Release Notes for Cisco LTE Serving Gateway Release 1.*x* on the Cisco SAMI, Cisco IOS Software Release 12.4 T3a Releases

September 30, 2010

Cisco LTE SGW Release 1.1, Cisco IOS Release 12.4(24)T3a1

This release note describes the requirements, dependencies, and caveats for the Cisco Long Term Evolution (LTE) Serving Gateway (SGW) Release 1.*x* on the Cisco Service and Application Module for IP (SAMI). These release notes are updated as needed.

For a list of the software caveats that apply to the Cisco LTE SGW Release 1.*x* Cisco IOS image, see the "Caveats" section on page 9 and *Caveats for Cisco IOS Release 12.4 T*. The caveats document is updated for every maintenance release and is located on Cisco.com and the Documentation CD-ROM.

Use these release notes with *Cross-Platform Release Notes for Cisco IOS Release 12.4* located on Cisco.com.

Contents

This release note includes the following information:

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Cisco LTE SGW Overview

The following sections provide a brief overview of the Cisco LTE SGW:

LTE Evolved Packet Core

The Cisco LTE SGW is a service designed for LTE Evolved Packet Core (EPC). The EPC is the main component of the System Architecture Evolution (SAE) that was designed by 3GPP to provide a migration path for 3GPP systems. The SAE is the core network architecture of LTE communication.

The SAE is an evolution of the General Packet Radio Service (GPRS) and Universal Mobile Telecommunication System (UMTS) that provides a migration path for 3GPP systems with the following differences:

- Simplified architecture
- All IP network
- Support for higher throughput and lower latency radio access networks (RANs)
- Support for and mobility between 3GPP (GPRS, UMTS, and LTE) and non-3GPP access technologies.

The LTE EPC is made up of the following primary elements:

- Mobility Management Entity (MME)
- Serving Gateway (SGW)
- Packet Data Network (PDN) Gateway (PGW)

Figure 1 shows the interworking (and interfaces) of the LTE EPC with different radio access technologies.

Note Paths represented by dashed lines are not supported by Cisco LTE PGW Release 1.*x*.

Figure 1 LTE Network Components with SGWs and PGWs Implemented on the Cisco Service and Application Module for IP in the Cisco 7600 Series Router

The following is a list of acronyms used in Figure 1.

- Serving GPRS Support Node (SGSN)
- UMTS Terrestrial Radio Access Network (UTRAN)
- GSM EDGE Radio Access Network (GERAN)
- Evolved UTRAN (E-UTRAN)
- Mobility Management Entity (MME)
- Serving Gateway (SGW)
- PDN Gateway (PGW)
- Charging Gateway Function (CGF)
- Home Subscriber Server (HSS)
- Policy and Charging Rules Function (PCRF)
- Online Charging System (OCS)
- Authentication, Authorization, and Accounting (AAA)
- Diameter Credit Control Application (DCCA)

Cisco LTE SGW Description

For each UE associated with the EPS, there is a single SGW at any given time.

The Cisco LTE SGW Release 1.*x* supports GTP-based non-roaming and roaming architectures, and control and data plane functions defined by 3GPP TS 23.401 for 3GPP access networks.

The Cisco LTE SGW provides the following support:

- Routes and forwards data packets from the UE
- Terminates the interface towards Evolved UMTS Terrestrial Radio Access Network (E-UTRAN)
- Mobility anchor point for inter-3GPP mobility (terminating S4 and relaying traffic between 2.5G/3G and LTE networks
- ECM-IDLE mode downlink packet buffering and initiation of network triggered service request procedure
- User traffic replication for Lawful Intercept
- Uplink (UL) and downlink (DL) charging per UE, packet data network (PDN), and quality of service (QoS) Class Identifier (QCI) (for example, for roaming with home-routed traffic)
- Handling of various messages between the MME, eNodeB, serving GPRS support node (SGSN), and PGW
- Processes both control and user plane messages

The Cisco LTE SGW runs on the Cisco Service and Application Module for IP (SAMI), a new-generation high performance service module for the Cisco 7600 series router platforms.

For more information about the Cisco SAMI, see the *Cisco Service and Application Module for IP User Guide*.

System Requirements

This section describes the system requirements for Cisco LTE SGW Release 1.*x* and includes the following sections:

- Memory Recommendations, page 5
- Hardware and Software Requirements, page 5
- Determining the Software Version, page 6
- Upgrading to a New Software Release, page 6

For hardware requirements, such as power supply and environmental requirements and hardware installation instructions, see the *Cisco Service and Application Module for IP User Guide*.

Memory Recommendations

Table 1 Images and Memory Recommendations for Cisco LTE SGW Release 1.x

Platforms	Feature Sets	Software Image	Recommended Flash Memory (MB)	Recommended DRAM Memory (GB)	Runs From
Cisco SAMI/ Cisco 7600	SGW Standard Feature Set	c7svcsami-l4ik9s-mz	128	2	RAM

Hardware and Software Requirements

Implementing a Cisco LTE SGW Release 1.*x* on the Cisco 7600 series Internet router platform requires the following hardware and software.

- Any module that has ports to connect to the network.
- A Cisco 7600 series router and one of the following supervisor engines running Cisco IOS Release 15.0(1)S or later:
  - Cisco 7600 Series Supervisor Engine 720 with a Multiplayer Switch Feature Card 3 (WS-SUP720)
  - Cisco 7600 Series Supervisor Engine 720 with a Multilayer Switch Feature Card 3 and Policy Feature Card 3B (WS-SUP720-3B)
  - Cisco 7600 Series Supervisor Engine 720 with a Multilayer Switch Feature Card 3 and Policy Feature Card 3BXL (WS-SUP720-3BXL)
  - Cisco 7600 Series Supervisor Engine 32 with a Multiplayer Switch Feature Card (WS-SUP32-GE-3B) with LCP ROMMON Version 12.2(121) or later on the Cisco SAMI.
  - Cisco 7600 Series Supervisor Engine 32 with a Mutlilayer Switch Feature Card and 10 Gigabit Ethernet Uplinks (WS-SUP32-10GE-3B) with LCP ROMMON Version 12.2[121] or later on the Cisco SAMI.

  Or one of the following Cisco 7600 series route switch processors running Cisco IOS Release 15.0(1)S or later:
  - Cisco 7600 Series Route Switch Processor 720 with Distributed Forwarding Card 3C (RSP720-3C-GE)
  - Cisco 7600 Series Route Switch Processor 720 with Distributed Forwarding Card 3CXL (RSP720-3CXL-GE)
  - Cisco 7600 Series Route Switch Processor 720 with 10 Gigabit Ethernet Uplinks with Distributed Forwarding Card 3CXL (RSP720-3CXL-10GE)

  For details on upgrading the Cisco IOS release running on the supervisor engine, refer to the "Upgrading to a New Software Release" section in the *Release Notes for Cisco IOS Release 15.0S*. For information about verifying and upgrading the LCP ROMMON image on the Cisco SAMI, refer to the *Cisco Service and Application Module for IP User Guide*.

Note The Cisco IOS software required on the supervisor engine is dependent on the supervisor engine being used and the Cisco mobile wireless application running on the Cisco SAMI processors.

- Cisco Service and Application Module for IP (Cisco Product Number: WS-SVC-SAMI-BB-K9). The Cisco SAMI must be running Cisco IOS Release 12.4(24)T3a or later.

Note The Cisco LTE SGW Release 1.*x* software application supports both the Cisco SAMI 1 GB memory default and the 2 GB memory option (Cisco Product Number: MEM-SAMI-6P-2GB[=]).

- For security, the IPSec VPN Services Module.
- For GTP-Session Redundancy, in addition to the required hardware and software above, implementing GTP-Session Redundancy (GTP-SR) requires at minimum:
  - In a one-router implementation, two Cisco SAMIs in the Cisco 7600 series router, or
  - In a two-router implementation, one Cisco SAMI in each of the Cisco 7600 series routers.

Determining the Software Version

To determine the version of Cisco IOS software running on your Cisco SAMI, log in to PPC3 and enter the **show version** EXEC command:

```
SGW# show version
Cisco IOS Software, SAMI Software (SAMI-L4IK9S-M), Experimental Version
12.4(20100928:164957)
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Tue 28-Sep-10 09:50 by

ROM: System Bootstrap, Version 12.4(20100716:044940) [sopm-smbu_lte_r1_5-CSCtf55588 105],
DEVELOPMENT SOFTWARE

SGW uptime is 22 hours, 6 minutes
System returned to ROM by reload at 01:14:27 UTC Sat Sep 25 2010
System restarted at 22:57:05 UTC Tue Sep 28 2010
System image file is "c7svcsami-l4ik9s-mz"
Last reload reason: Reload command by admin

...

SGW#
```

Upgrading to a New Software Release

For information on upgrading to a new software release, see the product bulletin *Cisco IOS Software Upgrade Ordering Instructions* at:

http://www.cisco.com/warp/public/cc/pd/iosw/prodlit/957_pp.htm

Upgrading the Cisco SAMI Software

For information on upgrading the Cisco SAMI software, see the *Cisco Service and Application Module for IP User Guide*:

Note The image download process automatically loads the Cisco IOS image onto the six SAMI processors.

MIBs

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

Limitations, Restrictions, and Important Notes

When configuring the Cisco LTE SGW, note the following:

- The Cisco LTE SGW does not support the Cisco Express Forwarding (CEF) neighbor resolution optimization feature, which is enabled by default.

  Therefore, to avoid the possibility of incomplete adjacency on VLAN interfaces for the redirected destination IP address and an impact to the upstream traffic flow for bearers/PDP sessions upon bootup, ensure that you configure the **no ip cef optimize neighbor resolution** command.

- The number of bearer/PDP contexts supported on a SGW is dependent on the memory and platform in use and the SGW configuration (for example, whether Dynamic Feedback Protocol [DFP] is being used or the memory protection feature is enabled, and what rate of bearer creation will be supported).

  The Cisco LTE SGW on the Cisco SAMI with the 2 GB memory option can support 380000 PDN connections and the 380000 of default bearers. When the maximum allowable number of bearers/PDP contexts is reached, the SGW refuses new mobile sessions until sessions are available.

- To avoid issues with high CPU usage, we recommend the following configurations:
  - To reduce the CPU usage during bootup, disable logging to the console terminal by configuring the **no logging console** global configuration command.
  - To ensure that the HSRP interface does not declare itself active until it is ready to process a peer's Hello packets, configure the delay period before the initialization of HSRP groups with the **standby delay minimum 100 reload 100 interface** configuration command under the HRSP interface.
  - To minimize issues with high CPU usage for additional reasons, such as periods of high PPP PDP processing (creating and deleting), disable the notification of interface data link status changes on all virtual template interfaces of the GGSN using the **no logging event link-status interface** configuration command.

    ```
    !
    interface Virtual-Template1
    description GGSN-VT
    ip unnumbered Loopback0
    encapsulation gtp
    no logging event link-status
    gprs access-point-list gprs
    end
    ```

New Implementations and Behavior Changes in Cisco LTE SGW Release 1.1

Support for the following 3GPP specification change requests (CRs) records for 29.274 has been introduced in Cisco LTE SGW Release 1.1:

- CR 267—Serving network
- CR 358—Bearer QoS in modify bearer request
- CR 430—UE timezone and user location information (ULI) included in bearer response messages
- CR 433—Correcting misaligned information element (IE) presence type statements
- CR 451—Charging characteristics value for active PDN connections
- CR 154—Offending IE in the cause IE

Additionally, commands to configure backward compliance have been added for the following 29.274 CRs:

- CR 308—LBI clarifications for Gn/Gp handovers. By default, compliance for this CR 308 is enabled on the PGW, but is disabled by default on the SGW.
- CR 324—APN-AMBR in the create/delete bearer request. Compliance must be enabled on the PGW and SGW. By default, compliance for this CR is disabled.
- CR 137—Combined uplink and downlink traffic flow template (TFT) IEs. CR 137 Compliance must be enabled on the PGW and SGW. By default, compliance for CR 137 is disabled.

To configure compliance for the above CR, complete the following tasks:

- Creating a Compliance Profile, page 9
- Creating a Remote Path Group, page 9

Creating a Compliance Profile

Operators can create a compliance profile in which they configure CR compliance. Once a compliance profile has been created, it can be applied to a path group to a remote node. For information on creating a path group to a remote node, see"Creating a Remote Path Group" section on page 9.

To create a compliance profile and its CR configuration, complete the following tasks, beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# gprs compliance profile name`	Creates or modifies a compliance profile, where *name* is the name of the compliance profile.
Step 2	`Router(config-compl-profile)# cr 29.274-0308`	Configures the gateway to comply with CR 308 (LBI clarifications for Gn/Gp handovers). On the PGW, CR 308 compliance is enabled by default. On the SGW, compliance is disabled by default.
Step 3	`Router(config-compl-profile)# cr 29.274-0324`	Configures the gateway to comply with CR 324 (APN AMBR in the create/delete bearer request). On the PGW and SGW, CR 324 compliance is disabled by default.
Step 4	`Router(config-compl-profile)# cr 29.274-0137`	Configures the gateway to comply with CR 137 (combine uplink and downlink TFT IEs). On the PGW and SGW, compliance is disabled by default.

Creating a Remote Path Group

Once a compliance profile has been configured, operators can create a path group. In the path group, the the address of the remote node is configured and as well as the compliance profile to use.

	Command	Purpose
Step 1	`Router(config)# gprs remote group name`	Creates or modifies a remote path group, where *name* is the name of the group.
Step 2	`Router(config-remote-group)# compliance name`	Applies a pre-configured compliance profile to the path group.
Step 3	`Router(config-remote-group)# ip address {v4 start_ipv4_addr end_ipv4_addr | v6 start_ipv6_addr end_ipv6_addr}`	Configures an IP address range in the remote path group, where: • **v4** *start_ipv4_addr end_ipv4_addr*—IPv4 address range. • **v6** *start_ipv6_addr end_ipv6_addr*—IPv6 address range.

Caveats

Caveats describe unexpected behavior in Cisco IOS software releases. Severity 1 caveats are the most serious caveats; severity 2 caveats are less serious. Severity 3 caveats are moderate caveats, and only select severity 3 caveats are included in the caveats document.

All caveats in Cisco IOS Release 12.4 and Cisco IOS Release 12.4 T are also in Cisco IOS Release 12.4(22)YE.

For information on caveats in Cisco IOS Release 12.4, see *Caveats for Cisco IOS Release 12.4*.

For information on caveats in Cisco IOS Release 12.4 T, see *Caveats for Cisco IOS Release 12.4T*, which lists severity 1 and 2 caveats and select severity 3 caveats and is located on Cisco.com and the Documentation CD-ROM.

Using the Bug Navigator II

If you have an account with Cisco.com, you can use Bug Navigator II to find caveats the most current list of caveats of any severity for any software release. To reach Bug Navigator II, log in to Cisco.com and click **Software Center**: **Cisco IOS Software**: **Cisco Bugtool Navigator II**. Another option is to go directly to http://www.cisco.com/support/bugtools.

This section contains the caveats for the following releases:

- Caveats - Cisco LTE SGW Release 1.1, Cisco IOS Release 12.4(24)T3a1, page 10
- Caveats - Cisco LTE SGW Release 1.0, Cisco IOS Release 12.4(24)T3a, page 11

Caveats - Cisco LTE SGW Release 1.1, Cisco IOS Release 12.4(24)T3a1

This section contains open and resolved caveats that pertain to Cisco LTE SGW Release 1.1, Cisco IOS Release 12.4(24)T3a1.

- Open Caveats, page 10
- Resolved Caveats, page 11

Open Caveats

Note Caveats open in one release are also open in prior releases.

The following sections document possible unexpected behavior and describe only severity 1 and 2 caveats and select severity 3 caveats.

- Cisco LTE SGW Caveats, page 11
- Cisco SAMI Caveats, page 11

Cisco LTE SGW Caveats

There are no Cisco LTE SGW caveats open for Cisco LTE SGW Release 1.1, Cisco IOS Release 12.4(24)T3a1.

Cisco SAMI Caveats

This section lists the SAMI caveats that are open with Cisco LTE SGW Release 1.1, Cisco IOS Release 12.4(24)T3a1.

- CSCtg64608

  The Cisco LTE gateway allows out of sequence traffic. This condition occurs when sending upstream traffic with the sequence number set to FFFF only with Mobile Express Forwarding (MEF). With Cisco Express Forwarding (CEF), the packets are dropped as designed.

  Workaround: Use CEF instead of MEF.

Resolved Caveats

There are no newly resolved caveats with Cisco LTE SGW Release 1.1, Cisco IOS Release 12.4(24)T3a1.

Caveats - Cisco LTE SGW Release 1.0, Cisco IOS Release 12.4(24)T3a

This section contains the following types of caveats that pertain to Cisco LTE SGW Release 1.0, Cisco IOS Release 12.4(24)T3a.

- Open Caveats—Cisco LTE SGW, page 11
- Open Caveats—Cisco SAMI, page 11

Open Caveats—Cisco LTE SGW

There are no Cisco LTE SGW caveats open for Cisco IOS Release 12.4(24)T3a.

Open Caveats—Cisco SAMI

This section lists the SAMI caveats that are open with Cisco IOS Release 12.4(24)T3a.

- CSCtg64608

  The Cisco LTE gateway allows out of sequence traffic. This condition occurs when sending upstream traffic with the sequence number set to FFFF only with Mobile Express Forwarding (MEF). With Cisco Express Forwarding (CEF), the packets are dropped as designed.

  Workaround: Use CEF instead of MEF.

Related Documentation

Except for feature modules, documentation is available as printed manuals or electronic documents. Feature modules are available online on Cisco.com.

Use these release notes with these documents:

Release-Specific Documents

The following documents are specific to Cisco IOS Release 12.4 and are located at Cisco.com:

- *Cisco IOS Release 12.4 Mainline Release Notes*

  Documentation > **Cisco IOS Software > Cisco IOS Software Releases 12.4 Mainline > Release Notes**

- *Cisco IOS Release 12.4 T Release Notes*

  Documentation > **Cisco IOS Software > Cisco IOS Software Releases 12.4 T > Release Notes**

Note If you have an account with Cisco.com, you can use Bug Navigator II to find caveats of any severity for any release. You can reach Bug Navigator II on Cisco.com at http://www.cisco.com/support/bugtools.

- Product bulletins, field notices, and other release-specific documents on Cisco.com at:

  Documentation > **Cisco IOS Software > Cisco IOS Software Releases 12.4 Mainline**

Platform-Specific Documents

These documents are available for the Cisco 7600 series router platform on Cisco.com and the Documentation CD-ROM:

- *Cisco Service and Application Module for IP User Guide*
- Cisco 7600 series routers documentation:
  - *Cisco 7600 Series Internet Router Installation Guide*
  - *Cisco 7600 Series Internet Router Module Installation Guide*
  - *Cisco 7609 Internet Router Installation Guide*

  Cisco 7600 series router documentation is available at:

  http://www.cisco.com/en/US/products/hw/routers/ps368/products_installation_guides_books_list.html

- Cisco IOS Software Documentation Set

  The Cisco IOS software documentation set consists of the Cisco IOS configuration guides, Cisco IOS command references, and several other supporting documents that are shipped with your order in electronic form on the Documentation CD-ROM, unless you specifically ordered the printed versions.

Documentation Modules

Each module in the Cisco IOS documentation set consists of two books: a configuration guide and a corresponding command reference guide. Chapters in a configuration guide describe protocols, configuration tasks, Cisco IOS software functionality, and contain comprehensive configuration examples. Chapters in a command reference guide list command syntax information. Use each configuration guide with its corresponding command reference. On Cisco.com at:

Documentation > **Cisco IOS Software > Cisco IOS Software Releases 12.4 Mainline > Command References**

Documentation > **Cisco IOS Software > Cisco IOS Software Releases 12.4 Mainline > Command References > Configuration Guides**

Note To view a list of MIBs supported by Cisco, by product, go to: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

Implementing a Cisco LTE SGW on the Cisco SAMI

The following sections list related documentation (by category and then by task) to use when you implement a Cisco LTE SGW on the Cisco SAMI platform.

General Overview Documents

Core Cisco 7609 Router Documents

http://cisco.com/en/US/products/hw/routers/ps368/tsd_products_support_series_home.html

Documentation List by Task

For the most up-to-date list of documentation on the Cisco 7600 series router, refer to the Cisco 7600 Series Routers Documentation Roadmap on Cisco.com at:

http://cisco.com/en/US/docs/routers/7600/roadmaps/7600map.html

Getting Started

- *Cisco 7600 Series Internet Router Essentials*

  http://cisco.com/en/US/products/hw/routers/ps368/products_quick_start09186a0080092248.html

- *Regulatory Compliance and Safety Information for the Cisco 7600 Series Internet Routers*

  http://www.cisco.com/en/US/partner/docs/routers/7600/Hardware/RCSI/78_13690.html

Unpacking and installing the Cisco 7600 router:

- *Cisco 7600 Internet Router Installation Guide*

  http://www.cisco.com/en/US/partner/docs/routers/7600/Hardware/Chassis_Installation/7600_Series_Router_Installation_Guide/pref.html

Installing the Supervisor module and configuring the router (basic configuration, such as VLANs, IP):

- *Cisco 7600 Series Internet Router Module Installation Guides*

  http://www.cisco.com/en/US/partner/products/hw/routers/ps368/prod_installation_guides_list.html

- Cisco IOS Software Configuration Guide that applies to the latest release at the time of FCS

Installing and completing the Cisco SAMI configuration:

- Cisco 7600 Series Internet Router Module Installation Guides

  http://www.cisco.com/en/US/partner/products/hw/routers/ps368/prod_installation_guides_list.html

- Cisco Service and Application Module for IP User Guide

  http://www.cisco.com/en/US/docs/wireless/service_application_module/sami/user/guide/samiv1.html

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS Version 2.0.

This document is to be used in conjunction with the *Cisco GGSN Release 9.0 Configuration Guide* and the *Cisco GGSN Release 9.0 Command Reference* publications.