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Accelerating the evolution to Open RAN networks

There are big hopes for Open RAN, with predicted savings of 30% and potential to bring more agility and innovation into telecommunications. However, CSPs must achieve cost/performance parity with today's RAN systems for Open RAN to succeed.

This has been challenging to date. One of the main reasons Open RAN has lacked the performance of traditional RAN has been the virtualized Distributed Unit (vDU) performance when running on commercial-off-the-shelf (COTS) servers.

Today, layer 1 and layer 2 computations in RAN systems are performed in purpose-built, highly optimized Baseband Unit (BBU) hardware. The performance gap between Open RAN vDUs and the BBU has created challenges that hinder wider Open RAN acceptance.

The Dell Open RAN Accelerator Card is an In-line Layer 1 (L1) solution that is both simple and practical. It utilizes already proven silicon and provides the ability to port L1 software onto the In-line L1 card, preparing the way for fresh telecom innovation.

Developed in partnership with Marvell Technology, the card uses the same industry-leading silicon as many traditional industry-leading RAN solutions. It also includes additional features to reduce complexity and simplify deployment.

At Dell Technologies, we don't just provide the hardware; we present integrated solutions. We work with our partners and customers and play an active role in organizations such as the O-RAN Alliance and Telecom Infra Project (TIP). Together, we're overcoming challenges and supporting the telecoms community to unlock the full potential of Open RAN.

The evolution to open networks

The evolution to more open, virtualized and intelligent networks is gathering pace, with Open RAN set to play a major role in enabling these new architectures.

According to Dell'Oro Group, more than 80% of the top 20 wireless operators are investing in or exploring this new architecture. It's not surprising, then, that Open RAN revenues are predicted to grow at double-digit rates over the next five years, with cumulative Open RAN investments expected to hit $10 billion by 2025.

The approach includes virtualizing parts of the network and disaggregating hardware and software, with the aim of moving to an interoperable, modular architecture, which allows CSPs to take advantage of the best-of-breed solutions. This will allow communication service providers (CSPs) to mix and match best-of-breed components. It will also help free them from vendor lock-in; a costly issue which has long slowed innovation and prevented the growth of a competitive vendor market.

Benefits of open RAN for CSPs

Cost savings

- The cost of radio units (RUs) will drop, due to increased levels of competition. Eventual mass deployment and economies of scale will help further reduce costs. A wider breadth of RU options, features, frequencies and power levels can also be expected, as new players emerge who can participate in the open marketplace.

- Open RAN software will be 30% less expensive than currently available proprietary software over time. This is a result of a combination of open source approaches and multiple software vendors in an open ecosystem.

- New innovations such as the RAN Intelligent Controller (RIC) will be an important element of the Open RAN architecture. As well as allowing CSPs to create new services and applications, the RIC can also improve performance and reduce operating costs by better managing and optimizing functions of the RAN.

- In recent months, a number of telecoms equipment vendors have signalled that they will raise the price of equipment due to inflation and supply chain issues. Looking for means of reducing capex will therefore be increasingly high on the priority list of CSPs.

- The total cost of ownership (TCO) of the RAN represents 70%–80% of network TCO. As such, reducing costs in the RAN offers the best opportunity to reduce costs overall.

New revenue opportunities

- The greater flexibility and agility afforded by Open RAN, and the move to software-based networking will accelerate innovation and development cycles, enabling CSPs to trial, roll out and monetize new revenue-generating features and services faster.

- The disaggregation of the hardware, software and opening of API interfaces, allows third party app developers to participate in enlarging the addressed solutions within new verticals, which allow for new revenue opportunities for CSPs.

- CSPs can take advantage of the increase in private network deployments by incorporating solutions and creating architectures that are customized to solve the specific needs of different industry verticals.

- Private networks offer CSPs a new revenue stream not previously well served by LTE. The disaggregated solution architecture also enables as-a-service models for enterprises to facilitate the new private network market penetration.

More efficient networks & better use of resources

- Virtualization and running software in the cloud allows CSPs to take advantage of economies of scale.

- Open RAN supports new approaches to network automation, such as the real time optimization of RAN (nRT-RIC) and application quality of service (QoS), ensuring a reliable, consistent experience for end users.

- Open RAN incorporates new artificial intelligence (AI) and machine learning (ML) features, such as ensuring the specific requirements for specific RAN network slices can be met efficiently, and at scale.

The challenges of Open RAN

However, introducing Open RAN raises challenges, which can be loosely divided into the 'three p's': performance, price, power consumption.

Price

- One of the main factors holding back Open RAN advancements is the difficulty in achieving the price performance offered by traditional RAN.

- In a study by Analysys Mason, the cost and complexity of integration was cited as the greatest risk of Open RAN deployment for most operators. Almost half of survey respondents said this was one of the top three barriers to commercial roll-out.

- There are fears that the integration of multi-vendor components — and testing and assuring networks prior to deployment — will be complex and costly.

- We're only in the early stage of the evolution to open networks, so uncertainties around costs, such as for maintenance, are understandable.

Performance

- A key drawback to the performance of early Open RAN deployments is how layer 1 activities are processed in the vDU. In the Open RAN split 7.2 architecture, layer 1 is split between the lower layer 1 and upper layer 1. The radio unit processes the lower layer 1 functionality, while the vDU processes the upper layer 1 functionality on standards-based COTS servers.

- Early Open RAN deployments process the layer 1 functions in the vDU using a 'look-aside' approach. This creates inefficient communications between the server's central processing unit (CPU) and the forward error correction (FEC) accelerator card, negatively impacting the overall performance of the vDU and Open RAN system.

- In addition, this approach forces the server CPU to process a majority of the layer 1 computations. This utilizes precious server cores, despite not being optimized to do so. Today's look-aside approach is a primary cause of the performance gap between traditional RAN and Open RAN systems and is a future scalability and capacity concern for CSPs..

Power consumption

- Managing and mitigating power consumption is critical. As processing demands increase, so too does power consumption. At the same time, CSPs are looking for ways to minimize energy use, both for financial and ESG reasons.

- Open RAN is expected to support process-intensive 5G use cases — and may well be the only means of doing so. According to an InterDigital/ABI Research study, the 5G ecosystem will see a 160% increase in power requirements by 2030.

Accelerating Open RAN with industry-leading RAN technologies

At Dell Technologies, we've welcomed and actively participated in the evolution to more open networks. This includes continuing to support CSPs to adopt and capitalize on Open RAN.

Via our Open Telecom Ecosystem Lab (OTEL), for instance, we're uniting stakeholders from across the telecoms sector to create open, cloud native, standards-based solutions. We're helping network builders and service providers overcome integration challenges which have traditionally presented barriers to growth and innovation. Our fourth state-of-the-art lab facility is set to open this year, allowing even more of the telecoms community to build, test and validate new solutions.

When we say 'open' we mean open. The emerging model promotes interoperability, greater choice for CSPs, and a levelling of the playing field for new stakeholders entering the market.

The Dell Technologies way is therefore not the only way. We work with CSPs to find solutions that are the best fit for their business and their customers. And we applaud the collaborations and achievements in Open RAN that we're seeing across the telecoms landscape.

Our most recent collaboration with Marvell is evidence of this. We've partnered to help make the Open RAN business case a viable and sustainable one for CSPs. Drawing on both parties' expertise, we've released our Open RAN Accelerator Card. This is an in-line layer 1 card that increases the efficiency and overall performance of the vDU, closing the performance and power consumption gaps to make Open RAN scalable, cost effective and harnessing the full performance potential of 5G.

Solving challenges and writing the Open RAN roadmap

Performance

- The Dell Open RAN Accelerator Card uses Marvell's OCTEON Fusion CNF95xx chipset; the same chipset used in traditional RAN solutions, allowing traditional RAN solutions to migrate smoothly with parity performance to an Open RAN architecture.

- Integrated Dell Remote Access Controller (iDRAC) technology helps administrators deploy, update, and monitor Dell PowerEdge servers and Layer 1 Accelerator cards anywhere, anytime. This helps ensure optimum network performance and reliability.

- Increases vDU and overall RAN performance by eliminating look-aside communications and conducting all layer 1 computations inline, freeing up the server CPU for layer 2 workloads.

- Simplifies vDU deployments by removing the need for additional fronthaul NIC, GNSS timing, and FEC offload accelerator cards.

- Efficiently implementing L1 can be done using is an In-line Layer 1 architecture. This allows the operator to use smaller servers with fewer cores, and less power consumption when minimum capacity is needed.

- It also allows CSPs to expand the number of In-line Layer 1 cards used in a server to expand the overall capacity of the server, making full use of the available cores. This type of architecture addresses the early scalability problems with look-aside architectures and addresses the important consideration of power consumption as well.

Power consumption

- Innovation in the radio ecosystem allows for power efficient RF designs to be made available to existing and new RAN vendors for integration.

- Power efficient new baseband solutions, with innovative In-line L1 solutions can dramatically increase the capacity per server and reduce the power/capacity ratio. As new L1 silicon options come to the market, the power consumption vs capacity ratio will continue to drop, yielding the best-in-breed capex and opex solutions for CSPs.

- The Dell Open RAN Accelerator Card reduces the number of server CPU cores needed, reducing overall power consumption.

- Consuming two-thirds of the workload leaves more capacity to support more workload at layer 2. The end result? You can do more with less: use servers which consume less power, while delivering the same high performance.

- By creating a solution that reduces power consumption, we're helping CSPs to adhere to sustainability regulations and net-zero targets.

- CSPs in regions with limited power supplies are also set to benefit. We're helping these players move closer to their goal of delivering a similar level of network performance and reliability as those larger CSPs on the global stage.

Price

- Pricing improvements over current solutions can be achieved by the introduction of innovation and competition. The arrival of multiple specialist ecosystem players allows new innovation and competitively priced solutions. The introduction of these new ecosystem players is facilitated by inter-operability testing with existing RAN network providers, as well as with the newer end-to-end RAN providers which are proactively integrating the best-in-breed solution elements.

- Open RAN does not mean parts arrive on the customer premise untested. It allows a solutions integrator to fully integrate them ahead of time, or an existing vendor to upgrade their end-to-end solution using best-in-breed network components.

- The Dell Open RAN Accelerator Card reduces the number of server CPU cores needed, reducing the cost of COTS hardware needed for open RAN implementation.

- Unlike current solutions, the Dell Open RAN Accelerator Card doesn't require an additional timing module: adding the timing module into the L1 Card enables all timing requirements – from precision time protocol (PTP) to Synchronous Ethernet (SyncE) – to be handled right out of the box with no need for additional hardware before connection to the GNSS antenna.
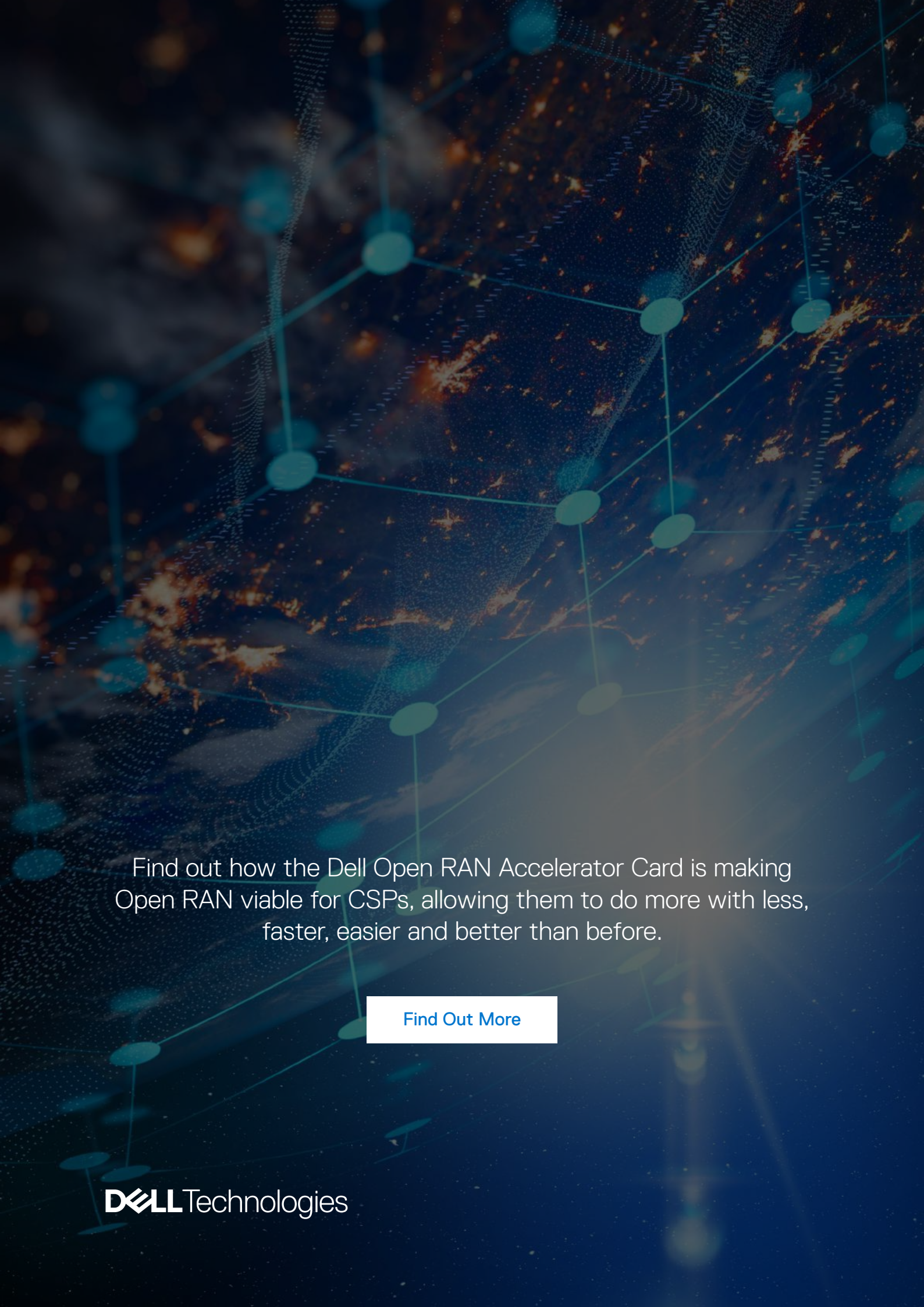
End-to-end support

5G is the future, but many in the telecoms community are still in the early stages of transition. Progressing this will be critical in realizing the 5G future.

Dell Technologies is helping to support CSPs to accelerate their journey; we'll be with you every step of the way.

To alleviate the multivendor integration challenge, we're building an ecosystem of Open RAN partners. Together we're creating and validating solutions, streamlining and simplifying the upfront requirements for CSPs deploying Open RAN.

As the world's largest provider of open, software-defined infrastructure, Dell Technologies is working to accelerate network innovation. By providing the tools and the partnerships, CSPs will be able to leverage Open RAN to generate new revenue streams by deploying new services.

Enterprise customers will benefit from these services, while CSPs will be able to realize ROI on 5G network investment. Thanks to the flexibility, agility and reduced costs involved in Open RAN models, it'll be possible to test, deploy and manage these services faster than ever. With our suite of Open RAN solutions, CSPs will be able to guarantee the same optimum performance levels as those of traditional RAN.

Find out how the Dell Open RAN Accelerator Card is making Open RAN viable for CSPs, allowing them to do more with less, faster, easier and better than before.

Find Out More

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