

NFD forwarding pipelines

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Overview

- Forwarding consists of pipelines and strategies
- Pipeline: a series of steps that operate on a packet or a PIT entry
- Strategy: a decision maker on whether, when, and where to forward an Interest

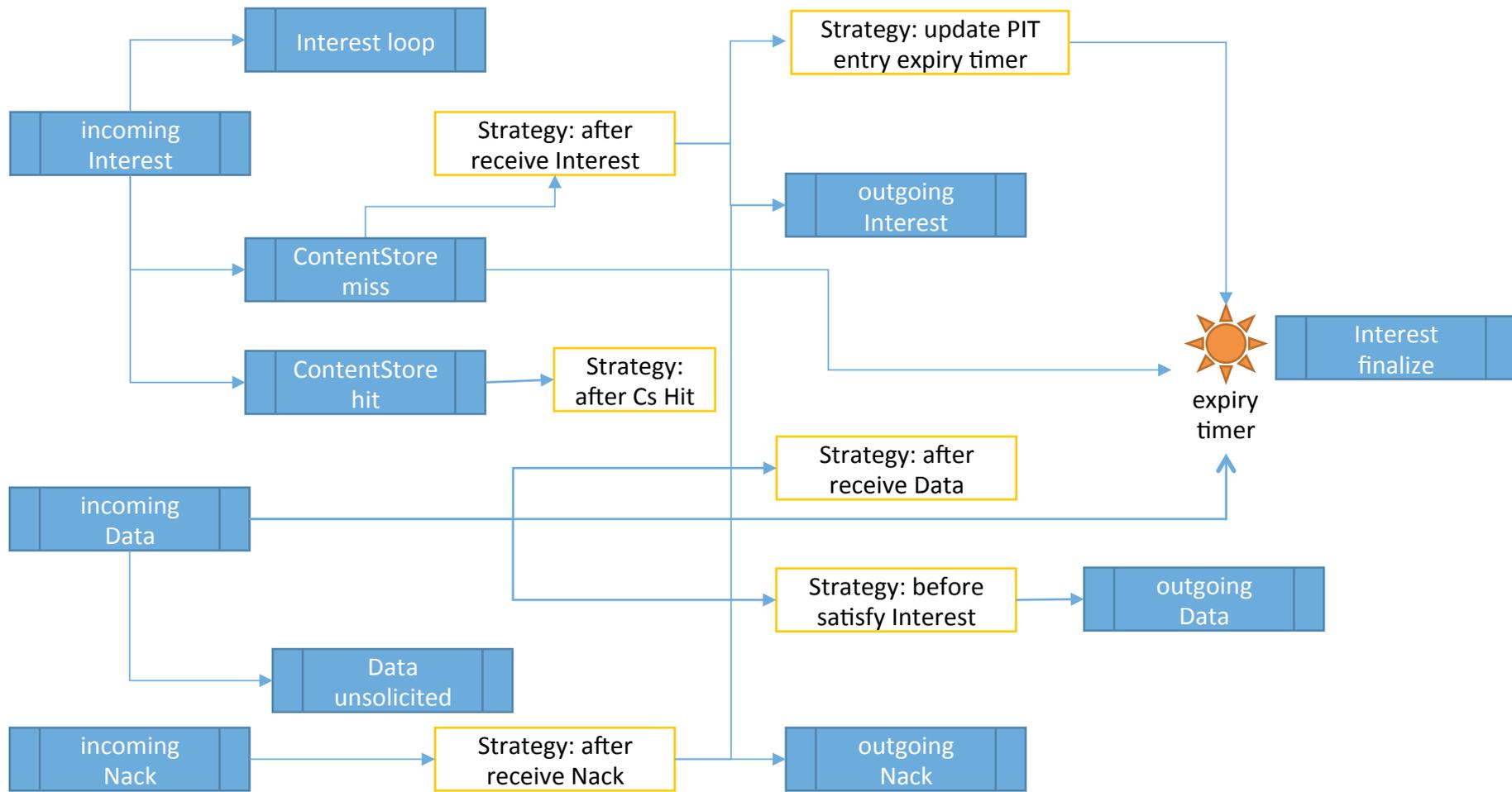
Pipelines

- incoming Interest
 - Interest loop
 - ContentStore miss
 - ContentStore hit
 - outgoing Interest
 - Interest finalize
- incoming Data
 - Data unsolicited
 - outgoing Data
 - incoming Nack
 - outgoing Nack

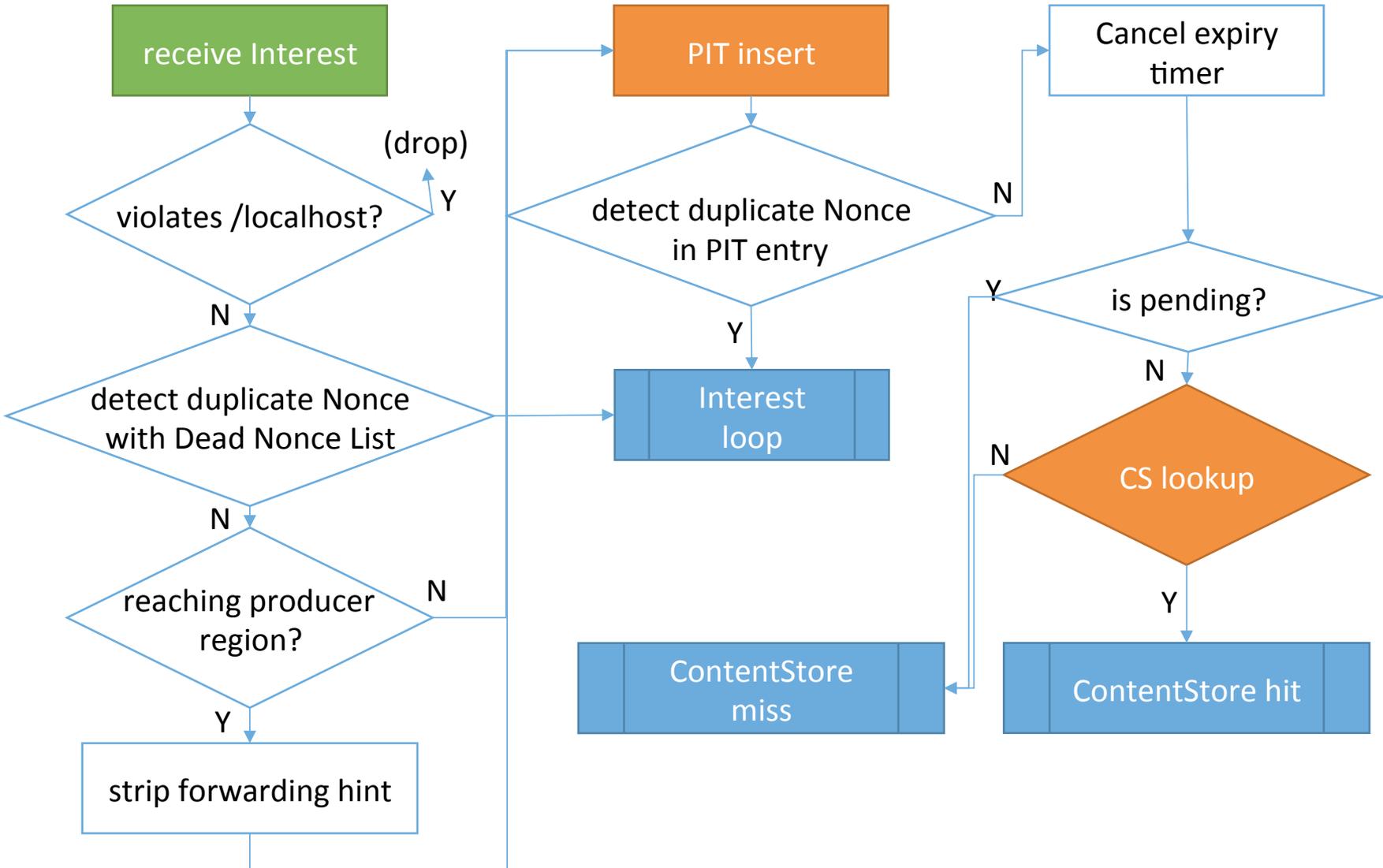
Legend in diagrams



Pipelines Overall Workflow



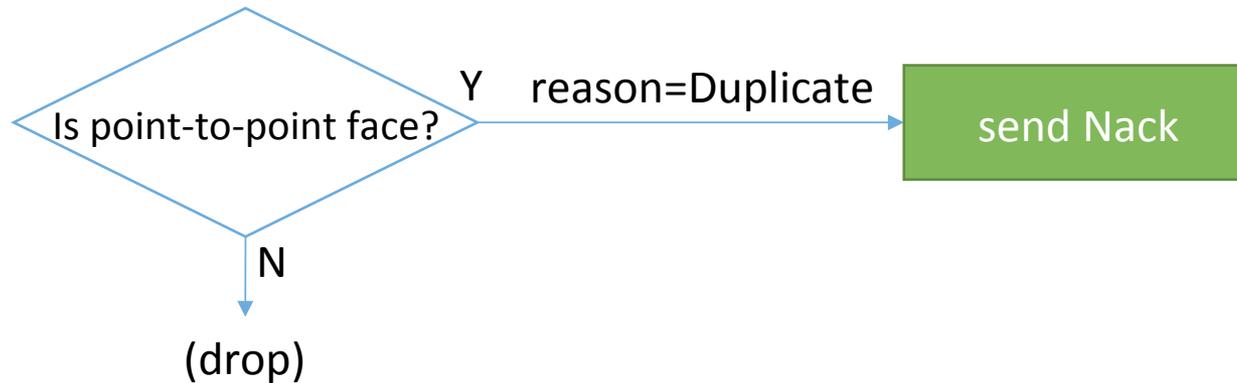
incoming Interest pipeline



detect duplicate Nonce

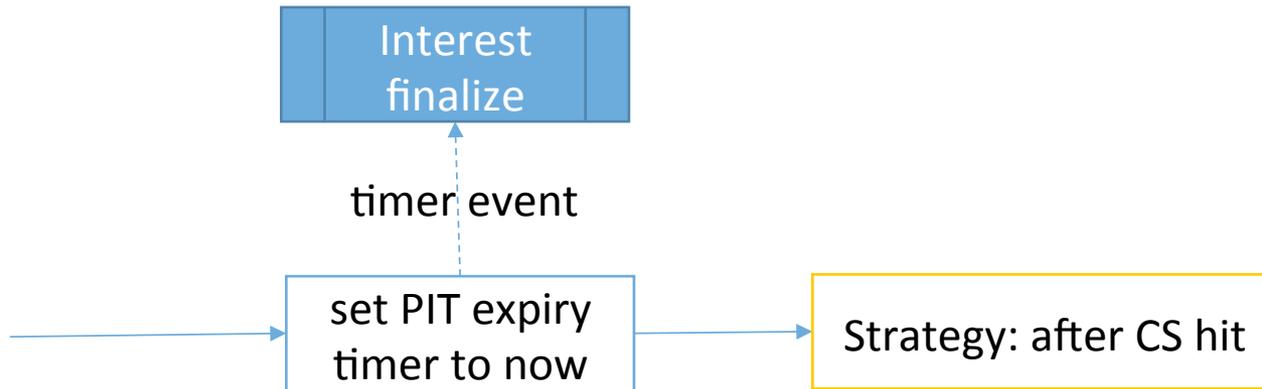
- If the Name+Nonce of the incoming Interest appear in Dead Nonce List, or any InRecord or OutRecord in PIT entry contains the same Nonce as the incoming Interest, a duplicate Nonce is detected.
 - If the duplicate Nonce is found in InRecord only, this is a multi-path arrival, and not a loop.
 - If the duplicate Nonce is found in OutRecord or Dead Nonce Table, this is either a multi-path arrival or a loop, and these two reasons are indistinguishable.
- Nonce is later recorded on an InRecord.

Interest loop pipeline



- Process an Interest that has been considered looped.
- Keep this simple for now: unconditionally send Nack-Duplicate when duplicate Nonce is detected.
- Don't enter outgoing Nack pipeline: in-record isn't inserted yet.
- In the future, strategy could be invoked, because duplicate Nonce may be multi-path arrival instead of loop.

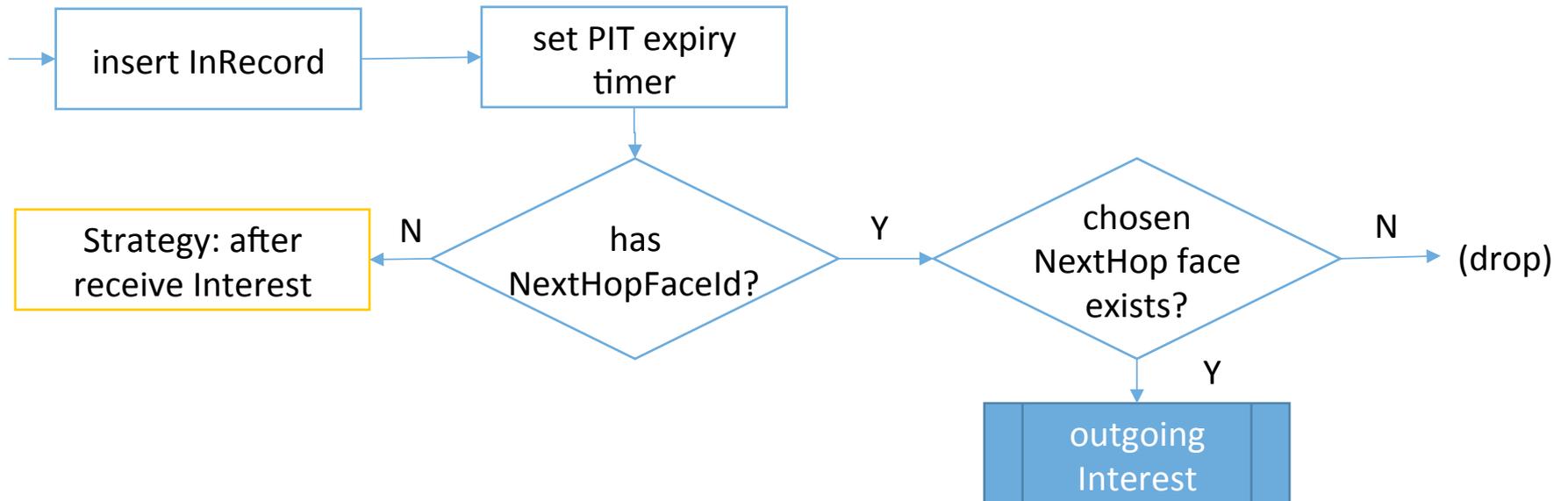
ContentStore hit pipeline



- Dispatch matched Data in CS to strategy
 - Given PIT entry and incoming Interest, determine which strategy should process this matched Data, and trigger that strategy

ContentStore miss pipeline

- This pipeline is entered when an incoming Interest
 - is pending (so ContentStore lookup is unnecessary), or
 - is miss from ContentStore
- This pipeline will start forwarding the Interest

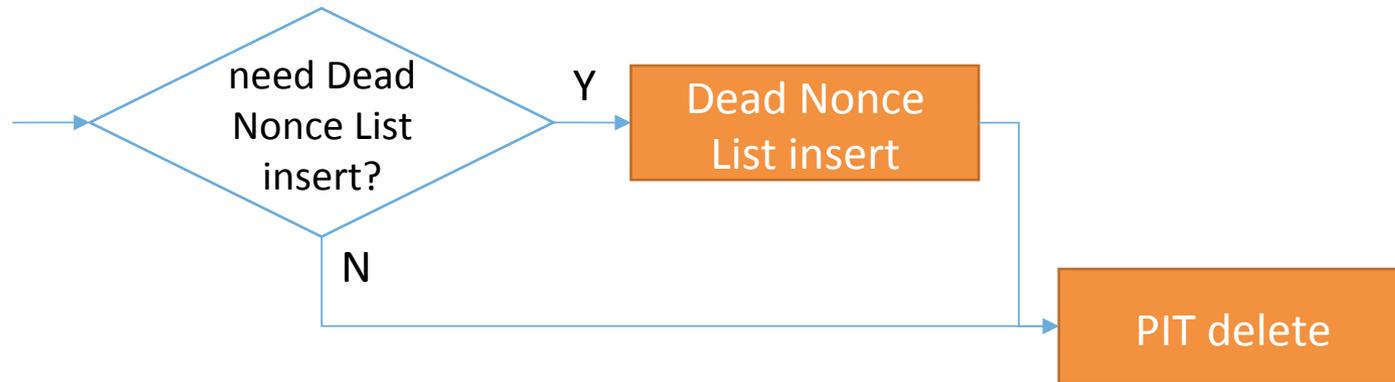


- Given PIT entry and incoming Interest, determine which strategy should process this Interest, and trigger that strategy

outgoing Interest pipeline



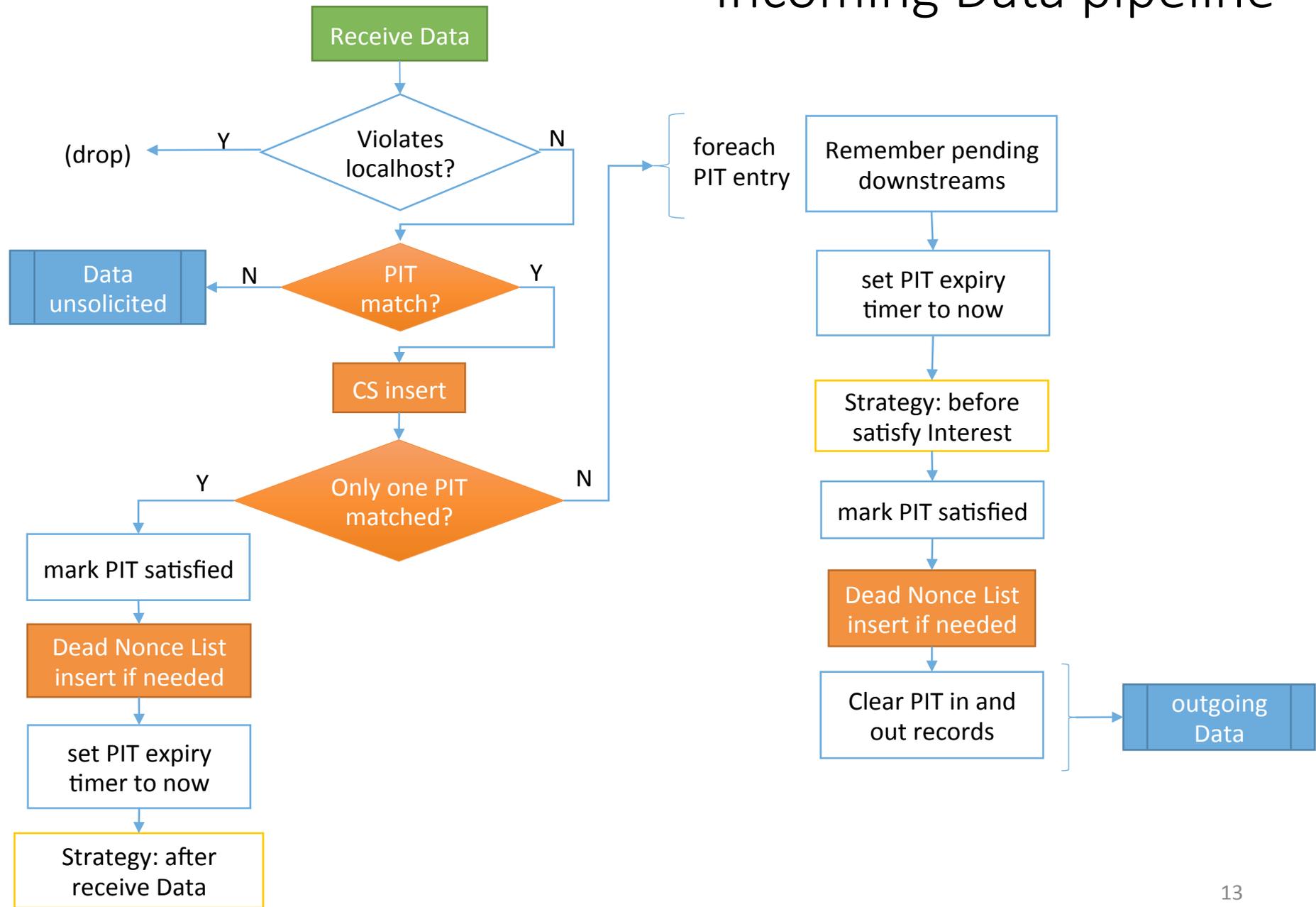
Interest finalize pipeline



- **Dead Nonce List insert**

- Dead Nonce List insertion is needed if:
 - Interest is unsatisfied, OR
 - Interest has MustBeFresh=yes and Data FreshnessPeriod is shorter than 6 seconds
- Nonces in OutRecords are inserted to Dead Nonce List.

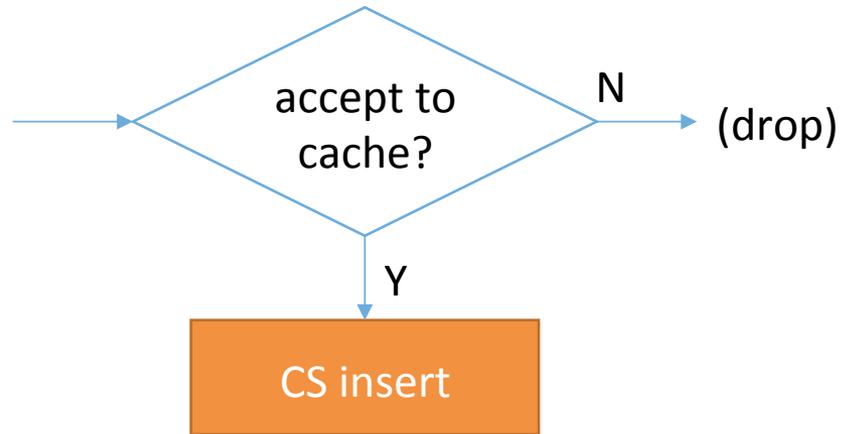
Incoming Data pipeline



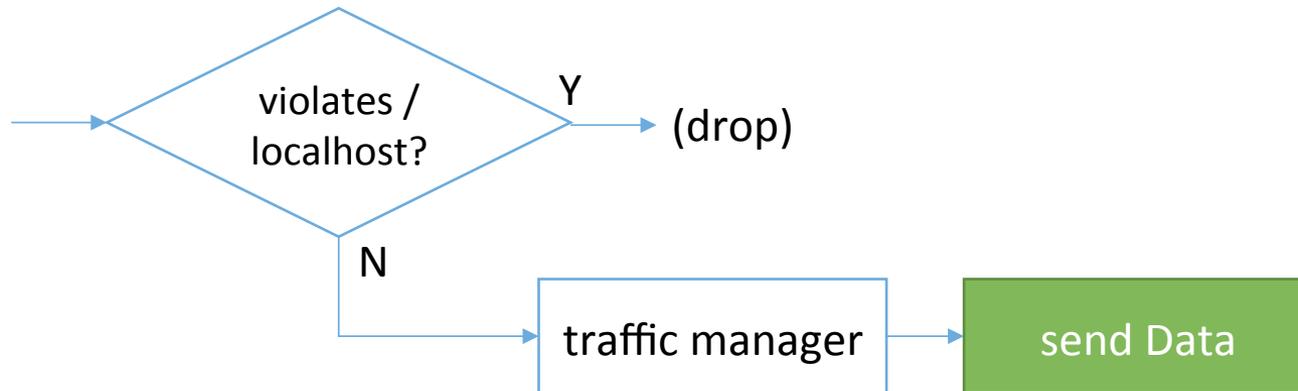
Dispatch incoming Data to strategy

- Given PIT entry, determine which strategy should process this Data, and trigger that strategy
- Strategies can use `strategy::sendDataToAll` helper function to send Data to all matched out Faces.

Data unsolicited pipeline



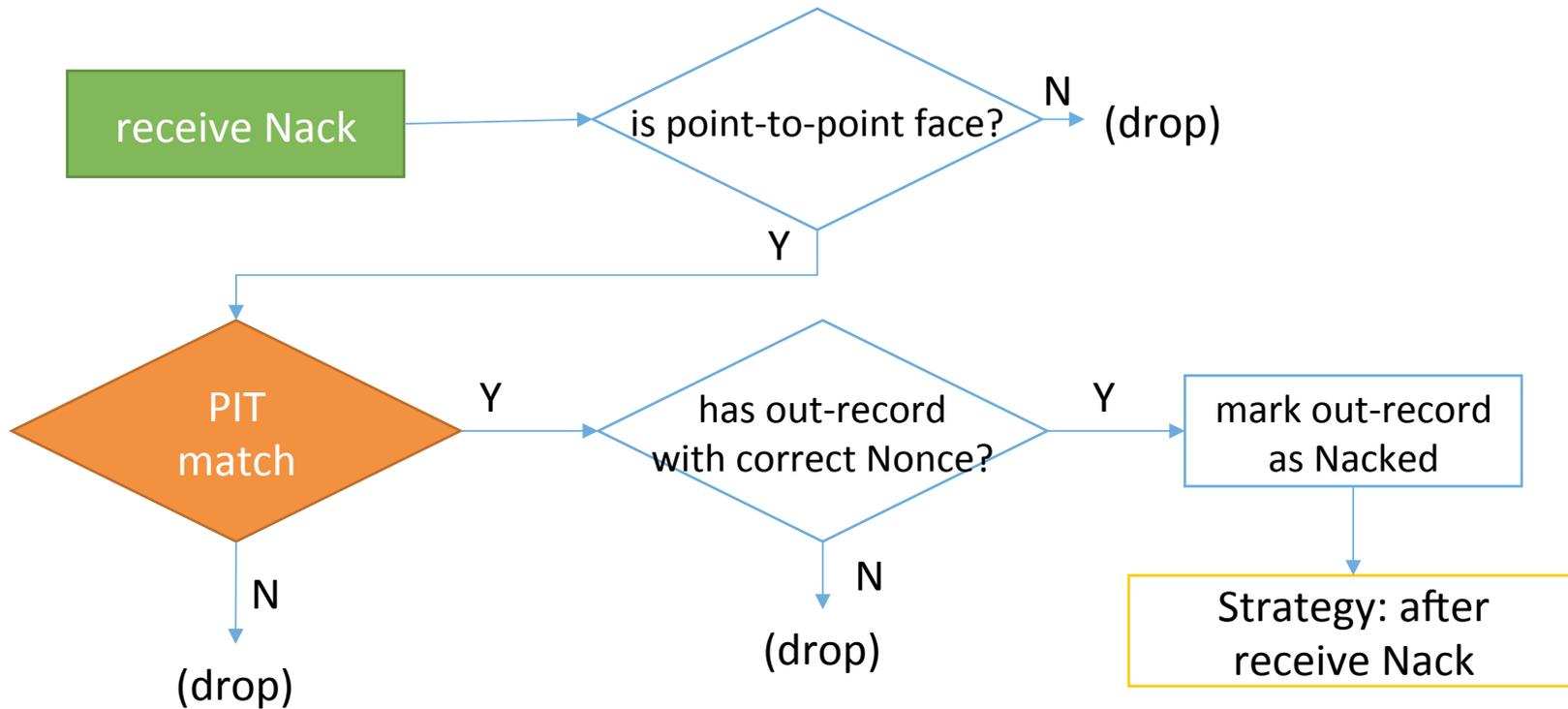
outgoing Data pipeline



Pass-through traffic manager

- Provide a traffic manager that does nothing and merely passes Data packet to the next step

Incoming Nack pipeline



Outgoing Nack pipeline

