ice devlink support

This document describes the devlink features implemented by the `ice` device driver.

Info versions

The `ice` driver reports the following versions

devlink info versions implemented

Name	Type	Example	Description
`board.id`	fixed	K65390-000	The Product Board Assembly (PBA) identifier of the board.
`fw.mgmt`	running	2.1.7	3-digit version number of the management firmware running on the Embedded Management Processor of the device. It controls the PHY, link, access to device resources, etc. Intel documentation refers to this as the EMP firmware.
`fw.mgmt.api`	running	1.5.1	3-digit version number (major.minor.patch) of the API exported over the AdminQ by the management firmware. Used by the driver to identify what commands are supported. Historical versions of the kernel only displayed a 2-digit version number (major.minor).
`fw.mgmt.build`	running	0x305d955f	Unique identifier of the source for the management firmware.
`fw.undi`	running	1.2581.0	Version of the Option ROM containing the UEFI driver. The version is reported in `major.minor.patch` format. The major version is incremented whenever a major breaking change occurs, or when the minor version would overflow. The minor version is incremented for non-breaking changes and reset to 1 when the major version is incremented. The patch version is normally 0 but is incremented when a fix is delivered as a patch against an older base Option ROM.
`fw.psid.api`	running	0.80	Version defining the format of the flash contents.
`fw.bundle_id`	running	0x80002ec0	Unique identifier of the firmware image file that was loaded onto the device. Also referred to as the EETRACK identifier of the NVM.
`fw.app.name`	running	ICE OS Default Package	The name of the DDP package that is active in the device. The DDP package is loaded by the driver during initialization. Each variation of the DDP package has a unique name.
`fw.app`	running	1.3.1.0	The version of the DDP package that is active in the device. Note that both the name (as reported by `fw.app.name`) and version are required to uniquely identify the package.
`fw.app.bundle_id`	running	0xc0000001	Unique identifier for the DDP package loaded in the device. Also referred to as the DDP Track ID. Can be used to uniquely identify the specific DDP package.
`fw.netlist`	running	1.1.2000-6.7.0	The version of the netlist module. This module defines the device's Ethernet capabilities and default settings, and is used by the management firmware as part of managing link and device connectivity.
`fw.netlist.build`	running	0xee16ced7	The first 4 bytes of the hash of the netlist module contents.

Flash Update

The `ice` driver implements support for flash update using the `devlink-flash` interface. It supports updating the device flash using a combined flash image that contains the `fw.mgmt`, `fw.undi`, and `fw.netlist` components.

List of supported overwrite modes

Bits	Behavior
`DEVLINK_FLASH_OVERWRITE_SETTINGS`	Do not preserve settings stored in the flash components being updated. This includes overwriting the port configuration that determines the number of physical functions the device will initialize with.
`DEVLINK_FLASH_OVERWRITE_SETTINGS` and `DEVLINK_FLASH_OVERWRITE_IDENTIFIERS`	Do not preserve either settings or identifiers. Overwrite everything in the flash with the contents from the provided image, without performing any preservation. This includes overwriting device identifying fields such as the MAC address, VPD area, and device serial number. It is expected that this combination be used with an image customized for the specific device.

The ice hardware does not support overwriting only identifiers while preserving settings, and thus `DEVLINK_FLASH_OVERWRITE_IDENTIFIERS` on its own will be rejected. If no overwrite mask is provided, the firmware will be instructed to preserve all settings and identifying fields when updating.

Reload

The `ice` driver supports activating new firmware after a flash update using `DEVLINK_CMD_RELOAD` with the `DEVLINK_RELOAD_ACTION_FW_ACTIVATE` action.

```
$ devlink dev reload pci/0000:01:00.0 reload action fw_activate
```

The new firmware is activated by issuing a device specific Embedded Management Processor reset which requests the device to reset and reload the EMP firmware image.

The driver does not currently support reloading the driver via `DEVLINK_RELOAD_ACTION_DRIVER_REINIT`.

Regions

The `ice` driver implements the following regions for accessing internal device data.

regions implemented

Name	Description
`nvm-flash`	The contents of the entire flash chip, sometimes referred to as the device's Non Volatile Memory.
`device-caps`	The contents of the device firmware's capabilities buffer. Useful to determine the current state and configuration of the device.

Users can request an immediate capture of a snapshot via the `DEVLINK_CMD_REGION_NEW`

```
$ devlink region show
pci/0000:01:00.0/nvm-flash: size 10485760 snapshot [] max 1
pci/0000:01:00.0/device-caps: size 4096 snapshot [] max 10

$ devlink region new pci/0000:01:00.0/nvm-flash snapshot 1
$ devlink region dump pci/0000:01:00.0/nvm-flash snapshot 1

$ devlink region dump pci/0000:01:00.0/nvm-flash snapshot 1
0000000000000000 0014 95dc 0014 9514 0035 1670 0034 db30
0000000000000010 0000 0000 ffff ff04 0029 8c00 0028 8cc8
0000000000000020 0016 0bb8 0016 1720 0000 0000 c00f 3ffc
0000000000000030 bada cce5 bada cce5 bada cce5 bada cce5

$ devlink region read pci/0000:01:00.0/nvm-flash snapshot 1 address 0 length 16
0000000000000000 0014 95dc 0014 9514 0035 1670 0034 db30

$ devlink region delete pci/0000:01:00.0/nvm-flash snapshot 1

$ devlink region new pci/0000:01:00.0/device-caps snapshot 1
$ devlink region dump pci/0000:01:00.0/device-caps snapshot 1
0000000000000000 01 00 01 00 00 00 00 00 01 00 00 00 00 00 00 00
0000000000000010 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000020 02 00 02 01 32 03 00 00 0a 00 00 00 25 00 00 00
0000000000000030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000040 04 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00
0000000000000050 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000060 05 00 01 00 03 00 00 00 00 00 00 00 00 00 00 00
0000000000000070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000080 06 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00
0000000000000090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000000000000a0 08 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00
00000000000000b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000000000000c0 12 00 01 00 01 00 00 00 01 00 01 00 00 00 00 00
00000000000000d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000000000000e0 13 00 01 00 00 01 00 00 00 00 00 00 00 00 00 00
00000000000000f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000100 14 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00
0000000000000110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000120 15 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00
0000000000000130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000140 16 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00
0000000000000150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000160 17 00 01 00 06 00 00 00 00 00 00 00 00 00 00 00
0000000000000170 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000180 18 00 01 00 01 00 00 00 01 00 00 00 08 00 00 00
0000000000000190 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000000000001a0 22 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00
00000000000001b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000000000001c0 40 00 01 00 00 08 00 00 08 00 00 00 00 00 00 00
00000000000001d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000000000001e0 41 00 01 00 00 08 00 00 00 00 00 00 00 00 00 00
00000000000001f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0000000000000200 42 00 01 00 00 08 00 00 00 00 00 00 00 00 00 00
0000000000000210 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

$ devlink region delete pci/0000:01:00.0/device-caps snapshot 1
```