

Automate engineering processes at scale

pSeven Enterprise Low-code platform to enable Digital Twins at scale

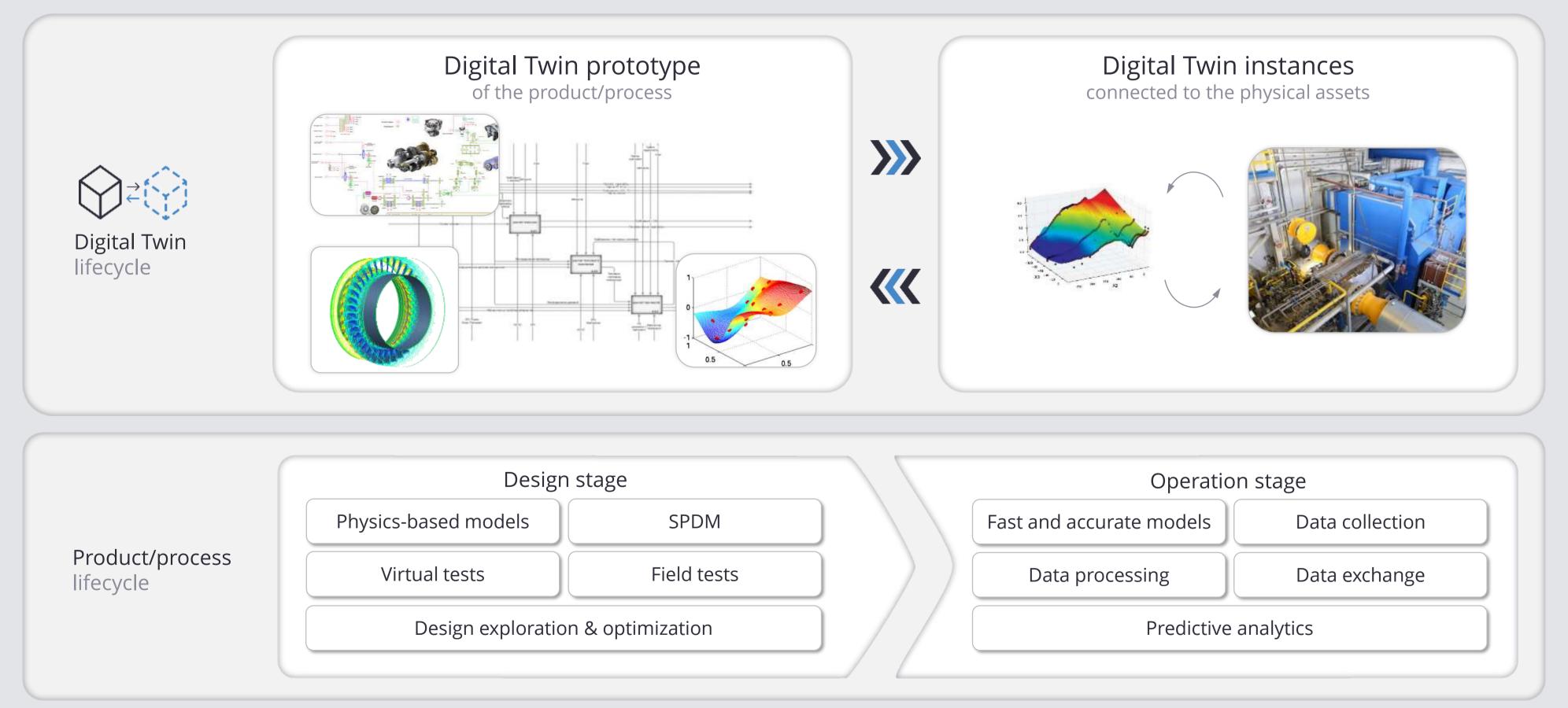
Sergey Morozov, President

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What is a Digital Twin?





Adoption of Digital Twin strategy

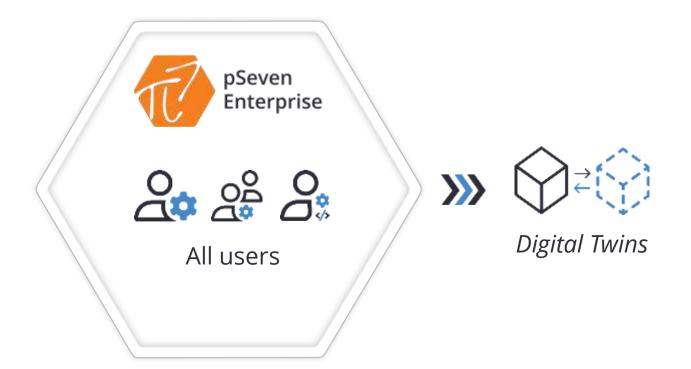
Challenge

- Even in big enterprises, the number of qualified engineers is not enough to implement the Digital Twin strategy:
 - The task usually lands on the tables of already busy qualified engineers, the others are not involved due to high level of the required expertise (subject + simulation + programming).
 - The developed approaches are hard to scale as is.
 - Just increasing the headcount doesn't help.



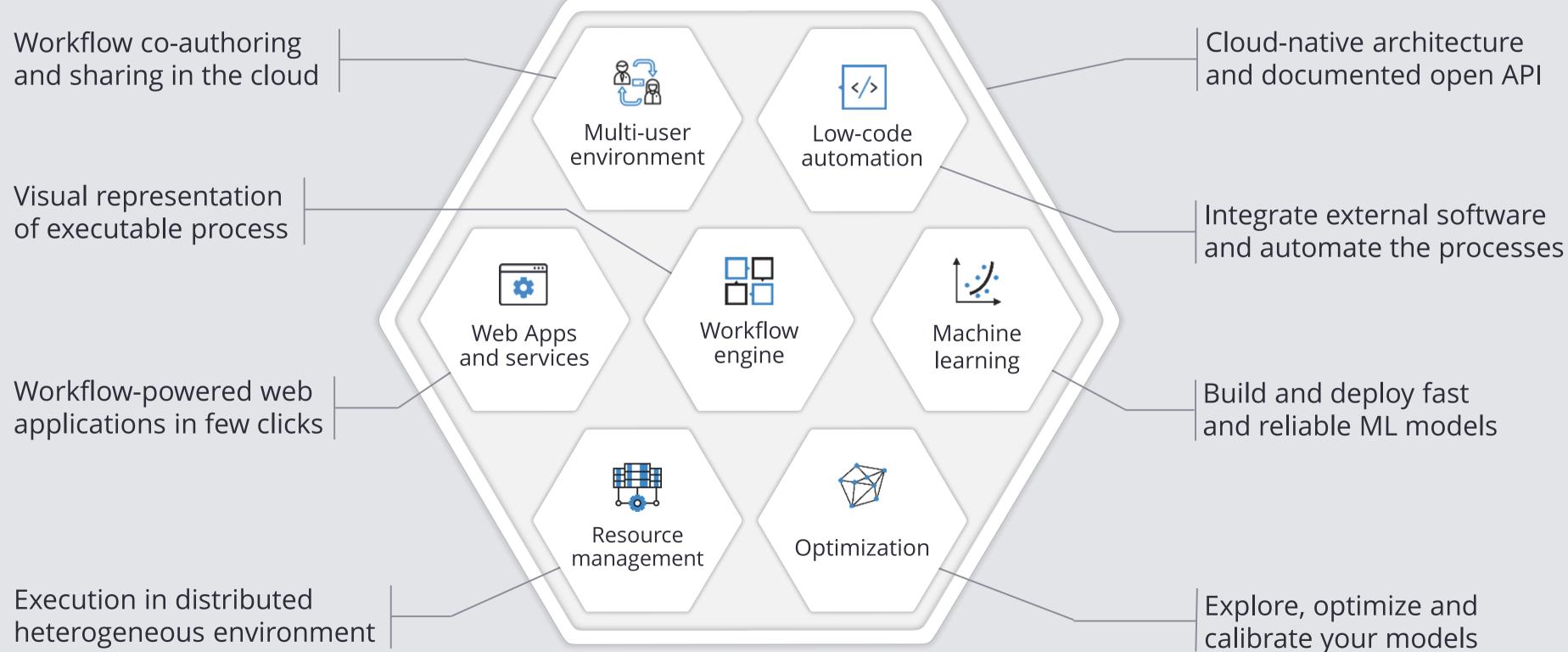
Solution

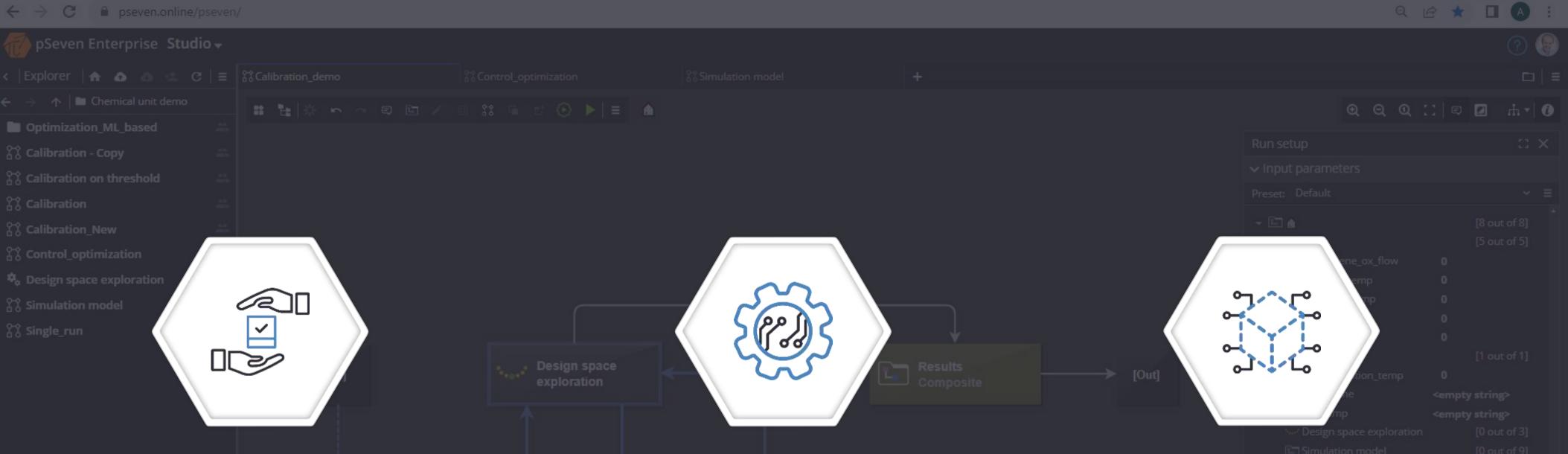
- Low-code collaborative engineering platform and split of responsibilities:
 - Professional developers build reusable components (hard-code).
 - Qualified users develop and manage automated workflows (low-code).
 - Other users run workflows as is or with slight adjustments (no-code).





pSeven Enterprise: All you need to power up Digital Twins





Capture and transfer knowledge

- Formalize and maintain complex multidisciplinary engineering processes at scale.
- Share, reuse and maintain knowledge easily with low-code approach.

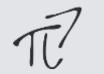
Automate repetitive tasks

- Accelerate product development cycle through productivity gain.
- Reduce time-to-market with standardization and democratization.

3x productivity gain reported

Enable Digital Twin strategy

- Bridge the gap between engineering and operations.
- Make better and faster operational decisions.



Low-code automation platform

- Powerful workflow engine:
 - Visual representation of executable processes
 - Multi-level (nested) workflows
 - Centralized & customizable block library
 - Everything is done in the cloud \rightarrow No need to move files
- Low-code approach:



 Faster implementation and development of MVPs



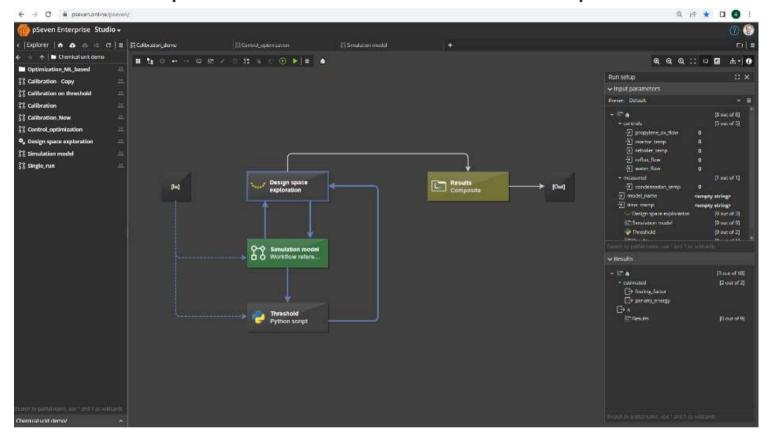
 Logic is always open for inspection and revision

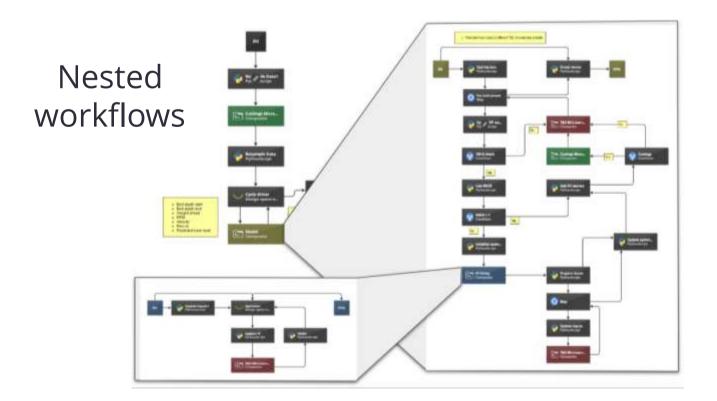


 Flexible depth and order of automation

Accelerate development cycle

Visual representation of executable processes





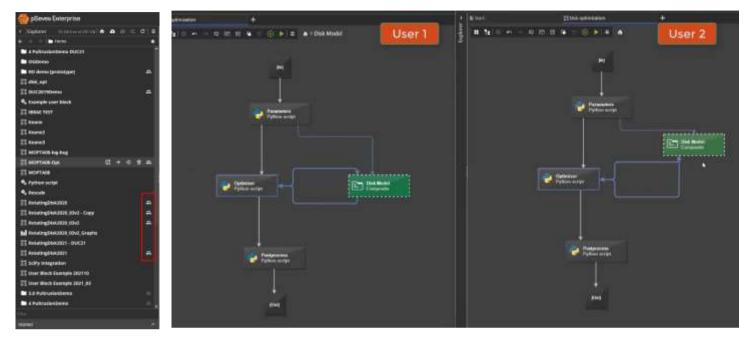


Collaborative engineering

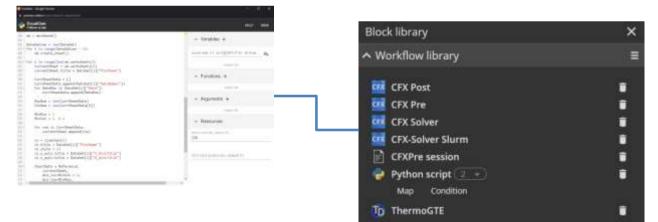
- Centralized architecture enabling collaboration:
 - Multi-user environment with roles
 - Co-authoring in real-time
 - Workflow sharing and aggregation
- Integration with other collaborative environments:
 - SPDM, PLM etc.

Share knowledge and maintain it easily

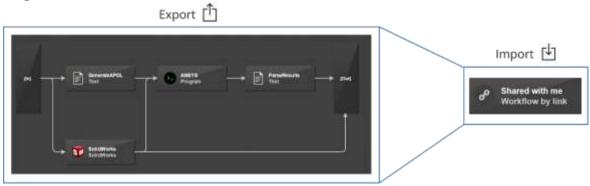
Co-authoring



Reuse blocks

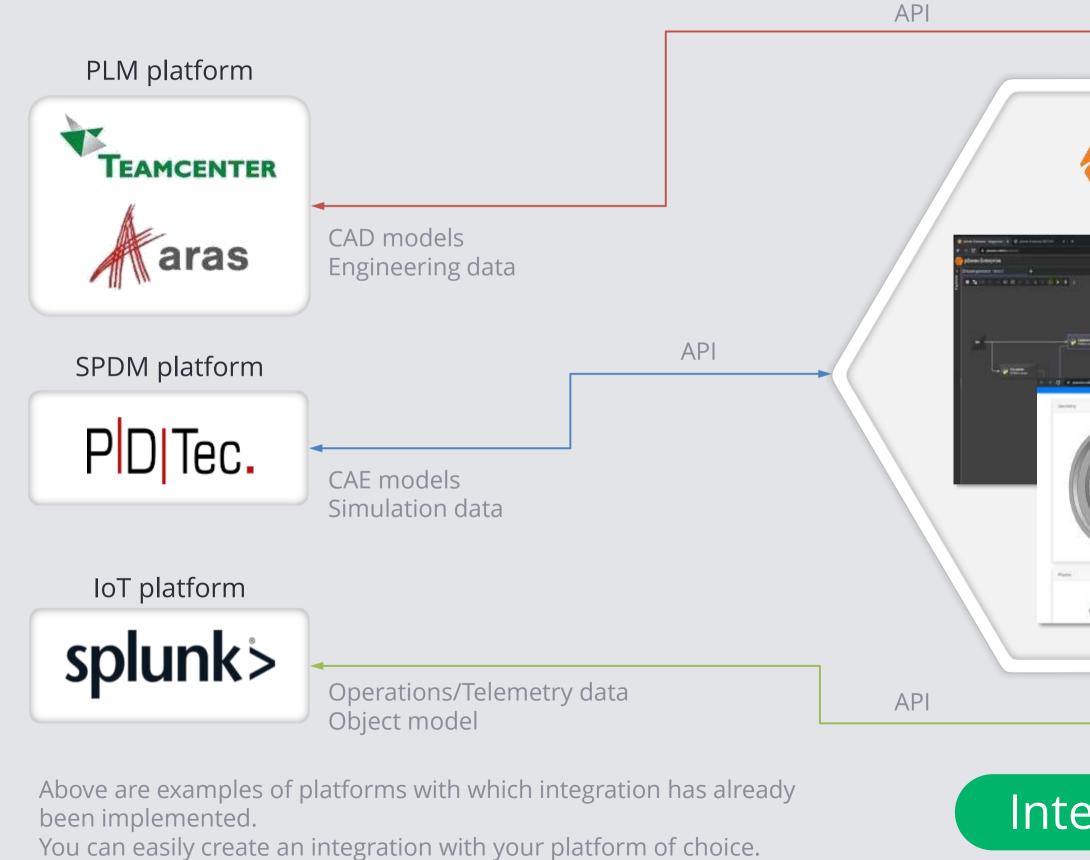


Workflow sharing by reference/link





Integrate with other enterprise IT platforms



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Interoperability

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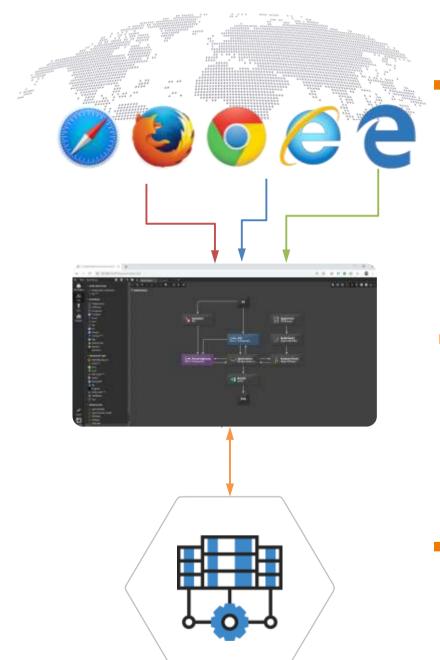


Cloud-native and accessible

- Cloud-native architecture:
 - One installation to support
 - Access from any browser and any device
 - Thin client is enough
- Runs in a predefined and well-controlled IT environment:
 - On-premises (Kubernetes)
 - Private cloud (AWS, Digital Ocean, Azure, Huawei Cloud etc.)



Access from anywhere



Access through any browser

 pSeven Enterprise web interface

On-premises
 Private or public cloud

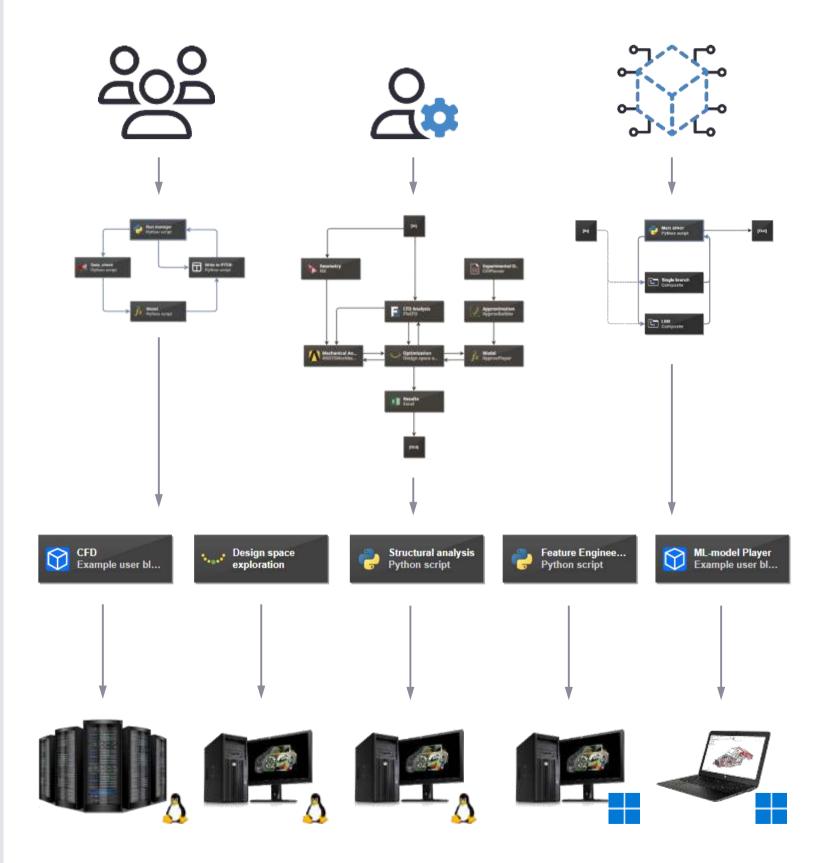




Resource management

- Execution:
 - Support of distributed heterogeneous environments
 - Run blocks on Linux nodes and external Windows machines
- Management:
 - Many users can run many resource-intensive workflows at the same time
 - pSeven Enterprise manages computing resources automatically
 - Number of simultaneously running workflows is limited only by your license and computational resources
- Monitoring:
 - Status of all running processes is presented on a dashboard





Managed and scheduled resources



Machine learning and optimization

- Use industry proven pSeven Core algorithms:
 - Efficient proprietary machine learning algorithms
 - Dedicated Design Space Exploration block:
 - Powerful single- and multi-objective Optimization algorithms
 - DoE and Adaptive DoE
 - Model identification, calibration and adaptation
 - SmartSelection, an AI technology for automatic selection and tuning of algorithms
- Use your favorite Python optimization/ML library:



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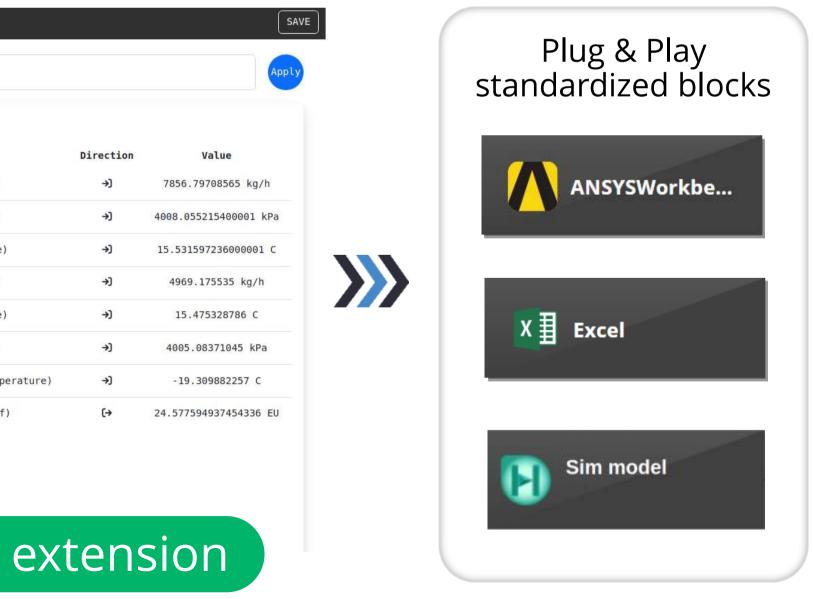
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Customizable block library



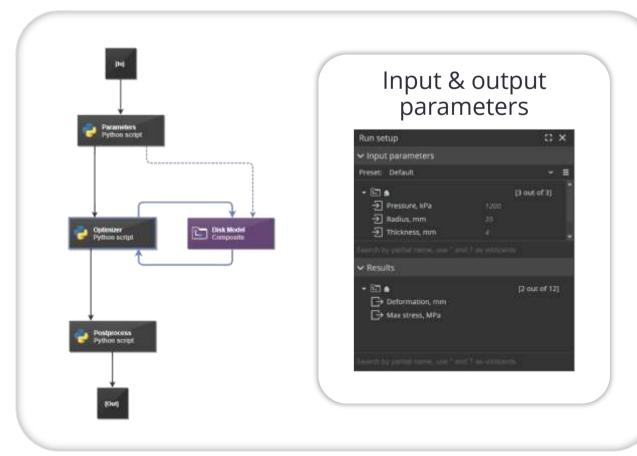
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Formalize software connectors and their logic Deploy and manage all your simulation and ML models from a single platform



Easily share engineering workflows as Web Apps

Prepare a workflow (by advanced users)



Create a Web App in few clicks

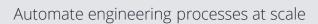


Democratization

 Qualified users build engineering workflows and share them as simple Web Apps with others. Create easy-to-use engineering calculators and hide the unneeded complexity.

> GUI is generated automatically (for citizen users)

Parameters		Results
Input parameters to be set by the user		Output values and result files will be available after run
Radius, mm		Max stress, MPa
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Bending tadius		Maximum equivalent stress
Thickness, mm		Deformation, mm
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Thickness of the pipe wall		Maximum deformation
Pressure, kPa		Files
1200	2 8 (34)	report.docx
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Files		
Select file	Browse	



Web App default GUI can be customized

Develop a custom GUI for an App

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Run on server



Bring advanced methods to citizen users

Explore result in any browser





Gallery of Web Apps and services - AppsHub

Workflows and models as Web Apps

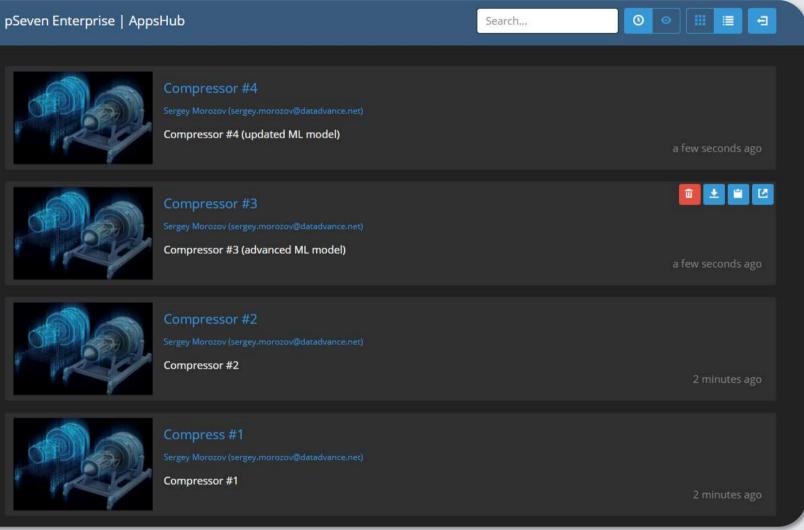
0 pSeven Enterprise | AppsHub Search... Actuation force Train an approximation model of an Optimize performance characteristics Optimize shape design of a bistable airfoil with variable parameters to of the rotating disk in a gas turbine micro-electro-mechanical system estimate the lift coefficient and drag engine using a FEM solver. (MEMS) switch. coefficient. aaction 2 Minimize the mass of a three-section Optimize hydraulic resistance and Optimize torque and mass of a single beam subject to a rigidity constraint cylinder gasoline engine simulated geometry of a heat exchanger with a using a FEM solver. required cooling rate. with Amesim

Workflows and models as services (access via REST API)











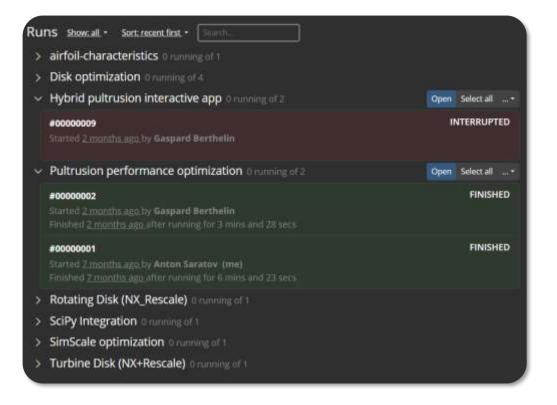


Service orchestration

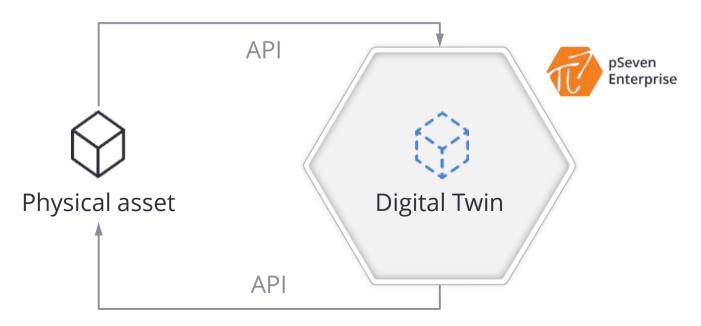
- Every workflow can be considered as a web service or model as a service with REST API.
- Full control over runs:
 - Who, when, run status etc.
- Execution on event and on schedule:
 - Example: the physical asset sends new input data to its Digital Twin for status update and/or for results that are used as input for the physical asset itself.



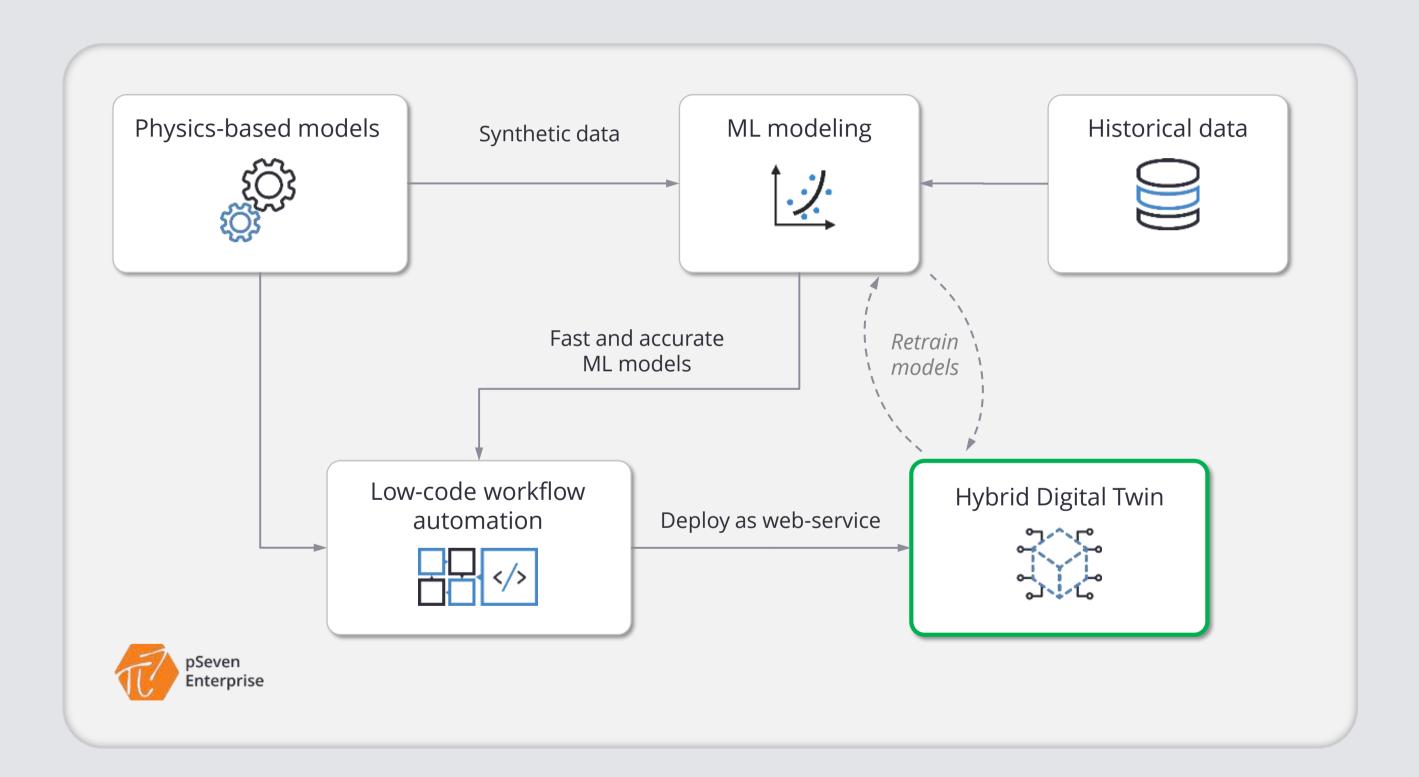
Run manager

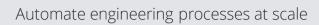


Digital Twin data exchange

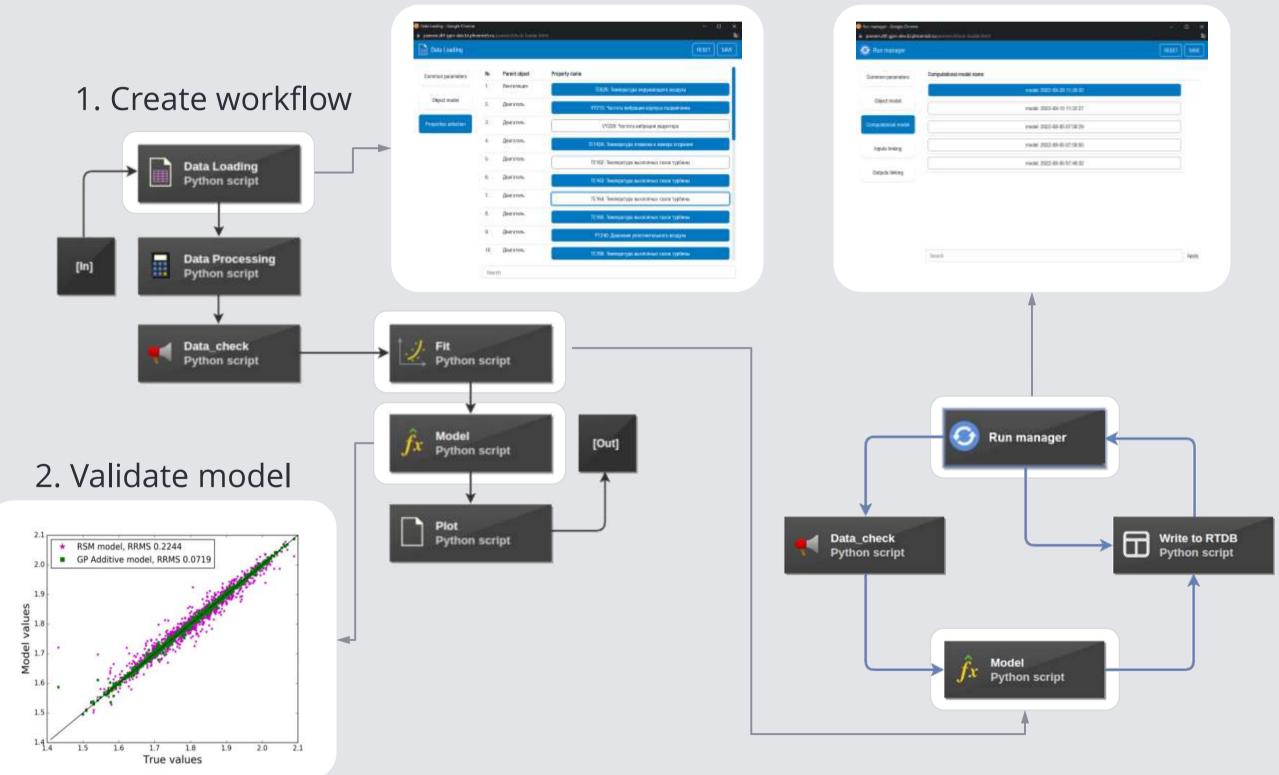


Assembling Hybrid Digital Twins in pSeven Enterprise



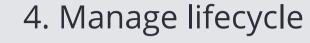


Deliver automated workflows across the enterprise



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3. Deploy as service

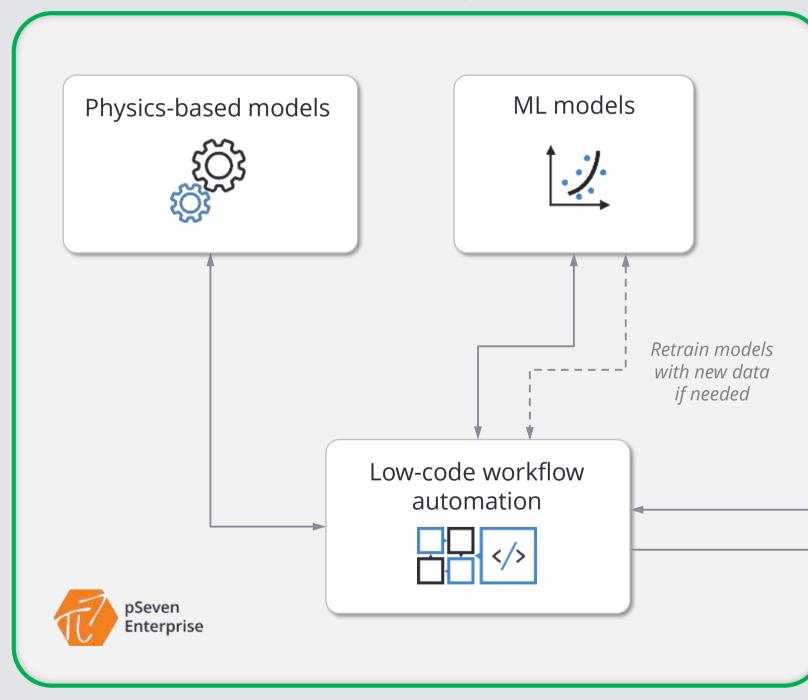


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Operating Hybrid Digital Twins in pSeven Enterprise

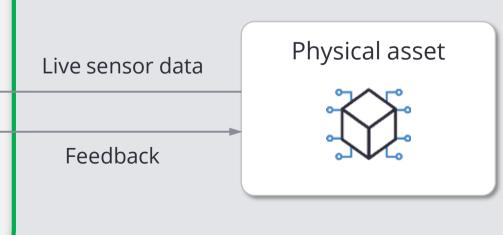


Online Hybrid Digital Twin



Bridge the gap between engineering and operations

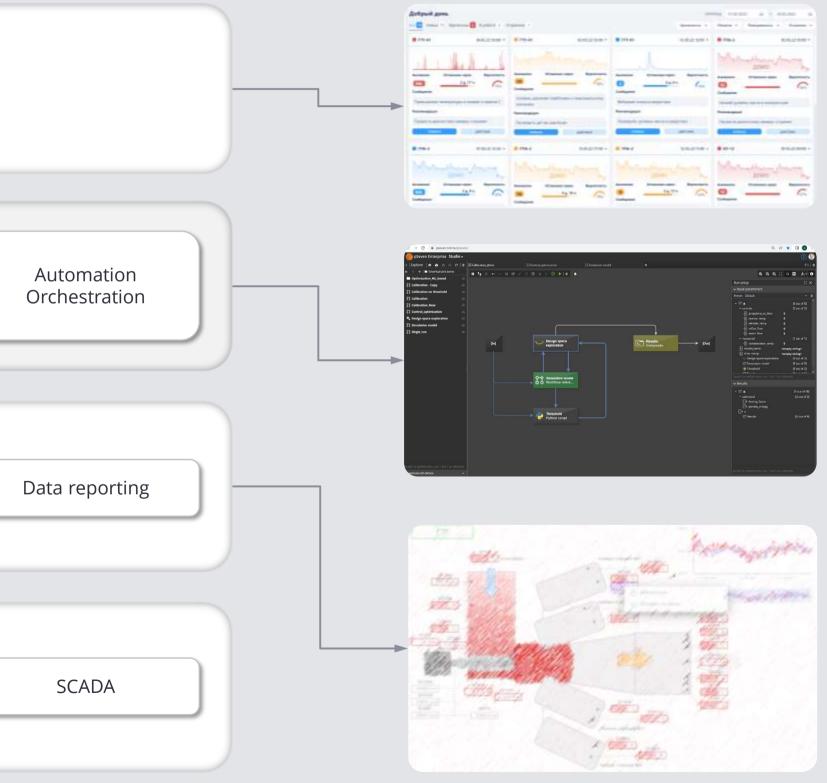
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Typical solution architecture for the Digital Twin

Business	Task management	CASE management	Anomaly diagnostics
applications	Failure prognosis	Optimization scenarios	Digital Twin
Models	Data preprocessing	ML models	Web Apps & services
& processes	Physics-based models	Design optimization	Lifecycle management
Data hub	Data storage	Data model	Data integration
Data sources	ERP	EAM	



Benefits from pSeven Enterprise adoption



Productivity gain

Reduce delivery time through automation of repetitive tasks



Flexibility

Improve flexibility of operations with low-code approach





Better designs

Improve product/process quality with optimization

THANK YOU

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