NRIC-NEI-EPRI Nuclear Quality Assurance Challenges Workshop

Digital Engineering and Digital Twins

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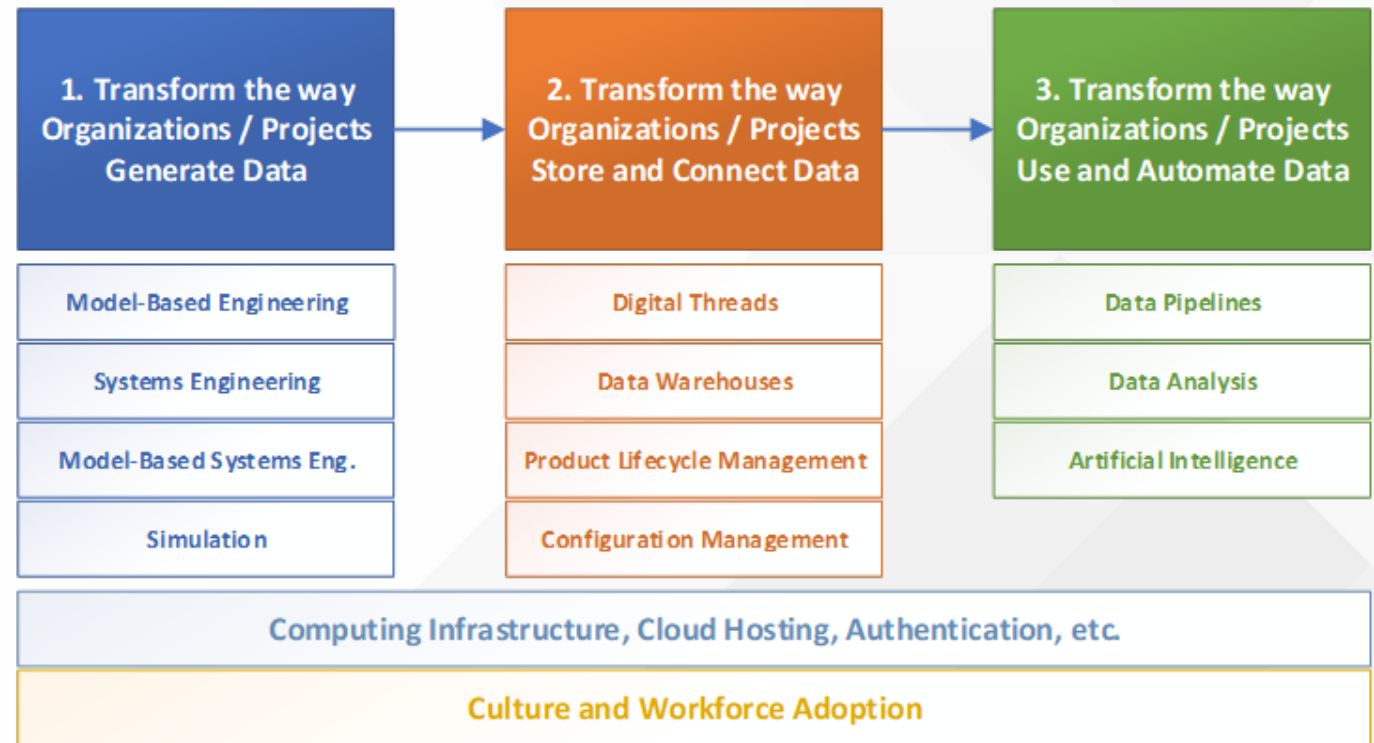
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Digital Engineering Vision

- Transform the way we design and operate energy assets:

- Deliver semi-autonomous design, autonomous operation, and real-time anomaly detection

- Drive research across compute platforms with integrated human centered visualization

- Integrate threads of data, visualizations, AI/ML, and physics models into a cohesive digital twin

1. Transform the way Organizations / Projects Generate Data

- Model-Based Engineering
- Systems Engineering
- Model-Based Systems Eng.
- Simulation

2. Transform the way Organizations / Projects Store and Connect Data

- Digital Threads
- Data Warehouses
- Product Lifecycle Management
- Configuration Management

3. Transform the way Organizations / Projects Use and Automate Data

- Data Pipelines
- Data Analysis
- Artificial Intelligence

Computing Infrastructure, Cloud Hosting, Authentication, etc.

Culture and Workforce Adoption

Digital Engineering

- Digital thread uses systems engineering principles to ensure quality-assured processes are followed.
  - Regulatory and design requirements link to design functions, features, and tests to ensure traceable verification and validation.
  - Configuration management processes enforce design control; automatically track and document all changes. (Do, Check, Approve)
- Project management, design, and analysis are coupled by data, not documents.
  - Break down silos between design teams
  - Everyone uses common configuration (single source of truth)
  - Less tedious and error-prone manual transcription.
  - Faster design iterations for improved design quality.
  - Leverage off-the-shelf software via open data frameworks.

NRIC National Reactor Innovation Center

Digital Twins

- Twins link simulations to physical systems.
- Simulations are progressively created during design and coupled during construction, commissioning, and operations.
- Each stage of development enables verification and validation of underlying assumptions.
  - Progressively indicate correctness
  - Reduce outstanding risks.

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