PRODUCT BROCHURE

Augmented Reality for Combat Training and Maintenance

Digital Twin Solutions for US Defense

KEYSIGHT

With lives and survivability on the line, defense leaders will not authorize 5G AR technologies until they know that the digital information will be securely, quickly, and reliably delivered to those who need it. They also need assurance that AR will not compromise network performance for other mission priorities.

Enhancing Situational Awareness with 5G

As 5G augmented reality (AR) technologies evolve to meet the rigorous performance and security demands of the military, defense leaders envision training programs that accelerate time to readiness for their fighting forces. They imagine AR-powered maintenance applications that can improve base agility.

Yet, as AR systems shift the burden of generating robust AR experiences from devices to 5G edge networks, leaders need assurance that their network can handle the load without compromising mission outcomes that rely on fast, secure, consistent communications.

The Promise of 5G Augmented Reality for Combat Training and Maintenance

AR superimposes a layer of information on top of natural vision. With the promise of 5G, defense leaders are preparing to immerse military troops in highly complex AR and virtual reality (VR) battlefield simulations and mission rehearsals as part of large-scale training exercises. Using untethered headsets equipped with radios, troops can move freely and interact in the digital and physical worlds, in outdoor and indoor training grounds.

Maintenance technicians can use AR to identify equipment and components, provide step-by-step instructions, or deliver other contextual information to support accurate and efficient maintenance and repair. Using AR, medical personnel can support remote surgical procedures with precision. In addition, remote-controlled vehicle operators can use AR when conditions do not support autonomous navigation.

Defense organizations recognize 5G's potential to enable very high speeds, low latency, and a capacity to handle large-scale communications across a massive number of devices. 5G is viewed as crucial for adopting game-changing AR defense applications at scale.

When Performance Matters

Keysight's 5G network digital twin solutions provide a 5G test network built upon network and traffic emulation. They ensure that 5G technologies function in the lab and, more importantly, that they can perform as needed to support AR-driven defense applications without degrading network performance for others.

By creating an emulated twin of the network, digital twin solutions can test the performance, resiliency, and security of the technologies and services engaged in any AR use case:

- **AR user perception.** Troop training that relies on AR is intolerant to high latency, which can create a version of motion sickness for users. User perception testing can evaluate and optimize the end-user experience long before training is initiated.
- **Edge network performance.** 5G shifts the compute power from AR and VR user devices to the powerful edge network, enabling a high volume of users to simultaneously move about freely while interacting with others in the digital world. Edge network performance testing can inform optimal configurations to support indoor and outdoor communications for AR and VR video and data traffic.
- **AR device performance.** As AR devices move from consumers' living rooms and corporations' training rooms into indoor and outdoor defense training arenas, the number of potential signal blocks increases. By evaluating device performance through obstacles such as natural terrain, buildings, atmospheric conditions, distance, and movement, AR devices can be configured to perform as needed in the live environment.
- **Network slicing configuration.** To run AR on a base, 5G network slices can be dedicated to this purpose and can be configured to support massive Machine Type Communications (mMTC), with an extremely high connection density of online devices. Testing can confirm that the AR applications are supported.
- **Network slicing prioritization.** While AR troop training and equipment maintenance are important, the supporting slices should not be prioritized over those that support life-saving slices on the same network. Prioritization testing can confirm that all slices are properly prioritized.

By artificially loading and impairing the network with massive traffic, cyberattacks, outages, and other interference, digital twin solutions reveal the performance of network and device behavior under rigorous conditions. Defense leaders can then optimize and, ultimately, deploy their 5G technologies for assured trainings, medical procedures, maintenance, and other communications and connections in complex environments.

Flexible 5G Testing to Ensure Reliable Augmented Reality

Keysight's 5G digital twin solutions emulate the key functional domains of a 5G network, so that defense organizations can test any combination of technologies in the lab. To ensure that the end-to-end services tested in the lab will operate similarly in the field, our 5G digital twin solutions support the blending of emulated and commercial elements.

For each use case, testing may determine if the technologies conform to standards, whether performance and security criteria are met, or where there are gaps to be addressed before deployment. All elements can be orchestrated by automation, configured, and coordinated to execute complex testing scenarios.

Digital twin emulates networks and networking conditions for AR combat training and maintenance — or replays capturing live conditions to recreate:

- **Traffic**, including mobile signaling and data usage, GNSS signaling, application traffic, and security threats
- **Network behavior** across core networks, access networks, GNSS simulation, and channel modeling

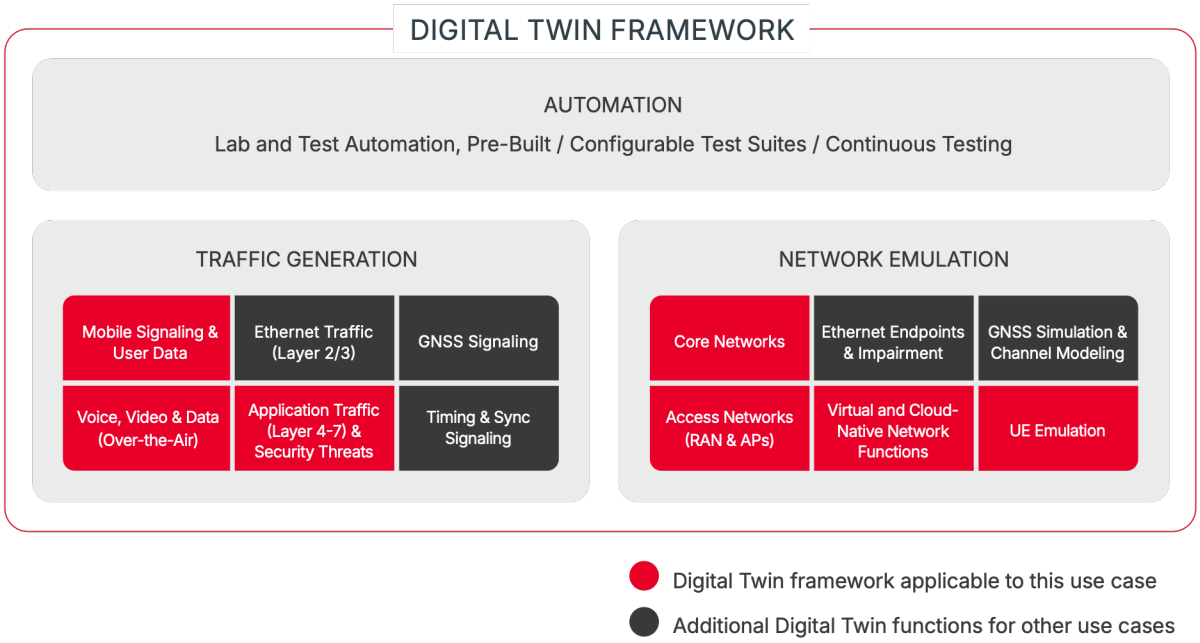

Figure 1. Digital twin framework chart showing traffic generation and network emulation capabilities

Why Choose 5G Network Digital Twin Solutions for AR Combat Training and Maintenance?

With high speeds, ultra-low latency, and support for a massive number of connected devices, 5G is poised to enable a class of augmented reality that transforms how defense organizations apply AR solutions for combat training, maintenance, and more.

Keysight's 5G network digital twin solutions offer defense leaders instant access to the most advanced 5G network environment, without the need for a significant capital investment in commercial infrastructure.

A smooth introduction of 5G technologies to their live environments is assured by combining a single source of testing across the entire network with cybersecurity, technologies, and defense industry experts.

For next-gen augmented reality applications, Keysight's digital twin solutions provide defense leaders:

- **Instant access** to the most advanced 5G network environment without a capital investment in commercial infrastructure
- **Single source** of testing across the entire 5G network
- **Optimized design**, based on proven experience executing large-scale 5G network tests
- **Defense community experts** for defense networks, cybersecurity, and technologies
- **Improved collaboration** within and across defense and commercial entities/environments
- **Reduced risk** of inefficient or ineffective testing that could jeopardize mission outcomes
- **Accelerated adoption** of 5G technologies and first-to-battlespace advantages

Contact your Keysight representative to experience the power of digital twin and 5G for AR combat training and maintenance.