G2 OPS, INC.

GOLD STANDARD METHODOLOGY™ (GSM™)

Framework, Ecosystem, and Approach

Executive Summary

The G2 Ops Inc. (G2 Ops) Gold Standard Methodology™ (GSM™) offers a thorough approach to Model-Based Systems Engineering (MBSE) solutions. The GSM™ stands as the culmination of engineering experience, efficiency-driven innovation, quality-minded processes, and the desire to provide automated, accelerated, and advanced engineering development for customers. It marries 'best of breed' MBSE practices, evolving automation techniques, and efficient modeling activities, streamlining the engineering lifecycle in a way that prioritizes efficiency, accuracy, and completeness.

The GSM™ Framework provides the MBSE schema necessary to tailor digital solutions directly to the customer, and the GSM™ Ecosystem is comprised of unique software applications, reports, plugins, and analytical tools intended for use across a variety of projects and use cases. The high-level GSM™ Approach is focused on meeting unique customer practices and concerns; its inherent flexibility grants G2 Ops' engineers multiple paths to meeting various customer needs, expectations, and implementations while yielding effective, consistent, and repeatable results.

Introduction

At the heart of the GSM™ is MBSE – a systems engineering methodology using the creation and exploitation of digital domain models as the primary means of information exchange between engineers (rather than document-based exchange).

The International Council on Systems Engineering (INCOSE) defines MBSE as "the formalized application of modeling to support system requirements, design, analysis, and verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases. MBSE is part of a long-term trend toward model-centric approaches adopted by other engineering disciplines, including mechanical, electrical and software. In particular, MBSE is expected to replace the document-centric approach that has been practiced by systems engineers in the past and to influence the future practice of systems engineering by being fully integrated into the definition of systems engineering processes." [1] Further, the Object Management Group (OMG) and the INCOSE have endeavored to standardize certain aspects of MBSE, most notably using the Systems Modeling Language (SysML).

G2 Ops' engineers have built the GSM™ over the foundation of both MBSE and SysML through several means, including a deep understanding of SysML and related modeling tools, ongoing engagement with industry best practices and involvement in industry groups, and lessons learned from over 10 years of experience implementing MBSE across diverse engineering design and integration projects.

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[1] https://www.omgwiki.org/MBSE/doku.php

G2 Ops' engineers developed the GSM™ to include the following three elements:

- **The GSM™ Framework:** an MBSE schema offering tailored implementations to address unique customer challenges
- **The GSM™ Ecosystem:** a set of MBSE-based capabilities that leverage the GSM™ Framework's schema, data, and implementations and includes:
  - MBSE reports that provide custom model outputs to customers
  - MBSE plugins that accelerate model development timelines
  - MBSE applications that increase the level of analysis capable of being implemented on MBSE models and reduce impact assessment timelines
  - All elements of the GSM include documentation for how to use the GSM™ schema, its approaches, and the associated GSM™ Ecosystem capabilities
- **The GSM™ Approach:** a customer-focused approach to integrate MBSE and applicable GSM™ capabilities into customer processes and environments, as well as provide customer-focused training to ensure the long-term success of MBSE with the customer's team
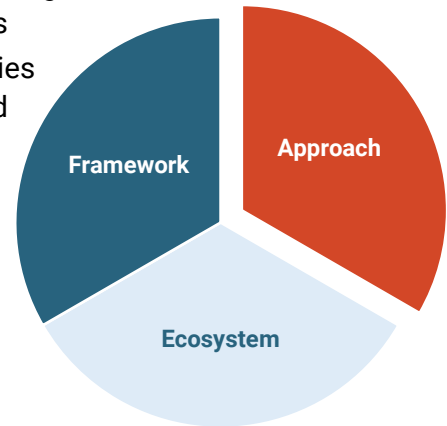
This combination results in a comprehensive collection of mature engineering automation use cases for every step in the development lifecycle, reducing the time needed to manually compile and ingest data and significantly reducing the number of labor hours necessary to complete tasks.

The GSM™ Framework

The GSM™ Framework provides the foundation for its MBSE-based solutions, and at its heart lies the GSM™ schema. The GSM™ schema is a comprehensive set of model structures, relationships, and data elements. These characteristics and their relationships build upon SysML base classes with a custom set of stereotypes and data Elements to establish a consistent resource for modeling and facilitate clarity and consistency throughout the project.

In addition to these foundational components, the GSM™ Framework includes a standard set of customizations to diagrams and the modeling environment itself, designed to streamline the customer's usage of MBSE and ultimately make it more efficient and user-friendly. Tailoring the modeling environment to the specific requirements of each project enhances the usability and accessibility of the GSM's™ MBSE tools and methodologies.

The GSM™ Framework also includes specialized approaches to implement federated MBSE models. This allows for the integration of multiple, interconnected models, which can be particularly valuable for complex systems.

Finally, the GSM™ Framework includes MBSE implementation approaches tailored to address specific customer challenges; this customization ensures that the framework aligns closely with the customer's unique needs and objectives. These can include capturing cybersecurity data within the framework, ensuring that security considerations are seamlessly integrated into the system design, and implementing detailed engineering analyses, such as reliability analysis, directly within the MBSE model. This holistic approach enables engineers to perform in-depth assessments and optimizations, contributing to the overall robustness and effectiveness of the engineering design and integration efforts.
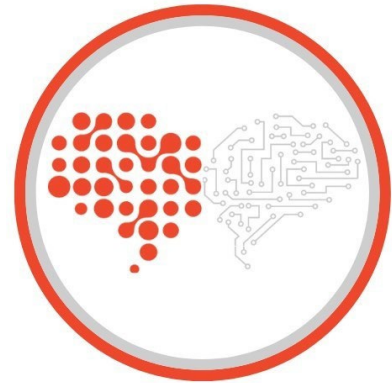
The GSM™ Ecosystem

The GSM™ Ecosystem encompasses a set of interconnected elements that enhance MBSE and other digital engineering efforts, offering comprehensive solutions for engineering projects. The GSM™ Ecosystem consists of MBSE reports, plugins, and applications.

- **MBSE reports** deliver custom outputs to customers and enable the efficient extraction of model data into standardized engineering documentation. This capability not only streamlines stakeholder engagement, but also improves information sharing. By providing customers with clear and structured documentation, the GSM™ Ecosystem reports enhance communication and ensure that all project stakeholders have access to the critical data they need, ultimately contributing to more effective decision-making and collaboration.

- **MBSE plugins** play a pivotal role in expediting model development timelines. By reducing the time required for both building out and developing models, they effectively lower the number of barriers to implementing MBSE and digital engineering methodologies. These tools enhance efficiency by automating various aspects of model creation and modification, enabling engineers to focus their efforts on higher-level tasks and design considerations. This, in turn, accelerates the overall project timeline, contributing to faster project delivery and reduced costs.

- **MBSE applications** serve to analyze, interpret, and report on data through comprehensive and user-friendly views and interfaces. These tools live within the GSM™ Ecosystem to provide continuous analysis and improvement, as well as ensure projects and customers engage in regulatory compliance with critical industry standards such as the National Institute of Standards and Technology (NIST) Risk Management Framework (RMF). Unique GSM™ software applications can also be developed to answer specific customer concerns when the need arises.

  One such example is **Monarch**, a G2 Ops-developed application that supports regulatory compliance with the NIST RMF. Monarch leverages existing MBSE model data and auto-generates required RMF artifacts like Authorization Boundary Diagrams (ABDs), Ports, Protocols, and Services Management (PPSM) registration reports, HW/SW lists, security control and data management artifacts, and more. By generating these items from existing engineering data, leveraging Monarch helps programs reduce overall RMF accreditation timelines.

The MBSE applications introduced by the GSM™ Ecosystem significantly elevate the level of cybersecurity and engineering analysis conducted within engineering projects. By harnessing the power of data-driven insights, engineers can perform in-depth assessments and optimizations that were previously challenging or time-consuming. This enhanced analytical capability not only improves the robustness and quality of engineering solutions but also ensures that critical cybersecurity considerations are seamlessly integrated into the system design.

Monarch

The GSM™ Ecosystem is a comprehensive framework that enhances MBSE and digital engineering endeavors by offering custom MBSE reports for improved documentation, MBSE plugins for accelerated model development, and MBSE applications for advanced engineering analysis and cybersecurity support. Together, these elements form a powerful toolkit that streamlines engineering processes, fosters collaboration, and enables more informed decision-making in complex engineering projects.
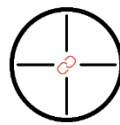
SOFIA

IRIS

M-RAMPS

ECR/TAS

ARIE

SEADES

Additional G2 Ops-Developed MBSE Applications

The GSM™ Approach

At its core, the GSM™ is the recognition of the unique nature of each customer's domain, processes, environment, and challenges. While there are consistencies in MBSE implementations, the methodology embraces a customer-centered approach. It acknowledges that one size does not fit all and encourages customization and adaptation. This approach allows teams to take the foundational MBSE, GSM™ Framework, and GSM™ Ecosystem capabilities and integrate them into their specific processes and environments. By tailoring these resources to solve customer-specific problems, the methodology empowers organizations to effectively address their unique engineering challenges. This flexibility ensures that the benefits of MBSE and GSM™ are maximized across a wide range of industries and projects.

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Moreover, the GSM™ places a strong emphasis on customer-focused training. Recognizing that long-term success with MBSE hinges on the proficiency of the customer's team, the GSM™ provides comprehensive training programs and resources. These training initiatives are designed to equip team members with the necessary skills and knowledge to utilize MBSE and GSM™ tools effectively. By investing in training, the methodology ensures that organizations can sustain their MBSE practices, adapt to evolving needs, and continuously derive value from the GSM™ framework.

Conclusion

G2 Ops' GSM™ combines the benefits and disciplines of MBSE, OMG, and INCOSE standards, 'best of breed' model development practices, products and applications, and evolving automation techniques. Through its Framework, Ecosystem, and Approach, the GSM™ provides the foundation, assets, and consideration necessary to provide efficient and repeatable model development activities that streamline the engineering lifecycle while focusing on quality, efficiency, and the bespoke needs of the customer.

G2 Ops leverages a decade of experience integrating Systems, Cybersecurity, and Software Engineering techniques to provide solutions to a growing list of Government and private customers. G2 Ops combines cutting edge tools with innovative engineering practices, data analytics, and risk algorithms that enhance visibility into complex infrastructures, optimizing resiliency in system design and operations.

G2 Ops is a woman-owned small business led by an executive staff known for providing cutting-edge solutions to solve our nation's most complex engineering challenges. G2 Ops has been named to the Inc. 5000 list of America's fastest growing companies each of the last 6 years (2018-2023) and has locations in Arlington, VA, Virginia Beach, VA, and San Diego, CA.