



# **Intel® Integrated Clock Controller (Intel® ICC) Tools**

**User Guide - NDA**

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***Revision 0.8***

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## Revision History

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Revision #	Description	Revision Date
0.8	• Rebranded	November 2021
0.5	• Initial Release for Raptor Lake	February 2021

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# 1 Introduction

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The purpose of the document is to provide guidance on the usage of the tools provided for Intel® Converged Security and Management Engine (Intel® CSME) Firmware Integrated Clock Controller (ICC) included within the Intel firmware kit for Raptor Lake.

## 1.1 Terminology

Acronym or Term	Definition
API	Application Programming Interface
BIOS	Basic Input Output System
CPU	Central Processing Unit
DLL	Dynamic Link Library
FW	Firmware
Intel® CSME	Intel® Converged Security and Management Engine
Intel® ICCS	Intel® Integrated Clock Controller Services
Intel® MEI	Intel® Management Engine Interface (formerly HECI)
Intel® MFIT	Intel® Modular Flash Image Tool
Intel® XTU	Intel® Extreme Tuning Utility
PCH	Platform Controller Hub
RPL	Raptor Lake. Platform Codename for Intel® CSME 17.0 based platforms

## 1.2 Reference Documents

Document	Document No./Location
Raptor Lake SPI Programming Guide	FW release kit
Raptor Lake Intel® CSME Firmware Bring Up Guide	FW release kit
Raptor Lake Platform Controller Hub (PCH) External Design Specification	RDC

## 2 Intel® ICCS SDK

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### 2.1 Intel® ICCS SDK

Intel® Integrated Clock Controller Services (Intel® ICCS) provides a lot of flexibility for OS applications. To ease OS application development and to avoid erratic programming of ICC, Intel provides an ICC Control Library and abstracts ICC hardware from clock tuning applications such as BIOS.

### 2.2 Intel® ICCS Control Library SDK Features

ICC HW is only accessible to Intel® Converged Security and Management Engine (Intel® CSME) and is accessible indirectly to the host software through a set of Intel® Management Engine Interface (Intel® MEI) APIs that are known to the Intel® Integrated Clock Controller Service. Intel does not expose those Intel MEI APIs and does not recommend OS applications to use them to keep platform stability.

Example of application that may call Intel® Integrated Clock Controller Service:

- Intel® Extreme Tuning Utility (Intel® XTU). This application can overclock or underclock platform BCLK (Processor clock).

### 2.3 Intel® Integrated Clock Controller Service Data Structures

Intel® Integrated Clock Controller Service provides a simplified ICC data structures and APIs for clock manipulation. The new data structure has significantly been reduced and simplified compared to previous generation of ICC control library. The ICC data structure is described in this section.

**Important Note:** Intel® ICC SDK is backwards compatible and more APIs would appear in the Intel® ICC SDK supporting previous programs. The table below lists only the APIs applicable to RPL.

**Table 2. Intel® Integrated Clock Controller Service API Data Structures**

Name	Type	Description
ICC_HECI_CLOCK_ID	Enum	Defines the clock id for applicable clocks
ErrorCodes	UINT32	Returns error codes from Intel® Integrated Clock Controller Service API calls
GET_MPHY_VERSION	Struct	Contains the current ChipsetInit version
IccLibGetMphyVersion	UINT32	Retrieves the MPHY version

Name	Type	Description
ICCLibGetMphySettingsWrapper	Method	Returns MPHY table with current settings
ICCLibSetMphySettingsWrapper	Method	Changes MPHY table current settings to the requested value

### 2.3.1 ICC\_HECI\_CLOCK\_ID Type

The ICC\_HECI\_CLOCK\_ID data structure provides the applicable clock to be selected with the following structure.

```
typedef enum
{
    ICC_HECI_PCIE_CLOCK_ID = 0,
    ICC_HECI_BCLK_CLOCK_ID = 1,
    ICC_HECI_WMPHY_CLOCK_ID = 2
}ICC_HECI_CLOCK_ID;
```

**Table 3. Intel ICC\_HECI\_CLOCK\_ID type**

Name	Description
ICC_HECI_PCIE_CLOCK_ID	PCIe Clock (CPUBCLK Signal to CPU)
ICC_HECI_BCLK_CLOCK_ID	BCLK Clock (CPUBCLK Signal to CPU)
ICC_HECI_WMPHY_CLOCK_ID	White Mountain PLL

### 2.3.2 ErrorCodes Type

The ErrorCodes data structure provides description of the return error code from the Intel® Integrated Clock Controller Service.

The returned values are represented in UINT32 the following function is required to parse the values into char type:

```
const char* GetErrorStringByCode(const UINT32 errorCode);
```

### 2.3.3 GET MPHY Version

The GET\_MPHY\_VERSION structure provides the MPHY table information as the following:

```
typedef union _GET_MPHY_VERSION
{
    UINT32 data;
    struct
    {
```



```

        UINT32 CRC : 16;
        UINT32 Ver : 8;
        UINT32 Product_and_Stepping : 8;
    } Fields;

} GET_MPHY_VERSION;

```

The returned values are represented in UINT32 the following function is required to retrieve the MPHY version:

```
UINT32 IccLibGetMphyVersion(GET_MPHY_VERSION *survTable)
```

### 2.3.4 IccLibGetMphyVersion

The IccLibGetMphyVersion returned values are represented in UINT32. The method format is the following:

```

@param[out] version      MPHY table version

@return status

UINT32 IccLibGetMphyVersion(GET_MPHY_VERSION *version)

```

### 2.3.5 IccLibGetMphySettingsWrapper

The IccLibGetMphySettingsWrapper returned values are represented in UINT32. The method format is the following:

```

@param[in] length        num of bytes to read

@param[in] offset        start offset

@param[out] buffer       current settings of mphy table

@param[out] bytesRead    num of bytes read

@param[out] mphyTotalSize size of MPHY table

@return status

UINT32 IccLibGetMphySettingsWrapper(UINT32 length, UINT32 offset, UINT8
*buffer,UINT32 *bytesRead, UINT32* mphyTotalSize);

```

### 2.3.6 IccLibSetMphySettingsWrapper

The IccLibSetMphySettingsWrapper changes MPHY table current settings to the requested value, leaving all others intact. Error will be returned on range violation.

The method format is the following:



`@param[in] mphyFileName` the name of the settings file

`@return status`

`UINT32 IccLibSetMphySettingsWrapper(char *mphyFileName);`

## 3 *Building an Executable*

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Here are the general steps to build an executable file with Intel® ICC SDK files:

1. Create a new Visual Studio\* project
2. Copy the following files to the project folder:
  - IccSdk.lib
  - Icc\_sdk\_api.h
3. Add to icc\_sdk\_api.h file:

```
#ifndef COMPILE_WITH_ICC_SDK_BINARIES  
  
#define COMPILE_WITH_ICC_SDK_BINARIES  
  
#endif
```
4. Link the library to the exe file:
  - Properties → Linker → Input → Additional Dependencies → Edit
  - ".\..\ADD\_PATH\_TO\_LIB\_FOLDER\IccSdk.lib"

