



STACKING GUIDE

**SUPERMICRO 1/10G Switches:
SSE-G24-TG4, SSE-G48-TG4,
SBM-GEM-X2C+,
SBM-GEM-X3S+**

Version 0.5

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2014/3/6	0.4	Julian Chang	Added MAC persistent feature.
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1. Introduction

This guide is intended to assist the system administrator who wants to build a logical switch which contains several Supermicro Intelligent Switches. The Supermicro Intelligent Switch offers a high-performance stacking solution that allows up to eight switches to be connect together so that they function as a logical unified switch, rather than as independent units. When assembled into a stack, the switches synchronize their actions so that network operations, like spanning tree protocol, VLAN and stack port trunks, are able to span across all of their Ethernet ports.

Observe the following requirements when planning the installation of the stack:

- ✧ Be sure all switches are at the same firmware version and hardware type (See Table 1-1).
- ✧ Be sure all switches are at the same stacking port assignment. Please refer to Table 1-2 to planning your stacking connection.
- ✧ We highly recommend that you connect the stack in a ring topology for resiliency. Cascading stack members without the redundant stacking connection may cause downtime due to any single point of failure. See Figure 1-1.

Stacking Type	Performance per Link	Cable Type & Lengths	Module Type	Supported Switch Type
Stacking using standardized CX4 interface.	12 Gbits/sec ¹	1 meter CX4-to-CX4 cable. (Part number: CBL-0494L) 3 meter CX4-to-CX4 cable. (Part number: CBL-0389L)	CX4 Module (Part number: AOM-SSE-X2C)	SSE-G24-TG4, SSE-G48-TG4, SBM-GEM-X2C+
Stacking using standardized SFP+ interface. (preferred)	10 Gbits/sec ¹	1 meter SFP+ Direct Attach Cable. (Part number: CBL-0347L) 3 meter SFP+ Direct Attach Cable. (Part number: CBL-0348L) 5 meter SFP+ Direct Attach Cable. (Part number: CBL-0349L)	SFP+ Module (Part number: AOM-SSE-X2S)	SSE-G24-TG4, SSE-G48-TG4, SBM-GEM-X3S+

Table 1-1: Supported models and accessories

¹ The switch may not be able to fully exploit the bandwidth of a stacking connection due to the overhead of inter-switch management traffic. See “Caution” note below.

Switch Type	Maximum number of switches per stack	Maximum number of stacking ports per unit
SSE-G24-TG4, SSE-G48-TG4	8	2 (XG1-2 / XG2-3)
SBM-GEM-X2C+	8	2 (XG2-3)
SBM-GEM-X3S+	8	2 (2 out of 3 SFP+ ports)

Table 1-2: Allowable stacking port assignments

Caution: Please note that the bandwidth across the stack is limited to 20Gbps full duplex at best. This bandwidth is used for administrative/management traffic as well as for any user data traffic that must be passed between ports on different stacked switches. Although there is a logical capacity for up to eight switches in a stack, traffic patterns may dictate smaller stacks. Users are advised to analyze as much as possible the expected amount of intra-stack, inter-switch traffic. If such traffic is expected, at peak, to be more than approximately 7Gbps, there should be serious consideration to implementing a smaller stack with a corresponding smaller intra-stack bandwidth demand.

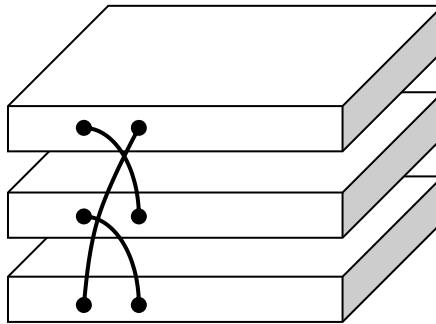


Figure 1-1 Stacking Multiple Switches in a Ring Topology

2. Terminology

The following terms are used throughout this document and are defined here for clarification:

- ✧ **Stacking:** Stacking refers to a method of connecting two or more switch entities together to build a large logical switch entity.
- ✧ **Stack Master:** A switch that controls the operation of the stack is called a Stack Master. Please note that there can be only one Stack Master in the stack at any given time.
- ✧ **Stack Slave:** A switch which is not elected (designated) or acting as the Stack Master is called a Stack Slave. On a Stack Slave the management and control plane remains passive unless it gets designated as Stack Master.
- ✧ **Preferred Master (PM):** A switch entity with Preferred Master setting has a higher priority to be elected as the Stack Master than a Backup Master or Preferred Slave. However, priority is not the

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only factor in deciding the Stack Master during the Master Election process.

- ✧ **Backup Master (BM):** A switch entity with Backup Master setting has a higher priority to be elected as the Stack Master than a Preferred Slave.
- ✧ **Preferred Slave (PS):** A switch entity with Preferred Slave setting has a lowest priority to be elected as a Stack Master.
- ✧ **Master Election:** A process that is used to elect a Stack Master from all participants in the stack.
- ✧ **Stack Identifier:** Each switch entity that will be involved in the Master Election must have a **unique** Stack Identifier. Valid range of Stack Identifiers is from 1 to 16, depending on the maximum size of stack. See Table 1-2.
- ✧ **Stacking Port:** A physical port of the switch that is used to exchange stacking information and aggregate data traffic between the peer switches.

3. Master Election

The first switch to boot up in a stack will be a Master. Then the Master Election process is used to elect a Stack Master from the stacking group. The election process will be triggered if any of the following occurs:

- The whole stack is reset.
- The link status of the stacking connection changes.
- The “stack force-discovery” command is executed.

The following rules have been defined to determine which stack entity within a stack is elected as the Stack Master. The Stack Master will be elected based on these rules, in the order specified:

- The switch entity that is **currently the Stack Master**².
- The switch entity that has highest stack member **priority value**.
- The switch entity that has lowest **Stack Identifier** or MAC address.

When you power on a switch, the switch displays the login prompt on the console and then triggers the stack election process. Please be aware that if you attempt to enter a username and password during the period of stack election, you will enter boot configuration mode, not Privileged EXEC mode; this is because the switch is not ready to process commands at this stage. After the stack election is completed, the logged-in user will be logged out automatically.

Once a master is elected, the Stack Master will take over the management role of whole stack and then the Stack Slaves will be added into the stack one after another. During the initialization, the following messages will be shown on the console of the Stack Master:

² This rule is only available in firmware version 1.0.13-10 and later.

```
...
Switch 2 Connected. Started Processing...
Processing completed for switch 2
Switch 3 Connected. Started Processing...
Processing completed for switch 3
...
```

Please note that if a new Stack Master comes up or any one of the stack members takes over the master role, the new master can take from 20 seconds to few minutes to complete the stack initialization, depending on the size of the stack and the number of the commands in the startup configuration on the Stack Master. During this period, the whole stack is unable to function adequately until all switch members are fully initialized. Therefore, please always keep the Stack Master alive to avoid unnecessary downtime.

After all switches are fully initialized, the configuration synchronization will be started> The following message will be shown on the console of the Stack Master if the synchronization is completed successfully:

```
...
Configuration restoration completed successfully.
...
```

The Supermicro Intelligent Switch does have an LED illuminated on all stack members. The illumination patterns are shown below in Table 3-1.

Switch Type	LED pattern in Stack Master	LED pattern in Stack Slave
SSE-G48-TG4 / SSE-G24-TG4	Solid green lights on the master LED	The master LED stays off
SBM-GEM-X2C+ / SBM-GEM-X3S+	Blue LED blinking in 2 seconds interval.	Blue LED blinking in 4 seconds interval.

Table 3-1 Master LED illumination pattern

SSE-G24-TG4 and SSE-G48-TG4 have seven segment LED display for stacking identifier. Due to the limited display of the stacking ID LED, it will display the stacking identifier as shown in Table 3-2.

Stacking Identifier	LED Display	Stacking Identifier	LED Display
1	'1'	9	'g'
2	'2'	10	'a'
3	'3'	11	'b'
4	'4'	12	'c'
5	'5'	13	'd'
6	'6'	14	'e'
7	'7'	15	'f'

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8	'8'	16	'g'
---	-----	----	-----

Table 3-2 LED Display for Stack ID (SSE-G24-TG4 and SSE-G48-TG4)

Similarly, the SBM-GEM-X2C+ has four LEDs to display the stacking identifier. Due to the limited space available for LEDs, the stacking identifier is displayed in binary form using these four stacking LEDs. See Table 3-3.

Stacking Identifier	Stacking ID LED 4	Stacking ID LED 3	Stacking ID LED 2	Stacking ID LED 1
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF

Table 3-3 LED Display for Stack ID (SBM-GEM-X2C+ only)

For SBM-GEM-X3S+, there is no LED to display the stacking identifier due to the space limitation.

4. Managing the Stack

After the entire stack comes up, the management interfaces are accessible through the serial port or through the management IP of the Stack Master. On a Slave switch the management plane and control plane remains passive.

For the blade models such as SBM-GEM-X2C+ or SBM-GEM-X3S+, the management IP should be configured through Supermicro's CMM software; therefore the configuration of management interface will not be saved in the startup configuration. When the master role is taken by the new master then the IP address of the management interface must be re-configured by the CMM software.

Conversely, the standalone models such as SSE-G24-TG4 and SSE-G48-TG4 do not have dedicated network management interfaces. Any IP configuration will be stored in the startup configuration and the configuration file will be copied to all stack members during the initialization stage. When the new master is elected, the whole stack will be re-initialized based on the backup copy of the configuration file stored in the new master.

Please be aware if the stack master changes, the MAC address of the new stack master determines the new MAC address of the layer 3 interface. However, when the MAC persistent feature³ is enabled in the switch before it takes over the master role, the newly elected master will continue to use the MAC address of the former stack master as the system MAC address. To enable the MAC persistent feature, just use "stack mac-persistent" CLI commands as shown below:

```
SMIS# stack mac-persistent
```

```
WARNING: The stack continues to use the base MAC address of old  
WARNING: Master as the system MAC. The network administrator must  
WARNING: make sure that the MAC address of old Master does not  
WARNING: appear elsewhere in this network domain. If it does,  
WARNING: user traffic may be blackholed.
```

Please note, that "stack mac-persistent / no stack mac-persistent" CLI commands are only available in Privileged EXEC mode.

After a new stack master takes over the master role, the system administrator can use the "show stack details" command to check the system MAC address. See below:

```
SMIS# show stack details
```

```
Self Status
```

³ The mac-persistent feature is available in version 1.0.15-9 and later.

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```
-----  
Switch Id      : 2  
Stack ports    : xg1,xg2,xg3,xg4  
Stack Ip       : 169.254.1.3  
Stack Mac      : 00:ff:ff:ff:06:02  
Priority       : PM  
Mac Persistent : Enabled  
System Mac     : 00:30:48:e0:7f:d8  
Current State  : Master
```

Peer Status

```
-----  
Switch      Stack IP          Stack MAC          Status  
-----
```

By default Supermicro switches act as standalone switches. This standalone default facilitates using 10G Ethernet ports as Extreme Ethernet ports for 10G uplinks. When stacking is enabled the stacking ports are dedicated for stacking traffic.

Stacking can be enabled using the command “stack” with a switch identifier and priority. See below:

```
SMIS# stack priority PM switchid 1 ports xg1,xg2  
After enabling stacking, switch will be reloaded immediately.  
Do you really want to execute this command and reload the switch? [y/n]
```

This example turns on stacking on the specified switch with Preferred Master priority and switch ID 1 and also assigns xg1 and xg2 as stacking ports.

To disable stacking on the specified switch, just use the “no stack” CLI command. After reboot, the switch will be configured in standalone mode.

```
SMIS# no stack  
After removing from stacking, switch will be reloaded immediately.  
Do you really want to execute this command and reload the switch? [y/n]
```

If a user chooses stacking using the “stack” command from the non-stacking state and if the configurations are already saved for restore, the switch will rename the configuration file by adding a **suffix _nonstack** and will not restore this file when the switch reboots with stacking enabled.

Similarly, if a user chooses non-stacking using the “no stack” command from a stacking state and if the configurations are already saved for restore, the switch will rename the configuration file by adding a **suffix _stack** and will not restore this file when the switch reboots with stacking disabled.

5. Stacking Scenarios

This section will present examples of how to configuring stacking for various scenarios and will provide step-by-step guidance using the CLI command.

◆ Creating a stack

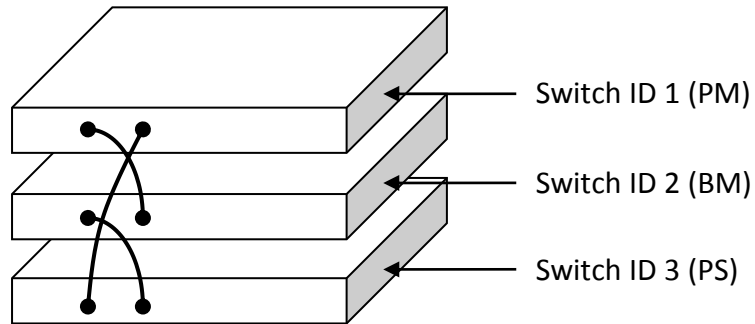


Figure 5-1 Stacking 3 Switches

Figure 5-1 shows the connectivity between the stack members using three cables. The detailed configurations are shown in below tables.

Stack ID	1
Priority	Preferred Master (PM)
Stacking Ports	XG1, XG2

Table 5-1 Switch 1 Configuration

Stack ID	2
Priority	Backup Master (BM)
Stacking Ports	XG1, XG2

Table 5-2 Switch 2 Configuration

Stack ID	3
Priority	Preferred Slave (PS)
Stacking Ports	XG1, XG2

Table 5-3 Switch 3 Configuration

Perform the following command for the switch 1:

```
SMIS# stack priority PM switchid 1 ports xg1,xg2
After enabling stacking, switch will be reloaded immediately.
Do you really want to execute this command and reload the switch? [y/n]
```

Reload Switch 1 and then configure Switch 2:

```
SMIS# stack priority BM switchid 2 ports xg1,xg2
After enabling stacking, switch will be reloaded immediately.
Do you really want to execute this command and reload the switch? [y/n]
```

Reload Switch 2 and then configure Switch 3:

```
SMIS# stack priority PS switchid 3 ports xg1,xg2
After enabling stacking, switch will be reloaded immediately.
Do you really want to execute this command and reload the switch? [y/n]
```

Power down all switches that will be joining the stack.

Now cable together all switches in a ring topology (See Table 1-1: Supported models and accessories) and then power up Switch 1 first to ensure that it becomes the Stack Master.

After Switch 1 comes up successfully, next power up the switch which is adjacent to it. Repeat this step until all switches are booted up. After the entire stack is booted, use the following command to verify the status of stack:

```
SMIS# show stack detail
```

◆ Adding a switch into an running stack

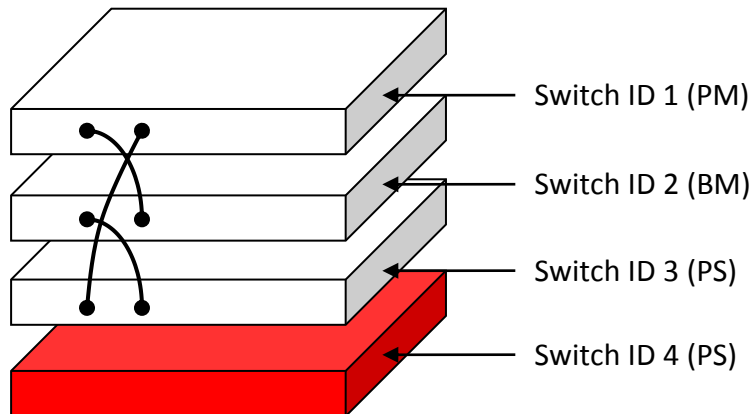


Figure 5-2 Before adding a switch into a running stack

Perform the following command for the switch 4:

```
SMIS# stack priority PS switchid 4 ports xg1,xg2
After enabling stacking, switch will be reloaded immediately.
Do you really want to execute this command and reload the switch? [y/n]
```

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Reload Switch 4 and then power down the specified switch.

Remove the stacking cable between Switch 3 and Switch 1 and then use the same cable to connect Switch 3 and Switch 4. (See Figure 5-3).

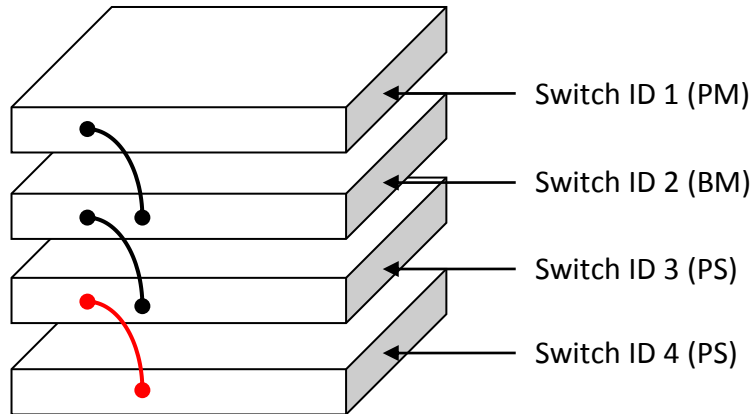


Figure 5-3 Cabling Switch 3 and Switch 4

Plug a new cable to the stacking ports on Switch 1 and Switch 4. (See Figure 5-4).

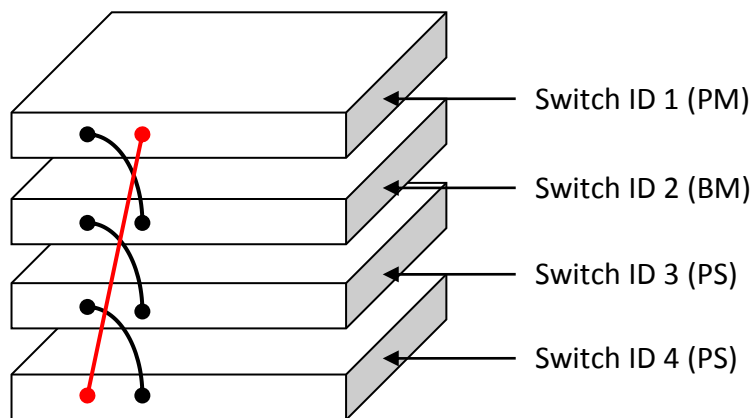


Figure 5-4 Cabling Switch 1 and Switch 4

Power up Switch 4 and use the “show stack detail” command to verify the specified switch is added into the running stack properly.

◆ Merging two running stacks into a single stack

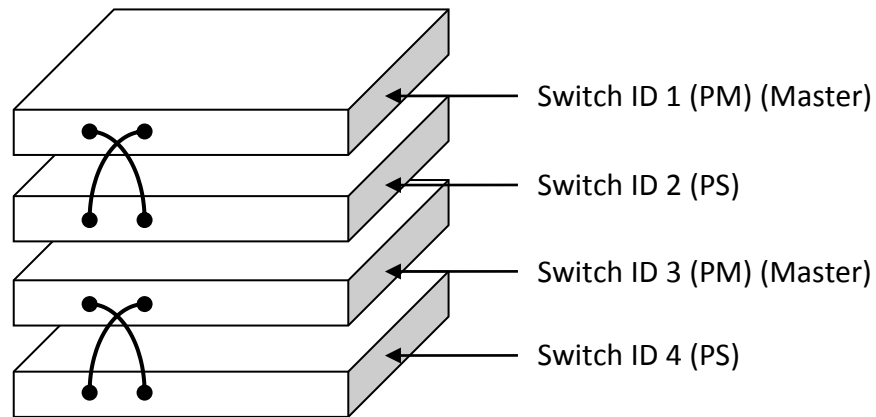


Figure 5-5 Before merging two separated stacks

Remove the redundant stacking cable from each running stack. The two running stacks should each be able to retain its members with the remaining cables.

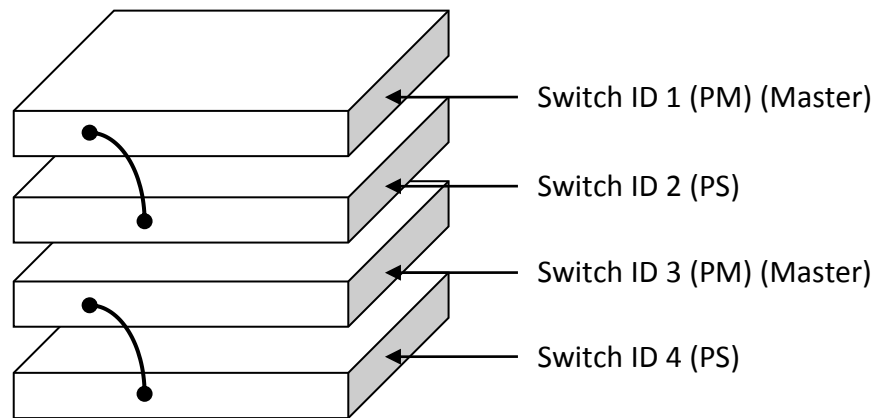


Figure 5-6 Remove redundant cables from each stack

Plug a new cable into the stacking ports on Switch 2 and Switch 3. The Master Election process occurs and Switch 1 wins the election because Switch 1 is the current master and has a lower MAC address than Switch 3.

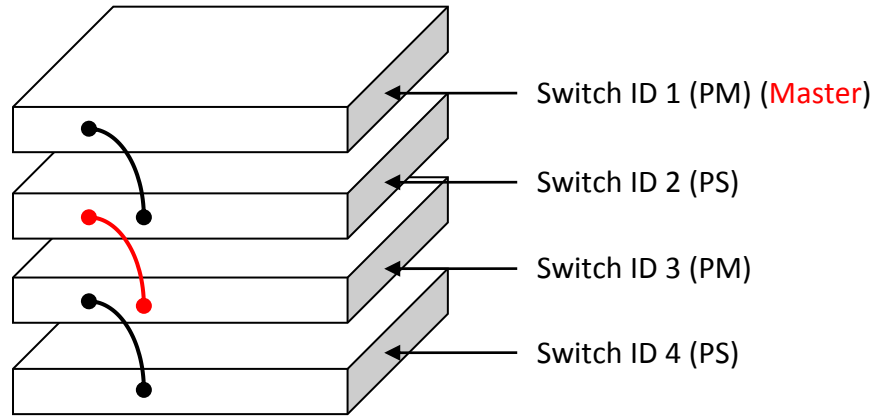


Figure 5-7 Merging two running stacks

Finally connect Switch 1 and Switch 4 with a redundant stacking link to increase the resiliency of whole stack.

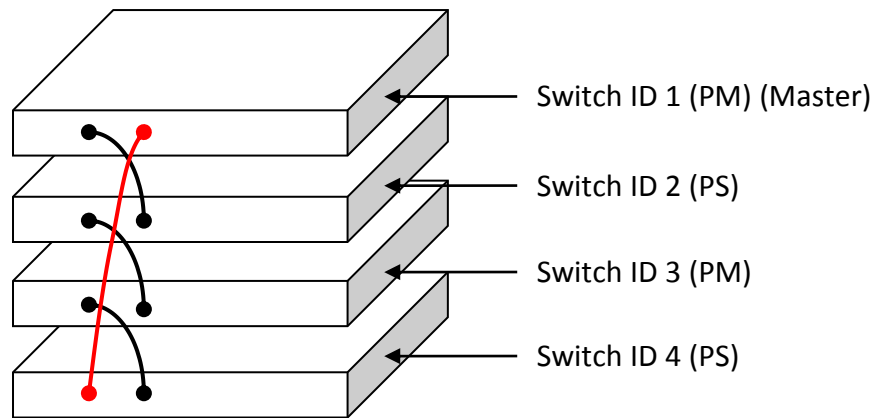


Figure 5-8 Cabling Switch 1 and Switch 4 in a ring topology