Overview of the Cisco ASR 1000 Series MIP and EPAs

This chapter provides an overview of the Cisco ASR 1000 Series Modular Interface Processor (ASR1000-MIP100), and Ethernet port adapters (EPAs).

This chapter includes the following sections:
- Introduction to MIPs and EPAs, page 1-1
- MIP and EPA Hardware and Software Compatibility Matrix, page 1-3
- Modular Optics Compatibility, page 1-4
- Displaying the Cisco ASR 1000 Series MIP Hardware Type, page 1-5
- Power Management, page 1-9
- LED Details, page 1-9

Introduction to MIPs and EPAs

Cisco ASR 1000 Series modular interface processors (MIPs) and Ethernet port adapters (EPAs) use a carrier card and port adapter architecture that increases modularity, flexibility, and density across Cisco routers for network connectivity. This section describes the MIPs and EPAs, and provides some guidelines for their use.

Modular Interface Processors

The ASR1000-MIP100 is a modular interface processor with a 100 Gbps connection to the backplane, for the ASR 1000 platform. However, it can have an interface bandwidth of up to 200 Gbps. The ASR1000-MIP100 provides higher I/O speeds, increased density, and interface flexibility to the ASR1000.

The ASR1000-MIP100 is capable of 100 Gbps full-duplex traffic forwarded using a modular-port interface design. The ASR1000-MIP100 architecture is composed of a host carrier card, which accepts up to two EPAs.
Introduction to MIPs and EPAs

Chapter 1      Overview of the Cisco ASR 1000 Series MIP and EPAs

Figure 1-1      ASR1000-MIP100 with EPAs Installed

The following list describes some of the general characteristics of a MIP:

- A MIP is a carrier card that inserts into a router slot like a line card. It provides no network connectivity on its own.
- A MIP has two subslots, which are used to house up to two EPAs. The EPA provides interface ports for network connectivity.
- During normal operation, the MIP should reside in the router fully populated either with functional EPAs in all subslots, or with a blank filler plate (EPA-BLANK=) inserted in all empty subslots.
- MIPs support online insertion and removal (OIR) with EPAs inserted in their subslots. EPAs also support OIR and can be inserted or removed independently from the MIP.

Note
Fully populate all slots and subslots with functional EPAs or blank filler plates for maximum efficiency of the cooling system.

Ethernet Port Adapters

EPAs are small plug-in modules containing circuitry to provide optical or electrical network interfaces. The packet data between the EPA and MIP carrier card can support a 100Gbps full-duplex bandwidth. The data path supports operating at various predefined data rates and protocols.

The following list describes some of the general characteristics of an EPA:

- An EPA is a modular type of port adapter that inserts into a subslot of a compatible MIP carrier card to provide network connectivity and increased interface port density.
- EPA inserts into one of the MIP-EPA bay, with EPA subslots as shown in Figure 1-1.
- Each EPA provides a certain number of connectors, or ports, that are the interfaces to one or more networks. These interfaces can be individually configured using the Cisco IOS command-line interface (CLI).
- Either a blank filler plate or a functional EPA should reside in every subslot of a MIP during normal operation to maintain cooling integrity.

EPAs support online insertion and removal (OIR). They can be inserted or removed independently from the MIP. MIPs also support OIR with EPAs inserted in their subslots.
Figure 1-2 1-Port 100 Gigabit Ethernet EPA (EPA-1X100GE)

Figure 1-3 2-Port 40 Gigabit Ethernet EPA with CPAK and Breakout Cable (EPA-CPAK-2X40GE)

Figure 1-4 10-Port 10 Gigabit Ethernet EPA (EPA-10X10GE)

Figure 1-5 18-Port 1 Gigabit Ethernet EPA (EPA-18X1GE)

Figure 1-6 1-Port 40 Gigabit QSFP Ethernet EPA (EPA-1X40GE) and 2-Port 40 Gigabit QSFP Ethernet EPA (EPA-2X40GE)
Figure 1-7 1-Port 100 Gigabit QSFP Ethernet EPA (EPA-QSFP-1x100GE)

The QSFP based EPA supports transceiver modules based on a QSFP form factor. Whereas EPA-1X100G supports CFP-based transceivers.

The 1-port 40 Gigabit Ethernet EPA and the 2-port 40 Gigabit Ethernet EPA are QSFP-based EPAs. Both these EPAs support Ethernet features, Synchronous Ethernet and MACsec. The 2-port 40 Gigabit EPA has two 40GE ports without any licenses. The 1-port 40 Gigabit EPA has two 40GE interfaces but only the first port is usable without license. Second port is license-based and supports Cisco Smart Licensing.

The 1-port 100 Gigabit Ethernet EPA is a QSFP-based EPA. This EPAs support Ethernet features, Synchronous Ethernet and MACsec. The port is license-based and supports Cisco Smart Licensing (FLSA1-MACSEC100G / L-FLA1-MACSEC100G=)

Table 1-1 Minimum Software for MACsec Support

The following EPAs support Synchronous Ethernet:

- EPA-10X10GE
- EPA-18X1GE
- EPA-1X40GE
- EPA-2X40GE
- EPA-1X100GE
- Built-in EPAs on ASR1001-HX, ASR1002-HX

Modular Optics Compatibilities

The EPA-1X100GE uses a CPAK module to provide network connectivity. The EPA-CPAK-2X40GE uses a CPAK module and a 2x40 GE breakout cable to provide network connectivity. The EPA-10X10GE uses small form-factor pluggable (SFP+) optical transceivers to provide network connectivity. The EPA-18X1GE uses SFP optical transceivers to provide network connectivity.

For more information, see Cisco Optics Compatibility Matrix (https://tmgmatrix.cisco.com/)
Displaying the Cisco ASR 1000 Series MIP Hardware Type

To verify the Cisco ASR 1000 Series MIP hardware type that is installed in your Cisco ASR 1000 series router, use the `show platform` command.

The following is a sample output of the `show platform` command for the MIP that is installed in Cisco ASR 1009-X Router.

Router# show platform
Chassis type: ASR1009-X

<table>
<thead>
<tr>
<th>Slot</th>
<th>Type</th>
<th>State</th>
<th>Insert time (ago)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ASR1000-MIP100</td>
<td>ok</td>
<td>03:10:14</td>
</tr>
<tr>
<td>1</td>
<td>ASR1000-MIP100</td>
<td>ok</td>
<td>03:10:14</td>
</tr>
<tr>
<td>1/0</td>
<td>EPA-10X10GE</td>
<td>ok</td>
<td>00:01:32</td>
</tr>
<tr>
<td>1/1</td>
<td>EPA-1X100GE</td>
<td>ok</td>
<td>00:01:24</td>
</tr>
<tr>
<td>2</td>
<td>ASR1000-MIP100</td>
<td>ok</td>
<td>09:34:16</td>
</tr>
<tr>
<td>2/0</td>
<td>EPA-1X100GE</td>
<td>ok</td>
<td>09:00:29</td>
</tr>
</tbody>
</table>

The following is a sample output of the `show platform` command for the MIP that is installed in Cisco ASR 1013 Router with EPA-QSFP-1X100GE inserted in slot 3.

Router# show platform
Chassis type: ASR1013

<table>
<thead>
<tr>
<th>Slot</th>
<th>Type</th>
<th>State</th>
<th>Insert time (ago)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ASR1000-MIP100</td>
<td>ok</td>
<td>14:47:17</td>
</tr>
<tr>
<td>0/0</td>
<td>EPA-10X10GE</td>
<td>ok</td>
<td>14:44:55</td>
</tr>
<tr>
<td>0/1</td>
<td>EPA-1X100GE</td>
<td>ok</td>
<td>00:00:09</td>
</tr>
<tr>
<td>1</td>
<td>ASR1000-MIP100</td>
<td>ok</td>
<td>14:47:17</td>
</tr>
<tr>
<td>1/0</td>
<td>EPA-18X1GE</td>
<td>ok</td>
<td>14:44:57</td>
</tr>
<tr>
<td>3</td>
<td>ASR1000-MIP100</td>
<td>ok</td>
<td>14:47:17</td>
</tr>
<tr>
<td>3/0</td>
<td>EPA-QSFP-1X100GE</td>
<td>ok</td>
<td>04:41:12</td>
</tr>
<tr>
<td>3/1</td>
<td>EPA-1X40GE</td>
<td>ok</td>
<td>10:16:05</td>
</tr>
<tr>
<td>4</td>
<td>ASR1000-SIP40</td>
<td>ok</td>
<td>14:47:17</td>
</tr>
<tr>
<td>4/0</td>
<td>SPA-2X1GE-V2</td>
<td>ok</td>
<td>14:45:25</td>
</tr>
<tr>
<td>4/1</td>
<td>SPA-5X1GE-V2</td>
<td>ok</td>
<td>14:45:25</td>
</tr>
<tr>
<td>4/3</td>
<td>SPA-1X100GE-L-V2</td>
<td>ok</td>
<td>14:45:19</td>
</tr>
<tr>
<td>5</td>
<td>ASR1000-2T+20X1GE</td>
<td>ok</td>
<td>14:47:17</td>
</tr>
<tr>
<td>5/0</td>
<td>BUILT-IN-2T+20X1GE</td>
<td>ok</td>
<td>14:45:10</td>
</tr>
<tr>
<td>R1</td>
<td>ASR1000-RP2</td>
<td>ok, active</td>
<td>14:47:17</td>
</tr>
<tr>
<td>F0</td>
<td>ASR1000-ESP200</td>
<td>ok, active</td>
<td>14:47:17</td>
</tr>
<tr>
<td>P0</td>
<td>ASR1013-PWR-AC</td>
<td>ok</td>
<td>14:46:19</td>
</tr>
<tr>
<td>P1</td>
<td>ASR1013-PWR-AC</td>
<td>ok</td>
<td>14:46:17</td>
</tr>
<tr>
<td>P2</td>
<td>ASR1013-PWR-AC</td>
<td>ok</td>
<td>14:46:17</td>
</tr>
<tr>
<td>P3</td>
<td>ASR1013/06-PWR-AC</td>
<td>ok</td>
<td>14:46:16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Slot</th>
<th>CPLD Version</th>
<th>Firmware Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15072100</td>
<td>16.3 (2r)</td>
</tr>
<tr>
<td>1</td>
<td>15072100</td>
<td>16.3 (2r)</td>
</tr>
<tr>
<td>3</td>
<td>15072100</td>
<td>16.3 (2r)</td>
</tr>
<tr>
<td>4</td>
<td>00200800</td>
<td>16.3 (2r)</td>
</tr>
<tr>
<td>5</td>
<td>00010000</td>
<td>12.2 (20120809:045831) [lokbuild 114]</td>
</tr>
<tr>
<td>R1</td>
<td>14111801</td>
<td>16.3 (2r)</td>
</tr>
<tr>
<td>F0</td>
<td>13041200</td>
<td>16.3 (2r)</td>
</tr>
</tbody>
</table>

Table 1-4 shows the hardware description that appears in the `show interfaces` command output for each Cisco ASR 1000 Series MIP that is supported on the Cisco ASR 1000 Series Router.
Table 1-2  MIP Hardware Descriptions in show interfaces Command Output

<table>
<thead>
<tr>
<th>MIP and EPA</th>
<th>Description in the show interfaces Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASR1000-MIP100 and EPA-1X100GE</td>
<td>Hardware is EPA-1X100GE</td>
</tr>
<tr>
<td>ASR1000-MIP100 and EPA-CPAK-2x40GE</td>
<td>Hardware is EPA-CPAK-2x40GE</td>
</tr>
<tr>
<td>ASR1000-MIP100 and EPA-10X10GE</td>
<td>Hardware is EPA-10X10GE</td>
</tr>
<tr>
<td>ASR1000-MIP100 and EPA-18X1GE</td>
<td>Hardware is EPA-18X1GE</td>
</tr>
<tr>
<td>ASR1000-MIP100 and EPA-1X40GE</td>
<td>Hardware is EPA-1X40GE</td>
</tr>
<tr>
<td>ASR1000-MIP100 and EPA-2X40GE</td>
<td>Hardware is EPA-2X40GE</td>
</tr>
<tr>
<td>ASR1000-MIP100 and EPA-QSFP-1X100GE</td>
<td>Hardware is EPA-QSFP-1X100GE</td>
</tr>
</tbody>
</table>

The following is a sample output of the `show interfaces` command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 0 and the EPA-2X40 GE in subslot 2:

```
Router# show interfaces fo0/2/1
FortyGigabitEthernet0/2/1 is up, line protocol is up
    Hardware is EPA-2X40GE, address is 74a2.e625.4421 (bia 74a2.e625.4421)
    MTU 1500 bytes, BW 40000000 Kbit/sec, DLY 10 usec,
        reliability 255/255, txload 1/255, rxload 1/255
    Encapsulation ARPA, loopback not set
    Keepalive not supported
    Full Duplex, 40000Mbps, link type is force-up, media type is QSFP-H40GE-ACU10M
    output flow-control is on, input flow-control is on
    EoMPLS Remote Link up
    ARP type: ARPA, ARP Timeout 04:00:00
    Last input 02:31:52, output 02:31:52, output hang never
    Last clearing of "show interface" counters never
    Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
    Queuing strategy: fifo
    Output queue: 0/40 (size/max)
    5 minute input rate 0 bits/sec, 0 packets/sec
    5 minute output rate 0 bits/sec, 0 packets/sec
    41 packets input, 3625 bytes, 0 no buffer
    Received 1 broadcasts (0 IP multicasts)
    0 runs, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 26 multicast, 0 pause input
    78 packets output, 5824 bytes, 0 underruns
    0 output errors, 0 collisions, 2 interface resets
    0 unknown protocol drops
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier, 0 pause output
    0 output buffer failures, 0 output buffers swapped out
    3 carrier tr
    ...
    ...
```
The following is a sample output of the `show interfaces HundredGigE` command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 1 and the EPA-1X100GE in subslot 1:

```
Router# show interfaces HundredGigE 1/1/0
HundredGigE1/1/0 is up, line protocol is up
Hardware is EPA-1X100GE, address is 74a0.2ff9.b7a0 (bia 74a0.2ff9.b7a0)
MTU 7500 bytes, BW 10000000 Kbit/sec, DLY 10 usec,
    reliability 249/255, txload 1/255, rxload 1/255
```
Encapsulation ARPA, loopback not set

The following is a sample output of the `show interfaces HundredGigE` command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 3 and EPA-QSFP-1X100GE installed in subslot 0:

```
Router# show interfaces HundredGigE 3/0/0
HundredGigE3/0/0 is up, line protocol is up
    Hardware is EPA-QSFP-1X100GE, address is badb.adba.e8c0 (bia badb.adba.e8c0)
    Internet address is 50.1.1.2/24
    MTU 7500 bytes, BW 100000000 Kbit/sec, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
    Encapsulation ARPA, loopback not set
    Keepalive not supported
    Full Duplex, 100000Mbps, link type is force-up, media type is QSFP_100G_AOC1SM
    output flow-control is on, input flow-control is on
    ARP type: ARPA, ARP Timeout 04:00:00
    Last input 00:04:23, output 00:35:50, output hang never
    Last clearing of "show interface" counters 00:00:05
    Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
    Queueing strategy: fifo
    Output queue: 0/40 (size/max)
    5 minute input rate 0 bits/sec, 0 packets/sec
    5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts (0 IP multicasts)
    0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 0 multicast, 0 pause input
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 unknown protocol drops
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier, 0 pause output
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
```

The following is a sample output of the `show interfaces FortyGigabitEthernet` command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 2 and the EPA-CPA-2x40GE in subslot 1:

```
Router# show interfaces FortyGigabitEthernet 2/1/0
FortyGigabitEthernet2/1/0 is administratively up, line protocol is up
    Hardware is EPA-CPA-2X40GE, address is 6c41.6ada.a7a0 (bia 6c41.6ada.a7a0)
    MTU 1500 bytes, BW 40000000 Kbit/sec, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
    Encapsulation ARPA, loopback not set
```

The following is a sample output of the `show interfaces GigabitEthernet` command on a Cisco ASR 1002-HX Router with the MIP installed in slot 0 and the EPA-18X1GE in subslot 2.

```
Router# show interfaces GigabitEthernet 0/2/0
GigabitEthernet0/2/0 is down, line protocol is down
    Hardware is EPA-18X1GE, address is 74a2.e624.e920 (bia 74a2.e624.e920)
    MTU 1500 bytes, BW 10000000 Kbit/sec, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
    Encapsulation ARPA, loopback not set
    Keepalive not supported
    Full Duplex, 1000Mbps, link type is auto, media type is unknown media type
    output flow-control is on, input flow-control is on
    ARP type: ARPA, ARP Timeout 04:00:00
    Last input never, output never, output hang never
```
Last clearing of "show interface" counters never
Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts (0 IP multicasts)
  0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 watchdog, 0 multicast, 0 pause input
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 collisions, 2 interface resets
  0 unknown protocol drops
  0 babbles, 0 late collision, 0 deferred
  0 lost carrier, 0 no carrier, 0 pause output
  0 output buffer failures, 0 output buffers swapped out

The following is a sample output of the show interfaces FortyGigabitEthernet command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 0 and the EPA-1x40GE in subslot 2:

```
Router# show interface FortyGigabitEthernet0/2/1
FortyGigabitEthernet0/2/1 is up, line protocol is up
Hardware is EPA-1X40GE, address is 74a2.e625.5d21 (bia 74a2.e625.5d21)
Internet address is 39.1.1.1/30
MTU 1500 bytes, BW 4000000 Kbit/sec, DLY 10 usec,
  reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive not supported
Full Duplex, 40000Mbps, link type is force-up, media type is QSFP_40GE_LR4
output flow-control is on, input flow-control is on
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:00, output 00:00:00, output hang never
Last clearing of "show interface" counters never
Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  7782 packets input, 2716260 bytes, 0 no buffer
  Received 2 broadcasts (0 IP multicasts)
  0 runts, 0 giants, 0 throttles
  2 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 watchdog, 7774 multicast, 0 pause input
  8169 packets output, 2756184 bytes, 0 underruns
  0 output errors, 0 collisions, 4 interface resets
  0 unknown protocol drops
  0 babbles, 0 late collision, 0 deferred
  0 lost carrier, 0 no carrier, 0 pause output
  0 output buffer failures, 0 output buffers swapped out
  4 carrier transitions
```

To display the transceiver type installed in an EPA, use the show hw-module subslot command.

The following is a sample output of the show hw-module subslot command on a Cisco ASR 1000 Series Router with the Cisco ASR 1000 Series Modular Interface Processor installed in slot 1 and the EPA-1X100GE in subslot 1:

```
Router# show hw-module subslot 1/1 transceiver 0 idprom
```
Displaying the Cisco ASR 1000 Series MIP Hardware Type

Chapter 1      Overview of the Cisco ASR 1000 Series MIP and EPAs

IDPROM for transceiver HundredGigE1/1/0:
Description = CPAK optics (type 131)
Transceiver Type: = CPAK 100GE SR10 (310)
Product Identifier (PID) = CPAK-100G-SR10
Vendor Revision = V01
Serial Number (SN) = FBN183122731
Vendor Name = CISCO
Vendor OUI (IEEE company ID) = 00.00.0C (12)
CLEI code = WOTRC5PBAA
Cisco part number = 800-41495-
Device State = Enabled.
Date code (yyyy/mm/dd) = 2014/08/03
Connector type = MPO.
Encoding = NRZ, Non-PSK.
Bit Rate = 111.8 Gbps
Maximum Bit Rate Network Lane = 11.2 Gbits/s
Maximum Bit Rate Host Lane = 11.2 Gbits/s

The following is a sample output of the `show hw-module subslot` command on a Cisco ASR 1000 Series Router with the Cisco ASR 1000 Series Modular Interface Processor installed in slot 0 and the EPA-1X 40GE in subslot 2:

```
Router# show hw-module subslot 0/2 transceiver 1 idprom
IDPROM for transceiver FortyGigabitEthernet0/2/1:
Description = QSFP optics (type 132)
Transceiver Type: = QSFP 40GE LR (323)
Product Identifier (PID) = QSFP-40G-LR4
Vendor Revision = 01
Serial Number (SN) = 1M2049M1AE
Vendor Name = CISCO-AVAGO
Vendor OUI (IEEE company ID) = 00.17.6A (5994)
CLEI code = CMUIAE7CAB
Cisco part number = 10-2842-02
Device State = Enabled.
Date code (yyyymm/dd) = 16/12/08
Connector type = LC
Encoding = 64B66B
Nominal bitrate per channel = Multi-rate 40G-LR4 (10800 Mbits/s)
```

Router#

The following is a sample output of the `show hw-module subslot` command on a Cisco ASR 1000 Series Router with the Cisco ASR 1000 Series Modular Interface Processor installed in slot 3 and the transceiver in port 0:

```
Router# show hw-module subslot 3/0 transceiver 0 idprom
IDPROM for transceiver HundredGigE3/0/0:
Description = QSFP28 optics (type 134)
Transceiver Type: = QSFP 100GE AOC15M (462)
Product Identifier (PID) = QSFP-100G-AOC15M
Vendor Revision = A
Serial Number (SN) = FIW213706D6-A
Vendor Name = CISCO-FINISAR
Vendor OUI (IEEE company ID) = 00.90.65 (36965)
CLEI code = CMPQAEXCAA
Cisco part number = 10-3178-02
Device State = Enabled.
Date code (yy/mm/dd) = 17/09/16
Connector type = No separable connector
Encoding = 64B66B
Nominal bitrate per channel = (25500 Mbits/s)
```

```
The following is a sample output of the `show hw-module subslot transceiver status` command on a Cisco ASR 1000 Series Router with the Cisco ASR 1000 Series Modular Interface Processor installed in slot 3 and the transceiver in port 0:

```
Router# show hw-module subslot 3/0 transceiver 0 status
The Transceiver in slot 3 subslot 0 port 0 is enabled.
Module temperature = +38.164 C
Transceiver Tx supply voltage = 3.2183 Volts
Transceiver Tx power = -40.0 dBm (0.0 mW)
Transceiver Rx optical power = <-40 dBm

Tx power Network Lane[00] = -40.0 dBm (0.0 mW)
Tx power Network Lane[01] = -40.0 dBm (0.0 mW)
Tx power Network Lane[02] = -40.0 dBm (0.0 mW)
Tx power Network Lane[03] = -40.0 dBm (0.0 mW)

Rx power Network Lane[00] = -40.0 dBm (0.0 mW)
Rx power Network Lane[01] = -40.0 dBm (0.0 mW)
Rx power Network Lane[02] = -40.0 dBm (0.0 mW)
Rx power Network Lane[03] = -40.0 dBm (0.0 mW)

Bias Current Network Lane[00] = 7.800 mA
Bias Current Network Lane[01] = 7.800 mA
Bias Current Network Lane[02] = 7.942 mA
Bias Current Network Lane[03] = 7.938 mA
```
Power Management

A MIP consumes chassis power. You must, therefore, ensure that the chassis is within the power budget on the Cisco ASR 1000 Series Aggregation Services Routers.

LED Details

This section provides information about the LEDs on the MIP and EPAs.

MIP LEDs

The ASR1000-MIP100 has two LEDs on the front panel to show the status of the card, as shown in Figure 1-6.

Figure 1-8  MIP LEDs

Table 1-5 describes the details of the LEDs.

Table 1-3  Power and Status LEDs

<table>
<thead>
<tr>
<th>Function</th>
<th>Color or State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Green</td>
<td>Line card is powered on and is operational.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Line card is powered off and not operational.</td>
</tr>
<tr>
<td>Status</td>
<td>Green</td>
<td>The OS has booted.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>BOOTROM has successfully loaded.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Line card failure has occurred.</td>
</tr>
<tr>
<td></td>
<td>Flashing red</td>
<td>Secure-boot failure has occurred.</td>
</tr>
</tbody>
</table>
EPA LEDs

The EPAs have two types of LEDs: an A/L (Active/Link) LED for each port on the EPA, and one STATUS LED, as shown in Figure 1-7 and Figure 1-8.

**Figure 1-9**  
**EPA-10x10GE LEDs**

1. A/L
2. STATUS

**Figure 1-10**  
**EPA-1x100GE and EPA-CPAK-2x40GE LEDs**

1. STATUS
2. A/L

**Figure 1-11**  
**EPA-18x1GE LEDs**

1. A/L
2. STATUS
Table 1-6 describes the details of the LEDs.

<table>
<thead>
<tr>
<th>Function</th>
<th>Color or State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/L (Active/Link)</td>
<td>Green</td>
<td>Port is enabled and the link is up.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Port is enabled but the link is down.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Port is not enabled.</td>
</tr>
<tr>
<td>Status</td>
<td>Green</td>
<td>EPA is ready and operational.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>EPA power is on and good, and the EPA is being configured.</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>EPA power is off.</td>
</tr>
</tbody>
</table>

Figure 1-12   EPA-1x40GE and EPA-2x40GE LEDs