Draft Updates

RG adoption:
draft-gundogan-icnrg-ccnlowpan-02 ⇒ draft-irtf-icnrg-icnlowpan-00

Update since -02

- CCNx stateless compression enhancements
- CCN-LoWPAN ⇒ ICN-LoWPAN
- Security considerations
ICN-LoWPAN Recap

Objectives

- Make ICN LoWPAN compliant
- Adapt to LoWPAN link constraints
- Compress TLVs efficiently for common use cases
- Provide additional stateful compression
Stateless Compression Scheme

- Use space-efficient TLV encoding & omit T where possible
- Convert TLV booleans to bit vector (2 octets $\Rightarrow$ 1 bit)
- Reorder header to remove Length fields
- Remove redundant header fields (e.g., CCNx PacketType == MessageType)
Stateless Compression for Interest

<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>Name</td>
<td>0</td>
<td>...</td>
</tr>
<tr>
<td>CanBePref</td>
<td>0</td>
<td>...</td>
</tr>
<tr>
<td>MustBFresh</td>
<td>0</td>
<td>...</td>
</tr>
<tr>
<td>FwdHint</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>Parameters</td>
<td>4</td>
<td>...</td>
</tr>
<tr>
<td>Nonce</td>
<td>2</td>
<td>...</td>
</tr>
<tr>
<td>Lifetime</td>
<td>1</td>
<td>...</td>
</tr>
<tr>
<td>HopLimit</td>
<td>1</td>
<td>...</td>
</tr>
</tbody>
</table>

**NDN**

<table>
<thead>
<tr>
<th>Version</th>
<th>Type</th>
<th>PacketLen</th>
</tr>
</thead>
<tbody>
<tr>
<td>HopLim</td>
<td>RSVD = 0</td>
<td>Flags = 0</td>
</tr>
</tbody>
</table>

**Optional Hop-By-Hop TLVs**

<table>
<thead>
<tr>
<th>MessageType</th>
<th>MessageLength</th>
</tr>
</thead>
<tbody>
<tr>
<td>NameType</td>
<td>NameLength</td>
</tr>
</tbody>
</table>

**Optional Interest Message TLVs**

**Optional Payload TLV**

**Optional Validation TLVs**

**Dispatch**

```
0 1 2 3 4 5 6 7
1 0 DIGEST PREFIX FRESH FWD PARAM CID
```

**CCNx**

```
   1 0 2 3 4 5 6 7
   FLG HBH PTY HPL FRS
MSG PAY VAL EXT RSV CID
```
Stateless Compression Performance for Interest

NDN

Name /ACM/BOS/R0/T1/FEB

CanBePrefix

MustBeFresh

Interest Lifetime

Hoplimit

18 Bytes

CCNx

Fixed Header

Interest Lifetime

Interest Message

29 Bytes
Stateful Compression

LoWPAN-local State

- **Context IDentifier (CID)** follows dispatch octet
- CID lookup table describes what to elide (prefix, suffix, options ...)
- CIDs must be known to all nodes (static/dynamic bootstrap)

En-Route State

- Compression state is accumulated during Interest and consumed by Data
- Returning Data includes **ephemeral HopID** instead of Name TLV
Stateless + Stateful Compression Performance (NDN)

Interest

<table>
<thead>
<tr>
<th>TL</th>
<th>/ACM/ICN/Boston/18/Temp</th>
<th>Nonce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disp L</td>
<td>/Boston/18/Temp</td>
<td>Nonce</td>
</tr>
</tbody>
</table>

Data

<table>
<thead>
<tr>
<th>TL</th>
<th>/ACM/ICN/Boston/18/Temp</th>
<th>21°C</th>
</tr>
</thead>
</table>
| Disp L 0 | 21°C |}

Octets

- 38
- 23 (≈ 40%)
- 38
- 11 (≈ 71%)
Questions to the Community

NDN and CCNx Folks:
▶ Does compressed TLV encoding meet your needs?
▶ Are type + length restrictions o.k.?
▶ Did we catch the common standard packets?

Implementers:
▶ NDNoT framework – ready for a joint implementation effort?
▶ Others willing to adopt in code?

All:
▶ Are we in line with the key use cases?
▶ Anything relevant missing?
Next Steps

**Implementation**
- Ongoing proof-of-concept using CCN-lite (NDN) and RIOT
- Integrate into NDNoT framework (?) ⇒ Interop. testing
- Use CCN-lite for CCNx? Other open source implementation available?

**Document**
- Improve compression & adapt to community feedback
- Restructure and editorial improvements
- Anything missing?