

MathWorks  
**AUTOMOTIVE  
CONFERENCE 2024**  
Korea

# 제품 개발 프로세스 성숙화를 위한 ALM 활용 방안

*Kyujin Jung, Solution Consultant, ptc Korea*



# Agenda

- ptc 소개
- Application Lifecycle Management
  - What / Why / How
- Codebeamer 활용 데모
- Simulink 연결 데모



- Revenue : Approximately \$2.4 billion (as of 2022)
- HQ : Boston, Massachusetts, USA
- Primary business :
  - DX, Digital Thread, Digital Twin
  - PLM, CAD, IoT, AR, ALM, SLM
- 28,000 customers worldwide
- NASDAQ : PTC – Approx. 21 billion market capitalization

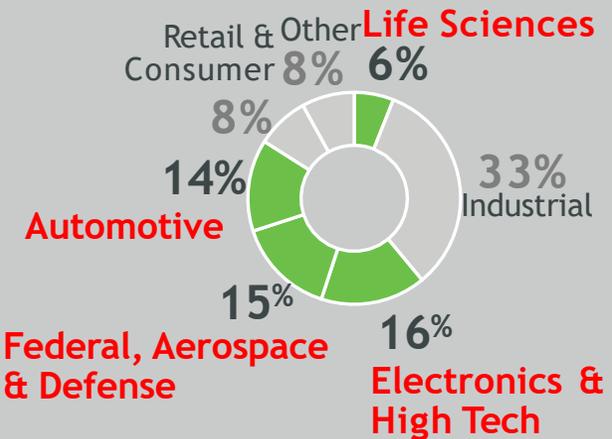
PHYSICAL



The Power To Create

Digital **Transforms** Physical

Market share by industry



Company Summary

**Over 35 years**

History of innovation

**~\$21.5B**

Market Cap

**~6,500**

Employees worldwide

Global Footprint



Partner : 25%~ 30%

Customer



## What is ALM?

ALM(Application Lifecycle Management, 애플리케이션 수명 주기 관리)은 소프트웨어 애플리케이션의 전체 수명 주기를 관리하는 프로세스를 의미합니다.

ALM 시스템은 요구사항 관리, 설계 및 개발, 테스트 관리, 구성 관리, 포트폴리오 관리와 같은 라이프 사이클의 모든 측면을 관리하기 위해 여러 프로세스, 도구 및 역할군이 함께 작업하는 협업 시스템을 의미합니다.

요구사항  
관리



테스트  
관리



리스크  
관리



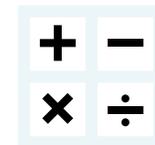
애자일  
엔지니어링



규제 준수



변형 관리



구성  
관리

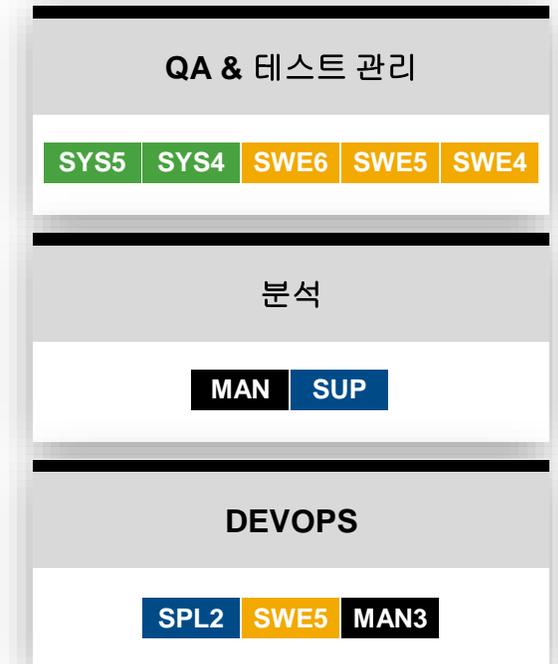
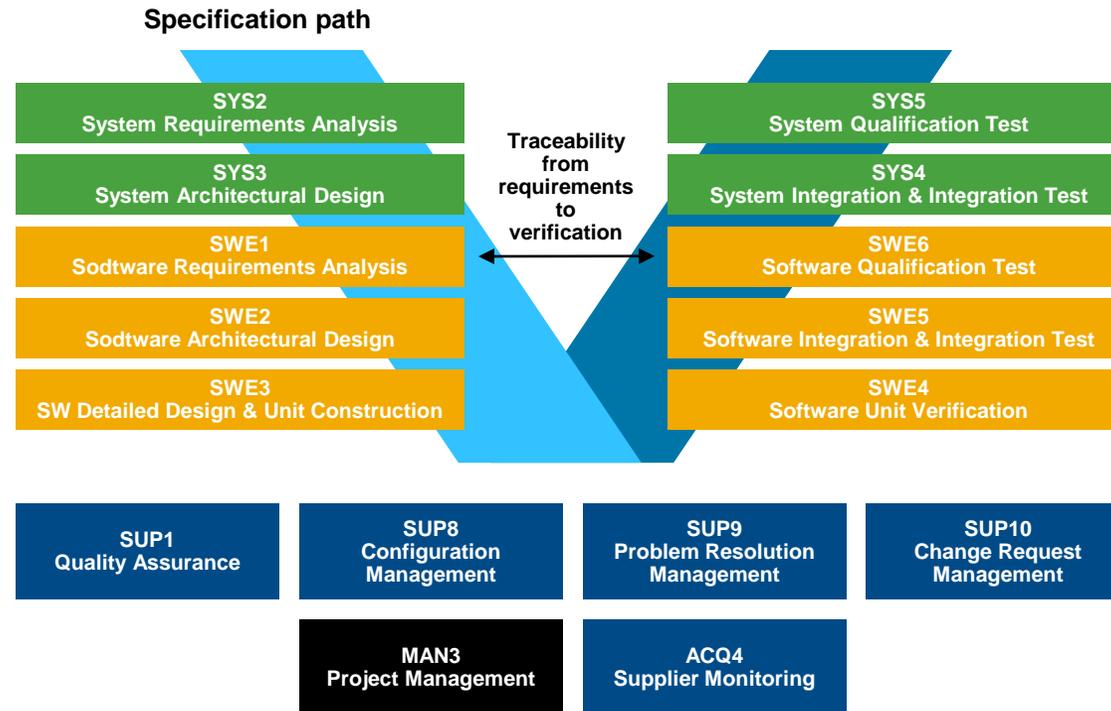
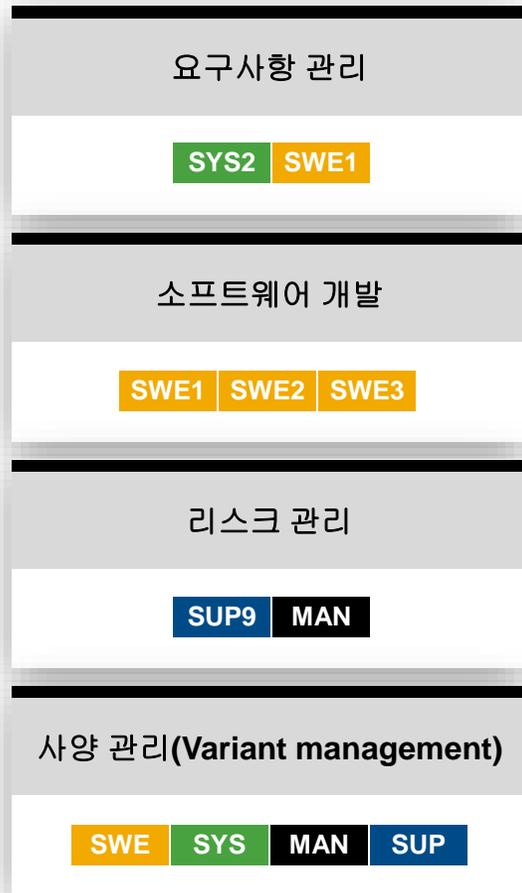


전략적  
재사용



# What is alm?

Codebeamer의 주요 기능을 A-SPICE®의 프로세스와 맵핑



## OTHER FEATURES

변경 및 구성 관리 · 작업 및 문제 관리 · 고급 워크플로, 프로세스 시행 · Import/Export 기능(MS Project, ReqIF, Word 및 Excel PDF Roundtrip Export) 등



# Why ALM? – 시장 변화에 따른 S/W 개발 환경의 변화

“Software-defined Vehicle” (SDV). 새로운 트렌드는 개발과 운영에 영향을 미칠 뿐만 아니라 새로운 비즈니스 모델과 협업 유형 변화시킵니다.

## 새로운 비즈니스

- 최적화 주행성능 보장
- 신기능 지속 구매
- “사용료” 기반 비즈니스

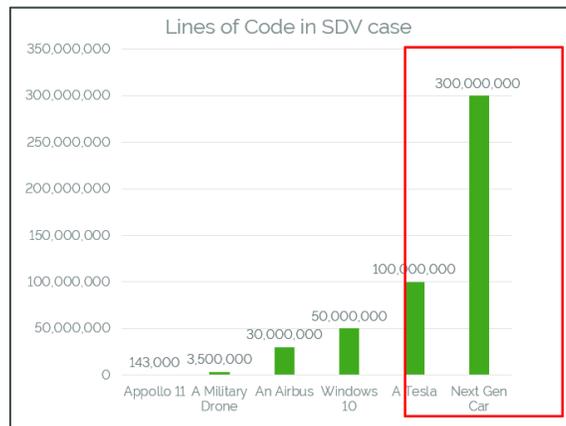


## 새로운 기술요구

- 원격 자율주행 성능 최적화
- SW 중심의 신상품
- 비즈니스 모델 변화(OTA)

SDV SW 개발 운영의 필수 고려사항

1. 지속적인 규제 변화에 대응
2. 대규모 기능개발 및 업데이트
3. 비 정규 기능 개선 및 기능안전을 모두 확보



급격히 늘어나는 SW 개발 코드

- S/W 중심의 제품개발 혁신
- Agile 방식의 제품개발 방법론
- 규제 표준을 위한 개발정보 추적성

“Enterprise Application Lifecycle Management는 Nice to Have가 아닌 Must Have입니다.”

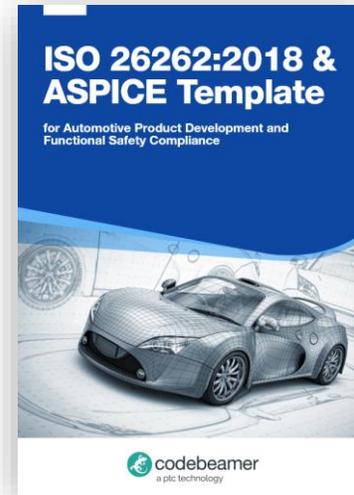
# How to alm?

**Codebeamer**는 전체 개발 수명주기 동안 모든 요구 사항, 변경 요청, 테스트 사례 및 결함을 추적할 수 있습니다.

이는 초기 아이디어부터 제품 출시까지 완전한 가시성을 확보할 수 있음을 의미합니다.

이러한 추적성은 ISO 26262, IEC 62304, ISO 21434, DO-178c 등과 같은 산업 표준을 준수하도록 보장합니다.

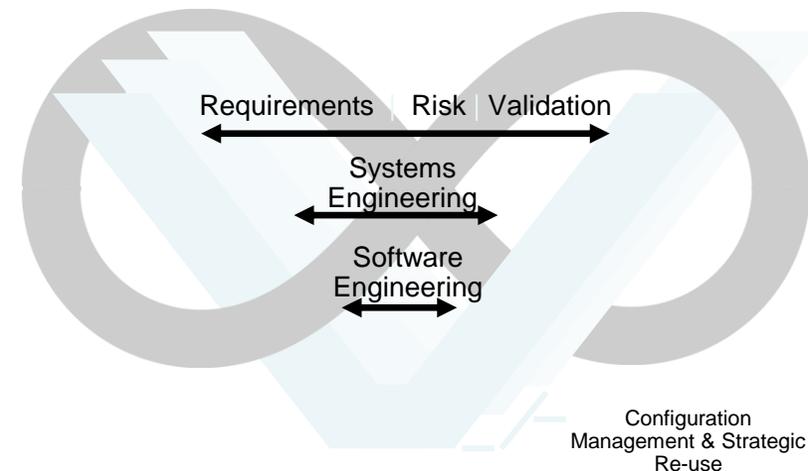
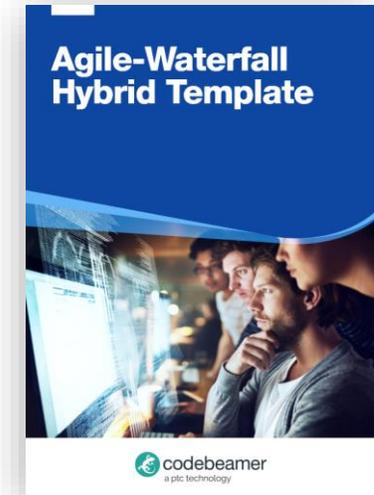
또한 산업 표준 프로세스에 대한 규제 준수 절차를 코드비머 내에서 템플릿 형태로 제공하여 제품 개발에 집중할 수 있는 환경을 제공합니다.



**AUTOMOTIVE TEMPLATE**

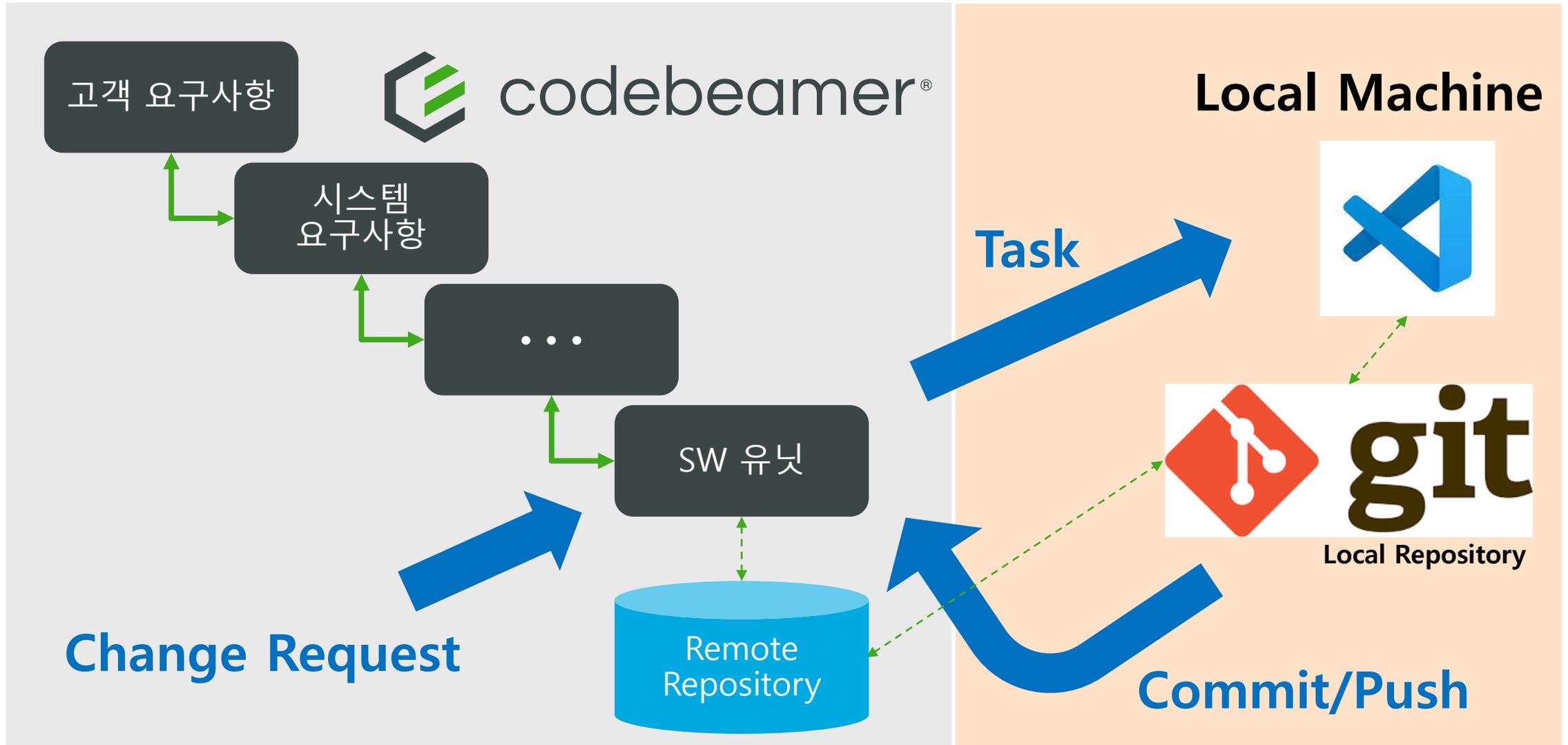


**AGILE FRAMEWORK TEMPLATE**



# 시나리오 1 - 소스코드 추적성

개발 담당자 관점에서의 ALM 활용 데모



# 시나리오 1 - 소스코드 추적성

개발 담당자 관점에서의 ALM 활용 데모

The screenshot displays the CodeBeamer Application Lifecycle Management (ALM) web interface. The browser address bar shows the URL: `pp-24042503552o.portal.ptc.io:9443/cb/projects/browse.spr`. The page title is "codebeamer codebeamer Application Lifecycle Management (ALM)".

The interface features a navigation menu with "My Start", "Projects", "Reports", "Review Hub", "Tags", and "System Admin". The "Projects" section is active, showing a "Project Browser" view. On the left, there is a "STATUS FILTERING" and "CATEGORIES" sidebar. The "Current view: Default View" is selected. Below this, a list of project categories is shown, each with a toggle switch:

- What's new 2.1 Project
- template
- Simulink Project
- Base Demo
- Snowmobile
- Automotive
- Medical
- Pharma
- Defense
- SAFE
- Service Desk
- Product Line Engineering

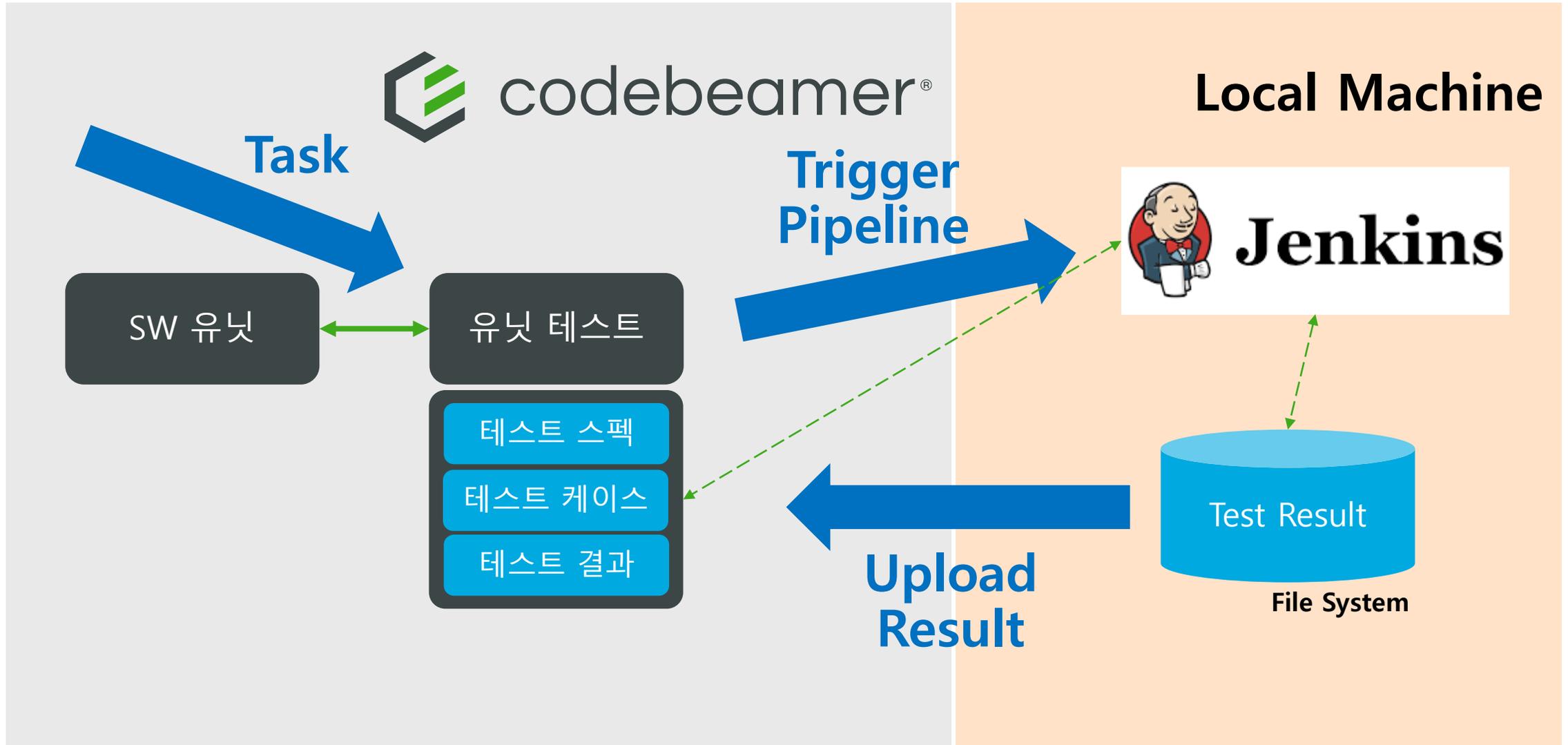
The main content area displays a grid of project templates under various categories:

- Base Demo**: Base Demo Template ADAS dataset, Codeb... Overview Demo, dSPACE Test Project, QnA project, Sample Data for Import Fileshare, Sandbox.
- Snowmobile**: Snowmobile Dataset.
- Automotive**: Automotive Template 2.0, Automotive Template 2.1.3, Codeb... Autom... Template 3.1.
- Medical**: Medical Device Engineering Template, Medical Audit & CAPA Management Demo.
- Pharma**: Pharma GMP 5.
- Defense**: DO 178C Avionics Template.

The footer of the page includes the text: "This site is powered by codebeamer 2.1.0.0 (postprod) | [Feedback](#) | [Questions](#) | [Knowledge Base](#) | [Hotkeys](#) | [Licensed by PTC](#)". The system tray at the bottom right shows the date and time: "2024-08-21 11:24".

# 시나리오 2 - 테스트 실행 및 결과 추적성

시험 담당자 관점에서의 ALM 활용 데모



# 시나리오 2 – 테스트 실행 및 결과 추적성

시험 담당자 관점에서의 ALM 활용 데모

The screenshot displays the Codebeamer Application Lifecycle Management (ALM) web interface. The browser address bar shows the URL: `pp-24042503552o.portal.ptc.io:9443/cb/projects/browse.spr`. The page title is "codebeamer Application Lifecycle Management (ALM)".

The interface features a navigation menu on the left with options: My Start, Projects, Reports, Review Hub, Tags, and System Admin. The main content area is titled "Project Browser" and shows a "Projects List" view. The left sidebar includes filters for "Type to filter", "STATUS FILTERING", "CATEGORIES", and "Current view: Default View".

The main content area displays project templates organized into categories:

- Base Demo:** Includes "Base Demo Template ADAS dataset", "Codeb... Overview Demo", "dSPACE Test Project", "QnA project", "Sample Data for Import Fileshare", and "Sandbox".
- Snowmobile:** Includes "Snowmobile Dataset".
- Automotive:** Includes "Automotive Template 2.0", "Automotive Template 2.1.3", and "Codeb... Autom... Template 3.1".
- Medical:** Includes "Medical Device Engineering Template" and "Medical Audit & CAPA Management Demo".
- Pharma:** Includes "Pharma GMP 5".
- Defense:** Includes "DO 178C Avionics Template".

The footer of the interface states: "This site is powered by codebeamer 2.1.0.0 (postgres) | [ROBOTS](#) | [QUESTION](#) | Knowledge Base | [Hotkeys](#) | Licensed by PTC". The system tray at the bottom shows the date and time: "2024-08-21 12:27".

# 시나리오 3 – 프로젝트 모니터링 및 형상 관리

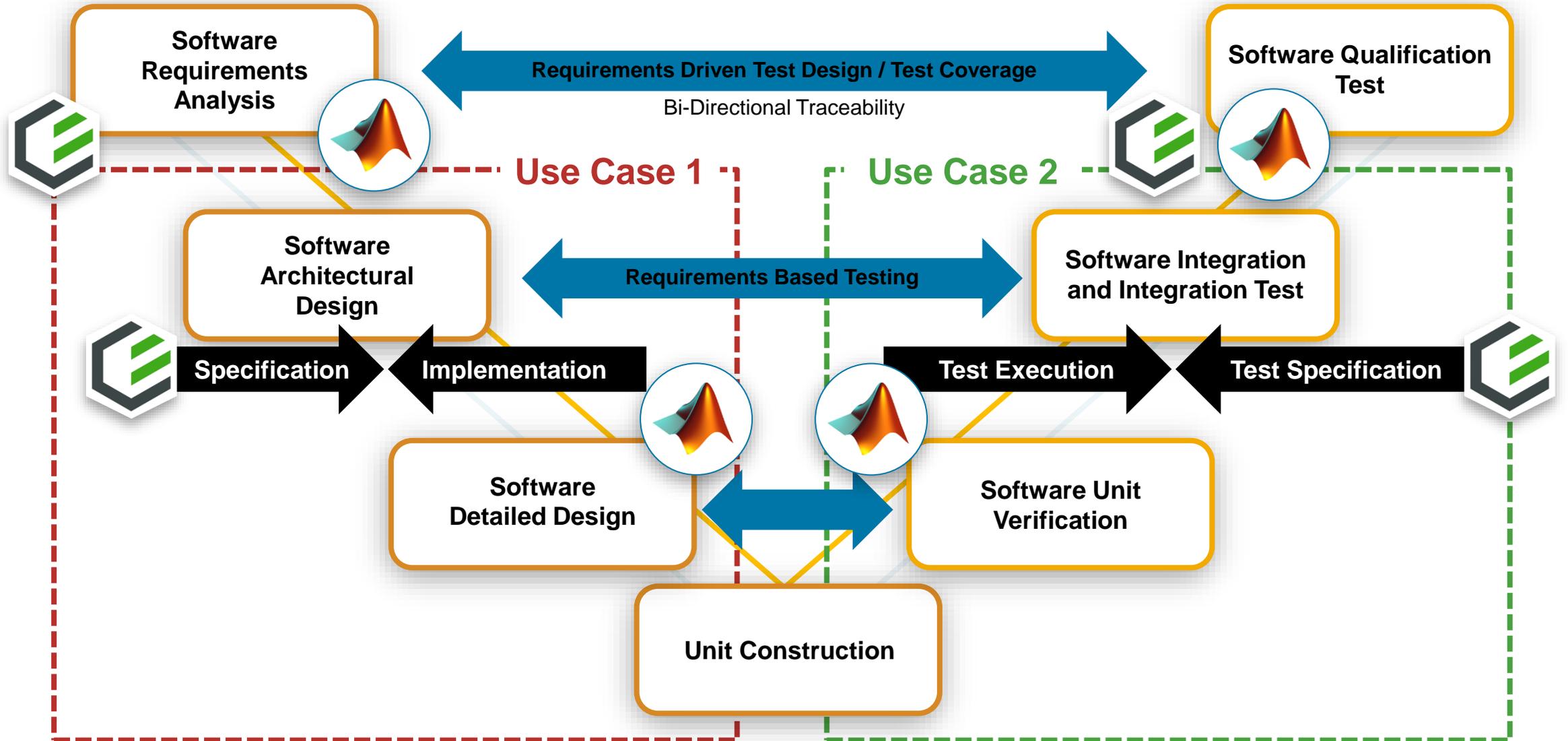
PM/관리자 관점에서의 ALM 활용 데모

The screenshot displays the Codebeamer Application Lifecycle Management (ALM) interface for Project Mattemhorn v1.1. The interface is divided into several sections:

- Portfolio:** A tree view on the left showing the project hierarchy, including Portfolio Value Stream (1/1), Strategic Themes (10/10), Program (01\_Customer Requirement Specifications 12/12), Team Release (11/12), Tasks (44/51), Change Request (0/0), System Requirement Specifications (16/16), System Architecture (2/2), Sub-System Requirement Module (0/0), Config Items (Test Set 0/0, Test Case 6/6, Test Configuration 0/0, Agile Teams 4/4, Build 0/0, Test Runs 2/2).
- My Current Items:** A table showing items with status, submitted date, and name. One item is highlighted as 'READY FOR EXECUTION'.
- Current Velocity:** A section indicating 'No change' with the note 'Same amount of open story points Today (0 resolved/closed, 0 new)'.
- Burn Down Chart:** A line graph showing the burn down of story points from Nov '23 to May '24. The chart includes a legend for ideal, remaining, resolved/closed, and new story points.
- My Reviews:** A section titled 'Nothing found to display'.
- Activity Stream:** A list of recent activities, including field modifications, status changes, and updates to strategic themes.

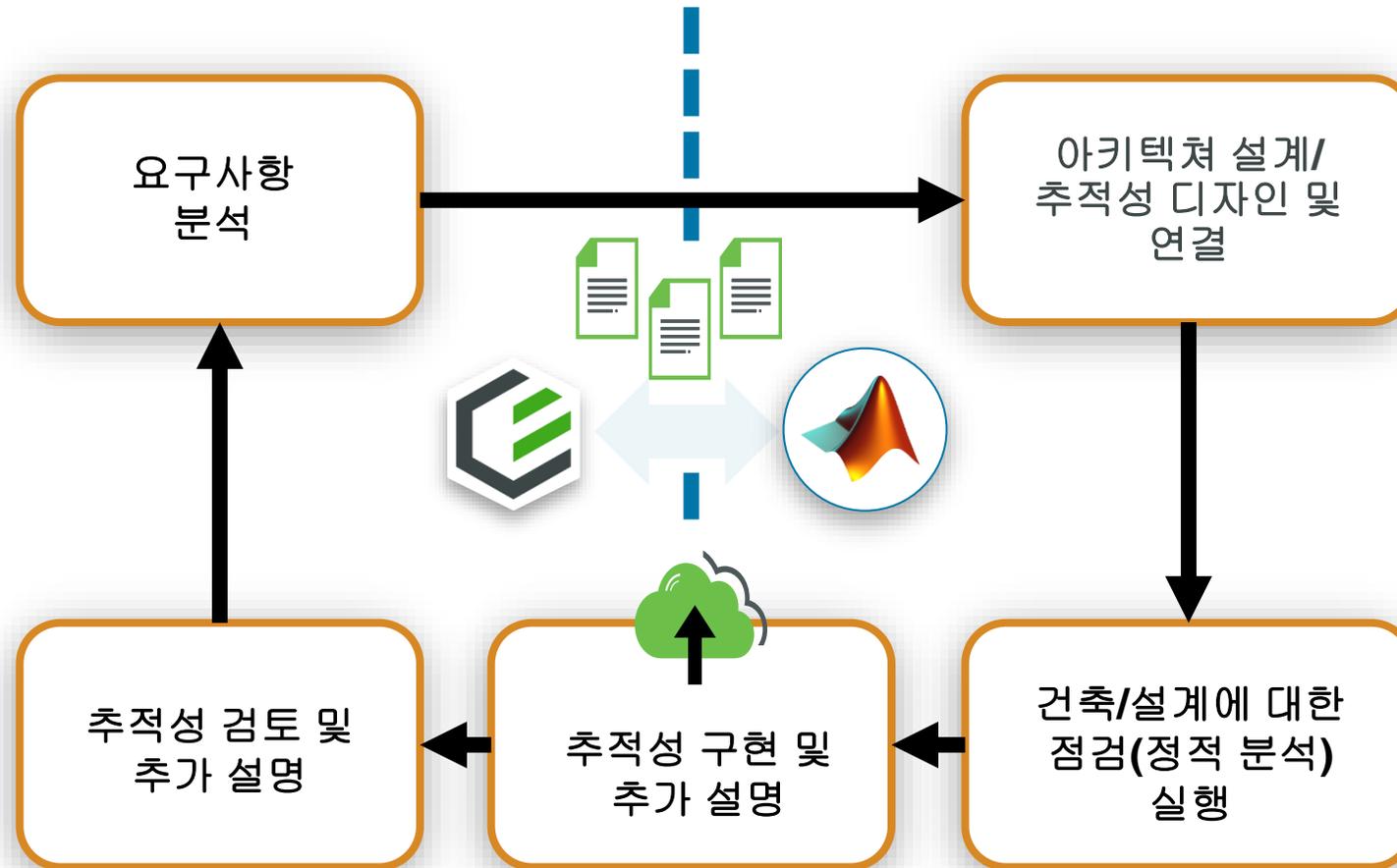
The bottom of the interface shows the system status: 'This site is powered by codebeamer 2.0.0.1 (postgresql) | Incident / Question | Knowledge Base | Hotkeys | Licensed by PTC'. The Windows taskbar at the bottom indicates the time is 11:59 AM on 9/25/2023.

# v-cycle 내의 활용 예제



## Use Case 1:

### 모델 기반 시스템 엔지니어링/모델 기반 디자인



# 모델 기반 시스템 엔지니어링 (MBSE)

## 요구사항 - 모델 간 양방향 추적성 연결

The image displays a Simulink model of a PID controller and its corresponding requirements in Codebeamer. The Simulink model includes blocks for Proportional Gain, Integral Gain, Derivative Gain, and Derivative Filter. A warning dialog box indicates that requirements are outdated for highlighted links. The Codebeamer interface shows a list of requirements, with a yellow highlight on the 'Derivative Specification' requirement, which is linked to the Derivative Gain block in the Simulink model.

**Warning Dialog:**

Warning  
Requirements outdated for highlighted links

**Requirement Links Table:**

Label	Source	Type	Destination
PID~mdl.slmx	Changed source: 0/5		Changed destination: 0/5
(PID/PID/Derivative Gain -> Derivative Specifi...)	Derivative Gain	Implements	Derivative Specifi...
(PID/PID/In1 -> Input) Error input should be ...	In1	Implements	Input
(PID/PID/Integral Gain -> Integrator Specific...)	Integral Gain	Implements	Integrator Specifi...
(PID/PID/Out_1 -> Output) Controller output s...	Out_1	Implements	Output
(PID/PID/Proportional Gain -> Gain Specificati...)	Proportional Gain	Implements	Gain Specificati...

**Codebeamer Requirements List:**

- Derivative Specification**  
A PID controller block should have a tunable derivative gain.  
**There is a requirement change**
- Gain Specification**  
A PID controller should have a tunable proportional gain
- Integrator Specification**  
A PID controller should have a tunable integral gain
- Input**  
Error input should be a port
- Output**  
Controller output should be a port
- PID Block**  
A PID controller should be an atomic sub model with an input and output port

**Requirement Details for [SRS-2074] Derivative Specification:**

- Tracker: System Requirement Specifications
- Business Value: --
- Mitigates: --
- Status: **WAITING FOR APPROVAL**
- Type: --
- Complexity: --
- Release: --
- Submitted by: AndrasBertok Sep 11 14:38
- Modified by: AndrasBertok Today 21:37
- Assigned to: --
- Customer Requirement: --
- Team: --

**Downstream References:**

- Component: [sl\_md1-3415] PID/PID/Derivative Gain **SUSPECTED**

# 모델 기반 시스템 엔지니어링 (MBSE)

## 요구사항 변경 확인

The image displays a dual-screen interface for Model-Based System Engineering (MBSE). The left window shows the Simulink environment with a PID controller model. The right window shows the Codebeamer web interface displaying system requirements.

**Simulink Model (Left Window):**

- Model Name: PID
- Block Diagram Components:
  - Input: 1
  - Proportional Gain: 1
  - Integral Gain: 1
  - Derivative Gain: 1
  - Derivative Filter: 1
  - Summing Junction: +
  - Integrator:  $\frac{1}{s}$
  - Output: Out\_1

**Codebeamer Interface (Right Window):**

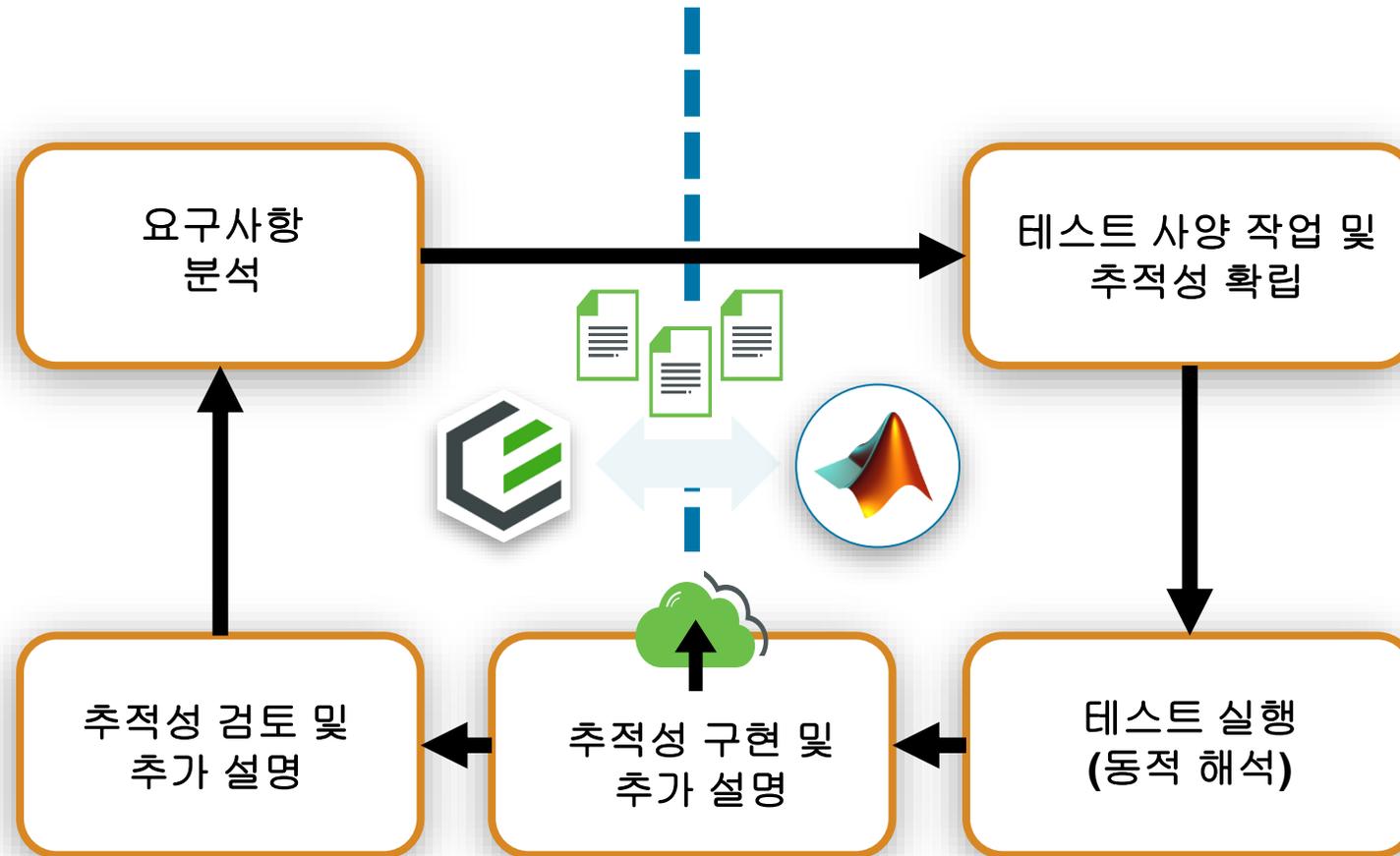
- Project: Customer\_Project\_A > Trackers
- System Requirement Specifications > All Items
- Working-Set: Default Working-Set
- Filter: Type to filter
- System Requirement Specifications List:
  - Gain Specification: A PID controller should have a tunable proportional gain
  - Integrator Specification: A PID controller should have a tunable integral gain
  - Derivative Specification: A PID controller block should have a tunable derivative gain.
  - Input: Error input should be a port
  - Output: Controller output should be a port
  - PID Block: A PID controller should be an atomic sub model with an input and output port

**Requirement Links Table (Bottom Left):**

Label	Source	Type	Destin
PID~mdl.slmx			

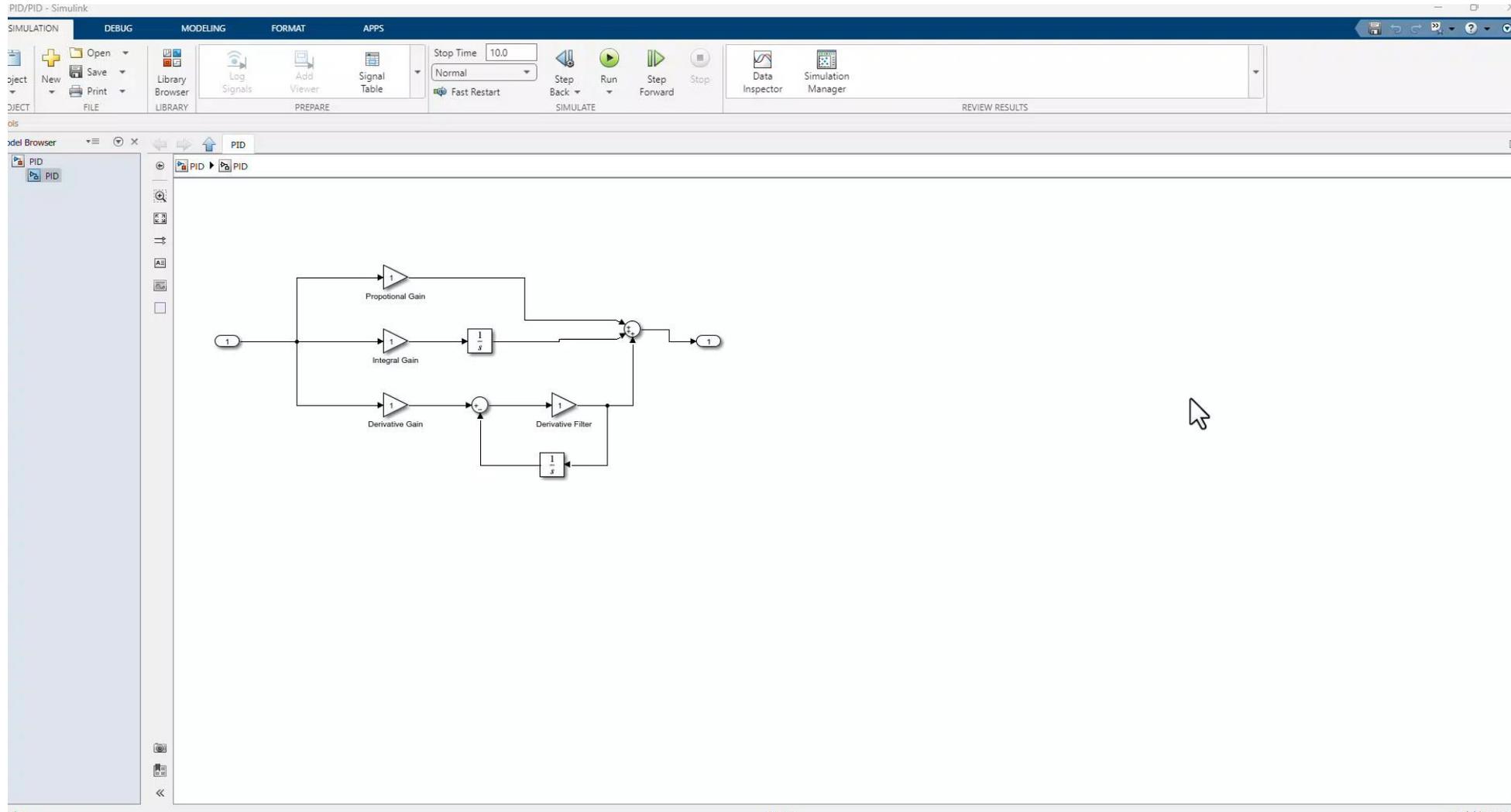
## Use Case 2:

### 요구사항 기반 테스트

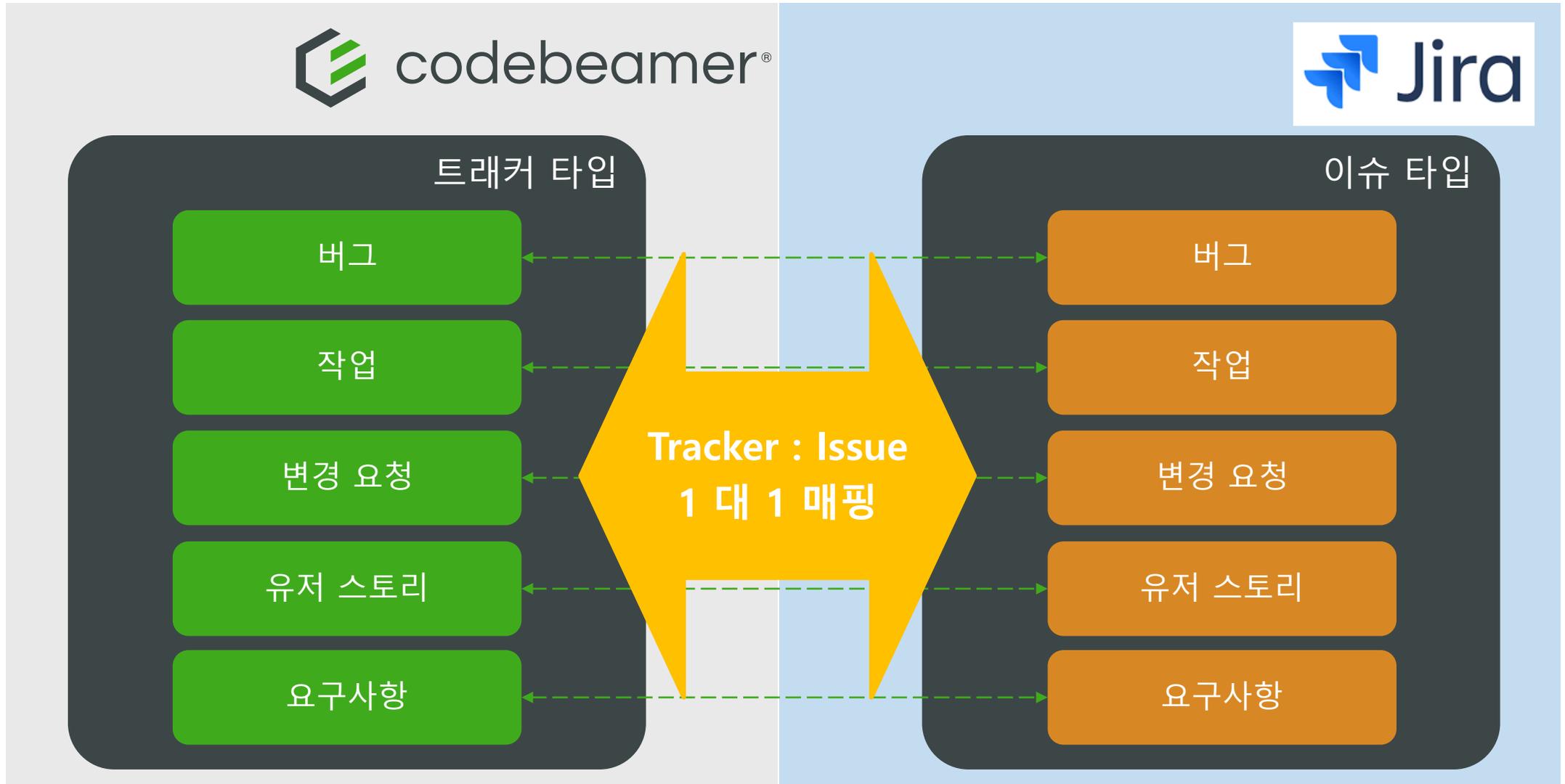


# Continuous Integration(CI) 자동화

## Matlab script을 활용한 CI 자동화



## 외부 툴 연계(JIRA)



# 외부 툴 연계(JIRA)

The image displays two side-by-side screenshots of web interfaces, illustrating the integration between Codebeamer and JIRA.

**Left Screenshot (Codebeamer):** Shows the Codebeamer Application Lifecycle Management (ALM) interface. The main content area displays a list of tasks under the heading "Base Demo Template ADAS dataset - Trackers". The tasks are listed in a table with columns for ID, Summary, Status, Upstream Reference, Team, Resolution, and Release. The tasks include:

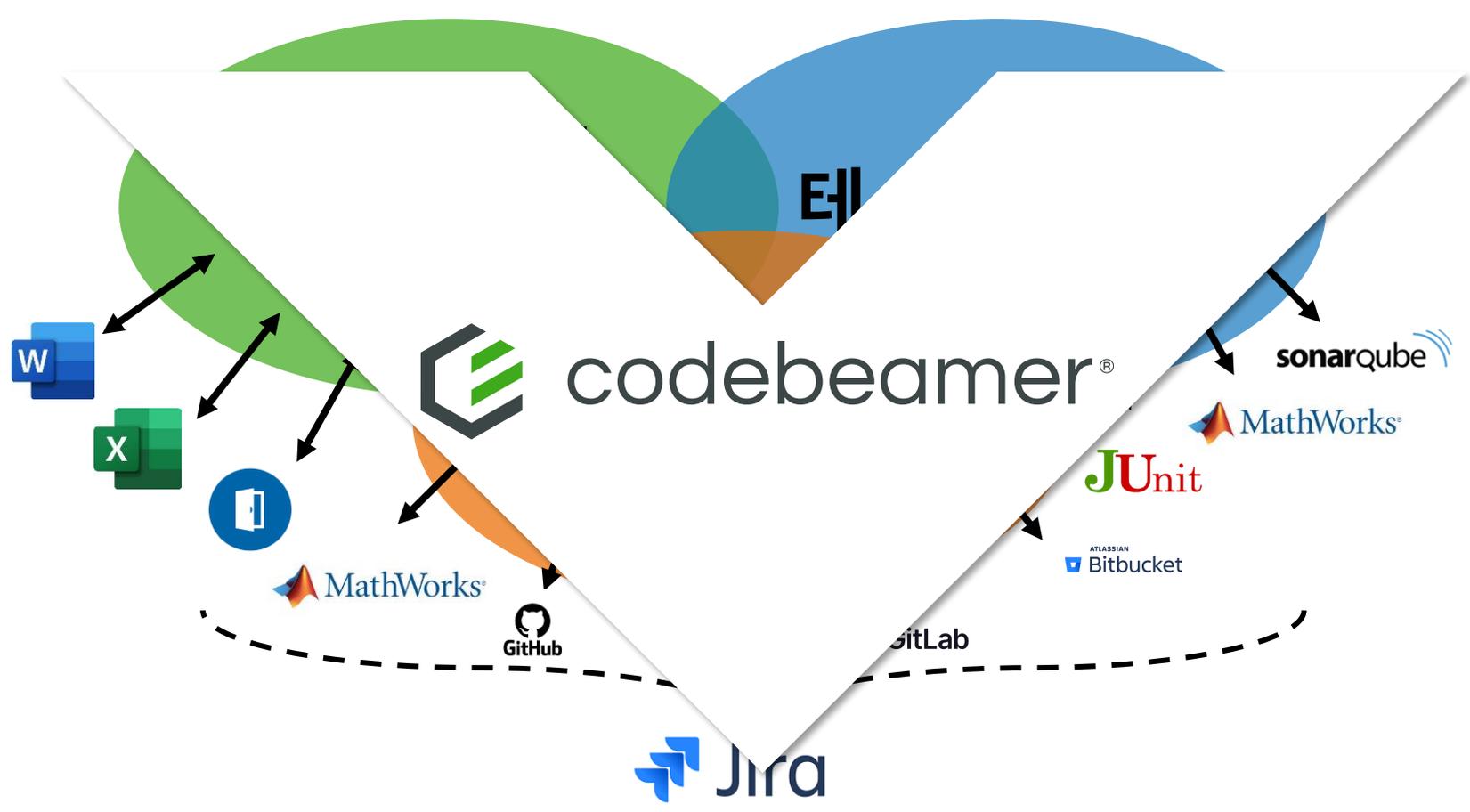
- [TASK-12087] 변경 요청에 따른 시험 요청입니다. (NEW)
- [TASK-12077] 변경 요청에 따른 테스트입니다. (NEW)
- [TASK-11545] task test (NEW)
- [TASK-11448] 코드비어 시험 테스트 데모 (NEW)
- [TASK-11445] 코드비어 테스트 데모 (NEW)
- [TASK-11405] Task Test Beta (TO VERIFY)
- [TASK-11395] Task Commit Test (COMPLETED)
- [TASK-5529] Fix the open bugs (NEW)
- [TASK-2786] Software update to demonstrate GIT integration (IN PROGRESS)

**Right Screenshot (JIRA Software):** Shows the JIRA issue navigator interface. The search results for "kyujin project" are displayed. The first result is selected, showing the following details:

- Summary:** 코드비어 시험 테스트 데모
- Description:** 자세한 사항 수정사항
- Reporter:** Inland Software
- Status:** Unresolved
- Resolution:** Unresolved
- Created:** 23/Jul/24
- Updated:** 23/Jul/24

The interface also shows a list of other issues, including "Task Test Beta", "Task Commit Test", "Fix the open bugs", and "Software update to demonstrate GIT integration".

# Conclusion



완전한  
추적/일관성

국제 표준 대응

개발 시간 단축



# Q&A

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**Thank you**



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