# PCS Priority Flag
# and
# VLAN Tags

IEEE 802.3z Interim

Coeur d'Alene

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# Needs being addressed

- Simple methods of carrying priority on Gb Ethernet are useful and can expand the Gb Ethernet market further.

- Lightweight priority mapping schemes will be important at high-speeds

- Compatibility and support for existing and emerging standards.

- What is *NOT* being considered!
    - Significant changes to the MAC or Repeater protocol
    - Any requirement for multiple queues in MACs or Switches

# Proposal

- Current Proposal for PCS symbols on fiber

```
MAC:     55   55 55 55 55 55 55 D5 Data
PCS:     SOP 55 55 55 55 55 55 D5 Data
```

- New Addition

```
MAC:     55   55   55 55 55 55 55 D5 Data
PCS:     SOP PRI 55 55 55 55 55 D5 Data
```

★ Cat 5 version would likely be similar.  PRI may need to be moved
  if SOP uses two symbols.

# PRI Flag

- PRI byte is binary value 10000pri where 'pri' is the 3-bit 802.2 priority value.

- PRI byte does not require FCS recalculation. Packets are bridged without modification.

- If 'pri' is not known or not implemented, the default value is binary 10101010.

# Impact on Other Layers

- **MAC**
  - A line of Pascal code might be added to MAC transmit and receive to handle priority parameter

- **Gigabit MII**
  - 3 bit priority could be separate lines, or preferably encoded in Gigabit MII interface based upon current proposal

- **Physical Layer**
  - No special control codes needed

Request(data, pri)
Indication(data, pri)

MAC

MII &larr; *Priority Encoded*

PHY
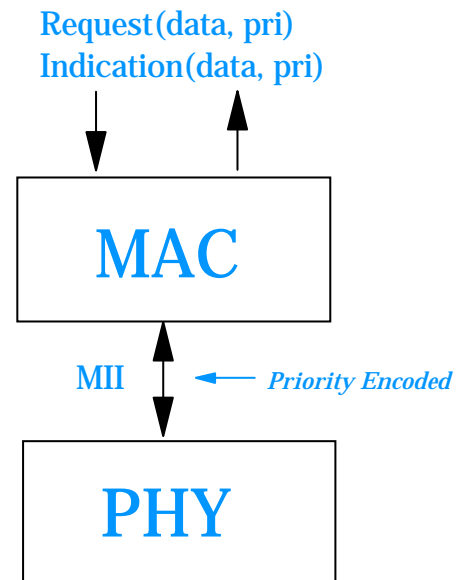
# Prioritizing Switch Traffic

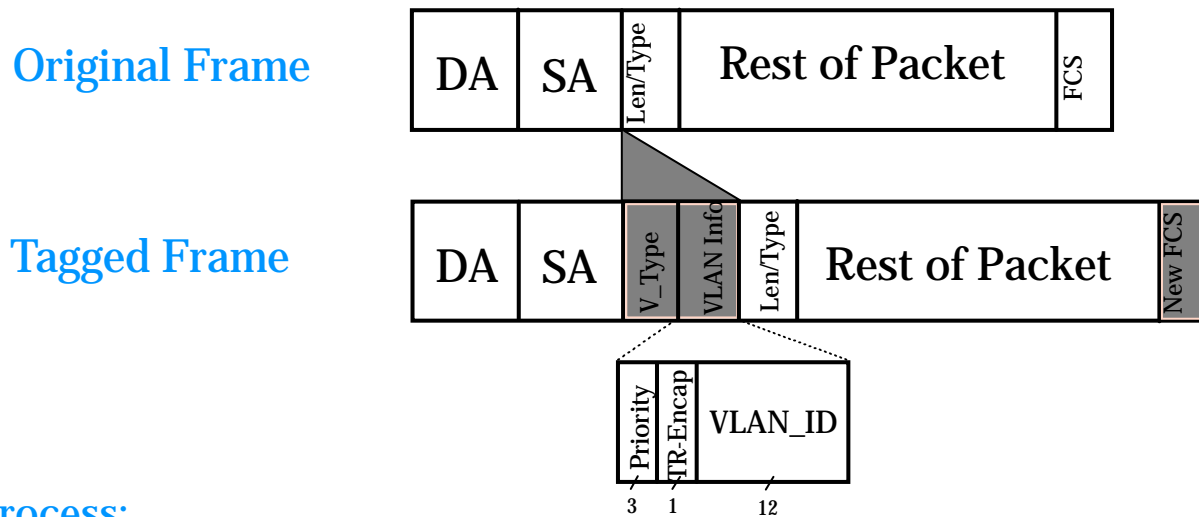## Priority traffic is either implicitly or explicitly defined

- ✓ Priority Field in VLAN Tag
- ✓ Multicast Address Mapping
- ✓ U/L Bit in Source Address (e.g. PACE)
- ✓ Input Link Priority (e.g. Token Ring)
- ✓ Higher Layer Protocol Mapping (e.g. IP/UDP/RTP)

# Why PCS Priority Flag Instead of VLAN Tag?

- A frame's priority may be indicated in a number of ways.  The VLAN tag is one of them.

- A lightweight scheme is needed at Gigabit speeds.

- The PCS priority flag supports the VLAN tag scheme as well as all other priority schemes.

- 802.1Q is working on a growing list of issues. Critical issues may not be resolved in time for the first round of Gigabit products.

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# A Current VLAN Tagging Proposal

*Not agreed upon, subject to change*

**Original Frame**

| DA | SA | Len/Type | Rest of Packet | FCS |
|---|---|---|---|---|

**Tagged Frame**

| DA | SA | V_Type | VLAN Info | Len/Type | Rest of Packet | New FCS |
|---|---|---|---|---|---|---|

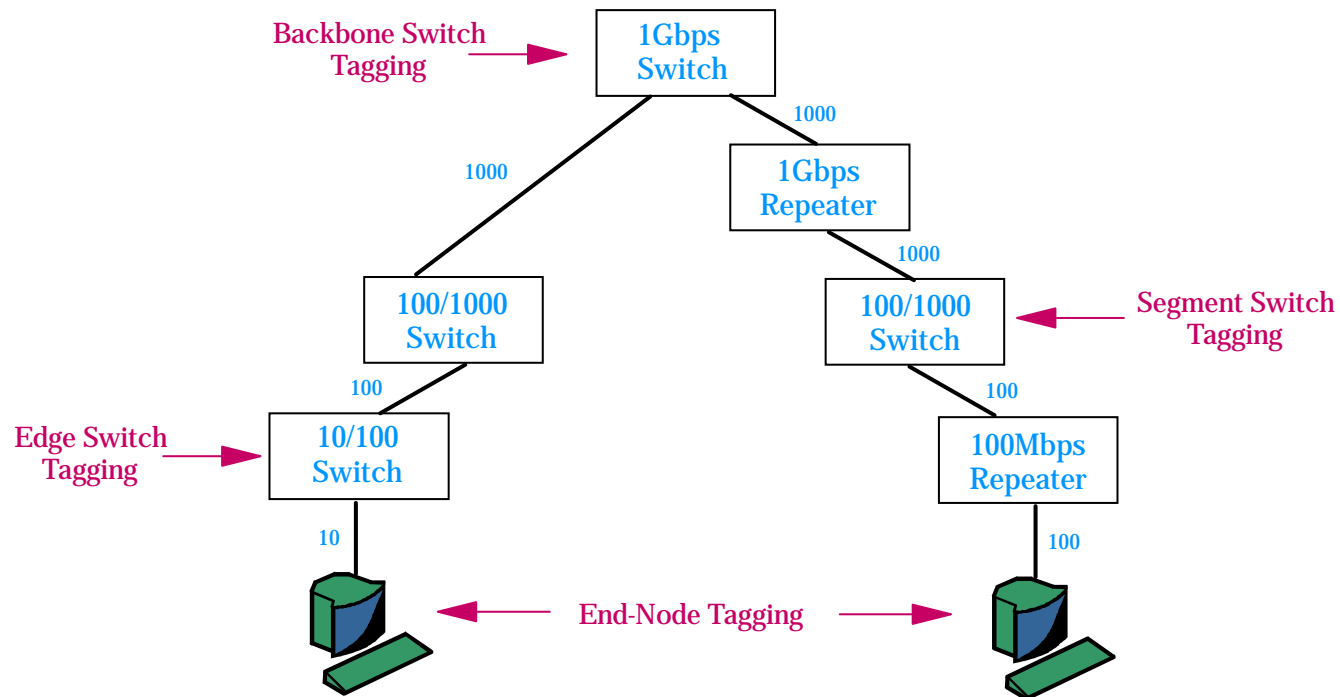| Priority | TR-Encap | VLAN_ID |
|---|---|---|
| 3 | 1 | 12 |

**Process:**

1) **Split Open Frame and Insert 32-bit VLAN Field**
   - 16-bits of VLAN Ethertype
   - 3-bits of Priority (Class of Service)
   - 12-bits of VLAN_ID
   - 1-bit of TR Encaps Flag

2) **Remove old FCS and Append new FCS**

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# Who Determines and Tags Priority?

Backbone Switch
Tagging →  **1Gbps Switch**

1000

**1Gbps Repeater**

1000    1000

1000

**100/1000 Switch**    **100/1000 Switch** ← Segment Switch Tagging

100    100

Edge Switch
Tagging →  **10/100 Switch**    **100Mbps Repeater**

10    100

← End-Node Tagging →

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# Priority in VLAN Tag

**Priority Field in VLAN Tag is the Best
Long Term End-to-End solution:**

**Getting There Requires:**

- Ultimate End-Node Participation
- Compatibility Protocols (When to Add, When to Strip)
- Resolution of Giant Packets on 10Mbps and 100Mbps
- Resolution of Translational Bridging issues
- Completion of 802.1Q VLAN Standard

# Tagging Packets at High Speed May be Expensive

100 → **100/1000 Switch** → 1000 → **1Gbps Switch** → 1000 →

| FCS | Data | Hdr |

| FCS | Data | Tag Hdr |
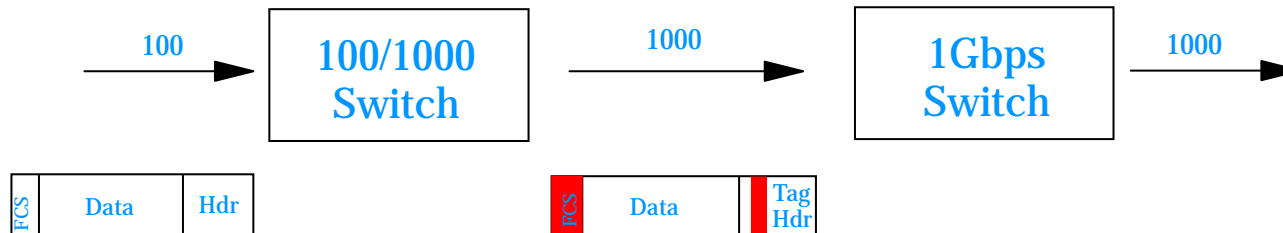
✔ Packet Modification Required

✔ FCS Regeneration Required

✔ Internal Switch Parity May Be Desired

✔ Determining the VLAN Tag Value May Impact Latency

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# PCS Priority Flag is Simple and Compatible

- VLAN Priority Tag is one of many ways to indicate a frames priority

- PCS Priority Flag easily supports VLAN Priority Tag as well as other implicit schemes

- Packet modification is not required to carry priority indication

- PCS Priority Flag is easy to remove

- No loss of bandwidth

- Minimal impact on other layers

# PCS Priority and VLAN Tag Can Coexist

- Priority field in VLAN Tag is end-to-end Class of Service (i.e. User Priority).

- PCS Priority Flag is Link Specific Access Priority.

- Mapping between the two is straight forward.

- Consistency between VLAN Tag Priority and PCS Flag Priority is handled same as in other networks (e.g. Token Ring).

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# Required, Optional or Negotiated Feature?

- Optional features are almost always a bad idea.

- No requirement to implement multiple queues. Simply pass along priority flag.

- Default PRI flag of binary 10101010 should be used if feature is not supported.  PRI flag can be ignored by non-supporting devices.

- No need for negotiation if default value is always supported.

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# Conclusions

- PCS Priority Flag is simple, useful and fully supports the direction of 802.1

- Requiring packets to be modified simply to forward on priority is excessive work.

- 802.1Q has many issues to resolve regarding tagging.  Gigabit Ethernet should support these resolutions, but may not want to wait for them.