제품 성능 개선을 위한 개발 방법과 디지털 트윈의 활용

Younhyuck Chang

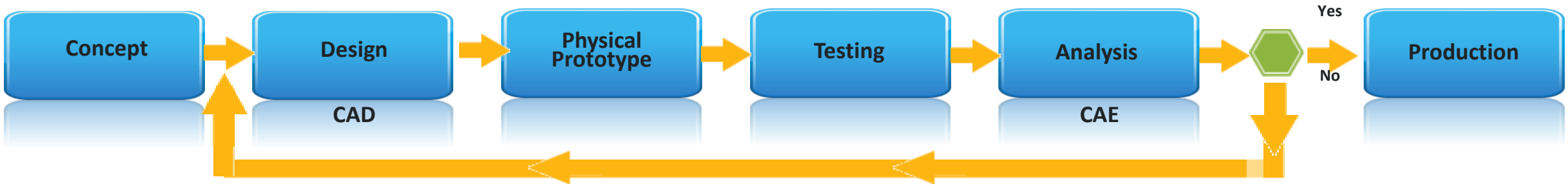
Ansys Korea

AGENDA

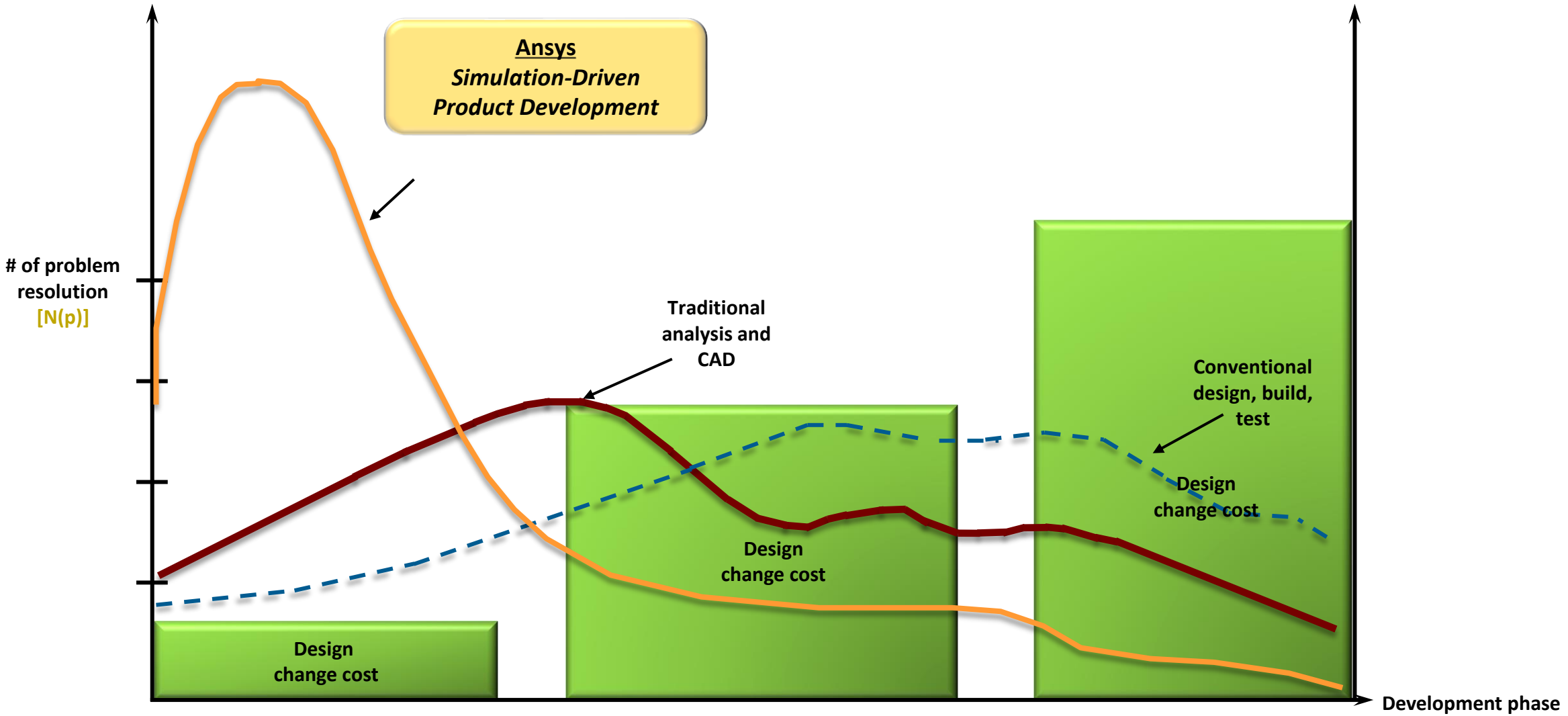
- 설계 패러다임의 변화
- 디지털 트윈 구현을 위한 구성요소
- 통합모델의 성능해석
- 디지털 트윈 구현사례
- Q&A

컴퓨터 해석 기반의 설계기법 변화

해석 기반의 제품 개발



개발 과정의 비교



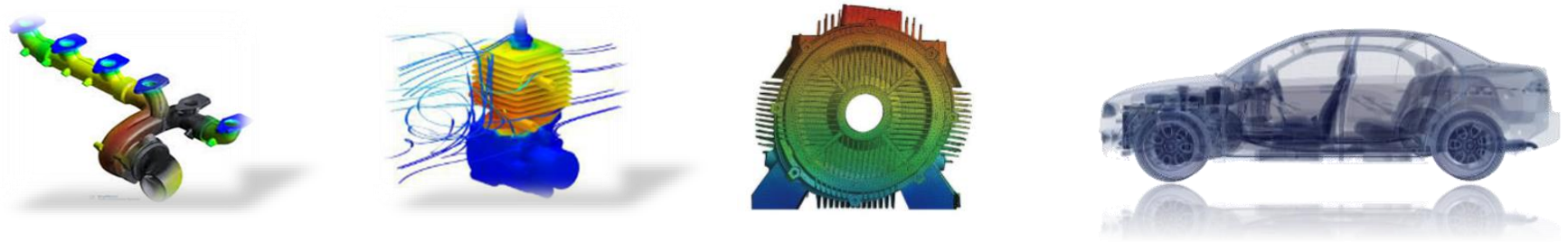
해석 기반의 Digital Twin은 무엇인가?

Connected, virtual **replica** of an in-service physical asset, in the form of an integrated multi-domain system simulation, that **mirrors** the **life and experience of** the **asset**

Enables **system design and optimization**, **predictive maintenance** and optimize industrial **asset management**

자산의 **수명 및 경험**을 **반영**하는 통합된 다중 도메인 시스템 해석의 형태로 서비스 중인 물리적 자산과 연결된 가상의 **복제본**

시스템 설계 및 최적화, **예측 유지보수** 및 산업 **자산 관리** 최적화가 가능



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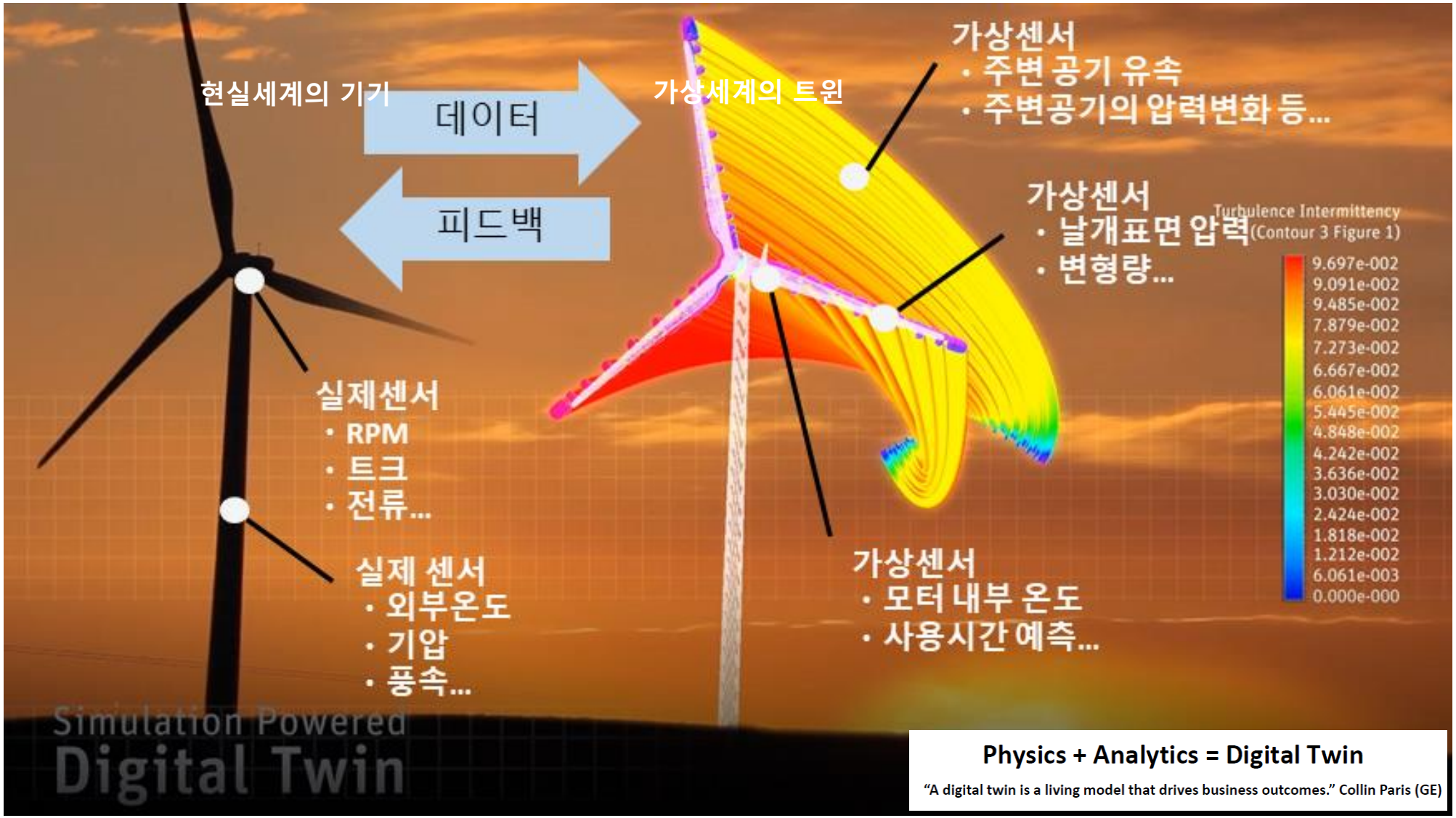
Ansys의 Digital Twin



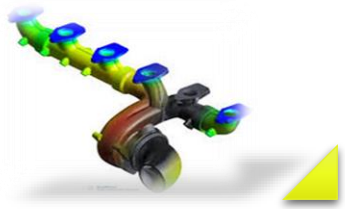
해석 모델의 복잡성

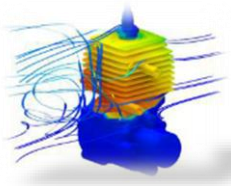
종래의 CAE
→ 각각
요소의 평가

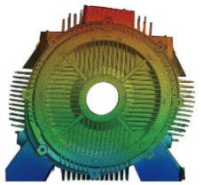
앞으로의
해석은,
요소를 조합한
시스템 평가

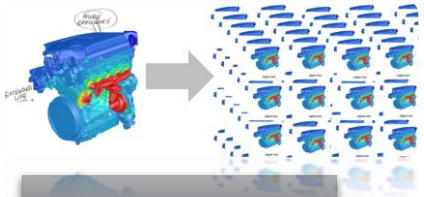
완성품의
디지털
시작 모델

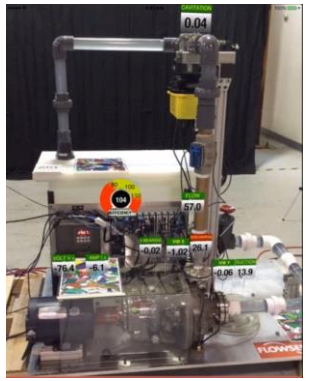
Digital Twin은
제품 설계 후에도
활용가능

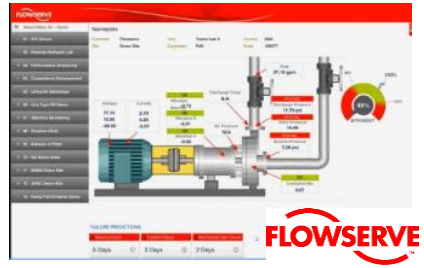












Single Physics
열전달

Multiple Physics
유동과 열

Multi-Physics
구조, 전자
유동

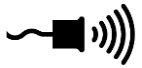
Complete Digital Prototypes
디지털
시작 모델

Digital Twin
완전한 복사

PLATFORM

디지털 트윈 구현의 중심에 있는 시뮬레이션

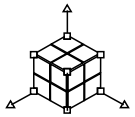
Ansys
Simulation-Based
& Hybrid Analytics



Create virtual sensors to “**measure**” missing data

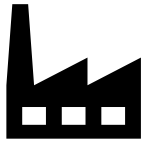
Perform **what-ifs** before applying a solution

Analyze accurate and deterministic **predictions** based on physical principles



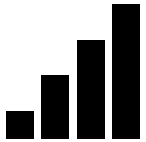
Explore **causality** and **failure modes** using physics

디지털 트윈의 대표적인 사용 사례



가상 커미셔닝, 문제 해결 및 시스템 구성

예측 및 처방, 유지관리



운영 최적화 및 사업계획의 수익률

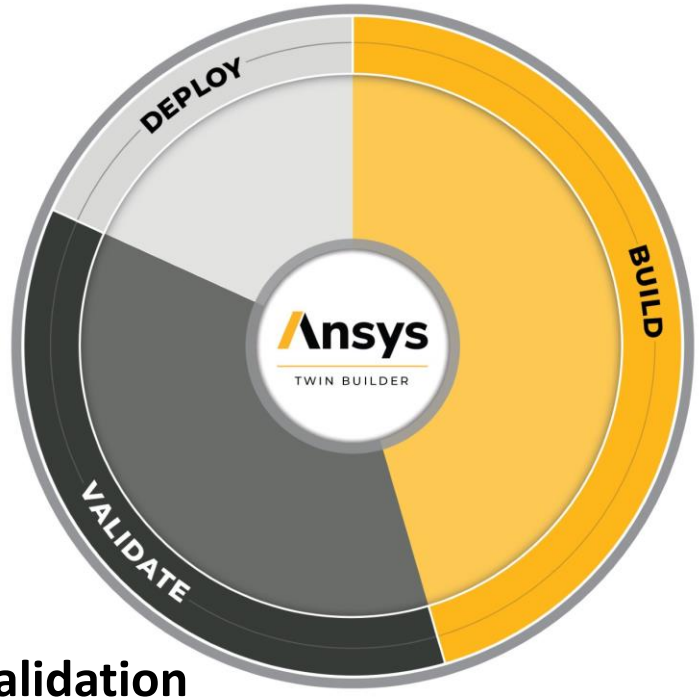
디지털 트윈 구현을 위한 구성요소

Ansys Twin Builder의 주요 기능

Deploy

Connect the Twins to IIoT Platforms and Deploy Run times in operation

System Predictive Maintenance



Build

System Simulation

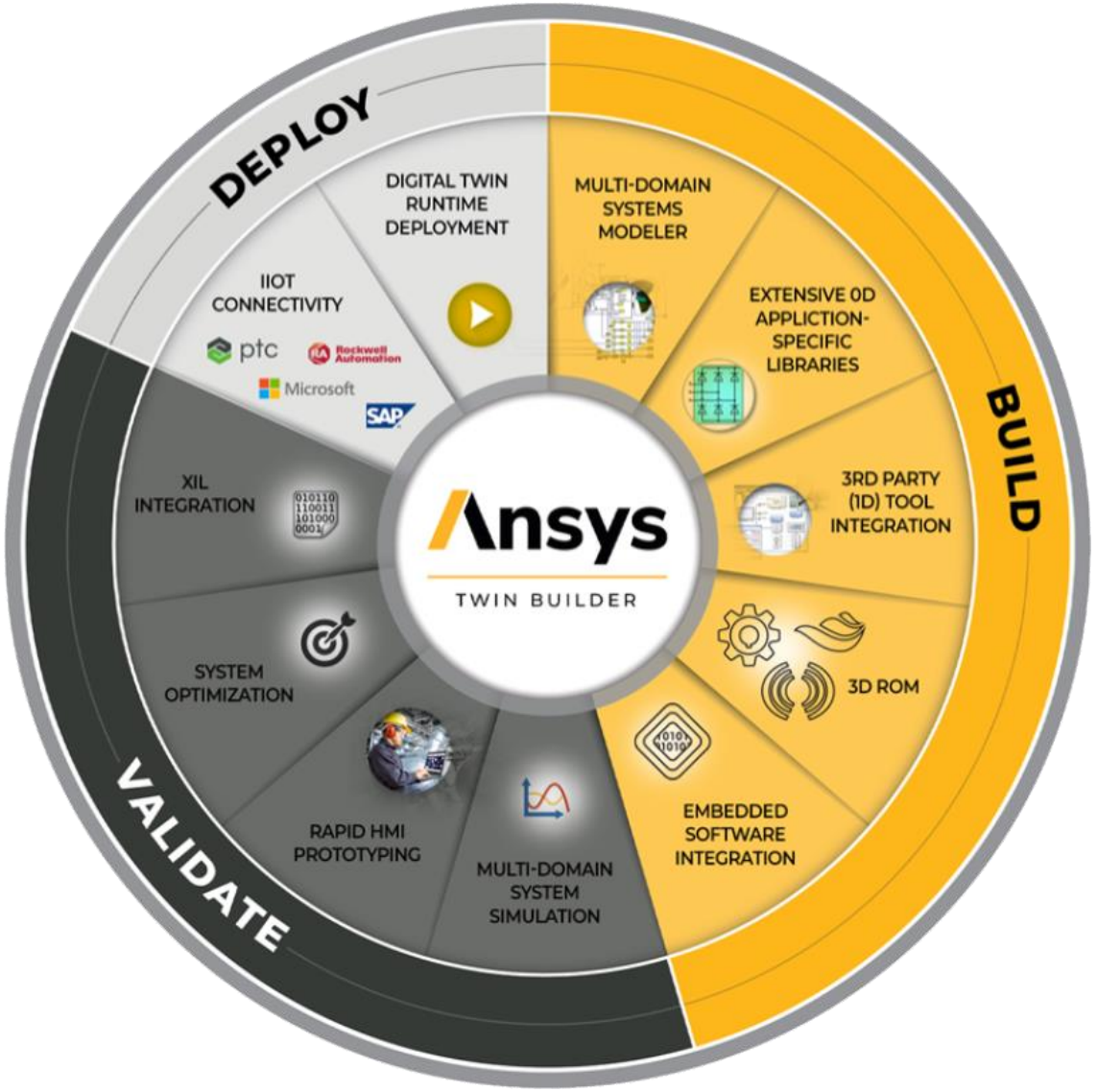
Build an accurate Physics-based Digital Twin in record time

Validate

System Validation and Optimization

Validate and Optimize the Twin

Ansys Twin Builder: 역량과 장점



멀티 테크놀로지 플랫폼

Multi-technology platform

축소 차수 모델링

State-of-the-art reduced order modeling

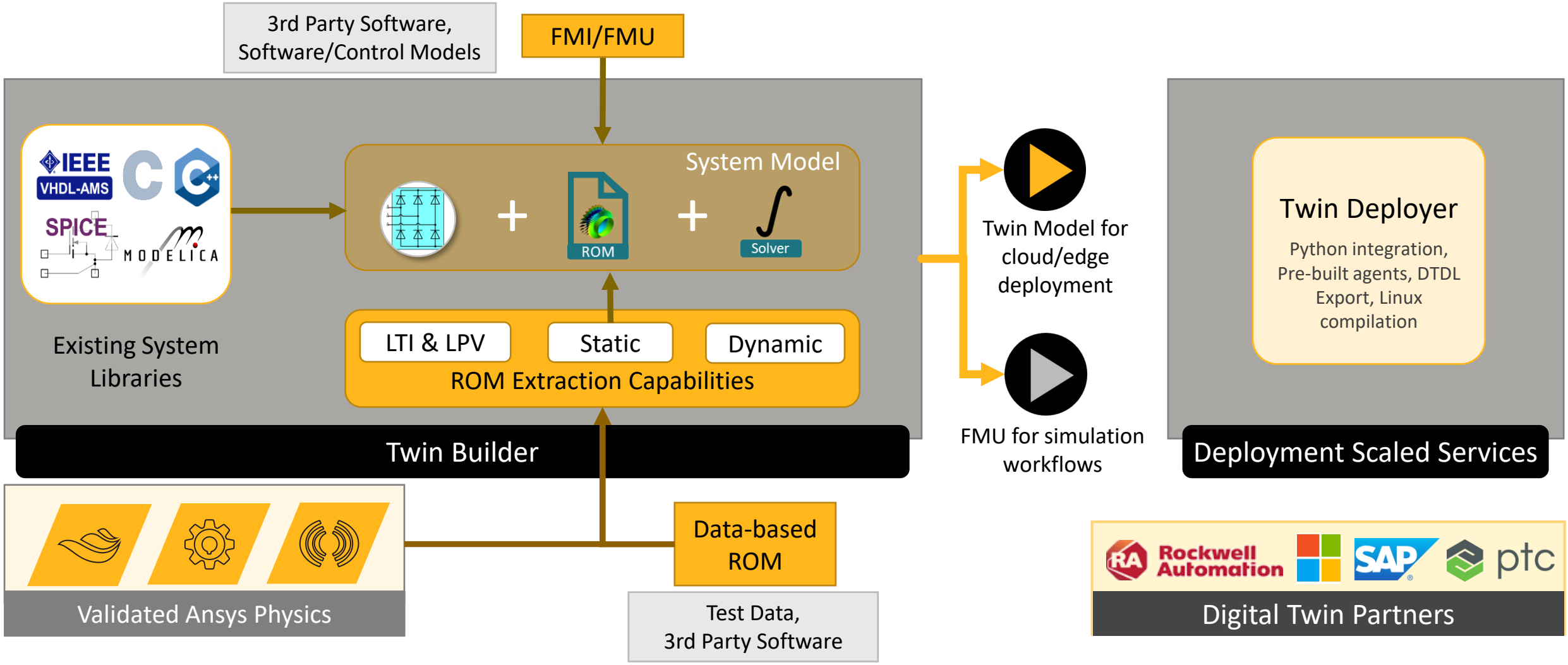
상호운용성 지원

Interoperability support

Digital Twin의 런타임 구축 기능

Ability to deploy runtimes for Digital Twin

디지털 트윈 솔루션 아키텍처



기술 기능 개요:
Twin Builder를 사용하여 디지털 트윈을 신속하게 구축

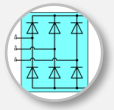
Build Phase Benefits and Capabilities

Easily assemble virtual replica from a variety of sources

Multi-domain, multi-fidelity, multi-language

Support for multiple modeling domains and languages

- Support for Modelica, VHDL-AMS, C/C++, SPICE and more



Extensive 0D Application Specific Libraries

- Electrical, Electronics, Std. Modelica Lib., Fluid Power, Thermal etc.

3rd Party Tool (incl. 1D) Integration

- Support for FMI/FMU, Ansys 3D solvers and co-simulation

3D Reduced Order Model Creation and Integration

- Simplify 3D physics by use of ROM (Dynamic, Static and DX)

Embedded Software Integration

- SCADE Suite, SCADE Display and more

기술 기능 개요:
디지털 트윈 검증 및 최적화

Validate Phase Benefits and Capabilities

Ensure Product Reliability and Robustness

Optimize System Performance with built in Optimizers

Easily Integrate and validate with Test data

Multi-Domain Simulation with Integrated Post Processing

- Analyze and optimize the interactions among the multi-domain components in a system.

Rapid HMI Prototyping

- Enhances the simulation experience with powerful, easy-to-design, and interactive graphical panels. etc.

System Validation and Optimization

- Support for DoE, Parameter Sweep and Scripting (VBA/Iron Python)

XIL Integration

- Support for co-simulation for Model-in-the-Loop (MiL) and Software-in-the-Loop (SiL) validation workflow

기술 기능 개요:
선도적인 IIoT 플랫폼에 디지털 트윈 구축

Deploy Phase Benefits and Capabilities

Optimize Operations

Deploy for Preventive Maintenance

Quickly Connect to supported IoT Platforms

- Configure connector to connect to IIoT platform and send and receive operational data
- SAP Predictive Engineering Insights enabled by Ansys
- Partnership with Rockwell Automation and Azure Digital Twins

Export and Deploy Generated Models

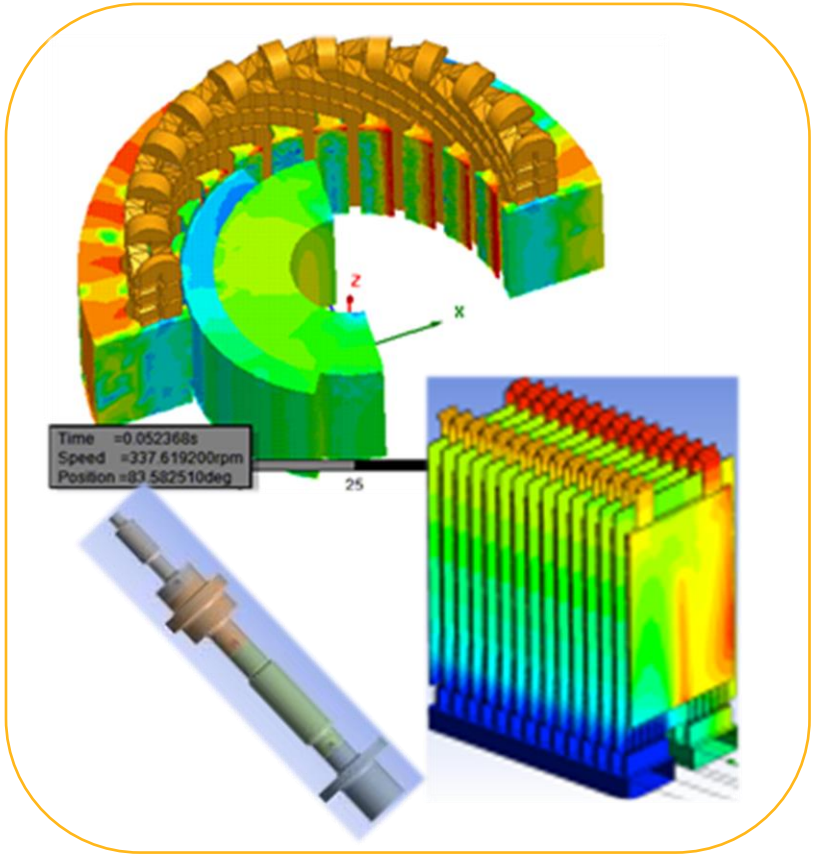
- Export from Twin Builder to generate portable, cloud deployable Twin

Easily Deploy Digital Twins with Ansys Twin Deployer

- Significantly reduce deployment time by performing validation and verification on Twins

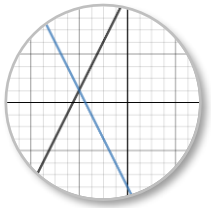
3D Reduced-Order Modeling Interfaces
Transforms 3D simulation results into system-level models

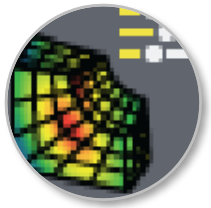
- Use Reduced-Order Modeling (ROM) interfaces to generate accurate, compact models from detailed 2D and 3D physics simulations.
- Simulates in a fraction of the time required by 3D Techniques for all Ansys physics
- Link to a variety of Ansys tools to create high performing models.



Connections with 3D Physics

Twin Builder에서 사용되는 세가지 종류의 ROM



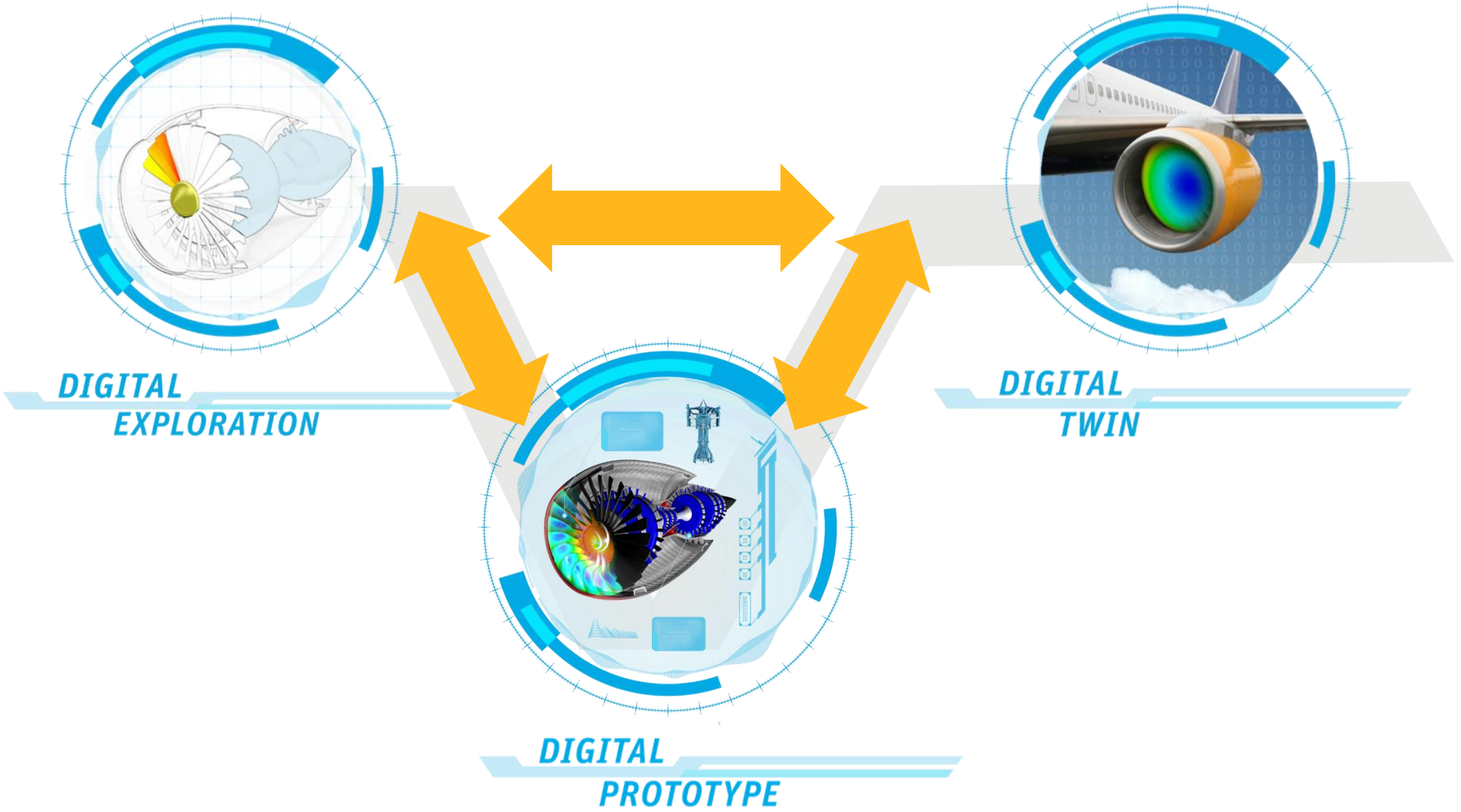


	Linear ROMS	**Non-linear, Static**	**Non-linear, Dynamic**
Techniques	State-Space/LTI Modal S-Parameter	**Twin Builder Static ROM Builder** Response Surface ROM OptiSLang	**Twin Builder Dynamic ROM Builder** Maxwell ECE
Supported Tools	Fluent, Mechanical, Icepak, Q3D, Maxwell, HFSS, SIwave	**Twin Builder Static ROM Builder:** All	**Dynamic ROM Builder:** All Maxwell ECE: Maxwell
Limitation	Linear system only Specific limitation for each tool Support enabled by tools	Static only Extending support for new tools requires effort	For Scalar only Limited input and outputs

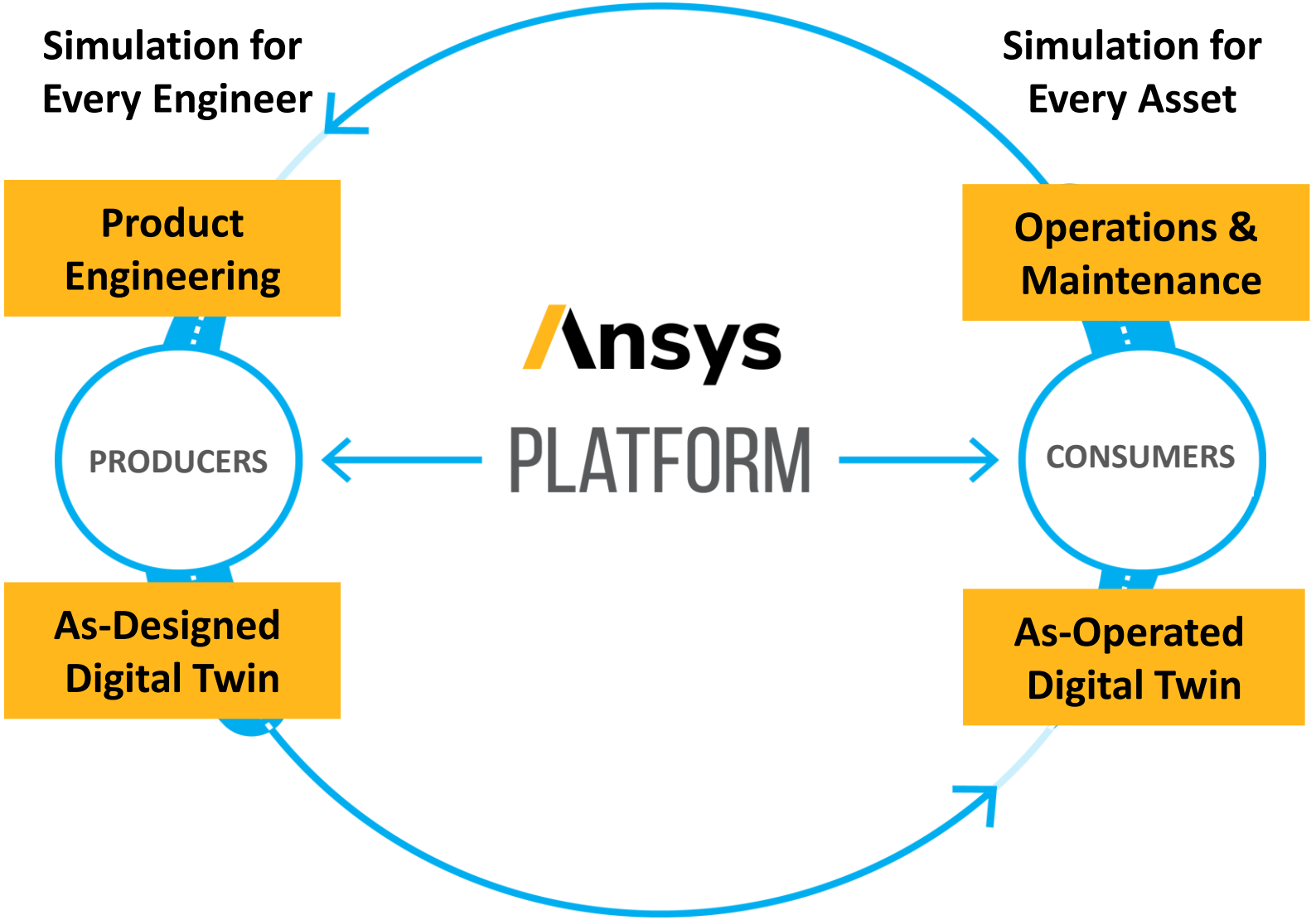
통합모델의 성능해석

Ansys

Ansys를 이용 엔지니어링 시뮬레이션



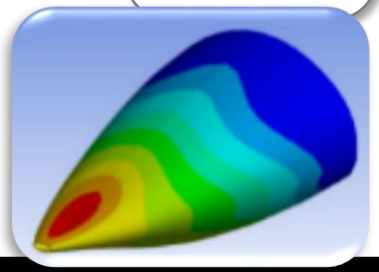
제품 설계 및 운영을 위한 공통의 Ansys 시뮬레이션 플랫폼



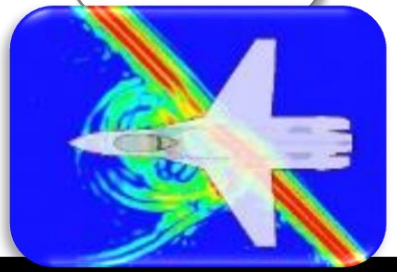
Ansys 시뮬레이션 플랫폼 개요

포괄적인 구성요소 수준 설계 및 시뮬레이션에서…

FLUIDS



STRUCTURES



ELECTRONICS

SEMI CONDUCTORS

EMBEDDED SOFTWARE

Ansys 시뮬레이션 플랫폼 개요

완전한 시스템 시뮬레이션 까지…

SYSTEMS

PLATFORM

MULTIPHYSICS

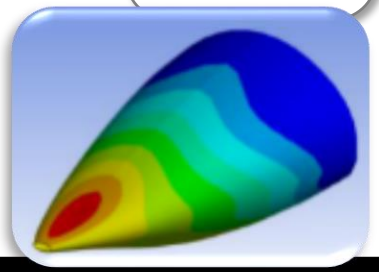
FLUIDS

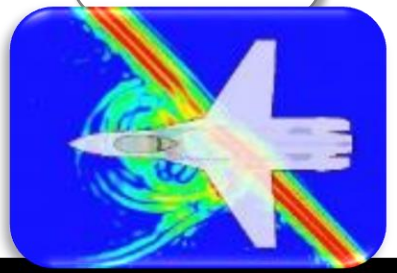
STRUCTURES

ELECTRONICS

SEMI CONDUCTORS

EMBEDDED SOFTWARE





Ansys

디지털 트윈 구현사례

Thank you!