# File-Like ICN Collections (FLIC)

## draft-irtf-icnrg-flic-04
## IETF 116, Yokohama

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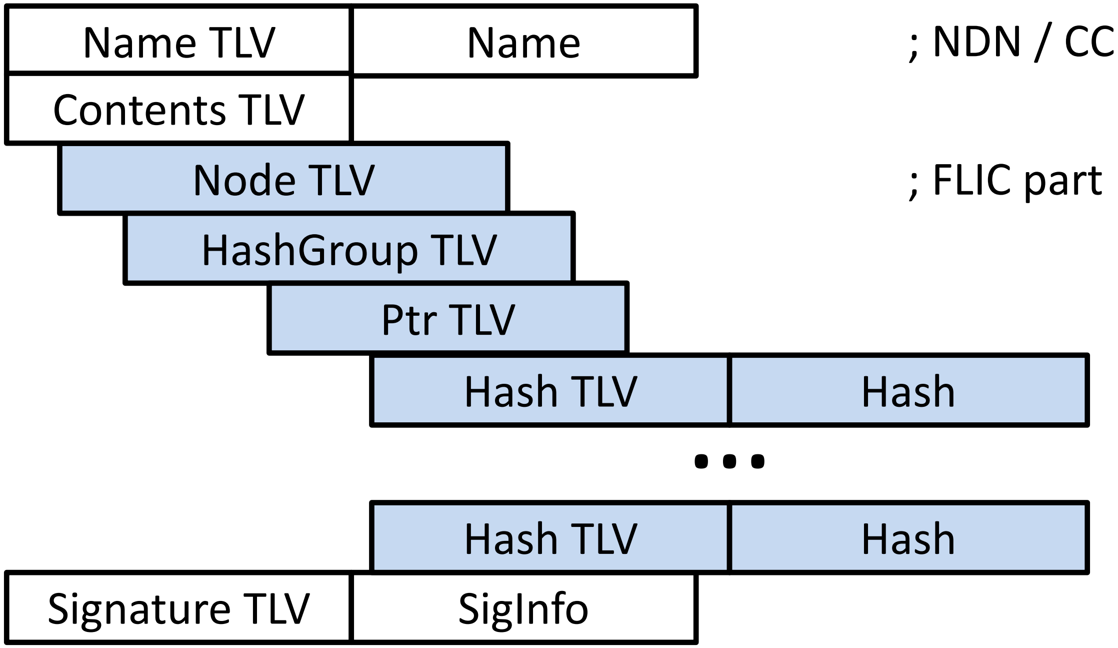
# Outline

- What FLIC does (super quick recap)
- Minimum Requirements
- Examples with focus on NDN
  - Two Name Constructors
  - SegmentIds for unique names
  - Routing Hints

# What FLIC does

- It provides a manifest of hashes that make up all the segments of a piece of application data.
- The manifest is hierarchical – that is the hash pointers can point to application data or to more manifests.
- There is a canonical traversal order. Metadata could provide other traversal hints, such as for video.
- FLIC has its own, extensible, encryption mechanism. Manifest encryption does not need to be related to content encryption.
- FLIC has several Interest construction techniques. The publisher can choose one or more of these naming techniques. More techniques could be added.

# Unencrypted Manifest



Name TLV Name

Contents TLV

Node TLV

HashGroup TLV

Ptr TLV

Hash TLV Hash

…

Hash TLV Hash

Signature TLV SigInfo

; NDN / CCNx part

; FLIC part

# NDN

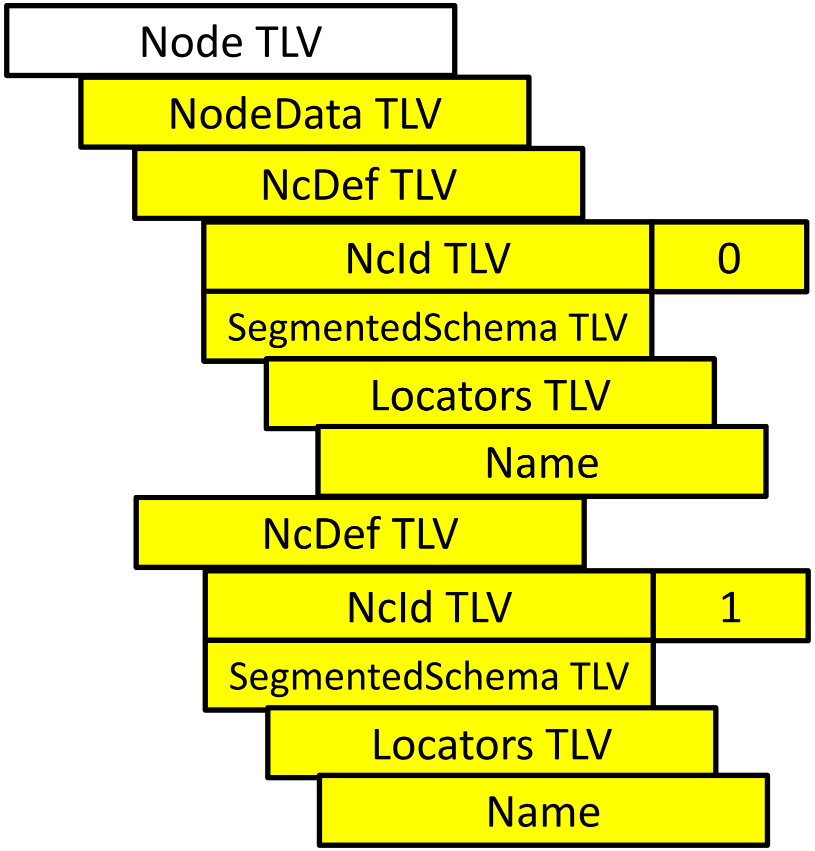
- ContentType 1024 is FLIC, which serves as the “Manifest TLV” from FLIC spec.
- HashType is ImplicitSha256DigestComponent
- The Ptr Length must be an integer multiple of the PTR TLV + HashValue length.
- Because there is no NodeData, it uses the default hash-based naming.

# More Practical NDN

- NDN prefers that each Data object have a unique name (not counting the implicit hash).
- FLIC uses Segmented Naming:

  `common prefix + segment number + hash`
- If the manifest has one name and the application data has a second name, then one must have two HashGroups.
- One must maintain two segment number counters, one for each HashGroup.
- One must traverse the manifest in-order because there's a global counter for each SegmentId.

# Unencrypted Manifest With NodeData



Node TLV

NodeData TLV

NcDef TLV

NcId TLV 0 ; Redefine the default for sub-manifest

SegmentedSchema TLV

Locators TLV ; e.g. NDN LinkContent TLV

Name ; Manifest name prefix

NcDef TLV

NcId TLV 1 ; new NcId for app data

SegmentedSchema TLV

Locators TLV

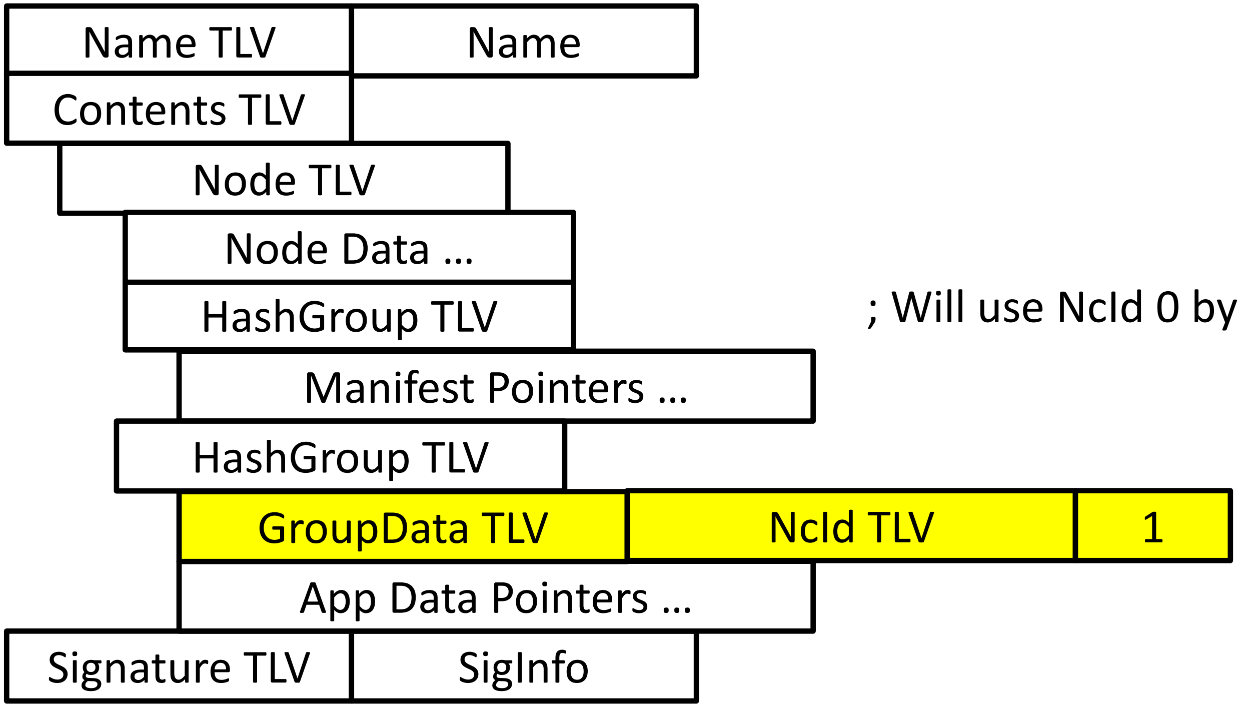
Name ; App Data name prefix

*NcDefs are inherited between manifests. We recommend only defining them at the root.*

# Redefining Name Constructors

- NcDef only applies to the current manifest and its children.
- Because one cannot fetch its children before reading the current manifest, it should not cause too much burden to redefine NcDefs.
- The FLIC processor must be able to track NcDefs per manifest branch.

# With NcId 0 and NcId 1



Name TLV

Name

Contents TLV

Node TLV

Node Data …

HashGroup TLV

; Will use NcId 0 by default

Manifest Pointers …

HashGroup TLV

GroupData TLV

NcId TLV

1

App Data Pointers …

Signature TLV

SigInfo

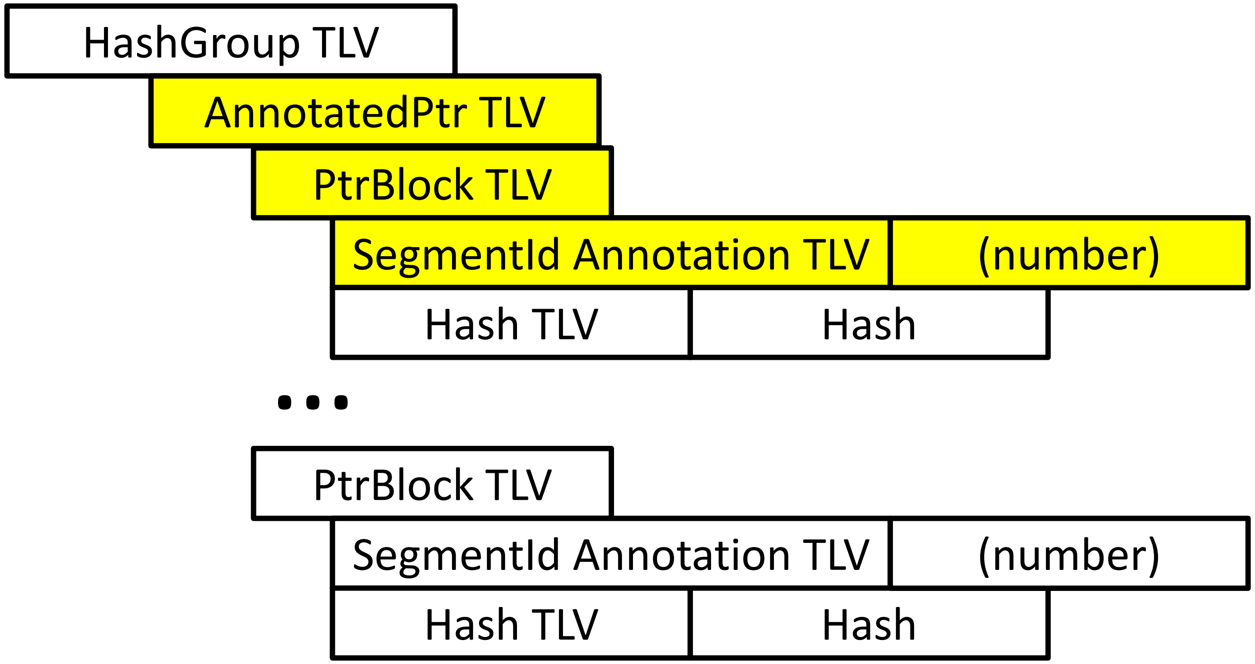
# Supporting Out-of-order

- The hash pointers must include the segment number annotation.

OR

- Give up on unique names and rely on the implicit hash to differentiate.  In that case, use the PrefixSchema or other Name Constructor schema.

# HashGroup with Annotations



HashGroup TLV

AnnotatedPtr TLV

PtrBlock TLV

SegmentId Annotation TLV (number)

Hash TLV Hash

...

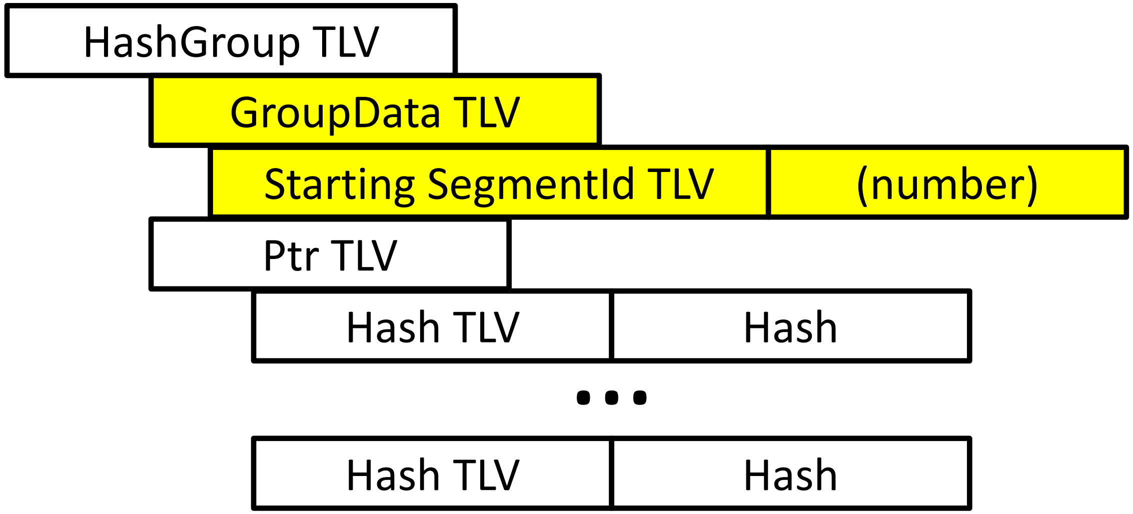
PtrBlock TLV

SegmentId Annotation TLV (number)

Hash TLV Hash

; missing in FLIC-04

# Alternate Proposal



HashGroup TLV

GroupData TLV

Starting SegmentId TLV (number)

Ptr TLV

Hash TLV Hash

• • •

Hash TLV Hash

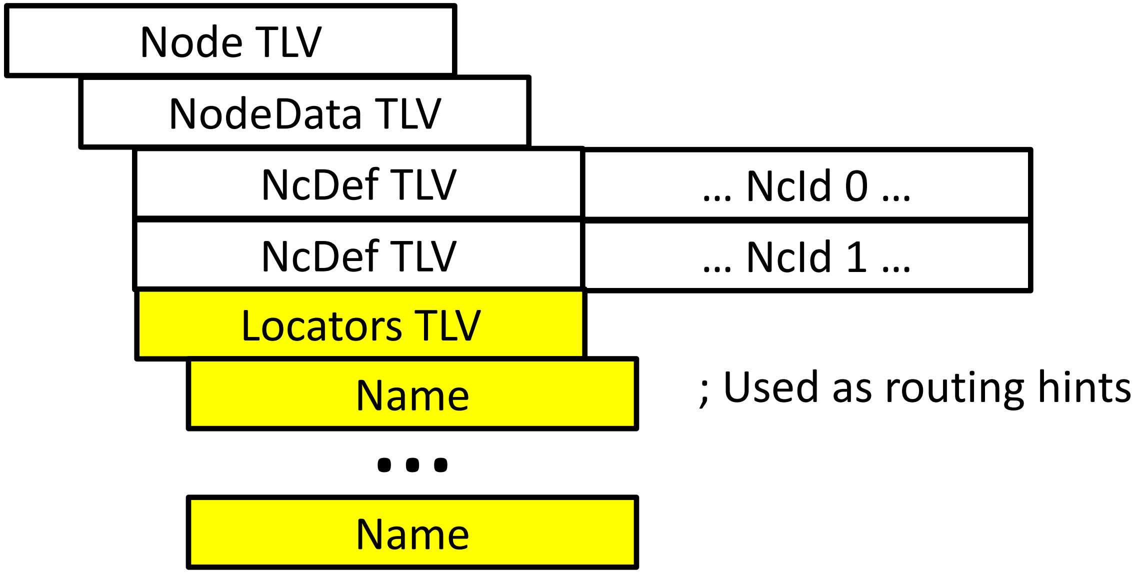
; new proposal

*One does not need to maintain a global counter.*
*It only needs to be local to each HashGroup.*

# Including Routing Hints

- Routing Hints are stored under the NodeData.
- FLIC-04 calls these “Locators.”
- FLIC-04 uses the same term “Locators” for the prefix of SegmentedSchema and PrefixSchema. But in this case, these are name prefixes used in a Name Contructor.
- We should change the word in Name Constructors to not confuse the purpose.

# Routing Hints

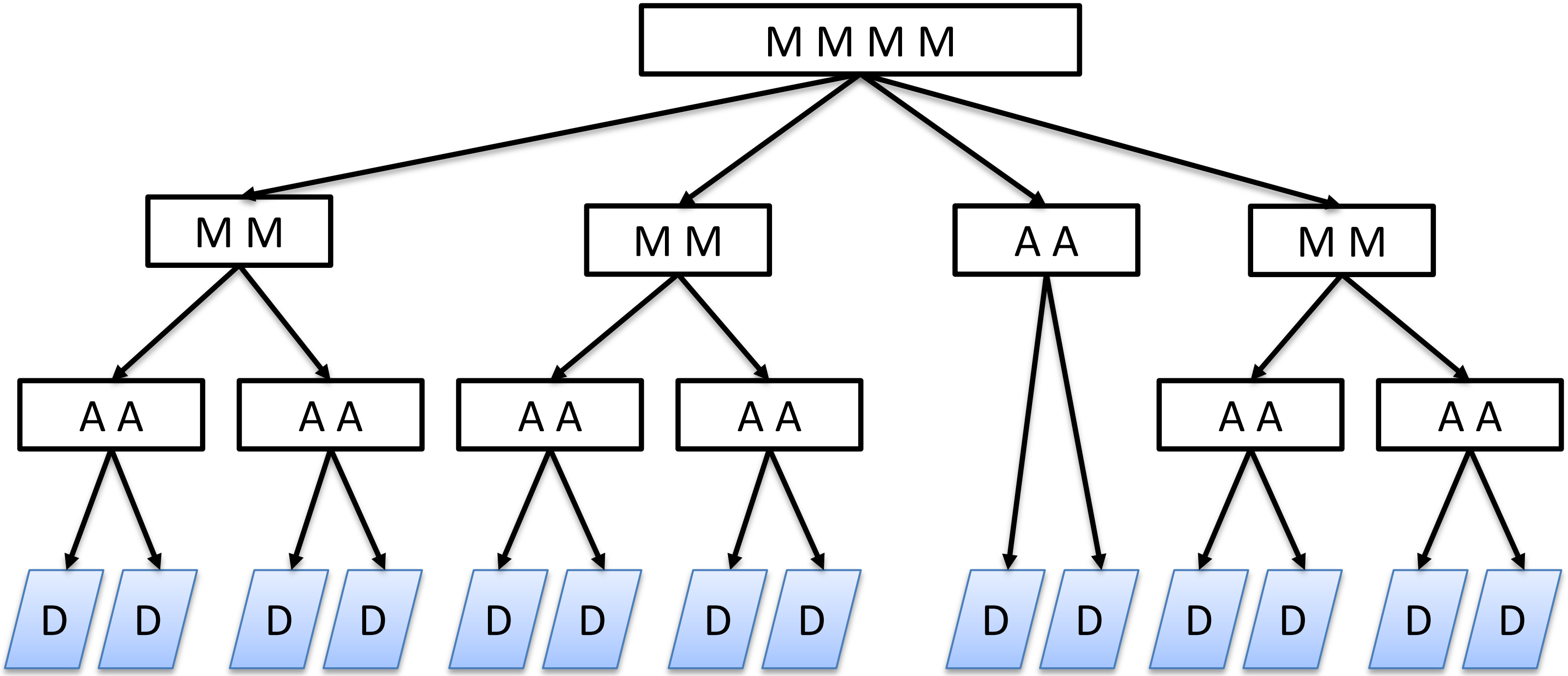


*Each FLIC packet (Node TLV) only has one set of Locators. If you need different locators for different HashGroups, you need to put only one HashGroup type per packet.*

# Multiple Routing Hints

- If, for example, Manifests use one set of Locators and App Data uses a different set of Locators, then each FLIC packet must be all Manifest or all AppData pointers.
- I.e., a tree where all internal Manifests only have Manifest pointers and all leaf Manifests only have App Data.

# Example of single-kind manifests



# Topics Not Discussed

- Encryption
- Metadata like SubtreeSize, SubtreeDigest, LeafSize, LeafDigest
- Schemas: InterestDerivedName, DataDerivedName, and PrefixName.
- ProtocolFlags

# Q&A