

Developing NS-3 based NDN simulator



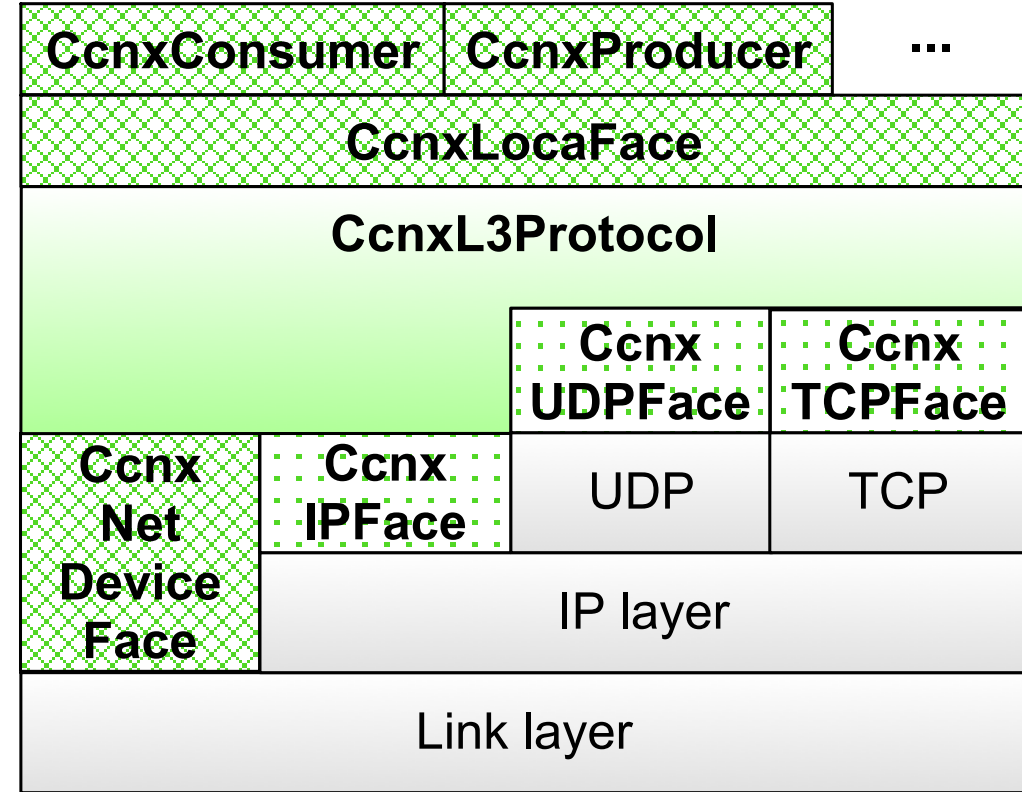
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Conceptual plan

1. CCNx packet format compatibility

2. Transport-layer universality

- face to talk with application (CcnxLocalFace)
- face to talk over link layer (CcnxNetDeviceFace)
- face to talk over IP layer (CcnxIpFace)
- face to talk over UDP/TCP (CcnxUdpFace)



3. Modular forwarding strategy

- flooding
- best-route
- ranking
- ranking with retransmission

Interest packet

Supported fields: Name, MinSuffixComponents, MaxSuffixComponents, Exclude, ChildSelector, AnswerOriginKind, Scope, InterestLifetime, Nonce

Unsupported fields: PublisherPublicKeyDigest, PublisherCertificateDigest, PublisherIssuerKeyDigest, PublisherIssuerCertificateDigest

Required fields: Name

Simplifications:

- Name: binary name components are not supported
- MinSuffixComponents and MaxSuffixComponents: if value is negative (default), will not be serialized
- ChildSelector, AnswerOriginKind: 0 - false, 1 - true, -1 not set
- Publisher* elements are not supported
- Exclude: only simple name matching is supported (Bloom support has been deprecated in CCNx)
- InterestLifetime: not used if negative
- Nonce: 32 bit random integer. If value is 0, will not be used

ContentObject packet

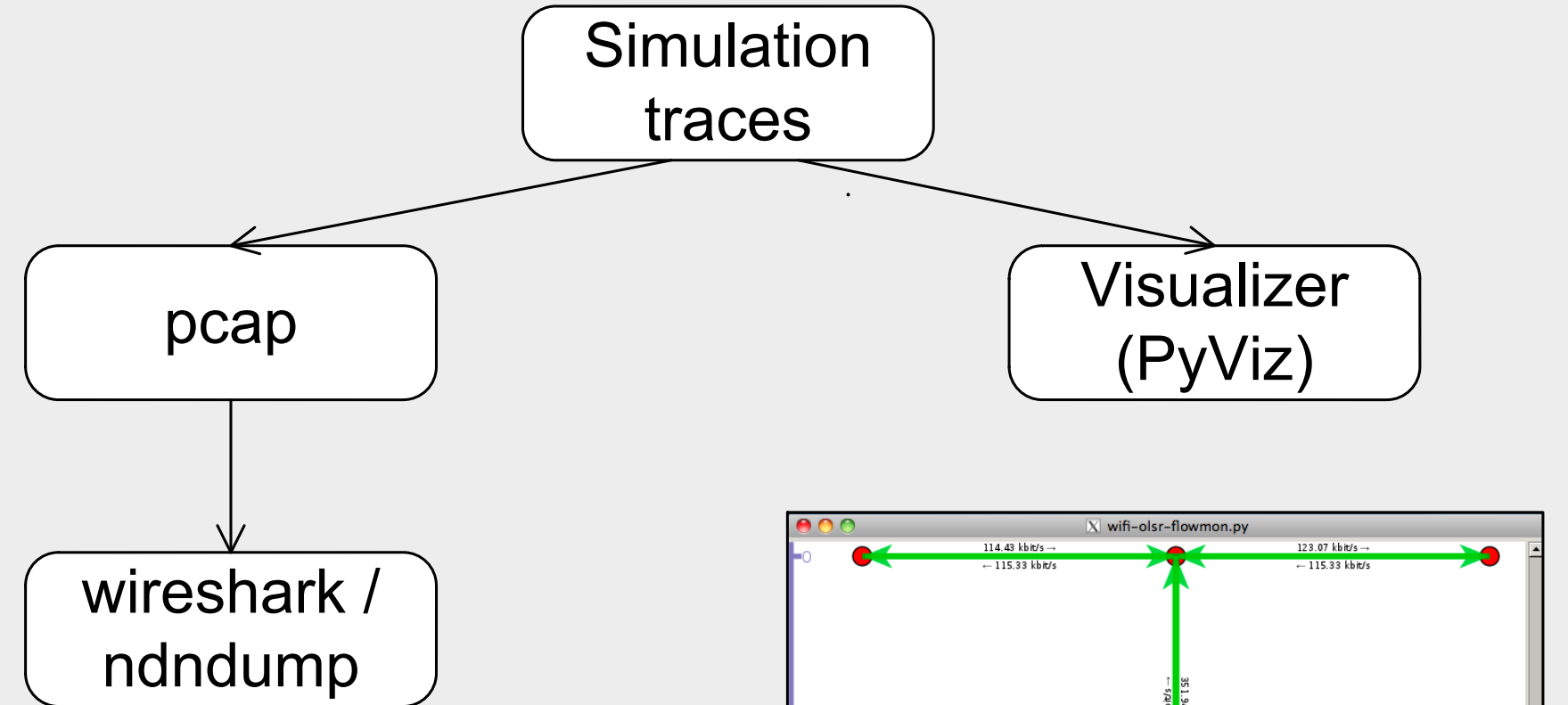
Supported fields: Name, Content

Virtually supported field (parsed, but ignored): Signature, SignedInfo

Simplifications:

- Signature: empty
- Name: (same as with Interest) binary name components are not supported
- SignedInfo: empty
- Content: virtual content (if dumped in pcap format, then will be filled with zeros)

Tools for simulation results analysis



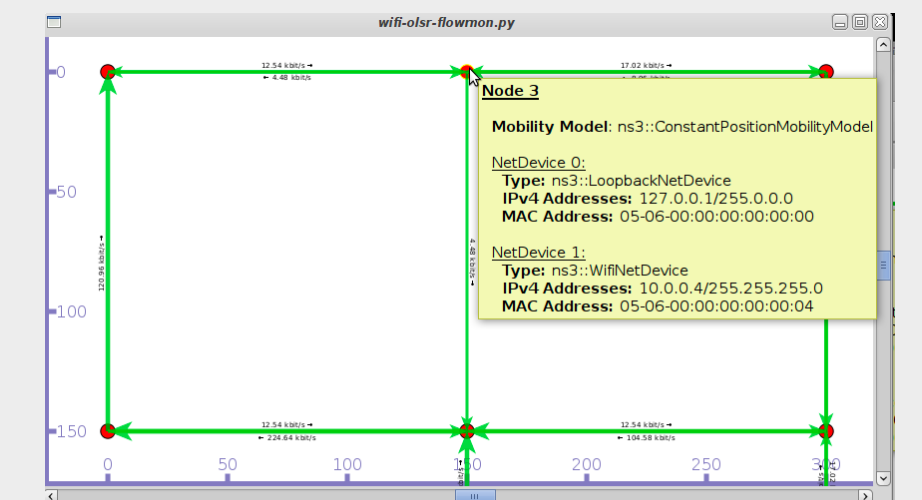
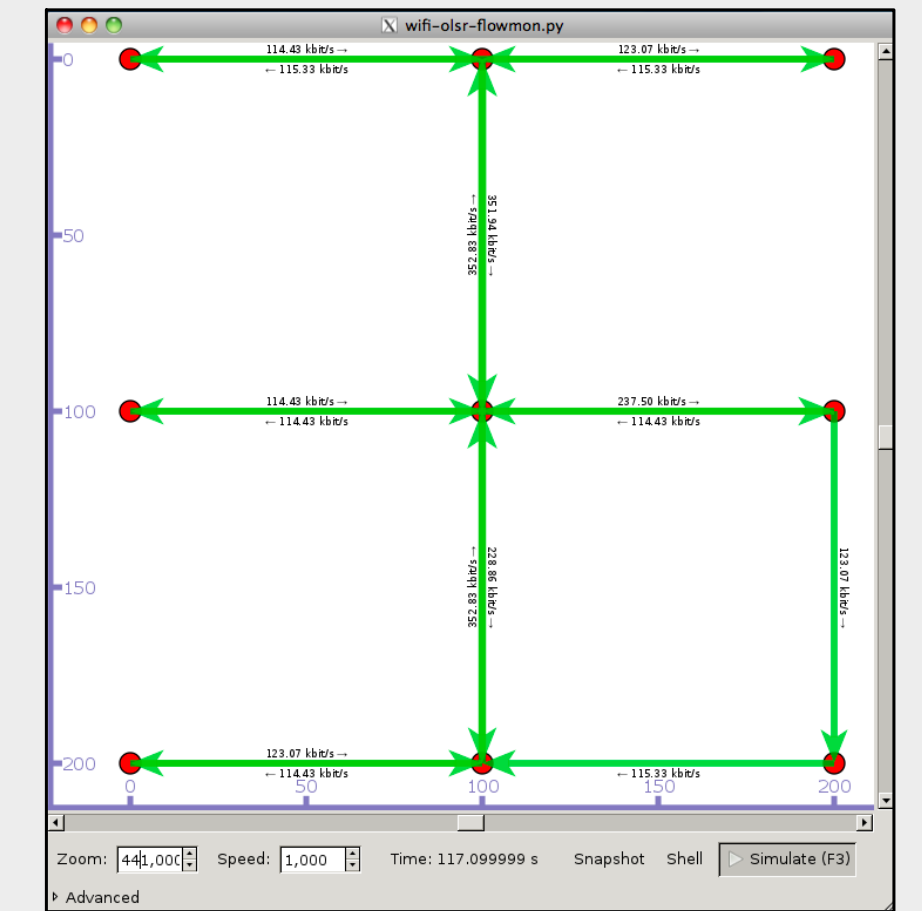
Reading from file ../pcap-example.pcap-0-0.pcap

```
16:00:00.000000 Tunnel Type: PPP, Packet Type: Interest, Name: /test/test2, Nonce: AQAAAA
<Interest>
<Name>
<Component>test2/<Component>
<Component>test2/<Component>
</Name>
<Nonce>AQAAAA</Nonce>
</Interest>
```

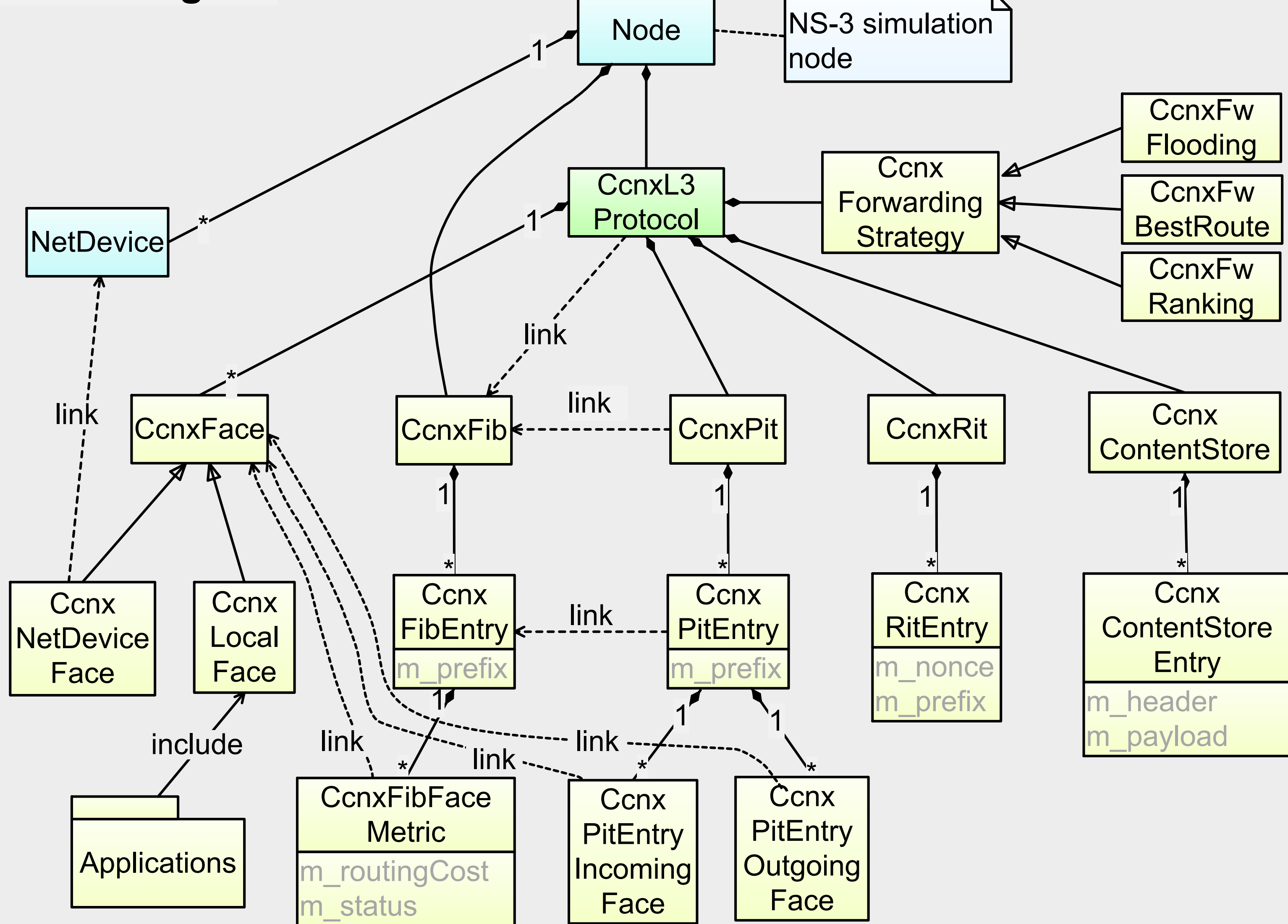
16:00:00.000023 Tunnel Type: PPP, Packet Type: Interest,

```
Name: /test/test4, Nonce: AgAAAA
<Interest>
<Name>
<Component>test3/<Component>
<Component>test4/<Component>
</Name>
<Nonce>AgAAAA</Nonce>
</Interest>
```

<https://github.com/cawka/ndndump>



Class Diagram



CcnxPit (Pending Interests Table)

Main methods

- Lookup (dataHeader) → PIT entry exception if entry not found
- Lookup (interestHeader) → PIT entry exception if entry not found

Contains

- PIT entries indexed by:
 - * prefix hash
 - * expiration time
 using Boost.MultiIndex library
- m_fib: Link to FIB

CcnxPitEntry

Main methods

- Constructor (prefix, fibEntry)
- AddIncoming (face)
- DeleteIncoming (face)
- AddOutgoing (face)
- DeleteOutgoing (face)
- ClearIncoming ()
- UpdateFibStatus (face, status, fib)
- EstimateRttAndRemoveFace (face, fib)

Contains

- m_prefix: PIT entry prefix
- m_incoming: list of incoming interests indexed by face
- m_outgoing: list of outgoing interests indexed by face

CcnxPitEntry IncomingFace

Main methods

- Constructor (face)

Contains

- m_face: link to face

- m_arrivalTime

more will be added

CcnxPitEntry OutgoingFace

Main methods

- Constructor (face)

Contains

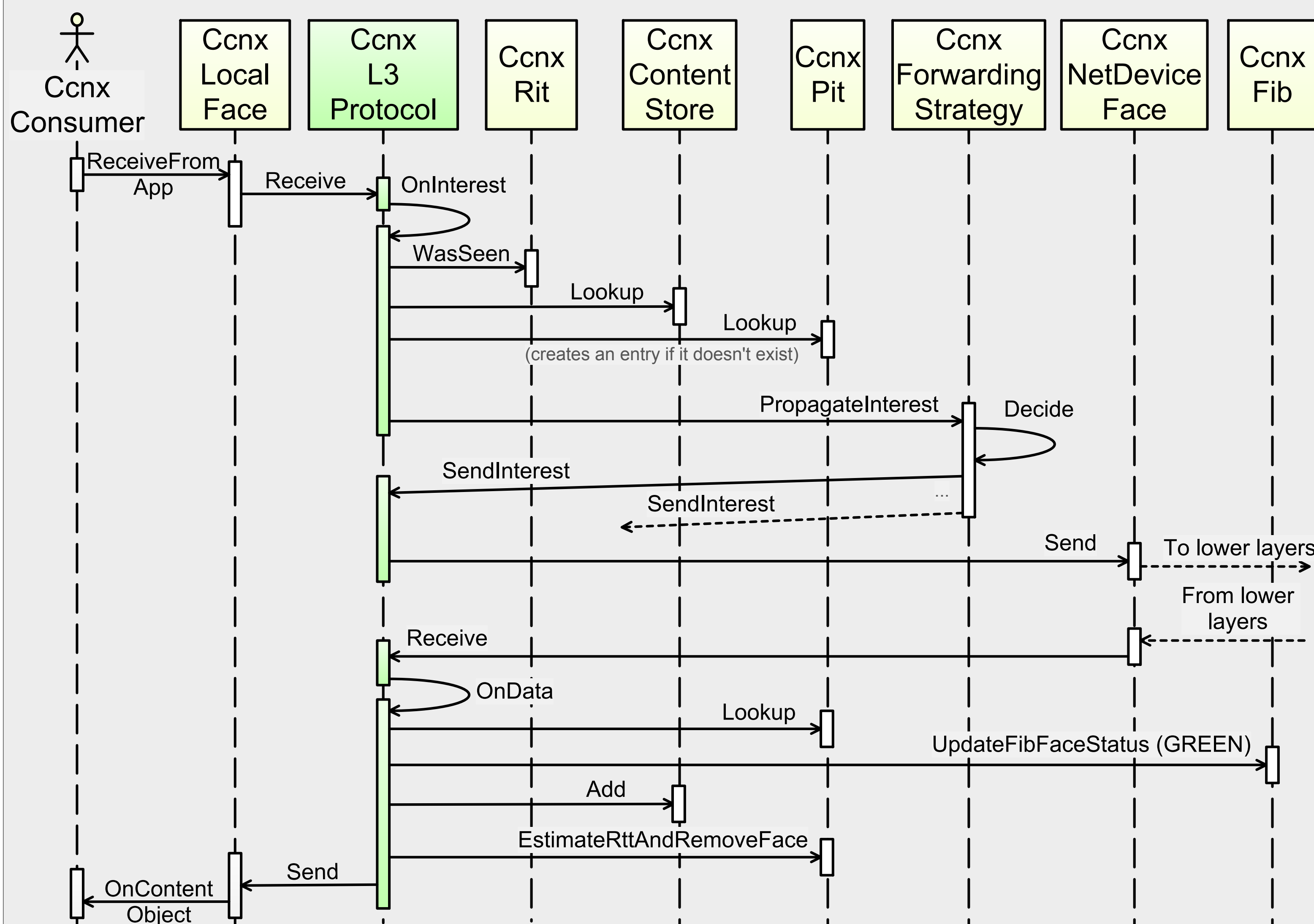
- m_face: link to face

- m_sendTime

- m_retNum

more will be added

Sequence Diagram



CcnxFib

Main methods

- LongestPrefixMatch (interestHeader) → valid FibEntry end () if not found
- Add (prefix, face, metric) ... other raw container operations

Contains

- FIB entries indexed by:
 - * prefix hash
- m_node: Link to simulation node

CcnxFibEntry

Main methods

- Constructor (prefix)
- UpdateStatus (face, status)
- AddOrUpdateRoutingMetric (face, metric)
- UpdateFaceRtt (face, rttSample)
- FindNthBestCandidate (n)

Contains

- m_prefix: PIT entry prefix
- m_faces: list of CcnxFibFaceMetrics indexed by:
 - * face
 - * metric (m_status + m_routingCost)
 - * random access

CcnxFibFaceMetric

Main methods

- Constructor (face, routingCost)
- UpdateRtt (rttSample)

Contains

- m_face: link to face

- m_arrivalTime

- m_status: Green, Yellow, Red

- m_routingCost

- m_sRtt

- m_rttVar

more may be added

Expected release date: mid 2012