ICN Content Security Using Encrypted Manifest and Encrypted Content Chunks

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Abstract and Background

Ubiquitous/opportunistic caching in ICN:

- Benefit: enables receiving content from nearest node with content in cache
- Drawback: content owner loses distribution control and analytics info

Proposal solves aforementioned issue by:

- Generating encrypted content
- Encrypting manifest per consumer
- Modifying the Namespace in initial Interest message for authentication, authorization, and analytics

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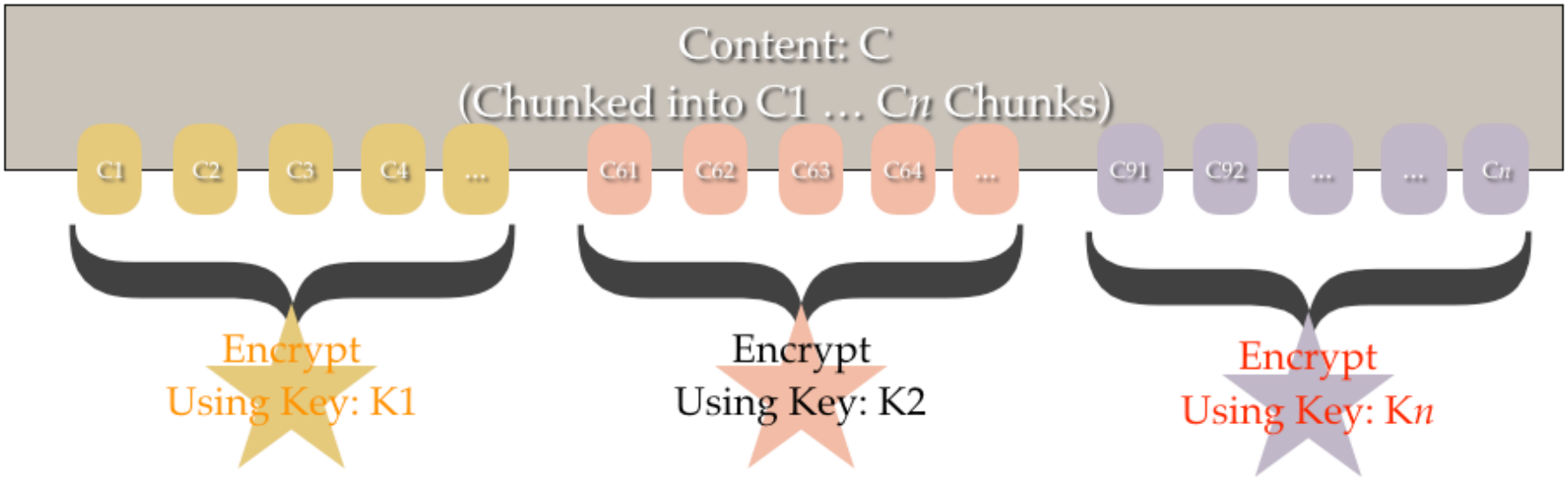
Design – Chunking and Encryption

Chunk (divide into pieces) Content File

Encrypt Chunks using a separate Key(or Key Pair) for every set of Chunks (1 … *n*) to Node Group (1 … *n*) pairing



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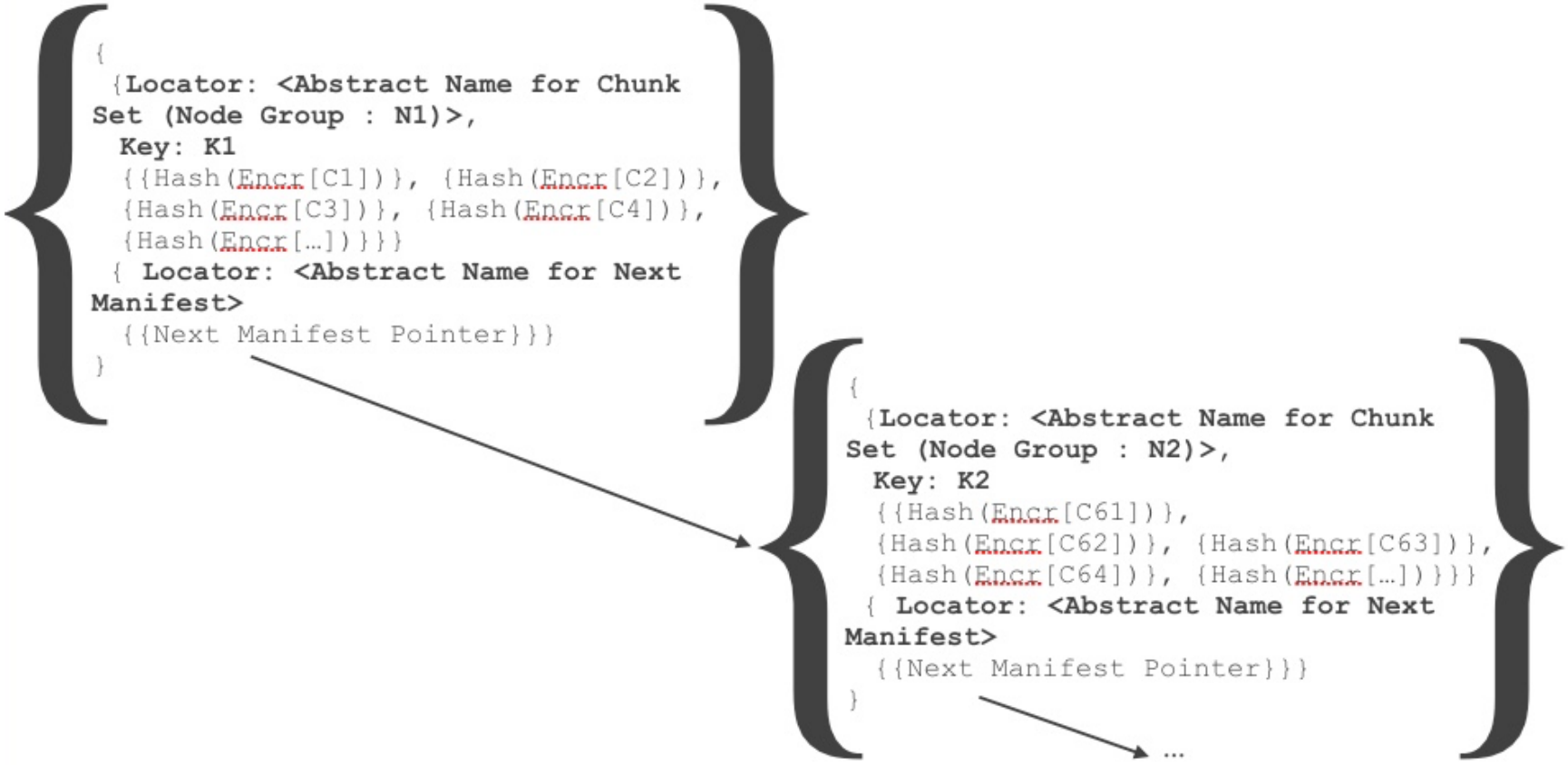
Design: Manifest Generation

Create the Manifest (include Nameless Object Reference (Hash of Encrypted Chunks) and encryption credentials



Design: Namespace Modification

Namespace modification for Interest messages takes the form of a consumer_ID plus nonce encrypted with the public key of the producer/provider

Example: namespace modification from different consumers for the same content

```
/foo/bar/content1/ID=dfdec888b72151965a34b4b59031290 --encrypt(<random> + consumer1234)
/foo/bar/content1/ID=21596697d99734b8ac404c4baa3988a --encrypt(<random> + consumer5678)
```

Example: namespace modification from same consumer for any content

```
/foo/bar/content1/ID=22f65b72888151965a903129034b1b5 --encrypt(<random> + consumer1234)
/foo/bar/content2/ID=855c3697d9979e78ac404c4ba2c6653 --encrypt(<random> + consumer1234)
```

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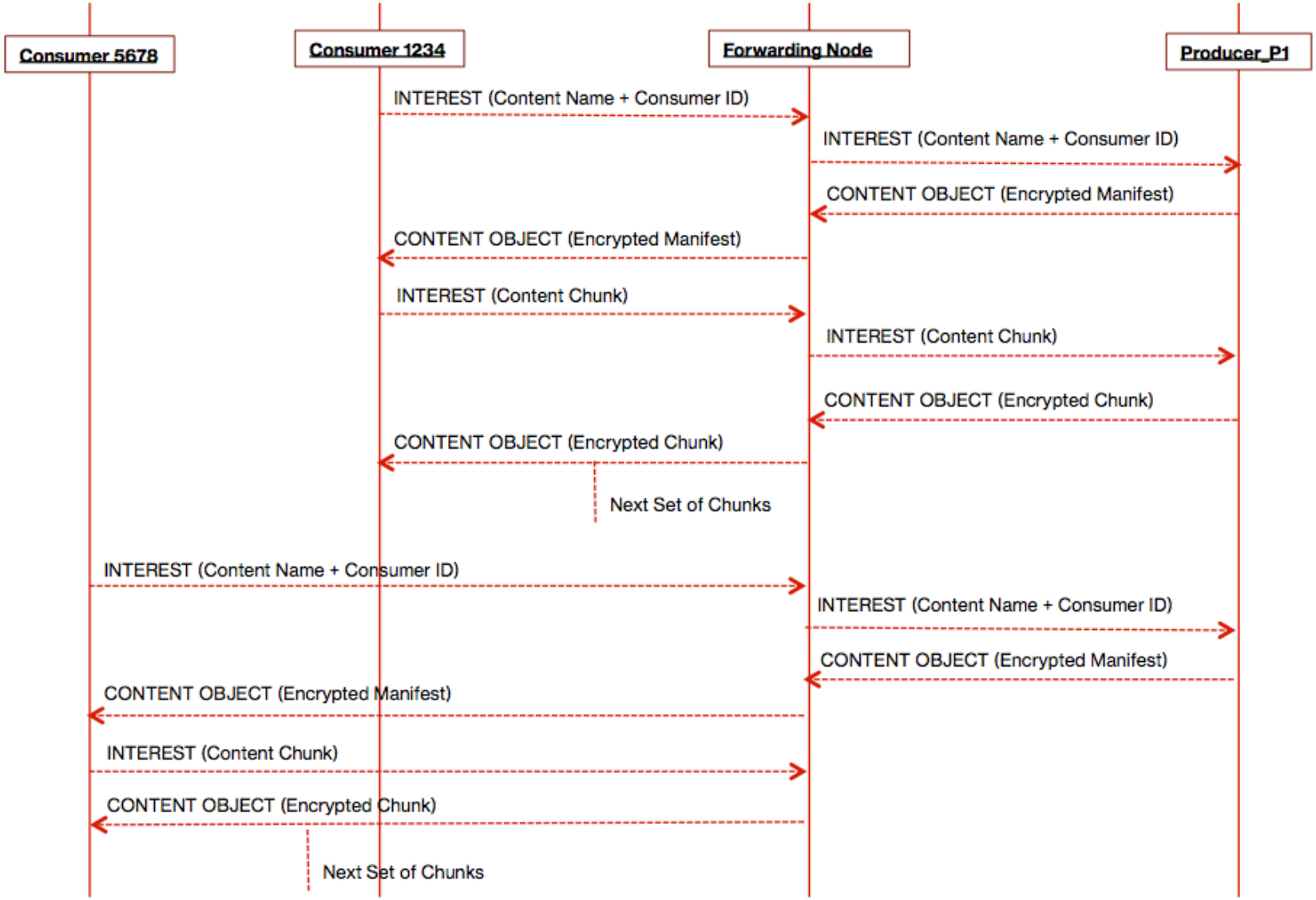
Design: Delivery



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Summary

ICN Content Security:

- Provides a scalable and distributed method for content access control and usage analytics
- All chunks can be cached ubiquitously achieving bandwidth savings
- Consumer Identifier in namespace guarantees uniqueness for Manifest Interest allowing discrete distribution control
- Longest prefix match results in efficient and manageable FIB sizes across the network

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Thank you.

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