Devlink Health

Background

The `devlink` health mechanism is targeted for Real Time Alerting, in order to know when something bad happened to a PCI device.

- Provide alert debug information.
- Self healing.
- If problem needs vendor support, provide a way to gather all needed debugging information.

Overview

The main idea is to unify and centralize driver health reports in the generic `devlink` instance and allow the user to set different attributes of the health reporting and recovery procedures.

The `devlink` health reporter: Device driver creates a "health reporter" per each error/health type. Error/Health type can be a known/generic (e.g. PCI error, fw error, rx/tx error) or unknown (driver specific). For each registered health reporter a driver can issue error/health reports asynchronously. All health reports handling is done by `devlink`. Device driver can provide specific callbacks for each "health reporter", e.g.:

- Recovery procedures
- Diagnostics procedures
- Object dump procedures
- OOB initial parameters

Different parts of the driver can register different types of health reporters with different handlers.

Actions

Once an error is reported, devlink health will perform the following actions:

- A log is being send to the kernel trace events buffer
- Health status and statistics are being updated for the reporter instance
- Object dump is being taken and saved at the reporter instance (as long as there is no other dump which is already stored)
- Auto recovery attempt is being done. Depends on:
  - Auto-recovery configuration
  - Grace period vs. time passed since last recover

User Interface

User can access/change each reporter's parameters and driver specific callbacks via `devlink`, e.g per error type (per health reporter):

- Configure reporter's generic parameters (like: disable/enable auto recovery)
- Invoke recovery procedure
- Run diagnostics
- Object dump

List of devlink health interfaces

Name	Description
DEVLINK_CMD_HEALTH_REPORTER_GET	Retrieves status and configuration info per DEV and reporter.
DEVLINK_CMD_HEALTH_REPORTER_SET	Allows reporter-related configuration setting.
DEVLINK_CMD_HEALTH_REPORTER_RECOVER	Triggers reporter's recovery procedure.
DEVLINK_CMD_HEALTH_REPORTER_TEST	Triggers a fake health event on the reporter. The effects of the test event in terms of recovery flow should follow closely that of a real event.
DEVLINK_CMD_HEALTH_REPORTER_DIAGNOSE	Retrieves current device state related to the reporter.
DEVLINK_CMD_HEALTH_REPORTER_DUMP_GET	Retrieves the last stored dump. Devlink health saves a single dump. If an dump is not already stored by devlink for this reporter, devlink generates a new dump. Dump output is defined by the reporter.
DEVLINK_CMD_HEALTH_REPORTER_DUMP_CLEAR	Clears the last saved dump file for the specified reporter.

The following diagram provides a general overview of `devlink-health`:

```
                                     netlink
                          +------------------------+
                          |                        |
                          |           +            |
                          |           |            |
                          +------------------------+
                                      |request for ops
                                      |(diagnose,
         driver                devlink|recover,
                                      |dump)
      +--------+            +------------------------+
      |        |            |   reporter|            |
      |        |            | +---------v----------+ |
      |        | ops execution | |                 | |
      |   <--------------------------------+        | |
      |        |            | | |                 | |
      |        |            | + ^------------------+ |
      |        |            | | request for ops    |
      |        |            | | (recover, dump)     |
      |        |            | |                    |
      |        |            | +-+------------------+ |
      |        | health report | | health handler | |
      |        +-------------------------------->   | |
      |        |            | +-------------------+ |
      |        | health reporter create |            |
      |        +------------------------->            |
      +--------+            +------------------------+
```