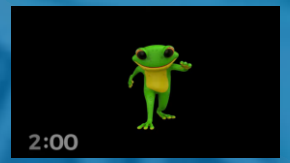
GARI SESSIONS



Let's start in a moment

You can use the chat for Q&A

Discover the potential of Software Engine

Jorge Lopes
Software Engine
Product Manager

Deepti Dua
Software Engine
Service Manager

José Félix
Software Engine
Product Owner

Santosh Kumar
Software Engine
Solution Architect

Capgemini engineering

1. Software Engine Overview
2. Integrated SW specifications and end-2-end execution
3. Scale agile to large projects / solutions
4. Start using DevSecOps from day 1
5. Address high-integrity software needs
6. Integrate Gen AI for Software
7. Wrap-up

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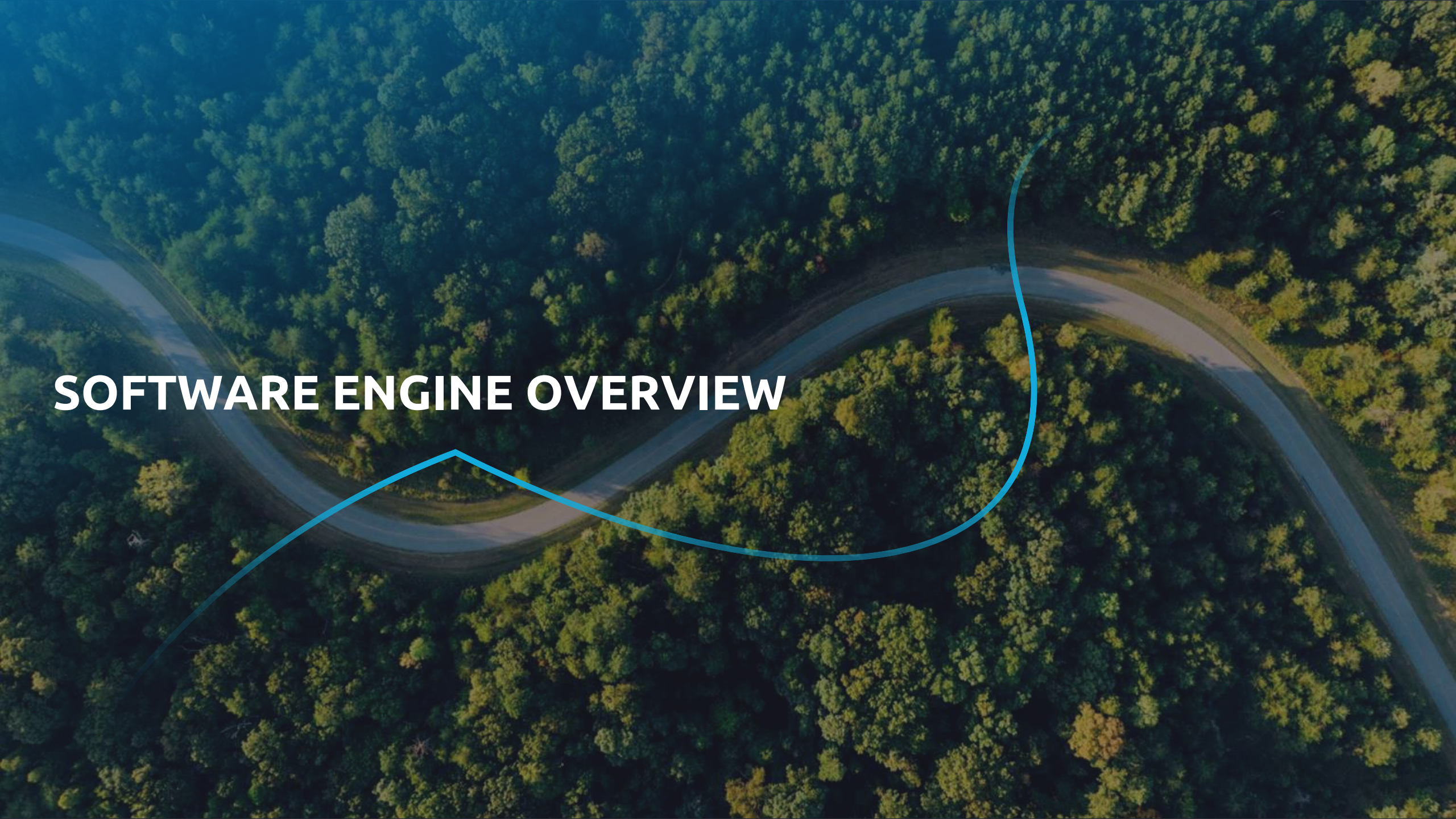
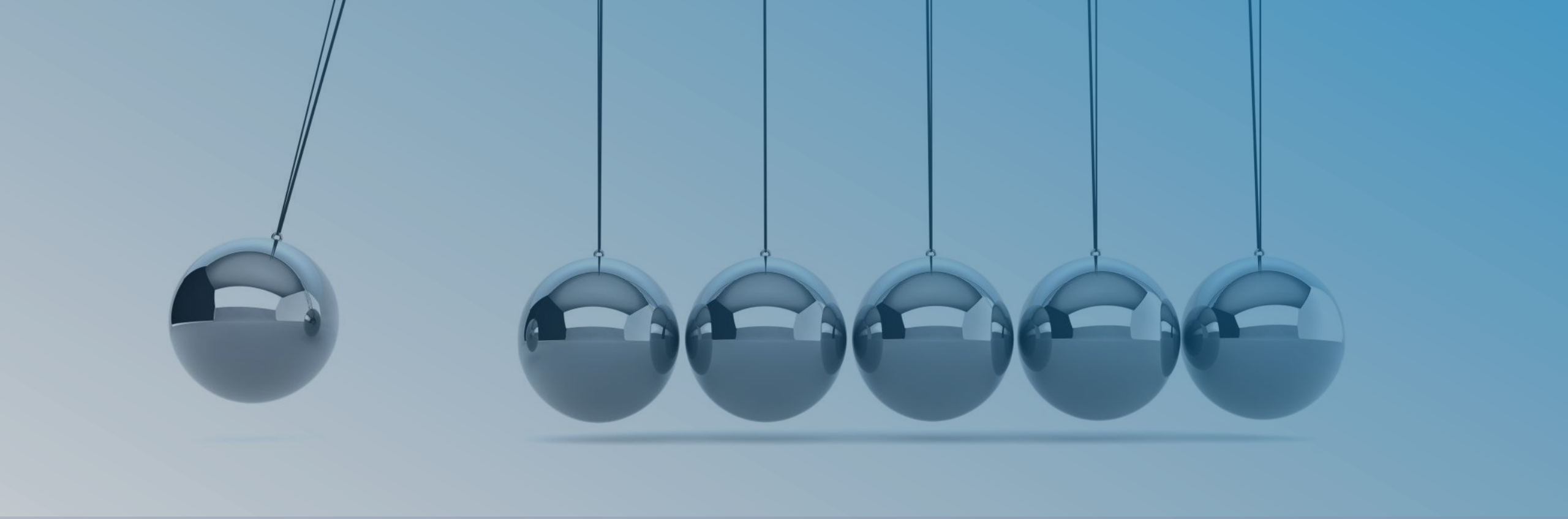


SOFTWARE ENGINE OVERVIEW



Only 30% of software projects succeed

There is considerable room for improvement

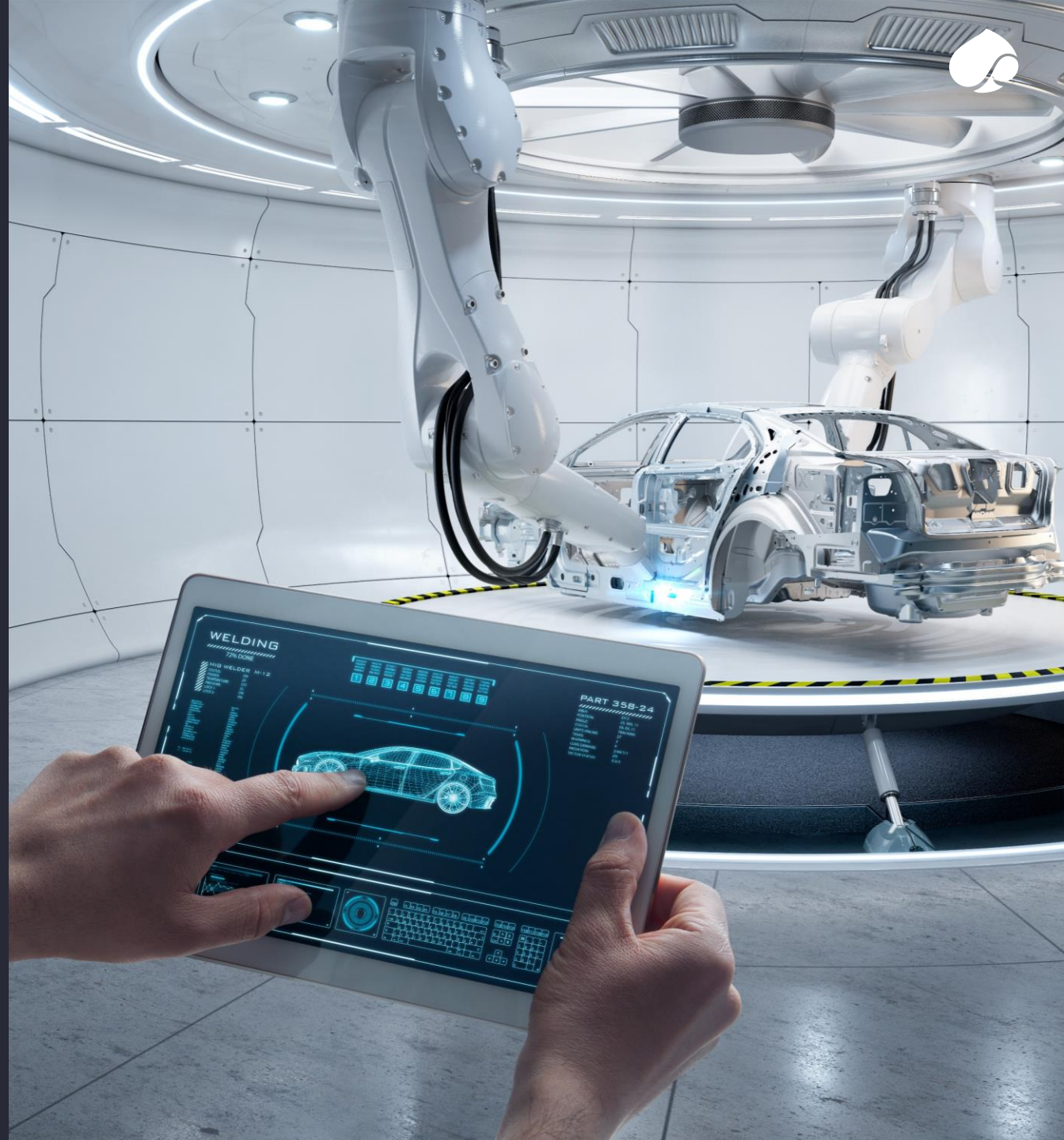
Major reasons to fail:

- Lack of clear goals (37%)
- Inadequate stakeholder engagement (25%)
- Ineffective risk management (23%)
- Poor communication (21%)

source

Some of the challenges

- Integrated SW Specifications and end-2-end execution
- Scale agile to large projects / solutions
- Using DevSecOps from day one
- Address the need of high-integrity software
- Integrate Gen AI for Software



What is the solution

Software ENGINE

End-to-end delivery platform for Capgemini Software Projects

Processes, Scope, Design

- Engineering Management
- Scope Management
- Software Design

ASPICE®, ISO 26262, ISO 13485 SaMD, ISO 27000, DO-178C

DevSecOps platform

Code	Build	Unit Tests
SAST	Test	Pack
Deploy	DAST	Repos

Platform as a Service

- Cloud
- On-prem
- Support

What do you get

BENEFITS

- ✓ Industrialized Quality (e.g. common processes, templates, trainings, etc.)
- ✓ Data management policies
- ✓ Can be used in regulated and non-regulated projects

15% **QUALITY IMPROVEMENT**

IMPACT

- ✓ Default (but customizable) templates for the CI/CD pipelines
- ✓ High Availability and Disaster Recovery ready
- ✓ High standard of service availability

40% **DEVSECOPS MATURITY IMPROVEMENT**

REALIZATIONS

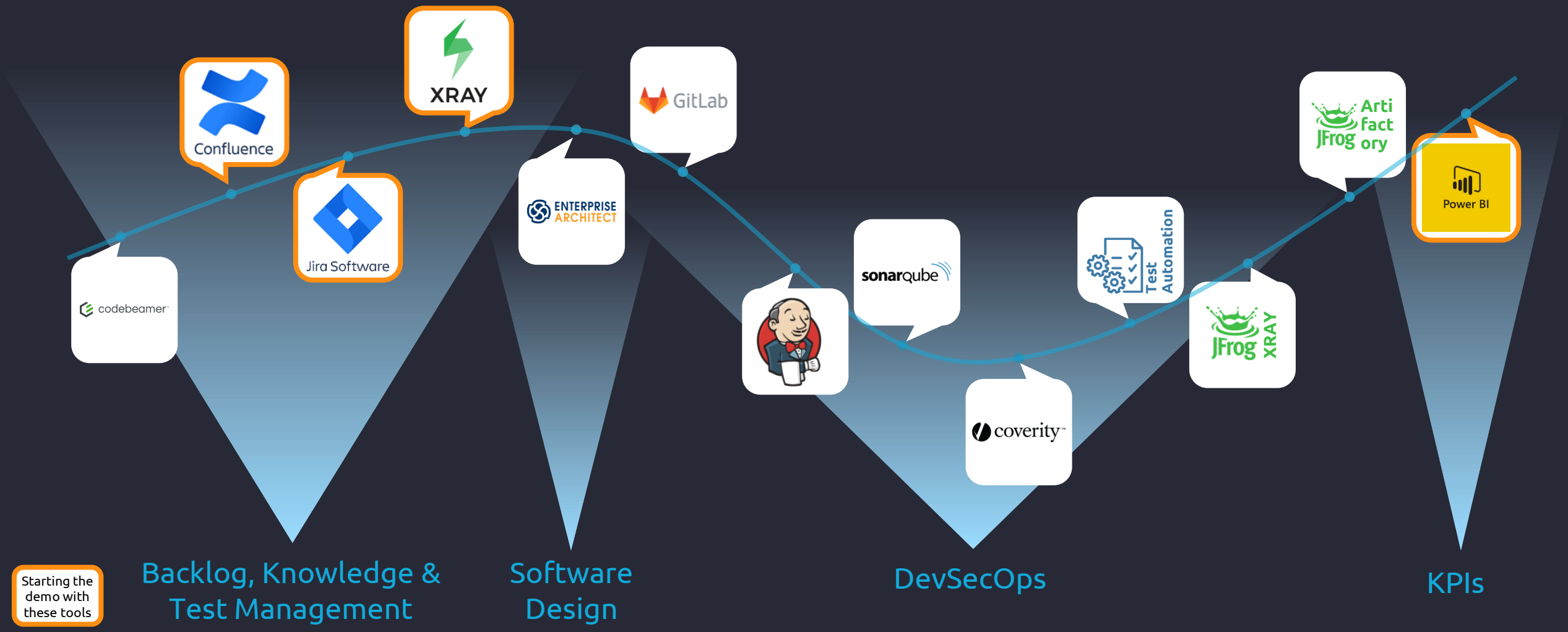
- ✓ Benefit from the maturity provided by SW Engine
- ✓ Engineering dashboards and KPIs
- ✓ Well-defined SLAs & commitments

8% to 12% **PRODUCTIVITY IMPROVEMENT**

INTEGRATED SW SPECIFICATIONS AND END-2-END EXECUTION

Integrated SW specifications and end-2-end execution

Software Engineering Process as base for Tools configuration



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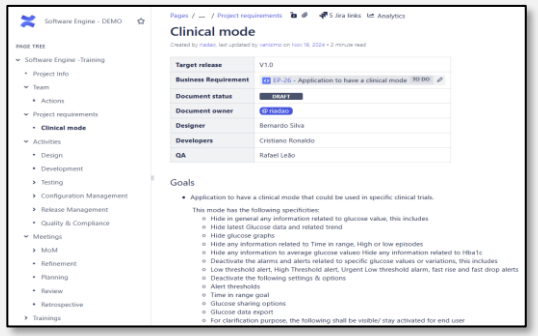
Integrated SW specifications and end-2-end execution

Software Engineering Process as base for Tools configuration

Confluence

Business Requirements

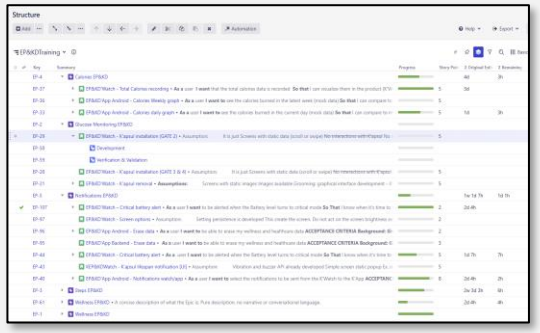


MoM

Jira

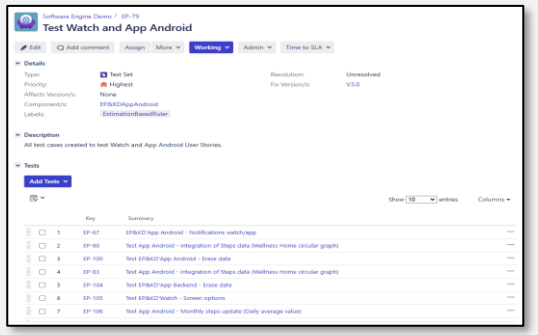
User Story

Structure



X-Ray

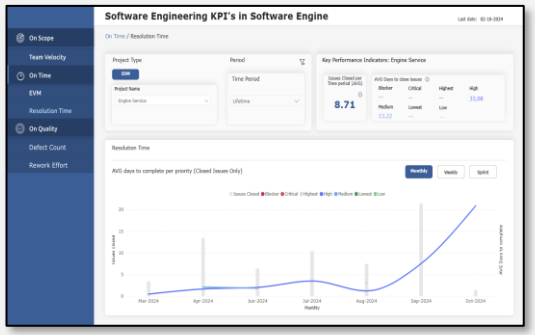
Test Set



Test

PowerBI

Engineering KPI's



Group KPI's

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SCALE AGILE TO LARGE PROJECTS / SOLUTIONS

Scaling Agile development

Software Engine supports the adoption of the Scaled Agile Framework (SAFe)

	Scrum	SAFe
Scope and Scalability	**1 team** Small, self-organizing teams (typically 5-9 people) with its own backlog	**Multiple teams** Large projects, scaling across teams or even organizations, with a more complex backlog
Planning and Coordination	**Sprints** Teams planning and working independently in sprints	**PIs (Planning Intervals)** Includes several sprints involving multiple teams
Structure and Roles	**3 main roles** Product Owner, Scrum Master and Dev team	**Several additional roles** RTE, Product Management, Solution Train Engineer, etc

Software Engine tools for SAFe

BigPicture
(JIRA plugin)

Tailored for managing multi-team agile programs according to the SAFe framework

Jira

Tailored for managing single-team agile projects according to the Scrum or Kanban methodologies

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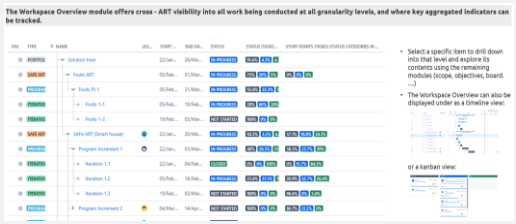
BigPicture plugin for Jira

BigPicture provides a set of modules that extend Jira's functionalities to support SAFe (and more…)

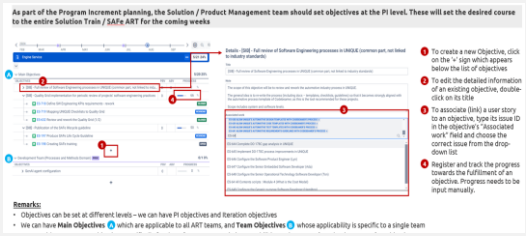
BigPicture modules

Overview - High-level view of the entire portfolio of projects



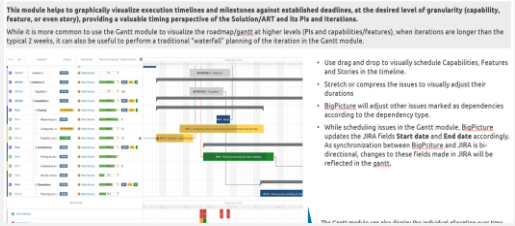
Scope – Backlog management / work breakdown structure

Objectives - High-level overview of strategic goals and objectives

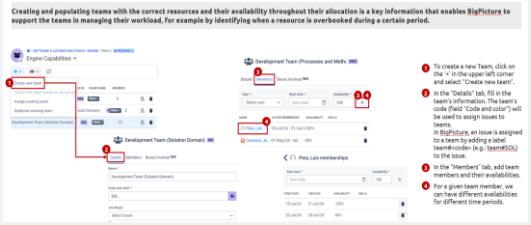


Board – Iteration planning and monitoring spanning multiple teams

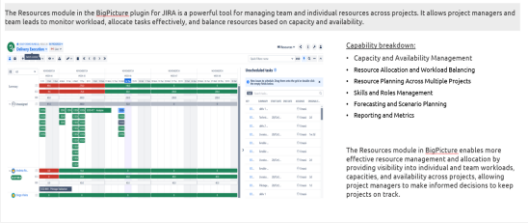
Gantt – Visual representation of project timelines



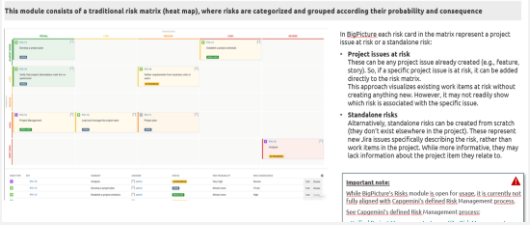
Teams – Manage and organize project teams



Resources – Manage and monitor resource allocation



Risk – Identify and manage project risk



Risk Management Plus plugin for JIRA is also available with Hazard Analysis (ISO 14971) and FMEA (IEC 60812) templates for safety-critical projects

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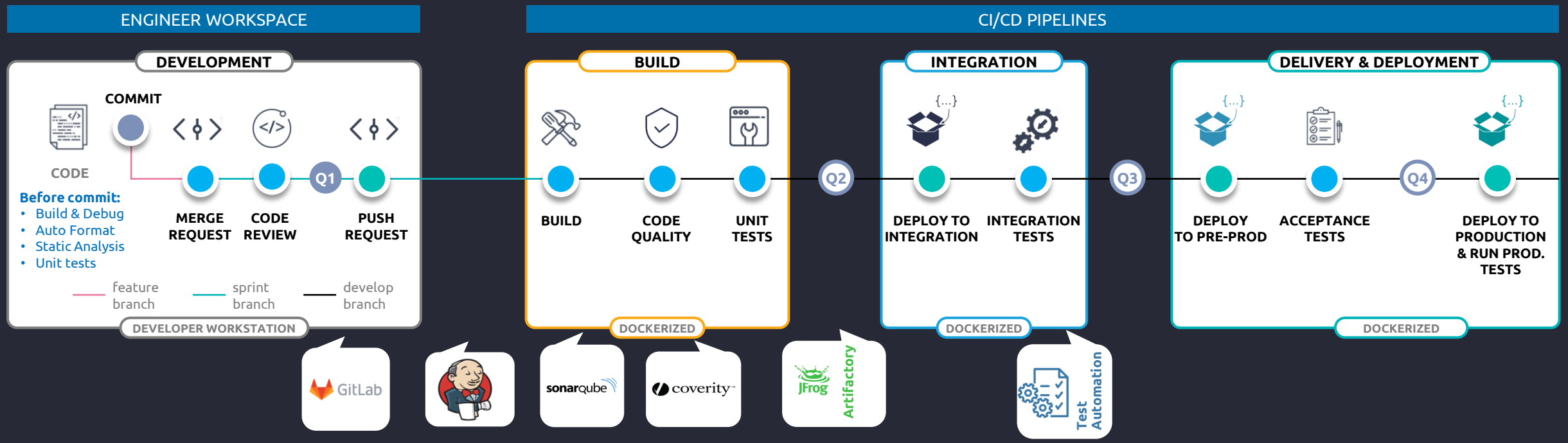
START USING DEVSECOPS FROM DAY 1

Continuous Integration / Testing / Delivery

Leverage on default CI/CD templates to have DevSecops from project day 1



Code and bin repos | Multiple stages | Dockerized | Branching strategy | Templates | Distributed pipelines | SAST & DAST | Test Automation

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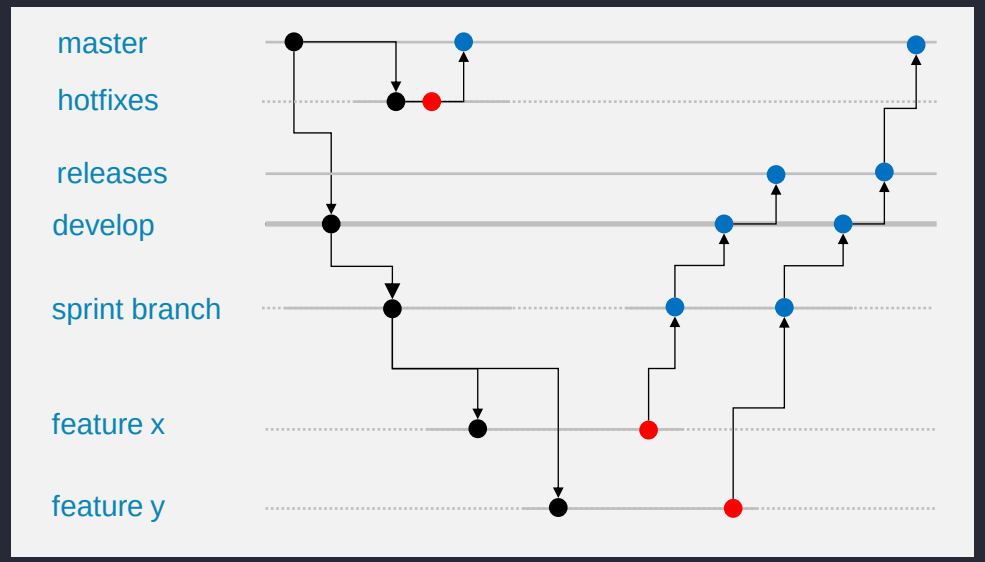
CI/CD details

Branching strategy



CI/CD pipelines can be

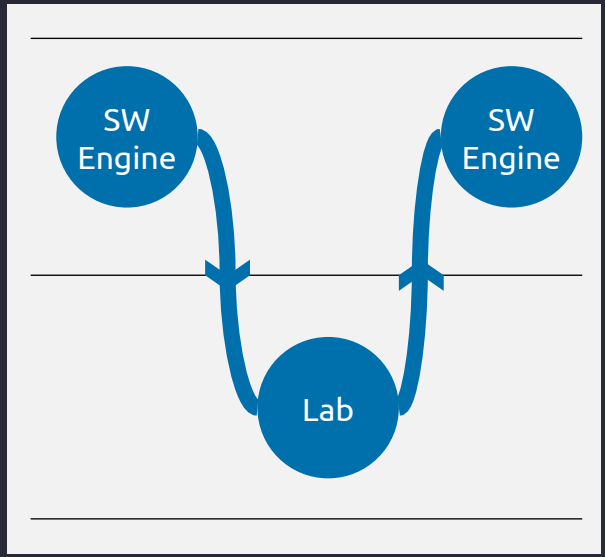
- different from branch from branch (e.g. a pipeline for coding & another one for integration)
- started in different moments (e.g. on commit, to have quick results, or nightly builds)

Templates

Stage	Customization
BUILD	command(s)
SAST / DAST	command(s)
TESTS	command(s)
STORE	command(s)
NEXT STEP	command(s)

Staged CI/CD enables having default templates with high level do customization.

Distributed CI/CD



Parts of the CI/CD pipelines can be delegated (e.g. HiL testing)

● **CODE REVIEW** - before merging to Sprint Branch or after hotfixes

● **TESTS** - before merging to different branches

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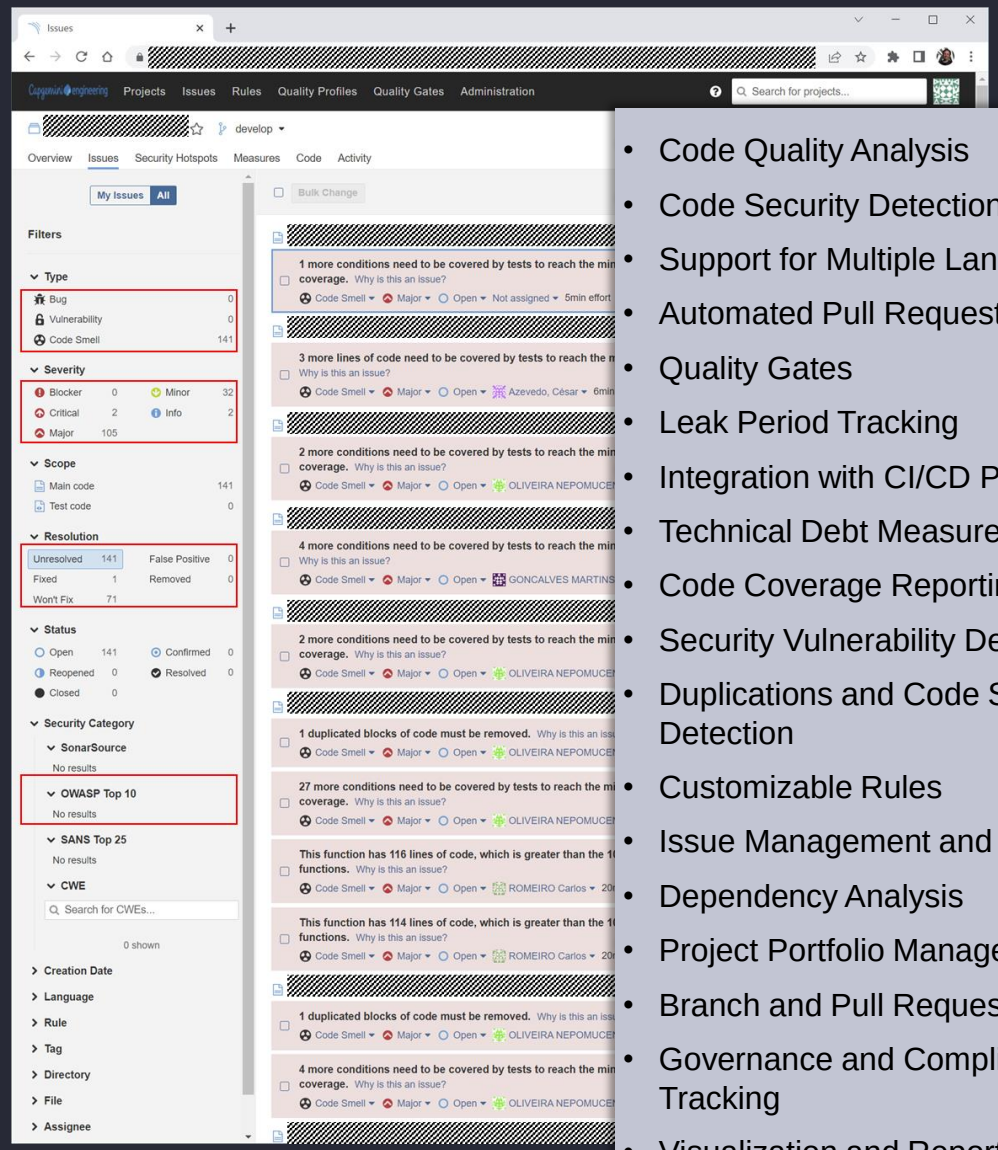
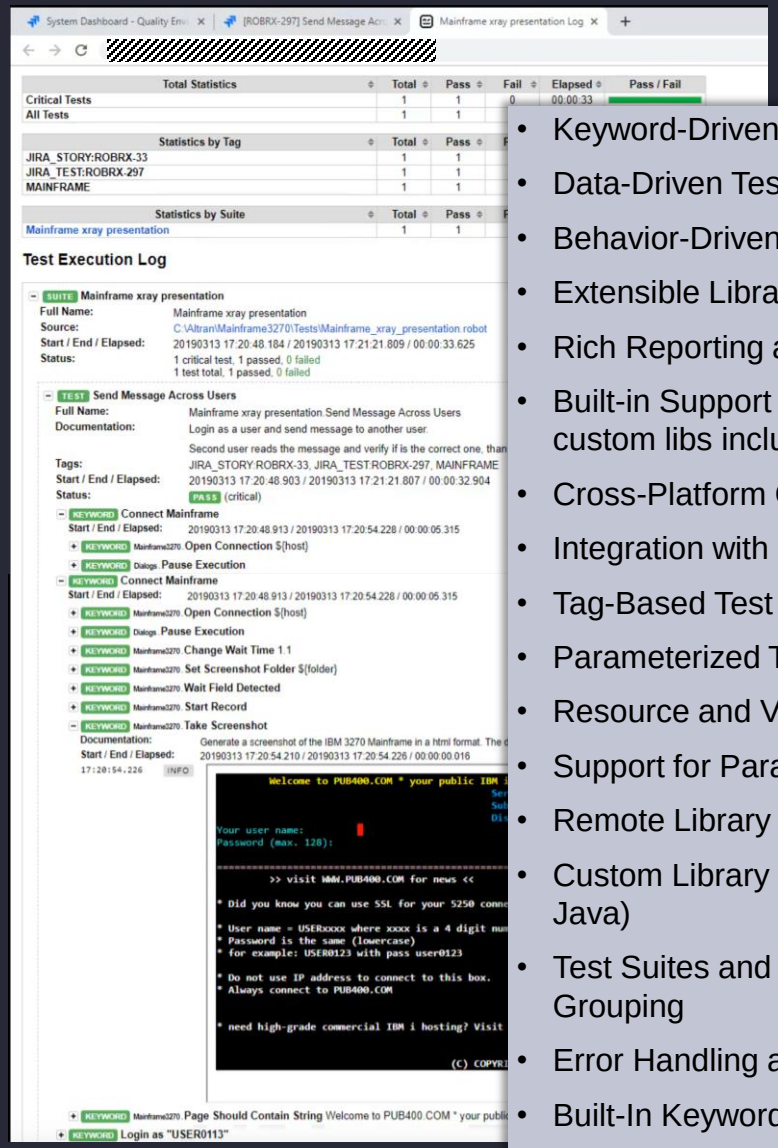
Code quality and test automation

SonarQUBE & Coverity (certified tool)



- Code Quality Analysis
- Code Security Detection
- Support for Multiple Languages
- Automated Pull Request Analysis
- Quality Gates
- Leak Period Tracking
- Integration with CI/CD Pipelines
- Technical Debt Measurement
- Code Coverage Reporting
- Security Vulnerability Detection
- Duplications and Code Smells Detection
- Customizable Rules
- Issue Management and Tracking
- Dependency Analysis
- Project Portfolio Management
- Branch and Pull Request Analysis
- Governance and Compliance Tracking
- Visualization and Reporting

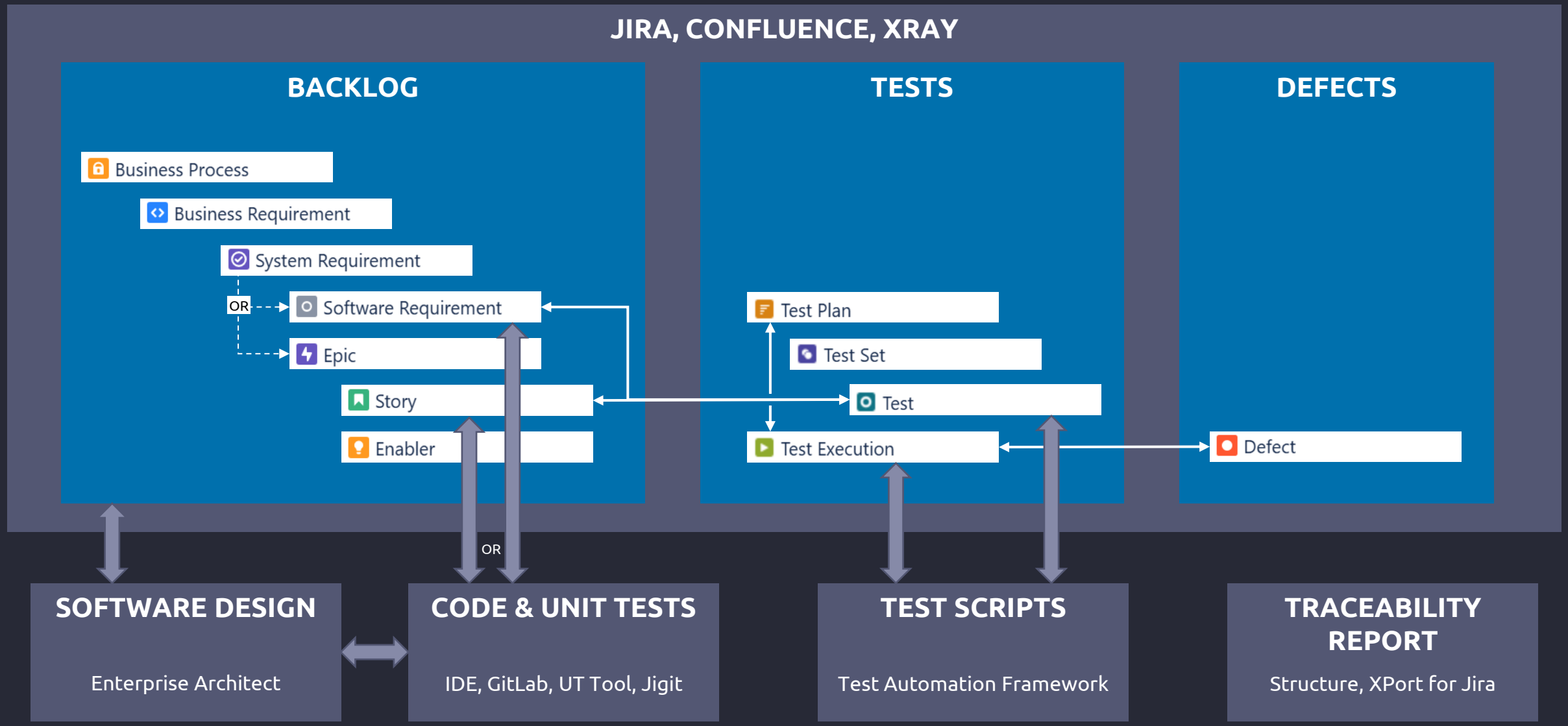
Test automation framework integrated in SW Engine



- Keyword-Driven Testing
- Data-Driven Testing
- Behavior-Driven Testing (BDD)
- Extensible Libraries
- Rich Reporting and Logs
- Built-in Support for Selenium & custom libs included
- Cross-Platform Compatibility
- Integration with SW Engine CI/CD
- Tag-Based Test Selection
- Parameterized Test Cases
- Resource and Variable Files
- Support for Parallel Test Execution
- Remote Library Interface
- Custom Library Support (Python, Java)
- Test Suites and Test Cases Grouping
- Error Handling and Recovery
- Built-In Keywords
- Detailed Logging Mechanism

ADDRESS HIGH-INTEGRITY SOFTWARE NEEDS

End-to-end bidirectional traceability implemented in the tools



Learn more: see IDM Guideline. See also WUD and Test Guidelines.

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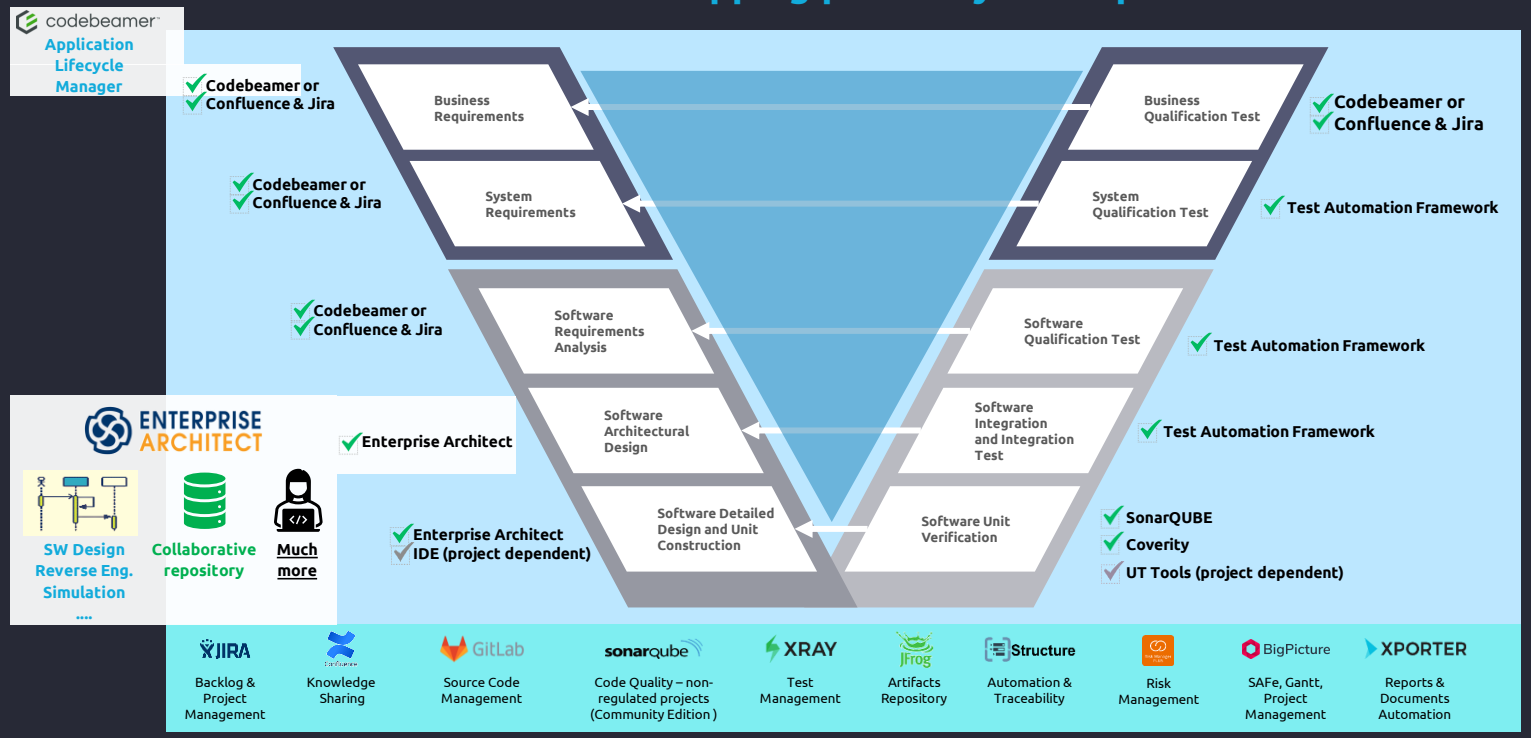
Interconnected tools aligned with the SW Engineering Process

Tools mapping per lifecycle step



Interconnected tools

	Codebeamer	Gitlab	Jenkins	SonarQube	Jira	Coverity	Enterprise Architect	Xray
Codebeamer	N/A	Yes	Yes		Yes			
Gitlab	Yes	N/A	Yes		Yes			
Jenkins	Yes	Yes	N/A	Yes		Yes		
SonarQube			Yes	N/A	Yes			
Jira	Yes	Yes		Yes	N/A		Yes	Yes
Coverity			Yes			N/A		
Enterprise Architect					Yes		N/A	
Xray					Yes			N/A

Additionally:

- **Jira** is integrated with: Confluence, BigPicture, XPorter, Structure.
- **JFrog** is integrated with all tools producing binary artifacts.
- **Codebeamer** integrates with: DOORS, GitHub, Microsoft Word, Microsoft Excel, Microsoft Project, CSV file in Microsoft Excel Style.

Codebeamer – when industry compliance is required

Application Lifecycle Manager: Manages and generates the artifacts required for the certification.

ALM, incl. HW, System, SW, etc.

Requirements & baselines

Kanban

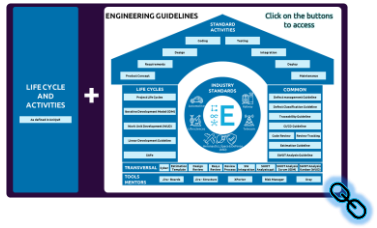
Test coverage

Traceability browser

Processes, Templates, Guidelines

The Software Engineering Process is composed of **three major blocks**:

1. **UniQuE Life Cycles** - access UniQuE here
2. **Industry Standards** (such as templates, checklists, guidelines, and industry-specific processes or activities) - access UniQuE here
3. **Engineering Guidelines** - access the guidelines in the diagram to the right.



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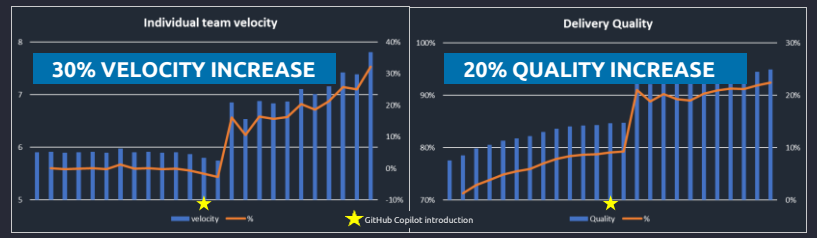
INTEGRATE GEN AI FOR SOFTWARE

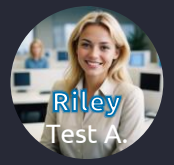
Deploying AI at scale across our Software Engineering practice to drive delivery productivity & competitiveness

Impact of GitHub Copilot: boost of velocity and quality

Schneider Electric



+3pp CM INCREASE



Generative Engine helping on the day-to-day activities

«[Lyn] is a perfect assistant for elaborating requirements, use cases, and discuss with me pro and cons of architectural decisions. (...) [Work is taking] hours instead of days. »
Fabrizio Valentini

Assets used in solutioning bring big competitiveness improvements

Mercedes deal won, with 15% productivity considered for a deal of 50+M€. Other deals ongoing (Renault, Nokia, etc.).

We augmented our Software Product Engineering services with AI to enhance quality, velocity & efficiency for our clients

Upskilled engineers' workforce for productive & secure use of AI

ER&D SW Engineers trained:
- Compliance: 8315
- GH Copilot fundamentals: 10274
- GH Copilot tool: 9557

Core Software Delivery Platform upgraded with AI

GitLab Duo · NVIDIA · Amazon Bedrock

Code Assistants
- GitLab Duo
- MS GitHub Copilot
- Continue
- Gemini Code Assist

LLMs (via Gen. Engine)
- AWS Titan Large
- Anthropic Claude
- Cohere Command
- GCP Vertex
- Meta Llama
- Mistral AI
- OpenAI.GPT
- StarCoder2

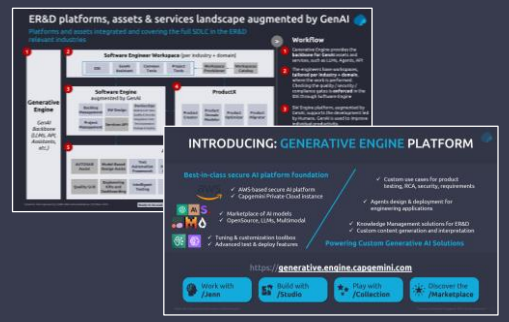
On-prem

Computing
- HPC Clusters
- Nvidia DGX A100 available + 2x DGX H200 (procurement)

LLMs & Assistants

GitLab Duo, StarCoder2, Continue

Custom AI Platform & Assets purpose-built for clients



Generative Engine, ProductX, SW Engine powered by AI, AUTOSAR Assist, MBSE Assist, etc.

AI Hub: Technologies provisioning, Playbooks, Assets, Training

NEXT: go at scale with a broader approach , dedicated assets for the industries domains, enforce the quality & securing delivery

Updated in October 2024

GitLab upgrade

ER&D Investment

GitLab Ultimate & GitLab DUO

Default AI assistant for software engineering

GitLab ULTIMATE

- Planning
- Source Code Management
- Continuous Integration
- SAST & DAST
- Cybersecurity
- Artifact Registry
- Continuous Delivery
- Observability
- Compliance

GitLab DUO

- Available in IDE and GitLab interface
- Feature-rich solution: covers the full SDLC
  - Generate issue description
  - Code Suggestions
  - Explain vulnerabilities
  - Ask questions
  - Code explanation
  - Root Cause Analysis
  - Generate test files
- SaaS and On-Prem
- Bring your own LLM
- Learn once, use it everywhere

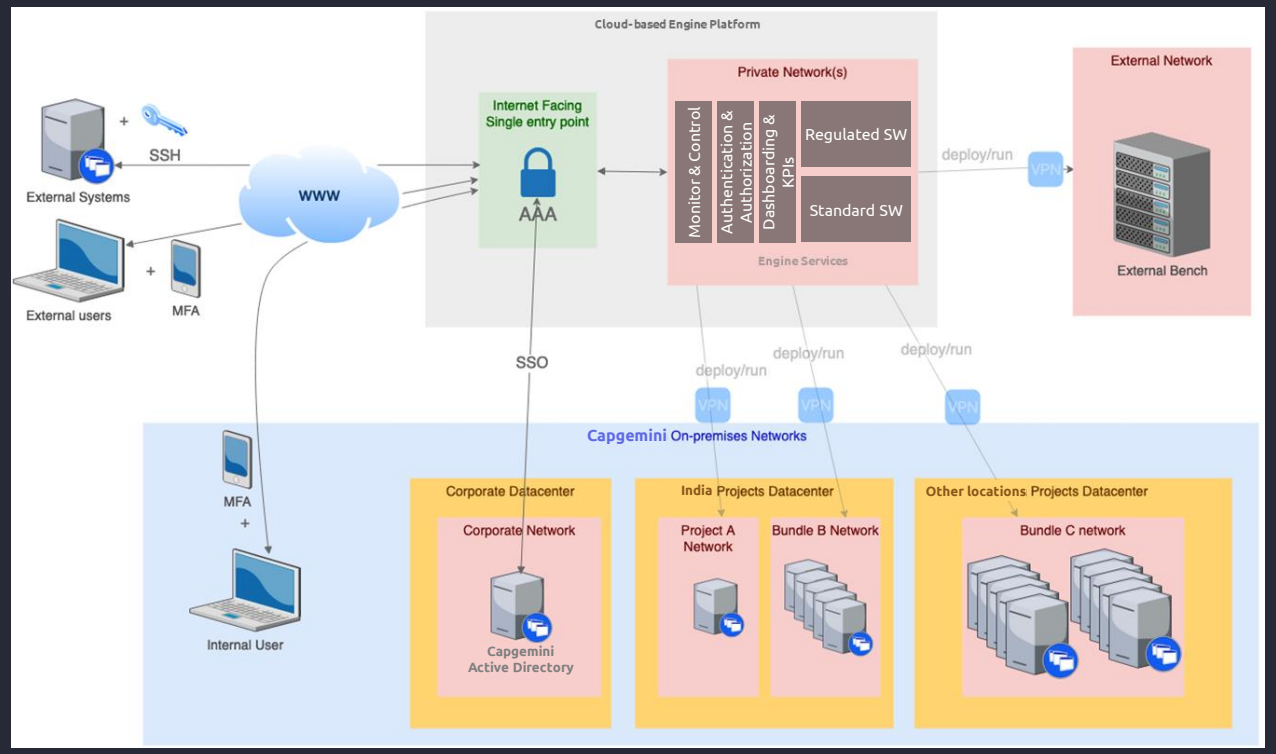
Full details in the appendix

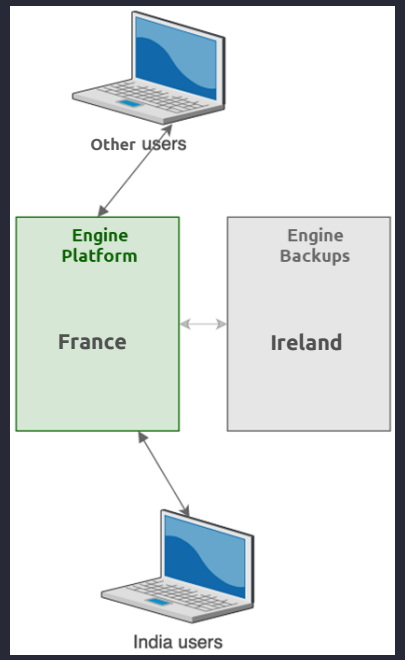
WRAP UP

Engine Infrastructure – High-Level view

Scalable, high-availability, certified infrastructure supporting Engine service

- Engine is an **Internet-facing** platform that uses Capgemini's **SSO** to authenticate its users.
- **Security** design and implementation have been **reviewed** and **validated** by Group Cyber, Group IT and AWS.
- Engine **connection to Capgemini resources**, such as servers and HW benches, requires joint setup of Project team, Engine team and Group IT.
- Main instantiation of Engine is **GDPR compliant** with data residency in Europe, having logical and physical segregation.





Key takeaways

- ✓ IaC, HA, DR out of the box
- ✓ Cloud based, using AWS for infrastructure, with on-prem capacity
- ✓ Automatic scalability
- ✓ Zones (for Data)
- ✓ Infra with efficient cost model
- ✓ Broad range of services for functional expandability
- ✓ Main data location is France, for GDPR compliance
- ✓ Disaster Recovery instance located in Ireland
- ✓ Full managed service, with dedicated support team
- ✓ 99.999999999% data durability
- ✓ Physical segregation of the sensitive data

AWS Review

AWS Well-Architected

AWS Well-Architected Tool Hamilton-MVP - AWS Well-Architected Framework Report

Cybersecurity

Stamped by Capgemini Group Cybersecurity, Capgemini Group IT & Capgemini Group Industrialization

Scalability

Automatic scalability to adjust to the workload.

Cloud based.

Can be deployed on-prem.

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Service includes training and support in its core

Training program, available on Capgemini NEXT, to educate all stakeholders and empower our engineering teams.

Three learning pathways are prepared to address the needs of the following groups:

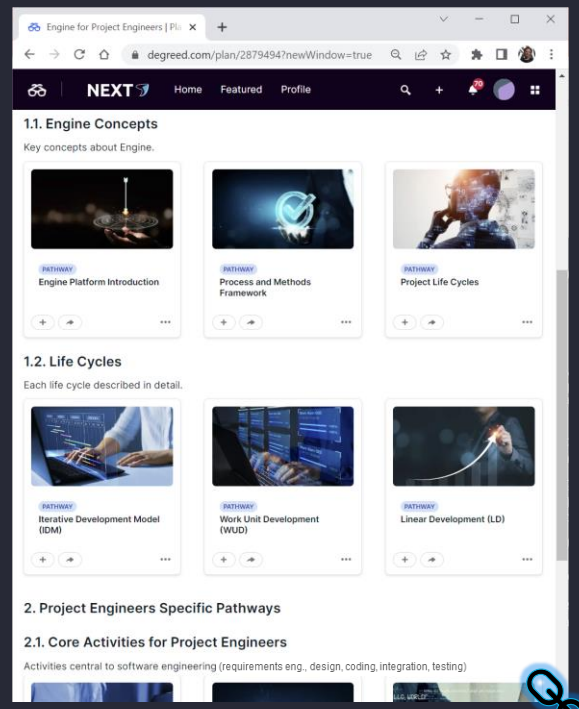
1. Project Engineers: how Engine helps engineers on their day-to-day work.

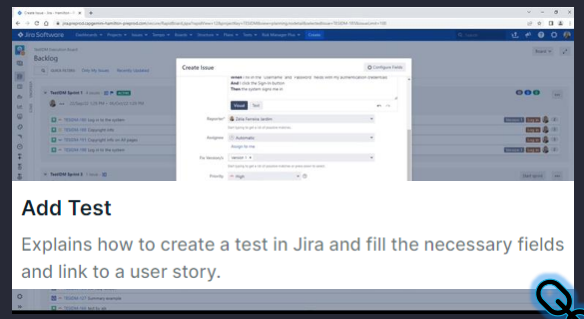
   Training focused on the SW Engineering Process (Scrum, V-Model, SAFe, Req. Analysis, Design, etc.) and on the tools (Jira, CI/CD, etc.).

2. Engagement Managers: using Engine to manage the engineering activities;

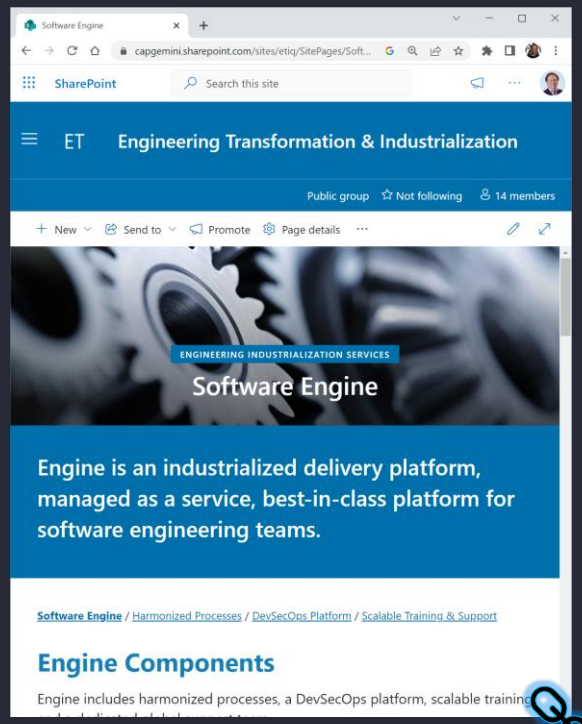
3. Sales & Pre-sales: how to position and use Engine to address customer needs.

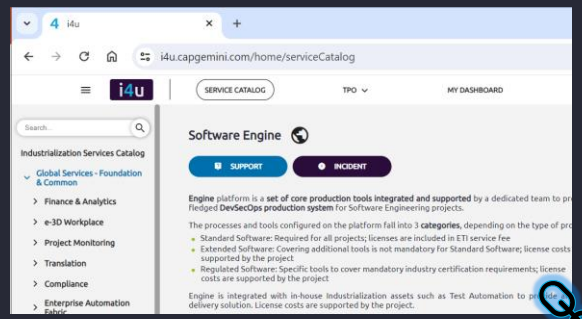
SW ENGINE TRAINING





SW ENGINE SUPPORT





Dedicated global team for support and quick project startup.

Well-defined SLAs and commitments:

- blocking issues: 4h;
- non-blocking issues: max 24h for 80% and max 48h for 20%.

- Provision of processes, methods and tools for the project, pre-configured and ready to be used.

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Selected project examples

Software Engine, the end-to-end software engineering delivery platform

Total Projects	Unique Users
725	4351

Updated November 2024

IN-VEHICLE INFOTAINMENT DEVELOPMENT

for a Tier 1 Supplier

Implementation of the latest generation of top segment IVI system for an OEM including several new features like multi-screen display, telematics, phone, SXM, parking assistant and driver assistant.

CONNECTED WEB & MOBILE VEHICLE APPLICATIONS

for a leading OEM

Strategic partnership with a leading automotive OEM for the development of all customer-facing web & mobile vehicle applications for a total of 23 applications connected with the car.

FULL DIGITAL INSTRUMENT CLUSTER

for a leading OEM

Implementation of 4 major instrument clusters for a leading OEM. E2E embedded software solution (booting, diagnostics, graphics, comms, application, safety and security), compliant with ISO 26262 and A-SPICE L3.

EMBEDDED SOFTWARE AS A MEDICAL DEVICE

for a biomed startup

Helping shape the future of healthcare through the development of an E2E Continuous Glucose Monitoring (CGM) solution that allows to check sugar levels discreetly by simply glancing at a smartwatch.

E2E SERVICES ACROSS NETWORK LIFECYCLE

for a leading NOC

Support a customer's Global Delivery Center with E2E services across the entire network lifecycle and covering multiple technologies in the access network (transmission and core).

Details and more examples in the appendix.

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Work smarter, not harder!
Transform your day-to-day with:

SOFTWARE
ENGINE

Thank you!

INFORMATION
- How to order
- Cost model

CONTACT
- engine@capgemini.com

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- More Information

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About Capgemini Engineering

World leader in engineering and R&D services, Capgemini Engineering combines its broad industry knowledge and cutting-edge technologies in digital and software to support the convergence of the physical and digital worlds. Coupled with the capabilities of the rest of the Group, it helps clients to accelerate their journey towards Intelligent Industry. Capgemini Engineering has 65,000 engineer and scientist team members in over 30 countries across sectors including Aeronautics, Space, Defense, Naval, Automotive, Rail, Infrastructure & Transportation, Energy, Utilities & Chemicals, Life Sciences, Communications, Semiconductor & Electronics, Industrial & Consumer, Software & Internet.

Capgemini Engineering is an integral part of the Capgemini Group, a global business and technology transformation partner, helping organizations to accelerate their dual transition to a digital and sustainable world, while creating tangible impact for enterprises and society. It is a responsible and diverse group of 340,000 team members in more than 50 countries. With its strong over 55-year heritage, Capgemini is trusted by its clients to unlock the value of technology to address the entire breadth of their business needs. It delivers end-to-end services and solutions leveraging strengths from strategy and design to engineering, all fueled by its market leading capabilities in AI, cloud and data, combined with its deep industry expertise and partner ecosystem. The Group reported 2023 global revenues of €22.5 billion.

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Capgemini engineering

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APPENDIX 1: COMPLEMENTARY SLIDES

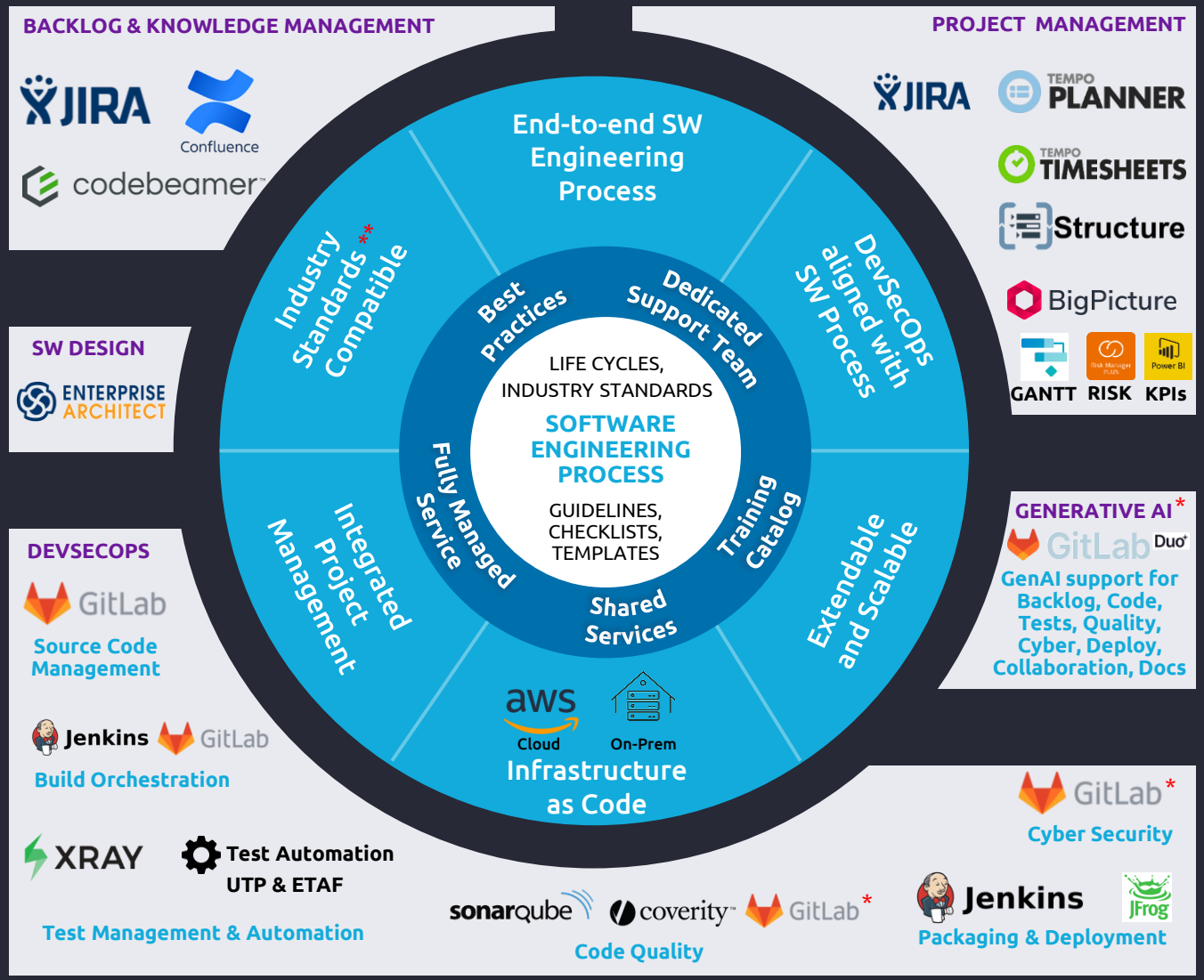
Software Engine

FULL MANAGED SERVICE COVERING BACKLOG & KNOWLEDGE MANAGEMENT, SW DESIGN, DEVSECOPS, AND PROJECT MANAGEMENT

Software Engine is a delivery platform including Application Lifecycle Management, Project Management, Requirements Management, Software Design and DevSecOps. It is composed by Processes, Methods and tools to cover the full SDLC. Certified Software as a Medical Device (ISO13485). Certifications for ISO 27K, TiSAX, DO 178C and A-SPICE planned for H2 2024.

BENEFITS

- **Maturity:** Proven Software Processes and Tools
- **Support:** dedicated team with associated SLAs
- **Simplicity:** Unified development environment
- **Full SDLC support**: From requirements to deliver, including traceability, configuration management, artifacts management, test automation.
- **Cost reduction**: start delivering from day 1 in the project
- **Business agility**: SAFe natively supported
- **Reliability**: High-availability, Disaster Recovery and backups out of the box.
- **Privacy:** Data segregation across the projects and zones (when required).



BUSINESS VALUE

- Deliver projects to customers with **transparency** and **agility.**
- **DevSecOps** adoption by default.
- Improve productivity and quality. **Release Cycle Time:** reduced from months to couple of weeks.
- **Data-driven Management**, with KPIs monitored live from the data provided by the tools.
- **Scalable and resilient architecture**, using AWS and its services: out-of-the box Infrastructure as Code, High Availability, Disaster Recovery, Backups, Automatic scalability, Zones (for Data), Infra with efficient cost model.
- Improve software development **maturity** and delivery **speed**.
- Focus on **delivering value**, instead of worrying about defining software processes and installing and configuring tools.

INFORMATION

- How to order
- Cost model
- More Information

* Planned for Q1 2025
Early access on Q4 2024

** SaMD (ISO13485) certified.
ISO 27K, TiSAX certifications and Do 178C planned for Q1 2025

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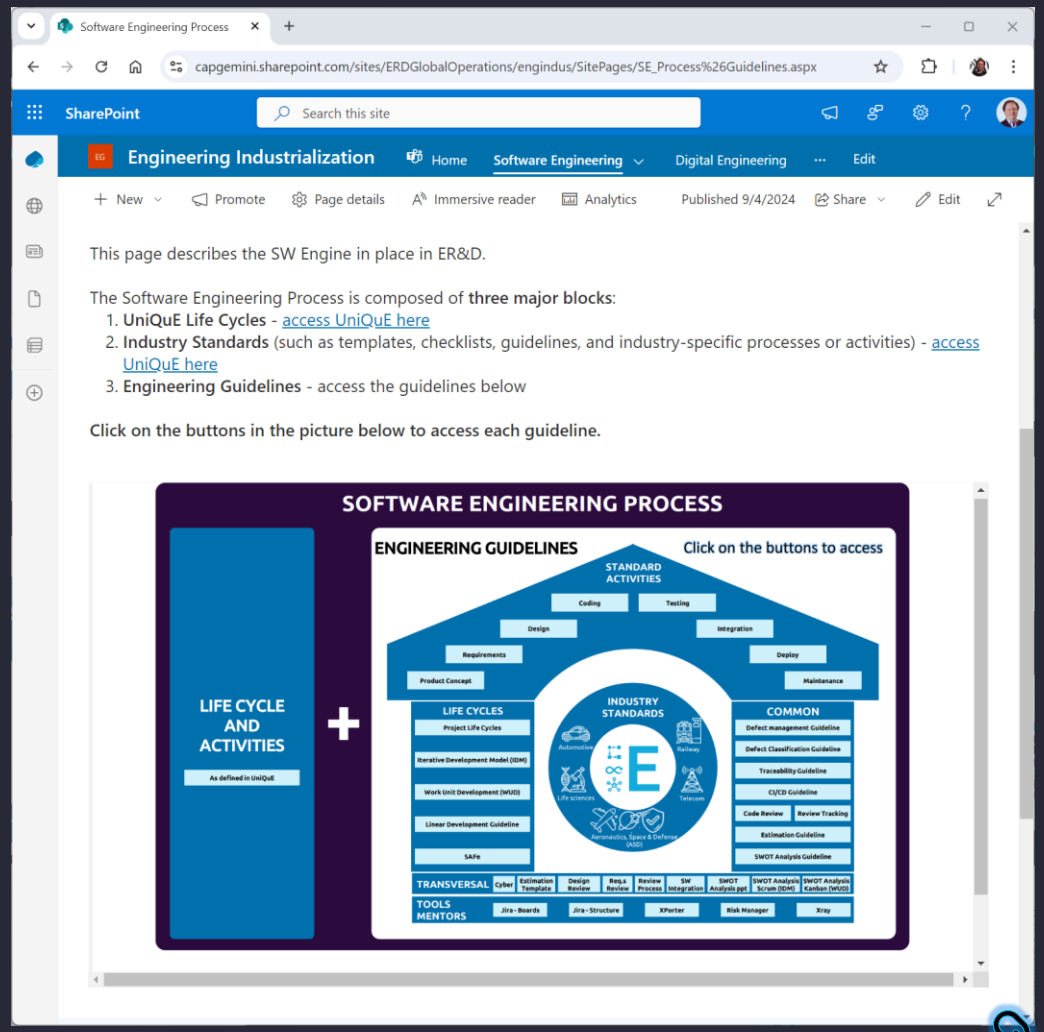
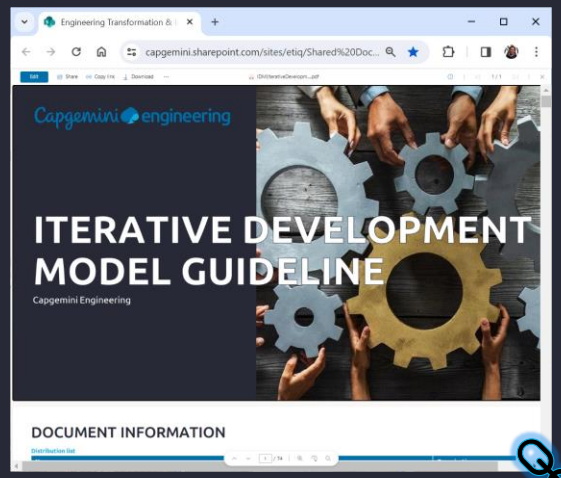
End-to-end software life cycle

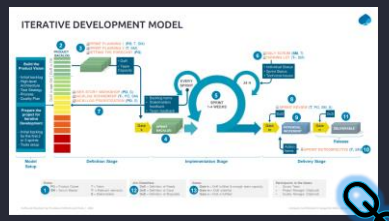
The SW Engineering Process is a core part of SW Engine. It establishes a common way of team working. And it is the base for configuring the tools.

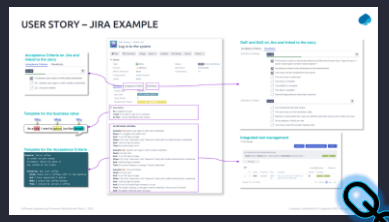
Published online

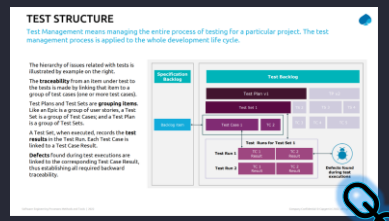


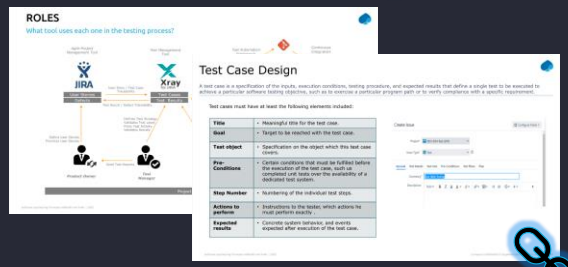
Two examples











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Internal Battle Card – SW Engine

Business Need, Audience, Target Market

Customer's Business needs:

- Improve software development maturity and delivery speed.
- Focus on delivering value, instead of worrying about defining software processes and installing and configuring tools.
- DevSecOps platform covering end-to-end SDLC activities.

Audience to talk to:

- CTO, procurement, head of software development departments, architects, solution managers, offer managers.
- **Target Organization/ Market**
- Clients requiring software development in the domains of embedded software, software product and operational technology software.
- Clients searching to implement software processes or DevSecOps Platforms.
- Clients looking for a DevSecOps SaaS solution to use in their projects.

Benefits to Customer

Customer Benefits

- Deliver projects to customers with transparency and agility. DevSecOps adoption by default.
- Average 8% 12% productivity improvement.
  - **Agility Improvements**: Developer Productivity, Build Frequency, Cycle Time;
  - **Quality Improvement**: execution and streamlining delivery;
  - **Release Cycle Time**: reduced from months to couple of weeks.
- Cloud based, using AWS and its services: out-of-the box Infrastructure as Code, High-Availability, Disaster Recovery, Backups, Automatic scalability, Zones (for Data), Infra with efficient cost model.

Differentiators

- Processes, methods and tools covering the end-to-end SDLC, packaged as Platform as a Service (PaaS) or Software as a Service (SaaS).
- Industry compliance support: certified Software as a Medical Device (ISO13485). ISO 27K, TiSAX certifications and Do 178C planned for H2 2024.

What to Listen for and What to Ask

Look out for these phrases:

- Scale-up software development (Agile, SAFe, Scrum, V-Model, DevSecOps)
- Deliver software upgrades at a faster rate
- Perform faster Root Cause Analysis (RCA) of application & environment issues
- Monitor and control project costs
- Compliance with SaMD (ISO13485), A-SPICE, ISO 26262, DO 178C, TiSAX, ISO 27K

Qualifying Questions:

- What is the delivery methodology (e.g. SAFe, Scrum, V-Model, DevSecOps)
- Where do you do requirements management, software design, software coding, unit tests, test management, test automation and teamwork management?
- Do you need to comply with any industry-specific regulation?
- Do you any requirement about data location (e.g. on-prem, on the cloud)

How Do We Deliver?

SERVICE 1: Improve Capgemini Engineering delivery. Capgemini and customer can use the asset to deliver the project or service.

SERVICE 2: New deployments to Capgemini or Clients: SW Engine used partially or in full to deploy a platform for the customer.

Competitors

- IBM
- Accenture
- Cognizant
- Infosys
- EPAM

Value Proposition

- **Maturity:** Proven Software Processes and Tools
- **Support:** dedicated team with associated SLAs
- **Simplicity:** Unified development environment
- **Full SDLC support**: From requirements to deliver, including traceability, configuration management, artifacts management, test automation.
- **Cost reduction**: start delivering from day 1 in the project
- **Business agility**: SAFe natively supported
- **Reliability**: High-availability, Disaster Recover and backups out of the box.
- **Privacy:** Data segregation across the projects.

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APPENDIX 2: SELECTED PROJECT EXAMPLES

BIOMEDICAL STARTUP COMPANY

Smartwatch as medical device for continuous glucose monitoring

CONTEXT & OBJECTIVES

Helping shape the future of healthcare through the development of an E2E Continuous Glucose Monitoring (CGM) solution that allows to check sugar levels discreetly by simply glancing at a smartwatch.

APPROACH & SOLUTION

Development of smartwatch embedded software, Mobile Android App and Cloud backend infrastructure fully compliant with ISO13485:2016 regulations.

RESULTS & ADDED VALUE

- SW development and testing (Project Management, Backlog Management, Build Management, Code Quality, Test Management & Automation) for a new smart watch to monitor blood glucose levels.
- 10 FTE over 2 years.
- SaMD Perform4All's (Engine predecessor) certification was key to the business.

SW ENGINE CONTRIBUTION TO THE PROJECT

Activity		Contribution
Iterative Development Model (IDM) as baseline for the SW Engineering Process		Common way of working for the team
Agile backlog management with Jira		Team backlog organization
Test Management with XRay + ETAF		Test design, automation and run
CI/CD with Jenkins		CI/CD pipelines
Code management with GitLab		Code repository, code review, merge requests
Code Quality with SonarQUBE		Code Quality, Security, Static Analysis

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IN-VEHICLE INFOTAINMENT DEVELOPMENT

IN-VEHICLE INFOTAINMENT FOR OEM (TIER 1 SUPPLIER)

CONTEXT & OBJECTIVES

Implementation of the latest generation of top segment In-Vehicle Infotainment system for OEM including several new features like multi-screen display, telematics, phone, SXM, parking assistant and driver assistant.

APPROACH & SOLUTION

- SW development in Portugal
- Requirement management and project management in Germany
- Specification to implementation
- Ensuring accurate interfaces to internal teams
- HMI implementation in C++, CGI, IAR Visual State, CANOE
- Test framework built in Python
- Project developed in **Scrum of Scrums**

RESULTS & ADDED VALUE

- 6 scrum teams
- 42 SW Engineers in DE and GEC PT

SW ENGINE CONTRIBUTION TO THE PROJECT

Activity		Contribution
Iterative Development Model (IDM) as baseline for the SW Engineering Process		Common way of working for the team
Agile backlog management with Jira		Team backlog organization
Test Management with XRay + ETAF		Test design, automation and run
CI/CD with Jenkins		CI/CD pipelines
Code management with GitLab		Code repository, code review, merge requests
Code Quality with SonarQUBE		Code Quality, Security, Static Analysis

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WEB & MOBILE CONNECTED APPS

CONNECTIVITY & INFOTAINMENT

CONTEXT & OBJECTIVES

Strategic partnership with leading automotive OEM for the development of all customer-facing connected web & mobile applications for a total of +23 applications connected with the car. Team ramp-up and transfer of +100 SW Engineers, of which 80 located in GEC Portugal.

APPROACH & SOLUTION

With a front-office in Wolfsburg – Germany, side-by-side with the client, an integrated solution approach comprising HMI, Graphics, SW development and Project Management is offered to VW. With GEC PT reliable software practice, CMMI3 certified, supported by a complete end-to-end integration as a basis, additional compliance with automotive industry standards like ASPICE and TISAX ensures that Volkswagen requirements for software quatity are fulfiled.

RESULTS & ADDED VALUE

- Connected Apps covering functionalities such as: parking assistance, fun & entertainment, location & tracking, fleet management, and other ride assistance
- +23 applications | 20 Germany + 80 FTEs in GEC PT (in progress)

SW ENGINE CONTRIBUTION TO THE PROJECT

Activity		Contribution
Iterative Development Model (IDM) as baseline for the SW Engineering Process		Common way of working for the team
Agile backlog management with Jira		Team backlog organization
Test Management with XRay		Test design, automation and run
CI/CD with Jenkins		CI/CD pipelines
Code management with GitLab		Code repository, code review, merge requests
Code Quality with SonarQUBE		Code Quality, Security, Static Analysis

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FULL DIGITAL INSTRUMENT CLUSTER

CONTEXT & OBJECTIVES

Implementation of four major instrument clusters variants, fully digital, to be deployed in the next high-end vehicles of a major OEM.

Delivery of an end-to-end embedded software solution for all areas of the clusters, such as booting, diagnostics, graphics, communications, application, safety, and security.

The instrument cluster complies with ISO 26262 and A-SPICE L3.

APPROACH & SOLUTION

- Product Backlog Management in Germany
- Software development in Portugal, following SAFe
- Requirement management with DOORS and User Stories managed in Jira
- SW Architecture using AUTOSAR and Model Driven Design based on EA

- Development with C++, EB Tresos / Dassault, GreenHills, CANoe
- 100% C1 coverage unit tests using gtest
- Validation with Robot Framework
- 4 years project
- 9 Scrum Teams + Quality Assurance Team
- ~120 Software Engineers in Germany and GEC Portugal (at maximum capacity)

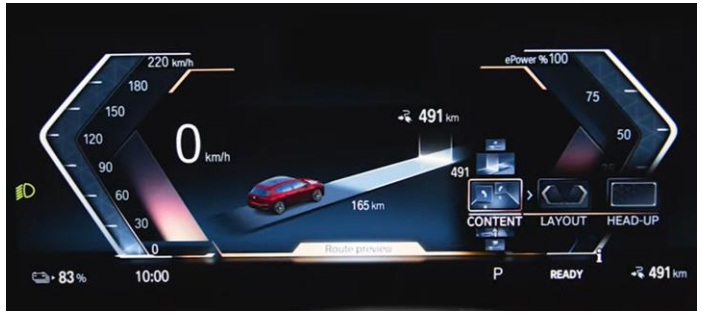
RESULTS & ADDED VALUE

- Fully qualified Instrument Cluster
- Product build iteratively with Scrum and SAFe

SW ENGINE CONTRIBUTION TO THE PROJECT

Activity		Contribution
Backlog Management with Jira		Team backlog organization
Defect Management With Jira		Defect logging and resolution tracking

Next-generation Digital Instrument Cluster



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FUTURE ARCHITECTURE COMPUTING ENVIRONMENT

French Multinational Automobile Manufacturer

CONTEXT & OBJECTIVES

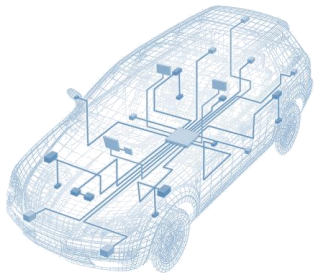
A major Automotive OEM Group asked Capgemini to design and develop the new Future Architecture Computing Environment (FACE), based on a Zonal E/E Architecture, that will equip the next-generation of electric vehicle for shared mobility services.

APPROACH & SOLUTION

- Centralized Architecture, based on SOA and MBSE, build on top multiple SW environments: Adaptive Autosar, Classic Autosar and Linux.
- Feature-based development (Full V-Cycle). Mixed-criticality (QM, ASIL A and B). Cyber-security zones.
- Main domains for SW development are eBody (climate, Wiping, Access, Lighting), Powertrain (E-Gas), Platform, Cybersecurity, Safety, Cyber, FOTA and Validation.
- Software development following SAFe framework.

RESULTS & ADDED VALUE

- Focus on new mobility, energy and data-related services.
- Developing both hardware – with a range of purpose-built vehicles - software and services, such as car charging, subscription and finance schemes.



SW ENGINE CONTRIBUTION TO THE PROJECT

Activity		Contribution
Project Management with Jira		Project tracking integrated with development backlog

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Capgemini engineering

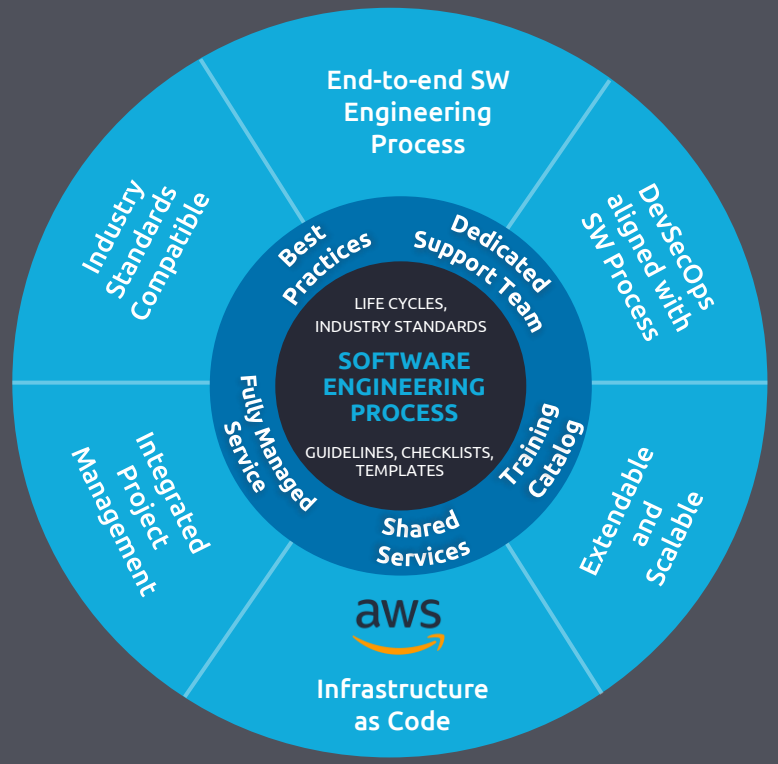
PLASTIC OMNIUM SOFTWARE HOUSE

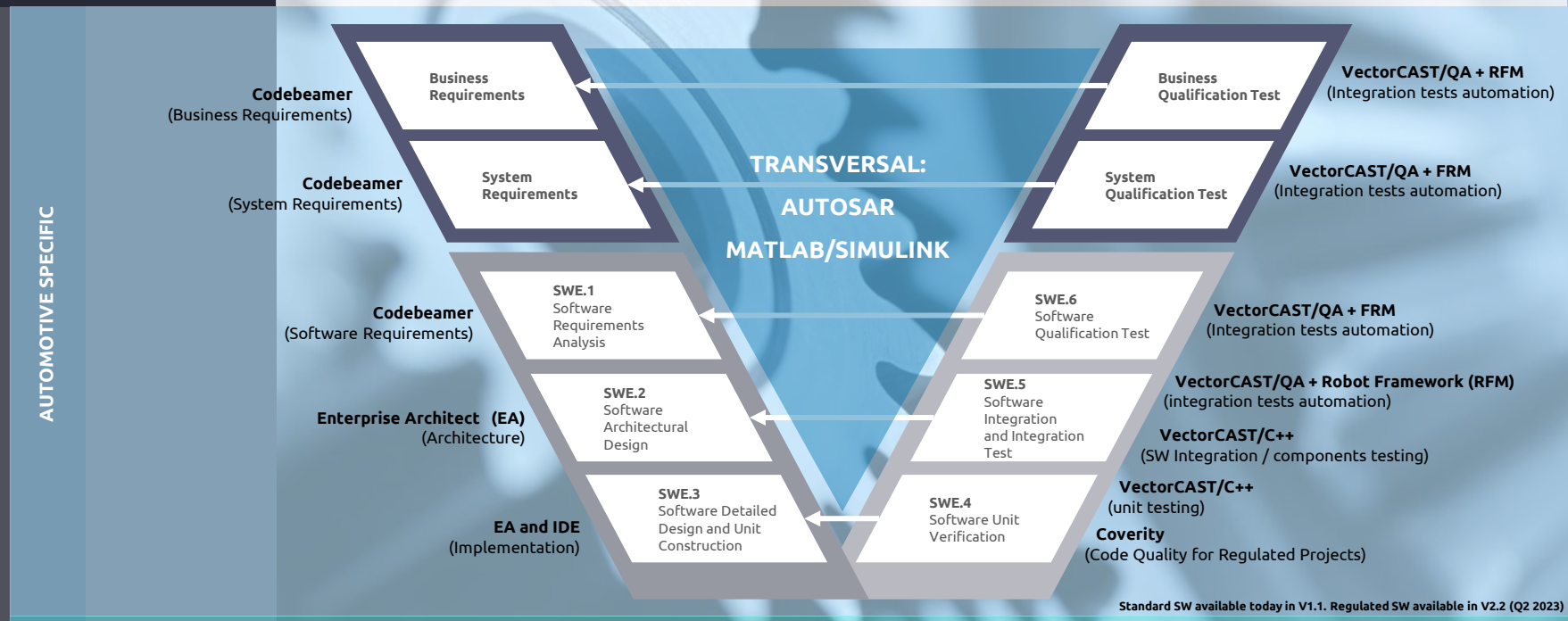
- SW Process for safety-critical Automotive projects
- Application Life Cycle management integrated with Project Management and DevSecOps
- ASPICE, ISO 26262, ISO 21434, ISO 27000, UN 155, UN 156, TISAX

Capgemini Engineering was awarded for setting up Plastic Omnium's Software House, leveraging on Software Engine to create an industrialized delivery solution.

The request included:

- **Consultancy phase** to assess the customer needs and tailoring Software Engine for Plastic Omnium.
- Definition and establishment of a complete **software engineering process** compliant with the **Automotive specific standards**.
- **Complete Software House setup**, including project management, roadmap & backlog management, requirements analysis, design, implementation & unit testing, component testing, integration testing, system testing, and build & deployment.
- **Implementation, testing, training and delivery** of the solution to the customer.





Standard SW available today in V1.1. Regulated SW available in V2.2 (Q2 2023)

BASELINE

JIRA	Backlog & Project Management
Confluence	Knowledge Sharing
GitLab	Source Code Management (Community Edition)
Jenkins	Automated Pipelines
sonarqube	Code Quality – non regulated projects (Community Edition)
XRAY	Test Management
JFrog	Artifacts Repository
Structure	Automation & Traceability
SVN Manager PLUS	Risk Management
OWASP	Cybersecurity
	Structure Gantt*
XPORTER	Reports & Documents Automation
TEMPO PLANNER	Team Management
TEMPO TIMESHEETS	Time Management

(*) to be replaced with BigPicture

APPENDIX 3: SOFTWARE ENGINE VERSION 3.3

SOFTWARE ENGINE VERSION 3.3

Project Management / ALM / Backlog Management / Knowledge Management / Software Design

PROJECT MANAGEMENT

1. Multiple available lifecycles, with tailored boards, reports, and issue types as defined by the SW Engineering Process. Including support for Backlog Prioritization, Release and Version Management, and Time Tracking and Logging.
   - ✓ IDM (Scrum)
   - ✓ VMD (V-Model)
   - ✓ WUD (Kamban)
   - ✓ SAFe
2. Use of Gantt Charts to better visualization of the project work.
3. Risk Management fully integrated with the project backlog and activities.
4. Multi-level hierarchical view of the issues in the backlog.
5. Work team planning (e.g. weekly work planning for Kamban projects).
6. Advanced time-tracking and resource management that helps teams log work hours, plan resources, and manage project costs.
7. Project portfolio management for planning, tracking, and managing multiple projects and resources with Scaled Agile Framework (SAFe).

KNOWLEDGE MANAGEMENT

1. Collaborative workspace tool that enables teams to create, share, and organize content and documentation in one centralized place.
2. Template for requirements and story creation with full details. Using reach text and images. Items linked to Jira, where they can be used in the project boards.
3. GitLab Pages for Static Site Hosting, Wiki and Documentation Support
4. GitLab Pages for Static Site Hosting, Wiki, and Documentation Support

APPLICATION LIFECYLE MANAGEMENT

1. Application Lifecyle Management (ALM) supporting extensive collaboration and addressing the industry compliance requirements.
2. Streamline development processes, from requirements to testing and delivery
3. End-to-end bidirectional traceability
4. Certified templates (e.g. A-SPICE)
5. Requirements baselining
6. Integrated with the SW Engine tools GitLab, Jenkins, Jira, Confluence, BigPicture, XPorter, Structure, Risk Management Plus, Planner, and Timesheets
7. Native integration with DOORS, GitHub, Microsoft Word, Microsoft Excel, Microsoft Project, CSV file in Microsoft Excel Style.

SOFTWARE DESIGN

1. Modelling and design supporting the full development lifecycle with capabilities for architecture, design, and analysis of complex systems.
2. Comprehensive support for UML 2.5
3. Cloud collaboration repository, implemented in SW Engine, to enable live collaboration of all engineers in the same project.
4. Model Driven Architecture support for transforming simple model elements into complex targets
5. Forward and Reverse Code Engineering
6. Real-time behavioral model execution and analysis
7. Integration with Visual Studio .NET or Eclipse (via plugins)
8. Database modelling
9. Full list here

BACKLOG MANAGEMENT

1. Issues hierarchy (Business Req., System Req, SW Requirement, Epic, Story, Task, Test Plan, Test Case, Enabler, etc.) to support structured software backlog.
2. Built-in bidirectional traceability across all backlog items, including user stories (or SW requirements), bi-directional traceability to SW design, software code, test plans, test cases and test executions.
3. Defect management, with traceability to the backlog.
4. Dependencies and Blocking Issues Visualization
5. Estimation and prioritization
6. Release and Version Tracking
7. Collaborative workspace tool that enables teams to create, share, and organize content and documentation in one centralized place.
8. Template for requirements and story creation with full details. Using reach text and images. Items linked to Jira, where they can be used in the project boards.

PROJECT MANAGEMENT WITH SAFe (details)

1. Full deployment of the SAFe framework in Jira using BigPicture.
2. Including the levels for Portfolio Teams, Solution Teams, Features Teams, and Delivery Teams.
3. Supporting the following views: Overview, Gannt, Scope, Board, Objectives, Resources, Teams, Calendar, and Reports.
4. Support for Program Increments (PI), PI Plannings, and for PI Iterations (e.g. sprints).
5. Aggregated views with details progress per level.

SOFTWARE ENGINE VERSION 3.3

DevSecOps: Source Code Management / CI/CD / Code Quality / Test Management / Test Automation

SOURCE CODE MANAGEMENT

1. Version Control and Repository Management provided by GitLab – an Integrated DevOps platform that provides tools for source code management, continuous integration/continuous deployment (CI/CD), and project collaboration.
2. Hosted on Capgemini controlled servers (on AWS).
3. Configured with a default branching strategy (based on Git Flow).
4. Traceability to the backlog (user stories or software requirements) via dedicated plugin.
5. Integrated Merge Request and Code Review Process

CODE QUALITY

1. Code quality and security analysis to helps teams detect bugs, code smells, and security vulnerabilities in their codebase, is supported by two tools: SonarQUBE and Coverity.
2. Code Quality is integrated in the CI/CD pipelines.
3. Pre-defined Code Quality Gates.
4. Security Vulnerability Detection.
5. Code Quality Metrics.
6. Technical Debt Measurement
7. Detailed Reporting and Dashboards.
8. Additionally, Coverity is certified according to several industry standards, such as ISO 26262, MISRA-C, DO-178C, etc. The tool also produces compliance reports for these standards.

CI/CD & PIPELINES AUTOMATION

1. CI/CD pipelines as code supported by two tools (Jenkins, being retired, and GitLab as default for new projects).
2. Staged pipelines with default steps for building the application, running unit tests, building the binary image, performing security analysis, running static code analysis (SAST), deploying the application, storing binary artifacts on the JFrog Artifactory, running test automation (integration tests or other), running dynamic analysis (DAST).
3. Stages customizable per project and application.
4. Pipelines can be customized per branch, enabling specific pipelines per branch (e.g. a pipeline for a developer working on a feature branch, another pipeline for the build branch, and another pipeline for the integration branch).
5. Pipeline triggering can also be customized, enabling triggering CI/CD on multiple scenarios (e.g. running a pipeline when a developer performs a commit on the feature development branch to get early feedback, running a pipeline when pull requests happens on the integration branch, having nightly builds, etc.).
6. Security analysis including code quality, container scanning, and secret detection.
7. Distributed CI/CD pipelines, where part of the pipeline runs in one environment (e.g. SW Engine build environment) and the other part runs on another environment (e.g. hardware bench existing in a lab for tests with hardware in the loop).
8. Supported OS: Linux, iOS, Android, Windows.
9. Connection to Hardware for HiL tests is available for projects using GitLab CI/CD.

TEST MANAGEMENT

1. Plan, execute, and report on testing activities, including Test Plans, Test Sets, Test Cases, and Test Executions.
2. Direct bi-directional traceability with the Jira issues, such as user stories, software requirements, etc.
3. Support for manual and automated test execution (via the tool API).
4. Integrated with the CI/CD pipelines.
5. Support for Test Data Management.

TEST AUTOMATION

1. Capgemini assets for test automation, with support for test script automation (**UTP** – Unified Test Platform) and for test design and automation based in keywords (**ETAF** – Engineering Test Automation Framework).
2. UTP and ETAF with support for common libraries such as Selenium, Apium, JUnit, and TestNG. ETAF, being based on Robot Framework, additional supports keywords-based testing, including libraries for well-known interfaces (e.g. CAN bus, Android devices, Raspberry PI. etc.).
3. Automatic uploading of the test results and test artifacts (e.g. screenshots, text logs, etc.) to XRay.
4. Test dashboards and test reports.
5. Test automation integrated in the CI/CD pipelines (ETAF only).

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SOFTWARE ENGINE VERSION 3.3

DevSecOps: Packaging & Deployment / Cyber Security

PACKAGING & DEPLOYMENT

1. Package the application in a deployable solution, such as installer or container.
2. Performed as part of the CI/CD pipelines of GitLab of Jenkins.
3. Management and distribution of binaries and dependencies across the software development lifecycle with JFrog.
4. Dependency and Version Management
5. Repository Replication and Distribution
6. Vulnerability Scanning and Security Management.
7. Artifact Traceability and Auditing.
8. Build Info and Release Management.

CYBERSECURITY

1. Security and vulnerability analysis to scan artifacts and dependencies.
2. Detect and mitigate security risks throughout the software supply chain.
3. Deep Artifact Scanning
4. Vulnerability Detection and Reporting
5. License Compliance Management
6. Integration with JFrog Artifactory
7. Continuous Security Scanning in CI/CD
8. Dependency Tree Analysis
9. Real-Time Threat Alerts and Notifications
10. Policy Creation and Enforcement
11. Customizable Security Rules
12. Impact Analysis and Dependency Mapping
13. Detailed Vulnerability Reports
14. REST API for Custom Automation
15. Role-Based Access Control
16. Audit and Compliance Reports

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APPENDIX 4: GITLAB

NEW FOCUS FOR GITLAB IN SW ENGINE

The introduction of GitLab Ultimate and GitLab Duo will bring a major upgrade to the platform.

GitLab Ultimate will put the focus on the following features:

- SAST with better Code Quality (improvement compared to SonarQUBE)
- CI/CD Pipelines
- DAST
- Cybersecurity
- GenAI (with GitLab DUO)
- Security templates per industry
- Collaboration
- Issue management
- Policy which can make code reviews mandatory before a pull request

GitLab DUO is an AI-powered suite designed to improve productivity, enhance software development workflows, and support development tasks with real-time assistance and automation.

- Includes a plugin to install in the IDE (like MS GitHub Copilot), which provide code suggestions, chat, code explanations, test generation, etc. It is also integrated in the GitLab, where several assistants help across the full SDLC.
- It is available on SaaS and on-prem (incl. using our own LLMs)
- Multiple LLMs are used (SaaS or on-prem) to choose the best LLM for the task
- Focus on the full SDLC (Epic summary, Issue summary, Generate issue description, Code explanation, Code suggestions, Suggest reviewers, Merge request summary, Test generation, Root cause analysis, Vulnerability Explanation, Vulnerability Resolution, Code review summary, Discussion summary, Value stream forecasting)

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GITLAB FEATURES (1/3)

Planning, Source Code Management, Continuous Integration

Planning
Regardless of your process, GitLab provides powerful planning tools to keep everyone synchronized.

GitLab enables portfolio planning and management through epics, groups (programs) and milestones to organize and track progress. Regardless of your methodology from Waterfall to DevSecOps, GitLab's simple and flexible approach to planning meets the needs of small teams to large enterprises. GitLab helps teams organize, plan, align and track project work to ensure teams are working on the right things at the right time and maintain end to end visibility and traceability of issues throughout the delivery lifecycle from idea to production.

- Team Planning
- Service Desk
- Portfolio Management
- Design Management
- Requirements Management
- Quality Management
- Wiki

Source Code Management
Create, view, and manage code and project data through powerful branching tools.

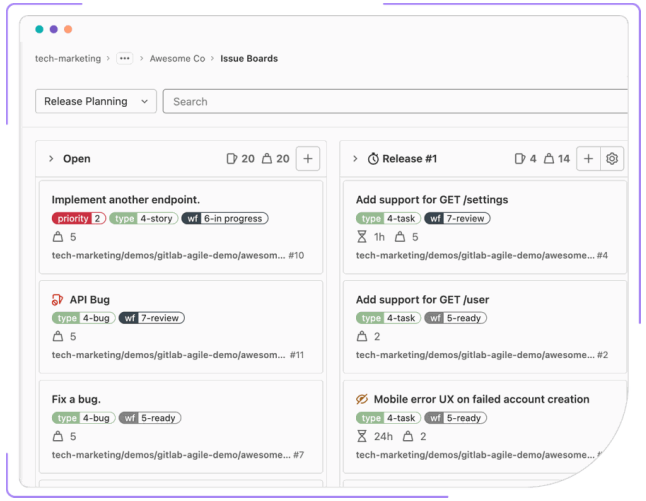
GitLab helps teams design, develop and securely manage code and project data from a single distributed version control system to enable rapid iteration and delivery of business value. GitLab repositories provide a scalable, single source of truth for collaborating on projects and code which enables teams to be productive without disrupting their workflows.

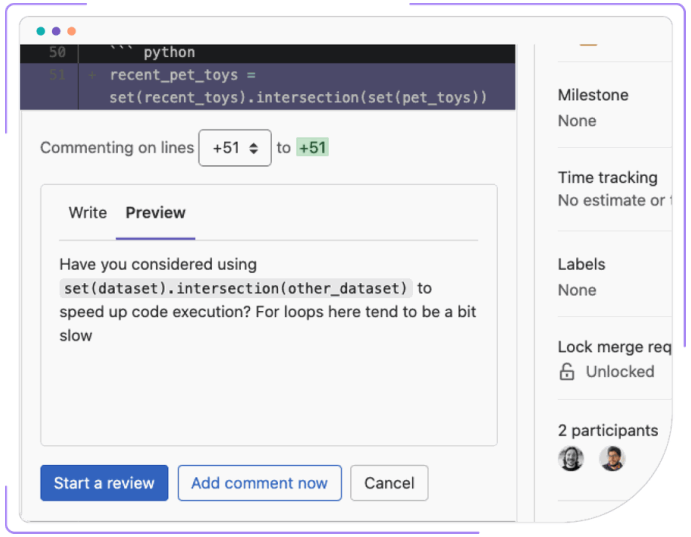
- Source Code Management
- Code Review Workflow
- GitLab CLI
- Web IDE
- Workspaces
- Editor Extensions
- Code Suggestions

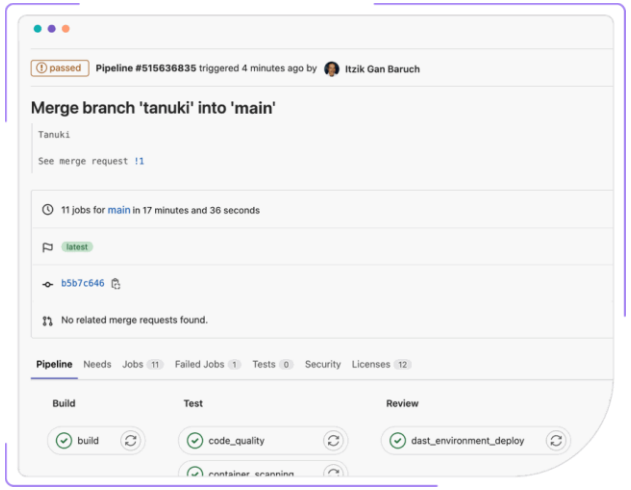
Continuous Integration
Keep strict quality standards for production code with automatic testing and reporting.

GitLab helps delivery teams fully embrace continuous integration to automate the builds, integration and verification of their code. GitLab's industry leading CI capabilities enables automated testing, Static Analysis Security Testing, Dynamic Analysis Security testing and code quality analysis to provide fast feedback to developers and testers about the quality of their code. With pipelines that enable concurrent testing and parallel execution, teams quickly get insight about every commit, allowing them to deliver higher quality code faster.

- Continuous Integration (CI)
- Merge Trains
- Code Testing and Coverage
- Review Apps
- Pipeline Composition







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GITLAB FEATURES (2/3)

Security, Artifact Registry, Continuous Delivery

Security
Security capabilities, integrated into your development lifecycle.

GitLab provides Static Application Security Testing (SAST), Dynamic Application Security Testing (DAST), Container Scanning, and Dependency Scanning to help you deliver secure applications along with license compliance.

Artifact Registry
Create a consistent and dependable software supply chain with built-in package management.

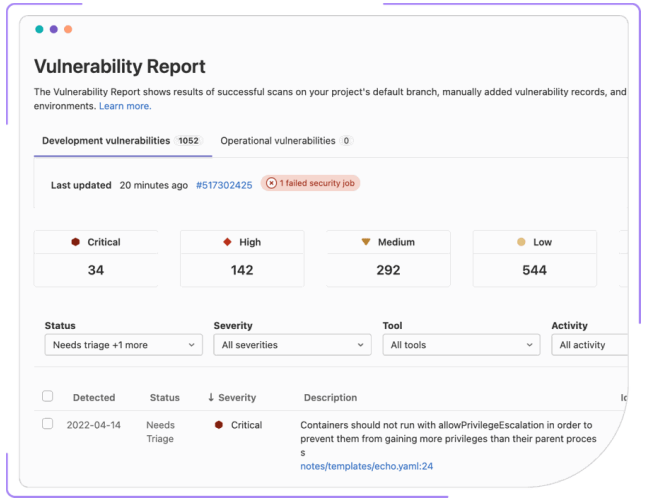
GitLab enables teams to package their applications and dependencies, manage containers, and build artifacts with ease. The private, secure, container and package registry are built-in and preconfigured out-of-the box to work seamlessly with GitLab source code management and CI/CD pipelines. Ensure DevSecOps acceleration and a faster time to market with automated software pipelines that flow freely without interruption.

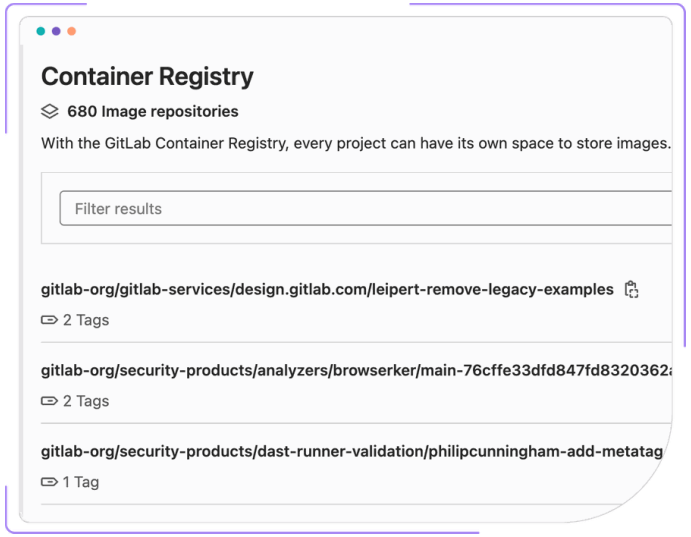
- Package Registry
- Helm Chart Registry
- Container Registry

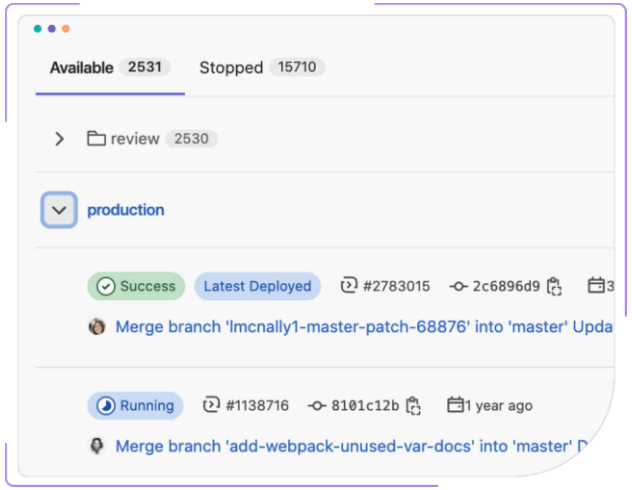
Continuous Delivery
GitLab's integrated CD solution allows you to ship code with zero-touch, be it on one or one thousand servers.

GitLab helps automate the release and delivery of applications, shortening the delivery lifecycle, streamlining manual processes, and accelerating team velocity. With zero-touch Continuous Delivery (CD) built right into the pipeline, deployments can be automated to multiple environments like staging and production, and the system just knows what to do without being told - even for more advanced patterns like canary deployments. With feature flags, built-in auditing/traceability, and on-demand environments, you'll be able to deliver faster and with more confidence than ever before.

- Auto DevOps
- Continuous Delivery
- Deployment Management
- Environment Management
- Feature Flags
- Infrastructure as Code
- Release Orchestration







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GITLAB FEATURES (3/3)

Observability, Compliance

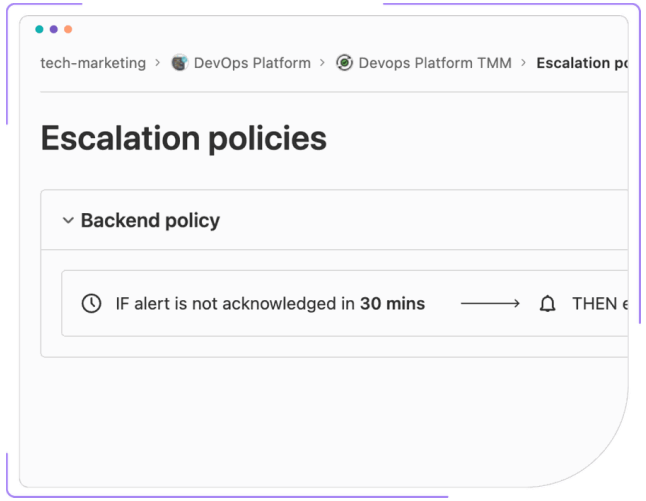
Observability
Help reduce the severity and frequency of incidents.

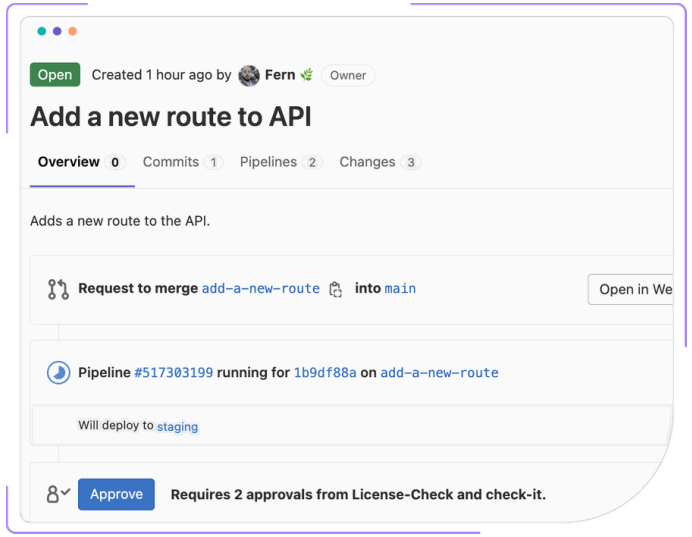
Get feedback and the tools to help you reduce the severity and frequency of incidents so that you can release software frequently with confidence.

- Incident Management
- On-call Schedule Management

Compliance
Adhere to compliance by managing security vulnerabilities, policies, and compliance across your entire organization.

GitLab allows you to ensure your software development process achieves regulatory compliance across different industries from a single platform. For finance, our customers use GitLab to comply with several compliance framework such as FEB, FCA, FINMA, and many more. For healthcare, GitLab provides the right tool-set to address the requirements of HIPAA. Additionally, other compliance frameworks can be met (SOC2, ISO, etc.) using GitLab's comprehensive compliance management solutions.





NOTES

Features details:

- Planning
- Source Code Management
- Continuous Integration
- Security
- Artifact Registry
- Continuous Delivery
- Observability
- Compliance

The features details also states the availability of the features per tier (free, premium, ultimate).

Summary of features by tiers premium and ultimate can be found here.

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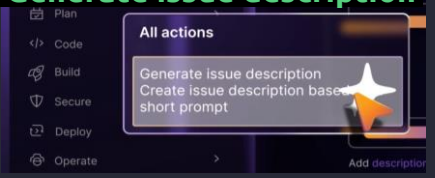
GITLAB DUO

Safer and faster software delivery with AI across the entire SDLC

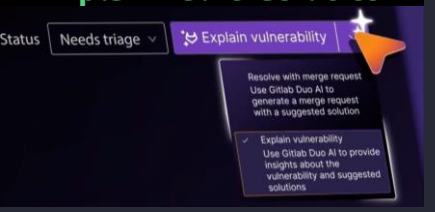
Generate issue description



Code Suggestions

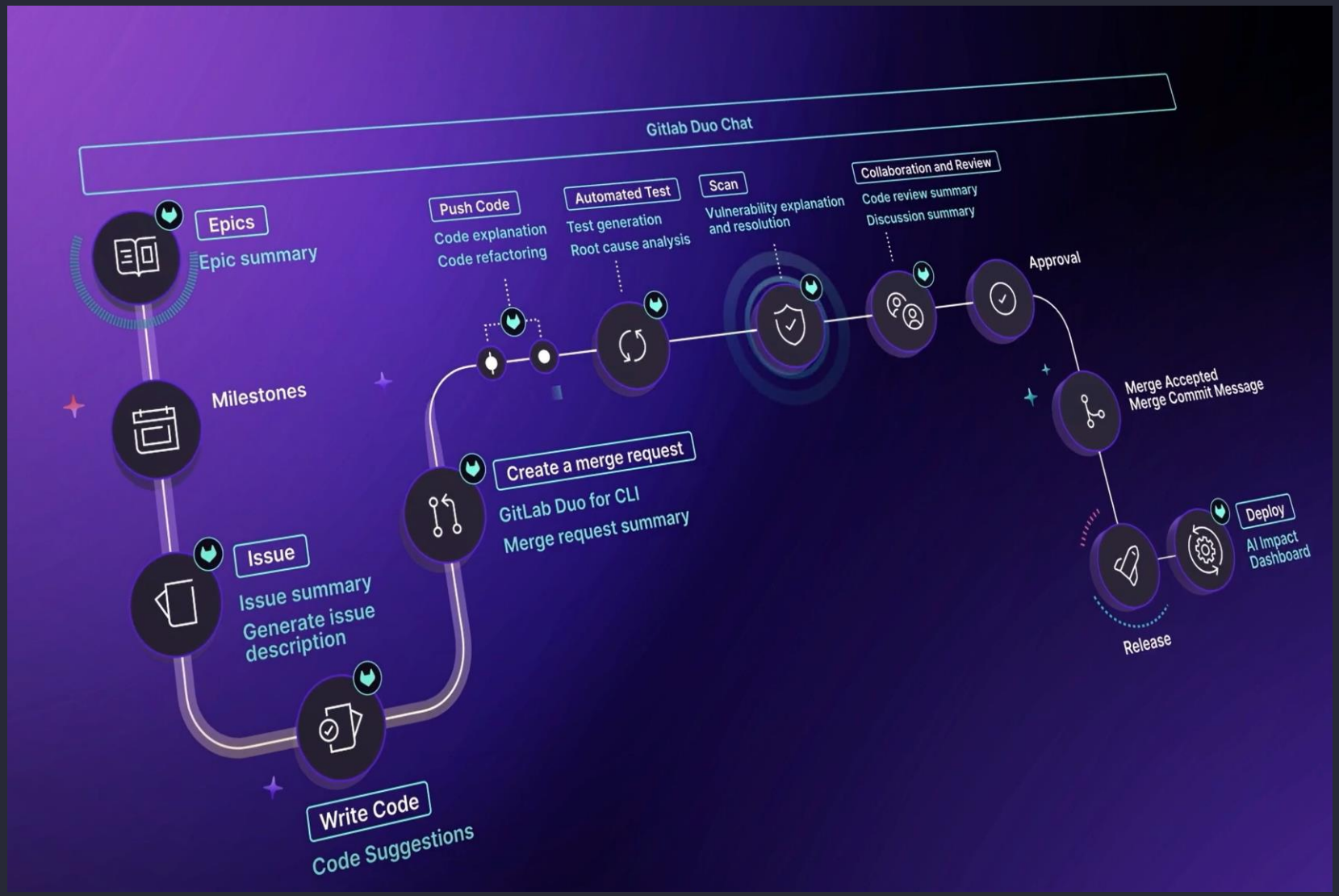
```
// Calculate average price of products
public double calculateAverage () {
    if (prices.isEmpty()) {
        return 0.0;
    }
    double sum = 0.0;
    for (Double price : prices) {
        sum += price;
    }
    return sum / prices.size();
}
```

Explain vulnerabilities



Ask questions

How do I include to my .gitlab-ci.yml security scans for my Go app?



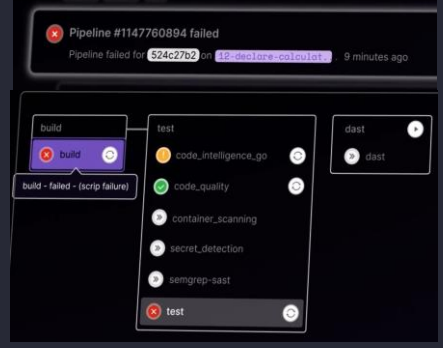
Code explanation

```
func orderHistoryHandler (w http.ResponseWriter, r
    // Parse request parameters
    customerID = parseQueryParamInt(r, "customer
    startTime := parseQueryParamTime (r, "start_
    endTime = parseQueryParamTime (r, "end_time"

    // Validate parameters
    if customerID == 0 || startTime. IsZero() ||
        http.Error(w, "Invalid parameters", h
        return
    }
```

The function **orderHistoryHandler** handles HTTP requests to retrieve the order history of a customer. It first parses the request parameters, including the customer ID, start time, and end time, from the query string. If any of these parameters are missing or invalid, it returns an error response. Otherwise, it calls

Root Cause Analysis



Generate test files

```
const { add)= require('lib/index');

describe(add', () => {
  it('should add two numbers', () => {
      expect(add(1, 2)).toBe(3);
  });
});
```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GITLAB DUO FEATURES

Generally available features

1. **GitLab Duo Chat**: Provides fast, interactive help for coding tasks, project updates, and GitLab usage through an AI-powered chat interface.
2. **Discussion Summary**: Summarizes lengthy issue conversations to help team members understand context and updates quickly.
3. **Code Suggestions**: Offers real-time code generation and suggestions as you type, improving coding efficiency.
4. **Code Explanation**: Delivers clear, natural language explanations of selected code to boost understanding.
5. **Test Generation**: Automatically creates tests for selected code, helping catch bugs and improve reliability early.
6. **Refactor Code**: Provides suggestions for refining and improving selected code for optimal performance.
7. **Fix Code**: Detects and fixes issues like bugs or typos in selected code snippets.
8. **GitLab Duo for the CLI**: Enables command-line discovery or recall of Git commands to streamline workflows.
9. **Merge Commit Message Generation**: Creates meaningful commit messages to accelerate the merging process.
10. **Root Cause Analysis**: Analyses CI/CD logs to identify the root cause of job failures effectively.
11. **Vulnerability Explanation**: Explains security vulnerabilities, potential exploitation methods, and remediation steps.
12. **AI Impact Dashboard**: Tracks and visualizes AI's impact on software metrics, adoption rates, and team performance.

Beta features

1. **Self-Hosted Models**: Enables the use of self-managed language models to power GitLab's AI features like Code Suggestions and Duo Chat, either through GitLab's vendors or by hosting custom models.
2. **Use GitLab Model Vendors**: Connects to external model providers, such as Google Vertex AI or Anthropic, through GitLab's managed AI Gateway for easy integration.
3. **Host Your Own Models**: Allows users to deploy and manage custom language models and AI Gateway within their own infrastructure, independent of GitLab's external providers.
4. **Merge Request Summary**: Speeds up merge request creation by generating a description based on code changes, streamlining documentation.
5. **Vulnerability Resolution**: Assists in resolving security vulnerabilities by generating a merge request that addresses identified issues.

Experimental features

1. **Issue Description Generation**: Quickly generates detailed issue descriptions from a short summary provided by the user to improve clarity and completeness.
2. **Code Review**: Provides an automated review of proposed changes in a merge request, identifying potential improvements or issues.
3. **Code Review Summary**: Summarizes all comments in a merge request review, making the handover process to reviewers more efficient.
4. **GitLab Duo Workflow**: Automates tasks within the development workflow to increase productivity and streamline operations.

Source: GitLab DUO site, visited on 2024/11/06

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APPENDIX 5: VIDEO

Software Engine [Introduction Video]