



Applicability and Tradeoffs of ICN for Efficient IoT

`draft-lindgren-icnrg-efficientiot-03`

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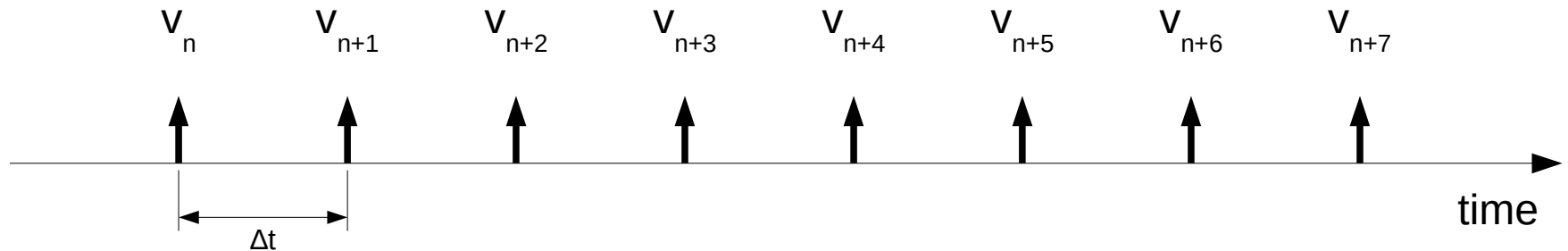
Recap: objectives

- Explore the opportunities and challenges of using ICN for the Internet of Things
 - Advantages and inconveniences
 - Design choices and trade-offs
- Main objective is to support efficient and scalable IoT over existing ICN designs
 - But avoid requiring IoT-specific changes of ICN as far as possible

Updates in -03

- Quite some overall polish
 - Hopefully a bit more consistent terminology, etc
- Streams of immutable IoT data
 - e.g., probing for most current value, gaps in sequence number space
- Importance of time
 - e.g., issues with explicit time in names
- Handling actuators
 - e.g., relation to caching and security
- Security
 - e.g., clarified the different kinds of security (data integrity, authenticity and confidentiality)

Streams of data

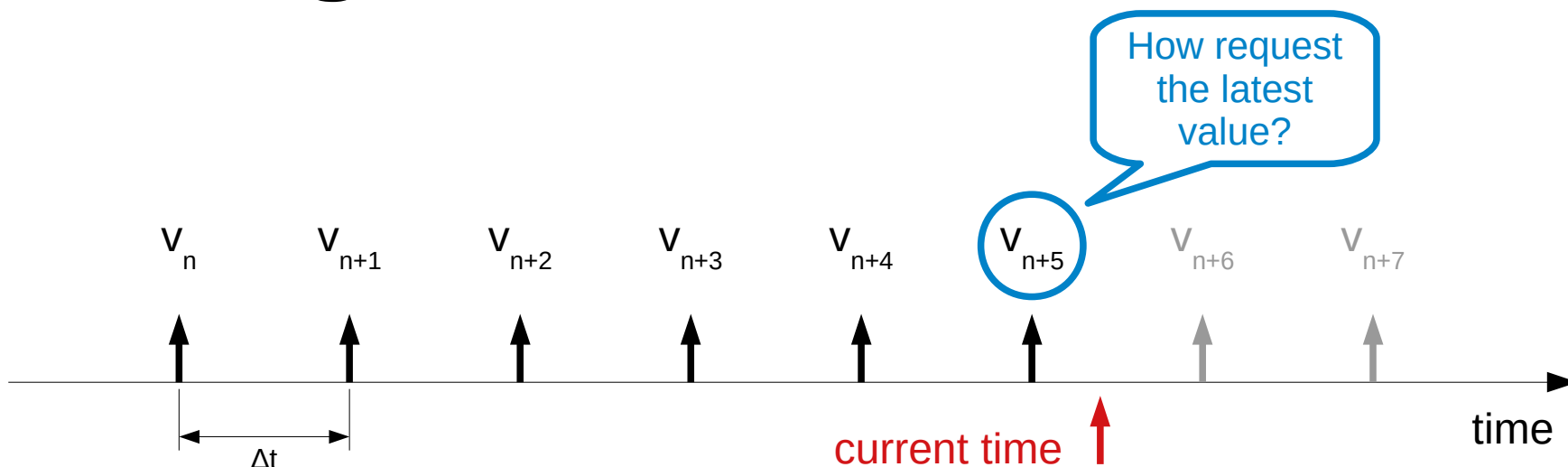


- Common with sensors that produce new values now and then
 - often at regular time intervals, whether it is sub-second or days
 - sometimes on demand
- Represent these with a name with sequence numbers
- Each value is immutable
- Very similar, if not identical, to live video streaming!

Streams of immutable data

- Values of the stream can be individually cached
 - No need to play tricks with caching (TTL etc)
 - Requesting old values work without issues
- How do clients find the “current” value?
 - Can be guided by advertised capabilities
 - Can make use of metadata
 - Can make use of subscription service
 - if available – requires state!
 - Can first request without sequence number
 - if possible – resulting in a data object with any sequence number
 - Can probe the sequence space (next slide)

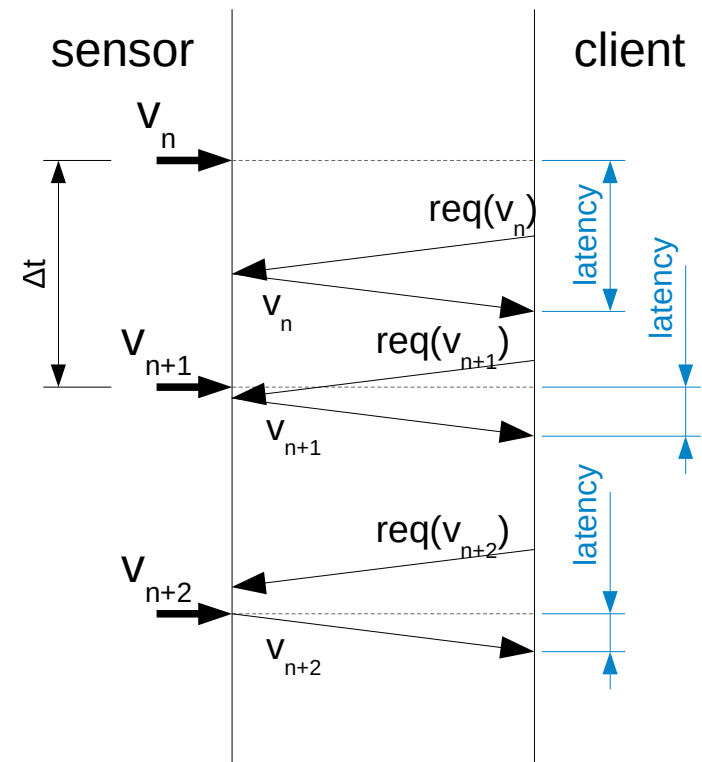
Probing for the latest value



- Need a starting sequence number:
 - sensor capability advertisement, application knowledge, request without sequence number
- Search (binary) or probe the sequence number space from the starting point
 - gaps (if common) would be a problem

Probing and latency

- Can probe arbitrarily close to time of availability
 - provided fixed frequency
 - (first two requests in figure)
 - potential issue with requesting non-existing data
- If data publisher (sensor) holds a request a short time until the value is available
 - the request acts as a one-time subscription
 - minimises latency
 - (last request in figure)



Importance of time

- Time is almost always important for IoT data
 - Should be possible to request data from a particular time
- Approach:
 - *Use only the sequence numbers* to name data
 - Let the application provide mapping between sequence numbers and time
 - Can be part of capability advertisement, metadata, or part of the actual IoT data
 - No need to extend the ICN service
- Alternative: Explicit time as sequence number
 - Would result in large gaps, making probing not work

Handling actuators: 2 models

- 1. Actuator state is represented by stream of immutable named data objects
 - Actuator regularly has to request its new state
 - Someone has to publish that state
 - “Clean” mapping to ICN's object and interaction model
 - May have issues with actuation latency and efficiency
- 2. Actuation invoked as a side-effect of receiving a particular request
 - State might be encoded in the name requested or supplied as additional information
 - Actuator might respond with its state in the data returned
 - Issues with security (authenticity and access control)
- Models could be combined
 - Request (model 2) that triggers the actuator to request its new state (model 1)

Summary

- draft-lindgren-icnrg-efficientiot updated to version 03
- Clarified a number of issues:
 - Sequences of immutable data
 - Importance of time
 - Handling actuators
 - Security