

Cisco ASR 920 Series Aggregation Services Router Overview

The Cisco ASR 920 Series Aggregation Services Router is a family of fixed configuration routers that enables Service Providers to provide business, residential, and mobile access services to their users. It is the Carrier Ethernet access platform providing Ethernet services.

The Cisco ASR 920 routers complement and extend Cisco's current and planned Carrier Ethernet routing portfolio providing a cost optimized, and extended temperature range access platform.

The Cisco ASR 920 routers do not have high availability features.

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Cisco ASR 920 Router Features

The Cisco ASR 920 family of routers includes:

- ASR 920-Indoor version [ASR-920-12CZ-A / ASR-920-12CZ-D]—This sub-family has fixed ENET interfaces (12 x 1GE + 2 x 10GE or 2 x 1GE or any combinations of 1 GE and 10 GE among the two ports available) and dual power supplies (AC/DC).
- ASR 920-Compact version [ASR-920-4SZ-A / ASR-920-4SZ-D]—This sub-family of routers have a compact form factor and configurable ports: 4 x 1 GE or 4 x 10 GE or any combinations of 1 GE and 10 GE among the four ports available. In addition, there are 2 x 1 GE copper ports available.

The following table provides snapshot of the number and type of supported ports:

ASR 920 Sub-family	1 GE Port	10 GE Port	Type of 1 GE Port	Type of 10 GE Port
ASR-920-12CZ-A / ASR-920-12CZ-D	12	2[1]	8 Combo + 4 SFP	Built in 2 SFP+ (dual rate)
ASR-920-4SZ-A / ASR-920-4SZ-D	2	4	2 Copper	Built in 4 SFP+ (dual rate)

[1] Each port can operate at either 1G or 10 G.

GigabitEthernet Copper Ports

Fixed copper GigabitEthernet (GE) interfaces are provided through standard RJ-45 connectors. These ports support the following features:

- Standard 10/100/1000Base-T/TX operation with forced or auto-negotiation for speed and duplex.
- Automatic crossover (auto-MDIX) for straight-through and crossover connections.
- Pause flow control as defined by the 802.3x standard.
- Frame size of 9216 bytes.
- Synchronous ENET operation that provides its recovered receive clock as an input clock source for the SETS as well as uses the system-wide reference clock to derive its transmit clock.

GE SFP Ports

The GE SFP ports support the following features:

- 100Base-FX and 1000Base-X SFP modules.
- Digital optical monitoring as specified by the SFP.
- Any mix of SFPs is supported unless specifically noted.

Note Only six Smart SFPs are supported on the router.

- Pause flow control as defined by the 802.3x standard.
- Frame size of 9216 bytes.
- Synchronous ENET operation that provides its recovered receive clock as an input clock source for the SETS as well as uses the system-wide reference clock to derive its transmit clock.

Note Copper based SFPs and Smart SFPs do not support synchronous ENET operations.

SFP+ Ports

The SFP+ ports support the following features:

- Digital optical monitoring as specified by the optical transceiver module.
- Any mix of SFPs is supported unless specifically noted.
- Pause flow control as defined by the 802.3x standard.
- Frame size of 9216 bytes.
- Smart SFPs do not support synchronous ENET operations

The following figures show the port numbering for the Cisco ASR 920 router:

Figure 1: Front Panel of Cisco ASR-920-12CZ-A Route

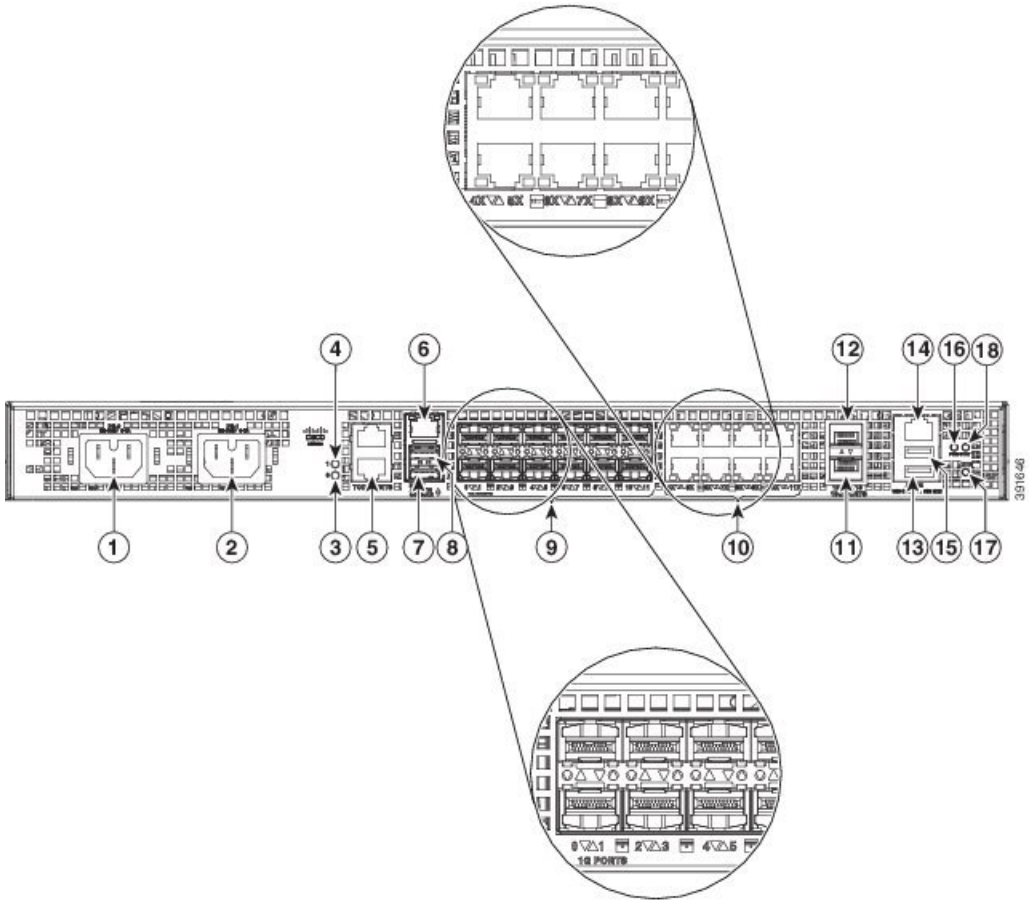
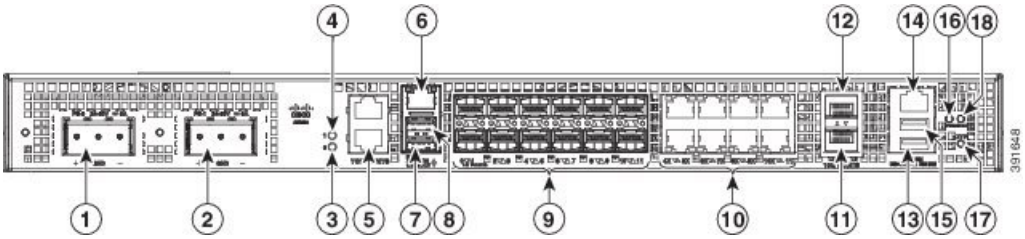


Figure 2: Front Panel of Cisco ASR-920-12CZ-D Router



1	**Power Supply 0 (AC or DC)**	10	**Eight Copper port**
2	Power Supply 1(AC or DC)	11	1G/10G Dual Rate port
3	Power Supply 0 LED (AC or DC)	12	1G/10G Dual Rate port
4	Power Supply 1 LED (AC or DC)	13	USB Console port
5	RJ-48 slots for BITS (upper slot) and ToD (lower slot)	14	Alarm port
6	Management port	15	USB Memory port

1	**Power Supply 0 (AC or DC)**	10	**Eight Copper port**
7	Console port (TIA/EIA-232F)	16	Board power LED
8	Auxiliary Console port	17	Zero Touch Provisioning button
9	4x1GE SFP + 8x1GE SFP combo ports **Note** Port 0 is located at the bottom left, port 1 is located at the top left, and so on.	18	System Status LED

Figure 3: Front Panel of Cisco ASR-920-4SZ-A Router

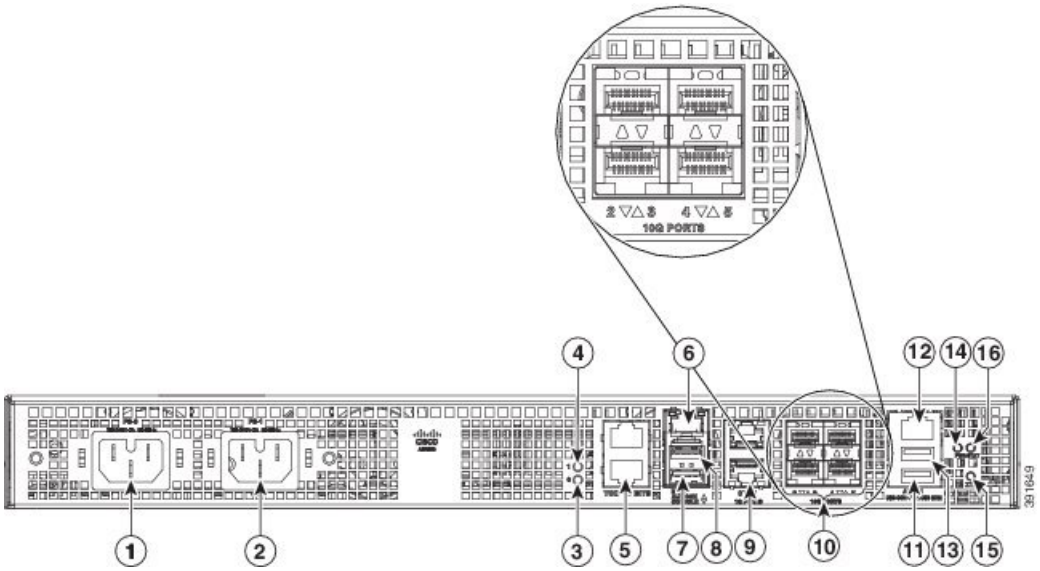
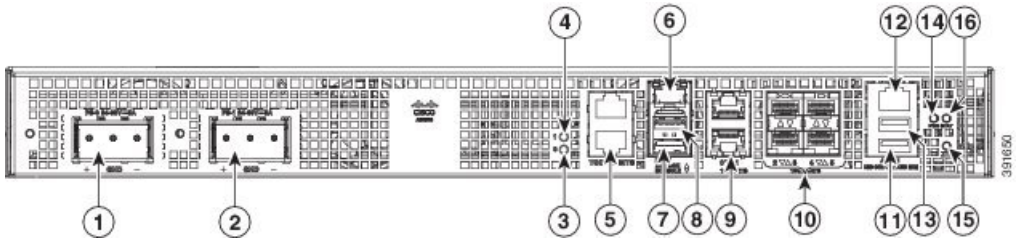


Figure 4: Front Panel of Cisco ASR-920-4SZ-D Router



1	**Power Supply 0 (AC or DC)**	9	**2 1GE Copper ports**
2	Power Supply 1 (AC or DC)	10	Four 1G/10G Dual Rate Ports **Note** Port 2 is located at the bottom left, port 3 is located at the top left, and so on.
3	Power Supply 0 LED (AC or DC)	11	USB Console port

1	Power Supply 0 (AC or DC)	9	2 1GE Copper ports
4	Power Supply 1 LED (AC or DC)	12	Alarm port
5	RJ-48 slots for BITS (upper slot) and ToD (lower slot)	13	USB Memory port
6	Management port	14	Board power LED
7	Console port (TIA/EIA-232F)	15	Zero Touch Provisioning button
8	Auxiliary Console port	16	System Status LED

The table below describes the other features of Cisco ASR-920-12CZ (AC and DC) and Cisco ASR-920-4SZ (AC and DC) Routers.

Table 1: Cisco ASR-920-12CZ and Cisco ASR-920-4SZ Router Specifications

Specification	ASR-920-12CZ-A/ASR-920-12CZ-D	ASR-920-4SZ-A/ASR-920-4SZ-D
DimensionWidth x Depth x Height	17.5 x 9.25 x 1.75 inches	15.5 x 9.25 x 1.75 inches
Weight	ASR-920-12CZ-A: 3.80 kg ASR-920-12CZ-D: 3.54 kg	ASR-920-4SZ-A: 3.50 kg ASR-920-4SZ-D: 3.22 kg
Rack Unit	One RU	One RU
Airflow	Front to back	Front to back
Cable access	Front cable access	Front cable access
System throughput	32 Gbps	42 Gbps
Power Supply		
Modularity	None	None
Redundant	Yes	Yes
AC	Yes	Yes
Power Specification	115 W	105 W
DC	Yes	Yes
Power Specification	110 W	105 W

Specification	ASR-920-12CZ-A/ASR-920-12CZ-D	ASR-920-4SZ-A/ASR-920-4SZ-D
Operating Temperature	–40º C to 70º C **Note** When using Smart SFPs, the systems should not operate beyond 40º C. **Note** The temperature range will vary for supported SFP/SFP+ installed on the router. See the corresponding SFP/SFP+ documentation for more details.	–40º C to 70º C **Note** When using Smart SFPs, the systems should not operate beyond 40º C. **Note** The temperature range will vary for supported SFP/SFP+ installed on the router. See the corresponding SFP/SFP+ documentation for more details.
Alarms	• 4 alarm dry contact inputs (normally open) • LED indicators for critical, major and minor alarms	• 4 alarm dry contact inputs (normally open) • LED indicators for critical, major and minor alarms
TDM Support	None	None
Mounting option	• Front or rear rail 19 inches or 23 inches • ETSI 300 mm cabinet • Wall Mount (with only side mount option). **Note** For more information, see Wall Mounting the Cisco ASR 920 Series Router, page 3-9 .	• Front or rear rail 19 inches or 23 inches • ETSI 300 mm cabinet • Wall Mount (with only side mount option) **Note** For more information, see Wall Mounting the Cisco ASR 920 Series Router, page 3-9 .
Port Configuration	12x1G and 2x10G/1G ports	2x1G and 4x10G/1G ports
Port Numbering	4x1G SFP – Port [0:3] 8x1G Combo – Port [4:11] 2x10G – Port [12-13]	2x1G Copper – Port [0:1] 4x10G – Port [2-5]
Combo Ports	Ports 4 to 11 are combo ports	No combo ports
Copper Port LEDs	Link/Activity/Duplex LED indication	Link/Activity/Duplex LED indication
Temperature Sensors	Four temperature sensors	Three temperature sensors
BITS/ToD	External ports for BITS/TOD	External ports for BITS/TOD

Limitation

- When a P router acts as a mid-node and has a multicast receiver connected to it, for a default Multicast Distribution Tree (MDT), the packets that reach the multicast receiver from the ingress Provider Edge

(PE) receive Experimental Bits (EXP). But, marking is lost when the same stream egresses out from the P router towards another PE router that has the same multicast receiver connected to it .

- In the Cisco ASR 920 router, PAUSE frames propagate over the 1G interfaces, while the 10G ports drop them as expected.

External Interfaces

The Cisco ASR 920 routers have these external physical interfaces on the front panel:

Network Interfaces

The network interfaces are provided through these fixed ports:

- GE SFP ports—supports 100/1000 modes
- GE Copper RJ-45 ports—supports 10/100/1000 operation
- 10GE SFP+—supports 10G/1G mode depending on the SFP+/SFP in the network interface slot

Network Timing Interfaces

- BITS input or output—The BITS interfaces support clock recovery from either a T1 at 1.544 MHz or an E1 at 2.048 MHz, configurable by software. BITS interface is provided through a standard RJ-48 connector on the front panel.
- 1PPS input or output and ToD input or output—This shielded RJ-45 interface is used for input or output of time-of-day (ToD) and 1PPS pulses. ToD format includes both NTP and IEEE 1588-2008 time formats.

The same RS422 pins for 1PPS and TOD are shared between input and output directions. The direction for each can be independently configurable through software.

External Alarm Inputs

The device supports four dry contact alarm inputs through an RJ-45 jack on the front panel.

The alarm condition is normally open, which indicates that no current flows through the alarm circuit, and the alarm is generated when the current is flowing. Each alarm input can be provisioned as being critical, major, or minor.

Management Interfaces

The Cisco ASR 920 routers have the following management interfaces:

Management ENET Port

A single management copper ENET port supporting 10/100/1000Base-T operation is provided at the front panel. It uses a standard RJ-45 jack.



Note The management ENET port is not a data plane port.

RS232 Console Port

The RS232 console port provides transmission (Tx), reception (Rx), and grounding (Gnd).

Note The RS232 console port is enabled through only the Cisco-designed cable adapter USB type A cable to RJ-45 adapter cable. To use this port, disable the flow control on the terminal.

USB Console

A single USB 2.0 Type-A receptacle is provided on the front panel of the Cisco ASR 920 router for providing console access to ROMMON, Cisco IOS-XE and diagnostics. While it uses the Type-A connector, it operates as a USB peripheral only for connection to an external host computer. This interface requires the use of a Type-A to Type-A connector instead of a standard USB cable.

Note Use of the USB console is mutually exclusive of the RS232 console port. This interface requires the use of a Type-A to Type-A USB cable.

USB Mass Storage

A single USB 2.0 Type-A receptacle is provided on the front panel of the Cisco ASR 920 router for inserting external USB mass storage devices, such as standard USB flash drives. This interface is used to load images, load or store configurations, write logs, and so on. It supports operation up to 12Mbps.

Maximum memory supported in ROMmon is 8GB and in Cisco IOS is 16GB.

Zero Touch Provisioning Button

The Zero Touch Provisioning (ZTP) button on the front panel initiates the ZTP process on a short press of less than eight seconds. Pressing the ZTP button for more than eight seconds causes a system reset.

For more information on ZTP, see *Power and Status LED* section.

RS232 Auxiliary Console Port

The RS232 Aux console port provides transmission (Tx), reception (Rx), and ground (Gnd).

Note The RS232 Aux console port is enabled only through the Cisco-designed cable adapter from USB type A cable to RJ-45 adapter cable.

Note This is a debug-only port. it is recommended that this port be used by field service engineers only.

Power Supply and Fans

The routers support AC and DC power supplies in a 1+1 redundant configuration.

One AC and one DC power supply in the same router is also a supported configuration.

Note The power supply units are built-in and are not modular.

Table 2: Power Supply Specification

Specification	AC	DC
Voltage	100 V – 240 V	24 V – 60 V
Current	2A through a standard C16 type receptacle	6A through a three-position terminal block
Input Power	115 W (ASR-920-12CZ-A/ASR-920-4SZ-A)	105 W (ASR-920-12CZ-D/ASR-920-4SZ-D)

Note This product requires surge protection as part of the building installation. To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, an external surge protective device (SPD) is required at the AC power service equipment.

Note For DC systems, if a surge of more than 500 V is expected, add an appropriate external surge protective device.

The routers have fixed fans are part of the system. The system is designed to operate at its maximum operating temperature of 70º C and at 65º C in case of failure of a single fan, for a maximum of four hours. The fan is not removable and in case of a failure, the system must be replaced.

Caution In case of power supply or fan failure, it is highly recommended to let a Cisco technician replace the router.

Table 3: Feature History

Feature Name	Release Information	Description
Switching Fan Speed	Cisco IOS XE Cupertino 17.8.1	This feature enables the fan speed for Cisco ASR-920-12CZ-A/D and Cisco ASR-920-4SZ-A/D to switch from default dynamic fan speed to static fan speed in the presence of smart SFP. This enables the smart SFPs to function efficiently.

The dynamic fan-speed algorithm sets the fan speed based on the ASIC temperature.

Prior to Cisco IOS XE Cupertino Release 17.8.1, when the smart SFP was inserted, it would not function with the static fan-speed algorithm mode. This was resulting in the increase of the router's temperature.

Starting with Cisco IOS XE Cupertino Release 17.8.1, when the smart SFP is inserted, the switch from default dynamic fan-speed algorithm to static fan-speed algorithm helps the smart SFP to function efficiently.

Use the **show platform fan-algorithm** command to verify the fan-speed algorithm configuration for the router:

```
Router#show platform fan-algorithm

Fan Algorithm : Static

Router#
```

Check LED Indicators

This section describes the different types of front panel LEDs and their behavior.

PWR and STAT LEDs

The PWR and STAT LEDs are available on the front panel. These LEDs provide power on the board (PWR) and overall router health (STAT) status. During power up state, these LEDs provide booting status and report errors.



Note The digital code signing functionality validates the integrity and authenticity of the ROMMON image before booting it.

Table 4: PWR and STAT LED Indications

PWR LED State	STAT LED state	Indication	Comment
Amber	Off	Power in the system is all right and FPGA configuration is taking place.	Permanent Amber/Off indicates FPGA configuration failure.
Amber	Red	FPGA Image Validation Error.	System is in unresponsive state.
Flashing Amber and Green alternatively	Amber	Upgrade FPGA image error, continuing with Golden FPGA image.	—
Flashing Amber and Green alternatively	Off	FPGA configuration successful and Digital code signing successfully validated FPGA image. Digital code signing passed the control to Microloader to boot ROMMON.	—
Flashing Amber and Green alternatively	Red	Digital code signing reported failure in ROMMON image validation.	—
Flashing Amber	Flashing Amber	ZTP process has begun. **Note** A short press of the ZTP button triggers the provisioning. A longer press of more than eight seconds, resets the board.	Both LEDs turn Green once provisioning is complete.

PWR LED State	STAT LED state	Indication	Comment
Green	Off	IOS-XE image is booting.	
Green	Green	Successfully booted and system is operating normally.	—
Green	Amber	A minor alarm or synchronization is in Holdover or free-running mode	—
Green	Red	A major or critical alarm (high temperature reported for any sensor) or multiple fan failure.	—

CPU Management Port LEDs

The LED for the 10/100/1000 Management port is integrated on the connector itself. There are two LEDs in the connector—the LED on the left indicates the Link/Activity status and the LED on the right is non-functional.

Note The CPU management port LED on the right is non-functional and hence doesn't indicate any port status.

Table 5: CPU Management Port LED Indication

LED	LED State	Indication
Left	Green	Link up in 1000 Mbps
	Blinking Green	Activity in 1000 Mbps
	Orange	Link up in 100 Mbps
	Blinking Orange	Activity in 100 Mbps
	Off	Link down

SFP LEDs

Each SFP port has an LED indicator. The LED is configured such that the up arrow indicates the port on the upside and the down arrow indicates the port on the downside.

Table 6: SFP Port LED Indication

LED	LED State	Indication
Labeled same as the SFP port number	Green	Link up in 1000Base-X/100Base-FX
	Blinking Green	Activity in 1000 Base-X/100Base-FX
	Yellow	Fault/Error
	Off	Link down

SFP+ LEDs

Each port in sets of GE SFP+ ports has an LED indicator.

Table 7: SFP+ Port LED Indication

LED	LED State	Indication
GE / GE SFP	Green	Link up in 10G/1G
	Blinking Green	Activity in 10G/1G
	Yellow	Fault/Error/Link down
	Off	Admin down

RJ-45 LEDs

Each RJ-45 port has two LED indicators. Left LED indicates the Link status; right LED indicates the status of the duplex LED.

Table 8: RJ-45 LED Indication

LED	LED State	Indication
Left	Green	Link up in 10/100/1000Base-T
	Blinking Green	Activity in 10/100/1000Base-T
	Yellow	Fault/Error
	Off	Link down
Right	Green	Link up in full duplex
	Off	Link up in half duplex

Power Supply Unit LEDs

Each power supply unit has a corresponding LED on the front panel.

Table 9: PSU LED Indication

LED	LED State	Indication
OK	Green	Power Supply is working and 12V output is alright.
	Red	12V output failure (Either input not present or fault in the power supply unit).

System–Interface LED Behavior

Table 10: 1G Copper and 1G SFP LED Indication

Event	1G Copper Port LEDs (Link/Duplex)	1G SFP Port LEDs
ROMMON	Off/Off	Off
IOS Shut	Off/Off	Off
IOS No shut (cable disconnect)	Yellow/Off	Yellow
IOS No shut (cable connect) (media-type RJ-45)	Green/Green	Off
IOS No shut (cable connect) (media-type SFP)	Off/Off	Green
IOS No shut (cable connect) (media-type auto)	Off/Off	Green

Table 11: Dual Rate and Management Port LED Indication

Event	Dual Rate (1G/10G) Port LEDs	Management Port LEDs (Link/Duplex)
ROMMON	Off	Green/Off
IOS Shut	Off	Off/Off
IOS No shut (cable disconnect)	Orange	Orange/Off
IOS No shut (cable connect)	Green	Green/Green in 1G mode Orange/Green in 100M mode

Online Insertion and Removal

The Cisco ASR 920 router supports the following OIR operations:

- When an SFP is removed, there is no effect on traffic flowing on other ports.

- When an SFP is installed, the system initializes that port for operation based upon the current configuration. If the inserted SFP is incompatible with the current configuration for that port, the port does not become operational until the configuration is updated.
- Both power supplies are installed and active and the load may be shared between them or a single PSU could support the whole load. When a power supply is not working or the input cable is removed, the remaining power supply takes the entire load without disruption. If the power supply needs repair, the whole system must be replaced.

Licensing the Cisco ASR 920 Router

The Cisco ASR 920 Series Routers support the following types of licenses:

- Port Licensing—Port Upgrade license is available as a "Pay as you Grow" model.
  - 1G upgrade license
  - 10G upgrade license
- Bulk licensing—Bulk port licensing allows you to enable all the ports with a single license.
- Timing license (1588)—Timing license is required if the router is used as a master clock.
- Advanced Metro IP Access
- Metro IP Access
- Metro Access (default)

The following methods are used to activate the above licenses:

- Cisco Software Licensing—The Cisco Software License Activation feature is a set of processes and components to activate Cisco software feature sets by obtaining and validating fee-based Cisco software licenses.



Note Licenses generated by the Cisco Software Licensing are tied to the UDI of the chassis and a corresponding watchtower device certificate (WDC) is stored in the system.

- Cisco Smart Licensing—Smart Licensing is usage-based licensing where devices register with the Cisco Secure server.