



Configuring Synchronous Ethernet ESMC and SSM

Synchronous Ethernet is an extension of Ethernet designed to provide the reliability found in traditional SONET/SDH and T1/E1 networks to Ethernet packet networks by incorporating clock synchronization features that support the Synchronization Status Message (SSM) and Ethernet Synchronization Message Channel (ESMC) for synchronous Ethernet clock synchronization.

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Understanding Synchronous Ethernet

Synchronous Ethernet (SyncE), described in ITU G.781, provides the required synchronization at the physical level. In SyncE, Ethernet links are synchronized by timing their bit clocks from high-quality, stratum-1-traceable clock signals in the same manner as SONET/SDH.

Ethernet Synchronization Message Channel (ESMC) incorporates the Synchronization Status Message (SSM) used in Synchronous Optical Networking (SONET) and Synchronous Digital Hierarchy (SDH) networks. While SONET and SDH transmit the SSM in a fixed location within the frame, ESMC transmits the SSM using a protocol: the IEEE 802.3 Organization-Specific Slow Protocol (OSSP) standard.

The ESMC carries a Quality Level (QL) value identifying the clock quality of a given synchronous Ethernet timing source. Clock quality values help a synchronous Ethernet node derive timing from the most reliable source and prevent timing loops.

When configured to use synchronous Ethernet, the router synchronizes to the best available clock source. If no better clock sources are available, the router remains synchronized to the current clock source.

The router supports two clock selection modes: QL-enabled and QL-disabled. Each mode uses different criteria to select the best available clock source.

Clock Selection Modes

The IR8340 router supports two clock selection modes:

- QL-Enabled Mode—In QL-enabled mode, the router considers the following parameters when selecting a clock source:
 - Clock quality level (QL)
 - Clock availability
 - Priority
- QL-disabled mode—In QL-disabled mode, the router considers the following parameters when selecting a clock source:
 - Clock availability
 - Priority

Configuring Synchronous Ethernet ESMC and SSM

Follow these steps to configure Synchronous Ethernet ESMC and SSM on the Cisco IR8340 Router.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **network-clock synchronization automatic**
4. **network-clock eec {1|2}**
5. **network-clock ynchronization ssm option {1|2} {GEN1 | GEN2 } }**
6. **network-clock input-source priority {interface interface_id | ptp domain domain_num | {external {R0 | R1 [{t1 {sf | esf } linecode {ami | b8zs } line-build-out length} | e1 [crc4 | fas] [125ohm | 75ohm] linecode [hdb3 | ami] } | 10m] } }**
7. **network-clock synchronization mode ql-enabled**
8. **network-clock wait-to-restore seconds global**
9. **esmc process**
10. **network-clock quality-level {tx | rx} value {interface interface-id | controller [E1 | BITS] slot/card/port | external [2m | 10m] }**
11. **interface interface-id**
12. **network-clock source quality-level value {tx|rx}**
13. **synchronous mode**
14. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	enable Example:	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.

	Command or Action	Purpose
	Router> enable	
Step 2	configure terminal Example: Router# configure terminal	Enter global configuration mode.
Step 3	network-clock synchronization automatic Example: Router(config)# network-clock synchronization automatic	Enables the network clock selection algorithm. This command disables the Cisco-specific network clock process and turns on the G.781-based automatic clock selection process. Note This command must be configured before any input source.
Step 4	network-clock eec {1 2} Example: Router(config)# network-clock eec 1	Specifies the Ethernet Equipment Clock (EEC) type. Valid values are <ul style="list-style-type: none"> • 1—ITU-T G.8262 option 1 (2048) • 2—ITU-T G.8262 option 2 and Telcordia GR-1244 (1544)
Step 5	network-clock ynchronization ssm option {1 2 {GEN1 GEN2 }} Example: Router(config)# network-clock synchronization ssm option 2 GEN1	Configures the G.781 synchronization option used to send synchronization messages. The following guidelines apply for this command: <ul style="list-style-type: none"> • Option 1 refers to G.781 synchronization option 1, which is designed for Europe. This is the default value. • Option 2 refers to G.781 synchronization option 2, which is designed for the United States. • GEN1 specifies option 2 Generation 1 synchronization. • GEN2 specifies option 2 Generation 2 synchronization.
Step 6	network-clock input-source priority {interface interface_id ptp domain domain_num [external {R0 R1 [{t1 {sf esf } linecode {ami b8zs } line-build-out length} e1 [crc4 fas] [125ohm 75ohm] linecode [hdb3 ami] } 10m] } Example: Router(config)# network-clock input-source 1 interface GigabitEthernet 0/0/0 Router(config)# network-clock input-source 1 external R0 1hz Router(config)# network-clock input-source 2 controller t1 0/2/0	Enables you to select an interface as an input clock for the router. You can select WAN interfaces (Gigabit Ethernet 0/0/0, Gigabit Ethernet 0/0/1), T1/E1 controllers, or an external interface. Selection priority for the clock source (1 is the highest priority). When the higher-priority clock source fails, the next-higher-priority clock source is selected. Note Before configuring ethernet interface as clock source, you should configure synchronous mode under interface configuration. SyncE is not supported on LAN interfaces.

	Command or Action	Purpose
	<pre>Router(config)# network-clock input-source 3 ptp domain 4</pre>	
Step 7	<p>network-clock synchronization mode ql-enabled</p> <p>Example:</p> <pre>Router(config)# network-clock synchronization mode ql-enabled</pre>	Enables automatic selection of a clock source based on quality level (QL).
Step 8	<p>network-clock wait-to-restore seconds global</p> <p>Example:</p> <pre>Router(config)# network-clock wait-to-restore 70 global</pre>	<p>(Optional) Configures a global wait-to-restore timer for synchronous Ethernet clock sources. The timer specifies how long the router waits before including a restored clock source in the clock selection process.</p> <p>Valid values are 0 to 86400 seconds. The default value is 300 seconds.</p>
Step 9	<p>esmc process</p> <p>Example:</p> <pre>Router(config)# esmc process</pre>	Enables the ESMC process globally.
Step 10	<p>network-clock quality-level {tx rx} value {interface interface-id controller [E1 BITS] slot/card/port external [2m 10m] }</p> <p>Example:</p> <pre>Router(config)# network-clock quality-level tx QL-SSU-A interface GigabitEthernet 0/0/0 Router(config)# network-clock quality-level rx QL-SSU-A interface GigabitEthernet 0/0/0 Router(config)# network-clock quality-level rx ql-prc external r0 1hz</pre>	<p>Specifies a quality level for a line or external clock source.</p> <p>The available quality values depend on the G.781 synchronization settings specified by the network-clock synchronization ssm option command:</p> <ul style="list-style-type: none"> • Option 1—Available values are QL-PRC, QL-SSU-A, QL-SSU-B, QL-SEC, and QL-DNU. • Option 2, GEN1—Available values are QL-PRS, QL-STU, QL-ST2, QL-SMC, QL-ST4, and QL-DUS. • Option 2, GEN 2—Available values are QL-PRS, QL-STU, QL-ST2, QL-TNC, QL-ST3, QL-SMC, QL-ST4, and QL-DUS.
Step 11	<p>interface interface-id</p> <p>Example:</p> <pre>Device(config)# interface gigabitethernet 0/0/0</pre>	Specifies a trunk interface and enters interface configuration mode.
Step 12	<p>network-clock source quality-level value {tx rx}</p> <p>Example:</p> <pre>Router(config-if)# network-clock source quality-level QL-PRS tx</pre>	(Optional) Provides the forced QL value to the local clock selection process.
Step 13	<p>synchronous mode</p> <p>Example:</p> <pre>Router(config-if)# synchronous mode</pre>	Configures the Ethernet interface to synchronous mode and automatically enables the ESMC and QL process on the interface.

	Command or Action	Purpose
Step 14	end Example: Device(config-if)# end	Exits interface configuration mode and returns to privileged EXEC mode.

