dpctl

- dpctl: command-line utility that sends basic OpenFlow messages, useful for viewing switch port and flow stats, plus manually inserting flow entries.
- little tool for first steps and debugging
- talks directly to the switch (This does not need any controller or respect any Flowvisor restrictions!)
- so no infrastructure needed
- part of the reference controller
- switch must support it, listening port either configurable or 6633.

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dpctl Example Usage

- Create a SSH window if you don't already have one.
- Connect all team members via screen.
- Create wired connections from your host to your VLAN.
- Run:

- $ dpctl show tcp:10.101.1.1?:6633
  - The 'show' command connects to the switch and dumps out its port state and capabilities.

dpctl Example Usage

- dpctl show tcp:10.101.1.1?:6633
  - features_reply (xid=0x21355842): ver:0x1, dpid:a2c27d7772d80
  - n_tables:2, n_buffers:256
  - features: capabilities:0x87, actions:0x7ff
  - 23(23): addr:2c:27:d7:77:2d:a9, config: 0, state:0
  - current: 1GB-FD AUTO_NEG
  - supported: 10MB-HD 10MB-FD 100MB-HD 100MB-FD 1GB-FD AUTO_NEG
  - 24(24): addr:2c:27:d7:77:2d:a8, config: 0, state:0
  - current: 1GB-FD AUTO_NEG
  - supported: 10MB-HD 10MB-FD 100MB-HD 100MB-FD 1GB-FD AUTO_NEG
  - LOCAL(local): addr:2c:27:d7:77:2d:80, config: 0, state:0
  - get_config_reply (xid=0xec6a5f73): miss_send_len=0

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dpctl Example Usage

- Dpctl status shows us information about the switch
  - Mostly controller related
  - Whether on not connected
  - Connected since
  - Address of controller
  - Messages sent and received

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dpctl Example Usage

- $ dpctl status tcp:127.0.0.1:6634 (not on HP)
  - config.datapath-id=0000000000000001
  - switch.now=16068
  - switch.uptime=6825
  - switch.pid=6811
  - remote.name=tcp:127.0.0.1:6633
  - remote.state=BACKOFF
  - remote.backoff=8
  - remote.probe-interval=5

dpctl Example Usage

- $ dpctl status tcp:127.0.0.1:6634
  - remote.is-connected=false
  - remote.sent-msgs=0
  - remote.received-msgs=0
  - remote.attempted-connections=856
  - remote.successful-connections=0
  - remote.last-connection=6825
  - remote.last-received=6825
  - remote.time-connected=0
  - remote.state-elapsed=2

dpctl Example Usage

- Let us add some first flow entries so we can ping from h1 to h2
  - Test to ping Host 1 from Host 2 (should fail as we do not have any flow entries yet)
  - Add the flow entries (change port numbers):
    - $ dpctl add-flow tcp:10.101.1.1?:6633 in_port=1,actions=output:2
  - $ dpctl add-flow tcp:10.101.1.1?:6633 in_port=2,actions=output:1
- Ping should work now!

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dpctl Example Usage

- $ dpctl show-protostat tcp:10.101.1.1?:6633 (not on HP)
  - error_msg (xid=0xe02519b2): type1(OFPET_BAD_REQUEST) code3(OFPBRC_BAD_VENDOR) payload:
  - vendor (xid=0xe02519b2):
  - dpctl: bad reply

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Dpctl protostat example output

OpenFlow protocol version 0x97 statistical information
Protocol message:
Rcvd: 12642 total msgs, 0 unknown msgs
1 hello, 0 errors, 0 echo, 0 echo reply, 0 vendor
1 feats, 0 feats reply
0 get config, 0 get config reply, 1 set config
0 packet in, 0 flow expried, 0 port status
10799 packet out, 1829 flow mod, 0 port mod
11 stats, 0 stats reply
Sent: 13151 total msgs, 0 unknown msgs
1 hello, 3 errors, 0 echo, 0 echo reply, 0 vendor
0 feats, 1 feats reply
0 get config, 0 get config reply, 0 set config
11461 packet in, 1674 flow expried, 3 port status
0 packet out, 0 flow mod, 0 port mod
0 stats, 11 stats reply

Flow manipulation:
Rcvd: 1764 add, 0 modify, 0 modify strict
65 delete, 0 delete strict, 0 unknown ops
Sent: 0 add, 0 modify, 0 modify strict
0 delete, 0 delete strict, 0 unknown ops
Error notification:
Rcvd: 0 hello fail: 0 incompat
0 bad request: 0 version, 0 type, 0 stat
0 vendor
0 bad action: 0 type, 0 len, 0 vendor, 0 vendor type
0 out port, 0 argument
0 flow mod fail: 0 all tables full
0 unknown type, 0 unknown code
Sent: 0 hello fail: 0 incompat
0 bad request: 0 version, 0 type, 0 stat
0 vendor
3 bad action: 0 type, 0 len, 0 vendor, 0 vendor type
3 out port, 0 argument
0 flow mod fail: 0 all tables full
0 unknown type, 0 unknown code

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dpctl Example Usage

- $ dpctl dump-ports tcp:10.101.1.1?:6633
  - Gives physical port information
  - Rx, Tx counters
  - Error counters

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dpctl Example Usage

- $ dpctl dump-ports tcp:10.101.1.1?:6633
  - stats_reply (xid=0xb2eeb981): flags=none type=4(port)
  - 3 ports
  - port 23: rx pkts=2756, bytes=527428, drop=0, errs=0, frame=?, over=?, crc=?
  - tx pkts=2721, bytes=523911, drop=0, errs=0, coll=?
  - port 24: rx pkts=2733, bytes=525187, drop=0, errs=0, frame=?, over=?, crc=?
  - tx pkts=2727, bytes=525296, drop=0, errs=0, coll=?
  - port 65534: rx pkts=?, bytes=?, drop=?, errs=?, frame=?, over=?, crc=?
  - tx pkts=?, bytes=?, drop=?, errs=?, coll=?

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dpctl Example Usage

- dpctl mod-ports tcp:10.101.1.1?:6633
- Allows manipulation of the switch ports
  - Possible commands are:
    - Up
    - Down
    - Flood
    - Noflood

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dpctl Example Usage

- $ dpctl mod-ports tcp:10.101.1.1?:6633 2 down
  - Ping should fail now
- $ dpctl mod-ports tcp:10.101.1.1?:6633 2 up
  - Ping works again
- Possible commands are up/down/flood/ noflood

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dpctl Example Usage

- $ dpctl dump-flows tcp:10.101.1.1?:6633
  - Gives us information about the flows installed
  - Rule itself
  - Timeouts
  - Actions
  - Packets and bytes processed by flow

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dpctl Example Usage

- $ dpctl dump-flows tcp:10.101.1.1?:6633
  - stats_reply (xid=0x63b24b68): flags=none type=1(flow)
  - cookie=0, duration_sec=460s, duration_nsec=129000000s, table_id=1, priority=32768, n_packets=456, n_bytes=43680, idle_timeout=60,hard_timeout=0,in_port=3,actions=output:2
  - cookie=0, duration_sec=464s, duration_nsec=401000000s, table_id=1, priority=32768, n_packets=456, n_bytes=43680, idle_timeout=60,hard_timeout=0,in_port=2,actions=output:3

dpctl Example Usage

- Lets change the flow to work on IP's
- dpctl add-flow tcp:10.101.1.1?:6633 ip,nw_dst=10.0.0.2,priority=33000,actions=output:2
- dpctl add-flow tcp:10.101.1.1?:6633 ip,nw_dst=10.0.0.3,priority=33000,actions=output:3
- **Priority changed!**

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dpctl Example Usage

Flow fields and syntax:

- in_port=port_no
- dl_vlan=vlan
- dl_src=mac
- dl_dst=mac
- dl_type=ethertype
- nw_src=ip[/netmask]
- nw_dst=ip[/netmask]
- nw_proto=proto

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dpctl Example Usage

Flow fields and syntax:

nw_tos=tos/dscp
tp_dst=port
icmp_type=type
icmp_code=code

The following shorthand notations are also available:

- ip Same as dl_type=0x0800
- icmp Same as dl_type=0x0800,nw_proto=1
- tcp Same as dl_type=0x0800,nw_proto=6
- udp Same as dl_type=0x0800,nw_proto=17
- arp Same as dl_type=0x0806

dpctl Example Usage

– What could be done with static flow rules?

- Using nw_src – Load balancing flows from different sources to webservers
- Using dl_src – sort wireless from wired clients by looking for mac-address prefixes coming from wireless vendors
- Using In_port + Out_port – create basic virtual circuits between end points

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dpctl Example Usage

- dpctl benchmark tcp:10.101.1.1?:6633 100 100
  - Sending 100 packets * 108 bytes (with header) = 10800 bytes total
  - Finished in 9.7 ms (10349 packets/s) (1117665 bytes/s)
- dpctl benchmark tcp:10.101.1.1?:6633 1000 1000
  - Sending 1000 packets * 1008 bytes (with header) = 1008000 bytes total
  - Finished in 94.4 ms (10594 packets/s) (10678984 bytes/s)

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Dpctl command list

For local datapaths and remote switches:

• show SWITCH	show basic information
• status SWITCH [KEY]	report statistics (about KEY)
• show-protostat SWITCH	report protocol statistics
• dump-desc SWITCH	print switch description
• dump-tables SWITCH	print table stats
• mod-port SWITCH IFACE ACT	modify port behavior
• dump-ports SWITCH [PORT]	print port statistics
• desc SWITCH STRING	set switch description
• dump-flows SWITCH	print all flow entries
• dump-flows SWITCH FLOW	print matching FLOWs
• dump-aggregate SWITCH	print aggregate flow statistics
• dump-aggregate SWITCH FLOW	print aggregate stats for FLOWs
• add-flow SWITCH FLOW	add flow described by FLOW
• add-flows SWITCH FILE	add flows from FILE
• mod-flows SWITCH FLOW	modify actions of matching FLOWs
• del-flows SWITCH [FLOW]	delete matching FLOWs
• monitor SWITCH	print packets received from SWITCH
• execute SWITCH CMD [ARG...]	execute CMD with ARGS on SWITCH

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