Forward Secrecy in ICN?

A) Yes

B) No

C) It Depends…

What is Forward Secrecy (FS)?

Loose Definition: exposure of principals' long-term secret keys does not compromise the secrecy of previous session keys.

Attacker: Someone (or something) logging traffic and trying to recover long-term keys.

Good and Bad

Benefits:

- Minimal data and key compromise windows
- Reduced attack vector

Drawbacks:

- Requires protocols, techniques, etc. for deriving fresh or updating keys regularly

ICN Literature (Subset) Breakdown

Work	Not FS
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ICN Literature Summary

Existing “object encryption” techniques are not forward-secure

What's in the "Real World"?

- Application layer
  - DNS-over-TLS
  - HTTPS
- Session-layer
  - TLS
  - DTLS
  - QUIC
- Transport-layer
  - tcpcrypt

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  - tcpcrypt FS

Claims

- If ICN is to be used for “Internet or IoT applications,” then it should at least be at parity with current Internet protocols
  - What else will it be used for?...
- Current Internet protocols are forward secure **because** key management is difficult
  - Key compromise should not harm past communications (=data transfers)

Argument #1: Data at Rest vs. Data in Transit

Transferring encrypted data at rest

Transferring (encrypted) data encrypted in transit

Argument #1: Data at Rest vs. Data in Transit

Transferring encrypted data at rest

Transferring (encrypted) data encrypted in transit

- Data in transit can be captured
- Data at rest is more difficult to acquire
- The keys protecting the content at rest are protected the same way
- So, transporting data without forward secrecy is distinctly less secure

Argument #2: Untrusted Caches are Not Helpful

Untrusted caches:

- Enable data correlation across multiple users
- Perform **no** authorization checks for interests
- Swallow usage statistics and make per-content accounting difficult

Argument #3: Network Names Reveal too Much

- TLS-protected traffic reveals IP addresses and ports
- Unencrypted and partially-encrypted interest names reveal all or some data context

```
/netflix/content/media/movies/TheAvengers/Chunk=0
/akamai/cdn/0x1827347182331…
```

- The name encryption “boundary” in ICN is an application decision…
  - … and developers make mistakes.

Q1) Under what conditions does transport security require forward secrecy?

Q2) Can object encryption subsume transport security?

Q3) Forward Secrecy in ICN?

A) Yes

B) No

C) It Depends…