KEYSIGHT

Editorial Backgrounder

Advancing Development with Digital Twins and AI

Introduction

Digital twins and artificial Intelligence (AI) promise to dramatically alter the world in very tangible ways. While the technologies themselves are not new, real-world use cases have emerged to show just how transformative these technologies may be today. As designs become ever more complex, digital twins enable modeling and simulation across the entire product lifecycle. AI accelerates the power of product developers to take full advantage of the new design capabilities stemming from digital twins.

Industry & Customer Challenges

1. Growing complexity in technology means more considerable risks across the design ecosystem:
    - Challenges arise when managing product development and requirement compliance.
    - You cannot test everything, but you also cannot sacrifice quality or reputation.
2. Between high speeds and higher expectations, there's no room for error:
    - Meeting market windows is critical. Project delays and schedule overruns can be devastating.
    - Customers have high expectations and more choices than ever before.
3. Project momentum is hard to spin up and even harder to sustain:
    - Changing requirements, emerging standards, and constant scope creep make it difficult gain project traction.
    - Managing stakeholders, organizational silos, and vendors slows output and impede collaboration.

Keysight Solutions

What Is a Digital Twin? A digital twin is a virtual model that accurately reflects a physical object. It can continuously learn and update itself to represent the physical system's near-real-time status and operating conditions.

Digital Twins in Design - At Keysight, we actively incorporate digital twins into the design and test workflow to reduce cost and time over the product lifecycle. We are also investigating novel ways to import and export information from digital twins and to share models, schema, and results across the product spectrum. Additionally, we are developing integrated digital twins to represent networked systems that may include hardware emulators and operational hardware devices.

Examples:

- PathWave ADS
- PathWave System Design
- eXata / Qualnet Network Modeling

Digital Twins in Emulation - Emulators are digital twins that replicate devices, protocols, communications layers, etc. They replace the physical devices with analog/digital hardware and software that simulates the device's behavior. Emulators are critical when testing physical devices.

Simulation and Emulation - On one side, we have digital twins that help model and simulate devices. On the other side, we have digital twins paired with hardware that helps to test and validate.
Examples:

- Radar Scene Emulator
- KORA
- L4-7 network emulators
- signal generation
- compliance test

Digital Twins and Artificial Intelligence – AI and machine learning (ML) have a pivotal role in the operation of digital twins. AI adds the element of automated learning, so the digital twin can dynamically and continuously improve the model's quality and its predictions' validity under alternative operational scenarios. Integrating machine-learning-based models into the digital twin is critical as we look to scale to tens or hundreds of thousands of nodes and represent very diverse real-world situations.

Examples:

- Eggplant Test & Automation Intelligence
- PathWave Manufacturing Analytics

Key Features and Customer Benefits

Fusing design, emulation, and test tools into a digitized, end-to-end framework, Keysight digital twins enable customers to:

- increase first-pass success by using high-fidelity models to develop and test designs before a prototype
- improve test coverage and quality by simulating additional parameters with unparalleled fidelity
- minimize costly rework by designing test parameters to match virtual models and physical counterparts
- accelerate time-to-market by streamlining lengthy, iterative design and validation cycles
- improve sustainability and negate the environmental toll of physical prototyping

Additional Information

Link to press relevant press releases, case studies and/or product areas on Keysight.com.

2022-06-28
Keysight Commissioned Research Finds Automated Testing Remains a Significant Challenge for Organizations

2022-06-15
Keysight Technologies and Sauce Labs Partner to Bring Real Device Cloud to Eggplant Cloud-Based Test Automation Platform

Keysight.com Links:

- Pathwave ADS
- PathWave System Design

- eXata / Qualnet Network Modeling
- Radar Scene Emulator
- PathWave Manufacturing Analytics
- Eggplant Test & Automation Intelligence