MathWorks Focus on Electrification

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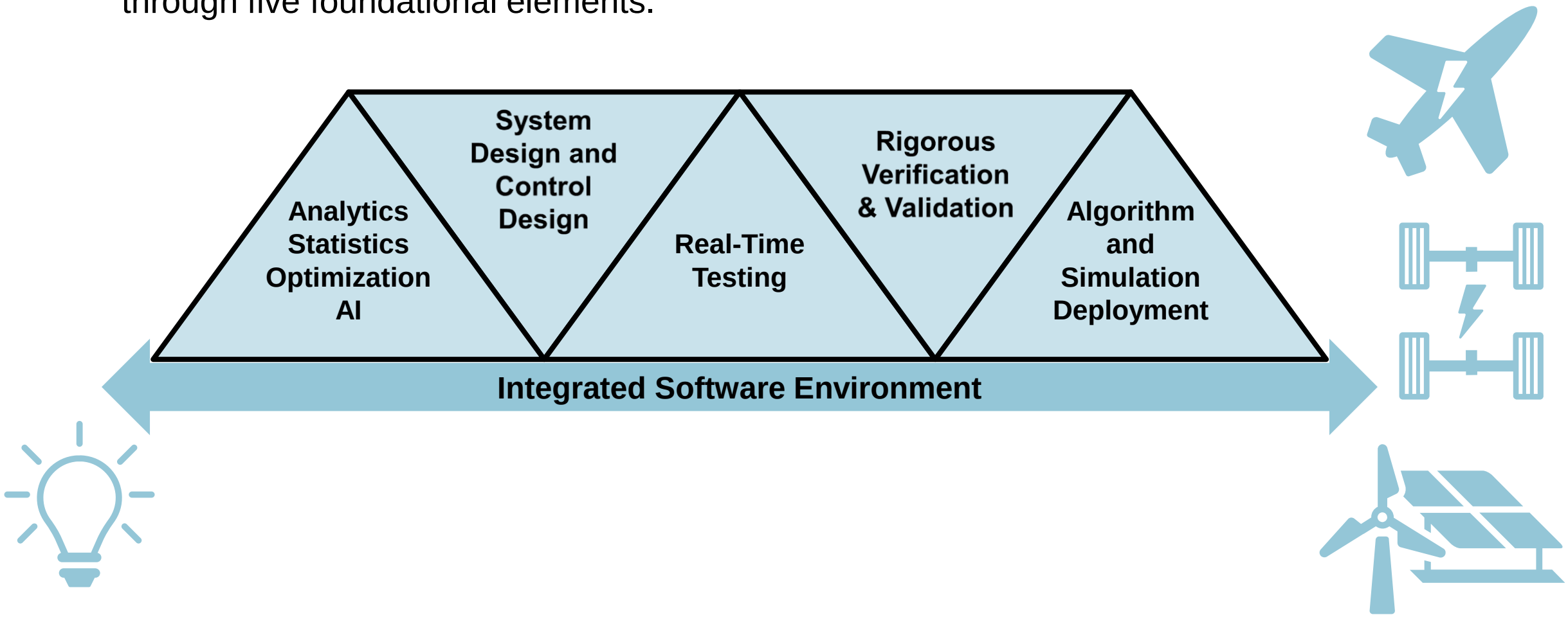
MathWorks

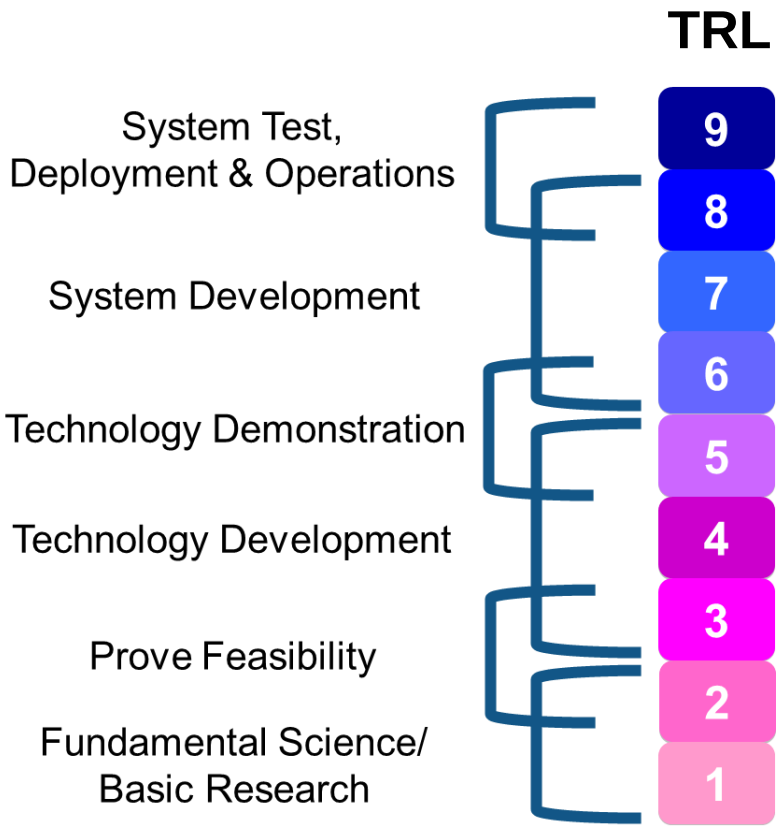
Create a bridge from idea to implementation

- MathWorks software creates a bridge across a technology development cycle through five foundational elements.



Guide system development through Technology Readiness

- Different engineering questions are asked at different stages of technology development. Mapping our software to different stages of technology readiness helps you navigate and answer those questions.

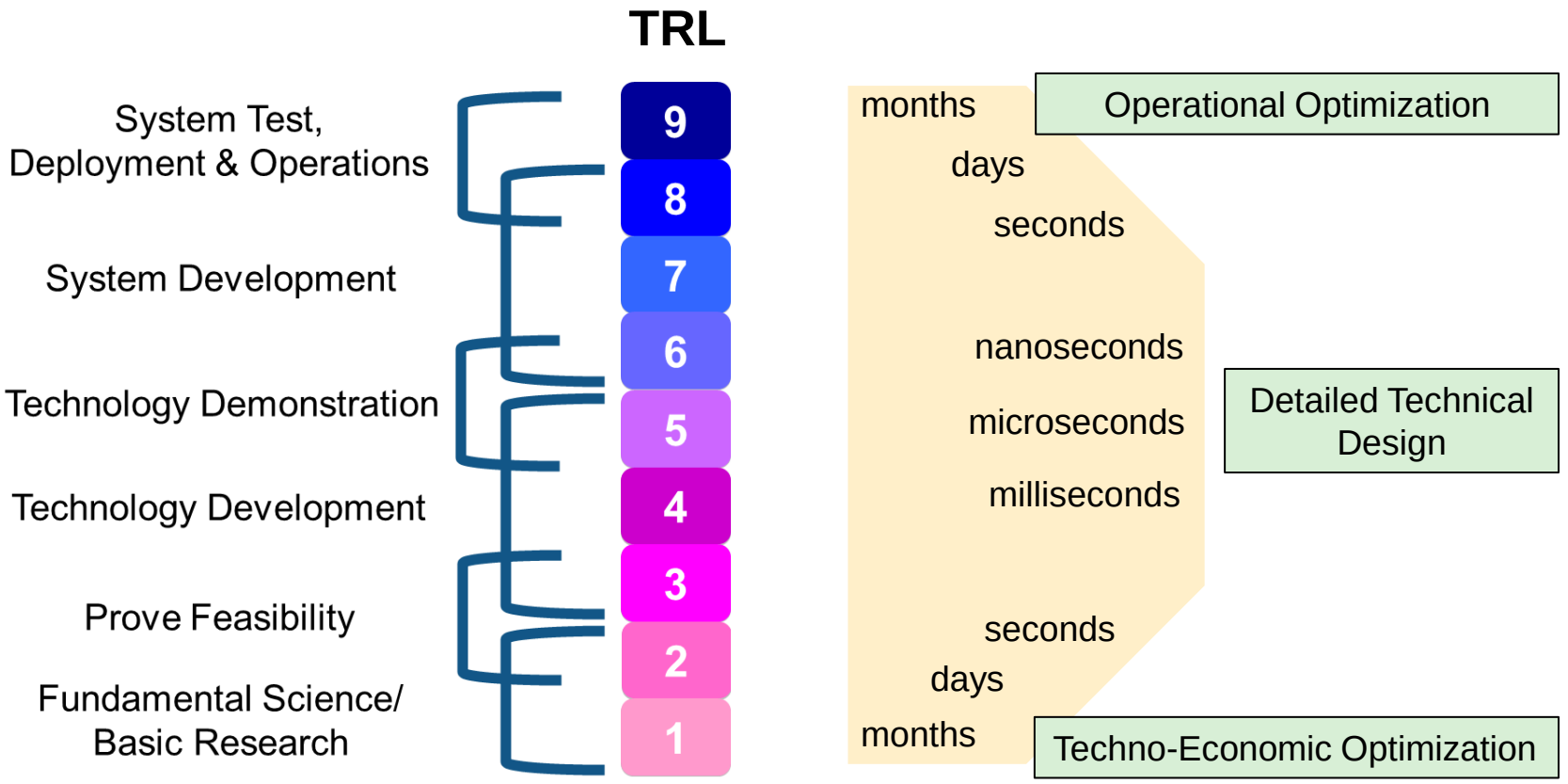


System Development

- Building Energy Management
- Renewable Energy & Energy Storage
- Generation, Transmission, & Distribution
- Electric Vehicles & Transportation
- Microgrid, Smart Grid, & Charging Infrastructure

Map system modeling to Technology Readiness

- Adjustable model fidelity is the key value of electrical system simulation for TRL mapping. This ranges from simple energy balance at early-stage, through to detailed power electronic switching at later-stage.



MathWorks helps engineers ‘see the whole picture’

Lockheed Martin Simulates Orion Spacecraft Missions Using a Multidomain Power System Model

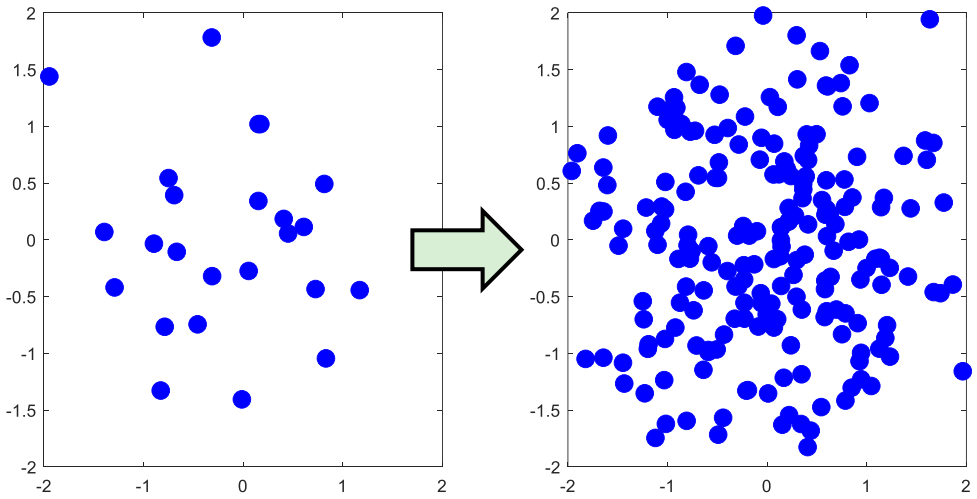
> “With Simscape Electrical we created an integrated power system model that connects electrical and thermal domains, so we get the whole picture during our mission-level simulations. If we need to model the motors that turn the solar arrays, we have the capability to integrate those mechanical components, too.”
>
> — *Hector Hernandez, Lockheed Martin*

NASA’s Orion spacecraft.

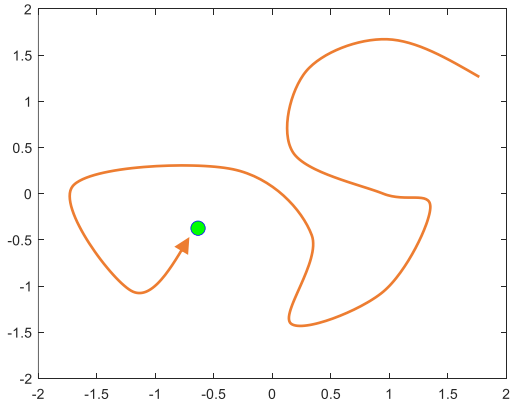
Build confidence through design space exploration

- Design Space Exploration is the process of architecting and evaluating multiple systems, and then selecting the best option for a given set of engineering and economic criteria.
- A question that can linger is how confident are you that the design you've selected is the best it can be?
- Confidence is built through two approaches…

Expand coverage of the design space

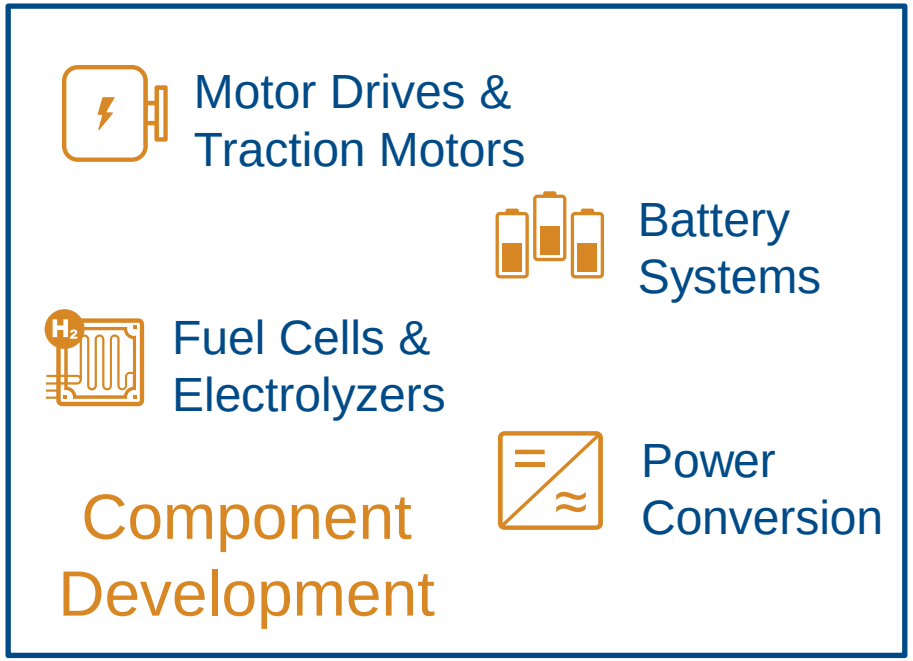


Apply Optimization



Develop embedded systems using Model-Based Design

- Model-Based Design emphasizes the use of simulation models to develop, test, verify and deploy the algorithms that monitor, control and operate your systems.



Model-Based Design adoption grid

	Modeling and Simulation	*Real-Time Simulation and Testing*	*Production Code Development*
Systematic Testing of Algorithms	System Verification	Automated Real-Time Testing	Certification
Simulating Algorithms with System Models	System Simulation	Hardware-in-the-Loop (HIL) Simulation	Software- and Processor-in-the-Loop (SIL, PIL) Simulation
Developing Algorithms	Algorithm Modeling	Rapid Prototyping	Embedded Code Generation

Model Usage

Code Generation

Develop embedded systems using Model-Based Design

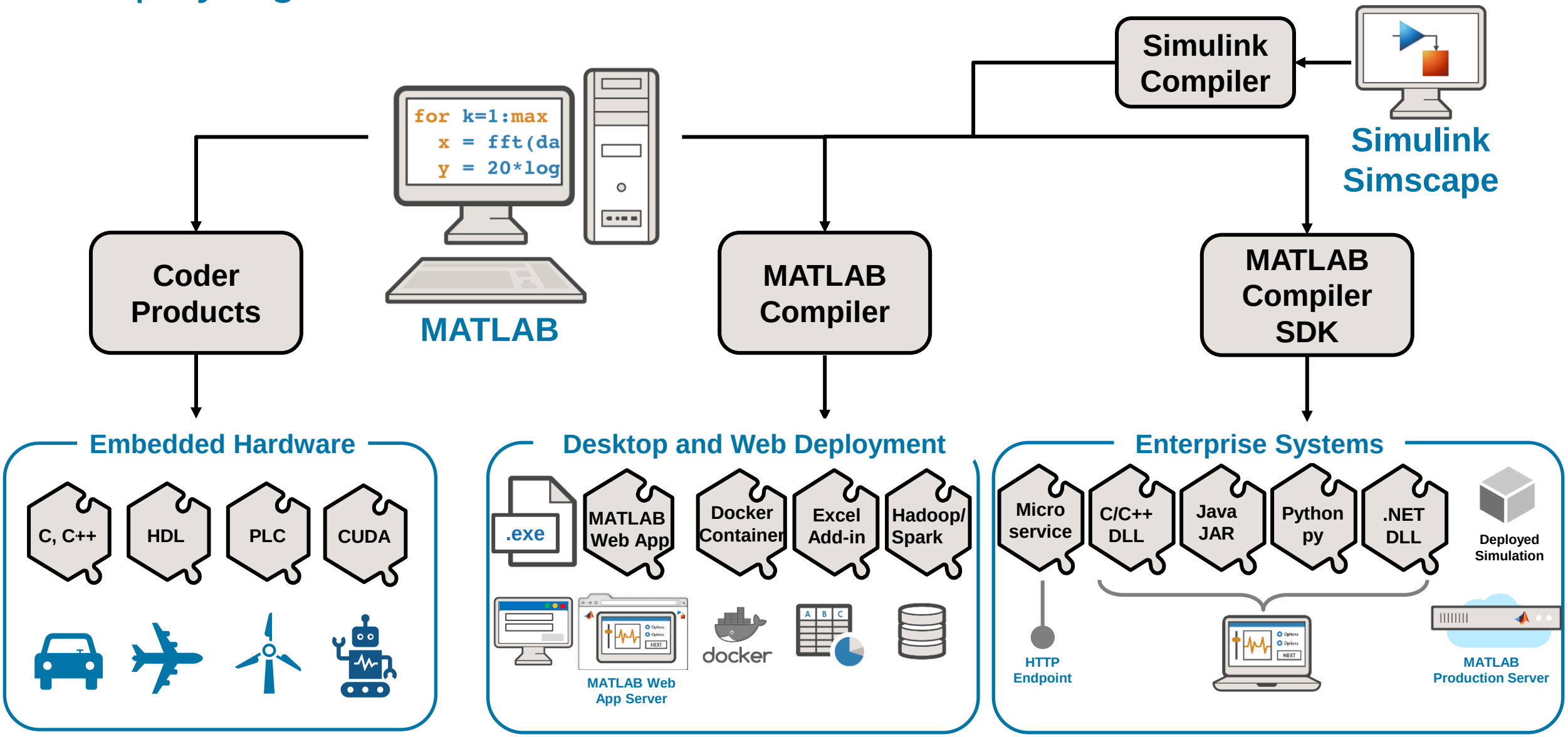
Vestas Develops Control Software for Wind Power Plants with Model-Based Design and Continuous Integration

"With Simulink and Embedded Coder, we can show our customers and grid operators a simulation that incorporates the actual code that will run in our power plant controller. That's what grid operators want, and it gives Vestas an advantage over competitors who still use conventional approaches."

— *Per Hagen Nielsen, Vestas*

Vestas turbines and power plant control.

Deploy algorithms and simulation models



Summary

MathWorks provides a powerful and integrated
multi-discipline development capability

that supports all stages of
electrical technology development
from early-stage feasibility to in-service operation

and helps engineers of any discipline
collaborate and innovate with confidence