



***Intel[®] IXP400 Software:
Integrating STMicroelectronics*
ADSL MTK20170* Chipset
Firmware***

Application Note

| September 2004

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Revision History

Date	Revision	Description
September 2004	002	Updated product branding.
January 2004	001	Initial release.

1.0 Scope

1.1 Purpose

This application note presents a detailed procedure on how to integrate STMicroelectronics* ADSL MTK20170* chipset firmware into Intel® IXP400 Software v1.5.

1.2 Assumptions

It is assumed that the reader of this document is familiar with IXP400 software, specifically the ADSL Driver[1].

This document assumes that a Linux-based development environment will be used to perform code builds for a Linux target platform; however, the general principles described may also apply for a Wind River Systems* VxWorks*-based platform.

This document assumes that the ADSL chipset will be connected to chip select 1 on the IXP42X product line expansion bus.

1.3 Applicability

This application note applies only to Intel® IXP400 Software v1.5 of Internal Version ID SQA5_2 and later. (The internal version is defined as IX_VERSION_INTERNAL_ID in the file IxVersion.h.)

1.4 Overview

This document explains how to integrate MTK20170 firmware version ASW_R13_9_22 into the ADSL driver of the Intel® IXP400 Software.

[Section 2.0](#) of this application note presents the procedure required to integrate STMicroelectronics ADSL MTK20170 chipset firmware¹ into the IXP400 software release².

[Section 3.0](#) describes how MTK20170 chipset firmware is supported in the ADSL driver.

[Section 4.0](#) describes feature differences between the default MTK20150* firmware and MTK20170 firmware.

Note: Originally produced by Alcatel*, the STMicroelectronics MTK20150 and MTK20170 chipsets retain their original part number and description.

1. See *Modem Firmware ASW_R13_9_22 Release Notes*, STMicroelectronics.
 2. See *Intel® IXP400 Software Programmer's Guide*.

1.5 Related Documents

Title	Document Number
Intel® IXP400 Software Programmer's Guide	252539
Modem Firmware ASW_R13_9_22 Release Notes, STMicroelectronics*	—
MTK20166* Datasheet, March 2002, Preliminary Version, STMicroelectronics	—
CPE CTRL-E Interface Specification r4.0, STMicroelectronics	—

2.0 Integrating STMicroelectronics* ADSL MTK20170* Chipset Firmware into Intel® IXP400 Software

For example purposes, steps 1 through 6 below use firmware version ASW_R13_9_22. Step 7 describes how to apply the procedure on other firmware releases targeted at STMicroelectronics ADSL MTK20170 chipset. Please note that the MTK20170 chipset firmware is supplied by STMicroelectronics.

1. Unpack zipfile containing firmware release ASW_R13_9_22 binaries from STMicroelectronics and place them into the ADSL component directory within your Intel® IXP400 Software install directory (i.e., ".../src/adsl" directory).

The firmware comprises two files listed below:

- ASW_init_13_9_22.bin
- ASW_R13_9_22.bin

ASW_init_13_9_22.bin is the boot code; ASW_R13_9_22.bin is the modem firmware.

2. Compile the bin2h utility in ".../src/adsl" directory to generate executable file bin2h.exe.


```
gcc -o bin2h.exe bin2h.c
```
3. The binary file must be converted to hex format using the compiled utility bin2h.exe in step 2. Instructions to perform the binary to hex conversion are provided below:

Note: The IXP400 software install directory is assumed to be "ixp425_xscale_sw").

```
cd ixp425_xscale_sw/src/adsl
bin2h.exe ASW_init_13_9_22.bin IxASW_init_13_9_22.c
bin2h.exe ASW_R13_9_22.bin IxASW_R13_9_22.c
```

4. Modify file *IxASW_init_13_9_22.c* by changing the array name and adding the array size parameter.

Before modification:

```
unsigned char adsl_load[]={
... array of hex symbols ...
};
```

After modification:

```
unsigned char ixASW_13_9_22_adsl_init[]=
{
... array of hex symbols ...
};
unsigned int ixASW_13_9_22_adsl_init_len = sizeof(ixASW_13_9_22_adsl_init);
```

5. Modify file *IxASW_R13_9_22.c* by changing the array name and adding the array size parameter.

Before modification:

```
unsigned char adsl_load[]={
... array of hex symbols ...
};
```

After modification:

```
unsigned char ixASW_R13_9_22_adsl_load[]=
{
... array of hex symbols ...
};
unsigned int ixASW_R13_9_22_adsl_load_len = sizeof(ixASW_R13_9_22_adsl_load);
```

6. Modify file *component.mk* to include the files into the build

Before modification:

```
# adsl_CFLAGS += -DIX_USE_ADSL_20170=1
# adsl_OBJ += \
#   IxASW_R13_9_22.o \
#   IxASW_init_13_9_22.o
```

```
adsl_CFLAGS += -DIX_USE_ADSL_20150=1
adsl_OBJ += \
  IxASW_R3_9_22.o \
  IxASW_init_3_9_22.o
```

After modification:

```
adsl_CFLAGS += -DIX_USE_ADSL_20170=1
adsl_OBJ += \
  IxASW_R13_9_22.o \
  IxASW_init_13_9_22.o
```

```
#adsl_CFLAGS += -DIX_USE_ADSL_20150=1
#adsl_OBJ += \
#   IxASW_R3_9_22.o \
#   IxASW_init_3_9_22.o
```

7. For MTK20170 chipset firmware versions other than *ASW_R13_9_22*:

- a. Substitute the release version number 13_9_22 with the appropriate version number in the steps above.
 - b. Substitute the release version number 13_9_22 with the appropriate version number in the files *component.mk*, *IxAdslUtil.c*, *IxAdsl.c*, *IxAdslCtrlConstants.h* and *IxAdslUtil.h* (all these files are located in the “.../src/adsl” directory described in Step 1).
8. To build the ADSL driver as a component in the IXP400 software Access Library in the Linux environment, issue the following command:
- ```
make ixp400.o (at the IXP400 software install directory)
```

### 3.0 How MTK20170\* Firmware is Supported in the ADSL Driver

Provided for informational purposes only, this section presents details on how support for the MTK20170 chipset firmware is realized in the ADSL driver code. Note that it is not necessary to implement these changes as they have already been incorporated into the driver in Intel® IXP400 Software v1.5.

**Table 1. ADSL Driver Code Modifications (Sheet 1 of 3)**

| File Name    | Description                                                                                                                                                                                                                                                                                                                                                                                                   | Code Modification                                                                                                                                                                                                                                                                                               |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| component.mk | <p>The component.mk file is modified to:</p> <ol style="list-style-type: none"> <li>1. Include the following firmware files into the build: <ul style="list-style-type: none"> <li>• IxASW_R13_9_22.o</li> <li>• IxASW_init_13_9_22.o</li> </ul> </li> <li>2. Enable firmware support for 20170 with following #defines: <ul style="list-style-type: none"> <li>• DIX_USE_ADSL_20170=1</li> </ul> </li> </ol> | <p>Please uncomment the following code:</p> <pre># adsl_CFLAGS += -DIX_USE_ADSL_20170=1 # adsl_OBJ += \ #   IxASW_R13_9_22.o \ #   IxASW_init_13_9_22.o</pre> <p>Please comment the following code:</p> <pre>adsl_CFLAGS += -DIX_USE_ADSL_20150=1 adsl_OBJ += \   IxASW_R3_9_22.o \   IxASW_init_3_9_22.o</pre> |
| IxAdslUtil.c | <p>IxAdslUtil.c is modified to use the block dump acknowledge code specific to MTK20170* chipset in function ixAdslUtilBlockWrite.<sup>a</sup></p>                                                                                                                                                                                                                                                            | <pre>#ifdef IX_USE_ADSL_20170     if ( rxResp != IX_ASW_BLOCKDUMP_ACK_166 )     {         status = IX_ADSL_STATUS_FAIL;     } #endif</pre>                                                                                                                                                                      |



Table 1. ADSL Driver Code Modifications (Sheet 2 of 3)

| File Name             | Description                                                                                                                                                                                                                                      | Code Modification                                                                                                                                                                                                                                                                                                                                                |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IxAdslCtrlConstants.h | <p>IxAdslCtrlConstants.h is modified to include constant definitions specific to MKT20170 chipset:<sup>b</sup></p> <ol style="list-style-type: none"> <li>CTRL-E sub-function code = 0x17</li> <li>Block dump acknowledge code = 0x64</li> </ol> | <pre>#ifndef IX_USE_ADSL_20170 /* 20170 specific defines */ #define IX_ASW_SUBFUNCTION_CODE_CPE 0x17 /* 20174 AFE Sub-function code for CPE */ #define IX_ASW_SUBFUNCTION_CODE_CO 0x0 /* 20174 AFE does not support CO */ #define IX_ASW_BLOCKDUMP_ACK 166 0x64 /* Block dump acknowledge is different for 20170 chipset */ #endif /* IX_USE_ADSL_20170 */</pre> |
| IxAdsl.c              | <p>UTOPIA addresses for the MKT20170 chipset is constrained to 2 bits.</p> <p>In the file IxAdsl.c, the function ixAdslLineOpenInternal must be modified to account for the UTOPIA addressing constraint.<sup>c</sup></p>                        | <pre>#ifndef IX_USE_ADSL_20170     adslLineConfig.UtopiaAddrFast  = 0x1c; /* The Utopia Address for 20170 must be formatted to bin xxx1 1lxx */     adslLineConfig.UtopiaAddrInterl  = 0x1c; /* The Utopia Address for 20170 must be formatted to bin xxx1 1lxx */ #endif /* IX_USE_ADSL_20170 */</pre>                                                          |

Table 1. ADSL Driver Code Modifications (Sheet 3 of 3)

| File Name    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Code Modification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ixAdslUtil.h | <p>The following changes are required in the file ixAdslUtil.h:<sup>d</sup></p> <ol style="list-style-type: none"> <li>1. Map the MTK20170 firmware data structures in external files (ixASW_init_13_9_22.c and ixASW_R13_9_22.c) to following generic definitions that are used by the ADSL Driver: <ul style="list-style-type: none"> <li>• IX_ASW_CPE_INIT</li> <li>• IX_ASW_CPE_INIT_LEN</li> <li>• IX_ASW_CPE_LOAD</li> <li>• IX_ASW_CPE_LOAD_LEN</li> </ul> </li> <li>2. Dummy definitions are assigned to the following CO definitions since the MTK20170 does not support CO functionality: <ul style="list-style-type: none"> <li>• IX_ASW_CO_INIT</li> <li>• IX_ASW_CO_INIT_LEN</li> <li>• IX_ASW_CO_LOAD</li> <li>• IX_ASW_CO_LOAD_LEN</li> </ul> </li> <li>3. Following firmware address definitions are assigned: <ul style="list-style-type: none"> <li>• IX_ASW_ADSLINIT_FW_LOAD_ADDR</li> <li>• IX_ASW_ADSLINIT_FW_JUMP_ADDR</li> <li>• IX_ASW_ADSLPHY_FW_LOAD_ADDR</li> <li>• IX_ASW_ADSLPHY_FW_JUMP_ADDR</li> </ul> </li> </ol> | <pre> /*-----*/ /* For MTK20170 Firmware Only -----*/ /*-----*/ #ifdef IX_USE_ADSL_20170 static unsigned char dummy_adsl_load[1]; static unsigned int dummy_adsl_load_len; extern unsigned char ixASW_13_9_22_adsl_init[]; extern unsigned int ixASW_13_9_22_adsl_init_len; extern unsigned char ixASW_R13_9_22_adsl_load[]; extern unsigned int ixASW_R13_9_22_adsl_load_len;  #define IX_ASW_CPE_INIT ixASW_13_9_22_adsl_init /**&lt; CPE initialisation firmware byte array */ #define IX_ASW_CPE_INIT_LEN ixASW_13_9_22_adsl_init_len /**&lt; CPE initialisation firmware byte array length */ #define IX_ASW_CPE_LOAD ixASW_R13_9_22_adsl_load /**&lt; CPE modem firmware byte array */ #define IX_ASW_CPE_LOAD_LEN ixASW_R13_9_22_adsl_load_len /**&lt; CPE modem firmware byte array length */ #define IX_ASW_CO_INIT dummy_adsl_init /**&lt; 20170 does not support CO */ #define IX_ASW_CO_INIT_LEN dummy_adsl_init_len /**&lt; 20170 does not support CO */ #define IX_ASW_CO_LOAD dummy_adsl_load /**&lt; 20170 does not support CO */ #define IX_ASW_CO_LOAD_LEN dummy_adsl_load_len /**&lt; 20170 does not support CO */ #define IX_ASW_ADSLINIT_FW_LOAD_ADDR 0x08000000 /**&lt; Initialisation firmware load address */ #define IX_ASW_ADSLINIT_FW_JUMP_ADDR 0x08000000 /**&lt; Initialisation firmware jump address */ #define IX_ASW_ADSLPHY_FW_LOAD_ADDR 0x00000000 /**&lt; Modem firmware jump address */ #define IX_ASW_ADSLPHY_FW_JUMP_ADDR 0x00000000 /**&lt; Modem firmware jump address */ #endif /* IX_USE_ADSL_20170 */ </pre> |

a. See Section 7 of the *CPE CTRL-E Interface Specification r4.0*, STMicroelectronics\*.

b. See Section 7 and 9 of the *CPE CTRL-E Interface Specification r4.0*, STMicroelectronics.

c. See Table 3 in the *MT20166\* Datasheet*, March 2002, Preliminary Version, STMicroelectronics.

d. See Section 2 of the *CPE CTRL-E Interface Specification r4.0*, STMicroelectronics.

Notes on platform-specific implementation:

1. For the ADSL device to be accessible in the memory map, the chip select number must be correctly specified in the ADSL Driver; this setting is specified at the function `ixAdslBaseAddressGet()` in the file `IxAdslUtil.c`.
2. The appropriate chip select number must be set at the definition “`IX_ADSL_CS_ENABLE`” in the file `IxAdslUtil.h`.

## 4.0 MKT20150\* Firmware R3\_9\_22 and MKT20170\* Firmware R13\_9\_22 Feature Differences

**Table 2. MKT20150\*–MKT20170\* Firmware Feature Comparison**

| Feature                   | 20170 Firmware R13_9_22                                                   | 20150 Firmware R3_9_22                                         |
|---------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------|
| Channel modes supported   | Single-channel CPE                                                        | Single-channel CPE or single-channel CO                        |
| UTOPIA loopback mode      | Not supported in this firmware release                                    | Loopback is supported                                          |
| Analog front-end hardware | MTC20174*                                                                 | MTC20154*                                                      |
| Modem hardware            | MTC20166*                                                                 | MTC20156*                                                      |
| UTOPIA                    | Level 1 and 2 support<br>Only 2 bits (LSB) available for UTOPIA 2 address | Level 1 and 2 support<br>5 bits available for UTOPIA 2 address |
| Channels available        | 1 channel: fast or interleaved                                            | 1 channel: fast or interleaved                                 |



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