DPDK

A framework for representation, configuration, and management of virtual function ports

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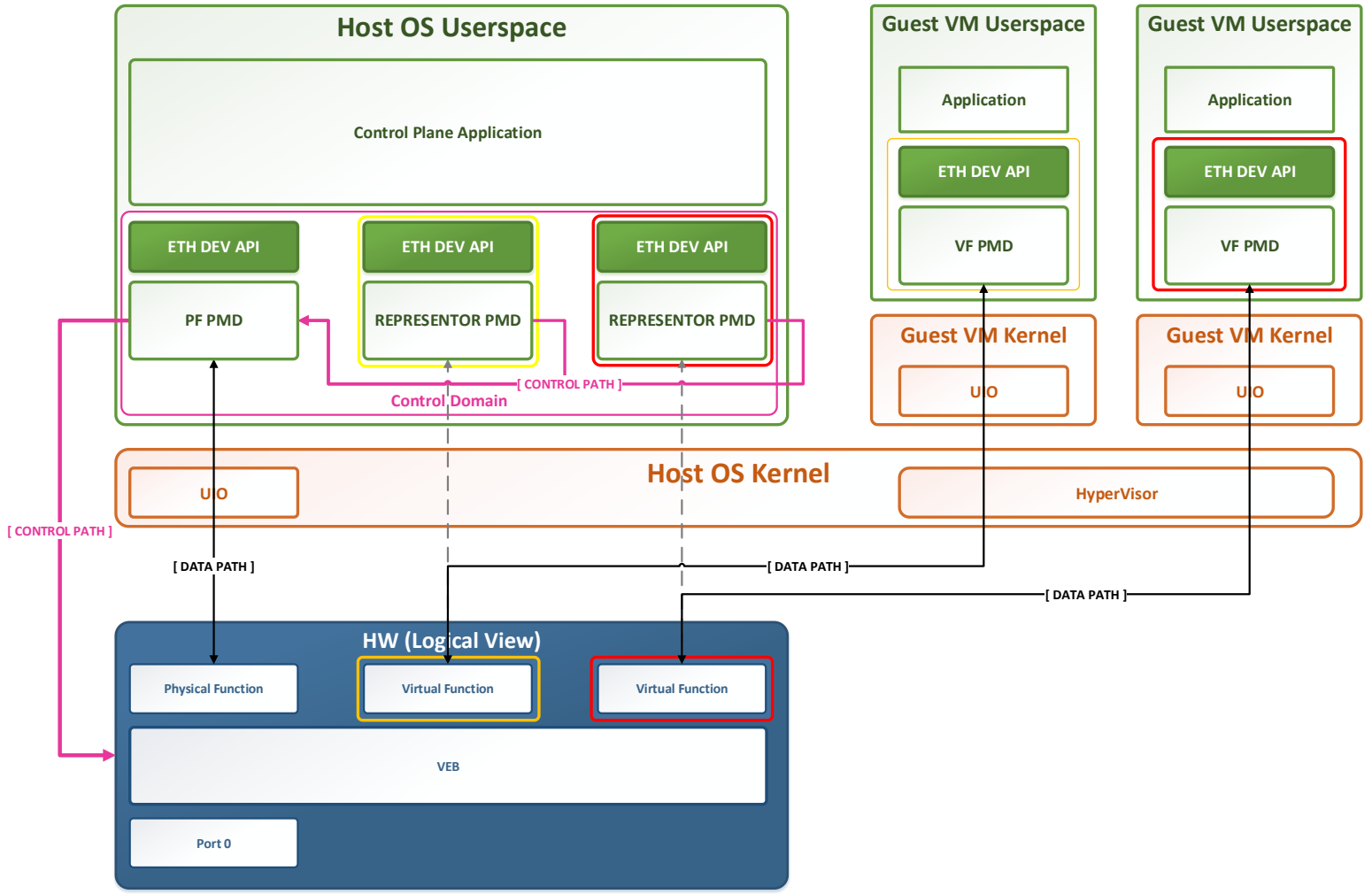
Agenda

- Port Representor Concepts
  - SR-IOV NIC
  - Multi-Port NIC
- Library Implementation Details
  - Object Model
  - Broker APIs
  - Port Representor APIs
  - Initialization Sequence
  - Example eth_dev_ops function
- Future Work

Port Representors

- Port Representors are virtual poll mode drivers (PMD) which provide a logical representation in DPDK for a port of a multi host port device.
- Primary purpose demonstrated in our RFC is to support configuration, management and monitoring of virtual functions of a physical function bound to a userspace control plane application.
- Port Representor PMDs are associated with a parent base driver which provide the backend implementations for the representor ports.
- Allows VF ports to managed using existing DPDK APIs without the need to create and maintain a set of device specific APIs.

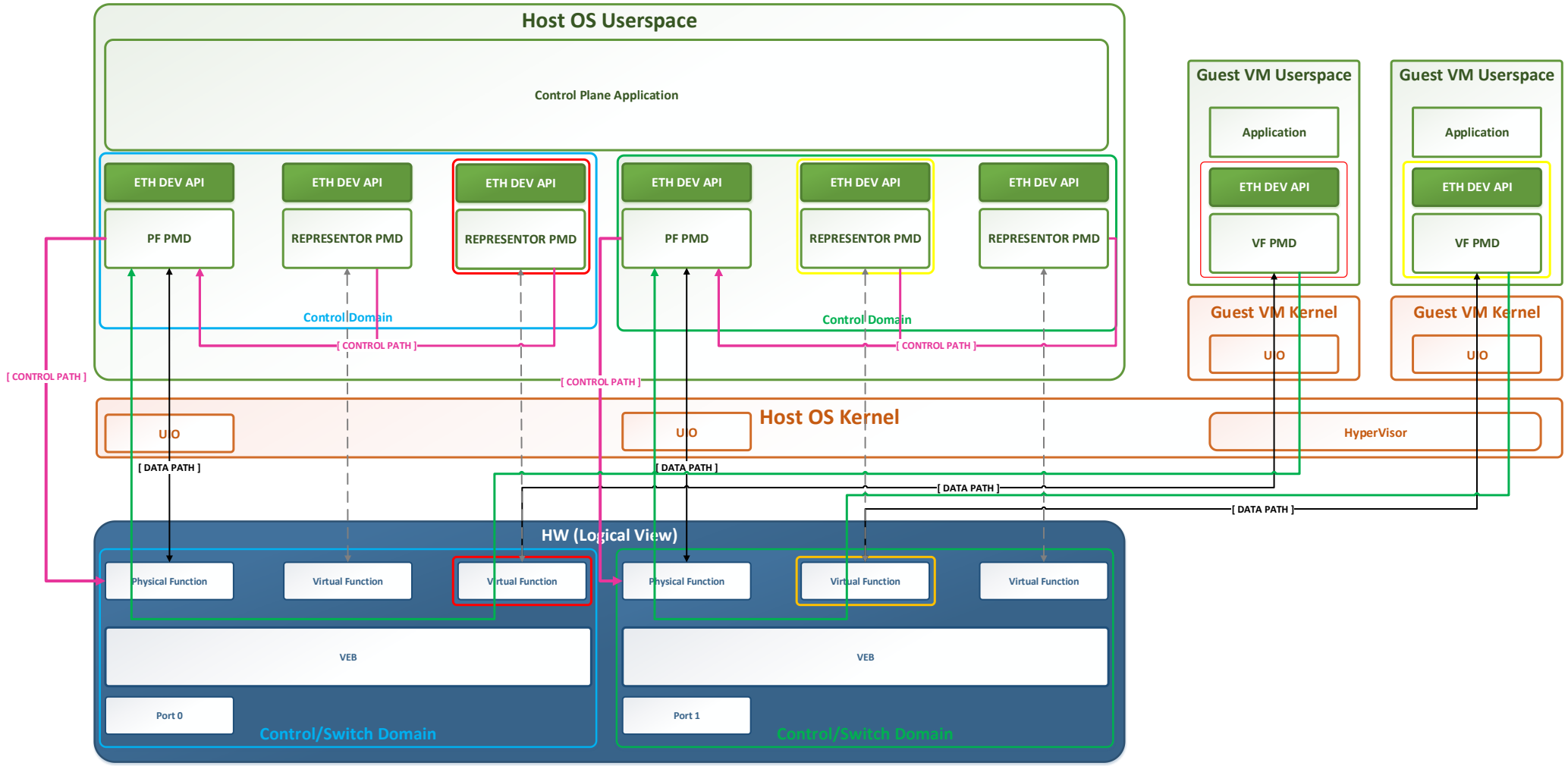
Port Representors for a NIC supporting SR-IOV



Port Representors for a NIC supporting SR-IOV

- Host Control Plane Application
  - Port Representor PMDs are created to represent each virtual function (VF) of the PF PMD.
  - Port Representor PMD control plane is through eth_dev_ops implemented by base driver (PF PMD).
  - Port properties configured through representor:
    - MAC, VLAN
    - Promiscuous Mode
    - Multicast/Broadcast
- Guest Application
  - Configuration of data path only:
    - Tx/Rx Queues
    - RSS/Flow Director
    - Offloads
- No data path supported for this use case.

Port Representors for a multi-port devices

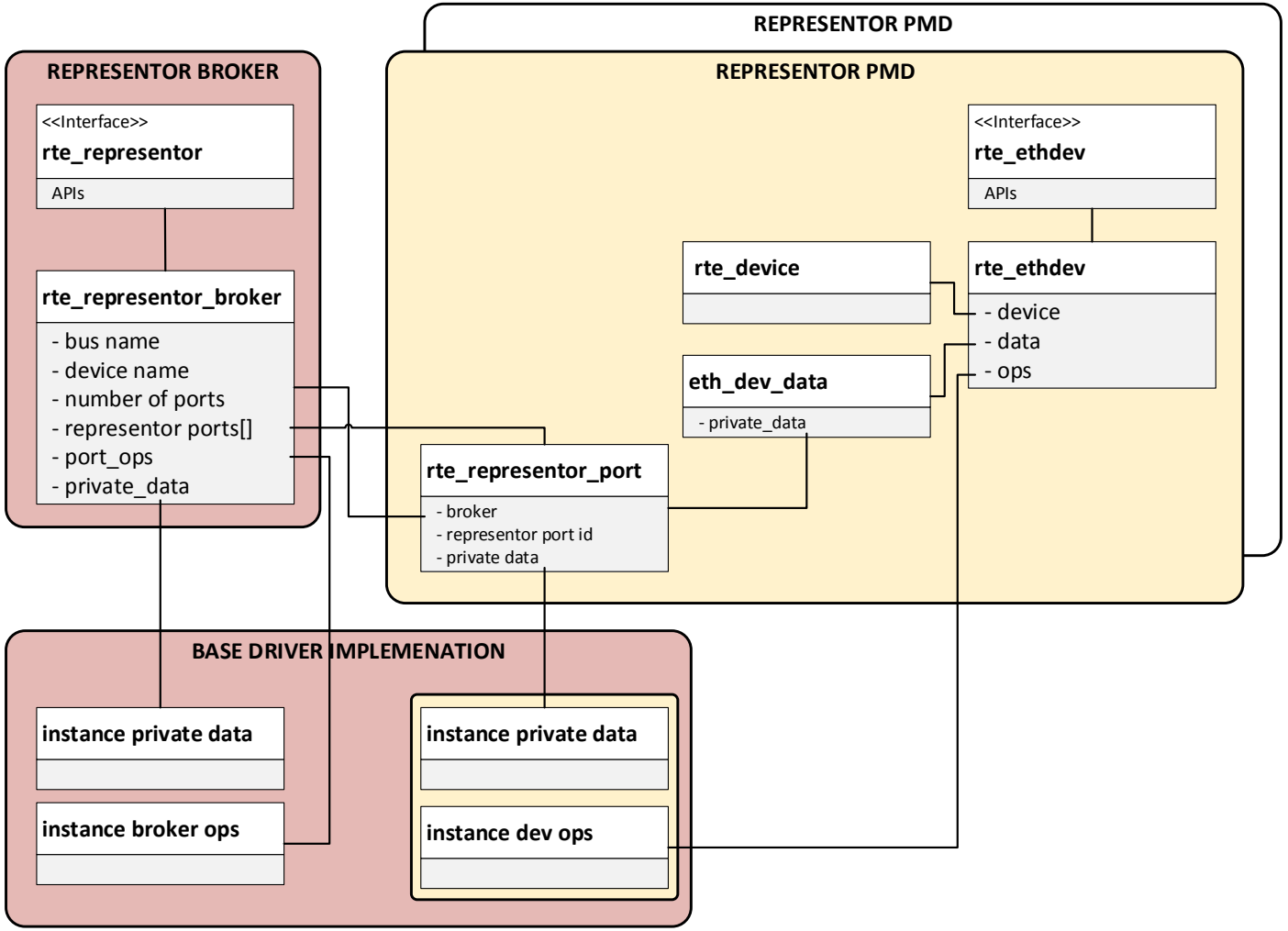


Port Representors for a multi-port devices

- Introduces the new concept of switch/control domain to ethdev's
  - Base driver defines the switch/control domain.
  - Each representor port inherits the domain from it's root device.
- If hardware supports advance port-to-port switching capabilities then switch domain can be use by application to know whether logical ports are in the same domain.

Library Implementation

Port Representor (Object Model)



Port Representor

- Representor PMD
  - Generic skeleton PMD with infrastructure for creation of representor port and registration with broker.
  - All configuration including capabilities and dev_ops functions configured by broker/ base driver.
  - No restrictions on port representor capabilities set by framework, all are controlled by the base driver.
- Representor Broker
  - Integrates into base driver (eg PF PMD)
  - Base driver is not required to be an ethdev.
  - Base driver configures number of representor ports supported and provides port configuration functions for representor port initialisation

Representor Broker APIs

- Register / Un-Register Broker in base driver
  - `int rte_representor_broker_register(struct rte_representor_broker *broker`
  - `int rte_representor_broker_unregister(struct rte_representor_broker *broker);`

```
struct rte_representor_broker {
    TAILQ_ENTRY(rte_representor_broker) next;

    const char *bus;
    const char *device;
    /**< Base Device Bus/Device Name */
    uint16_t nb_virtual_ports;
    struct rte_representor_port *virtual_ports;
    /**< Array of virtual(representor) ports */
    struct rte_representor_broker_port_ops *port_ops;
    /**< Port Initialisation Functions */
    void *private_data;
    /**< Base Driver private data */
};
```

```
struct rte_representor_broker_port_ops
{
    port_priv_data_set;
    port_priv_data_free;
    port_capabilities_set;
    port_ops_get;
};
```

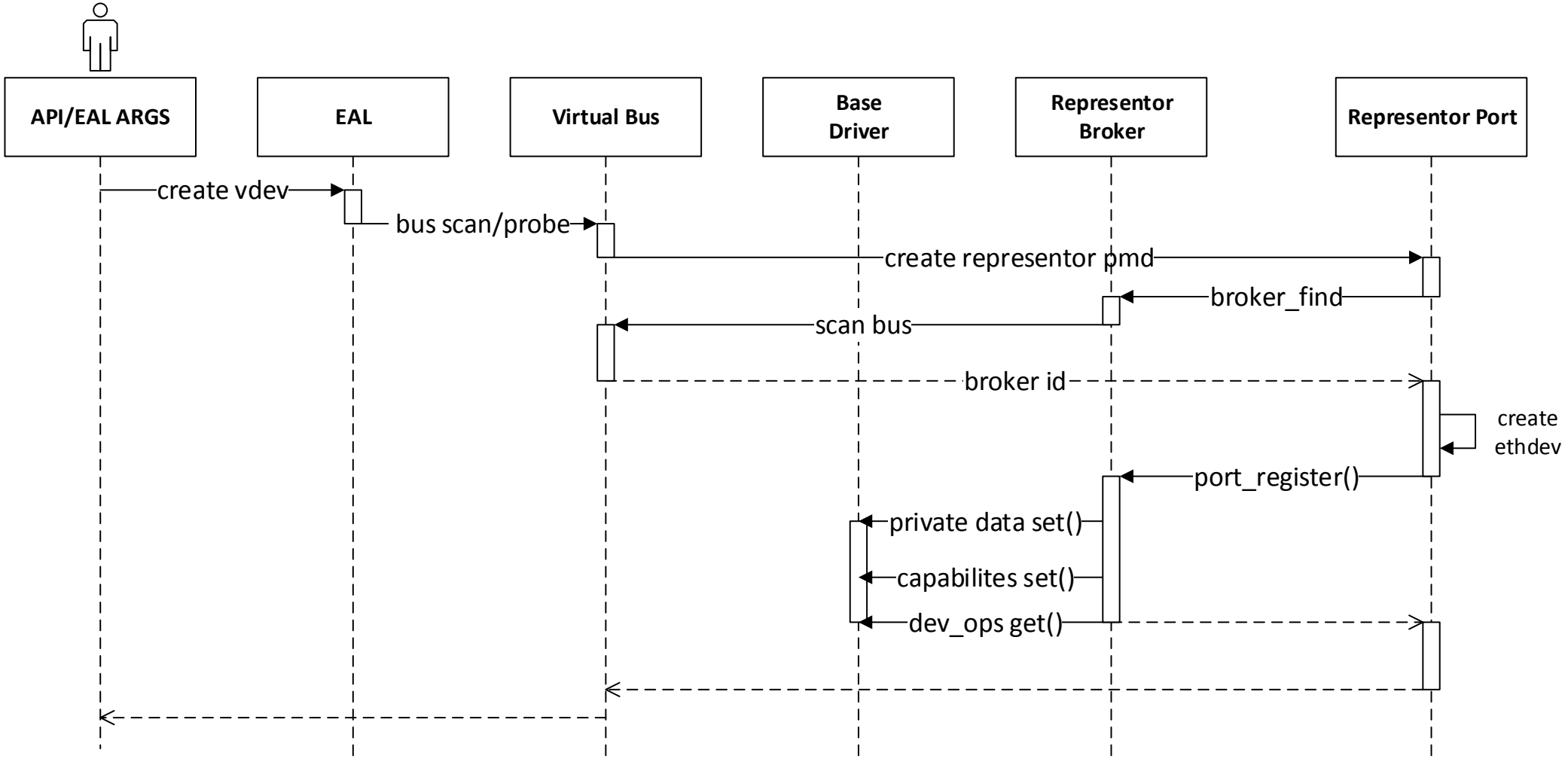
Representor Port APIs

- `struct rte_representor_broker *`
  `rte_representor_broker_find(const char *bus, const char *device);`

- `int rte_representor_port_register(struct rte_representor_broker *broker,`
  `uint32_t vport_id,`
  `struct rte_eth_dev *ethdev);`

- `Int rte_representor_port_unregister(struct rte_eth_dev *ethdev);`

Port Representor (Initialisation Sequence)



Example eth_dev_ops function


```
struct rte_representor_port {
    struct rte_representor_broker *broker;
    uint16_t id;
    struct rte_eth_dev *ethdev;
    enum {
        RTE_REPRESENTOR_PORT_INVALID,
        RTE_REPRESENTOR_PORT_VALID
    } state;
    void *priv_data;
};
```

```
struct i40e_representor_priv_data {
    struct rte_eth_dev *pf_ethdev;
};
```

```
static void
i40e_port_representor_dev_infos_get(struct rte_eth_dev *ethdev,
                struct rte_eth_dev_info *dev_info){

    struct rte_representor_port *port_rep = ethdev->data->dev_private;
    struct i40e_representor_priv_data *i40e_priv_data = port_rep->priv_data;

    /**< Function Implementation */
    …
};
```

Future Work

Possible Future Work

- Data path enablement (next talk!)
- Enable hot-plug support so representor ports get created automatically, as VF are created.
- Port-to-Port switching through rte_flow using logical port id's.
- Advance port capabilities management
  - Port representor could be used to define capabilities of the underlying port. e.g. make a VF untrusted so it can change it's MAC address etc.
  - Limit hardware resources port can use, e.g. number of flow director rules.
- Policy enforcement
  - stop VF over riding configuration applied in control plane application.
  - Would require hooks into base driver to catch configuration requests coming through hardware mailbox

Questions?

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