A New HPC Community Initiative

Simplifying Operation and Use of Infrastructures for Engineering Simulations

The practice of automating processes that run simulations, to dramatically increase engineers' productivity & contribution.

Wolfgang Gentzsch, SimOps

SimOps eBook: https://www.simops.com/post/revolutionizing-engineering-simulation-with-simops

Learning from DevOps: Redefined Software Delivery

DevOps started in 2008, when software development and IT operations raised concerns what they felt was a fatal level of dysfunction in the industry.

DevOps combines software **Dev**elopment and **Op**eration**s** to increase the efficiency, speed, and security of software development and delivery compared to traditional processes, resulting in a competitive advantage for businesses and their customers.

SimOps

SimOps: Redefined Simulation Operations

CHALLENGES:

- **Lack of a common shared perspective among stakeholders**
- **Complex multi-physics interactions across teams & projects**
- **Allocating HPC resources, reducing costs, maintaining performance**
- **Data protection, compliance with regulations, and disaster recovery**
- **Shortage of skilled personnel in HPC and simulation operations**
- **Facilitating cross-functional collaboration, breaking down silos**
- **Inefficient use of resources lead to increased costs**
- **Apps need to scale dynamically based on demand**

PRACTICES:

- Simulations Drive Modern Product Development which Requires Sim-Driven Decision-Making
- Manage, Optimize, and Monitor Costs and Resource and Retain Control of Proprietary Data
- Automated Simulation Workloads on Scaling and Flexible Infrastructure Through Cloud Services
- Achieve Operational Efficiency Using Hybrid-Cloud Practices
- SimOps Promotes Collaboration and Communication Between Engineering and Operations Teams

PEOPLE:

- SimOps Design & Development Engineers & Managers
- IT Specialists
- Decision Makers

TEAMS:

- Integrated SimOps Teams
- SimOps as a Service
- SimOps CoE

IMPACT:

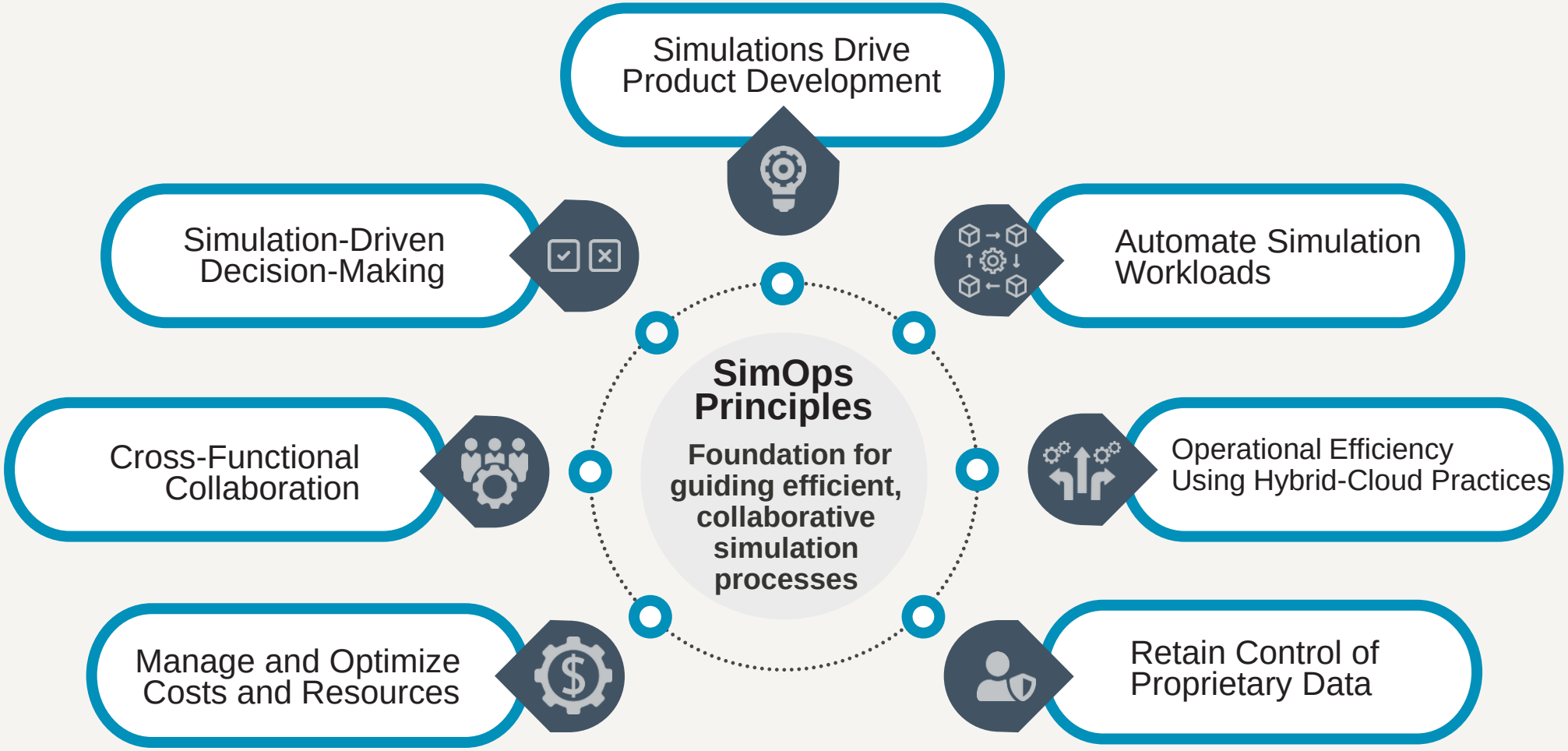
- Breaking Down Silos
- Shift-Left Approach
- Increased Automation
- Continuous Feedback

SimOps

SimOps - Identifying Challenge:

- Lack of a common shared perspective among stakeholders, with ownership often ill-defined.
- Allocating sparse HPC resources and reducing costs while maintaining performance.
- Ensuring data protection, compliance with regulations, and disaster recovery.
- Significant shortage of skilled personnel in HPC and simulation operations.
- Facilitating cross-functional collaboration and breaking down silos across specialized domains (automotive, etc.).

SimOps Principles: A North Star



SimOps Maturity Stages

PROVE

No-compromise engineering experience
Engineers' work patterns are not disrupted

Fully leverage cloud capacity and capabilities
Run simulations much faster and at scale

SCALE

Conforms to Enterprise IT requirements
Leverage IT toolchains, cloud provider, and CSP capabilities

Increase org-wide engineering productivity
Standardized simulation tools and workflows deployed across teams and geographies

OPTIMIZE

Drive cost optimization
Model cost and performance and measure against enterprise KPIs

Make simulation-based decisions
Integrate simulation into up- and downstream processes and run system-level simulations

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SimOps Framework

SimOps is a structured operational framework that integrates cultural practices to automate simulation operations, optimizing the business value of simulation resources. SimOps facilitates timely, data-driven decision-making and promotes operational accountability by enhancing the effectiveness of simulation use.

SimOps

Principles

- Simulations Drive Modern Product Development
- Require Simulation-Driven Decision-Making
- Cross-Functional Collaboration is a Must
- Automate Simulation Workflows
- Achieve Operational Efficiency Using Hybrid-Cloud Practices
- Retain Control of Proprietary Data
- Manage and Optimize Costs and Resources

Domains

Simulation Workflow Automation

- Workflow Orchestration and Automation
- Self-Service Simulation Management
- Design and Model Validation Tools
- Digital Twin Integration
- Job Management
- Integration with PLM and CAD Tools
- Resource and Infrastructure Optimization
- Predictive Maintenance Modeling
- Enhanced Simulation Scope: System-Level Simulation

Data Management

- Data Collection and Storage
- Data Integration and Management
- Data Quality and Integrity Assurance
- Data Preparation and Preprocessing
- Real-Time Simulation and Feedback Loops
- Post-Simulation Data Processing

Compliance, Security, and Risk

- Compliance and Risk Management
- Data Security and Access Management
- Disaster Recovery and Business Continuity Planning

Reporting, Analytics, and Insights

- Advanced Reporting and Analytics
- Simulation Dashboards and Visualization Tools
- Machine Learning and AI Integration for Predictive Insights
- User Experience Monitoring
- Interdisciplinary Collaboration and Concurrent Engineering
- Scenario Management
- Advanced Simulation Objectives: Shift from Verification to Optimization

SimOps Core

- Governance and Policy Management
- SimOps Practice Operations
- SimOps Tools and Services
- SimOps Practice Assessment
- License Management
- SimOps Onboarding
- SimOps Education and Enablement
- Sustainability in Simulation Operations

Stakeholders

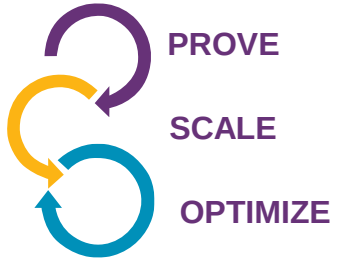
Core

- R&D Engineer
- Simulation Engineer
- Systems Engineer
- Product Owner
- Data Scientist
- Quality Assurance

Allied

- IT Operations
- Finance
- Procurement
- Product Support
- Leadership
- Business Operations

Maturity



More Framework Details: https://shorturl.at/qCFfG

Next Steps: Community Building

- Join SimOps Non-profit Organization
- Pass SimOps Trainings and Certifications
- Embrace Development of Best Practices
- Become a SimOps Advocate
- Join as a Charter or Advisory Community Member

SimOps

Sources and References

- **McKinsey Report** "Unveiling the Next Frontier of Engineering Simulation." 2023.
- **Intersect360 Research White Paper** "SimOps: Automating Engineering Innovation Across Today's Tools." May 2024.
- **SimOps eBook** "Revolutionizing Engineering Simulation with SimOps. An Introduction to Simulation Operations Automation. September 2024.
- **SimOps Framework White Paper** "Optimizing Simulation Operations with the SimOps Framework: A Comprehensive Guide to Automation and Efficiency." September 2024.

Thank You

SimOps

SimOps: Benchmarking Performance

CAPABILITY	SIMOPS LOW PERFORMING	SIMOPS HIGH PERFORMING
Replicate internal engineering experience in the cloud	› Engineering work patterns are disrupted › New tools and UI's required to operate › Cannot leverage proprietary IP & codes	› Engineers work patterns are replicated as is › Run existing CAE workflows and applications › No learning curves to overcome
Exploit cloud scale and capabilities	› Struggle to perform simulation at cloud scale › Continue to rely on on-prem tools & infrastructure › No performance gain, even for 1 workload	› Simulations at scale with infinite on-demand resources › Run simulation jobs in parallel › Cloud resource orchestration & automation built-in
Integrate enterprise-wide tools	› Limited ability to integrate apps, tools, services across IT infrastructure and assets › Requires manual coordination & unfamiliar tools › Often limited by existing vendor capabilities	› Integrate sim environment with enterprise-wide IT tooling › SimOps operations meet security & compliance requirements › Native deployment provides full extensibility & integration
Org-wide deployment	› Difficulty supporting multiple teams, workflows, geos › No central app/workflow catalog to streamline processes › Limited collaboration abilities	› Support teams using unified cloud environments › Well-maintained catalog enables easy discovery, access, and license management › Easy cross-team and org-wide collaboration
Workload & cost optimization	› Lack of tools to define and track perf indicators › Manual cost analysis and economic modelling › Limited ability to optimize cost & performance	› Real-time visibility into performance and cost KPIs › Ongoing economic modeling to increase overall ROI › Seamless resource and workload optimization

SimOps

Assessing Relevance of SimOps

01	How often do you encounter challenges in managing the complexity of simulations?
02	Are you currently experiencing resource management issues with HPC resources?
03	Do you face difficulties ensuring data integrity and security in your simulation operations?
04	How effective is cross-functional collaboration within your teams?
05	Do skill and knowledge gaps hinder your simulation operations?
06	Are stakeholder roles and responsibilities clearly defined in your simulation projects?

SimOps

Related Engineering Simulation Organizations

NAFEMS - Facilitate unbiased worldwide **communication and collaboration** between industries, academia, and government organizations for the advancement of best practice in multidisciplinary **engineering simulation** expertise. https://www.nafems.org/

ASSESS - Analysis, Simulation & Systems Engineering Software Strategies. vastly increase the availability and utility of **Engineering Simulation**, leading to significantly increased business benefits across the full spectrum of industries, applications and users. https://www.nafems.org/community/assess/

Revolution in Simulation - Rev-Sim is a resource and community platform educating, innovating and collaborating for the **Democratization of engineering simulations**. https://revolutioninsimulation.org/

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