

5G: CHALLENGES, SOLUTIONS & FUTURE PROSPECTS



Divya Jyothi V

Specialist 2, Inside Product
Dell Technologies
Divyajyothiv.jyothiv@emc.com

Lavanya Srinivasachari

Specialist 2, Inside Product
Dell Technologies
Marylavanyas.sriniva@dell.com



The Dell Technologies Proven Professional Certification program validates a wide range of skills and competencies across multiple technologies and products.

From Associate, entry-level courses to Expert-level, experience-based exams, all professionals in or looking to begin a career in IT benefit from industry-leading training and certification paths from one of the world's most trusted technology partners.

Proven Professional certifications include:

- Cloud
- Converged/Hyperconverged Infrastructure
- Data Protection
- Data Science
- Networking
- Security
- Servers
- Storage
- Enterprise Architect

Courses are offered to meet different learning styles and schedules, including self-paced On Demand, remote-based Virtual Instructor-Led and in-person Classrooms.

Whether you are an experienced IT professional or just getting started, Dell Technologies Proven Professional certifications are designed to clearly signal proficiency to colleagues and employers.

[Learn more at www.dell.com/certification](http://www.dell.com/certification)

Table of Contents

Introduction	4
What is 5G Technology?.....	4
Evolution of 5G Technology.....	4
Key Benefits of 5G Technology	5
Current Challenges	6
Industry Solutions that accelerate the journey to 5G	6
Use Cases by Industry	7
Conclusion	10
References	10

Disclaimer: The views, processes or methodologies published in this article are those of the authors. They do not necessarily reflect Dell Technologies' views, processes or methodologies.

Introduction

Mobile technology has undergone a massive evolution since the release of first generation (1G). 5G, the fifth-generation global wireless standard mobile network helps to connect with everyone and everything virtually with high speed, ultralow latency, and high availability.

This article illustrates the evolution of 5G technology, key benefits, current challenges, and industry solutions along with addressing the future prospects/opportunities with different use case scenarios on how it elevates user experience.

What is 5G Technology?

5G is the fifth generation of cellular networks. Up to 100 times faster than 4G, 5G technology is providing faster connectivity speed, ultralow latency and greater bandwidth which is helping to transform industries and enhance end user experience.

Evolution of 5G Technology

As we enter the new data era, by 2025, the total amount of digital data created worldwide will rise to 175 zettabytes, with 30% of data processed in real time. To quantify that number, consider this; today we send 500m tweets a day, 350m photos on Facebook a day, and 394b emails a day. That's expected to be nearly 4x greater in the next 5 years. This is a narrative we are all familiar with if you have been working in tech in the past decade or so. That being the case, data generation is far from centralized these days. Meaning more data is traversing a network or being processed at the edge. Challenges exist due to a lack of open standards for massive scale machine-to-machine communication and efficient API calls for low latency requirements.

Looking closer at the drivers behind the Data Era we realize how interconnected our world has become. Unfortunately, the fabric that connects us all today is saturated and limited to emerging workloads such as Intelligent and Connected Vehicles, Smart Cities/Factories, and Virtual Care. Without adoption of modern network innovations like 5G, realizing the full potential of next generation technologies will not be fulfilled. So, the investment must start today.

The technical tenets of 5G – very low latency, scalable bandwidth and device capacity density (per sq km) – are all based on a software-defined networking virtualized architecture.

Key Benefits of 5G Technology

- 5G is up to 10x faster than 4G. To put this into the context of connected mobility, a lightning speed network is essential to a 5G road; it will enable real-time interaction between the infrastructure and the vehicles that use it. To put this into the context of what's in your pocket, think commercial digital cinema quality video calls on your phone.
- 5G has 10x lower latency – the time it takes to get a response to information sent – than 4G; approximately 1-2 milliseconds. This represents a near instantaneous process of data sent from your device and back to your device. The combination of speed and near zero latency is essential when it comes to autonomous vehicles. Think about your car knowing what's around the corner and braking quicker than our own reflexes. Responsiveness is mandatory in that scenario.
- Device density is where massive Internet of Things (IoT) really comes to life in the 5G story. The 5G standard will support an incredible 1 million devices per square kilometer or 0.38 square miles. This standard of connection density ensures a network can handle an enormous number of devices deployed for IoT applications. Back to our connected mobility example, think of the number of devices that will be constantly communicating in a single block to ensure the safety of an autonomous vehicle passenger. 5G delivers the speed, near-zero latency, and the ability to host millions of devices in a square kilometer.
- 5G is very energy efficient; 100x more energy efficient than its predecessor. This results in reducing power requirements for base station antennas and the like for client devices, extending battery life for smartphones and IoT devices. This is huge when you consider the amount of energy service providers consume, especially when mobile data traffic is expected to grow at a 35% compounded annual growth rate. The quandary of network energy use and costs is answered by 5G's ability to keep our hardware alive for longer – in turn creating more reliable devices.

Current Challenges

Challenges are an inherent part of new developments in technology and 5G is no exception. Here are the top 5G issues and challenges:

- The promised speed of 5G is difficult to achieve considering the sub-optimal technological support in many parts of the world.
- Many of the old devices that do not support 5G will need to be replaced. 5G could cause unexpected problems for devices relying on the old 3G network. Thus, the transition experience will not be good as one has to buy another phone to be able to use the latest cellular technology which
- The switch from 4G to 5G will be infrastructure-intensive and development of infrastructure for 5G is very expensive; adding a 5G network infrastructure component means that more hardware and supporting software are necessary. A microcell costs around \$200,000 to set up and small cells are estimated at \$10,000 each. So, to fulfil its promise, 60 small cells per square mile are to be installed. Apart from that the costs to buy spectrum, configure, test, and manage networks will need to be maintained and continuously updated.
- 5G faces network security challenges too, as starters build the 5G wireless telecommunications with legacy technologies such as 4G LTE networks. Therefore, existing vulnerabilities in those networks will threaten the security of 5G networks as well. Implementation of 5G technology involves more components which increases the number of access points and network edges. The fact that 5G technology infrastructure relies on cellular towers, beamforming, small cells, and cellular devices will result in increased digital attack surface. Also, many of these components lack physical security measures which makes them vulnerable to physical attacks.
- 5G cannot take off without basic infrastructure foundation, such as standard servers, open application programming interfaces (APIs), etc.

Industry Solutions that accelerate the journey to 5G

- **uCPE & SD-WAN Enterprise Edge:** Branch to Data Center form factors validated, integrated and delivered globally with choice of software to meet any use case.
- **Distributed Network Edge:** Transform how people and machines interact with digital services at the edge with infrastructure that can go wherever data demands.
- **Micro & Modular Data Centers:** Modernize edge and on premises infrastructure at a fraction of the time & cost for vRAN, Edge Compute, and NFV / SDN deployments.
- **Telco Cloud NFV Solutions:** Deliver lower risk, faster NFV deployments with Dell EMC pre-validated Ready Solution with VMware or RHOS Ready Architectures.
- **SP Analytics Solutions:** Accelerate digital transformation via advanced and modular network and business-driven use cases on a unified data platform.

Use Cases by Industry

- **HEALTHCARE**

Scenario	Key Feature	Preferred Technology
<p>Security and surveillance. CCTV cameras at hospitals to be monitored and stored at backend office.</p>	<p>Low user density Low bandwidth</p>	<p>Wi-Fi</p>
<p>Asset tracking. Track real-time bed, room and equipment usage will provide better service and more comfortable environments for patients.</p> <p>Building Automation. Hospital surgeons use control interfaces outside their operating rooms to create pressurized spaces. Empowers hospital staff to use mobile tablet devices and management apps to view air, humidity, pressure and temperature data.</p>	<p>Good coverage</p>	<p>Cellular</p>
<p>Video-driven In-hospital patient monitoring with AI in complement to legacy sensors. Video-driven emergency rescue, in a situation where every second counts, enabling real-time streaming of high-definition camera that could help emergency responders to understand or visualize the scene before they arrive and feedback information as the situation evolves.</p>	<p>High bandwidth Low latency High security</p>	<p>Cellular 5G</p>

- **ENERGY**

Scenario	Key Feature	Preferred Technology
Real-time personnel and critical asset location.	Good coverage High security	Cellular
Real-time high-quality video surveillance of critical assets. Remote operation. Automating mission-critical applications (e.g. emergency shutdowns). Intelligent and automated production management.	Good coverage Low Latency High bandwidth High security	Cellular 5G

- **SPORTS**

Scenario	Key Feature	Preferred Technology
Internet service.	Basic bandwidth	Wi-Fi
AR and VR based immersive content consumption for remote consumers.	High user density High bandwidth Low Latency	Cellular 5G
Immersive content production for media outlets avoiding reliance on Outside Broadcasting units (OBs).	High user density High bandwidth Low Latency	Cellular 5G

- **RETAIL**

Scenario	Key Feature	Preferred Technology
Security and surveillance. Digital Marketing. Send promotions/advertising when visitors connect to Wi-Fi hotspots.	Low user density Low bandwidth	Wi-Fi
Mobile Point of Sale/Mobile cashier. Real-time flow analysis and visitor-specific content pushing.	Good coverage High bandwidth Low latency	Cellular
AR/VR shopping from anywhere. Let consumers try before they buy during customer visits. Interactive Fitting Rooms. Try on attire before buying.	High bandwidth Low latency	Cellular 5G

Conclusion

The rise of 5G networks is more than just the next step in the ongoing evolution. It is a very significant leap forward that opens the door to unprecedented possibilities and new capabilities for enterprises but only for those that are prepared to seize the day.

For IT and business leaders laying the groundwork for 5G-enabled solutions, services and business processes, it's important to think big. Think about things you can do now that you couldn't do before. Imagine how your enterprise can optimize and leverage this new technology to drive new revenue streams, enhance your operations, reach more people, and do something better.

References

<https://www.drishtiiias.com/printpdf/fifth-generation-cellular-technology-5g>

https://www.ericsson.com/en/5g?gclid=EAlaIQobChMIInOKq4dnj9QIVn5ImAh2XmAhxEAAAYASAAEgJI4_D_BwE&gclidsrc=aw.ds

Dell Technologies believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED "AS IS." DELL TECHNOLOGIES MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying and distribution of any Dell Technologies software described in this publication requires an applicable software license.

Copyright © 2022 Dell Inc. or its subsidiaries. All Rights Reserved. Dell Technologies, Dell, EMC, Dell EMC and other trademarks are trademarks of Dell Inc. or its subsidiaries. Other trademarks may be trademarks of their respective owners.