DSA switch configuration from userspace

The DSA switch configuration is not integrated into the main userspace network configuration suites by now and has to be performed manualy.

Configuration showcases

To configure a DSA switch a couple of commands need to be executed. In this documentation some common configuration scenarios are handled as showcases:

single port

Every switch port acts as a different configurable Ethernet port

bridge

Every switch port is part of one configurable Ethernet bridge

gateway

Every switch port except one upstream port is part of a configurable Ethernet bridge. The upstream port acts as different configurable Ethernet port.

All configurations are performed with tools from iproute2, which is available at https://www.kernel.org/pub/linux/utils/net/iproute2/

Through DSA every port of a switch is handled like a normal linux Ethernet interface. The CPU port is the switch port connected to an Ethernet MAC chip. The corresponding linux Ethernet interface is called the master interface. All other corresponding linux interfaces are called slave interfaces.

The slave interfaces depend on the master interface. They can only brought up, when the master interface is up.

In this documentation the following Ethernet interfaces are used:

eth0

the master interface

lan1

a slave interface

lan2

another slave interface

lan3

a third slave interface

wan

A slave interface dedicated for upstream traffic

Further Ethernet interfaces can be configured similar. The configured IPs and networks are:

single port

- lan1: 192.0.2.1/30 (192.0.2.0 - 192.0.2.3)
- lan2: 192.0.2.5/30 (192.0.2.4 - 192.0.2.7)
- lan3: 192.0.2.9/30 (192.0.2.8 - 192.0.2.11)

bridge

- br0: 192.0.2.129/25 (192.0.2.128 - 192.0.2.255)

gateway

- br0: 192.0.2.129/25 (192.0.2.128 - 192.0.2.255)
- wan: 192.0.2.1/30 (192.0.2.0 - 192.0.2.3)

Configuration with tagging support

The tagging based configuration is desired and supported by the majority of DSA switches. These switches are capable to tag incoming and outgoing traffic without using a VLAN based configuration.

single port

```
# configure each interface
ip addr add 192.0.2.1/30 dev lan1
ip addr add 192.0.2.5/30 dev lan2
ip addr add 192.0.2.9/30 dev lan3

# The master interface needs to be brought up before the slave ports.
ip link set eth0 up

# bring up the slave interfaces
ip link set lan1 up
ip link set lan2 up
ip link set lan3 up
```

bridge

```
# The master interface needs to be brought up before the slave ports.
ip link set eth0 up

# bring up the slave interfaces
ip link set lan1 up
ip link set lan2 up
ip link set lan3 up

# create bridge
ip link add name br0 type bridge

# add ports to bridge
ip link set dev lan1 master br0
ip link set dev lan2 master br0
ip link set dev lan3 master br0

# configure the bridge
ip addr add 192.0.2.129/25 dev br0

# bring up the bridge
ip link set dev br0 up
```

gateway

```
# The master interface needs to be brought up before the slave ports.
ip link set eth0 up

# bring up the slave interfaces
ip link set wan up
ip link set lan1 up
ip link set lan2 up

# configure the upstream port
ip addr add 192.0.2.1/30 dev wan

# create bridge
ip link add name br0 type bridge

# add ports to bridge
ip link set dev lan1 master br0
ip link set dev lan2 master br0

# configure the bridge
ip addr add 192.0.2.129/25 dev br0

# bring up the bridge
ip link set dev br0 up
```

Configuration without tagging support

A minority of switches are not capable to use a taging protocol (DSA_TAG_PROTO_NONE). These switches can be configured by a VLAN based configuration.

single port

The configuration can only be set up via VLAN tagging and bridge setup.

```
# tag traffic on CPU port
ip link add link eth0 name eth0.1 type vlan id 1
ip link add link eth0 name eth0.2 type vlan id 2
ip link add link eth0 name eth0.3 type vlan id 3

# The master interface needs to be brought up before the slave ports.
ip link set eth0 up
ip link set eth0.1 up
ip link set eth0.2 up
ip link set eth0.3 up

# bring up the slave interfaces
ip link set lan1 up
ip link set lan1 up
ip link set lan3 up

# create bridge
ip link add name br0 type bridge

# activate VLAN filtering
ip link set dev br0 type bridge vlan_filtering 1

# add ports to bridges
ip link set dev lan1 master br0
ip link set dev lan2 master br0
ip link set dev lan3 master br0

# tag traffic on ports
bridge vlan add dev lan1 vid 1 pvid untagged
bridge vlan add dev lan2 vid 2 pvid untagged
bridge vlan add dev lan3 vid 3 pvid untagged

# configure the VLANs
ip addr add 192.0.2.1/30 dev eth0.1
ip addr add 192.0.2.5/30 dev eth0.2
ip addr add 192.0.2.9/30 dev eth0.3

# bring up the bridge devices
ip link set br0 up
```

bridge

```
# tag traffic on CPU port
ip link add link eth0 name eth0.1 type vlan id 1

# The master interface needs to be brought up before the slave ports.
ip link set eth0 up
ip link set eth0.1 up

# bring up the slave interfaces
ip link set lan1 up
ip link set lan2 up
ip link set lan3 up

# create bridge
ip link add name br0 type bridge

# activate VLAN filtering
ip link set dev br0 type bridge vlan_filtering 1

# add ports to bridge
ip link set dev lan1 master br0
ip link set dev lan2 master br0
ip link set dev lan3 master br0
ip link set eth0.1 master br0

# tag traffic on ports
bridge vlan add dev lan1 vid 1 pvid untagged
bridge vlan add dev lan2 vid 1 pvid untagged
bridge vlan add dev lan3 vid 1 pvid untagged

# configure the bridge
ip addr add 192.0.2.129/25 dev br0

# bring up the bridge
ip link set dev br0 up
```

gateway

```
# tag traffic on CPU port
ip link add link eth0 name eth0.1 type vlan id 1
ip link add link eth0 name eth0.2 type vlan id 2

# The master interface needs to be brought up before the slave ports.
ip link set eth0 up
ip link set eth0.1 up
ip link set eth0.2 up

# bring up the slave interfaces
ip link set wan up
ip link set lan1 up
ip link set lan2 up

# create bridge
ip link add name br0 type bridge

# activate VLAN filtering
ip link set dev br0 type bridge vlan_filtering 1

# add ports to bridges
ip link set dev wan master br0
ip link set eth0.1 master br0
ip link set dev lan1 master br0
ip link set dev lan2 master br0

# tag traffic on ports
bridge vlan add dev lan1 vid 1 pvid untagged
bridge vlan add dev lan2 vid 1 pvid untagged
bridge vlan add dev wan vid 2 pvid untagged

# configure the VLANs
ip addr add 192.0.2.1/30 dev eth0.2
ip addr add 192.0.2.129/25 dev br0

# bring up the bridge devices
ip link set br0 up
```