

Nuvoton 8051 IAR ICE Driver User Manual

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1 Overview

1.1 Introduction

The Nuvoton 8051 IAR Driver allows the IAR Embedded Workbench to communicate with Nuvoton on-chip debug logic.

In-system flash memory programming integrated into the driver allows the user to rapidly update target code. The IAR Embedded Workbench can be used to start and stop program execution, set breakpoints, check variables, inspect and modify memory contents, and single-step through programs to run your actual target hardware.

This document describes how to install and use 8051 IAR Driver with programs written using IAR's compiling and flash tools.

1.2 Features

The Nu-Link driver supports the following features. Some functions are triggered by IAR. The usage of these functions can be found in the IAR User Guide.

- Erase/program/verify Nuvoton chips. (via flash algorithm of Nu-Link IAR driver)
- Easy registers access of Nuvoton chips. (via the .ddf file of Nu-Link IAR driver)

1.3 Supported Devices

Open hyperlink to see supported 8051 devices: Link (search for 8051 series).



2 Installing Nu-Link IAR Driver

2.1 System Requirements

- **Software:** IAR Embedded Workbench for 8051
- Hardware: Nu-Link ICE adapter

2.2 Installation

Double click Nu-Link_IAR_Driver.exe, the following directories and files can be found after package is installed successfully:

- .\Samples: The sample project that uses Nu-Link driver for IAR.
- .\ Nu-Link_IAR_51.dll: The driver DLL.



3 Example – Create and Debug a Project

3.1 Start a New Project

This section describes how to start a new project based on 8051 series chips. The fast and easy way to start a new project is open an existing IAR project. To make sure the user knows about all the steps to create an IAR project, this section will start with an empty project.

1. Open IAR Embedded Workbench, and click "File" → "New" → "Workspace".



Figure 3.1 Create a New Workspace

2. Create a new project by clicking "**Project**" \rightarrow "Create New Project".

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File Edit View	Pro	ject Tools Window Help					
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Files		Add Project Connection					
		Edit Configurations	_				
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		C-STAT Static Analysis	•				
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	0	Download and Debug Ctrl+D					
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	G	Make & Restart Debugger Ctrl+R					
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		Download	•				
		SFR Setup					
Create a new project	t and	insert it into the workspace					CAP NUM OVR

Figure 3.2 Create a New Project

3. Select "ARM" as the tool chain for this project, and then click "OK".

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Figure 3.3 Select the Tool Chain for the Project

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4. Now you'll be prompted to save the project. Select a folder and input a project name to save it.

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IAR Embedded Workbench ID)E								- U ×
File Edit View Project Too	ols Window Help								
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neauy								CAPIN	JM OVR //

Figure 3.4 Save a Project

5. After the project is saved, right click on the project name of workspace area, and click "**Options**" to open the option setting form.



Figure 3.5 Open Project Options Form

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Nordic Semiconductor Data model Calling convention ROM-Monitor Small IDATA stack reentrant Analog Devices IDATA stack reentrant IDATA stack reentrant Silicon Labs Number of virtual registers: 8 Location for constants and strings Simulator Use MDU C ROM mapped as data C CODE memory	ptions for node "hellowork Category: General Options Static Analysis C/C++ Compiler Assembler Custom Build Build Actions Linker Debugger Third-Party Driver Texas Instruments FS2 System Navigator Infineon Segger J-Link	d"
	Segger J-Link Nordic Semiconductor ROM-Monitor Analog Devices Silicon Labs Simulator	Near Use extended stack Data model Calling convention Small IDATA stack reentrant Number of virtual registers: 8 Image: Use MDU CODE memory

Figure 3.6 Options Form

6. The default options are neither for 8051 series. Check the "**Device**" option and click the "Device" icon on the right to select the correct device name, such as "Nuvoton -> N76E003".

Category: General Options Static Analysis	
C/C++ Compiler Assembler Custom Build Build Actions Linker Debugger Third-Party Driver Texas Instruments FS2 System Navigator Infineon Segger J-Link Nordic Semiconductor ROM-Monitor Analog Devices Silicon Labs Simulator Use MDU Library Options MISRA-C:2004 MISRA-C:1998 Data Pointer Code Bank Output Device information Device information Device information Device information Device information Device information Device information Device information Device Plain Code model Near Data model Calling convention Small Use extended st Code model Mumber of vitual registers: 3 Use MDU CK Mearview MDU CK Mearview MDU	
Nordic Semiconductor	
	n3
NuvoTon N76E0	00

Figure 3.7 Select Target Devices

7. To link and run the program in flash memory, override the default link script for this project. In this example, simply specify the link script used in the sample project "Samples\GPIO".

Options for node "GPIO"		×
Category: General Options Static Analysis C/C++ Compiler Assembler Custom Build Build Actions Linker Debugger Third-Party Driver Texas Instruments FS2 System Navigator Infineon Segger J-Link C:\Program Filesci (\$60)\liART S ROM-Monitor Analog Devices Silicon Labs Simulator	Factory Settings #define Diagnostics Checksum Edra Options Config Output Edra Output List Log Unker configuration file ✓ Ovemide default ✓ STOOLKIT_DIRS\config\devices\NuvoTon\nk51ew_N76E00 … Ovemide default program entry © Entry symbol program_start ✓ Operined by application Steanch paths One per me Workbench 8.0\8051\config \$TOOLKIT_DIRS\LIB\ ✓ … Raw binary image Symbol: Segment: Align: File:	devices\NuvoTor

Figure 3.8 Select Linker Configuration File

8. Select "Nu-Link" as the debugger driver for this project. On the "Debugger" page, select "**Third-Party Driver**"; and on the "Third-Party Driver" page, fill in the path of Nu-Link_IAR_51.dll.



Figure 3.9 Select Debugger Driver

Figure 3.10 Use Nu-Link for Debugger Driver

9. After the option settings are done, click the "OK" button and save the project.

To build the project, you should add the startup code and user application code to the project. Please follow the steps below:

1. Now add the main function to this project. Click "File" → "New" → "File", and input the main function in the new file's editing pane.

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<u>File Edit View Project Tools</u>	Window	<u>t</u> elp	
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Fies Fies helloworld - Debug *		<pre>void main (void) { Set_All_GFUO_Quasi_Mode; // Define in Function_define.h #if 1 InitialUARTO_Timer3(115200); set_CODE; while(1) {</pre>	// Tiny board GPIO1 LED defi
Log			
Wed Oct 25, 2017 17:33:36: IAF	R Embedd	d Workbench 10.10.1 (C.\Program Files (x86))\AR Systems\Embedded Workbench 8.0\\$051\bin\8051proc.dll)	
Ready		Ln 18, Col 7	System CAP NUM OVR

Figure 3.11 Add the Main Function in a New File

 Click "File" → "Save" to save the new text file as "GPIO.c". Add "GPIO.c" to the current project. After "GPIO.c" has been added, it will be listed in the "Workspace" pane.

helloworld - IAR Embedded Workbench IDE	8051 10.10.1	
<u>F</u> ile <u>E</u> dit <u>V</u> iew <u>P</u> roject <u>I</u> ools <u>W</u> indow	Help	
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Workspace 👻 A 🗙	GPIO.C X	=
Debug	main()	fo
Files # 0% Image: Comparison of the second	Timer1_Delay10ms(10);)]	1
	void main (void)	
	Set_All_GFIO_Quasi_Mode; // Define in Function_define.h	
	<pre>#if 1 InitialUART0_Timer3(115200); eet_CLOEN;</pre>	
	<pre>while(1) { clr_GPI01;</pre>	// Tiny board GPIO1 LED de
	fendif P17_OpenDrain_Mode: Enable_INT_Port1:	_
helloworld		
Debug Leg Log Wed Oct 25, 2017 17:33 36: IAR Embedd	ed Warkbench 10.10.1 (C\Program Files (x86))JAR Systems\Embedded Warkbench 8.0\8051\bin\8051proc.dll)	- n x
Ready	Ln 136, Col 2	System CAP NUM OVR

Figure 3.12 Save the New File and add "main.c" File to the Project

3. Click "File" → "Save Workspace". In the file dialog, input a name for this workspace and save it.

9 Save Workspace As										
🚱 🕞 🚽 🔹 N76E003_BSP_IAR_C51_V1.0.1 🔹 Sample_Code 👻 🔹 🖬 Search Sample_Code										
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ouve us gyper prom	space riles (renny									
Hide Folders Save Cance										

Figure 3.13 Save the Workspace

4. Now start to build the project by clicking "**Project**" \rightarrow "**Rebuild All**" or "**Make**".

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Debug	[+]	Import File List	fo
Files		Add Project Connection	
GPIO - De		Edit Configurations	C function. Program execution starts
- Common	1	Pamova	er stack initialization.
E Delay.c			vector=0x3b
GPI0.C	D	Create New Project	upt void PinInterrupt_ISR (void)
La GPIO.	0	Add Existing Project	if (PIF == 0x80)
	¢	Options Alt+F	
		Marilan Cantal Catan	cir_GFI01; Time1 Poly:(10);
		Version Control System	set GFIOI;
	0	Make F	Timer1_Delay10ms(10);
		Compile Ctrl+F	cir_GFID1; Timer1 Delay10me(10);
GPIO	0	Rebuild All	
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Debug Log	G	Make & Restart Debugger Ctrl+	- a x
beougeog	c	Restart Debugger Ctrl+Shift+	
		Download	
		SFR Setup	
		Open Device Description File	
		Save List of Perioters	
		sare est of negotelin	
Clean and make the	activ	project	Errors 0, Warnings 1 Ln 154, Col 9 System CAP NUM OVR

Figure 3.14 Rebuild the Project



5. The project is created successfully.

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File Edit View Project Tools Window	Help	
it 🗅 🔛 🕋 🔚 🛛 X 💼 🗂 I 5 C		
Workspace 👻 🔍 🗙	GPIO.C x	•
Debug 💌	main()	fo
Files # ™ ■ GPI0 - Debug ✓ ■ Common.c ● ■ Delay.c ■ GPI0.C ■ GPI0.d51	<pre>InitialUART0_Timer3(115200); set_CLOEN; while(1) { clr_GFI01; clr_GFI01; Timer0_DelayImm(300); set_GFI01; Timer0_DelayImm(300); //Send_Data_To_UART0(0X55); //UART0_send_ascii "U" </pre>	
Build		▼ ₽ ×
Messages GPIO.C Done: 0 error(s): 0 warning(s)	File I	_ine
Build Debug Log		

Figure 3.15 Build the Project Successfully



3.2 Debug a project

IAR is a tool for users to debug the project easily. After the project is created successful and the target device and Nu-Link debugger is correctly connected.

 Click "Project" → "Download and Debug" to start to download and debug the project. Using the project described 3.1, the program will pause at function main().

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File Edit View	Pro	ject Tools Window Help	
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GPIO.C	t	Create New Project	1)
GPIO.	0	Add Existing Project	Ir GPI01; // Tiny board GPI01 LED de
	٥	Options Alt+F7	imero_Delayims(300); er GDIO:
		Version Control System	imero_Delayims(300);
	0	Make F7	/send_usta_loukatV(Uxbs); //UARIV send_ascil "U"
GPIO		Compile Ctrl+F7	
Build	0	Rebuild All	→ a ×
Messages	₫	Clean	File
GPIO.C	•	Batch build F8	
Done, 0 erro		C-STAT Static Analysis	
	8	Stop Build Ctrl+Break	
	D	Download and Debug Ctrl+D	
	►	Debug without Downloading	
Build Debug Log	9	Attach to Running Target	
Debug Log	G	Make & Restart Debugger Ctrl+R	
	C	Restart Debugger Ctrl+Shift+R	
		Download	
		SFR Setup	
		Open Device Description File	
		Save List of Registers	
Download the appli	catio	n and start the debugger	Errors 0, Warnings 0 [Ln 138, Col 9 [System] CAP NUM OVR

Figure 3.16 Download Code and Debug

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A		
GPIO - JAR Embedded Workbench IDE - 80	hi 10.10.1 Window Help	
Workspace		
Debug	mainl	fo
Files to Debug ✓ GPIO - Debug ✓ H © Common c H © Coley c H © GPIO C H © Output	Timerl_Delay10ms(10); clr_GFIG1; Timerl_Delay10ms(10); set_GFIG1; Timerl_Delay10ms(10); clr_GFIG1; Timerl_Delay10ms(10); set_GFIG1; Timerl_Delay10ms(10); } }	
	<pre></pre>	'/ Tiny board GPI01 LED dt
GPID	4	<u> </u>
Disassembly		<u>→</u> û ×
Go to		
Disassembly 00023A 90 03 D5 MOV 00023D 78 08 MOV 00023D 78 MOV 000242 AA 08 MOV 000242 AA	DPTR, #0x03D5 R0, #0x08 L 71_H0V_C R2, V0 R2, V0	A

Figure 3.17 Pause at Main Function while Debugging



The following section introduces the debug features using the project described above.

 Move the cursor to the line want to set breakpoint, press "F9" to set a breakpoint, and then press "F5" to run the program until one breakpoint occurs. Now the program pauses at the breakpoint line.

GPIO - IAR Embedded Workbench IDE -	8051 10.10).1				
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Files * E GPIO - Debug H Common c H Delay.c H GPIO C H Output		<pre>Timer1_ clr_GPIC Timer1_ set_GPIC Timer1_ clr_GPIC Timer1_ set_GPIC Timer1_F } } void main (void) { Set_All_GPIO_Quasi_Mode;</pre>	<pre>elay10ms(10); ;; elay10ms(10); 1; elay10ms(10); 1; elay10ms(10); 1; elay10ms(10);</pre>	// Defin	e in Function_define.h	z
GPID		<pre>InitialUARTO_Timer3(115: set_CLOEN; while(1) { clr_GPIO1; Timer0_Delayime(300); set_GPIO1; ret_GPIO1;</pre>				// Tiny board GPIO1 LED d:
Disassembly						▲ 廿 ×
Lio to Code	_					
Usassembly 000270 AC 0A M 000272 AD 0B M 000274 12 02 A9 L set CIOEN:	IOV R4, IOV R5, ICALL Ini	V2 V3 .tialUARTO_Timer3				
						<u> </u>
Debug Log Disassembly					In 140, Col 9	Surtem CAD NUM OVO
step out or the current function					LN 140, COL9	System [CAP NOM OVR]

Figure 3.18 Pause the Program by Setting Breakpoints

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Click "View" → "Memory" to open the Memory pane, in which user can view or edit the memory on the target device.
 © GPU0 - JAR Embedded Workberch IDE - 8051 10.101



Figure 3.19 Open Memory Pane



Figure 3.20 Memory Pane

● Click "View" → "Register" to open the Register pane, in which user can view or edit the registers on the target device.

File Eat Verw Project Debug Tools Window Help Wetsages Source Browser Bebug Files Debug Files Call Stack Watch W	Selo - IAR E	mbedded Workbench II	DE - 805	.10.1	
Messages Workspace Debug Source Browser Source Browser Source Browser Set_All_GPIO_Quasi_Mode; Main Messages Set_All_GPIO_Quasi_Mode; Main Messages Set_All_GPIO_Quasi_Mode; Main Messages Set_All_GPIO_Quasi_Mode; Main Messages Set_All_GPIO_Quasi_Mode; Messages Set_CLOBN; Wath Set_CLOBN; Set_CLOBN; Set_Set_CLOBN; Wath Set_Set_CLOBN; Wath Set_CLOBN; Set_Set_CLOBN; Set_Set_Set_Set_Set_Set_Set_Set_Set_Set_	File Edit Vie	ew Project Debug 1	Tools	dow Help	
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Image: Contract Set_All_GFI0_Quasi_Mode; // Define in Function_define.h Image: Contract Set_All_GFI0_Quasi_Mode; // Define in Function_define.h Image: Contract Set_All_GFI0_Quasi_Mode; // Timesd (15000); Image: Contract Set_All_GFI0_Quasi_Mode; // Define in Function_define.h Image: Contract Set_All_GFI0_Quasi_Mode; // Timesd (15000); Image: Contract Set_All_GFI0_Quasi_Mode; // Define in Function_define.h Image: Contract Set_All_GFI0_Contract Set_A	Debug	Source Browser	<u>ا</u>	ain()	fo
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Figure 3.21 Open Register Pane

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			R2	0x2C
	clr GPI01:		R3	0x01
	TimerO Delav1ms(300);		R4	0x00
	set GPI01;		R5	0×00
	TimerO Delay1ms(300);		R6	0×00
	Send Data To UARTO(0x55);	//UART0 send ascii '	R7	0×00
	<pre>// printf UART("hello world");</pre>		SP	0xC1
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	Enable_BIT7_FallEdge_Trig;		CCTINERI	3
			CCTINER?	2
	set_EPI;	// Enable pin inter:	CCETER	2
	set_EA;	// global enable bit	CCSIEF	3
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Figure 3.22 Register Pane

4 Firmware Update

When trying to debug a project, it will check the firmware version first. If the current firmware version is not consistent with the installed Nu-Link IAR Driver, a dialog box will pop up as follows:

GPIO - IAR Embedded Workbench IDE - 80	1 10.10.1	
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Figure 4.1 Firmware Update Selection Dialog Box

Click "Yes" to update firmware or click "No" to cancel.

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When update is complete, it is necessary to recreate a connection between Nu-Link and PC. Please plug out the Nu-Link from PC and plug in again.

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Figure 4.3 Re-connect Nu-Link to Complete Firmware Update

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Figure 4.4 Update Firmware Completely



5 Revision History

Revision	Date	Description
1.00	2017/10/25	initial release

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