ALTAIR
CHANNEL PARTNER

DIGITAL TWIN

Enhancing real-time monitoring, simulation, and optimization of physical systems.

MESSEN LABS
Measuring Excellence, Empowering Innovation

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INTRODUCTION

Advanced technologies like simulation, artificial intelligence (AI), high-performance computing (HPC), machine learning, and data analytics have already begun transforming the fabric of modern business operations. The next frontier, however, is one that complements and strengthens those existing technologies – digital twin technology.

Digital twin technology is the process of using data streams to create a digital representation of a real-world asset to improve collaboration, information access, and decision-making.

Data obtained from digital twins gives organizations a world of new insight and can help teams work more efficiently to create better products, generate less waste, consume less energy, better assess risk, and so much more.

TYPES OF DIGITAL TWIN

1.Design Twin

Design Twin is a digital replica of a physical product or system created during the design phase. It focuses on simulating and optimizing the design before the actual production.

2.Operational Twin

Operational Twin represents the real-time state of a physical system during its operational phase. It is used to monitor, manage, and optimize the performance and maintenance of the system.

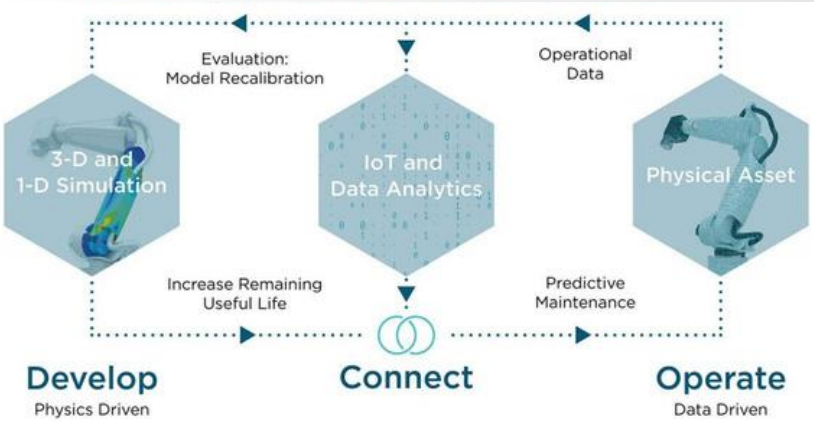
3. Production Twin

Production Twin focuses on the production process, representing the virtual system of the manufacturing environment. It aims to improve the efficiency and quality of the production process.

BENEFITS OF DIGITAL TWIN

- **Enhanced Decision-Making:** Provides data-driven insights and predictive analytics to make informed decisions.
- **Operational Efficiency:** Helps in optimizing processes, reducing downtime, and increasing productivity.
- **Cost Savings:** Predictive maintenance and optimized operations lead to significant cost reductions.
- **Innovation and Design:** Facilitates better design and innovation by allowing virtual testing and iteration.
- **Customer Experience:** Improves product customization and service delivery, enhancing overall customer satisfaction.

KEY COMPONENTS OF DIGITAL TWIN



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APPLICATIONS OF DIGITAL TWINS

- **Manufacturing:** In smart factories, digital twins of machines and production lines help optimize operations, predict maintenance needs, and improve product quality.
- **Healthcare:** Digital twins of patients can be used to tailor personalized treatment plans, simulate surgeries, and monitor health in real-time.
- **Smart Cities:** Cities use digital twins to manage urban infrastructure, monitor traffic, plan city development, and respond to emergencies more efficiently.
- **Aerospace and Defense:** Digital twins of aircraft and defense systems help in predictive maintenance, performance optimization, and mission planning.
- **Energy Sector:** Utilities use digital twins of grids and power plants to optimize energy distribution, predict failures, and manage assets effectively.
- **Automotive:** Automotive OEM's & suppliers create digital twins of vehicles to enhance design, simulate driving conditions and improve safety features.

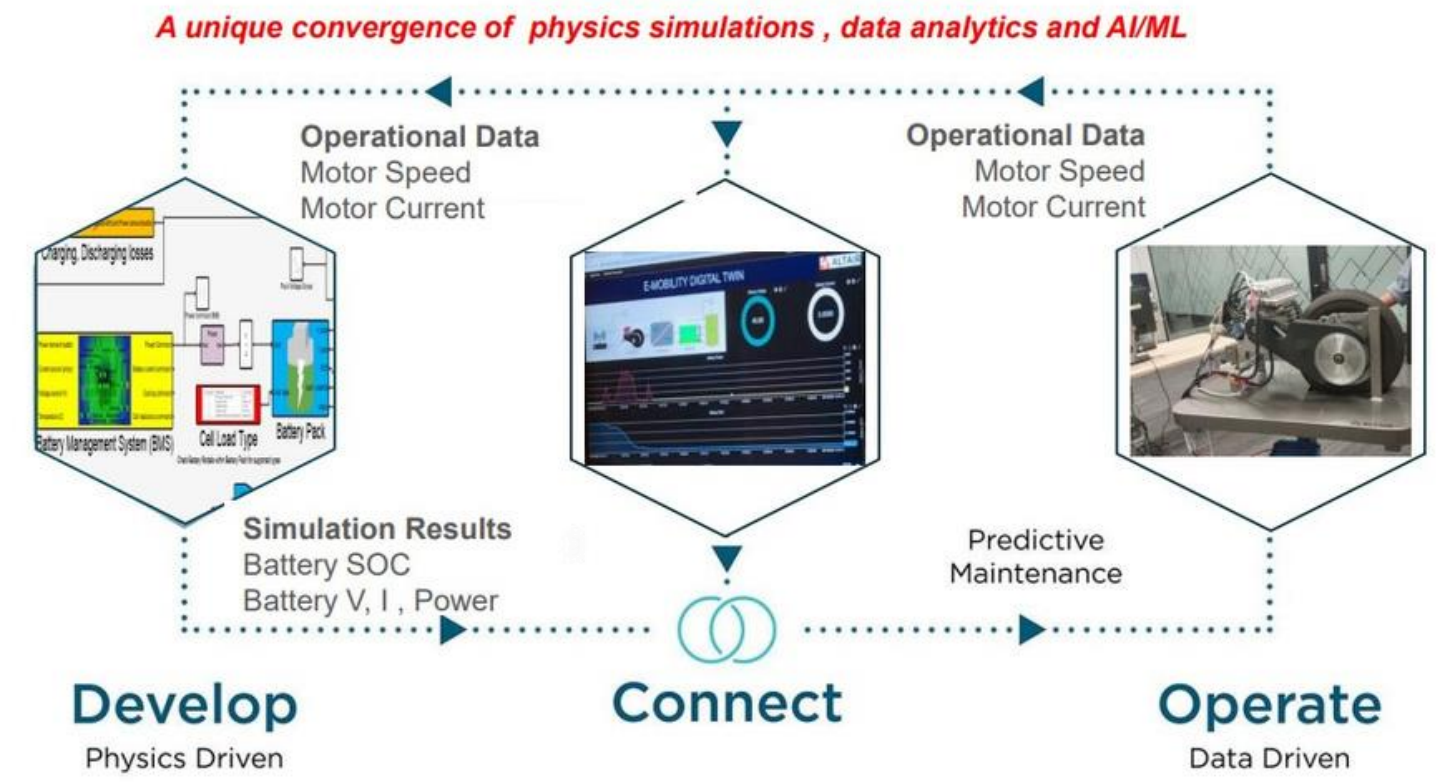
INDUSTRY FOCUS

• Aerospace • Architecture, engineering, and construction (AEC) • Automotive • Consumer electronics • Energy, oil, and gas • Healthcare • Heavy equipment • Industrial equipment •Manufacturing • Technology and information technology (IT) Services • COE for E-Mobility Digital Twin

DIGITAL TWIN LAB

A Digital Twin Lab is a cutting-edge virtual environment designed to create digital replicas of physical systems for real-time simulation, analysis, and optimization. By integrating advanced technologies such as IoT, AI, and data analytics, it allows researchers and engineers to monitor system performance, predict potential issues, and enhance operational efficiency. This innovative lab for E-Mobility enables rapid prototyping, iterative design improvements, and data-driven decision-making, Improving State of Health(SoH) & State of Charge(SoC).

This lab enables competency building for Academia, R&D, Incubation centers. Bring open communication, sharing & developing cross functional team/departments.



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DIGITAL TWIN INTEGRATION FOR FULL SYSTEM ELECTRIC VEHICLE

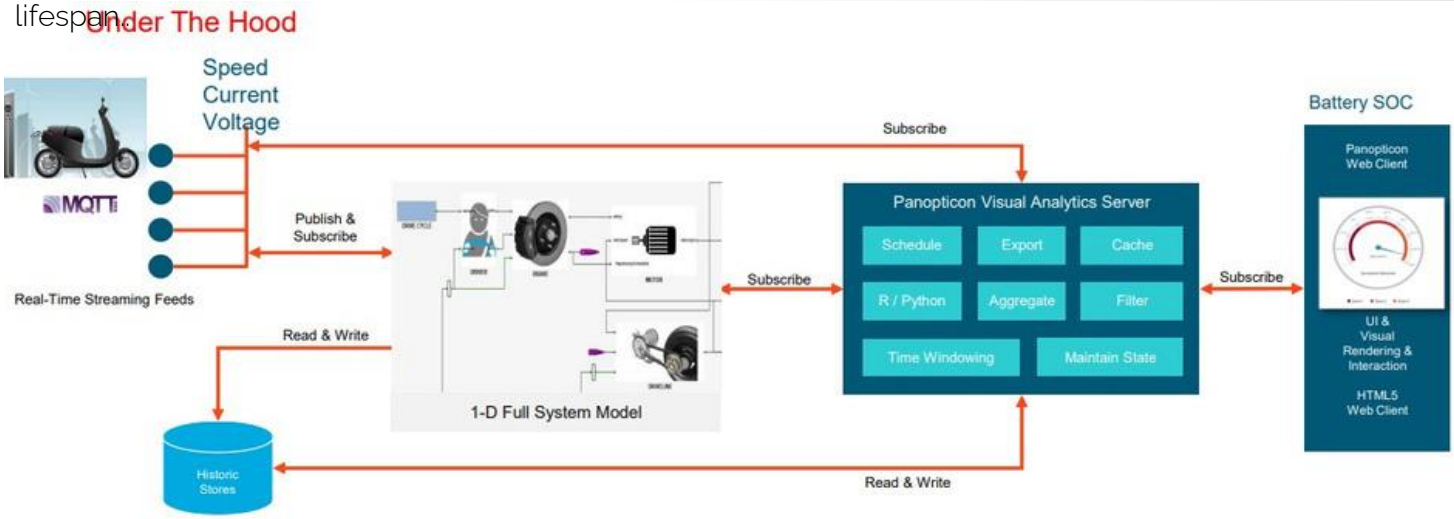
Digital Twin Integration for Full System Electric Vehicle (EV) involves creating a comprehensive virtual model of the entire EV system. This digital twin encompasses all critical components, including the battery, motor, power electronics, and software controls. By leveraging real-time data from sensors and IoT devices, the digital twin enables continuous monitoring, simulation, and optimization of the EV's performance, efficiency, and reliability.

Key Features:

- **Real-Time Monitoring:** Collects and analyzes data from the EV's sensors to provide a real-time view of the vehicle's health and performance.
- **Predictive Maintenance:** Uses machine learning algorithms to predict potential failures and schedule maintenance proactively, reducing downtime and extending the vehicle's lifespan.
- **Performance Optimization:** Simulates various driving conditions and scenarios to optimize energy consumption, battery management, and overall efficiency.
- **Software Updates:** Facilitates remote updates and improvements to the vehicle's software, enhancing functionality and user experience without the need for physical interventions.

ENABLING TECHNOLOGIES FOR DIGITAL TRANSFORMATION

1. Artificial Intelligence (AI & ML)
2. Internet of Things (IoT) & Real Time Analytics
3. HPC & Cloud Computing
4. Big Data Analytics
5. Computing Science & Multiphysics
6. Digital Twin & MBSE
7. Edge Computing
8. 5G Technology & Semi-Conductor
9. Robotic Process Automation (RPA)
10. Augmented Reality (AR) and Virtual Reality (VR)



DELIVERABLES FOR DT EMOBILITY LAB

SOFTWARE PRODUCTS

- Altair Twin Activate
- Altair Rapid Miner
- Altair Panopticon
- ROM AI
- Altair Embed
- Altair Compose

HARDWARE COMPONENTS

- E-Mobility hardware system
- EPK Kit: PMSM 5.5 KW Motor
- 48 Volt 44Ah Li-Ir battery
- Motor Controllers
- Data Acquisition: CAN Bus & MQTT
- Drive Train & Wheel Tyre

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