IOSM Driver for Intel M.2 PCIe based Modems

The IOSM (IPC over Shared Memory) driver is a WWAN PCIe host driver developed for linux or chrome platform for data exchange over PCIe interface between Host platform & Intel M.2 Modem. The driver exposes interface conforming to the MBIM protocol [1]. Any front end application (eg: Modem Manager) could easily manage the MBIM interface to enable data communication towards WWAN.

Basic usage

MBIM functions are inactive when unmanaged. The IOSM driver only provides a userspace interface MBIM "WWAN PORT" representing MBIM control channel and does not play any role in managing the functionality. It is the job of a userspace application to detect port enumeration and enable MBIM functionality.

Examples of few such userspace application are: - mbimcli (included with the libmbim [2] library), and - Modem Manager [3]

Management Applications to carry out below required actions for establishing MBIM IP session: - open the MBIM control channel - configure network connection settings - connect to network - configure IP network interface

Management application development

The driver and userspace interfaces are described below. The MBIM protocol is described in [1] Mobile Broadband Interface Model v1.0 Errata-1.

MBIM control channel userspace ABI

/dev/wwan0mbim0 character device

The driver exposes an MBIM interface to the MBIM function by implementing MBIM WWAN Port. The userspace end of the control channel pipe is a /dev/wwan0mbim0 character device. Application shall use this interface for MBIM protocol communication.

Fragmentation

The userspace application is responsible for all control message fragmentation and defragmentation as per MBIM specification.

/dev/wwan0mbim0 write()

The MBIM control messages from the management application must not exceed the negotiated control message size.

/dev/wwan0mbim0 read()

The management application must accept control messages of up the negotiated control message size.

MBIM data channel userspace ABI

wwan0-X network device

The IOSM driver exposes IP link interface "wwan0-X" of type "wwan" for IP traffic. Iproute network utility is used for creating "wwan0-X" network interface and for associating it with MBIM IP session. The Driver supports upto 8 IP sessions for simultaneous IP communication.

The userspace management application is responsible for creating new IP link prior to establishing MBIM IP session where the SessionId is greater than 0.

For example, creating new IP link for a MBIM IP session with SessionId 1:

```
ip link add dev wwan0-1 parentdev-name wwan0 type wwan linkid 1
```

The driver will automatically map the "wwan0-1" network device to MBIM IP session 1.

References

[1] "MBIM (Mobile Broadband Interface Model) Errata-1"
- https://www.usb.org/document-library/

[2] libmbim - "a glib-based library for talking to WWAN modems and devices which speak the Mobile Interface Broadband Model (MBIM) protocol" - http://www.freedesktop.org/wiki/Software/libmbim/

[3] Modem Manager - "a DBus-activated daemon which controls mobile broadband (2G/3G/4G) devices and connections" - http://www.freedesktop.org/wiki/Software/ModemManager/