INTEL Modem introduce

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1.Modem Flashing and Provisioning

The Modem supports flashing over two physical interfaces:

- HSI: used for flashing from the Application Processor
- USB: can be used for flashing from external PC (for R&D and Production)

- There are three ways to flash the modem from the AP:
  - Fastboot : through Fastboot protocol
  - Cmfwdl in Android : just for R&D purposes ; not be part of final Android* image
  - FOTA: over the air via a proprietary FOTA solution

- Modem如果想要正常使用需要有以下组件:

- The PSI Primary signed image.
- Signed Modem FW Image.
- Signed IMEI.
- SIMlock configuration files properly signed and flashed.
- SIMlock Tickets (personalization keys) properly signed and flashed.
- System tickets properly signed and flashed.
- Timestamp - Emergency numbers list integrity protection with HMAC.

- The HSI flashing protocol driver provides the HSI framing and handling used during the various phases and procedures linked to flashing:
  • PSI RAM download.
  • EBL download.
  • FW/NVM(CTP6360_V2.fls/patch_nvm.tlv) download, certificate download, and HW ID retrieval to sign the images.

- Modem flashing结束后整个modem需要重启。

- 在 POS阶段, the HSI EDLP protocol driver 还没有任何clients 所以 HSI port 只能被HSI Flashing Protocol使用

Figure 9-163.Modem Firmware Lib Download Flow

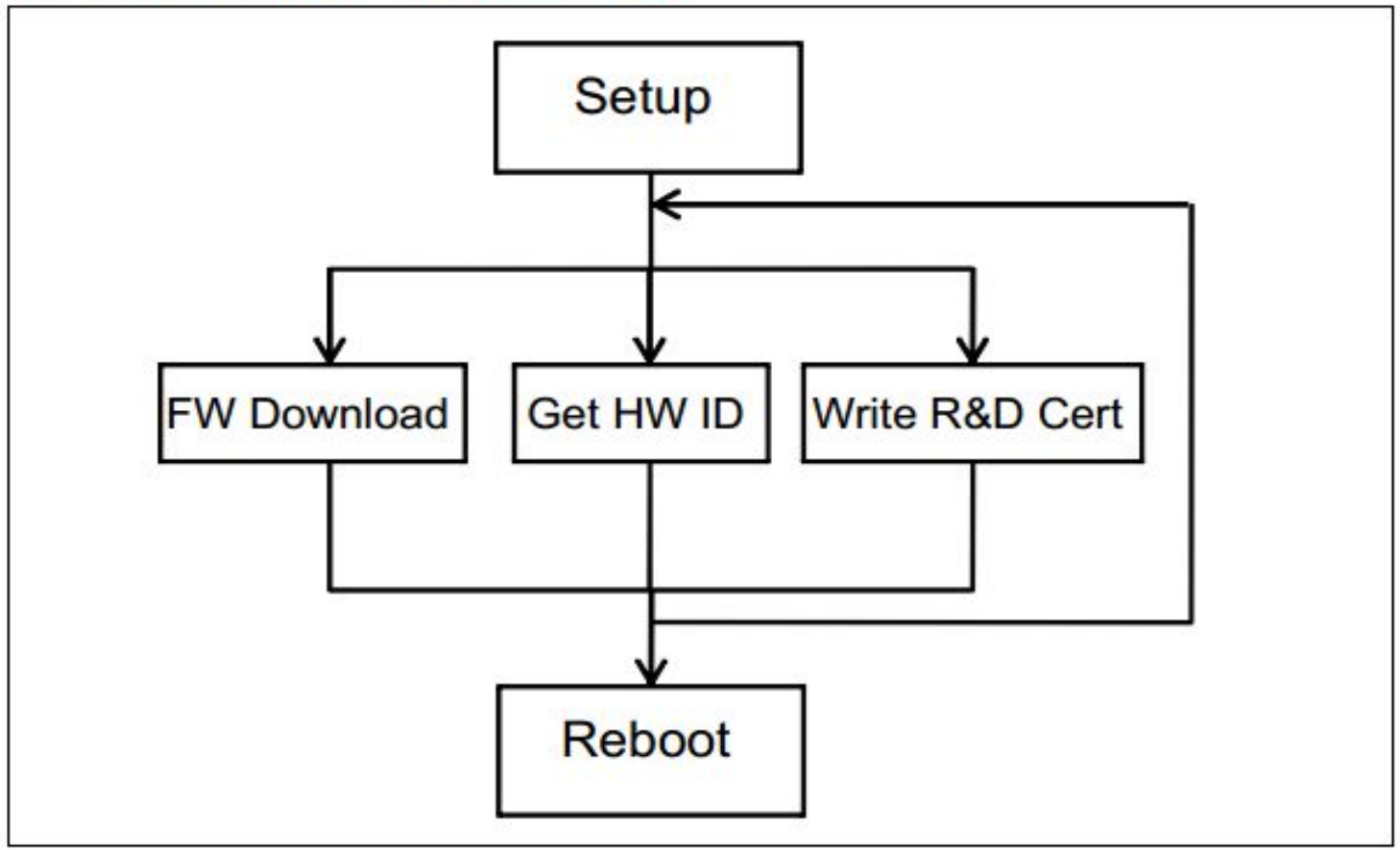
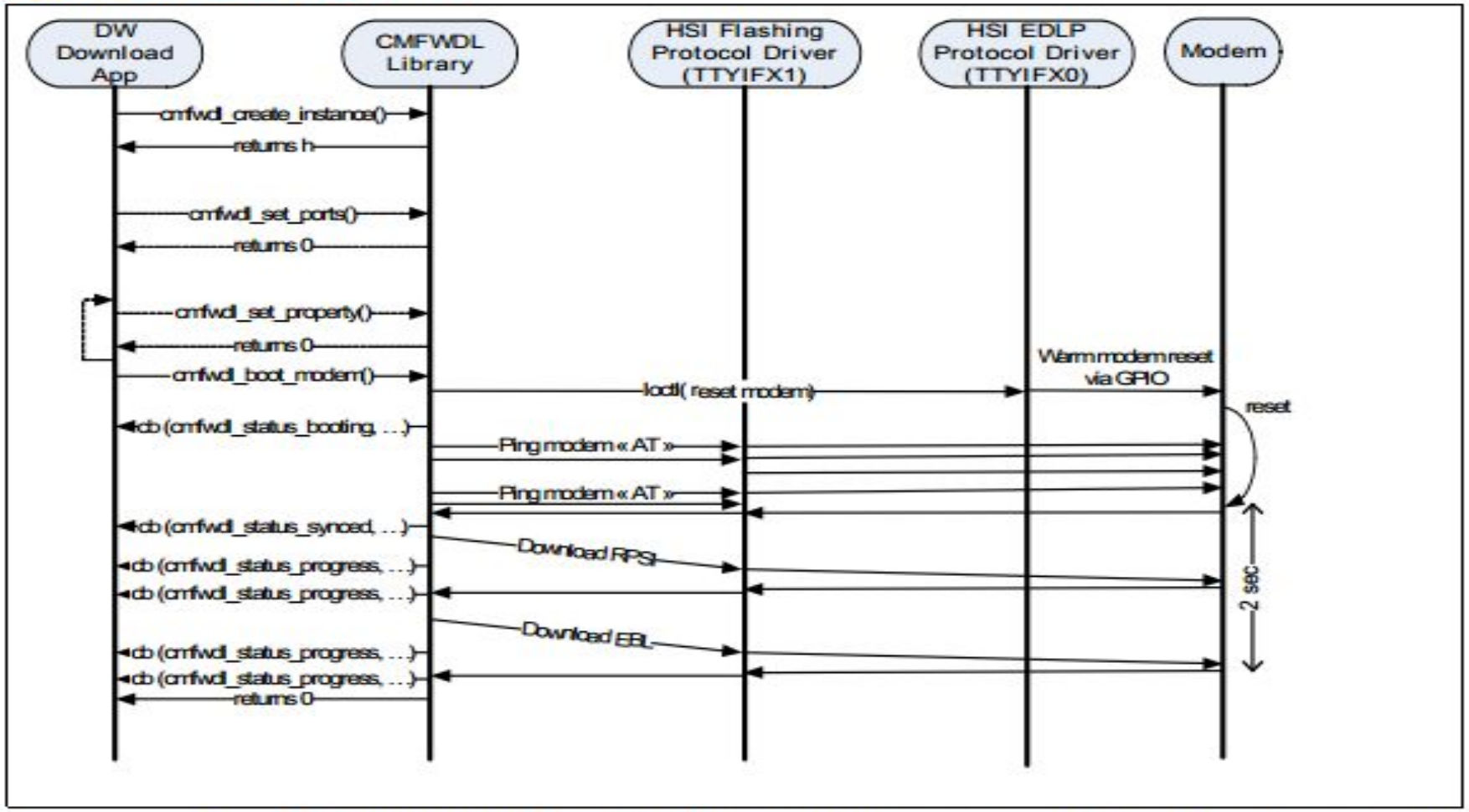


Figure 9-164.Setup Sequence



Note: The EBL is downloaded in the Modem RAM. Once it is stored in the RAM, the modem is booting on the EBL, and it is reading for flashing.

The Cellular Modem FirmWare DownLoad library

Figure 9-165.Download Sequence

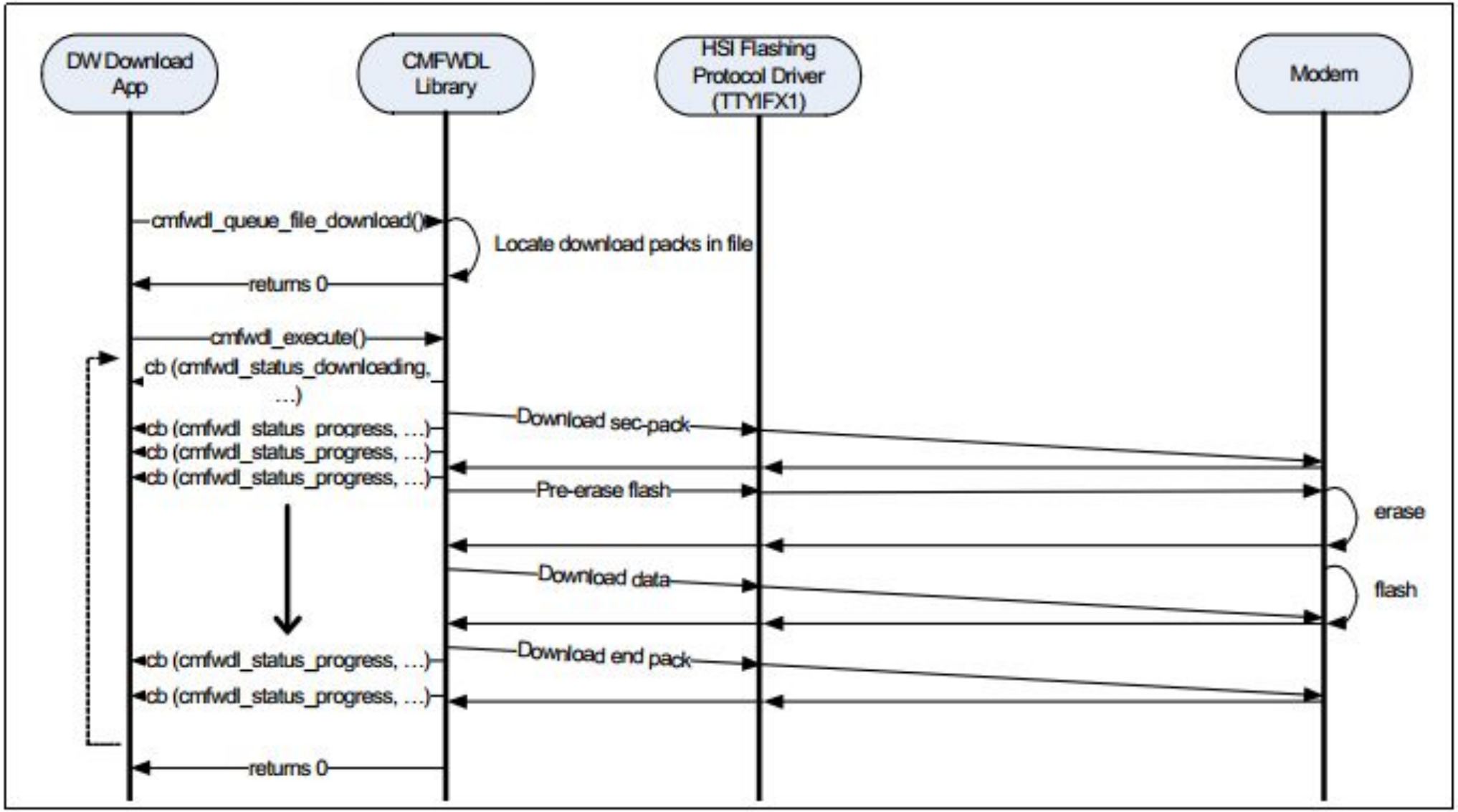


Figure 9-166.Obtaining Hardware ID Sequence

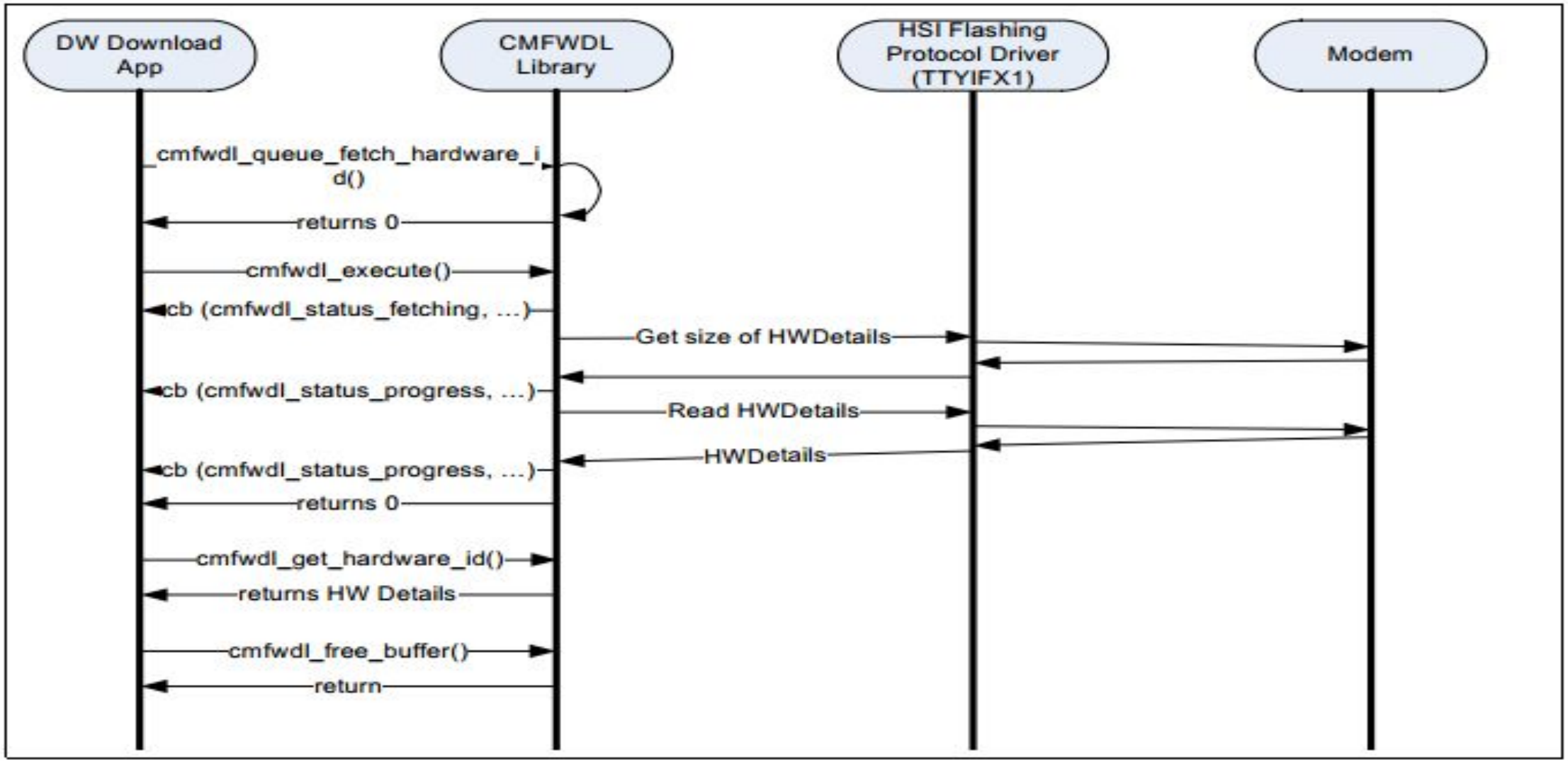
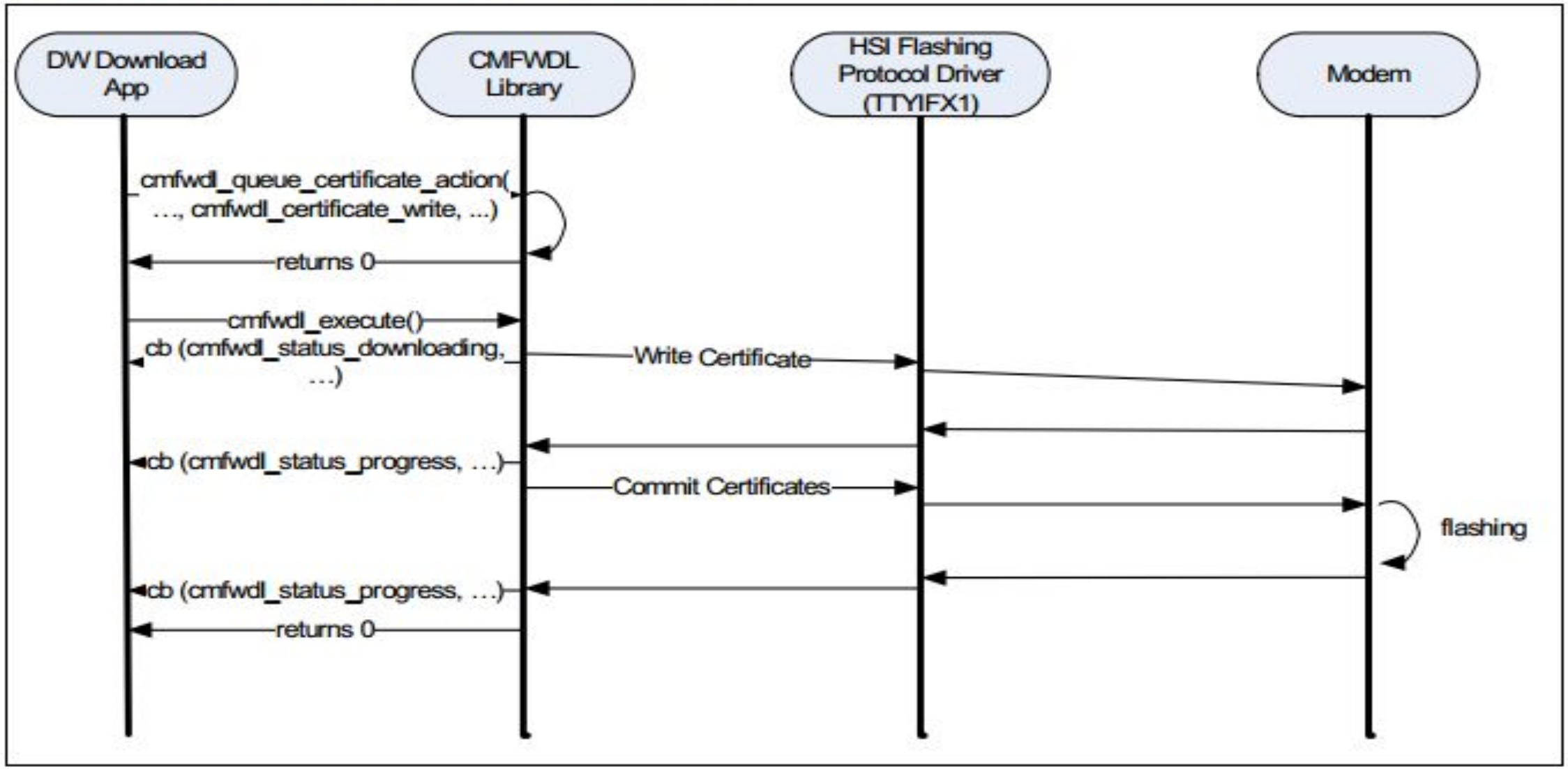


Figure 9-167.Writing Certificates Sequence



- 就zc451cg平台而言，一开始fls和tlv放在 vender/intel/fw/modem/IMC/6360_dsdc/FW/ZC451CG/
- 然后在ZC451CG.mk里用PRODUCT_COPY_FILE+=将其copy到
- System/etc/firmware/modem/里

2.Modem core dump

- The XMM6360 has the ability to generate and send a core dump over the Cloverview SoC UART1 after each unexpected modem reset. The core dump is stored in the file system in a directory defined in a configuration file.

The core dump reader(MCDR):

- Opens the UART1 tty.
- Sets the baud rate.
- Creates an output path (if necessary).
- Disables power management (so that the UART does not go to sleep).
- Captures the core dump data following a pre-defined protocol.
- Re-enables power management and finally closes the UART1 tty.
- A timestamp is generated and saved as a string in the file name.

Figure 9-147.Modem Core Dump Sequence

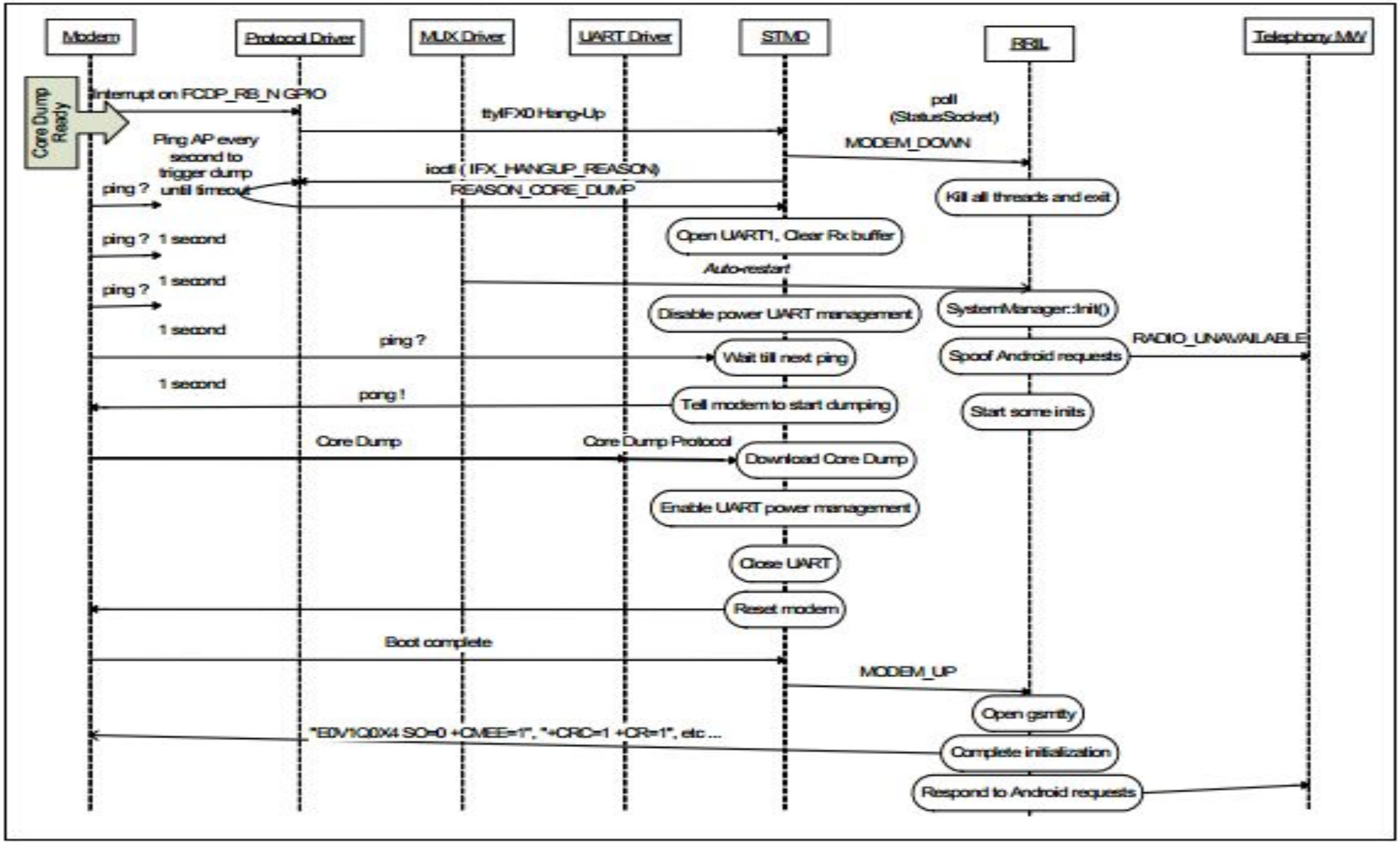
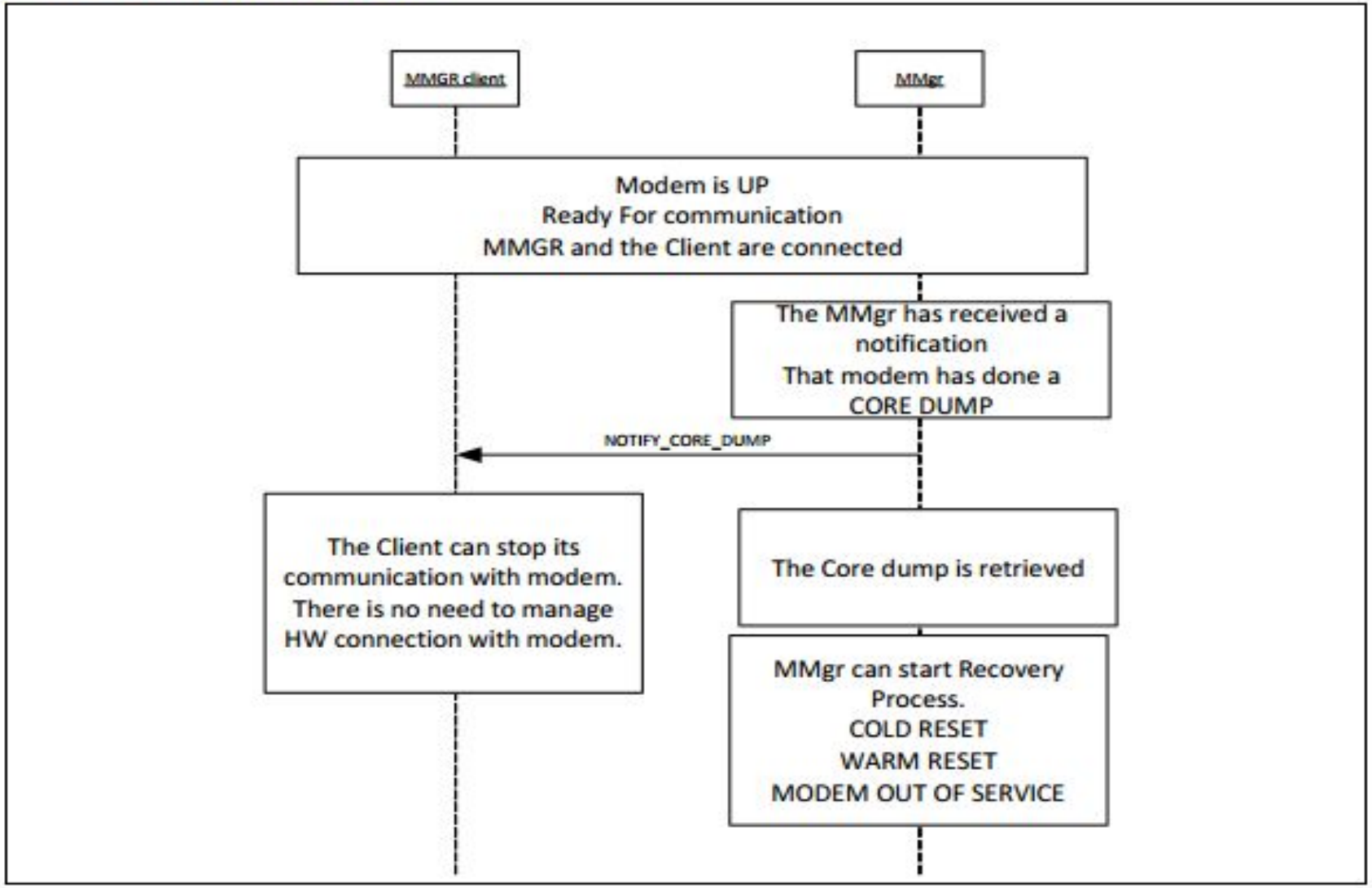


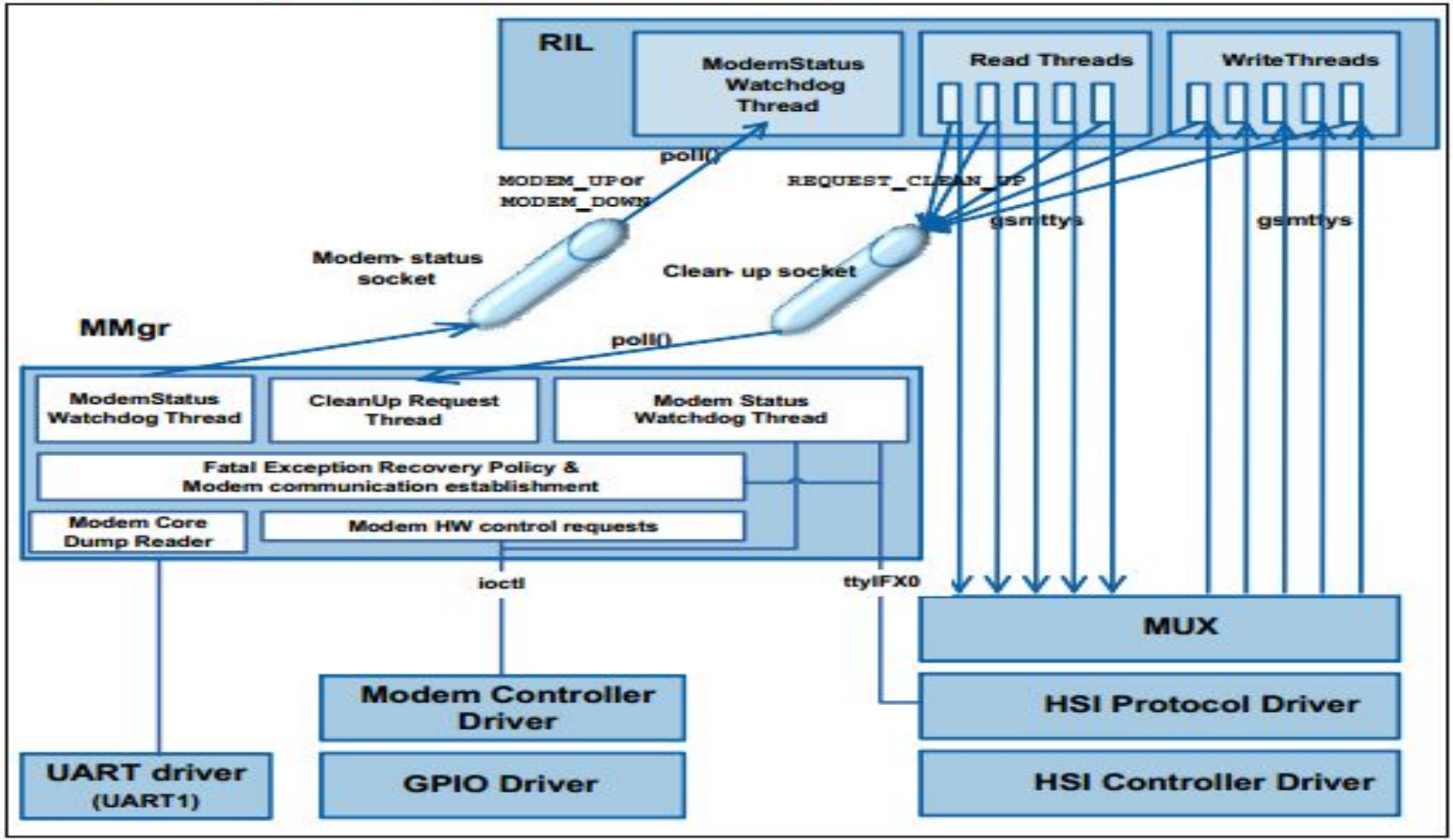
Figure 9-139.Core Dump Notification



3.Mmgr

- The MMgr is a component which manages the following aspects:
  - Modem reset / boot sequence and IPC components being ready for communication.
  - Enables and configures the Cloverview SoC-to-XMM6360 IPC multiplexed communications.
  - Synchronizes modem client(s) start-up with modem communication readiness.
  - Monitors communication exceptions, informs RIL about modem state and recovers from error situations (modem self-reset, unresponsive commands, core dumps).

Figure 9-136.MMgr Architecture and RIL Relationship



MMgr is also responsible for managing modem core dump downloads when such an event occurs

- The MMgr provides an API to the Client to perform the following services:
  - Modem State.
  - Request for Modem Restart or Recovery.
  - Modem Resource Management.
  - Update Modem Firmware and Configuration (Will be described in a future version).
- MMgr is also responsible for managing modem core dump downloads when such an event occurs

Figure 9-137.MMgr Connection (Modem UP)

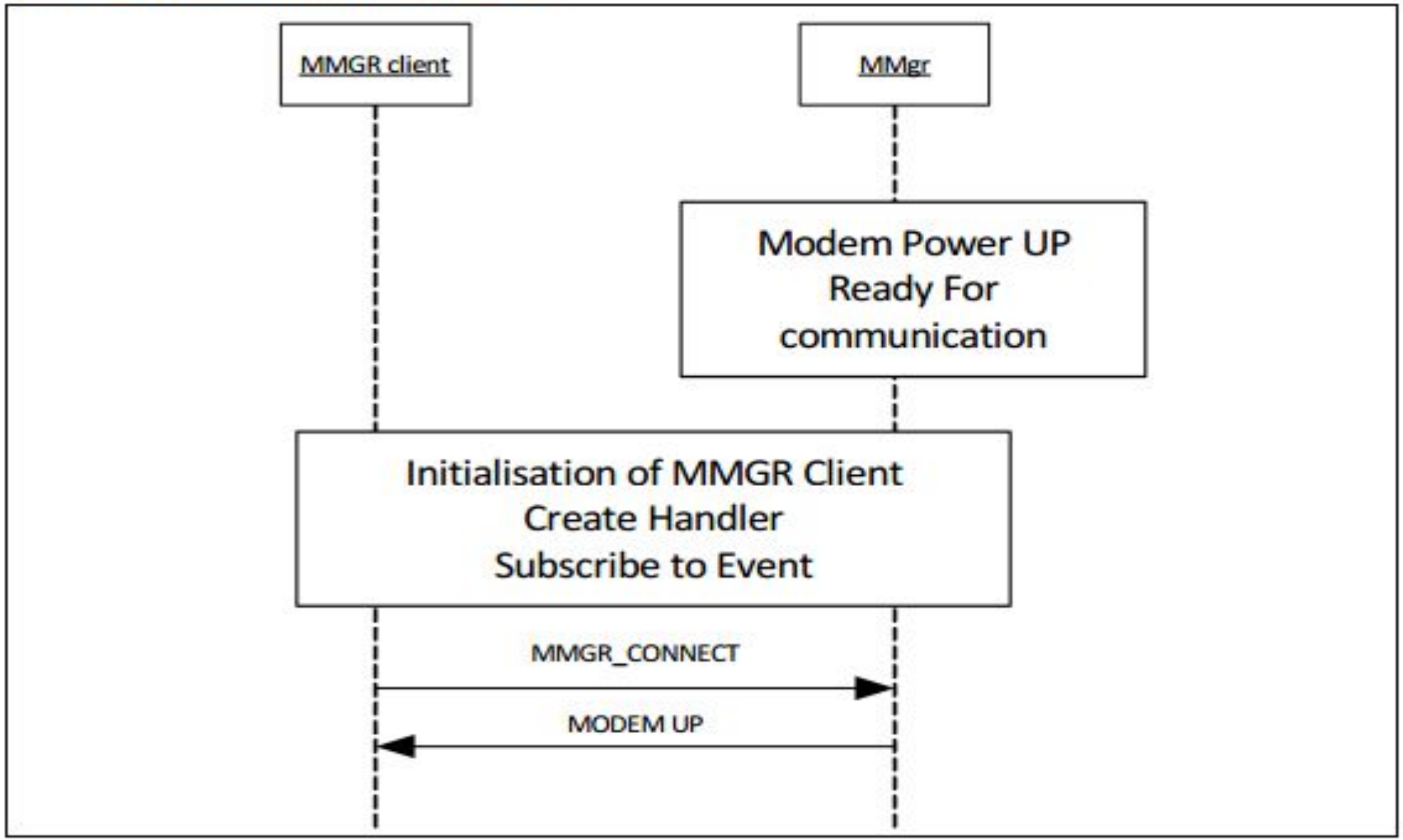


Figure 9-138.Modem Switch to UP

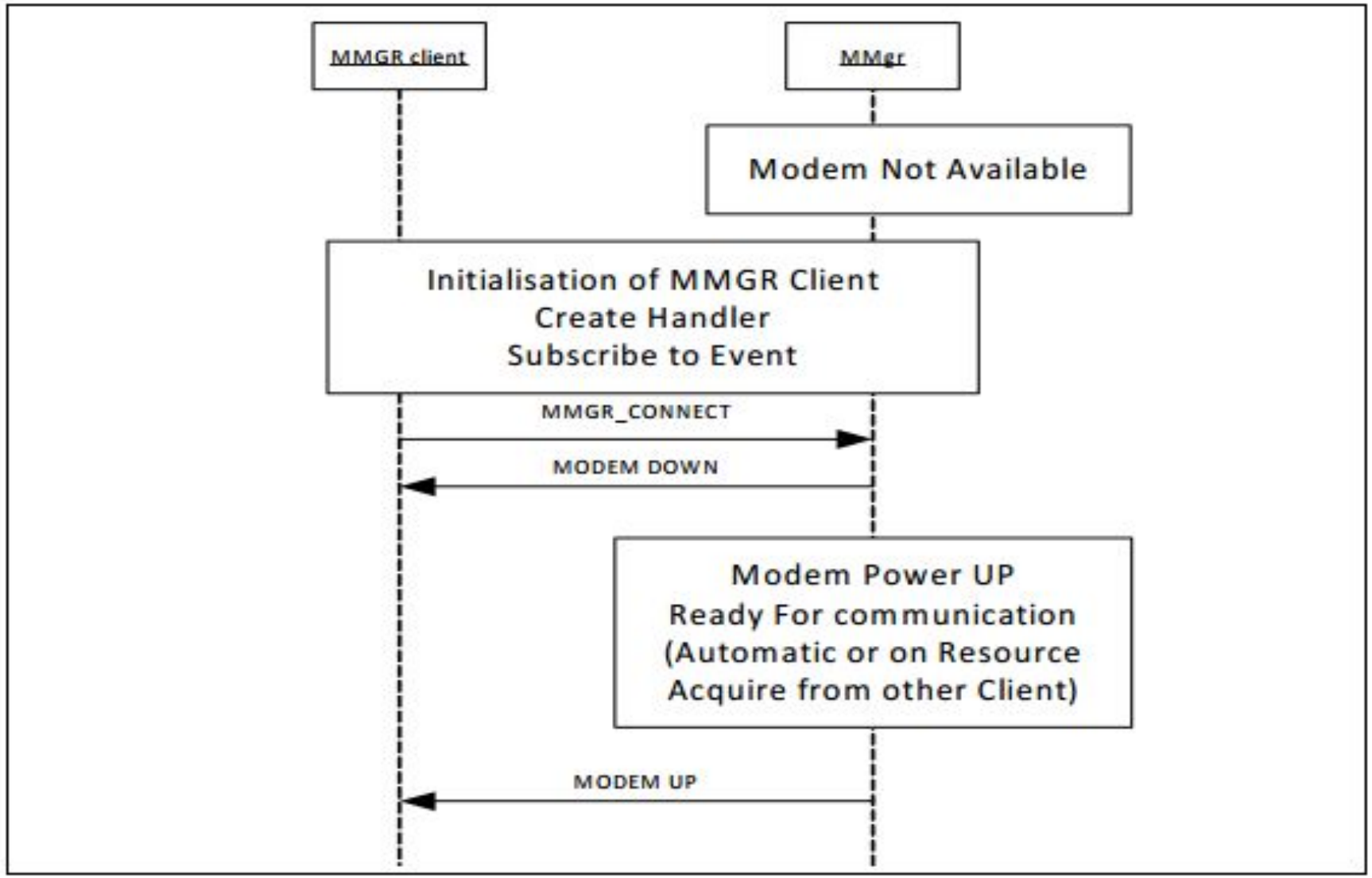


Figure 9-139.Core Dump Notification

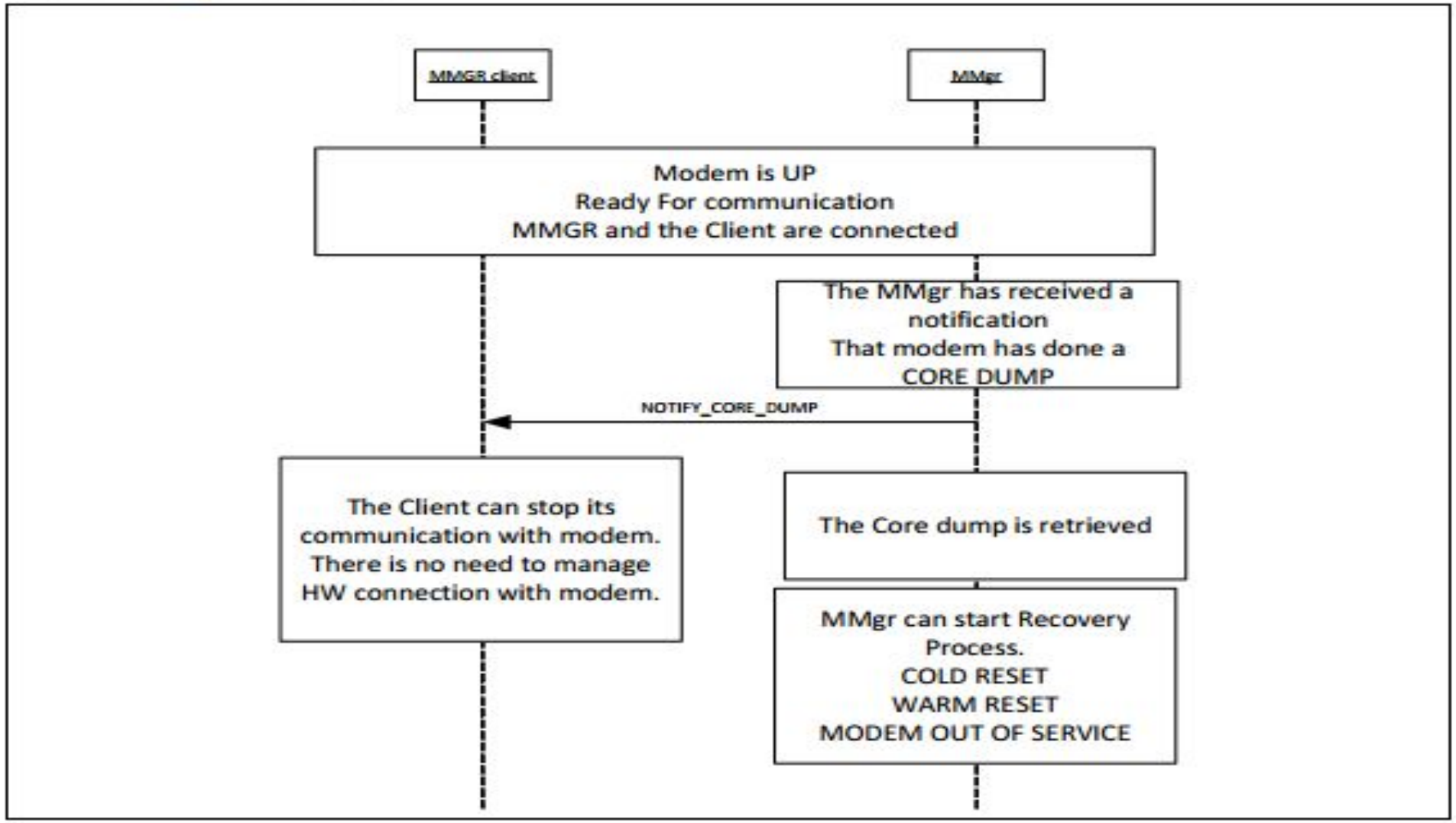


Figure 9-140.Modem Shutdown

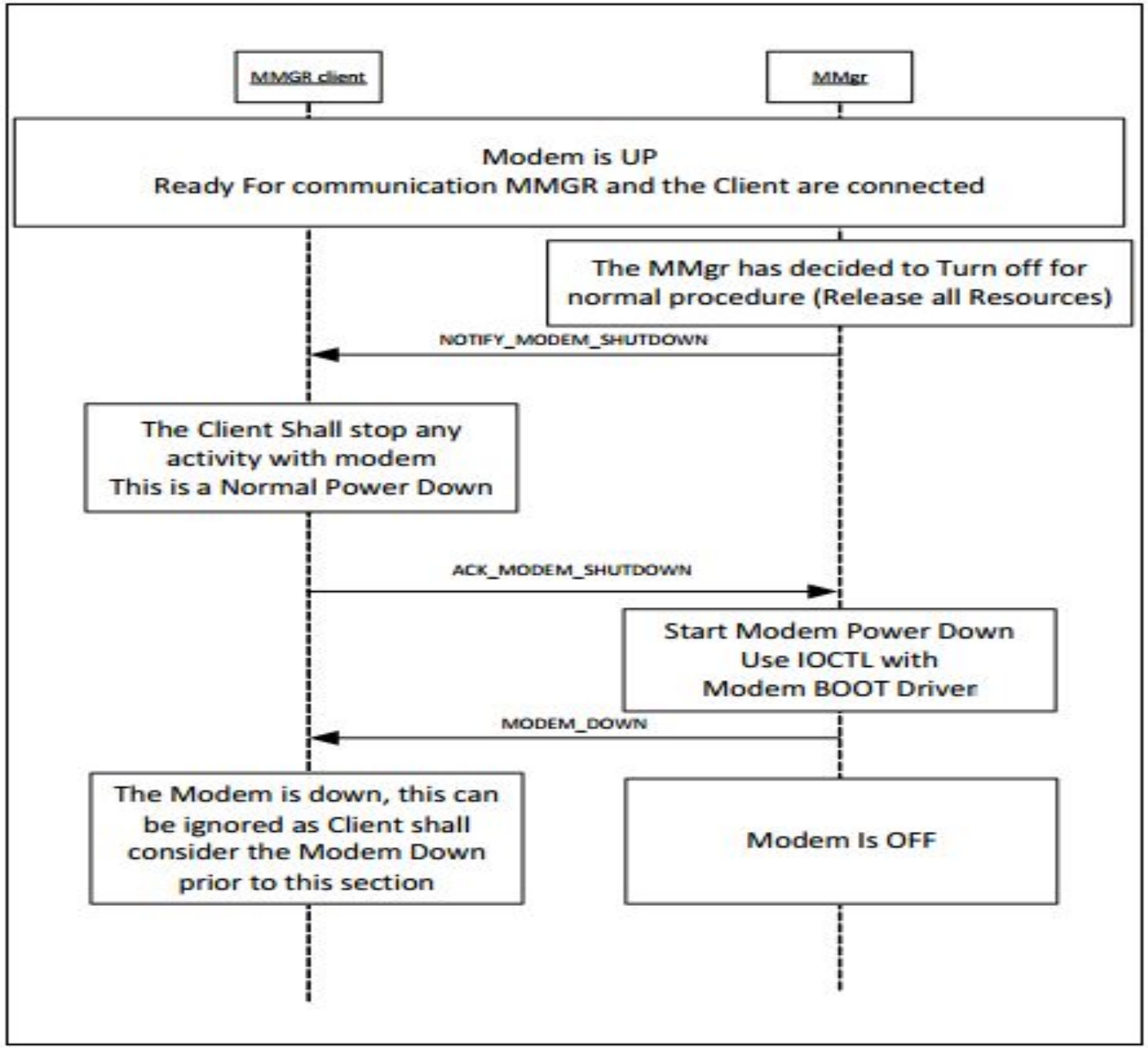


Figure 9-141.Modem Cold Reset

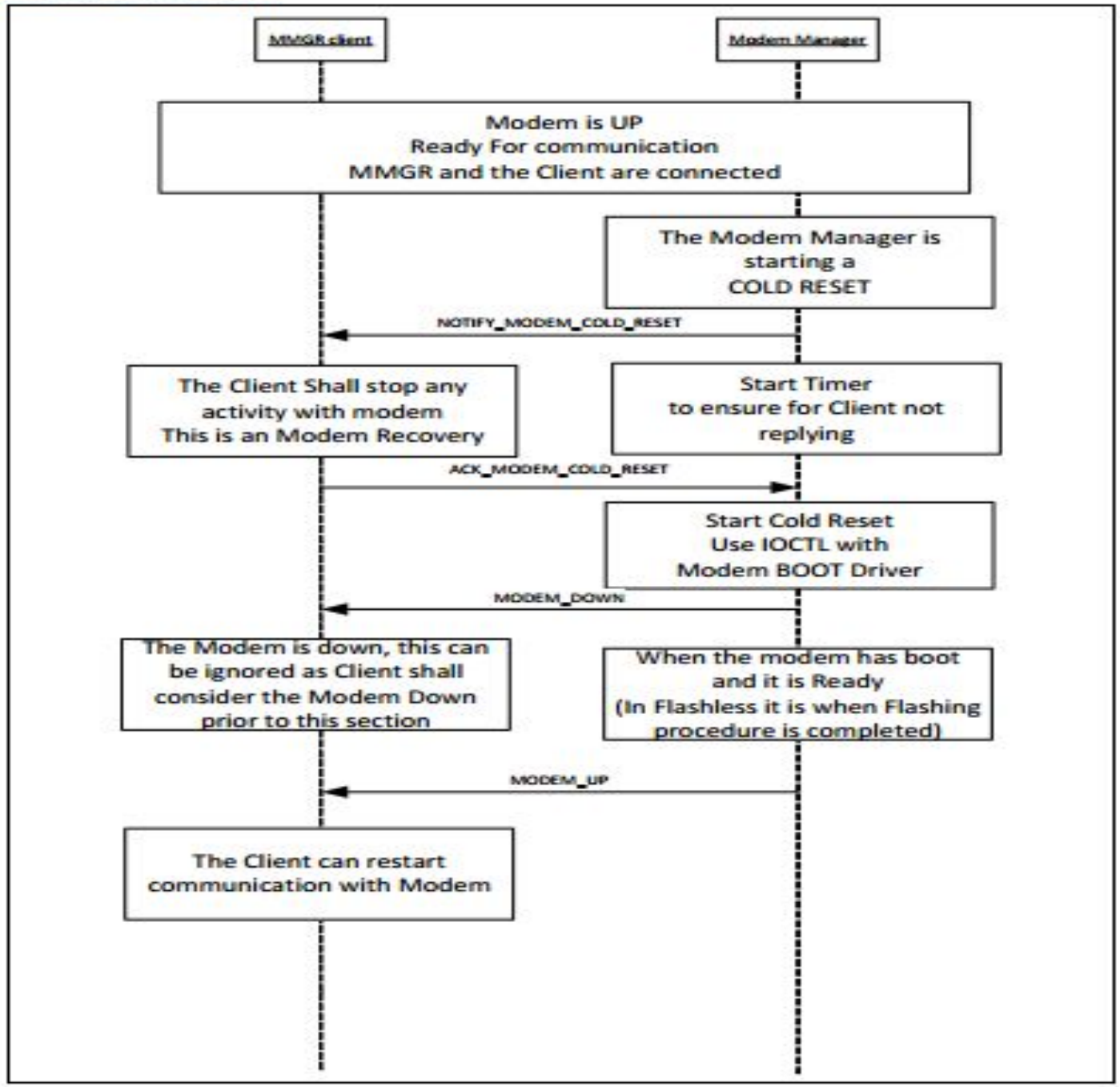


Figure 9-142.Resource Acquire

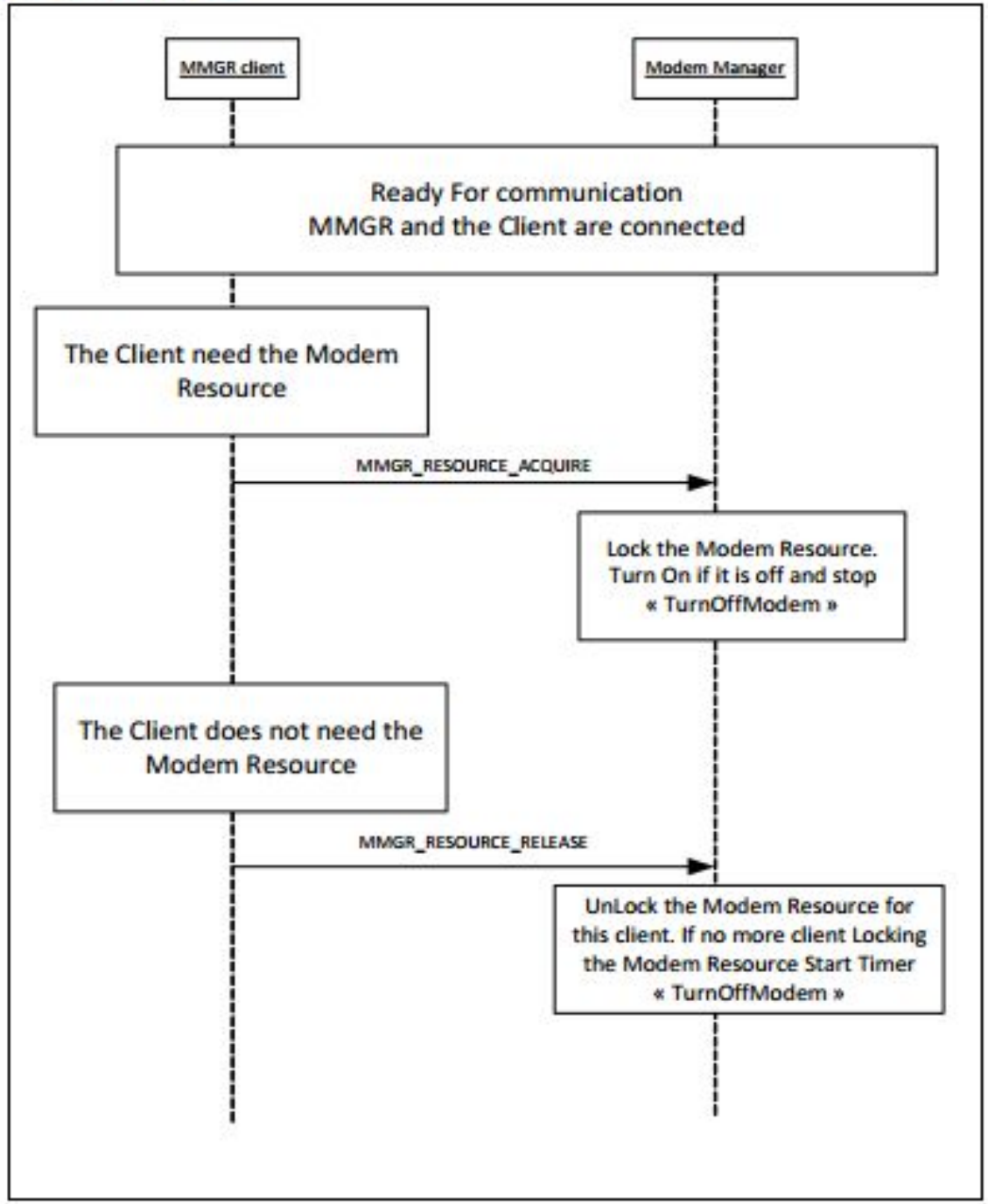
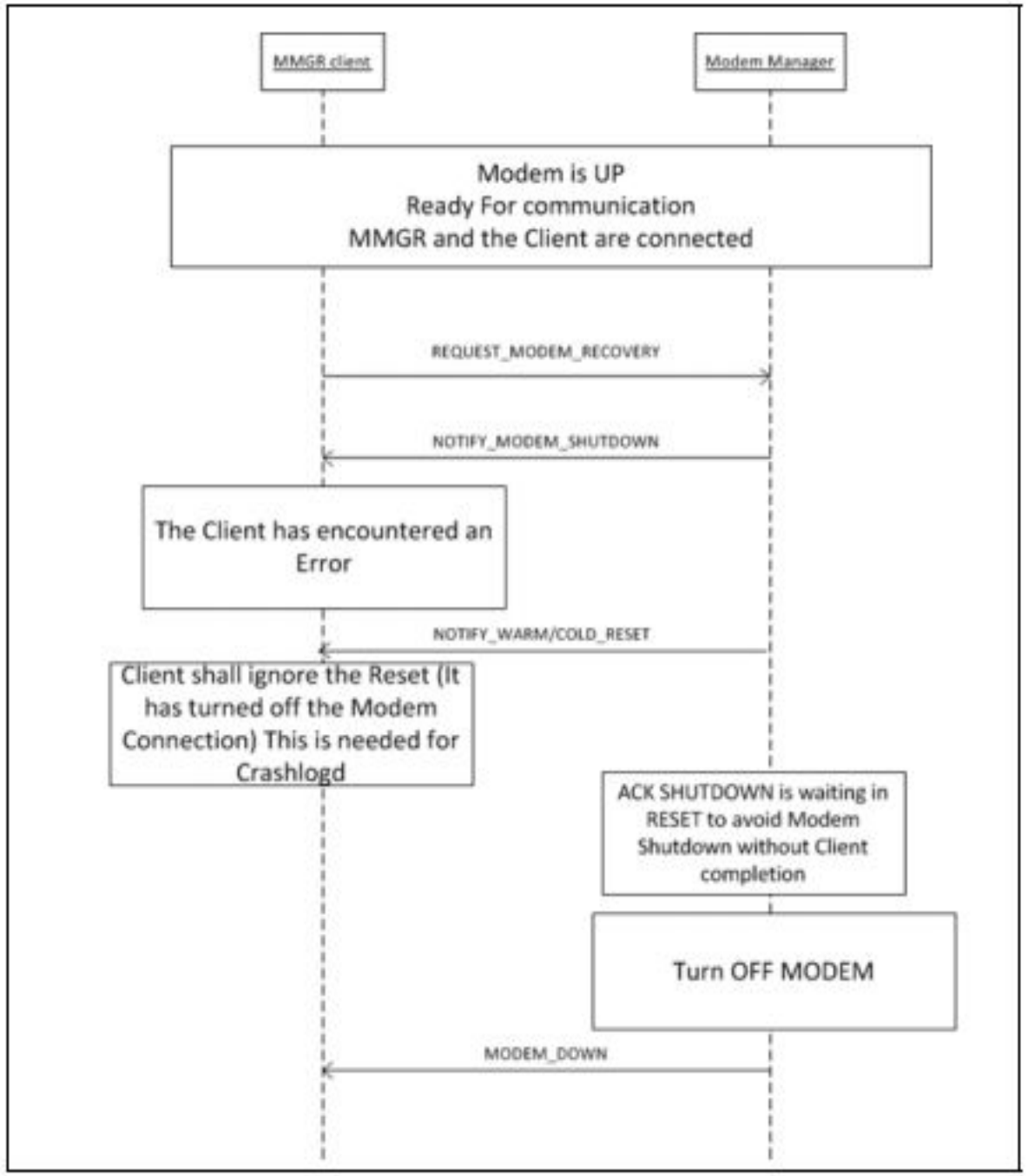


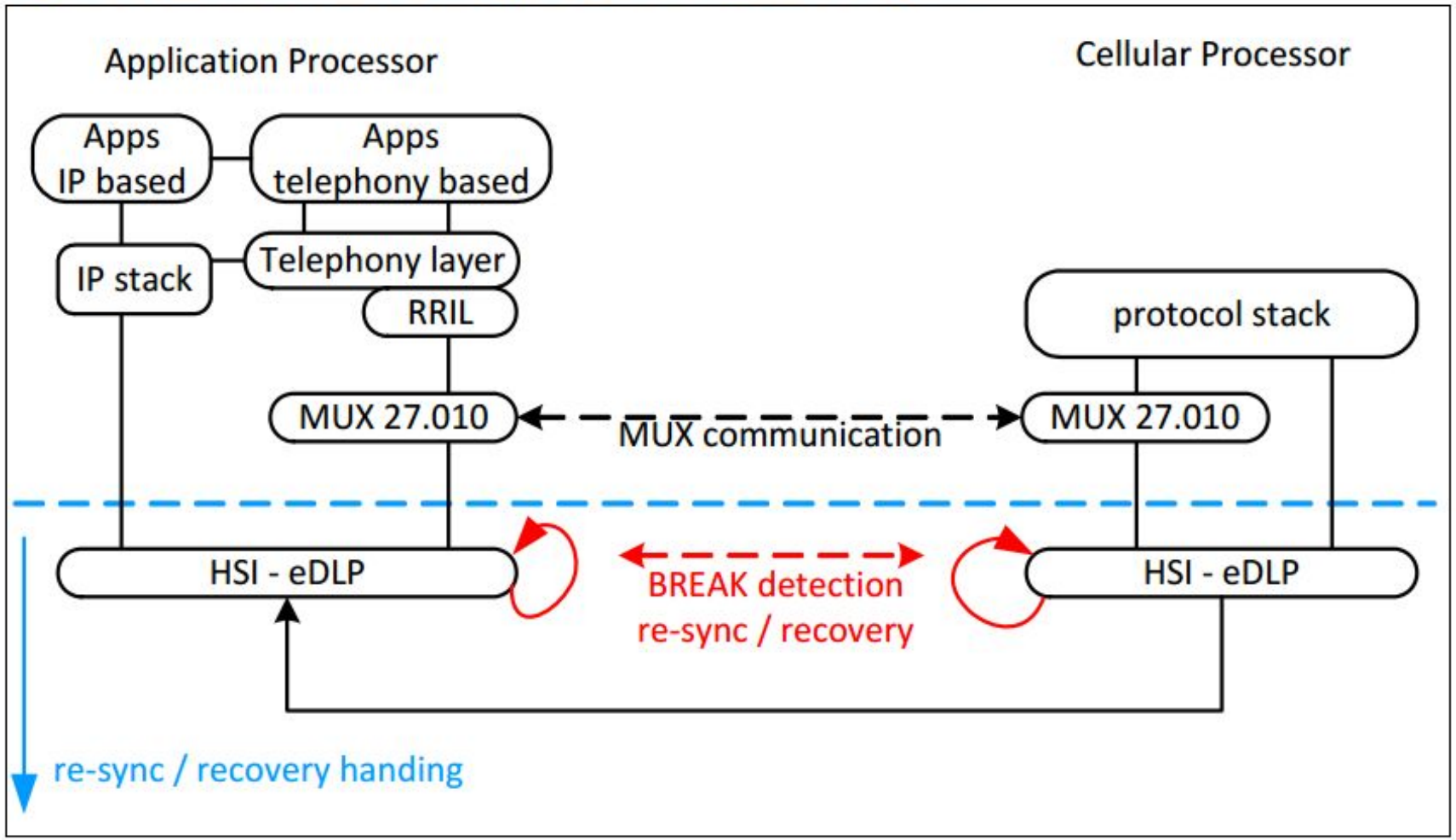
Figure 9-143.Request Modem Reset

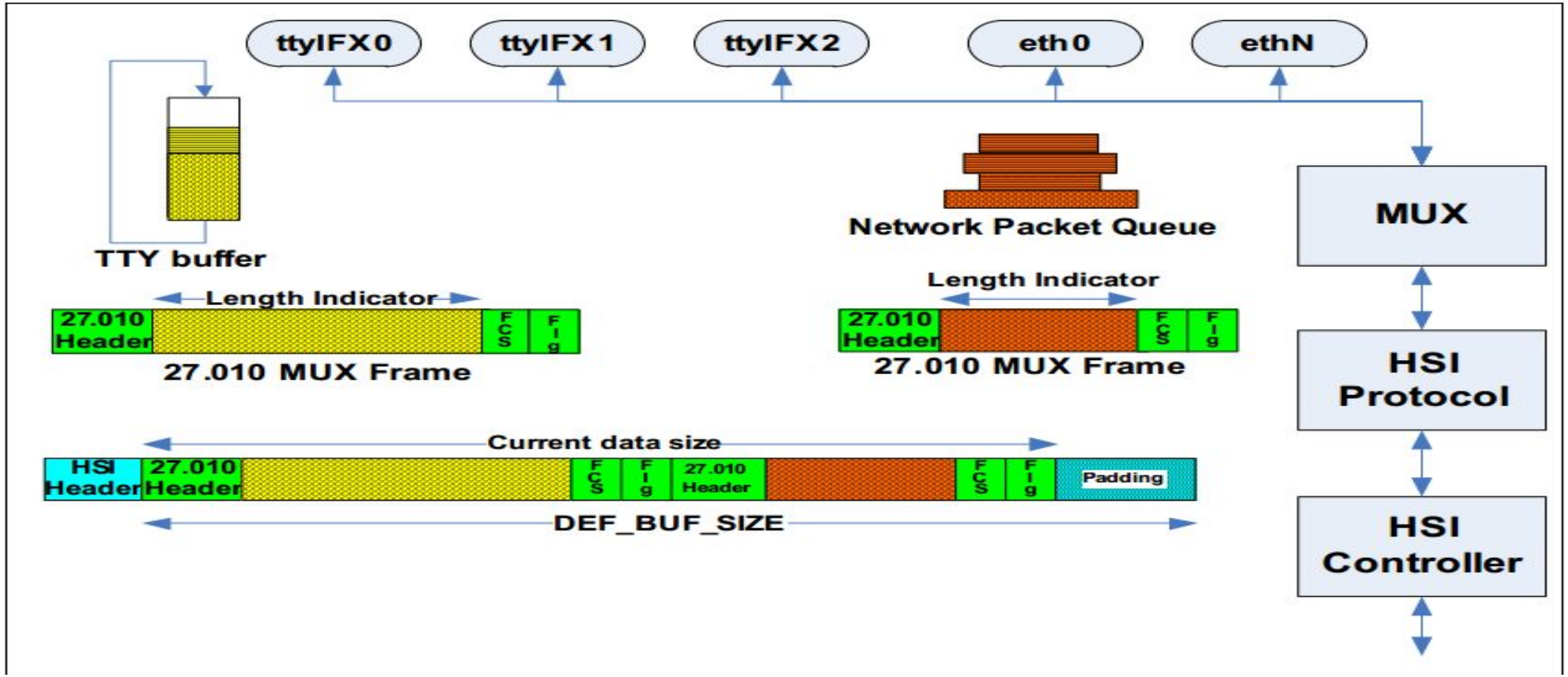


4.Modem driver

- **Modem Drivers**
  There are three levels of drivers; stacked, from the lower level to the highest.
-
  Level 1 (Controller driver - these drivers are not further detailed within):
  • HSI Controller driver: manages the HSI interface with the Cloverview SoC.
  • DMA driver and GPIO driver.
-
  Level 2 (Protocol driver):
  • HSI Protocol drivers: manage HSI transfers and catches events on GPIO.
  • HSI Flashing Protocol Driver and HSI EDLP Protocol driver are mutually exclusive.
-
  Level 3:
  • MUX Driver: manages the framing of data and multiplexing/demultiplexing according to 3GPP 27.010 specification.

Figure 9-123.HSI Recovery: High-Level Architecture Diagram





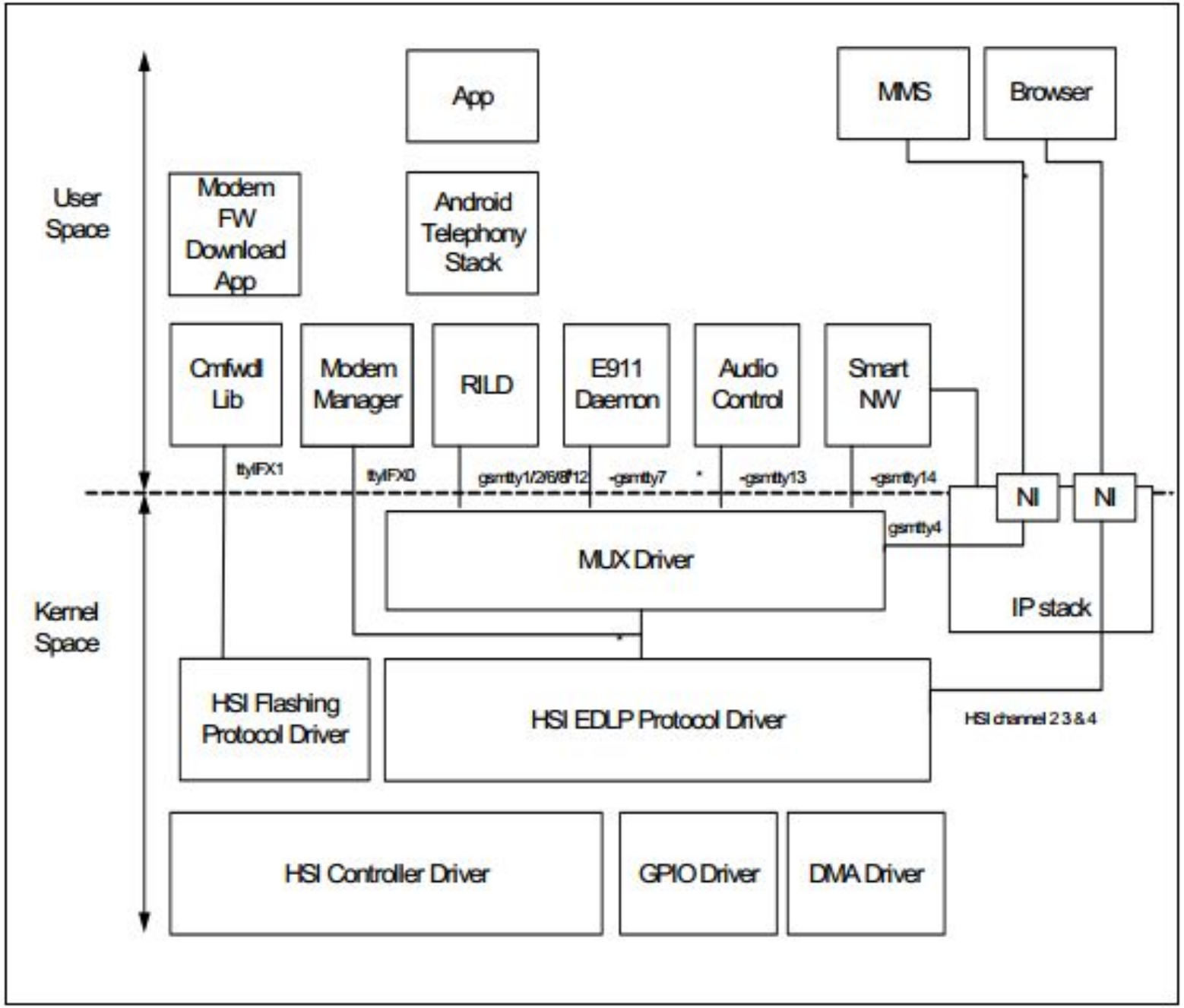
从上图中可以看出，mux interface是建立在HIS interface之上的

Table 9-79. HSI Channel Mapping

ID	Logical HSI Channel	Comment
1	Channel 0	Control channel, no DMA support
2	Channel 1	MUX 27.010 channel DMA support.
3	Channel 2	PDP context (Type is dynamically chosen by the RIL), DMA support. Data Connection control is done on a DLC (Dynamically chosen by RIL).
4	Channel 3	PDP context (Type is dynamically chosen by the RIL), DMA support. Data Connection control is done on a DLC (Dynamically chosen by the RIL).
5	Channel 4	Modem Tracing

Table 9-86. DLC Channel Allocation (Sheet 1 of 2)

DLC ID	Channel Type	Short Id	Name	Description	Modem Buffer size (bytes)	Modem WM (1)%	Modem WM (2)%
0	Serial	mux0	Mux	27.010 MUX control channel	processed immediately, not buffered		
1	Serial	cel1	Modem URC	Monitoring of URC coming from modem	1024	25	75
2	Serial	cel2	Packet registration	GPRS attach/detach	1024	25	75


App
MMS
Browser
User Space
Modem FW Download App
Android Telephony Stack
Cmfwdl Lib
Modem Manager
RILD
E911 Daemon
Audio Control
Smart NW
ttyIFX1
ttyIFX0
gsmtty1/2/6/8/12
gsmtty7
gsmtty13
gsmtty14
NI
NI
gsmtty4
MUX Driver
IP stack
Kernel Space
HSI Flashing Protocol Driver
HSI EDLP Protocol Driver
HSI channel 2 3 & 4
HSI Controller Driver
GPIO Driver
DMA Driver

- In POS, the HSI EDLP protocol driver does not have any clients so the HSI port (i.e. the HSI controller driver) can be accessed exclusively by the HSI Flashing Protocol.
-
  In Android* the HSI EDLP protocol already owns exclusive usage of the HSI port.

5.Modem log

- 1.modem flashing log
- 2.modem core dump log

6. AT Proxy

- In AT Proxy mode, the Clover Trail Plus platform offers an AT command server to an external host
- 开启proxy需要设置
- ./device/intel/clovertrail/redhookbay/config/init.modem.flashless.rc:
  #start proxy-tunneling
- on property:system.at-proxy.mode=2
- stop ad_proxy
- stop proxy
- setprop sys.usb.config rndis,acm,adb
- start proxy-tunneling

- service proxy-tunneling /system/bin/proxy -d /dev/gsmtty1 -m /dev/gsmtty10 -t on
- class main
- user radio
- group radio system cache inet misc
- disabled