The MPLS “first nibble” is the high-order 4-bit field (nibble) of the first octet after the last label in the stack (i.e., the one with the BoS bit set).

This nibble has been used for various things in the past:

- and is still being used currently

This draft explains the uses of this nibble, and proposes:

1. A Requirement and a Recommendation on its use
2. A registry for the first nibble values
3. A registry for “post-stack data”
<table>
<thead>
<tr>
<th>Label</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label 1</td>
<td>0</td>
</tr>
<tr>
<td>Label 2</td>
<td>0</td>
</tr>
<tr>
<td>Label n</td>
<td>1</td>
</tr>
</tbody>
</table>

**MPLS First Nibble (MFN)**
TWO CASES

<table>
<thead>
<tr>
<th>Label 1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label 2</td>
<td>0</td>
</tr>
</tbody>
</table>

Label n

“naked” IPv4/IPv6 or Layer 2 packet

Payload

PSD

Payload
USES OF THE MFN

1. As a heuristic that the payload is an IP packet and thereby extract fields for load balancing

2. As an indication of the type of “post-stack data” (PSD)

PSD today can be a pseudowire or detnet control word, or a BIER header, or a GACH, or …

Note: PSD is often signaled in the control plane (e.g., it is known ahead of time that the packet will carry a PW control word)
THINGS ARE BROKEN

- We should recognize this
- The heuristic can fail badly
- We must allow current implementations to work, with the above big caveats
- We cannot continue to confuse IP version numbers with the MFN
- We have new and better ways to load balance all packets, not just IPv4/v6
MUST, MUST, MUST

• Allow current implementations to continue working, bad heuristics notwithstanding
• Lay the groundwork for better, more efficient implementations
• Lay the groundwork for easier, self-contained handling of PSD
PROBLEMS AND WORKAROUNDS

1. In case of an Ethernet payload, the MFN can take any value
   • There are RFCs recommending that Ethernet packets SHOULD have a control word

2. Current PSD types stay away from the values of 4 and 6
   • This is to prevent confusion between PSD and IPv4 and IPv6 packets which would have MFN values of 4 and 6, respectively
   • This leads to possible confusion between the IP version number registry and MFN values – suggestion to “merge” them

3. Recognition and parsing of the PSD is dependent on signaling and/or the presence of heralding labels (e.g., BIER label, GAL label)
LONGER TERM SUGGESTIONS

1. Mandate that, GOING FORWARD, the only “naked” payload types are IPv4 and IPv6
   • Any other version of IP, and any other type of packet MUST have a PSD
   • This decouples MFN from IP version numbers (except 4 and 6)
   • *Could go further and mandate a PSD for all payloads*

2. RECOMMEND that, for load balancing purposes, an Entropy or a FAT PW Label SHOULD be used

3. Keep recognition and parsing of the PSD completely in the data plane

4. Create an MFN registry that will serve simultaneously as a PSD registry
EXISTING IMPLEMENTATIONS

- The load balancing heuristic can continue to be used
  - with the caveats already mentioned
- PW and DetNet CWs work as is; no changes are to be made to them
- GAch PSD continues as is
- BIER PSD continues as is
- Any new ideas for PSD MUST use a new MFN codepoint

The MFN space is very small; accommodations for expansion must be made