QUALITY & SPEED: EMPLOYING DIGITAL TWINS TO ACCELERATE THE PRODUCT LIFECYCLE

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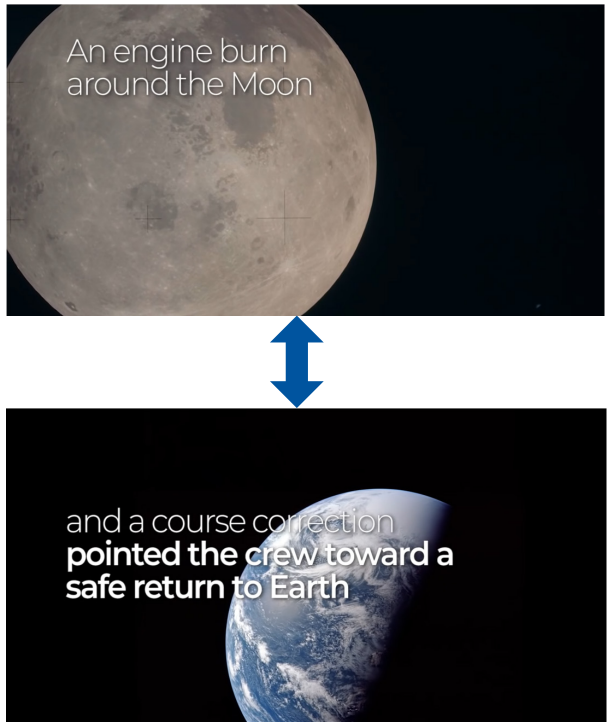
Houston, we've had a problem…

Jim Lovell – Apollo 13 Mission Commander

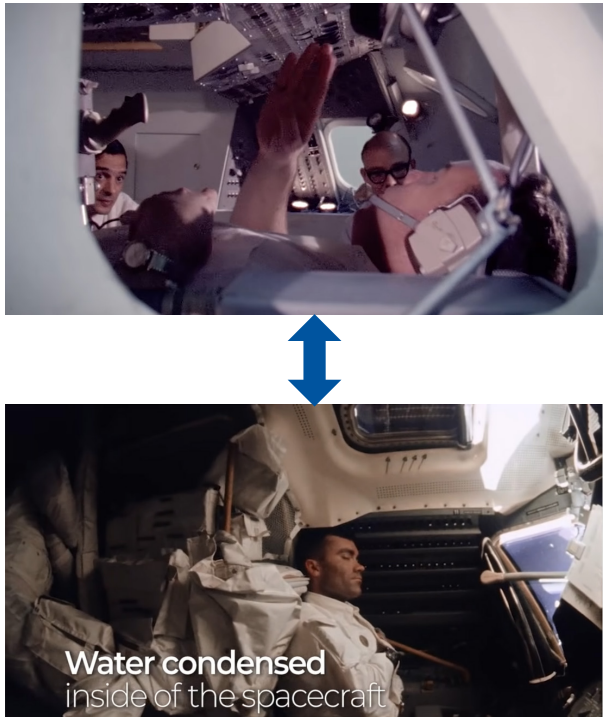
NASA pioneered the use of digital twin technology during its space exploration missions of the 1960/70s, when each voyaging spacecraft was exactly replicated in an earthbound version that was used for study and simulation purposes by NASA personnel serving on flight crews.

Apollo 13
April 1970

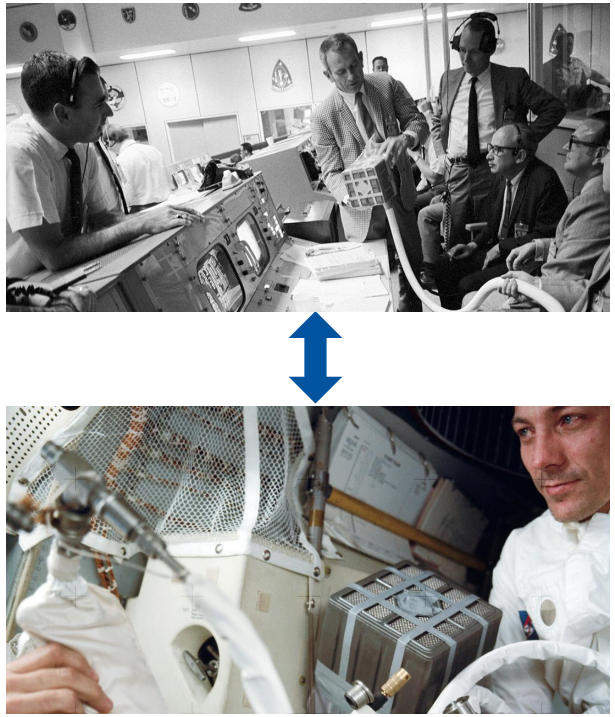
Explosion of oxygen tank turned lunar landing into a mission for survival



Real-time Trajectory calcs with unplanned parameters



Real-time testing of configuration changes



Real-time problem-solving support

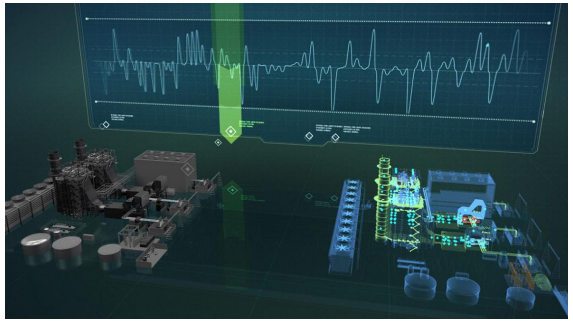
https://www.youtube.com/watch?v=MdvoA-sjs0A

Digital Twin

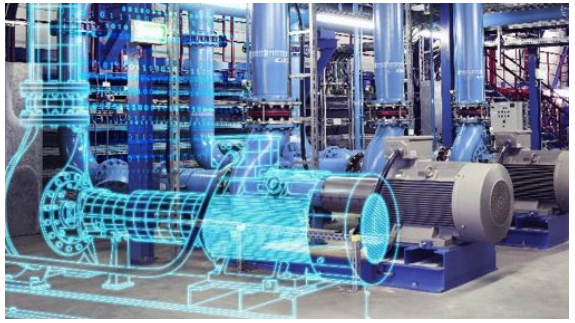
A digital twin is a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to generate insights and help decision-making

https://www.ibm.com/topics/what-is-a-digital-twin

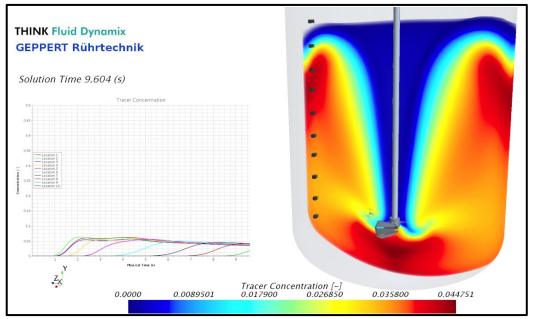
Power Generation



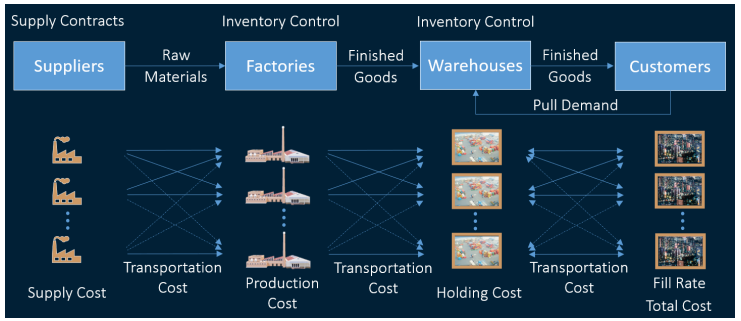
Manufacturing



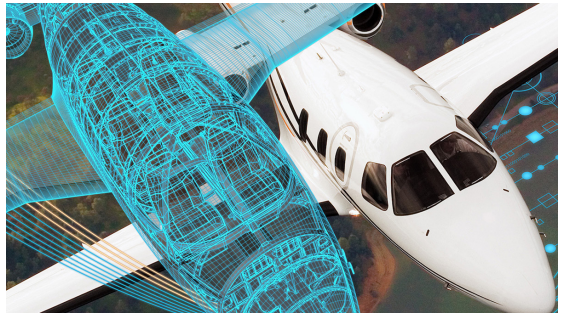
Asset Performance



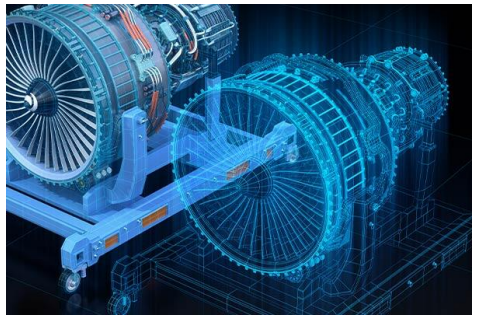
Process Modeling



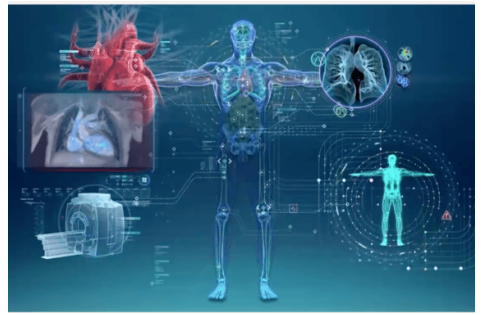
Supply Chain Optimization



Performance Optimization

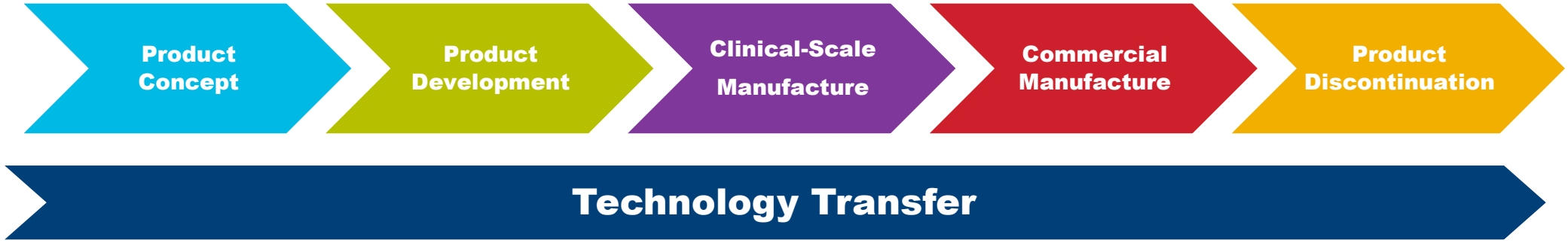


Product Development

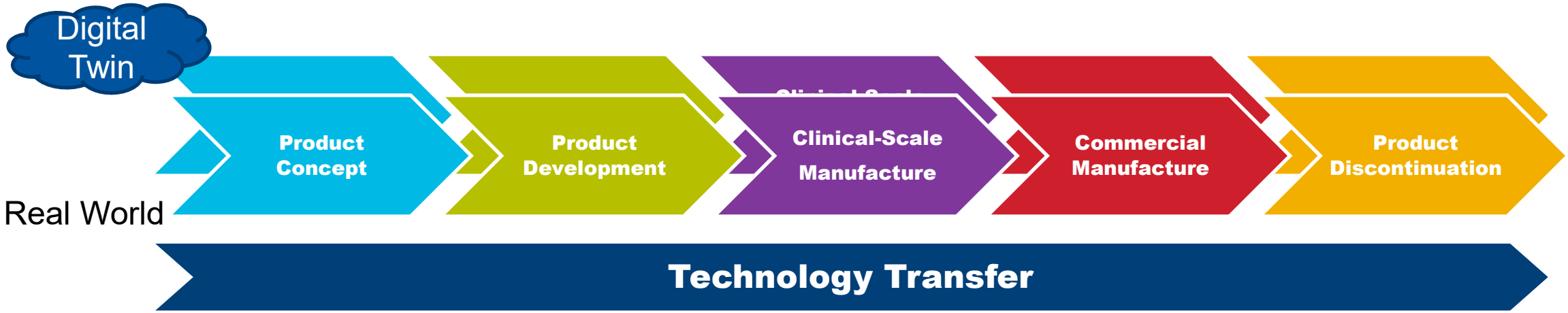


Healthcare R&D

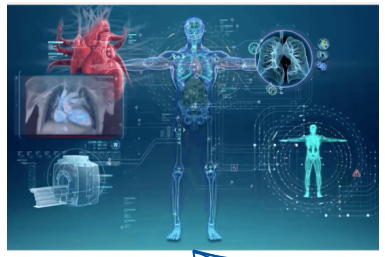
TECH TRANSFER → PRODUCT REALIZATION

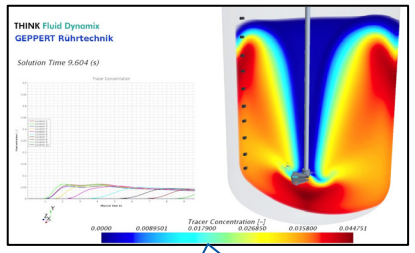


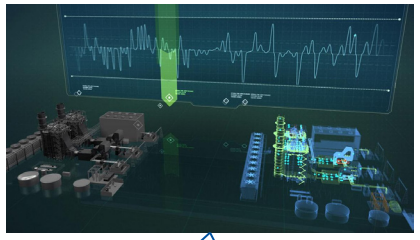
TECH TRANSFER → PRODUCT REALIZATION

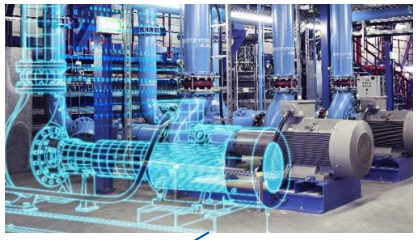


Digital Twin Applied to Pharmaceutical Product Lifecycle









Discovery
R&D
Clinical Trials
Pharmacovigilance

Process Dev
Process Scale-up
Investigations

Batch Records
Asset Utilization

Asset Management
Maintenance Optimization

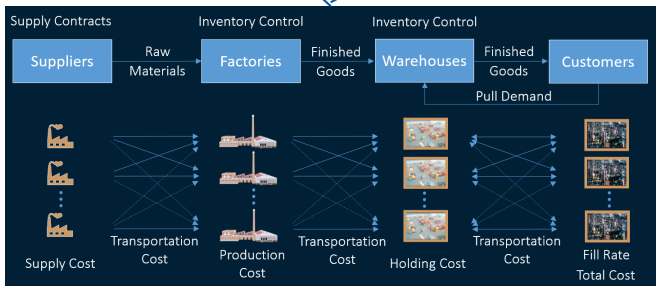
Digital Twin

Real World

Product Concept → **Product Development** → **Clinical-Scale Manufacture** → **Commercial Manufacture** → **Product Discontinuation**

Method Development
& Transfer

Supply Chain
Development & Optimization

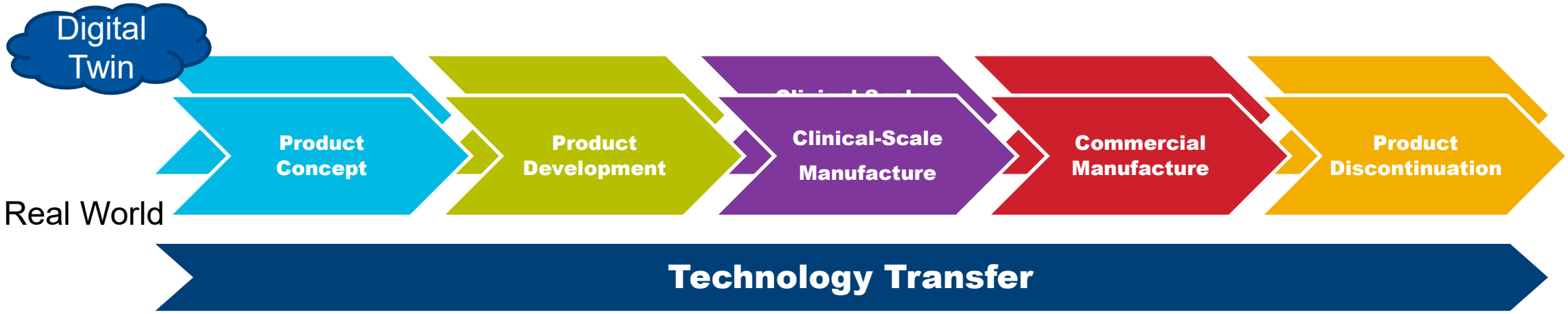


Hand-off to Generic
Manufacturers

Digital Twin Benefits

- Framework to organize and retain Product and Process Knowledge (PPK) throughout Product Lifecycle
- Automates generation of deliverables
- Enables employment of Analytics and Artificial Intelligence
- Increases value of the drug asset
- Accelerates and Improves Tech Transfer Process

TECH TRANSFER → PRODUCT REALIZATION

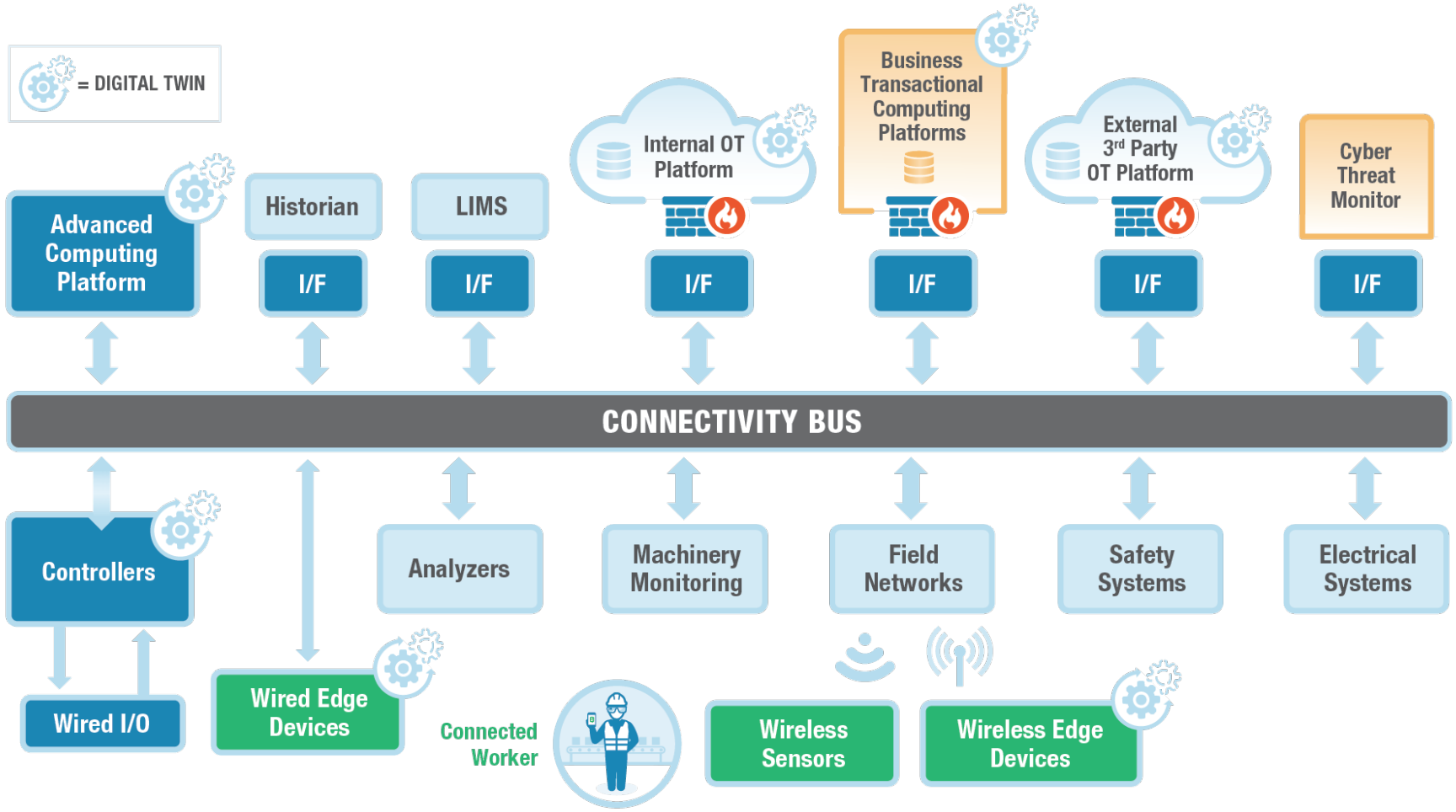


Digital Twin Accelerates Product Lifecycle

Speed with Quality

QUESTIONS

Connecting the Digital Twin with the Factory Floor



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