Update on our experimental Wire-speed CCN / NDN packet format.
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We had 4 different TLV types discriminated through first 2 bits:
- 00 with one Byte for the Type and one Byte for the Length (1B-1B)
- 01 with one Byte for the Type and one Byte for the Length (1B-2B)
- 10 with one Byte for the Type and one Byte for the Length (2B-1B)
- 11 with one Byte for the Type and one Byte for the Length (2B-2B)

We limit TLV types to the latter one 2B-2B for simplicity:
- Avoid aliasing,
- simpler parsing.
- If needed we can add further TLV types later.
- Fixed header (Convergence Layer)
- Hop-by-Hop fragmentation/reassembly is required but not yet defined:
  - May use additional fixed header fields (through hdr length and/or reserved):
    1. Variable length (optional Hop-by-Hop TLVs)?
    2. Fixed length (additional fields)?
- Reassembly is mandatory for both data and interests.
A TLV for the name is not required.

Due to Hop-By-Hop fragmentation and reassembly through the fixed header, msg. Type and msg. Length are needed.

Nonce is mandatory and inserted after the name.
  - Used to prevent loops coupled with name (only associated to a PIT entry, any specific data structure)
• Fixed Header is the same of Interest
• NONCE is not needed
• Signature and security TLVs (Signature is mandatory)
No TLV inside a name container. Field (component) separator needed.
Offset TLV contains the list of offsets of the different components 2B (or 1B depending on the compact/extended Component offset TLV used):
- Fast parsing form Exact Match (PIT, CS) and LPM (FIB)
- Name segment id is encoded with a numeric type (i.e. 4byte unsigned int)
- Other special components (e.g., version) may be added similarly to segm id
NAME ENCODING EVALUATION - SETUP

• Intel DPDK version of our content router (credits goes to L. Saino - UCL)
• General purpose server, Intel Xeon processor:
  • L1 Cache 32 KB (each core)
  • L2 Cache 256 KB (each core)
  • L3 Cache 8MB
  • Intel 82599EB 10Gbps card

• Test on FIB lookup and Hash computation+Name decoding cost
  • 60B names composed of 5 or 10 components with different Name encodings
  • FIB with 1 million prefixes

FIB Lookup, two stages approach [1]:
1. Check the Bloom filter
   (Check length n, n-1, …)
2. Check hash at identified length \(d\)

[1] D. PERINO, M. VARVELLO, L. LINGUAGLOSSA, R. LAUFER, R. BOISLAIGUE,
NAME ENCODING EVALUATION

- 60B names with components 5:
- 2 name encoding under test:
  - Name +offsets (1 Byte component separator needed)
    Total length: 65B, Components length: 13B 7.6% overhead
  - Nested TLVs \((T+L = 2B+2B)\)
    Total length: 80B, Components length: 12B (+4B of T+L). 25% overhead

### Lookup cost

```
<table>
<thead>
<tr>
<th>Match Len.</th>
<th>All in one Hash (Nested TLVs)</th>
<th>Multiple hashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2000</td>
<td>1800</td>
</tr>
<tr>
<td>1</td>
<td>1800</td>
<td>1600</td>
</tr>
<tr>
<td>2</td>
<td>1600</td>
<td>1400</td>
</tr>
<tr>
<td>3</td>
<td>1400</td>
<td>1200</td>
</tr>
<tr>
<td>4</td>
<td>1200</td>
<td>1000</td>
</tr>
<tr>
<td>5</td>
<td>1000</td>
<td>800</td>
</tr>
<tr>
<td>6</td>
<td>800</td>
<td>600</td>
</tr>
</tbody>
</table>
```

### Hash + parsing cost

```
<table>
<thead>
<tr>
<th>Match Len.</th>
<th>All in one Hash (Nested TLVs)</th>
<th>Multiple hashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1000</td>
<td>800</td>
</tr>
<tr>
<td>1</td>
<td>800</td>
<td>600</td>
</tr>
<tr>
<td>2</td>
<td>600</td>
<td>400</td>
</tr>
<tr>
<td>3</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>4</td>
<td>200</td>
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</tr>
<tr>
<td>5</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
```
NAME ENCODING EVALUATION

- 60B names with components 10:
- 2 name encoding under test:
  - Name +offsets (1 Byte component separator needed)
    Total length: 70B, Components length: 7B. 12.25% overhead
  - Nested TLVs (T+L = 2B+2B)
    Total length: 100B, Components length: 6B (+4B of T+L) 40% overhead

**Lookup cost**

**Hash + parsing cost**
Fixed header + extension
- Topological information (e.g., Hop limit)
- Hop-by-hop fragmentation and reassembly

Naming
- Only few type of *special* components (segment, what else?)

Under discussion
- TLV format: for the moment 2B+2B. Need more?
- Payload for Interest packet ? Not for the moment; security issues.
- ICN architecture interoperability
- Network management/processing commands