

# Amazon ACK HMCU On NuMaker-M032SE

[www.nuvoton.com](http://www.nuvoton.com)

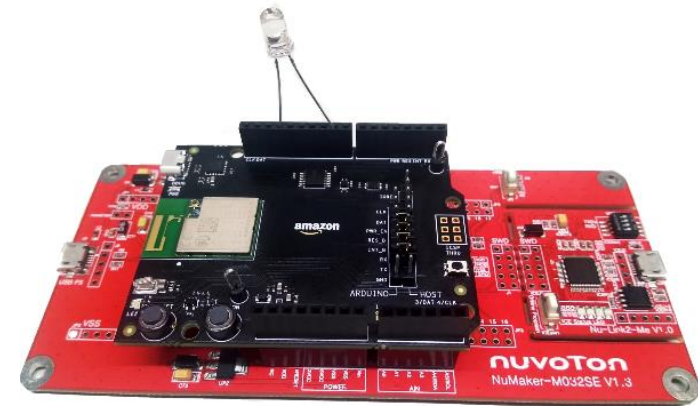
**MS70 Wayne Lin**

2020/12/14

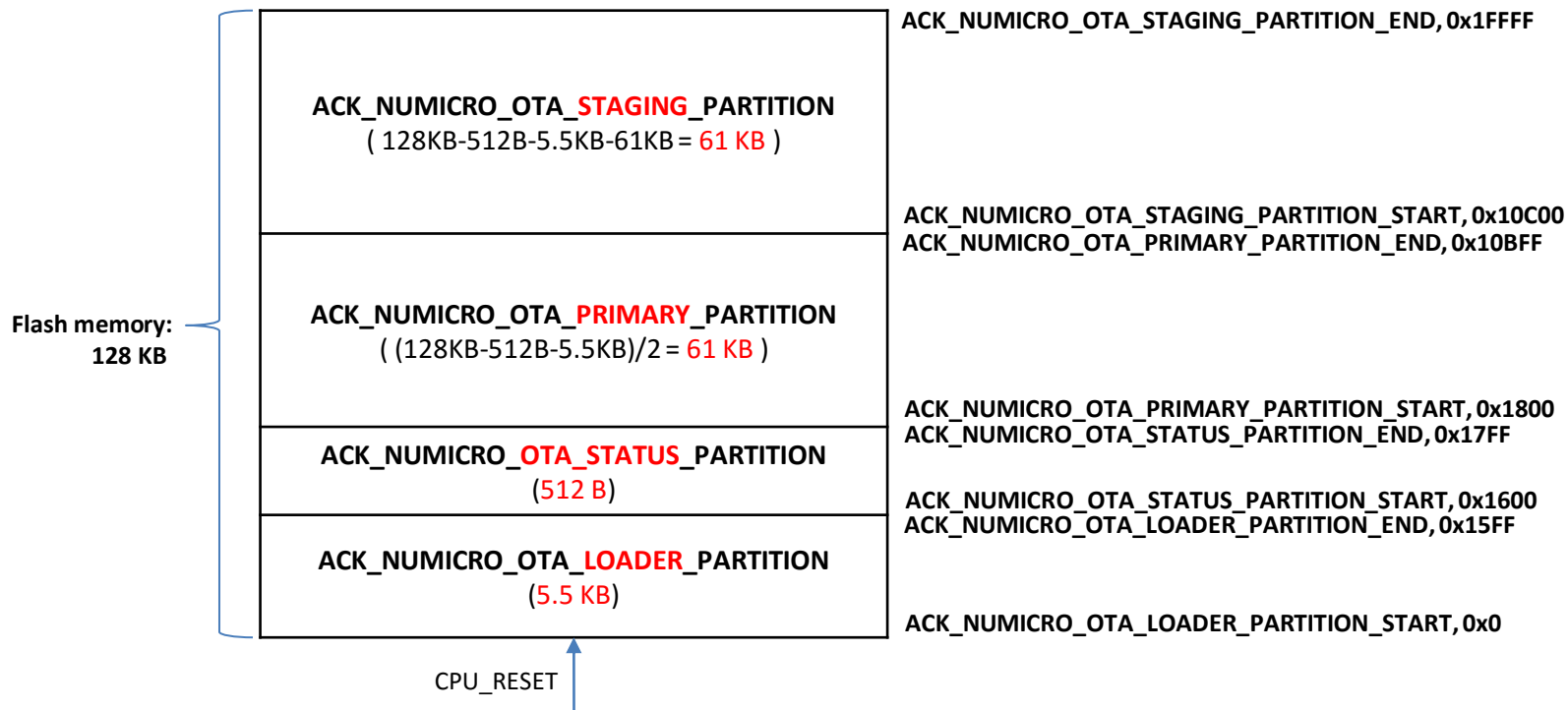
- **Introduce you Amazon ACK**
- **Partition layout, Boot flow & OTA upgrading**
- **Demo**
- **Some notes**

# Introduction

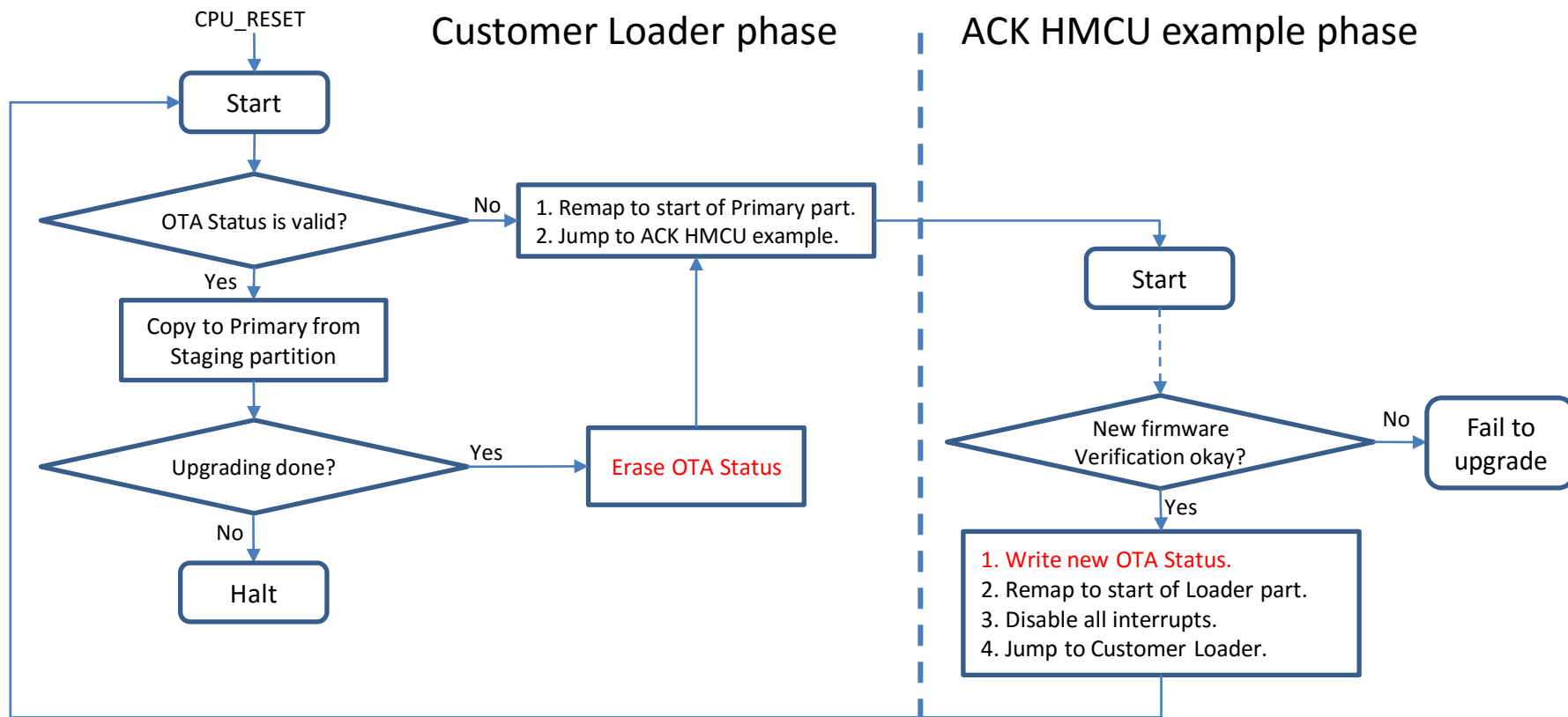
- **ACK – Alexa Connect Kit**
- **An Amazon-managed solution that makes it simpler, faster, and more economical to create and manage Alexa-controlled, Wi-Fi-enabled smart devices.**
  - ACK module
  - High-reliability/Low-latency device control cloud
  - ACK Management Console
  - Extensibility APIs
  - Dash Replenishment Service



# Partition layout



# Boot flow & OTA upgrading



# Demo

- Requirements
- Driver Installation
- Build Steps
- HMCU Board Setting
- ACK HMCU Firmware Installation
- ACK HMCU Boot Option Configuration

# Requirements

- **Hardware**

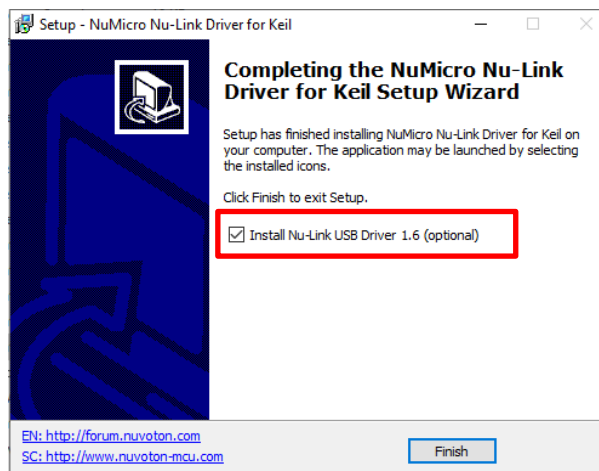
- An ACK module board (USI MT7697H development kit)
- An development board for ACK HMCU (NuMaker-M032SE board)
- An internet-accessible **2.4G** Wi-Fi router
- A mobile phone with Alexa APP
- A LED, a dupont line and an USB Micro line

- **Software/Drivers**

- Keil MDK 5.26
- Latest Nu-Link Keil drivers
- Python-3.8 environment

# Driver Installation

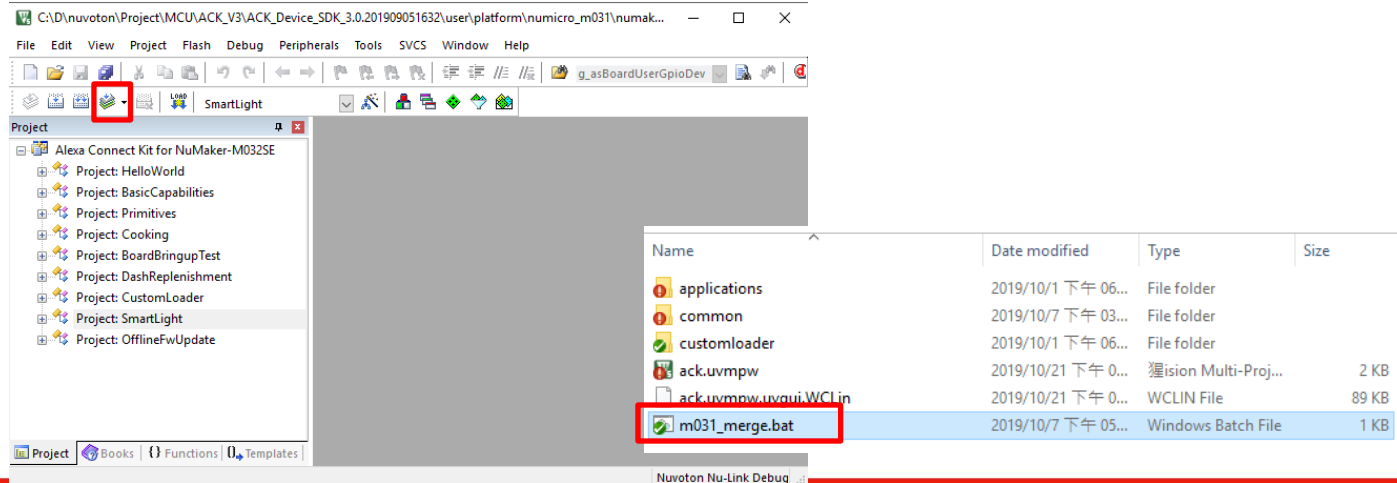
- **Install “Nu-Link Driver for Keil” on Window platform**
  - Nuvoton provides installshield wizard to help user to install these utilities for keil.
  - It also includes a Nu-Link USB Driver. Please install it for MDK-ARM debugger and Nuvoton virtual COM(VCOM) function.





# Build Steps

- Open ack.uvmpw Keil multiple project file using MDK 5.26.
  - Path: <Path-to-ACK\_Device\_SDK>\user\platform\numicro\_m031\numaker-m032se\ack.uvmpw
- Press “Batch rebuild” to build all examples.
- Finally, execute “m031\_merge.bat” to merge customer\_loader and example into a hex file.



# Python Installation

- **Python 3.8** or later is required, with the following optional modules (install with pip): intelhex, protobuf, pyserial.
  - Download: <https://www.python.org/ftp/python/3.8.6/python-3.8.6-amd64.exe>
  - The **intelhex** is \*MUST\* before you executing the **m031\_merge.bat** script.
  - To execute '**pip install intelhex**' in command line window.
  - Remember to add python execution to **PATH** variable.

# m031\_merge.bat

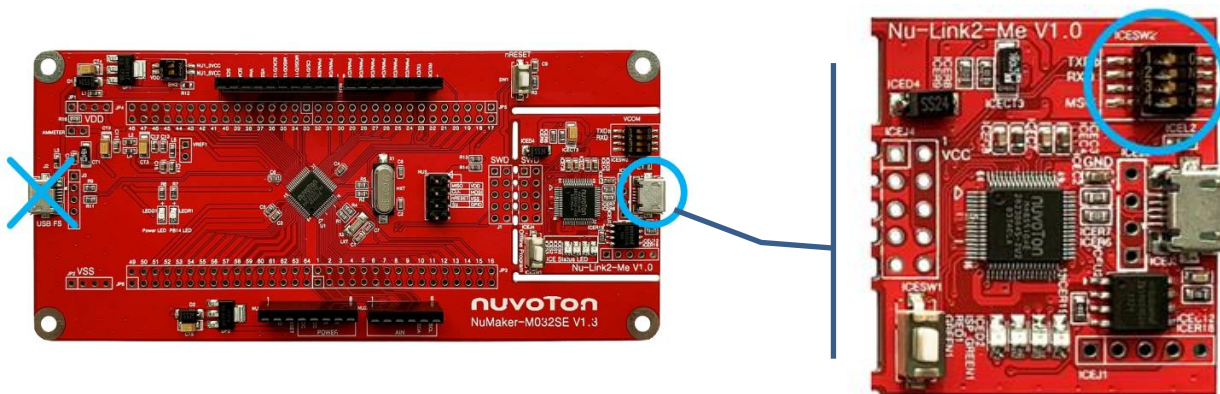
- This is batch script for window platform. Help user to get all merged firmwares for programming, just a double-click step.
- It invokes some python utilities Amazon provided
  - For producing a merged firmware for NuMicro MCU.
  - For OTA upgrading file for publishing on Amazon Cloud.

Name	Date modified	Type	Size
applications	2019/10/1 下午 06...	File folder	
common	2019/10/7 下午 03...	File folder	
customloader	2019/10/1 下午 06...	File folder	
ack.uvmpw	2019/10/21 下午 0...	狸ision Multi-Proj...	2 KB
ack.uvmpw.uvgui.WCLin	2019/10/21 下午 0...	WCLIN File	89 KB
m031_merge.bat	2019/10/7 下午 05...	Windows Batch File	1 KB

Merged_BasicCapabilities.hex	2019/10/21 下午 0...	HEX File	177 KB
Merged_BoardBringupTest.hex	2019/10/21 下午 0...	HEX File	153 KB
Merged_Cooking.hex	2019/10/21 下午 0...	HEX File	186 KB
Merged_DashReplenishment.hex	2019/10/21 下午 0...	HEX File	162 KB
Merged_HelloWorld.hex	2019/10/21 下午 0...	HEX File	159 KB
Merged_OfflineFwUpdate.hex	2019/10/21 下午 0...	HEX File	79 KB
Merged_Primitives.hex	2019/10/21 下午 0...	HEX File	182 KB
Merged_SmartLight.hex	2019/10/21 下午 0...	HEX File	182 KB

# HMCU board Setting









- Switch Pin 1 and pin 2 of VCOM(ICESW2) on Nu-Link2-Me to “ON” position.
- Bridge USB micro line between Nu-Link2-Me and PC.
- After that, PC will show a “NuMicro MCU” disk on Window file manager.

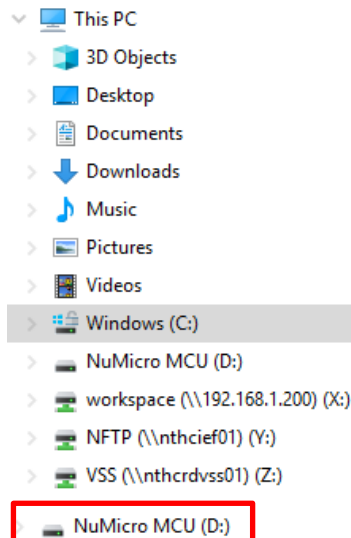


- **Nu-Link2-Me firmware upgrade guiding**
  - Please find out Chapter 5 of ‘NuMicro Cortex-M Keil ICE driver user manual.pdf’ in installed Nu-Link\_Keil driver folder - C:\Program Files (x86)\Nuvoton Tools\Nu-Link\_Keil\.

# ACK HMCU Firmware Installation

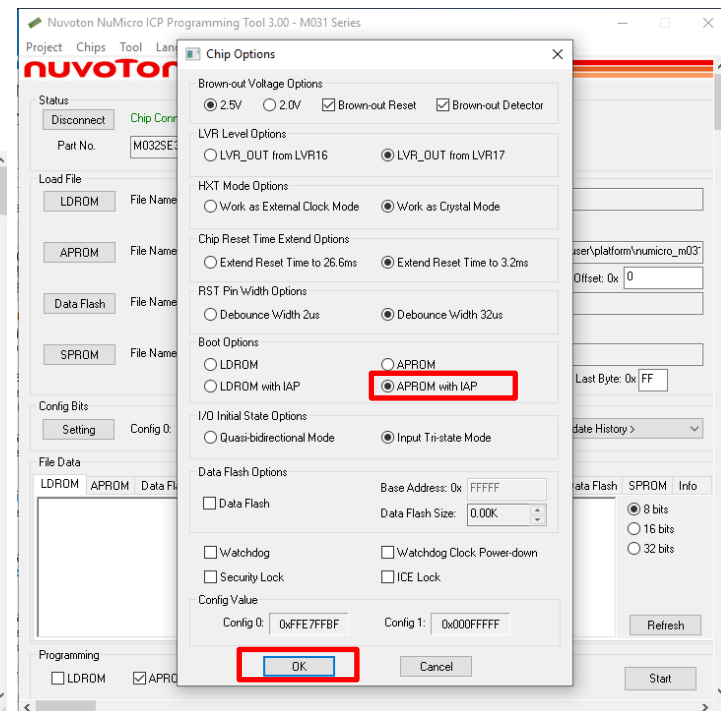
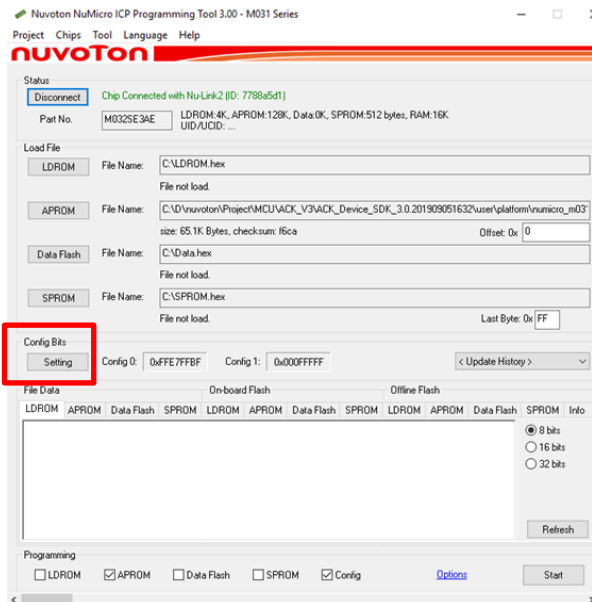
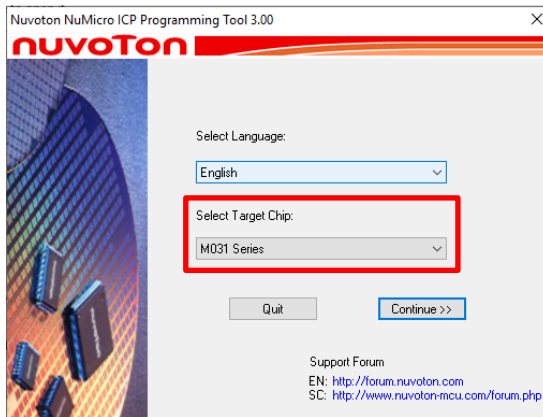
- Drag-and-drop firmware into “NuMicro MCU” disk.
  - The firmware includes a bootloader and an ACK example in a .hex file is merged by hexmerge.py.
  - After copying finished, firmware installation is done.

	Merged_BasicCapabilities.hex	2019/10/21 下午 0...	HEX File	177 KB
	Merged_BoardBringupTest.hex	2019/10/21 下午 0...	HEX File	153 KB
	Merged_Cooking.hex	2019/10/21 下午 0...	HEX File	186 KB
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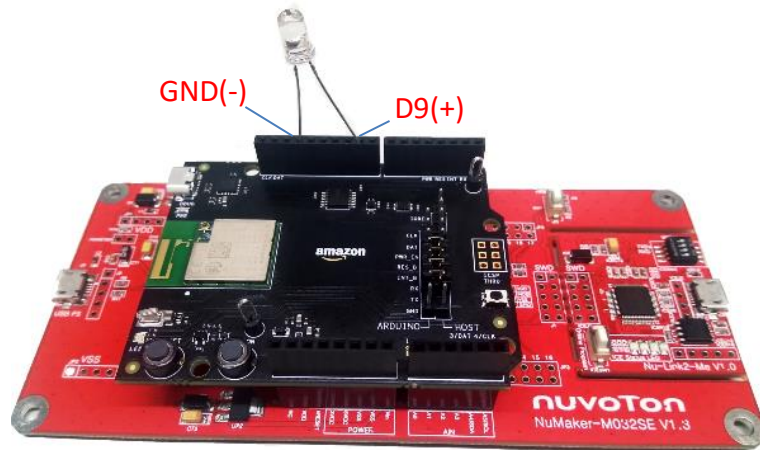
# ACK HMCU Boot Option Configuration

- Configure “Boot Options” is in “APROM with IAP” mode using ICP programming Tool.



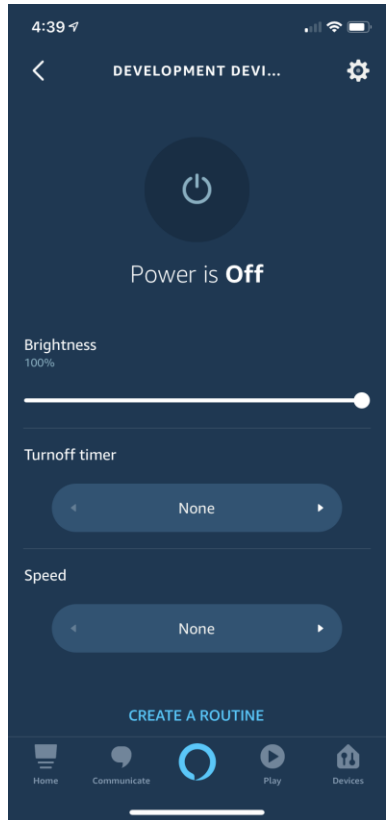
# Wiring and Alexa APP

- Mount ACK connectivity board on Arduino shield of NuMaker board.
- Connect a LED to D9(+) and GND(-).
- Use terminal utility to see Log
  - Open window device manager to get Nuvoton VCOM COM port number.
  - UART communication setting is **115200N81**.
- Associate with an Internet-accessible Wi-Fi router
- Install Amazon Alexa APP in your mobile device
  - Got an Amazon account to login.
  - Make sure the APP version number is latest.



# Alexa APP controlling

- You can use Alexa APP to set smart-light functions
  - Press Turn-on/off button
    - LED will be turn-on/off.
  - Slide brightness bar to [1-100] percent.
    - LED light brightness will be adjusted.
  - Select speed option to none/low/medium/high.
    - LED blink speed will changed to none/low/medium/high.
  - Select Turnoff timer option to none/5mins/10mins/1hours.
    - LED will be turn be after specified time.



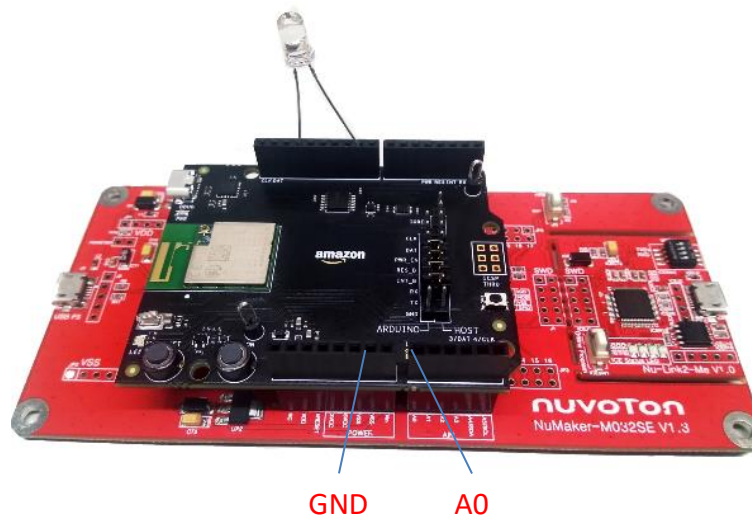


# Speech controlling

- Golden utterances
  - <https://developer.amazon.com/zh/docs/device-apis/alexa-brightnesscontroller.html>
- You also can talk to Alexa APP below commands.  
(Renamed development board to light)
  - Alexa, turn-on light
  - Alexa, turn-off light
  - Alexa, set turn off timer to **five minutes**. (none/5minutes/10minutes/1hour)
  - Alexa, set the speed to **low** on light. (none/low/medium/high)
  - Alexa, set light to **fifty** percent. [1-100%]

# To Restore factory setting

- You can use a dupont line to short A0 to GND over 5 seconds to enter restoring factory setting mode.
  - After restoring, all settings on ACK module will be cleared. So, you need to register ACK module again.



# HMCU firmware version control

- You can modify `ACKUser_GetFirmwareVersion` function to do version control. This version number is for ACK HMCU firmware OTA upgrading.
  - PATH: `<PATH-TO-ACKDeviceSDK>\user\platform\numicro_m031\ack_user_device.c`
  - We use building-date-time to implement the function.
  - You need to publish new version number and HMCU firmware on Amazon cloud.

# ACK development kits

- Please visit Amazon ACK official page
  - <https://developer.amazon.com/en-US/alexa/connected-devices/alexa-connect-kit/dev-kits>

# MO31 Series Resources

- **Link to Keil tools for Nuvoton NuMicro**
  - <http://www2.keil.com/nuvoton/M0-M23>
- **Technical reference manual**
  - [http://www.nuvoton.com/resource-files/TRM\\_M031\\_Series\\_EN\\_Rev1.03.pdf](http://www.nuvoton.com/resource-files/TRM_M031_Series_EN_Rev1.03.pdf)
- **Development board user manual**
  - [http://www.nuvoton.com/resource-files/UM\\_NuMaker-M032SE\\_EN\\_Rev1.00.pdf](http://www.nuvoton.com/resource-files/UM_NuMaker-M032SE_EN_Rev1.00.pdf)
- **Latest Nu-Link Keil driver download**
  - [https://www.nuvoton.com/opencms/resource-download.jsp?tp\\_GUID=SW0520101208200142](https://www.nuvoton.com/opencms/resource-download.jsp?tp_GUID=SW0520101208200142)
- **Latest ICP Programming tool download**
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