New Features for Cisco IOS-XE 17.3.1

The following are the new features available on the IR1101 for IOS-XE release 17.3.1:

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Yang Support for IO Ports

This feature increases the compatibility between the Command Line Interface and the Yang Model. Cisco IOS-XE Yang Data Models are found here:

https://github.com/YangModels/yang/tree/master/vendor/cisco/xe

Each release has a directory, and the 17.3.1 release is found under 1731. The two modules for Digital IO are Cisco-IOS-XE-digital-io-oper and Cisco-IOS-XE-digitalio.

The following are relevant IOS-XE CLI commands available:

Show Commands

- show run
- show alarm
- show led

Configuration Commands

- alarm contact attach-to-iox
- no alarm contact attach-to-iox
- alarm contact 1 enable enable
- no alarm contact <1-4> enable
- alarm contact <1-4> application <wet | dry>
- no alarm contact <1-4> application

- alarm contact <1-4> description <alarm description>
- no alarm contact <1-4> description
- alarm contact <1-4> severity <critical | major | minor | none>
- no alarm contact <1-4> severity
- alarm contact <1-4> threshold <1600-2700>
- no alarm contact <1-4> threshold
- alarm contact <1-4> trigger <closed | open>
- no alarm contact <1-4> trigger
- alarm contact <1-4> output <1 | 0>
- alarm contact <1-4> output relay temperature <critical | major | minor>
- alarm contact <1-4> output relay input-alarm <0-4>
- no alarm contact <1-4> output

Support for Security-Enhanced Linux (SELinux)

Security-Enhanced Linux is a set of patches to the Linux kernel and some utilities to incorporate a strong, flexible mandatory access control (MAC) architecture into the major subsystems of the kernel. SELinux provides an enhanced mechanism to enforce the separation of information based on confidentiality and integrity requirements, which allows threats of tampering and bypassing of application security mechanisms to be addressed and enables the confinement of damage that can be caused by malicious or flawed applications.

SELinux enforces mandatory access control policies that confine user programs and system servers to the minimum amount of privilege they require to do their jobs. This reduces or eliminates the ability of these programs and daemons to cause harm when compromised (for example, via buffer overflows or mis-configurations). This confinement mechanism operates independently of the traditional Linux access control mechanisms.

The are no additional requirements or configuration steps required to enable or operate the SELinux feature. The solution is enabled/operational by default as part of the base IOS-XE software on supported platforms.

The following are enhanced show commands that have been defined for viewing SELinux related audit logs.

show platform software audit all

show platform software audit summary

show platform software audit switch *<<1-8> | active | standby> <FRU identifier from a drop-down list>*

Command Examples

The following is a sample output of the **show software platform software audit summary** command:

```
Device# show platform software audit summary
=====================================
AUDIT LOG ON switch 1
```

```
-----------------------------------
AVC Denial count: 58
===================================
```

The following is a sample output of the **show software platform software audit all** command:

```
Device# show platform software audit all
===================================
AUDIT LOG ON switch 1
-----------------------------------
========== START ============
type=AVC msg=audit(1539222292.584:100): avc:  denied  { read } for  pid=14017
comm="mcp_trace_filte" name="crashinfo" dev="rootfs" ino=13667
scontext=system_u:system_r:polaris_trace_filter_t:s0
tcontext=system_u:object_r:polaris_disk_crashinfo_t:s0 tclass=lnk_file permissive=1
type=AVC msg=audit(1539222292.584:100): avc:  denied  { getattr } for  pid=14017
comm="mcp_trace_filte" path="/mnt/sd1" dev="sda1" ino=2
scontext=system_u:system_r:polaris_trace_filter_t:s0
tcontext=system_u:object_r:polaris_disk_crashinfo_t:s0 tclass=dir permissive=1
type=AVC msg=audit(1539222292.586:101): avc:  denied  { getattr } for  pid=14028 comm="ls"
 path="/tmp/ufs/crashinfo" dev="tmpfs" ino=58407
scontext=system_u:system_r:polaris_trace_filter_t:s0
tcontext=system_u:object_r:polaris_ncd_tmp_t:s0 tclass=dir permissive=1
type=AVC msg=audit(1539222292.586:102): avc:  denied  { read } for  pid=14028 comm="ls"
name="crashinfo" dev="tmpfs" ino=58407 scontext=system_u:system_r:polaris_trace_filter_t:s0
 tcontext=system_u:object_r:polaris_ncd_tmp_t:s0 tclass=dir permissive=1
type=AVC msg=audit(1539438600.896:119): avc:  denied  { execute } for  pid=8300 comm="sh"
name="id" dev="loop0" ino=6982 scontext=system_u:system_r:polaris_auto_upgrade_server_rp_t:s0
 tcontext=system_u:object_r:bin_t:s0 tclass=file permissive=1
========== END ============
```

(output omitted for brevity)

The following is a sample output of the **show software platform software audit switch** command:

```
Device# show platform software audit switch active R0
========== START ============
type=AVC msg=audit(1539222292.584:100): avc:  denied  { read } for  pid=14017
comm="mcp_trace_filte" name="crashinfo" dev="rootfs" ino=13667
scontext=system_u:system_r:polaris_trace_filter_t:s0
tcontext=system_u:object_r:polaris_disk_crashinfo_t:s0 tclass=lnk_file permissive=1
type=AVC msg=audit(1539222292.584:100): avc:  denied  { getattr } for  pid=14017
comm="mcp_trace_filte" path="/mnt/sd1" dev="sda1" ino=2
scontext=system_u:system_r:polaris_trace_filter_t:s0
tcontext=system_u:object_r:polaris_disk_crashinfo_t:s0 tclass=dir permissive=1
type=AVC msg=audit(1539222292.586:101): avc:  denied  { getattr } for  pid=14028 comm="ls"
 path="/tmp/ufs/crashinfo" dev="tmpfs" ino=58407
scontext=system_u:system_r:polaris_trace_filter_t:s0
tcontext=system_u:object_r:polaris_ncd_tmp_t:s0 tclass=dir permissive=1
type=AVC msg=audit(1539222292.586:102): avc:  denied  { read } for  pid=14028 comm="ls"
name="crashinfo" dev="tmpfs" ino=58407 scontext=system_u:system_r:polaris_trace_filter_t:s0
 tcontext=system_u:object_r:polaris_ncd_tmp_t:s0 tclass=dir permissive=1
type=AVC msg=audit(1539438624.916:122): avc:  denied  { execute_no_trans } for  pid=8600
comm="auto_upgrade_se" path="/bin/bash" dev="rootfs" ino=7276
scontext=system_u:system_r:polaris_auto_upgrade_server_rp_t:s0
tcontext=system_u:object_r:shell_exec_t:s0 tclass=file permissive=1
type=AVC msg=audit(1539438648.936:123): avc:  denied  { execute_no_trans } for  pid=9307
comm="auto_upgrade_se" path="/bin/bash" dev="rootfs" ino=7276
scontext=system_u:system_r:polaris_auto_upgrade_server_rp_t:s0
tcontext=system_u:object_r:shell_exec_t:s0 tclass=file permissive=1
type=AVC msg=audit(1539438678.649:124): avc:  denied  { name_connect } for  pid=26421
comm="nginx" dest=8098 scontext=system_u:system_r:polaris_nginx_t:s0
tcontext=system_u:object_r:polaris_caf_api_port_t:s0 tclass=tcp_socket permissive=1
```

```
type=AVC msg=audit(1539438696.969:125): avc:  denied  { execute_no_trans } for  pid=10057
comm="auto_upgrade_se" path="/bin/bash" dev="rootfs" ino=7276
scontext=system_u:system_r:polaris_auto_upgrade_server_rp_t:s0
tcontext=system_u:object_r:shell_exec_t:s0 tclass=file permissive=1
type=AVC msg=audit(1539438732.973:126): avc:  denied  { execute_no_trans } for  pid=10858
comm="auto_upgrade_se" path="/bin/bash" dev="rootfs" ino=7276
scontext=system_u:system_r:polaris_auto_upgrade_server_rp_t:s0
tcontext=system_u:object_r:shell_exec_t:s0 tclass=file permissive=1
type=AVC msg=audit(1539438778.008:127): avc:  denied  { execute_no_trans } for  pid=11579
comm="auto_upgrade_se" path="/bin/bash" dev="rootfs" ino=7276
scontext=system_u:system_r:polaris_auto_upgrade_server_rp_t:s0
tcontext=system_u:object_r:shell_exec_t:s0 tclass=file permissive=1
type=AVC msg=audit(1539438800.156:128): avc:  denied  { name_connect } for  pid=26421
comm="nginx" dest=8098 scontext=system_u:system_r:polaris_nginx_t:s0
tcontext=system_u:object_r:polaris_caf_api_port_t:s0 tclass=tcp_socket permissive=1
type=AVC msg=audit(1539438834.099:129): avc:  denied  { execute_no_trans } for  pid=12451
comm="auto_upgrade_se" path="/bin/bash" dev="rootfs" ino=7276
scontext=system_u:system_r:polaris_auto_upgrade_server_rp_t:s0
tcontext=system_u:object_r:shell_exec_t:s0 tclass=file permissive=1
type=AVC msg=audit(1539438860.907:130): avc:  denied  { name_connect } for  pid=26421
comm="nginx" dest=8098 scontext=system_u:system_r:polaris_nginx_t:s0
tcontext=system_u:object_r:polaris_caf_api_port_t:s0 tclass=tcp_socket permissive=1
========== END ============
==================================
```

Syslog Message Reference

Facility-Severity-Mnemonic

- %SELINUX-3-MISMATCH

Severity-Meaning

- ERROR LEVEL Log

Message Explanation

- A resource access was made by the process for which a resource access policy is not defined. The operation was flagged but not denied.
- The operation continued successfully and was not disrupted. A system log has been generated about the missing policy for resource access by the process as denied operation.

Recommended Action

- Please contact CISCO TAC with the following relevant information as attachments:
  - The message exactly as it appears on the console or in the system log.
  - Output of "show tech-support" (text file)
  - Archive of Btrace files from the box using the following command ("request platform software trace archive target <URL>") For Example:

Device#**request platform software trace archive target flash:selinux_btrace_logs**

Support Added for the P-LTEAP18-GL Modem PID

The P-LTEAP18-GL PID uses the Telit modem LM960 modem. Details about all of the IR1101 modems are found here:

https://www.cisco.com/c/en/us/td/docs/routers/access/1101/b_IR1101HIG/b_IR1101HIG_chapter_01.html#con_1161147

Initial Bootup Security Improvements

This section contains the following:

Enforce Changing Default Password

Previous software versions allowed the user to bypass setting a new enable password. When the device was first booted after factory reset or fresh from the factory, the following prompt is received on the console:

Would you like to enter the initial configuration dialog? [yes/no]:

Previous software versions allowed answering **no** and the device would drop to the **Router>** prompt with a blank enable password. At this point, the router could be configured and brought into service with a blank enable password.

In previous documentation, Cisco recommended using the **enable secret** command instead of the **enable password** command because this offers an improved encryption algorithm.

Starting with 17.3.1, the initial dialog has been changed to force setting a new enable password, and also using the **enable secret** command instead. The following is an example:

```
Would you like to enter basic management setup? [yes/no]: yes
Configuring global parameters:

  Enter host name [Router]: router-1

  The enable secret is a password used to protect access to
  privileged EXEC and configuration modes. This password, after
  entered, becomes encrypted in the configuration.
  Enter enable secret: ********
  Confirm enable secret: ********

  The enable password is used when you do not specify an
  enable secret password, with some older software versions, and
  some boot images.
  Enter enable password: **********

The virtual terminal password is used to protect
  access to the router over a network interface.
  Enter virtual terminal password: *********
  Configure SNMP Network Management? [yes]: no

Enter interface name used to connect to the
management network from the above interface summary: Ethernet0/0

Configuring interface Ethernet0/0:
  Configure IP on this interface? [yes]: no
```

```
The following configuration command script was created:
hostname router-1
enable secret 9 $9$emUzIshVXwlUaE$nTzhgi9STdZKzQc4VJ0kEaCqafjUNdCD7ZUf37SY9qg
enable password password-1
.
.
[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.

Enter your selection [2]: 2
.
.
router-1>en
Password:
router-1#sh run | sec enable
enable secret 9 $9$emUzIshVXwlUaE$nTzhgi9STdZKzQc4VJ0kEaCqafjUNdCD7ZUf37SY9qg
enable password password-1
```

The following is an example of what happens if you answer **no** to the initial configuration dialog:

```
Would you like to enter the initial configuration dialog? [yes/no]: no
The enable secret is a password used to protect access to
  privileged EXEC and configuration modes. This password, after
  entered, becomes encrypted in the configuration.
  Enter enable secret: ********
  Confirm enable secret: ********
Would you like to terminate autoinstall? [yes]: yes

.
.
router-1>en
Password:
router-1#sh run | sec enable
enable secret 9 $9$emUzIshVXwlUaE$nTzhgi9STdZKzQc4VJ0kEaCqafjUNdCD7ZUf37SY9qg
```

After the enable secret is prompted during the first login, and the admin enters a password, the admin entered password will be always masked. If the admin enters a weak password, they will be prompted again to enter strong password (i.e. the standard mix of upper/lower case characters, special characters, numbers etc.). The prompting will continue until the admin enters a strong password. The admin will be prompted to enter the strong secret password twice for confirming that admin is sure that it is the secret that they want to configure.

Telnet and HTTP

There has been a change in the telnet and http boot configuration. When the device is first booted after factory reset or fresh from the factory, the following takes place:

- Disable telnet
- Disable http server. HTTP client works.
- Enable SSH
- Enable https server

Note This only applies to the IR1101, other IoT routers configuration remains the same.