RN00010

Release notes for ISSDK v1.8

Rev. 2 — 31 May 2022 Release notes

Document information

Information	Content
Keywords	IoT Sensing SDK, ISSDK, MCUXpresso, middleware
Abstract	Release notes for IoT Sensing SDK (ISSDK) v1.8 middleware

Revision history

Rev	Date	Description
2	20220531	• Section 2 "Features", added new bulleted list of features and moved sections 2.1 through 2.6 to Section 10. • Section 2.1 "Supported sensors", Table 1, revised as follows: – Title: Revised "Sensors supported by ISSDK v1.7" to "Sensors supported by ISSDK v1.8". – Revised "FXLS896xAFR1" to "FXLS8962AFR1". – Revised "FXLS8964AF" to "FXLS8964AFR3" and revised the description of the sensor type. – Inserted new table rows for "FXLS8967AFR3" and "FXLS8974CFR3". – Section 2.2, revised section title from "Algorithm support" to Supported algorithms". • Section 3 "Development tools", revised as follows: – Revised "MCUXpresso IDE v11.5.0" to "MCUXpresso IDE v11.6.0". – Revised "IAR Embedded Workbench for ARM version v9.20.1" to "IAR Embedded Workbench for ARM version v9.20.4". – Revised "MDK-ARM Microcontroller Development Kit (Keil) v5.36" to "MDK-ARM Microcontroller Development Kit (Keil) v5.37". – Revised "*Makefiles* support with GCC revision 10-2021.07 from ARM Embedded" to "*Makefiles* support with GCC revision 10-2021.10 from ARM Embedded". • Section 4 "PC configurations", Table 2, removed "Windows 7 /" from the "Operating system" row. • Section 5 "Supported development systems", revised as follows: – Table 3, added table entry for "FRDM-K22F-A8974". – Table 4, revised the table title from "Custom sensor kits supported by ISSDK v1.7" to "Custom sensor kits supported by ISSDK v1.8". – Table 4, added table entries for "FRDM-K22F with A8967" and "EVK-MIMXRT1040 with A8974". • Section 6 "Release contents", Table 5, revised as follows: – Replaced the "Status" column with "Details" column and added new content in the "Details" column for each row. – Removed the "ISSDK specific drivers" and "Host protocal compliant demo sources" rows from the table. • Section 9 "Known issues", revised "SDK 2.11.0 Rel 15" to "SDK 2.12.0". • Section 10 "Change log", revised as follows: – Inserted new section titled "Change log". – Relocated sections Section 10.1 through Section 10.6 from Section 2 to Section 10. – Section 10.1 "What is new in ISSDK v1.8", revised and added additional content.
1	20211130	Initial release for RN00010. This document supercedes ISDK17RN

1 Overview

The IoT Sensing Software Development Kit (ISSDK) is the embedded software framework enabling NXP's digital and analog sensors platforms for IoT applications. ISSDK provides a unified set of sensor support models that target NXP's portfolio of sensors across a broad range of ARM Cortex core-based Microcontrollers. ISSDK is offered as a middleware component in MCUXpresso SDK for supported microcontrollers. ISSDK relies on the SDK 2.x drivers and project release infrastructure to create a unified user experience. ISSDK v1.8 combines a set of robust sensor drivers and algorithms along with example applications to allow a user to get started using NXP sensors quickly.

2 Features

- Enables rapid prototyping and production applications using NXP sensors.
- Provides NXP's sensor register definitions, register access interfaces and sensor level multiple register read/write interfaces.
- Enables easy porting across broad range of NXP's Arm Cortex M based Microcontrollers by using Arm CMSIS Driver APIs.
- Leverages MCUXpresso SDK (Kinetis, LPC and i.MX SDK) drivers and release infrastructure.
- Provides out-of-box examples and reference software demonstrating configuration and usage of sensors in various supported modes along with application examples using NXP's sensors.
- Provides bare metal and FreeRTOS based reference examples using NXP's sensors.
- Provides reference algorithm examples, libraries and interfaces to access algorithms like sensor fusion and pedometer.
- Provides out-of-box sensor demonstration projects using FreeMASTER Sensor Tool.
- Supports multiple toolchains: MCUXpresso, IAR, KEIL MDK, Arm GCC.

2.1 Supported sensors

The following NXP sensors are supported by ISSDK v1.8:

Table 1. Sensors supported by ISSDK v1.8

Sensor part number	Sensor type	Interface		
		SPI	I^2C	ADC
FXAS21002C	Gyroscope	✓	✓	—
FXLC95000CL	Intelligent accelerometer	✓	✓	—
FXLS8471QR1	Digital accelerometer	✓	✓	—
FXLS8962AFR1	Low power, 12-bit, 3-axis digital accelerometer	✓	✓	—
FXLS8964AFR3	Low power, 12-bit, 3-axis accelerometer for automotive keyfob applications.	✓	✓	—
FXLS8967AFR3	Low power, 12-bit, 3-axis digital accelerometer for automotive comfort and safety applications.	✓	✓	—

Table 1. Sensors supported by ISSDK v1.8*...continued*

Sensor part number	Sensor type	Interface		
		SPI	I^2C	ADC
FXLS8974CFR3	Low power, 12-bit, 3-axis digital accelerometer for industrial/mechanical IoT applications.	✓	✓	—
FXOS8700CQ	Digital accelerometer and magnetometer	✓	✓	—
FXPQ3115BV	Pressure/Bio-Compatible	—	✓	—
FXPS7250A4	Analog absolute pressure sensor, 20 kPa to 250 kPa	—	—	✓
FXPS7250D4	High-performance, high-precision, barometric absolute pressure sensor	—	✓	—
MAG3110	Digital magnetometer	—	✓	—
MMA845xQR1	Digital accelerometer	—	✓	—
MMA8491Q	Digital accelerometer	—	✓	—
MMA8652FCR1	Digital accelerometer	—	✓	—
MMA9553	Intelligent accelerometer	—	✓	—
MPL3115A2	Digital pressure	—	✓	—
MPXV5004DP	Differential and gauge, integrated analog pressure sensor	—	—	✓

2.2 Supported algorithms

ISSDK v1.8 supports Sensor Fusion V7.2.x algorithm deployed as example applications and source code libraries.

ISSDK v1.8 supports a pedometer algorithm V1.0 deployed as example applications, interface files and a binary library.

3 Development tools

The ISSDK v1.8 is supported with the following development toolchains:

- MCUXpresso IDE v11.6.0
- IAR Embedded Workbench for ARM version v9.20.4
- MDK-ARM Microcontroller Development Kit (Keil) v5.37
- *Makefiles* support with GCC revision 10-2021.10 from ARM Embedded

4 PC configurations

The system configurations required to use ISSDK v1.8 supported development toolchains are as follows:

Table 2. PC configurations

Parameter	Minimum configuration	Recommended configuration
Operating system	Windows 10	
Communications to target hardware	USB port	
Processor speed in GHz	1.8	2.6
RAM in GB	4	8
Free disk space in GB	20	400

5 Supported development systems

ISSDK v1.8 is designed to be distributed as codebases created by MCUXpresso SDK Builder targeting a particular sensor demonstration kit. A sensor demonstration kit is defined as a known combination of a Freedom Development Board and an Arduino compatible Sensor Shield board. MCUXpresso SDK Builder allows selection of these kits as input configurations to the SDK Builder.

The following standard (Table 3) and custom (Table 4) sensor kits are supported by ISSDK v1.8:

- Standard sensor kits are official MCU board - sensor shield kits which are available for end user to order from NXP Sensor Evaluation Boards web page.
- Custom sensor kits are board shield pairs which will not be available for end user to order as official MCU board - sensor shield kits (MCU board and sensor shield must be ordered separately).

Table 3. Standard sensor kits supported by ISSDK v1.8

Sensor kit	MCU board	Sensor shield board
FRDM-K22F-A8964	FRDM-K22F	FRDM-STBA-A8964
FRDM-K22F-A8974	FRDM-K22F	FRDM-STBI-A8974
FRDM-K22F-AGMP03	FRDM-K22F	FRDM-STBC-AGMP03

Table 3. Standard sensor kits supported by ISSDK v1.8*...continued*

Sensor kit	MCU board	Sensor shield board
FRDM-K22F-AGM01	FRDM-K22F	FRDM-STBC-AGM01
FRDM-K22F-SA9500	FRDM-K22F	FRDM-STBC-SA9500
FRDM-K64F-AGM01	FRDM-K64F	FRDM-STBC-AGM01
FRDM-K64F-AGM04	FRDM-K64F	FRDM-STBC-AGM04
FRDMKE15-DP5004	FRDM-KE15Z	FRDMSTBCDP5004
FRDM-KL25Z	FRDM-KL25Z	Using on-board MMA8451
FRDMKL25-A8471	FRDM-KL25Z	FRDMSTBC-A8471
FRDMKL25-A8491	FRDM-KL25Z	FRDMSTBC-A8491
FRDMKL25-P3115	FRDM-KL25Z	FRDMSTBC-P3115
FRDM-KL27Z	FRDM-KL27Z	Using on-board MMA8451, MAG3110
FRDMKL27-B3115	FRDM-KL27Z	FRDMSTBI-B3115

Table 4. Custom sensor kits supported by ISSDK v1.8

Sensor kit	MCU board	Sensor shield board
FRDM-KE15Z with PA7250	FRDM-KE15Z	FRDM-STBA-PA7250
LPCXpresso55S06 with AGM01	LPCXpresso55S06-EVK	FRDM-STBC-AGM01
EVK-MIMXRT1170 with AGM01	EVK- MIMXRT1170	FRDM-STBC-AGM01
EVK-MIMXRT595 with AGM01	EVK-IMXRT595	FRDM-STBC-AGM01
MIMXRT1024-EVK with AGM01	MIMXRT1024-EVK	FRDM-STBC-AGM01
FRDM-KE15Z with PD7250	FRDM-KE15Z	FRDM-STBA-PD7250
FRDM-K22F with A8967	FRDM-K22F	FRDM-STBA-A8967
FRDM-KL27Z with A8471	FRDM-KL27Z	FRDM-STBC-A8471
FRDM-KL27Z with P3115	FRDM-KL27Z	FRDM-STBC-P3115
FRDM-KL27Z with A8491	FRDM-KL27Z	FRDM-STBC-A8491
EVKB-IMXRT1050 with AGM01	EVKB-IMXRT1050	FRDM-STBC-AGM01
EVK-MIMXRT1040 with A8974	EVK-MIMXRT1040	FRDM-STBI-A8974
EVK-MIMXRT1010 with AGM01	EVK-MIMXRT1010	FRDM-STBC-AGM01
EVK-MIMXRT1015 with AGM01	EVK-MIMXRT1015	FRDM-STBC-AGM01
EVK-MIMXRT1020 with AGM01	EVK-MIMXRT1020	FRDM-STBC-AGM01

Table 4. Custom sensor kits supported by ISSDK v1.8...*continued*

Sensor kit	MCU board	Sensor shield board
EVK-MIMXRT1050 with AGM01	EVK-MIMXRT1050	FRDM-STBC-AGM01
EVK-MIMXRT1060 with AGM01	EVK-MIMXRT1060	FRDM-STBC-AGM01
EVK-MIMXRT1064 with AGM01	EVK-MIMXRT1064	FRDM-STBC-AGM01
FRDM-K32L3A6 with AGM01	FRDM-K32L3A6	FRDM-STBC-AGM01
FRDM-K32W042 with AGM01	FRDM-K32W042	FRDM-STBC-AGM01
FRDM-K64F with MULT2B	FRDM-K64F	FRDM-FXS-MULT2-B
LPCXpresso54114 with AGM01	LPXCpresso54114	FRDM-STBC-AGM01
LPCXpresso55S16 with FRDM-STBC-AGM01	LPCXpresso55S16	FRDM-STBC-AGM01
LPCXpresso55s69 with AGM01	LPCXpresso55s69	FRDM-STBC-AGM01
MEK-MIMX8QM	MEK-MIMX8QM	Using on-board FXOS8700, FXAS21002, MPL3115, ISL29023
MIMXRT685-EVK with FRDM-STBC-AGM01	MIMXRT685-EVK	FRDM-STBC-AGM01

6 Release contents

Table 5. Release contents

Deliverable	Location	Details
Kits	<install_dir>/boards/<kit_name>	Sensor board kit files and examples.
Sensor driver examples	<install_dir>/boards/<kit_name>/issdk_examples/sensors	ISSDK reference sensor driver examples for chosen sensor kit.
Algorithm examples	<install_dir>/boards/<kit_name>/issdk_examples/algorithms	ISSDK reference algorithm examples for chosen kit.
Board kit specific configuration	<install_dir>/middleware/issdk/boardkit	ISSDK source files containing board-shield mapping files for sensor kits.
CMSIS driver Implementations	<install_dir>/middleware/issdk/drivers	ISSDK source files for ISSDK specific additional drivers.
Documentation	<install_dir>/docs/ISSDK	ISSDK documentation
Middleware	<install_dir>/middleware/issdk	ISSDK middleware sources deployed in MCUXpresso SDK package

Table 5. Release contents*...continued*

Deliverable	Location	Details
Sensor algorithms	<install_dir>/middleware/issdk/algorithms	ISSDK algorithm sources
Driver examples	<install_dir>/middleware/issdk/driverexamples	ISSDK sensor driver example sources
Sensor drivers	<install_dir>/middleware/issdk/sensors	ISSDK sensor driver sources with sensor register definition files
CMSIS Driver API Includes	<install_dir>/CMSIS/Driver/Include	ISSDK CMSIS driver includes

7 MISRA compliance

All MCUXpresso SDK drivers comply to MISRA 2012 rules with exceptions in

Table 6. MISRA exception rules

Exception rules	Description
Directive 4.4	Sections of code should not be commented out.
Directive 4.5	Identifiers in the same name space with overlapping visibility should be typographically unambiguous.
Directive 4.6	Typedefs that indicate size and signedness should be used in place of the basic numerical types.
Directive 4.8	If a pointer to a structure or union is never dereferenced within a translation unit, then the implementation of the object should be hidden.
Directive 4.9	A function should be used in preference to a function-like macro where they are interchangeable.
Directive 4.13	Functions which are designed to provide operations on a resource should be called in an appropriate sequence.
Rule 1.2	Language extensions should not be used.
Rule 2.3	A project should not contain unused type declarations.
Rule 2.4	A project should not contain unused tag declarations.
Rule 2.5	A project should not contain unused macro declarations.
Rule 2.6	A function should not contain unused label declarations.
Rule 2.7	There should be no unused parameters in functions.
Rule 4.2	Trigraphs should not be used.
Rule 5.1	External identifiers shall be distinct.
Rule 5.4	Macro identifiers shall be distinct.
Rule 5.9	Identifiers that define objects or functions with internal linkage should be unique.
Rule 8.7	Functions and objects should not be defined with external linkage if they are referenced in only one translation unit.
Rule 8.9	An object should be defined at block scope if its identifier only appears in a single function.

Table 6. MISRA exception rules*...continued*

Exception rules	Description
Rule 8.11	When an array with external linkage is declared, its size should be explicitly specified.
Rule 8.13	A pointer should point to a const-qualified type whenever possible.
Rule 10.5	The value of an expression should not be cast to an inappropriate essential type.
Rule 11.4	A conversion should not be performed between a pointer to object and an integer type.
Rule 11.5	A conversion should not be performed from pointer to void into pointer to object.
Rule 12.1	The precedence of operators within expressions should be made explicit.
Rule 12.3	The comma operator should not be used.
Rule 12.4	Evaluation of constant expressions should not lead to unsigned integer wrap-around.
Rule 13.3	A full expression containing an increment (++) or decrement (–) operator should have no other potential side effects other than that caused by the increment or decrement operator.
Rule 15.4	There should be no more than one break or go to statement used to terminate any iteration statement.
Rule 17.5	The function argument corresponding to a parameter declared to have an array type shall have an appropriate number of elements.
Rule 18.8	A function parameter should not be modified.
Rule 19.2	The union keyword should not be used.
Rule 20.1	#include directives should only be preceded by preprocessor directives or comments.
Rule 20.10	The # and ## preprocessor operators should not be used.
Rule 21.1	#define and #undef shall not be used on a reserved identifier or reserved macro name.
Rule 21.2	A reserved identifier or macro name shall not be declared.
Rule 21.12	The exception handling features of <fenv.h> should not be used.

8 Open and closed defects

8.1 ISSDK v1.8 open defects

There are no open defects in ISSDK v1.8.

8.2 ISSDK v1.8 closed defects

There are no closed defects in ISSDK v1.8 (no open defects reported in ISSDK v1.7).

9 Known issues

There are no known issues in this software release. For known issues in MCUXpresso SDK 2.12.0, refer to the release notes for MCUXpresso SDK.

10 Change log

10.1 What is new in ISSDK v1.8

- ISSDK middleware component integrated with MCUXpresso SDK 2.12.0 ecosystem.
- ISSDK enablement for FXLS8964AF - 3 axis accelerometer for automotive keyfob applications.
  - Added FXLS8964AF sensor driver
  - Added FRDM-K22F-A8964 (sensor evaluation kit for FXLS8964AF) and reference examples into MCUXpresso SDK.
- ISSDK enablement for FXLS8967AF - 3 axis accelerometer for automotive security and convenience applications.
  - Added FXLS8967AF sensor driver
  - Added custom kit FRDM-K22F with A8967 (sensor evaluation kit for FXLS8967AF) and reference examples into MCUXpresso SDK.
- ISSDK enablement for FXLS8974CF - 3 axis accelerometer for industrial/medical IoT applications.
  - Added FXLS8974CF sensor driver
  - Added sensor kit FRDM-K22F-A8974 (sensor evaluation kit for FXLS8974CF) and reference examples into MCUXpresso SDK.

10.2 What is new in ISSDK v1.7

- ISSDK middleware component integrated with MCUXpresso SDK 2.10.0 Rel 14 ecosystem
- Added ISSDK examples for FreeMASTER Sensor Tool using FreeMASTER communication drivers.
  - Added FXLS8962 ISSDK example project for FreeMASTER Sensor Tool.
    Added FXOS8700 ISSDK example project for FreeMASTER Sensor Tool.
    Added MMA8652 ISSDK example project for FreeMASTER Sensor Tool.
- ISSDK enablement on LPCXpresso55S06
  - Added sensors examples for LPCXpresso55S06 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on EVK-MIMXRT1170
  - Added sensors examples for EVK-MIMXRT1170 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on MIMXRT1024-EVK
  - Added sensors examples for MIMXRT1024-EVK custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on EVK-MIMXRT595
  - Added sensors examples for EVK-MIMXRT595 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on LPC55S16-EVK
  - Added sensors examples for LPCXpresso55S16 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on MIMXRT685-EVK
  - Added sensors examples for MIMXRT685-EVK custom kit with FRDM-STBC-AGM01

in MCUXpresso

- ISSDK enablement on EVKB-IMXRT1050
  - Added sensors examples for EVKB-IMXRT1050 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement for EVK-MIMXRT1010
  - Added sensor examples for EVK-MIMXRT1010 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on EVK-MIMXRT1015
  - Added sensors examples for EVK-MIMXRT1015 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on EVK-MIMXRT1020
  - Added sensors examples for EVK-MIMXRT1020 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on EVK-MIMXRT1060
  - Added sensors examples for EVK-MIMXRT1060 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on EVK-MIMXRT1064
  - Added sensors examples for EVK-MIMXRT1064 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement for FRDM-K32L3A6
  - Added sensor examples for FRDM-K32L3A6 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement for FXPS7250A4 Analog absolute pressure sensor.
  - Added FXPS7250A4 sensor driver
  - Added sensor example for FRDM-KE15Z kit with FRDMSTBA-PA7250 in MCUXpresso
- ISSDK enablement on LPC55S69-EVK
  - Added sensors examples for LPCXpresso55S69 custom kit with FRDM-STBC-AGM01 in MCUXpresso
- ISSDK enablement on MEK-MIMX8QM
  - Enabled on-board sensors (FXOS8700, FXAS21002, MPL3115, ISL29023) examples for MEK-MIMX8QM in MCUXpresso
- Added MCUXpresso IDE support for pedometer examples for kits based on FRDM-STBC-AGM01, FRDM-STBC-AGM04 and FRDM-STBC-MULT2-B, and on-board sensor kits based on FRDM-KL25Z and FRDM-KL27Z

10.3 Delivered in ISSDK v1.6

- ISSDK middleware component integrated with MCU SDK 2.3 Rel7 ecosystem
- ISSDK enablement on EVK-MIMXRT1050
  - Added GPIO abstraction layer
  - Added sensors examples for EVK-MIMXRT1050 custom kit with AGM01 in MCUXpresso
- ISSDK enablement on LPC5411x
  - Added GPIO abstraction layer
  - Added custom kit examples for AGM01 and AGMP03 in MCUXpresso
- ISSDK enablement on KE15Z
  - Added kit examples for MPXV5004DP in MCUXpresso
  - Added sensor driver and sample applications for MPXV5004DP

  - FRDM-KE15Z analog example project for MPXV5004DP
- Added orientation demos with Host I/O support (AGM01)
- ISSDK enablement on FRDM-K32W042
  - Added GPIO abstraction layer
  - Added sensors examples for FRDM-K32W042 custom kit with AGM01 in MCUXpresso

10.4 Delivered in ISSDK v1.5

- ISSDK middleware component integrated with MCU SDK 2.2 Rel6 ecosystem.
- ISSDK project generation module updated to support MCUXpresso IDE. ISSDK kits sensor and algorithm example projects are now supported with MCUXpresso IDE.
- Added additional sensor examples:
  - FRDM-KL27Z on-board MAG3110 examples
  - FXAS21002 SPI example
- Added STB-CE host protocol compliant demo sources supported with STB-CE (Freedom Sensor ToolBox – Community Edition).

10.5 Delivered in ISSDK v1.1

- ISSDK middleware component integrated with MCU SDK 2.1 Rel5 ecosystem.
- Adoption of KSDK 2.0 CMSIS driver implementations.
- Added FRDM-K64F-AGM04 kit.
- Created sensor driver for FXPQ3115 pressure/bio-compatible sensor.
- Added FRDMKL27-B3115 kit.
- Added FRDM-KL25Z as an MMA8451 kit.
- Added FRDM-KL27Z as an MMA8451 kit.
- Added FreeRTOS sensor fusion algorithm examples for FRDM-K64F-AGM04.
- Added bare metal sensor fusion algorithm examples for FRDM-K64F-AGM01 and FRDM-K22F-AGM01.
- Added pedometer algorithm example for FRDM-K64F-AGM04.
- Added pedometer algorithm example for FRDM-KL25Z as an MMA8451 Kit and FRDM-KL27Z as an MMA8451 kit.

10.6 Delivered in ISSDK v1.0

- ISSDK middleware component introduced and integrated with MCU SDK 2.0 ecosystem.
- Designed ISSDK middleware component design into MCU SDK 2.0 ecosystem.
- Created sensor drivers for MMA845X, MMA865X, FXLS8471, MMA8491, FXLC95000, FXAS21002, FXOS8700, MMA9553 and MPL3115 sensors.
- Added FRDM-K64F-AGM01 kit.
- Added FRDM-K64F-MULT2B kit.
- Added FRDM-K22F-AGM01 kit.
- Added FRDM-K22F-SA9500 kit.
- Added FRDMKL25-A8471 kit.
- Added FRDMKL25-A8491 kit.
- Added FRDMKL25-P3115 kit.

- Added FreeRTOS sensor fusion algorithm examples for FRDM-K64F-AGM01, FRDM-K22F-AGM01 and FRDM-K64F-MULT2B kits.
- Added bare metal sensor fusion algorithm examples for FRDM-K64F-MULT2B kit.
- Added pedometer algorithm example for FRDM-K64F-AGM01, FRDM-K22F-AGM01 and FRDM-K64F-MULT2B kits.

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