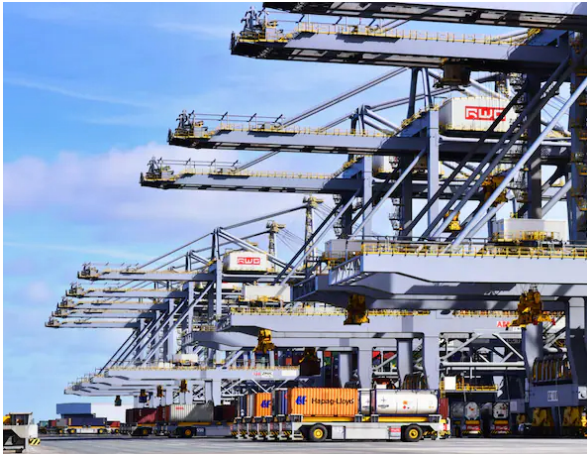
More recently, Ericsson has partnered with Verizon to provide a private 5G network to support the use of autonomous over-the-road trucks at the Port of Virginia. Back in 2020, the port received a grant from the US Department of Transportation (USDOT) related to a project evaluating the operating implications of handling the autonomous over-the-road vehicles (AVs).

Rich Ceci, senior vice president of technology and projects for the Port of Virginia, told **CM**: “It seems likely that in the next seven to 10 years the AV technology will become more common because of the rate of advancement in technology-assisted, over-the-road passenger vehicles.

“The COVID-19 pandemic emphasised the shortage of truck drivers and one solution may involve fully- or partially autonomous trucks. We operate the most technologically-advanced port in the country – both of our primary deep-water container terminals include an automated stack yard – and believe the Port of Virginia is a good place for this new technology to be evaluated.”

During the next four years the port will implement the necessary communications infrastructure to support this project, including the private 5G network. The system is being installed at the Virginia International Gateway (VIG) container





terminal and is due to be operational by mid-December 2022.

Ceci believes 5G to be a “key enabler” within the project, which will also be evaluating V2x technology, which is focused on low-level safety systems and control system feedback. Meanwhile, 5G will support reliable vehicle management scenarios thanks to its high bandwidth.

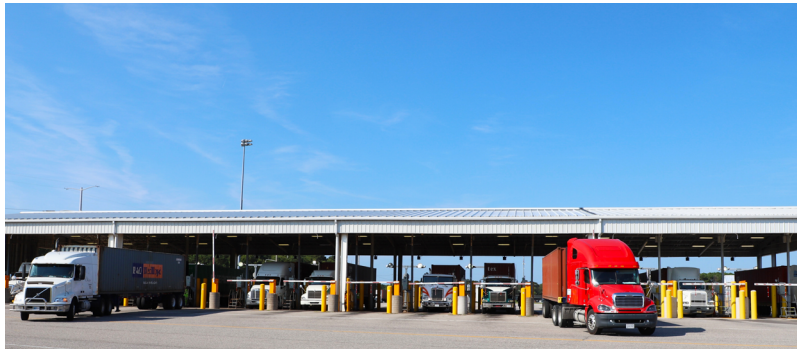
“5G is an emerging technology and has the attributes to support the notion of AVs moving in public spaces,” Ceci explained. “The speeds are very high, the reliability is exceptional, and the ancillary benefits (location sensing) are very compelling: the 5G location tracking technology has proven to be accurate to about 2 cm, or roughly an inch, allowing for exceptional position monitoring in real-time.”

Schipper said that he expects the throughput numbers from this project to be extremely favourable. In this instance, the 5G network deployed will make use of ‘millimetre wave’ technology. While it is technically possible to deploy this technology across a whole port, it is well-suited in this use case. Millimetre wave holds the highest capacity and the lowest latency within the spectrum Ericsson is looking at for 5G according to Jan Diekmann, technical account manager at Ericsson.

In addition to the AV project, the Port of Virginia will evaluate 5G for communicating with over-the-road trucks in the terminal. “For example, imagine a driver with a cell phone app that ends up looking very similar to an AV, but with a human consuming the messages,” Ceci said. “We plan on implementing technology so we can see where over-the-road trucks are on the terminal, react to hot spots, help lost drivers get back on track and potentially change the truck’s mission to real-time.”

Another potential usage for 5G within the Port of Virginia involves replacing or augmenting the differential GPS (DGPS) it uses today to track its on-terminal vehicles, which is correct to about 1 ft. He noted that there are newer vehicle tracking products emerging for container terminals that use both DGPS and the 5G location tracking technology RTK.

Ceci added: “Finally, we think that 5G may be a replacement for on-terminal private Wi-Fi, but this is something we want to take and examine more closely. Our terminals are already blanketed with Wi-Fi, but there are times that coverage is spotty, so we want to see if 5G may do a better job. Keeping our workforce fully connected is a key success factor to the technology working as intended.”



Diekmann told **CM** that the confined environment of the port gives 5G solutions providers such as Ericsson more freedom to design a network for that particular environment. Within a port, Diekmann noted, 5G can be the “glue” between the data acquisition technology on the port’s yard into a digital system to provide the necessary information.

This was shown to be true at the Port of Livorno, where Ericsson helped to provide a 5G network as part of a project to find out how certain technologies and measures impact the operations of a port in terms of efficiency and sustainability. Here the network was able to help support a digital twin of the port that mirrored the facility’s day-to-day operation. The project as a whole triggered a big improvement within the yard and helped the port to save a calculated 8% of carbon emissions per terminal operations.

Diekmann hopes that the future of 5G will see it gluing together all the new technologies available to enable a fully digitalised port. “There are other technologies still, but 5G really helps to enable a large part of all these new technologies that are no longer impossible and are coming to life.

“AI, autonomous driving, autonomous vehicles, remote operation... 5G will move together all these technologies to create a more worthwhile and resilient part of the overall transportation chain and at the same time also contributing to a huge extent in better sustainability.”

For now though, Ericsson is working on projects such as those at the ports of Virginia and Livorno to further explore 5G’s capabilities within the port industry. “We’re eager to take that technology further and show that 5G can contribute even on a big scale because Livorno was on a small, confined scale,” Diekmann said. “That’s evolved, and now we’re really eager to show it can work on an even larger scale and to refine it alongside our 5G deployments.”

**Opposite Page:**  
The Port of Virginia is exploring 5G’s capabilities

**This Page:**  
**Top Right:** Cellular networks require less infrastructure  
**Top Left:** 5G helped make operations more sustainable at the Port of Livorno  
**Bottom:** 5G is well-suited to support autonomous vehicles