

```

/*
 * Protocol Header Format
 *
 *      0              1              2              3
 *      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 *      +-----+-----+-----+-----+-----+-----+-----+-----+
 *      |   Version   |   Type   |   Message Length   |
 *      +-----+-----+-----+-----+-----+-----+-----+
 *      |                                     Transaction ID                                     |
 *      +-----+-----+-----+-----+-----+-----+-----+
 *
 * Version
 *   Indicates version of OpenFlow protocol.
 *
 * Type
 *   Indicates type of OpenFlow protocol message.
 *   0 Hello
 *   1 Error
 *   2 Echo Request
 *   3 Echo Reply
 *   4 Vendor
 *   5 Features Request
 *   6 Features Reply
 *   7 Get Config Request
 *   8 Get Config Reply
 *   9 Set Config
 *  10 Packet Input Notification
 *  11 Flow Removed Notification
 *  12 Port Status Notification
 *  13 Packet Output
 *  14 Flow Modification
 *  15 Port Modification
 *  16 Stats Request
 *  17 Stats Reply
 *  18 Barrier Request
 *  19 Barrier Reply
 *
 * Message Length
 *   Length of total message (header + payloads), in octets.
 *
 * Transaction ID
 *   Transaction ID used to control transaction of packets and matching
 *   of requests and responses. Transaction ID associated with this
packet.
 *   Reply messages use the same ID as was in the request to facilitate
 *   pairing.

```

```

*/
/*
* Protocol Payload Format - Hello
*
*   0                               1                               2                               3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+-----+-----+-----+-----+-----+
*   | <Arbitrary Data> ...
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*
* Arbitrary Data
*   TBD (but must be ignored by receiver)
*/

/*
* Protocol Payload Format - Error
*
*   0                               1                               2                               3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+-----+-----+-----+-----+-----+
*   |           Type           |           Code           |
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   | <Data> ...
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*
* Type
*   TBD
*   0 Hello protocol failed.
*   1 Request was not understood.
*   2 Error in action description.
*   3 Problem modifying flow entry.
*
* Code
*   TBD
*   Type 0: 0 No compatible version.
*   Type 0: 1 Permissions error.
*   Type 1: 0 ofp_header.version not supported.
*   Type 1: 1 ofp_header.type not supported.
*   Type 1: 2 ofp_stats_request.type not supported.
*   Type 1: 3 Vendor not supported.
*   Type 1: 4 Vendor subtype not supported.
*   Type 1: 5 Permissions error.
*   Type 2: 0 Unknown action type.
*   Type 2: 1 Length problem in actions.
*   Type 2: 2 Unknown vendor id specified.

```

```

*   Type 2: 3   Unknown action type for vendor ID.
*   Type 2: 4   Problem validating output action.
*   Type 2: 5   Bad action argument.
*   Type 2: 6   Permissions error.
*   Type 3: 0   Flow not added because of full tables.
*   Type 3: 1   Attempted to add overlapping flow with CHECK_OVERLAP flag
set.
*   Type 3: 2   Permissions error.
*   Type 3: 3   Flow not added because of non-zero idle/hard.
*
* Data
*   Interpreted based on the type and code.
*/

```

```

/*
* Protocol Payload Format - Echo Request
*                               Echo Reply
*
*   0                               1                               2                               3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   | <Arbitrary Data> ...
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*
* Arbitrary Data
*   TBD (but must be replied to sender)
*/

```

```

/*
* Protocol Payload Format - Vendor
*
*   0                               1                               2                               3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   |                               Vendor ID                               |
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   | <Vendor Defined Arbitrary Data> ...
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*
* Vendor ID
*   TBD
*
* Vendor Defined Arbitrary Data
*   TBD
*/

```

```

/*
 * Protocol Payload Format - Features Request
 *
 *      0                1                2                3
 *      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 *      +-----+-----+-----+-----+-----+-----+-----+-----+
 *      |
 *      +-----+
 *
 * There is no payload for Features Request
 */

```

```

/*
 * Protocol Payload Format - Features Reply
 *
 *      0                1                2                3
 *      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 *      +-----+-----+-----+-----+-----+-----+-----+-----+
 *      |                                                                 |
 *      +                               Datapath ID                       +
 *      |                                                                 |
 *      +-----+-----+-----+-----+-----+-----+-----+-----+
 *      |                               Available Number of Packets Can Be Held                               |
 *      +-----+-----+-----+-----+-----+-----+-----+-----+
 *      | # of FlowTabs |                               Reserved                               |
 *      +-----+-----+-----+-----+-----+-----+-----+-----+
 *      |                               <Switch Capability Flags>                               |
 *      +-----+-----+-----+-----+-----+-----+-----+-----+
 *      |                               Action Capability Flags                               |
 *      +-----+-----+-----+-----+-----+-----+-----+-----+
 *      | <Port Descriptors> ...
 *      +-----+-----+-----+-----+-----+
 *
 * Datapath ID
 *      TBD
 *
 * Available Number of Packets Can Be Held
 *      TBD
 *
 * Number of Flow Tables
 *      TBD
 *      0 - 255      Normal
 *
 * Reserved
 *      Must be zero.
 *
 */

```

```
* Switch Capability Flags
*   See Payload Element <Switch Capability Flags>
```

```
* Action Capability Flags
*   TBD
*   0x00000001 Output to switch port
*   0x00000002 Set 802.1Q VID
*   0x00000004 Set 802.1Q PCP
*   0x00000008 Strip 802.1Q tag
*   0x00000010 Set Ethernet source address
*   0x00000020 Set Ethernet destination address
*   0x00000040 Set IPv4 source address
*   0x00000080 Set IPv4 destination address
*   0x00000100 Set IPv4 DSCP
*   0x00000200 Set TCP/UDP source port
*   0x00000400 Set TCP/UDP destination port
```

```
* Port Descriptors
*   See Payload Element <Port Descriptor>
*/
```

```
/*
* Protocol Payload Format - Get Config Request
*
*   0           1           2           3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   |
*   +-----+
*
* There is no payload for Get Config Request
*/
```

```
/*
* Protocol Payload Format - Get Config Reply
*                               Set Config
*
*   0           1           2           3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   | <Switch Configuration Flags> |           Miss Send Length           |
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*
* Switch Configuration Flags
*   See Payload Element <Switch Configuration Flags>
*
```

```

* Miss Send Length
*   Indicates maximum octets of new flow should send to the controller.
*   Default value is 128.
*/

```

```

/*
* Protocol Payload Format - Packet Input Notification
*
*   0           1           2           3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   |                                     Packet Buffer ID                                     |
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   |   Ethernet Frame Length   |   Ingresss <Port Number>   |
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   |   Reason   |   Reserved   |                                     |
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   |                                     Ethernet Frame                                     |
*   |                                     ~                                     |
*   |                                     |                                     |
*

```

```

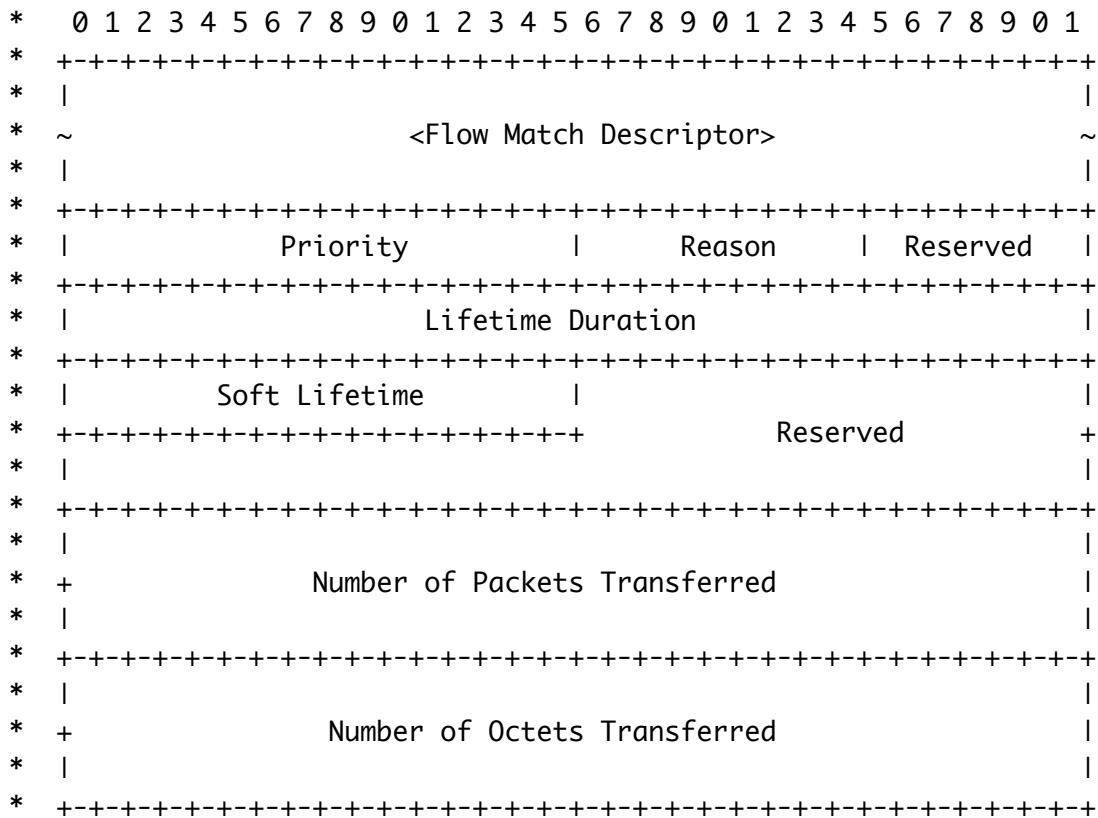
* Packet Buffer ID
*   TBD
*
* Ethernet Frame Length
*   TBD
*
* Ingress Port Number
*   See Payload Element <Port Number>
*
* Reason
*   TBD
*   0 No matching flow.
*   1 Action explicitly output to controller.
*
* Reserved
*   Must be zero.
*
* Ethernet Frame
*   TBD
*/

```

```

/*
* Protocol Payload Format - Flow Removed Notification
*
*   0           1           2           3

```



* Flow Match Descriptor
 * See Payload Element <Flow Match Descriptor>

* Priority
 * TBD
 * Default value is 32768.

* Reason
 * TBD
 * 0 Flow idle time exceeded soft lifetime.
 * 1 Time exceeded hard lifetime.
 * 2 Evicted by a DELETE flow mod.

* Reserved
 * Must be zero.

* Lifetime Duration
 * TBD

* Soft Lifetime
 * TBD

* Reserved

```

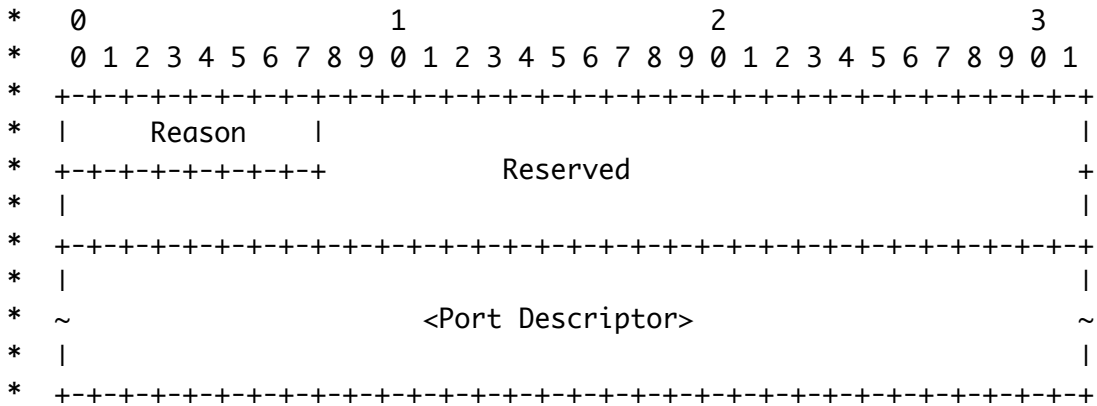
*   Must be zero.
*
*   Number of Packets Transferred
*   TBD
*
*   Number of Octets Transferred
*   TBD
*/

```

```

/*
*   Protocol Payload Format - Port Status Notification
*

```



```

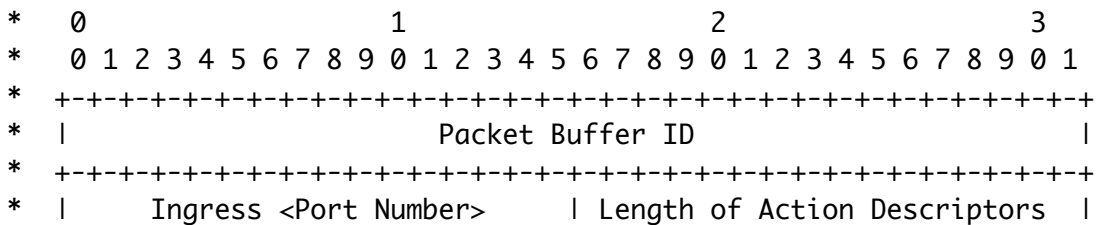
*   Reason
*   TBD
*   0 Indicates the port was attached.
*   1 Indicates the port was detached.
*   2 Indicates the port configuration was modified.
*
*   Reserved
*   Must be zero.
*
*   Port Descriptor
*   See Payload Element <Port Descriptor>
*/

```

```

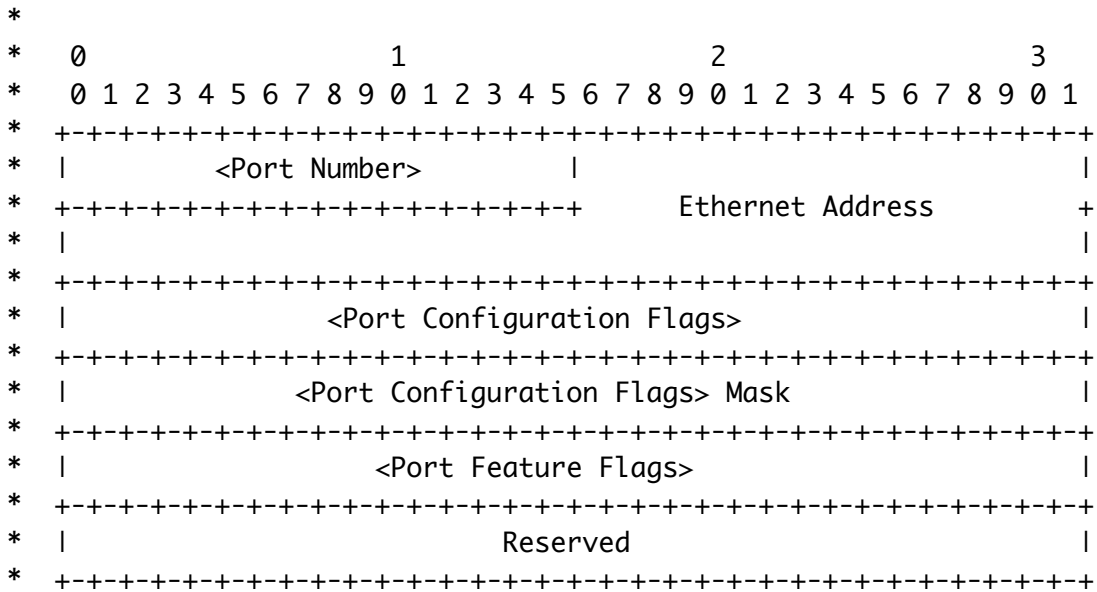
/*
*   Protocol Payload Format - Packet Output
*

```




```
*   See Payload Element <Flow Match Descriptor>
*
* Command
*   TBD
*   0 Add new flow.
*   1 Modify all matching flows.
*   2 Modify entry strictly matching wildcard flows.
*   3 Delete all matching flows.
*   4 Delete Strictly match wildcards and priority.
*
* Soft Lifetime
*   TBD
*
* Hard Lifetime
*   TBD
*
* Priority
*   TBD
*   Default value is 32768.
*
* Packet Buffer ID
*   TBD
*
* Egress Port Number
*   See Payload Element <Port Number>.
*
* CU (currently unused)
*   Must be zero.
*
* E
*   Remark this is for emergency.
*
* O
*   Check for overlapping entries first.
*
* R
*   Send flow removed message when flow expires or is deleted.
*
* Reserved
*   Must be zero.
*
* Action Descriptors
*   See Payload Element <Action Descriptor>
*/
/*
```

* Protocol Payload Format - Port Modification



* Port Number
 * See Payload Element <Port Number>.

* Ethernet Address
 * TBD

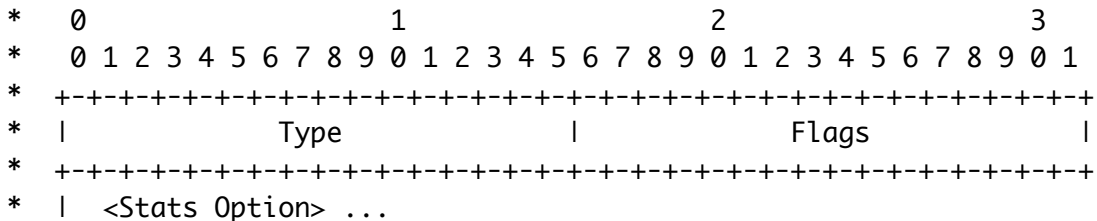
* Port Configuration Flags
 * See Payload Element <Port Configuration Flags>.

* Port Configuration Flags Mask
 * See Payload Element <Port Configuration Flags>.

* Port Feature Flags
 * See Payload Element <Port Feature Flags>.

* Reserved
 * Must be zero.

/*
 * Protocol Payload Format - Stats Request



```

* +-----+
*
* Type
*   TBD
*   0 Description of this OpenFlow switch.
*   1 Individual flow statistical information.
*   2 Aggregate flow statistical information.
*   3 Flow table statistical information.
*   4 Port statistical information.
* 65535 Vendor extension.
*
* Flags
*   TBD
*   Must be zero.
*
* Option
*   TBD
*   See Payload <Stats Option>.
*
* Possible Option
*   <Flow Stats Request>
*   <Aggregate Flow Stats Request>
*/

/*
* Protocol Payload Format - Stats Reply
*
*   0           1           2           3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+
*   |           Type           |           Flags           |
*   +-----+-----+-----+-----+
*   | <Stats Option> ...
*   +-----+
*
* Type
*   TBD
*   0 Description of this OpenFlow switch.
*   1 Individual flow statistical information.
*   2 Aggregate flow statistical information.
*   3 Flow table statistical information.
*   4 Port statistical information.
* 65535 Vendor extension.
*
* Flags
*   TBD

```

* 0x0001 More replies to follow.

*

* Option

* TBD

* See Payload <Stats Option>.

*

* Possible Option

* <Description of Switch>

* <Individual Flow Stats>

* <Aggregate Flow Stats>

* <Table Stats>

* <Port Stats>

*/

/*

* Protocol Payload Format - Barrier Request

* Barrier Reply

*

* 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 3

* 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

* +-----+

* |

* +-----+

*

* There is no payload for Barrier Request and Barrier Reply

*/

/*

* Protocol Payload Element Format - Switch Configuration Flags

*

* 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 3

* 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

* +-----+

* | CU IRIDI

* +-----+

*

* CU (currently unused)

* Must be zero.

*

* R

* Reassemble IPv4 fragment packets only if OFPC_IP_REASM set.

*

* D

* Drop IPv4 fragemnt packets.

*/


```

/*
 * Protocol Payload Element Format - Port Number
 *
 *      0                1                2                3
 *      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 *      +-----+-----+-----+-----+
 *      |                Port Number                |
 *      +-----+-----+-----+-----+
 *
 * Port Prefix  0x00 - 0xfe  Indicates switch ports
 *               0xff      Indicates output action ports
 *
 * Range          M/O  Description
 *
 *-----
 * 0x0000          M   Reserved
 * 0x0001 - 0xfeff M   Switch ports
 * 0xff00          M   Reserved, Maximum number of switch ports
 * 0xff01 - 0xffff M   Reserved
 * 0xffff8        M   IN_PORT, Send the packet out the ingress port.
 * 0xffff9        M   TABLE, Perform actions in flow table, only for
 *                   PACKET_OUT message.
 * 0xffffa        O   NORMAL, Process the packet using the traditional
 *                   L2/L3 switching.
 * 0xffffb        O   FLOOD, Flood the packet except ingress port.
 * 0xffffc        M   ALL, Send the packet out all ports except ingress
 *                   and non-xSTP ports.
 * 0xffffd        M   CONTROLLER, Send the packet to the controller.
 * 0xffffe        M   LOCAL, Send the packet to switch local port such
 *                   as bridge/switch virtual interface.
 * 0xfffff        M   NONE, TBD
 */

```

```

/*
 * Protocol Payload Element Format - Port Configuration Flags
 *
 *      0                1                2                3
 *      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 *      +-----+-----+-----+-----+
 *      |                CU                IPIFIFIDIDISIAI
 *      |                CU                I IWILICIDITISI
 *      |                INIDIDIPIPIITI
 *      +-----+-----+-----+-----+
 *
 * CU (currently unused)
 * Must be zero.

```

```

*
* PIN
*   TBD
*   Indicates please o not send packet-in msgs for port.
*
* FWD
*   TBD
*   Indicates forwarded packets to port will be dropped.
*
* FLD
*   TBD
*   Inidcates please do not include this port when flooding.
*
* DCP
*   TBD
*   Indicates received 802.1D STP packets (BPDU) will be dropped.
*
* DDP
*   TBD
*   Indicates all packets will be dropped except 802.1D spanning tree
*   packets.
*
* STP
*   TBD
*   Indicates IEEE 802.1D spanning tree status will be disabled.
*
* AST
*   TBD
*   Indicates port administratevely status.
*/

```

```

/*
* Protocol Payload Element Format - Port Status Flags
*
*   0           1           2           3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*   +-----+-----+-----+-----+-----+-----+-----+-----+
*   |                                     ISISISI                               |OI
*   |                                     IBIFILI                               CU   |SI
*   |                                     ILIWINI                               |TI
*   +-----+-----+-----+-----+-----+-----+-----+-----+

```

```

* CU (currently unseud)
*   Must be zero.
*

```

```

* SBL

```

```

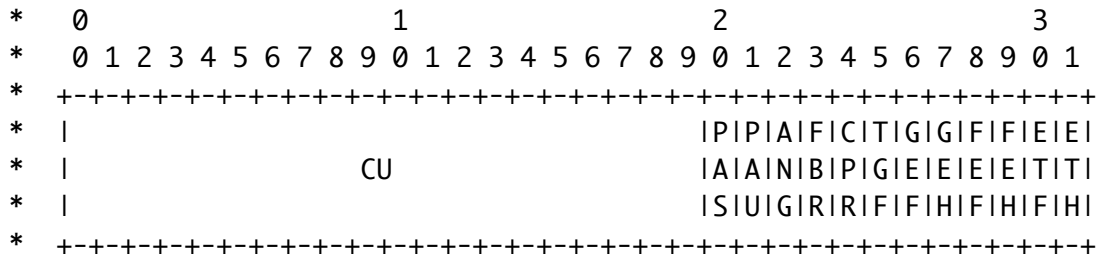
*   TBD
*   Not part of spanning tree.
*
*   SFW
*   TBD
*   Learning and relaying frames.
*
*   SLN
*   TBD
*   Learning but not relaying frames.
*
*   CU (currently unseud)
*   Must be zero.
*
*   OST
*   Indicates operational status.
*/

```

```

/*
* Protocol Payload Element Format - Port Feature Flags
*

```



```

*   CU (currently unseud)
*   Must be zero.
*

```

```

*   PAS
*   TBD
*   Asymmetric pause.
*

```

```

*   PAU
*   TBD
*   Pause.
*

```

```

*   ANG
*   TBD
*   Auto-negotiation.
*

```

```

*   FBR
*   TBD

```

```

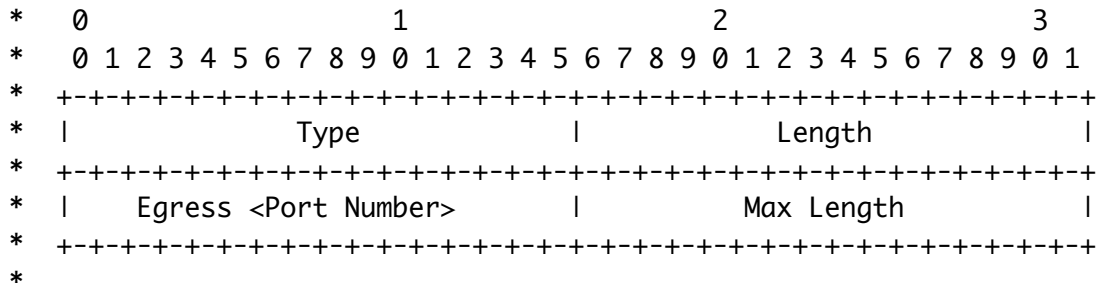
*   Fiber medium.
*
*   CPR
*   TBD
*   Copper medium.
*
*   TGF
*   TBD
*   10Gbps full-duplex rate support.
*
*   GEF
*   TBD
*   1Gbps full-duplex rate support.
*
*   GEH
*   TBD
*   1Gbps half-duplex rate support.
*
*   FEF
*   TBD
*   100Mbps full-duplex rate support.
*
*   FEH
*   TBD
*   100Mbps half-duplex rate support.
*
*   ETF
*   TBD
*   10Mbps full-duplex rate support.
*
*   ETH
*   TBD
*   10Mbps half-duplex rate support.
*/

```

```

/*
* Protocol Payload Element Format - Output Action Descriptor
*

```



```

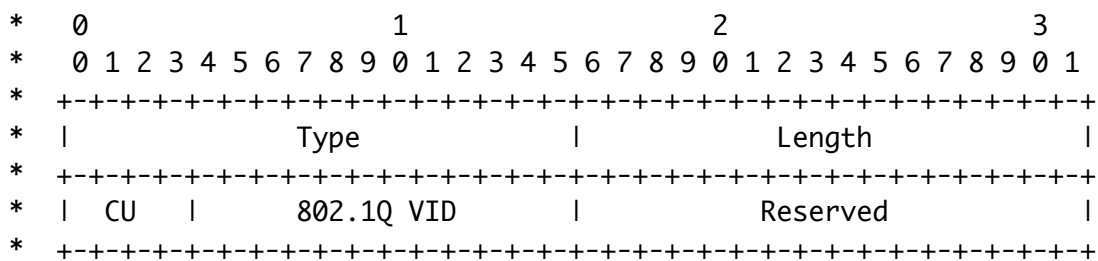
* Type
*   0
*
* Length
*   8
*
* Egress Port Number
*   TBD
*   See Payload Element <Port Number>
*
* Max Length
*   Indicates maximum octets of new flow should send to the controller.
*   Default value is 128.
*/

```

```

/*
* Protocol Payload Element Format - VLAN VID Action Descriptor
*

```



```

* Type
*   1
*
* Length
*   8
*
* CU (currently unused)
*   Must be zero.
*
* 802.1Q VID
*   IEEE 802.1Q VLAN Identifier.
*
* Reserved
*   Must be zero.
*/

```

```

/*
* Protocol Payload Element Format - VLAN PCP Action Descriptor
*

```



```

* 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
* +-----+-----+-----+-----+-----+-----+-----+-----+
* |                               |                               |
* |                               Type                               |
* |                               |                               |
* |                               Length                           |
* |                               |                               |
* | CU   | PCP |                               Reserved           |
* |-----+-----+-----+-----+-----+-----+-----+-----+
*
* Type
*   2
*
* Length
*   8
*
* CU (currently unused)
*   Must be zero.
*
* PCP
*   IEEE 802.1Q PCP (Priority Code Point).
*
* Reserved
*   Must be zero.
*/

```

```

/*
* Protocol Payload Element Format - Strip VLAN tag Action Descriptor

```

```

* 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
* 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
* +-----+-----+-----+-----+-----+-----+-----+-----+
* |                               |                               |
* |                               Type                               |
* |                               |                               |
* |                               Length                           |
* |                               |                               |
* |                               Reserved                           |
* |-----+-----+-----+-----+-----+-----+-----+-----+
*
* Type
*   3
*
* Length
*   8
*
* Reserved
*   Must be zero.
*/

```

```

/*
* Protocol Payload Element Format - Ethernet Address Action Descriptor

```



```

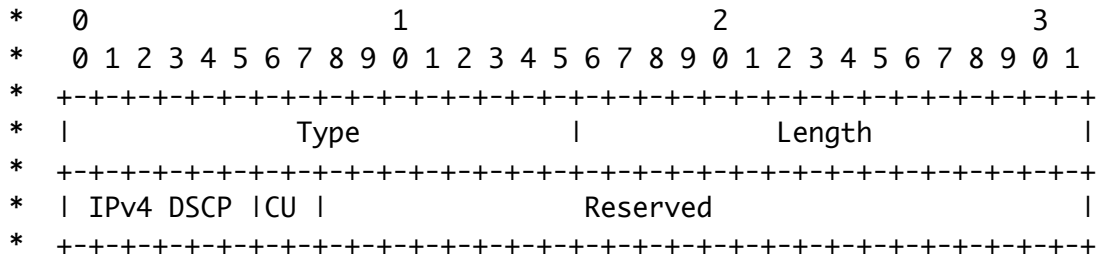
*
* IPv4 Address
*   TBD
*/

```

```

/*
* Protocol Payload Element - IPv4 DSCP Action Descriptor
*

```



```

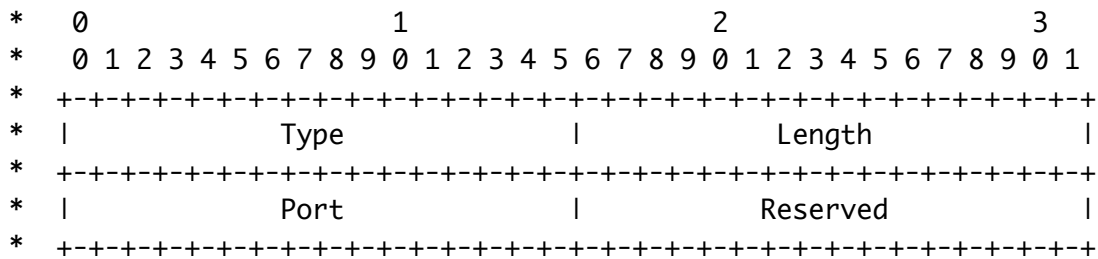
*
* Type
*   8
*
* Length
*   8
*
* IPv4 DSCP (DiffServ Code Point)
*   TBD
*
* CU (currently unused)
*   Must be zero.
*
* <IPv4 ToS = IPv4 DSCP + CU>
*
* Reserved
*   Must be zero.
*/

```

```

/*
* Protocol Payload Element - TCP/UDP Port Action Descriptor
*

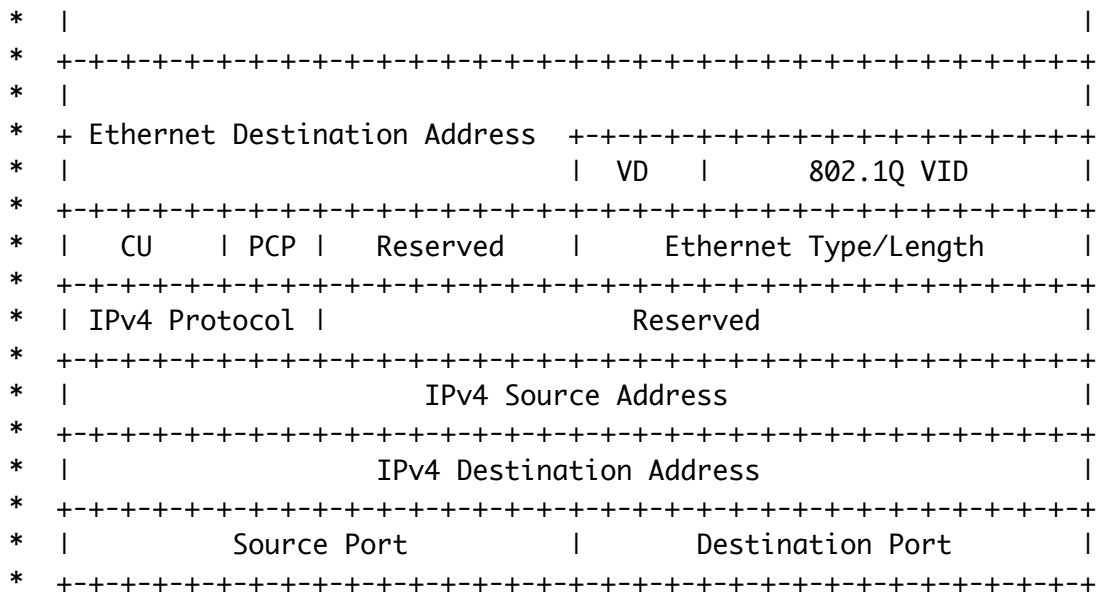
```



```

* Type

```

* Flow Wildcard
 * See Protocol Payload Element <Flow Wildcard>

* Ingress Port Number
 * See Protocol Payload Element <Port Number>

* Ethernet Source Address
 * TBD

* Ethernet Destination Address
 * TBD

* VD (VLAN Designator)
 * 0x0 (0000) Indicates IEEE 802.1Q tag exists.
 * 0xf (1111) Indicates no IEEE 802.1Q tag exists.

* 802.1Q VID
 * IEEE 802.1Q VLAN Identifier.

* <VD + 802.1Q VID>
 * 0x0000 - 0x0fff Indicates IEEE 802.1Q tag exists.
 * 0xffff Indicates no IEEE 802.1Q tag exists.

* CU (currently unused)
 * TBD

* 802.1Q PCP
 * IEEE 802.1Q PCP (Priority Code Point).

```

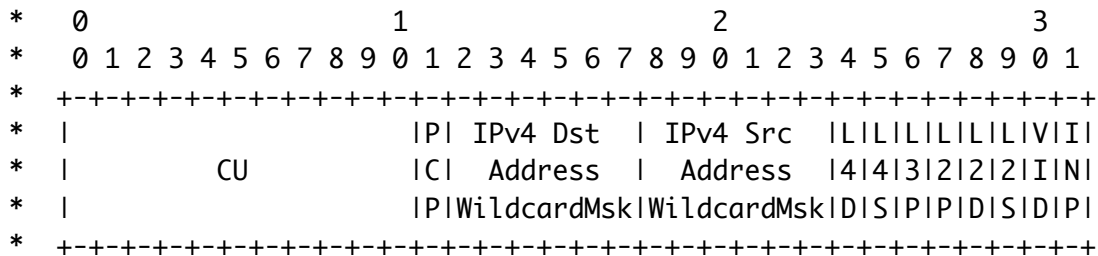
* Reserved
*   Must be zero.
*
* Ethernet Type/Length
*   TBD
*
* IPv4 Protocol
*   TBD
*
* Reserved
*   Must be zero.
*
* IPv4 Source Address
*   TBD
*
* IPv4 Destination Address
*   TBD
*
* TCP/UDP Source Port
*   TBD
*
* TCP/UDP Destination Port
*   TBD
*/

```

```

/*
* Protocol Payload Element Format - Flow Wildcard
*

```



```

* CU (currently unused)
*   Must be zero.
*

```

```

* PCP
*   TBD
*   IEEE 802.1Q PCP.
*

```

```

* IPv4 Destination Address Wildcard Mask
*   TBD
*   IPv4 destination address wildcard bit count. 0 is exact match,

```

* 1 ignores the LSB of IPv4 address, 2 ignores the 2 least-significant
 * bits, ..., 32 and higher wildcard the entire field. This is the
 * *opposite* of the usual convention where e.g. /24 indicates that 8

bits

* (not 24 bits) are wildcarded.

* e.g.,

* Wildcard	* Mask	* Address/PfxLen
* 0	* 255.255.255.255	* a.b.c.d/32 (exact match)
* 1	* 255.255.255.254	* a.b.c.d/31
* 2	* 255.255.255.252	* a.b.c.d/30
* 3	* 255.255.255.248	* a.b.c.d/29
* 4	* 255.255.255.240	* a.b.c.d/28
* :		
* 8	* 255.255.255.0	* a.b.c.d/24
* :		
* 28	* 240.0.0.0	* a.b.c.d/4
* 29	* 224.0.0.0	* a.b.c.d/3
* 30	* 192.0.0.0	* a.b.c.d/2
* 31	* 128.0.0.0	* a.b.c.d/1
* 32 - 63	* 0.0.0.0	* a.b.c.d/0

* IPv4 Source Address Wildcard Mask

* TBD

* L4D

* TBD

* TCP/UDP destination port.

* L4S

* TBD

* TCP/UDP source port.

* L3P

* TBD

* IPv4 protocol.

* L2P

* TBD

* Ethernet frame type.

* L2D

* TBD

* Ethernet destination address.

* L2S

* TBD

```

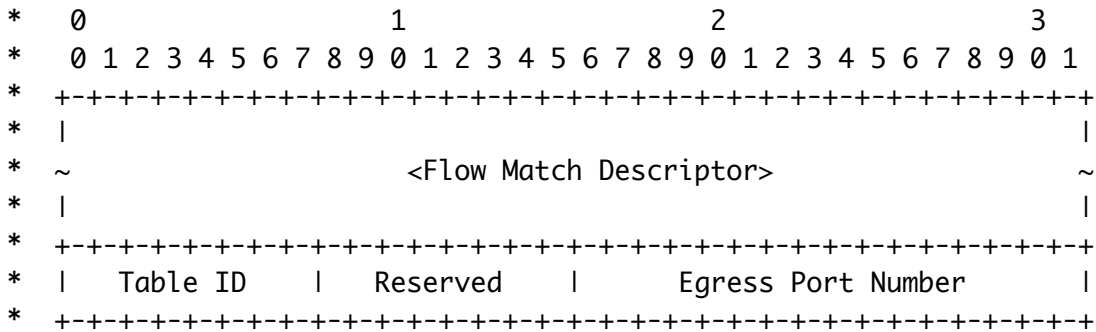
*   Ethernet source address.
*
*   VID
*   TBD
*   IEEE 802.1Q VID
*
*   INP
*   TBD
*   Switch input port.
*/

```

```

/*
* Protocol Payload Stats Option Format - Flow Stats Request
*

```



```

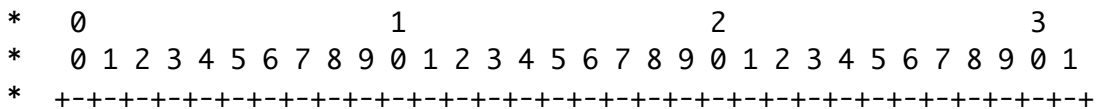
* Flow Match Descriptor
*   See Payload Element <Flow Match Descriptor>
*
* Table ID
*   TBD
*   0 - 253 Normal Flow Table
*   254 Emergency Flow Table
*   255 All Normal Flow Table
*
* Reserved
*   Must be zero.
*
* Egress Port Number
*   See Payload Element <Port Numver>
*/

```

```

/*
* Protocol Payload Stats Option Format - Aggregate Flow Stats Request
*

```



```

* | | |
* ~ | | | <Flow Match Descriptor> | ~
* | | | |
* +-----+
* | Table ID | Reserved | Egress Port Number |
* +-----+
*
* Flow Match Descriptor
* See Payload Element <Flow Match Descriptor>
*
* Table ID
* TBD
* 0 - 253 Normal Flow Table
* 254 Emergency Flow Table
* 255 All Normal Flow Table
*
* Reserved
* Must be zero.
*
* Egress Port Number
* See Payload Element <Port Numver>
*/

```

```

/*
* Protocol Payload Stats Option Format - Description of Switch
*
* 0 1 2 3
* 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
* +-----+
* | | | | |
* ~ | | | | | Manufacturer Description | ~
* | | | | |
* +-----+
* | | | | |
* ~ | | | | | Hardware Description | ~
* | | | | |
* +-----+
* | | | | |
* ~ | | | | | Software Description | ~
* | | | | |
* +-----+
* | | | | | Serial Number Description |
* +-----+
*
* Manufacturer Description
* TBD

```

```

*   256 octets
*
* Hardware Description
*   TBD
*   256 octets
*
* Software Description
*   TBD
*   256 octets
*
* Serial Number Description
*   TBD
*/

```

```

/*
* Protocol Payload Stats Option Format - Individual Flow Stats
*
*   0                               1                               2                               3
*   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
* +-----+-----+-----+-----+-----+-----+-----+-----+
* |                               Length                               | Table ID | Reserved |
* +-----+-----+-----+-----+-----+-----+-----+-----+
* |                               <Flow Match Descriptor>                               |
* +-----+-----+-----+-----+-----+-----+-----+-----+
* |                               Lifetime Duration                               |
* +-----+-----+-----+-----+-----+-----+-----+-----+
* |           Priority           |           Soft Lifetime           |
* +-----+-----+-----+-----+-----+-----+-----+-----+
* |           Hard Lifetime           |           Reserved           |
* +-----+-----+-----+-----+-----+-----+-----+-----+
* |                               Number of Packets Transferred                               +
* |                               +-----+-----+-----+-----+-----+-----+-----+
* |                               Number of Octets Transferred                               +
* |                               +-----+-----+-----+-----+-----+-----+-----+
* | <Action Descriptors> ...
* +-----+-----+-----+-----+-----+-----+-----+-----+
*/

```

```

/*
* Protocol Payload Stats Option Format - Aggregate Flow Stats

```

```

*
*      0              1              2              3
*      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              Number of Packets Transferred              +
*      |
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              Number of Octets Transferred              +
*      |
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              Number of Flows              +
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              Reserved              +
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*/

```

```

/*
* Protocol Payload Stats Option Format - Table Stats
*

```

```

*      0              1              2              3
*      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |  Table ID  |              Reserved              |
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              +
*      |
*      +              Table Description String              +
*      |
*      +              +
*      |
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              <Flow Wildcard>              +
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              Maximum Number of Flows Supported              +
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              Number of Flows Installed              +
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              Number of Packets Looked up              +
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*      |
*      +              Number of Packets Matched              +
*      +-----+-----+-----+-----+-----+-----+-----+-----+
*/

```

```

/*
 * Protocol Payload Stats Option Format - Port Stats
 *
 *      0              1              2              3
 *      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Pakctes Received               +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Pakctes Transmitted             +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Octets Received                 +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Octets Transmitted              +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Packets Dropped in Reception    +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Packets Dropped in Transmission +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Errors in Reception             +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Errors in Transmission          +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Alignment Errors                +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+
 * |
 * +               Number of Overrun Errors                  +
 * |
 * +-----+-----+-----+-----+-----+-----+-----+-----+

```

```
* | |
* + Number of CRC Errors +
* | |
* +-----+
* | |
* + Number of Collision Errors +
* | |
* +-----+
*/
```