Valid8 Virtual Labs

Applying Virtual Labs to the Connected World

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Virtual Labs technology enables businesses across a range of industries to leverage simulations for a variety of value-added activities. Whether it is improved training and onboarding, better addressing cybersecurity, or enhancing organizations' capabilities in sales and development, Virtual Labs offer flexibility and quantifiable results.

Telecommunications is a Vital Component of Most Industries

Since the dawn of the new millennium, technology has evolved at an exponential pace, In 2000 when landlines were in 7 out of 10 US households [1], the most common mobile communication device was the Nokia 3310, a simple phone with an LCD screen and texting capabilities. The BlackBerry was emerging as the technology of choice for businesses with its ability to send emails and access a small number of apps. 3G was just about to be launched and most users were connecting to the internet between 256kpbs to 1Mb [2].

The last 25 years have seen dramatic increase in speed and capabilities. Today, mobile devices are essentially handheld computers, cameras and video recorders, that also make phone calls. Network speeds on 5G far surpass the speeds of 2000. Users now have access to thousands of apps enabling play, productivity and socialization and these innovations are just the beginning.

The global telecom sector's total service revenue across fixed and mobile rose 4.3% in 2023 to US$1.14 trillion worldwide [3]. "PWC's Perspectives from the Global Telecom Outlook 2024-2028" report further discusses how core products have become commoditized, creating difficulty in infrastructure investing while struggling to raise prices. Telecommunications organizations, whether network or device providers are looking for new technologies and enhanced capabilities that can address the ever-increasing demand for bandwidth.

Key Trends Driving Businesses in 2025 and Beyond

- **5G Expansion & Beyond to 6G** - The adaptation of 5G networks worldwide continues to gain market share. By the end of 2025, the industry expects to grow to 3 billion 5G users, with research into 6G gaining momentum for even faster speeds and ultra-low latency [2].
- **The Impact of AI-Driven Networks** - AI is now being utilized for optimizing network performance, automating maintenance, and enhancing cybersecurity. This game-changing technology will enable telecom to compute faster, handle exponentially larger loads, handle increasing network complexity and provide greater security.
- **Edge Computing Evolution** - Bringing computations and data storage closer to the source reduces information delays and improves data processing efficiency for IoT and real-time applications.
- **Sustainability in Telecom** - Green technologies, energy-efficient networks, and sustainable infrastructure are becoming industry priorities.
- **Private & Hybrid Networks** - As security risks increase, organizations are investing in private 5G and hybrid networks. Although it is more costly than using a public network, private networks provide higher reliability and advanced security measures.
- **Virtualization & Cloud-Native Solutions** - Software-defined networking (SDN) and network function virtualization (NFV) are enabling more flexible and cost-efficient telecom services.
- **Enhanced Cybersecurity Measures** - As cyber threats evolve, telecom providers are implementing stronger encryption, zero-trust security models, and AI-powered threat detection.
- **Competition for Capable, Experienced Resources** - Between the expansion in the use of technologies across industries and the retirement of many subject matter experts, the demand for highly trained, educated resources is increasing.

With Innovation Comes Opportunity - The Digital Twin & Virtual Lab Revolution

The next few years offer tremendous opportunities for telecommunications organizations in both the public and private sectors. Advancements in technology occur virtually every week, some are small adjustments, others are large significant upgrades. It becomes mission critical for businesses and organizations to stay current, effectively manage new tech, and maintain security and the interoperability of networks. Digital Twin Technology answers that call.

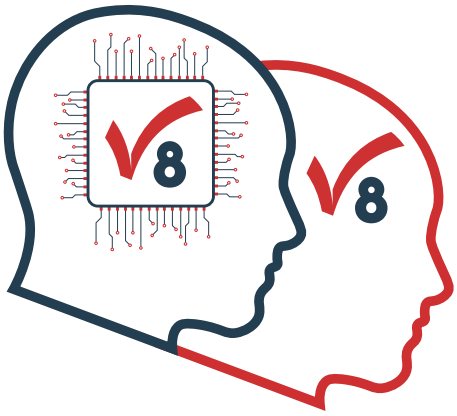
Businesses are seeing real results when digital twins are employed. The article, "Digital twins: 5 success stories", [4] highlights the successes of businesses leveraging digital twin technology. Companies reviewed include Rolls-Royce, NTT IndyCar, Mars, TIAA, and Bayer. The use cases detail their operations monitoring, maintenance planning, enhanced customer experiences and supply chain enhancements.

Digital twin technology "helps organizations simulate scenarios that would be too time-consuming or expensive to test with physical assets." [4]

Utilizing Digital Twins

Digital Twin Technology provides a cutting-edge solution for creating dynamic, real-time representations of real-world assets, processes, systems, and environments. By utilizing advanced simulations and real-time data, this technology empowers businesses to better understand and optimize their networks. The key benefits include:

- **Insight:** Into the complex relationships within your network, including how components interact and influence each other. Fully comprehend the potential impact of integrating new technologies and systems into your network.
- **Preparation Time:** With a clear, real-time view of your network's status and performance, you can anticipate potential challenges ahead of time. This foresight allows you to plan for upgrades, transitions, and changes, ensuring that the network can evolve without disruptions or delays.
- **Scalability & Stability:** As your network grows and expands, Digital Twin Technology ensures that your infrastructure can scale seamlessly and remain stable. It provides a virtual model of your network that adapts to increasing complexity, ensuring that your infrastructure evolves alongside your business needs, without requiring overhauls or inefficiencies.
- **Testing & Validation:** Before actual deployment, Digital Twin Technology allows for thorough testing in a virtual environment, enabling you to simulate various scenarios and ensure the network performs as expected. This validation step ensures that your network is ready for live deployment, minimizing the risk of issues post-launch.



"Our goal was to create a secure environment for businesses and organizations that would provide a quick and easy replication of their unique environment. A place where they could explore and test virtually unlimited network possibilities. All before any equipment purchase."

- Ian Carpenter, CEO Valid8 -

Competition for Resources

With the advent of the Internet of Things (IoT), telecom and adjacent technology expertise has dramatically increased in demand across many industries. From autonomous vehicles to increased use of robotics to IoT-enabled aircraft, the demand for specialized skills crosses industries is rising. According to consulting firm McKinsey and Company, "As telcoms evolve to deliver on the opportunities that AI, augmented and virtual reality, and other emerging technologies unlock, they will need to be highly strategic about identifying and attracting talent with the expertise and abilities that each technology demands." [5]

Organizations may first search for talent at universities and technical schools that focus on these specialized degrees, such as computer science, electrical engineering, software development and other data sciences. By utilizing digital twin and virtual lab technology, universities can offer a "real world" experience, preparing their students for success on day one of their new job!

Improving the quality and speed of onboard training is another crucial success key. By offering real-world scenarios and specific scenarios unique to "their" network, new hires can be ready to add value immediately.

Cybersecurity

Cyberattacks are the dark side effect of the connected world. Whether it is international espionage or hacks into home video cameras, the threat of a technical weakness being exploited keeps business leaders up at night. Protecting telecommunications infrastructure from cyberattacks is a complex and ongoing challenge, requiring a comprehensive understanding of the risks and the implementation of effective solutions.

The cybersecurity challenges faced by organizations are significant and complex. However, by understanding these challenges and implementing robust security measures, and testing protocols, organizations can help to minimize and protect their infrastructure from cyber threats. Technology can be the key.

It's a Small World

Connecting people, businesses, and communities across the globe, expanding high-speed networks, enhancing mobile-connectivity, and enabling real-time communication, the telecommunications industry bridges geographical gaps, fosters global collaboration and connects people over vast distances.

- **Global Connectivity & Internet Access** - Broadband and mobile networks along with emerging satellite technologies are further extending our connectedness.
- **Real-Time Communication & Collaboration** - Talk, video and document sharing enables seamless remote work and cross-border teamwork on nearly every continent.
- **Smart Cities & IoT Integration** - Empower rural, remote and smaller communities to offer smarter healthcare, public services and connectivity to the world at large.
- **Disaster Response & Humanitarian Aid** - Telecom networks play a critical role in emergency response, allowing governments and aid organizations to coordinate relief efforts and provide real-time updates during natural disasters and crises.

Since the following famous words were spoken back on March 10, 1876, "Mr. Watson - come here - I want to see you", the telecommunication industry has played a crucial role in the advancement of humanity in nearly every aspect of our lives.

Virtual Labs Drive Success

Industries of all shapes and sizes can benefit from utilizing a virtual lab model in their testing process. Whether it is a telecom company, an equipment provider, a government organization, or a test lab, Virtual Labs deliver quantifiable value.

Operators can easily visualize any impacts to their network, quickly assess potential challenges and evaluate potential interoperability issues when working in a Virtual Lab or digital twin environment.

For example, imagine an operator is tasked to replace an existing piece of technology in a remote location 100 miles from the base station. By leveraging Virtual Labs, the existing technology can be tested, appraised and QC inspected before traveling to and from the remote location, saving time, money and resources.

Equipment vendors & system integrators benefit from the ability to leverage a "simulated" network for use across the product and sales life cycle. Sales representatives can perform product demonstrations using a simulated network that reflects the real world. In the product life cycle, regression testing or interim product testing can be performed in a "digital playground" network environment, allowing for any bug fixes earlier and speeding the time to market.

For third-party testing labs that are expanding their offerings to include new test capabilities, virtual labs offer the ability to work in an environment where the business can gain comfort and expertise while deciding whether to include that new capability in their broader portfolio. In addition, virtual labs make it easier for technicians to get up to speed on the new portfolio offering.

Virtual labs enable corporations to improve their onboarding and upskilling of technicians. With a virtual lab, new hires experience more realistic on-the-job training through a simulated, real-world environment. This allows for more practical exercises and increased confidence that the new hire is ready to take on the role.

Universities can stand out with virtual labs. Access to an environment that represents real-world conditions enhances class structure and enables professors to use real-world cases and labs.

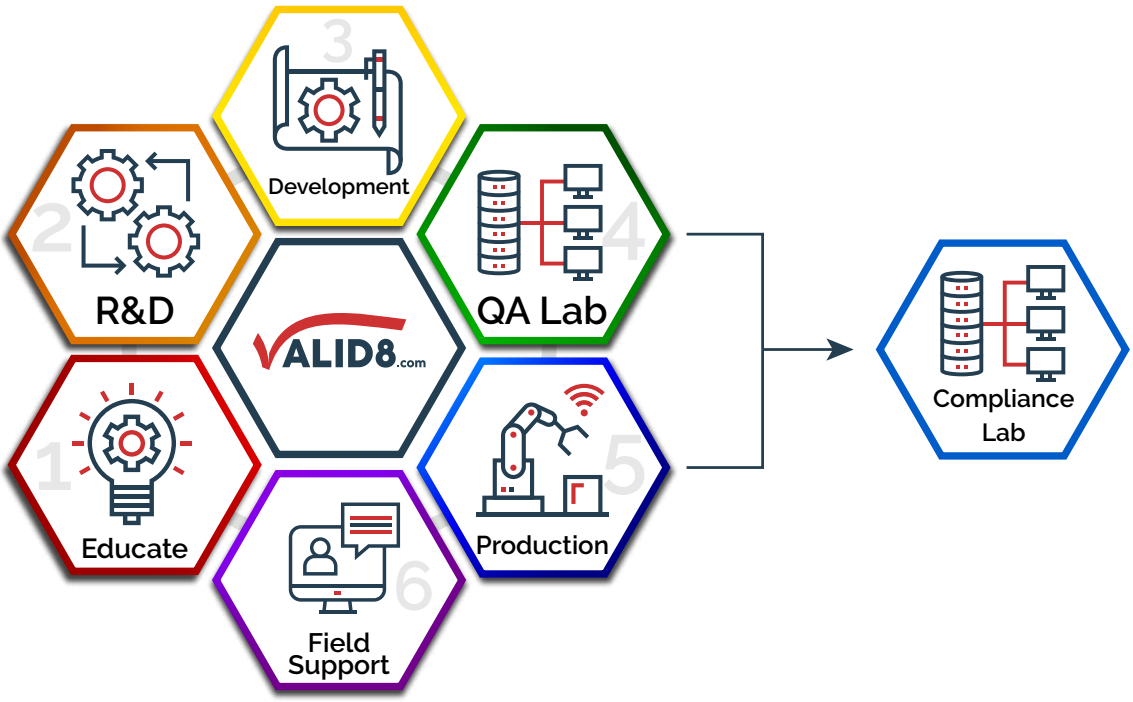
Public Safety organizations can leverage virtual labs to rapidly make the transition to new technologies such as P25 and MCX, enabling the use of these generally accepted technologies during emergencies.

Valid8 Virtual Lab Adds Quantifiable Value

Valid8 Virtual Labs provides an all-in-one, cost-effective and ultra-portable network for demonstration, testing and training purposes. This enables a self-contained, end-to-end environment; a digital twin playground for testing.

Valid8 Virtual Lab enables all the necessary network subsystems for a realistic end-to-end emulation of the network and is applicable to use cases across industries.

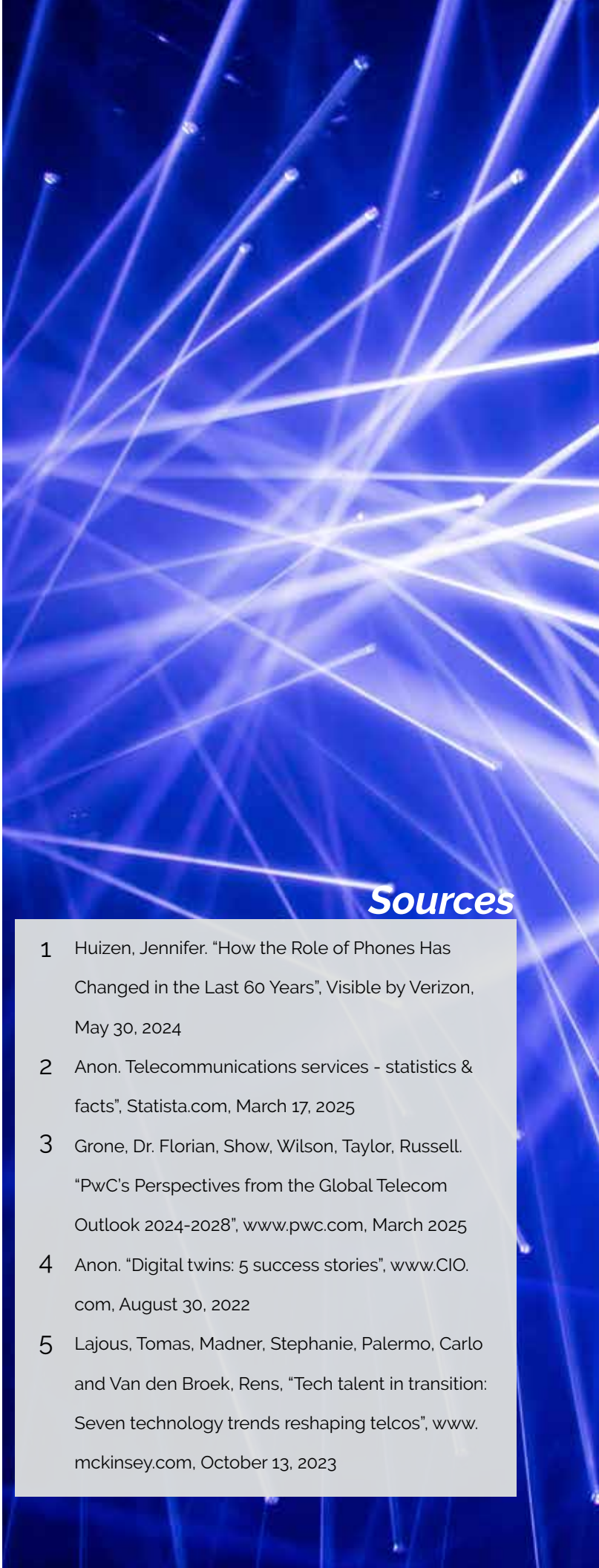
- **Test Labs** - test technicians, sales team (for demos/POCs), researchers
- **Equipment vendors (including functional elements/network functions, probes and call recorders)** - developers, QA team (managers, engineers), CTO, sales team (for demos/POCs), researchers
- **System Integrators** - deployment technicians, sales team (for demos/POCs), researchers
- **Network operators** - QA team (managers, engineers), researchers
- **Universities** - professors (for coursework), research assistants, students
- **Corporate training facilities** - trainers



Virtual Lab - A Case Study

For one public safety equipment provider, a cloud-based, virtual lab provided the flexibility and capability to rapidly and cost-effectively test their products. By incorporating a virtual lab, their capabilities increased, allowing them to be more responsive to customer demands with shorter lead times. The subscription-based model allowed them to leverage the technology for the specific period of need, then pause or change their subscription level to meet new client requirements, all at a dramatically lower cost than purchasing a hardware solution.

Telecommunications technology has become ubiquitous. No matter the industry, technologies such as IoT, Wi-Fi and P25 have become an integral feature of virtually every company and organization. Challenges such as cybersecurity and a limited skilled resource pool permeate the workspace. Leadership must look to technologies such as virtual labs and digital twins to anticipate the unexpected, prepare for increasing consumer demands, and adapt to intensified security measures in the era of connectivity.



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Let's Meet!