



# MissileNgin

Launching Sequence Test &  
Simulation for Air-Launched Missile

# Contents

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1. MissileNgine Features
2. MissileNgine Components
3. SMC/STORE Development Issues
- 4.mStudio(Platform)
- 5.mStudio(Store)
- 6.ICD Manager Lite
- 7.SMC Model
- 8.Store Model
- 9.Test Flow



# 1. MissileNgine Features

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## ■ What is MissileNgine?

A equipment that simulates sending and receiving MIL-STD-1760 based ICD messages according to the air-to-missile launching sequence.

## ■ Applied Field

- Development of Store Management Computer (SMC)
- Development of Air-launched Missile (Store)

## ■ Features

- Flexibility
  - Message Drag & Drop to create various test scenarios
  - Design and Run Scenario without compilation
  - Message Auto Generation by ICD import
- Accuracy
  - Real-time timing guarantee and data monitoring using RTOS(VxWorks)
  - Simulink based SMC/Store model design for logic and code Integrity
- Efficiency
  - Written scenario re-usage
  - Scenario and project history management
  - Test result reporting
- Error Injection and Verification
  - Timing/ MIL-STD-1760 Message Error/Status Error



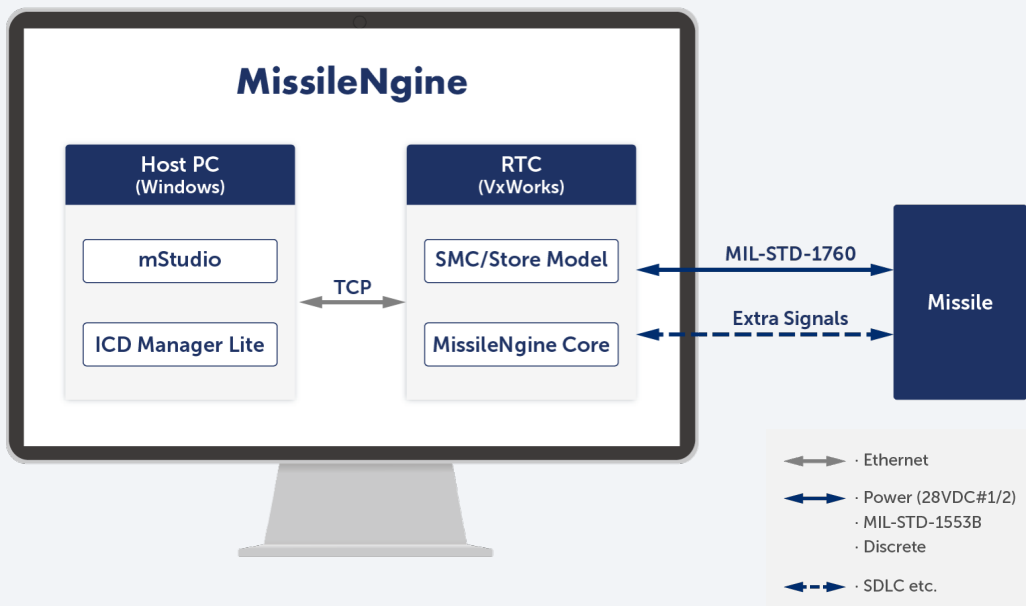
# 2. MissileNginer Components

## Hardware

- VxWorks based Real-time Computer
- Host PC for User Interface
- MIL-STD-1760 Interface
- Additional Interface (SDLC etc.)

## Software

- mStudio
- ICD Manager Lite
- SMC/Store Model
- MissileNginer Core



# 3. SMC/STORE Development Issues

## ■ Absence of counterpart equipment

- ▶ Difficulty in interface test due to absence of counterpart equipment when developing.
- ▶ Increasing the logic accuracy of the real equipment by utilizing the MissileEngine as the interface target when developing each SMC / STORE.

## ■ Frequent ICD Updates

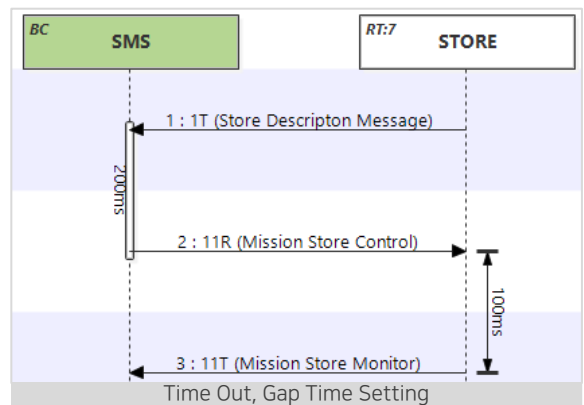
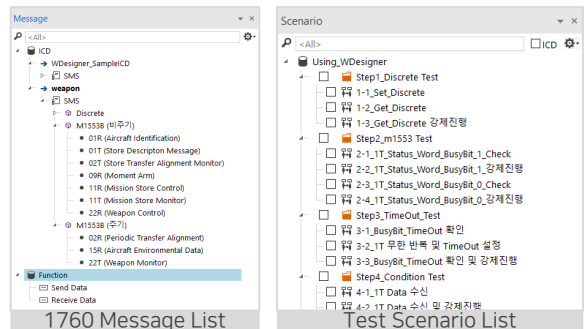
- ▶ Code modification / recompilation and functional test of real equipment are required whenever ICD changed.
- ▶ Function/Status of system can be checked immediately before / after ICD change.

## ■ Strict Time Line Validation

- ▶ The avionics requires accurate real time / periodic message.
- ▶ Can be tested by reflecting the requirements for Time Out, Gap Time, etc. in the scenario.
- ▶ Versatile functional verification is possible through various launch sequence design and repetitive execution.

## ■ Error Injection

- ▶ Error injection of real equipment during testing is limited.
- ▶ For the error injection function, the real equipment must be inserted with a test code.
- ▶ Various error simulations are possible with simple UI operation by the user.



Entry/Exit	Message	Status Word
<input checked="" type="checkbox"/>	Message Error	1
<input type="checkbox"/>	Instrumentation	
<input type="checkbox"/>	Service Request	
<input type="checkbox"/>	Broadcast Command Received	
<input checked="" type="checkbox"/>	Busy	1
<input type="checkbox"/>	Subsystem Flag	
<input type="checkbox"/>	Dynamic Bus Control Acceptance	
<input type="checkbox"/>	Terminal Flag	

Entry/Exit	Message	Status Word						
Use	Id	Name	Type	Ret	Set V.	HEX	DEC	Use
<input type="checkbox"/>	1	[W01] Header	UN176	1		0x0000	0	
<input type="checkbox"/>	2	[W02] Invalidity 1	UN176	1		0x0000	0	
<input type="checkbox"/>	3	[W03] Invalidity 2	UN176	1		0x0000	0	
<input type="checkbox"/>	4	[W04] Critical Control 1	UN176	1		0x0000	0	
<input type="checkbox"/>	5	[W05] Critical Authority 1	UN176	1		0x0000	0	
<input type="checkbox"/>	6	[W06] Critical Control 2	UN176	1		0x0000	0	
<input type="checkbox"/>	7	[W07] Critical Authority 2	UN176	1		0x0000	0	
<input type="checkbox"/>	8	[W08] Reserved_08	UN176	1		0x0000	0	
<input type="checkbox"/>	9	[W09] Reserved_09	UN176	1		0x0000	0	
<input type="checkbox"/>	10	[W10] Reserved_10	UN176	1		0x0000	0	
<input type="checkbox"/>	11	[W11] Reserved_11	UN176	1		0x0000	0	
<input type="checkbox"/>	12	[W12] Reserved_12	UN176	1		0x0000	0	
<input type="checkbox"/>	13	[W13] Reserved_13	UN176	1		0x0000	0	
<input type="checkbox"/>	14	[W14] Reserved_14	UN176	1		0x0000	0	
<input type="checkbox"/>	15	[W15] Reserved_15	UN176	1		0x0000	0	
<input type="checkbox"/>	16	[W16] Reserved_16	UN176	1		0x0000	0	
<input type="checkbox"/>	17	[W17] Reserved_17	UN176	1		0x0000	0	
<input type="checkbox"/>	18	[W18] Reserved_18	UN176	1		0x0000	0	
<input type="checkbox"/>	19	[W19] Reserved_19	UN176	1		0x0000	0	
<input type="checkbox"/>	20	[W20] Reserved_20	UN176	1		0x0000	0	
<input type="checkbox"/>	21	[W21] Reserved_21	UN176	1		0x0000	0	
<input type="checkbox"/>	22	[W22] Reserved_22	UN176	1		0x0000	0	
<input type="checkbox"/>	23	[W23] Reserved_23	UN176	1		0x0000	0	
<input type="checkbox"/>	24	[W24] Reserved_24	UN176	1		0x0000	0	



# 4. mStudio(Platform)

## ■ mStudio for Platform

▶ SW tool for designing and testing timelines from the SMC aspect.

## ■ Features

- ▶ Time Line(1760) Design
- ▶ Scenario Management
- ▶ Additional Signal In/Out Test
- ▶ Launch Sequence Display
- ▶ Test Result Display
- ▶ Test Condition Manipulation
- ▶ Test Result Report

The screenshot displays the mStudio software interface. The main window shows a scenario timeline for 'Noname4\*' with a 'Main Frame Time' of 10 ms. The timeline includes several steps and messages:

- Step1\_Discrete Test (BC SMS)
- Step2\_m1553 Test (RT:7 STORE)
- Step3\_TimeOut Test
- Step4\_Condition Test
- Step5\_Gap Time Test
- Step6\_주기메시지 T...

The timeline shows four messages:

- 1: 1T (Store Description Message)
- 2: 11R (Mission Store Control)
- 3: 11T (Mission Store Monitor)
- 4: 2R (Periodic Transfer Alignment) (25Hz) 40ms/so

The Message Properties panel on the right shows the 'Message Flow' section with 'Name' set to 'Store Description Message' and '1T' selected. Below this, there is a table of message properties:

Use	Idx	Name	Type
<input type="checkbox"/>	1	[W00] Command Word	UINT
<input type="checkbox"/>	2	[W01] Message Des...	UINT
<input type="checkbox"/>	3	[W02] Country Code	UINT
<input type="checkbox"/>	4	[W03] Reserved_03	UINT
<input type="checkbox"/>	5	[W04] Store ID Char...	UINT
<input type="checkbox"/>	6	[W05] Store ID Char...	UINT
<input type="checkbox"/>	7	[W06] Store ID Char...	UINT
<input type="checkbox"/>	8	[W07] Store ID Char...	UINT
<input type="checkbox"/>	9	[W08] Store ID Char...	UINT
<input type="checkbox"/>	10	[W09] Store ID Char...	UINT
<input type="checkbox"/>	11	[W10] Store ID Char...	UINT
<input type="checkbox"/>	12	[W11] Store ID Char...	UINT
<input type="checkbox"/>	13	[W12] Maximum Inte...	UINT
<input type="checkbox"/>	14	[W13] Store Configur...	UINT
<input type="checkbox"/>	15	[W14] Store Configur...	UINT
<input type="checkbox"/>	16	[W15] Store Configur...	UINT
<input type="checkbox"/>	17	[W16] Reserved_16	UINT
<input type="checkbox"/>	18	[W17] Reserved_17	UINT
<input type="checkbox"/>	19	[W18] Reserved_18	UINT

The Log panel at the bottom shows the following messages:

```
[21:21:28.0220] ▶Connect TCP PC-RTCore Fail  
[21:21:07.0283] [1/3] + Connect PC-Daemon
```



# 5. mStudio(Store)

## ■ mStudio for Store

▸ SW tool for status monitoring and behavior simulation from the Store aspect.

## ■ Features

- Store Status Monitoring
- Store Environment Setting
- Panel Builder based GUI
- Message Drag & Drop
- 1553 Message Injection
- Exchanged Message Display

The screenshot shows the mStudio Store Launch Sequence interface. The main window displays a 'Message Init' table with the following data:

Message ID	Description	Status
22T/W04/B03-B06	#B03_B06# TXA_Quality	0
22T/W02/B00	#B00# Safe_To_Release	0
22T/W02/B12	#B12# BAT_On	0
22T/W04/B13-B14	#B13_B14# Nav_Solution_Quality	00

The 'Condition Panel' dialog is open, showing a list of 'T Message' and 'R Message' events with their corresponding status indicators:

- T Message**
  - Store in IBIT
  - BIT
  - Aircraft ID Received
  - Moment Arm Received
  - Target Data Received
  - Air Data Received
  - TXA Good
- R Message**
  - Safe to Release
  - Store Standby
  - Release Consent
  - BAT ON
  - CTS Received
  - Committed To Store

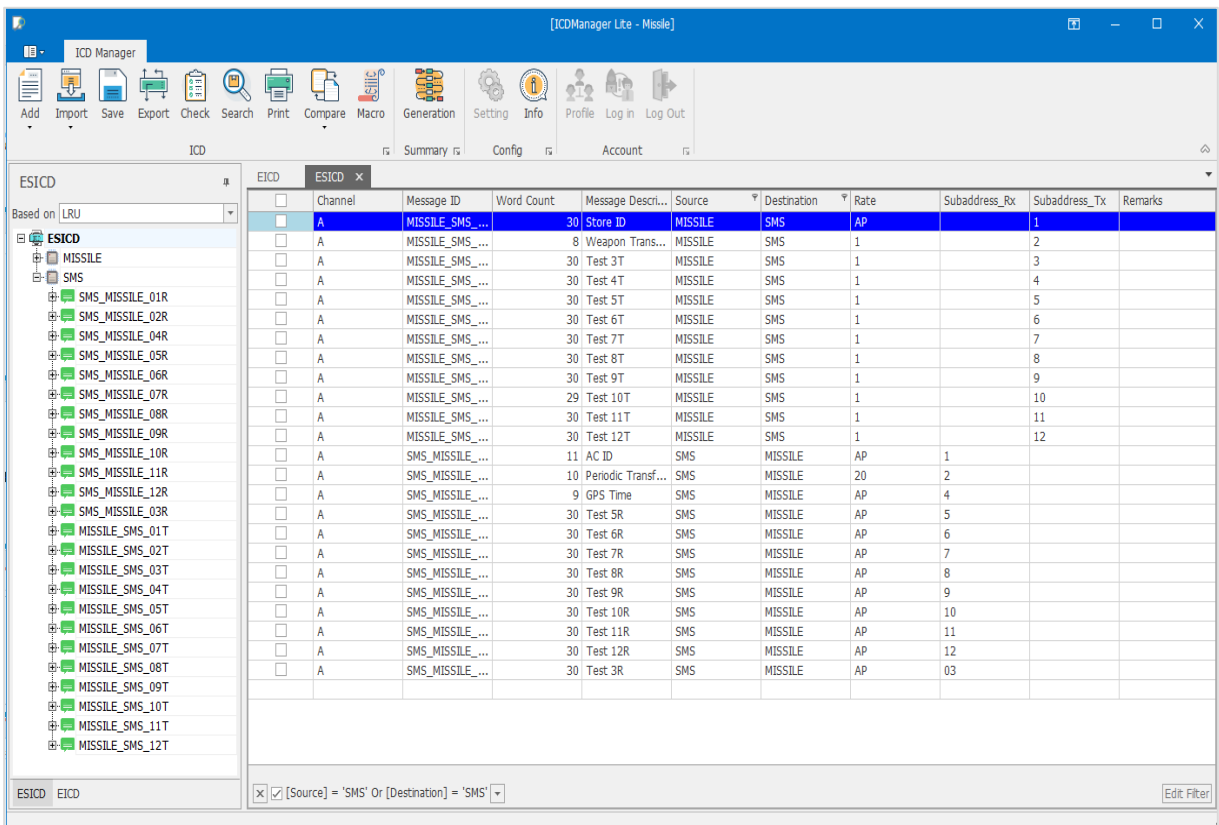
# 6. ICD Manager Lite

## ■ ICD Manager Lite

▸ SW tool for ICD management and conversion.

## ■ Features

- 760 ICD Create/Edit
- DB Import/Export
- Data Validation
- ICD Compare
- Project xml Creation
- ICD Print

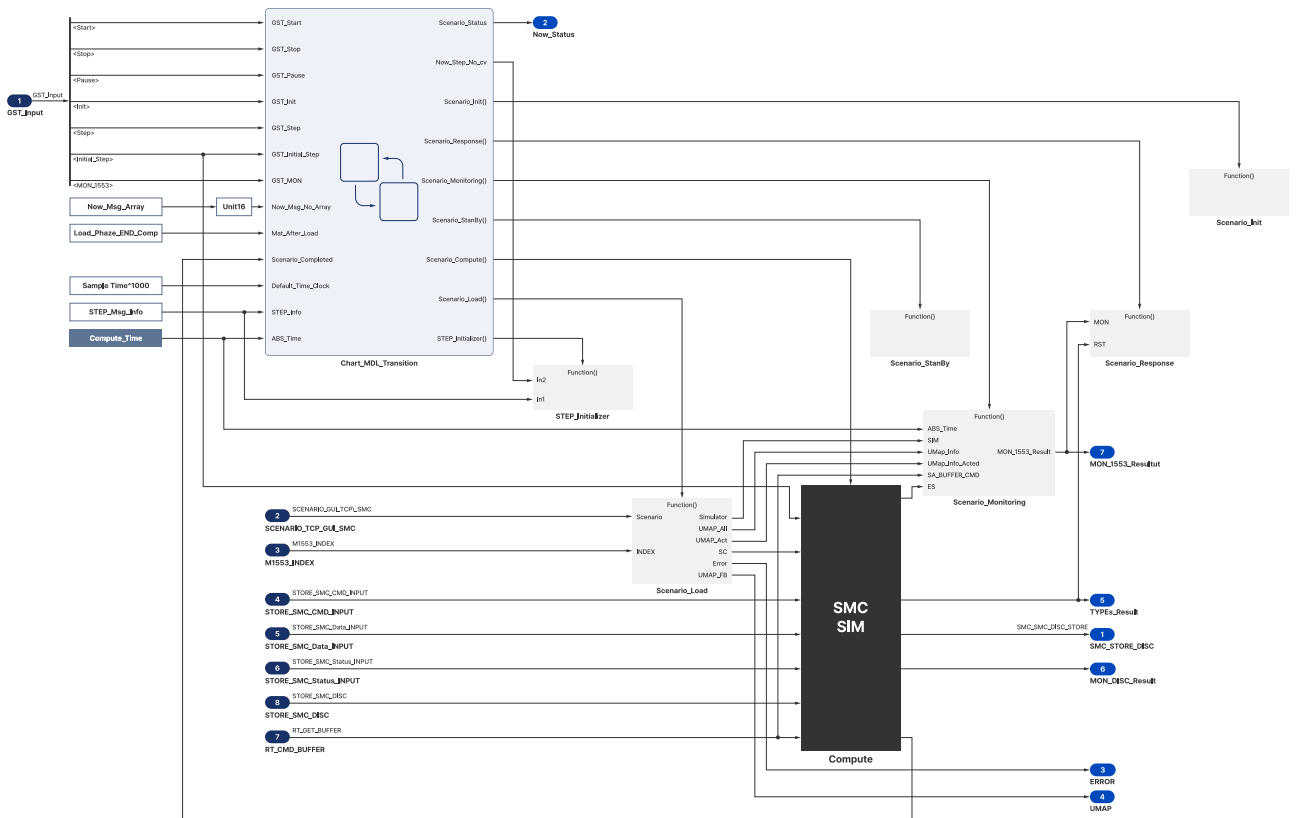




# 7. SMC Model

## ■ SMC Model for Platform

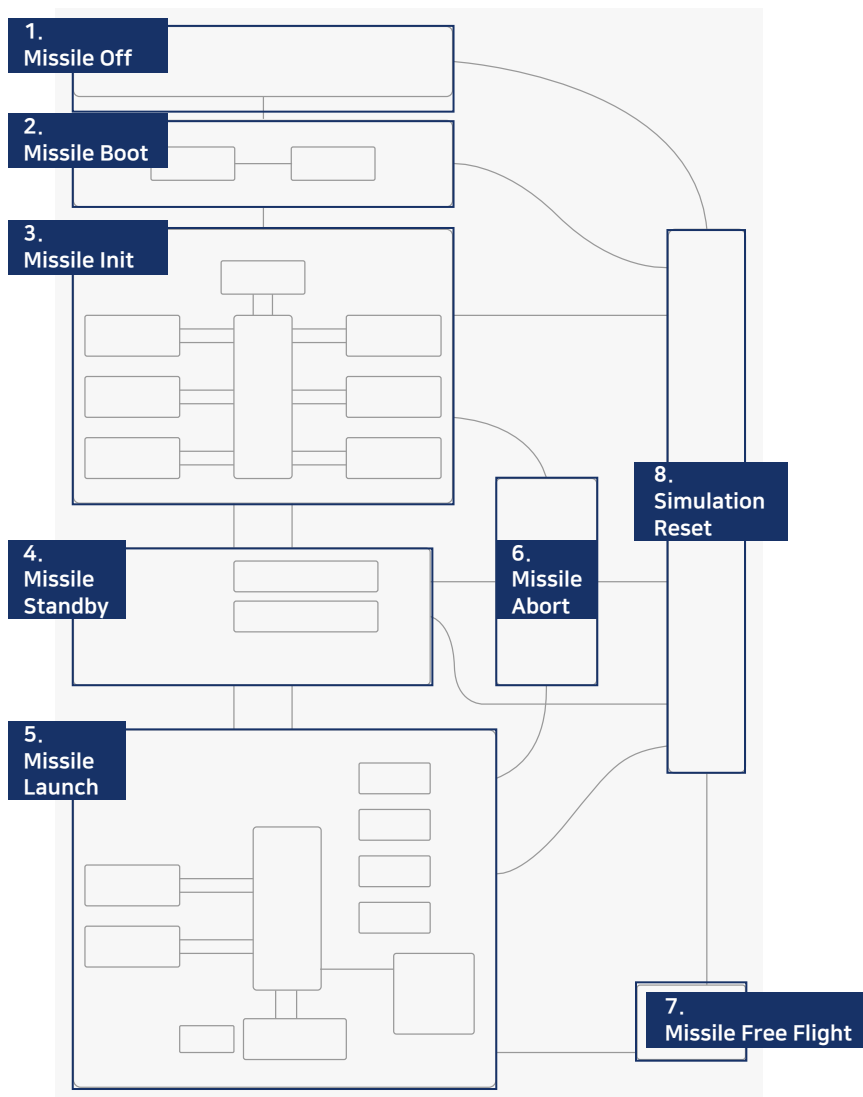
- ▶ SMC Behavior Simulation
- ▶ BC Scheduling (Periodic/Aperiodic)
- ▶ Periodic Message Enable/Disable
- ▶ Aperiodic Message Handling
- ▶ Command Word Control
- ▶ Time Line Execution
- ▶ Message Pass/Fail Judgment



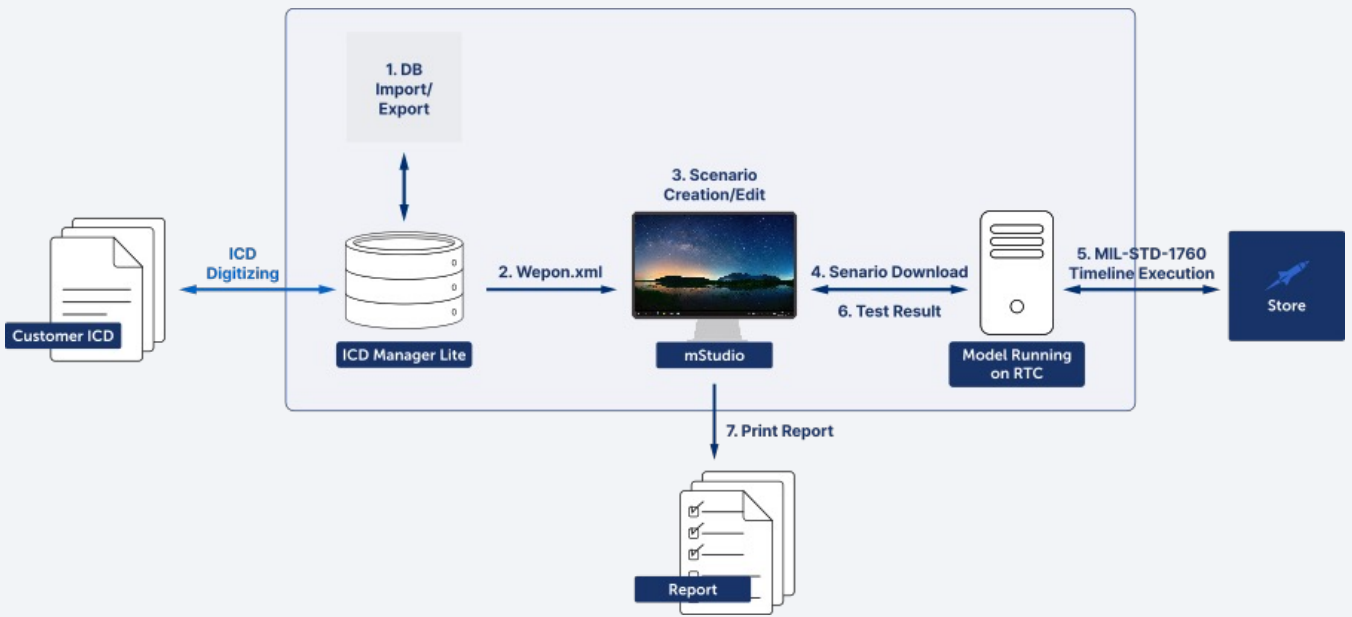
# 8. Store Model

## ■ Store Model

- Store Behavior Simulation
- Remote Terminal
- From Power to Free Flight
- Stage Modulation for Customizing
- Store Status Monitoring
- Status Word Manipulation
- Message Error Injection



# 9. Test Flow





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