MIPv6 Binding Lifetime Extension

MOBOPTS RG

IRTF/IETF-60

Jari Arkko *(jari.arkko@nomadiclab.com)*

Christian Vogt *(chvogt@tm.uka.de)*

Outline of the Presentation

- Reasons for optimization
- RFC 3775 approach to lifetimes
- Our proposed alternative approach
  - Simple - no config, no fancy crypto, one new option
  - Based on exponentially earned lifetime credit
- Analysis
  - Up to 70-fold decrese in amount of signaling

Reasons for Optimizations

Reasons for Optimization

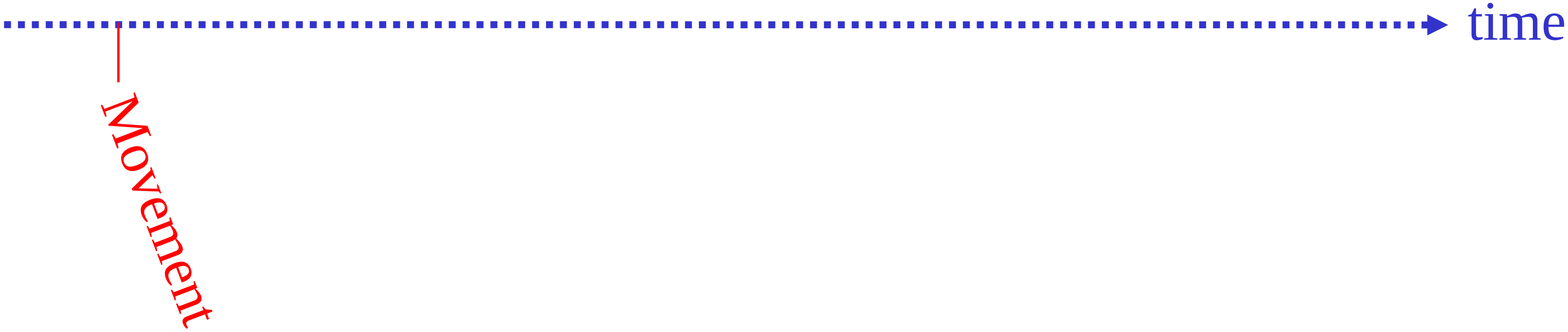
- RFC 3775 RR efficiency:
  - Generally requires 6 messages (376 bytes)
  - These are per movement and per peer
  - And two round-trips
- Not a problem for current normal usage
  - Not issue upon movements because the rest of stack uses even more messages
- However, it can still be an issue when
  - Nodes don’t move that often
  - The rest of the stack becomes faster

Nodes that do not move often

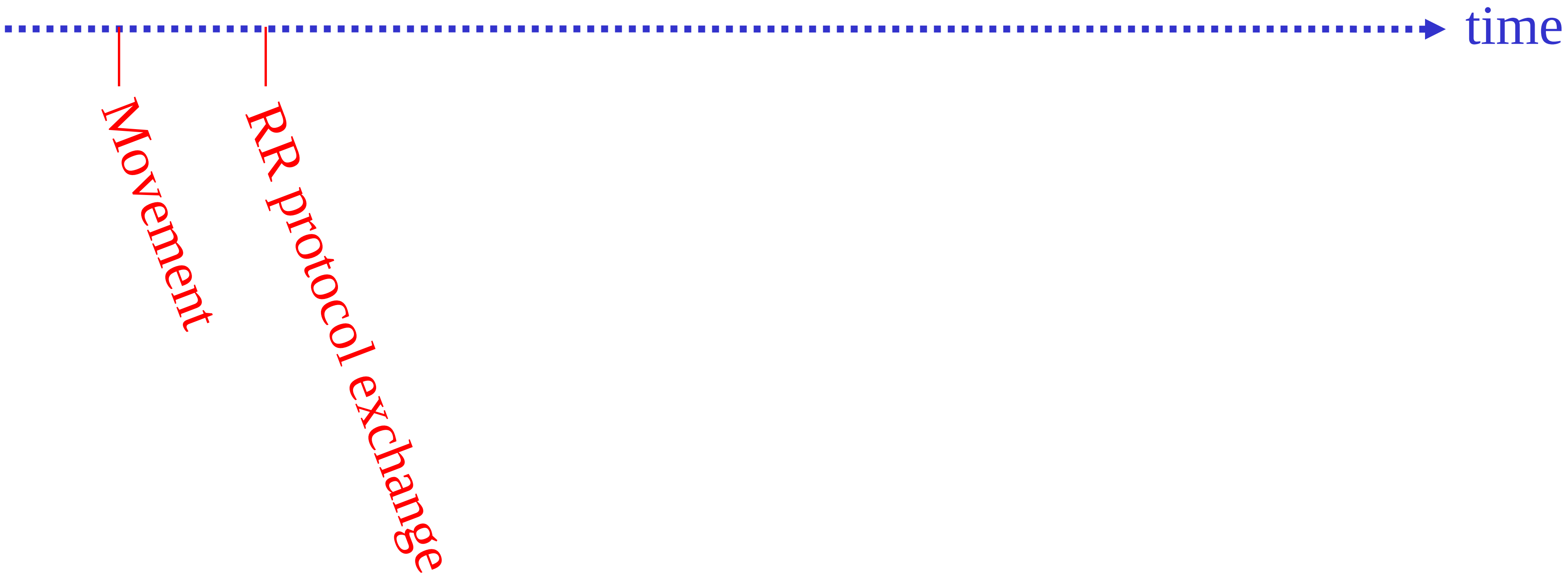
- Movement frequencies
  - Movement is inherently infrequent on many link layers (GSM, UMTS, CDMA)
  - While frequent movements can happen on some link layers (WLAN), it is unlikely to be the most common case
- RFC 3775 RR causes 7.16 bits/s, if a node wishes to keep its RO state up
- This is not that significant, but waking up every few minutes may be

RFC 3775 Approach to Lifetimes

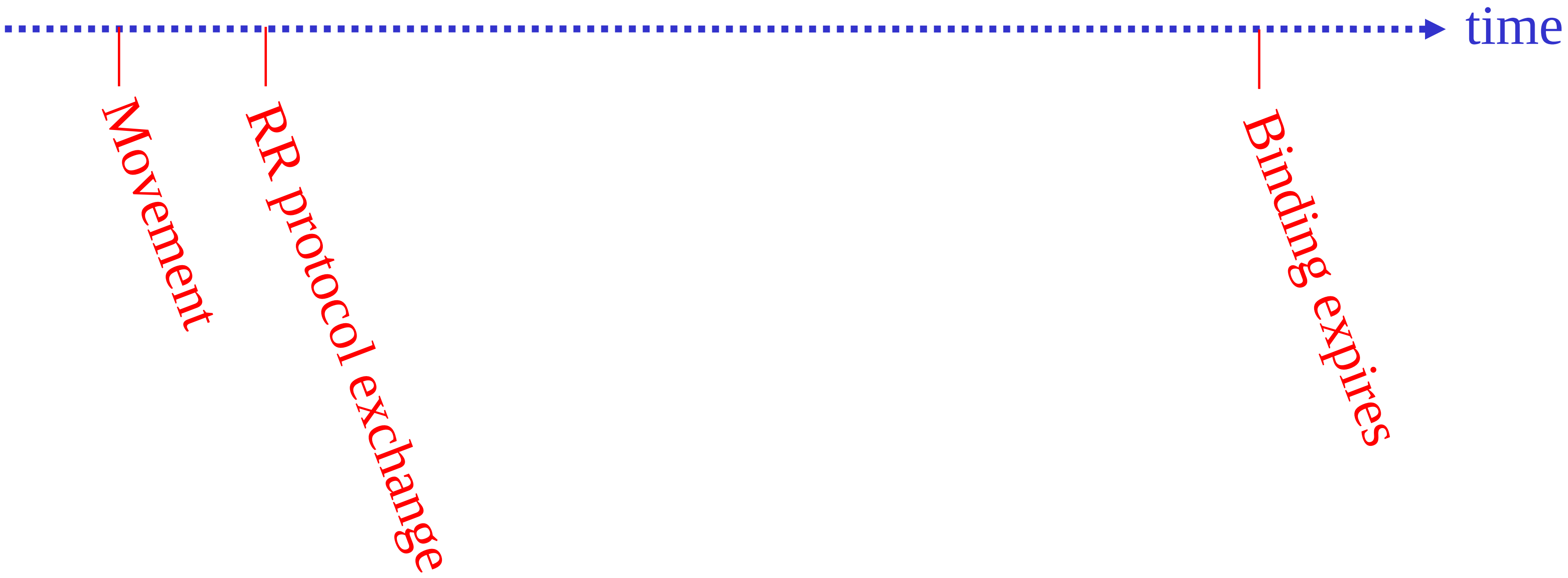
RFC 3775 Approach to Lifetimes



RFC 3775 Approach to Lifetimes



RFC 3775 Approach to Lifetimes



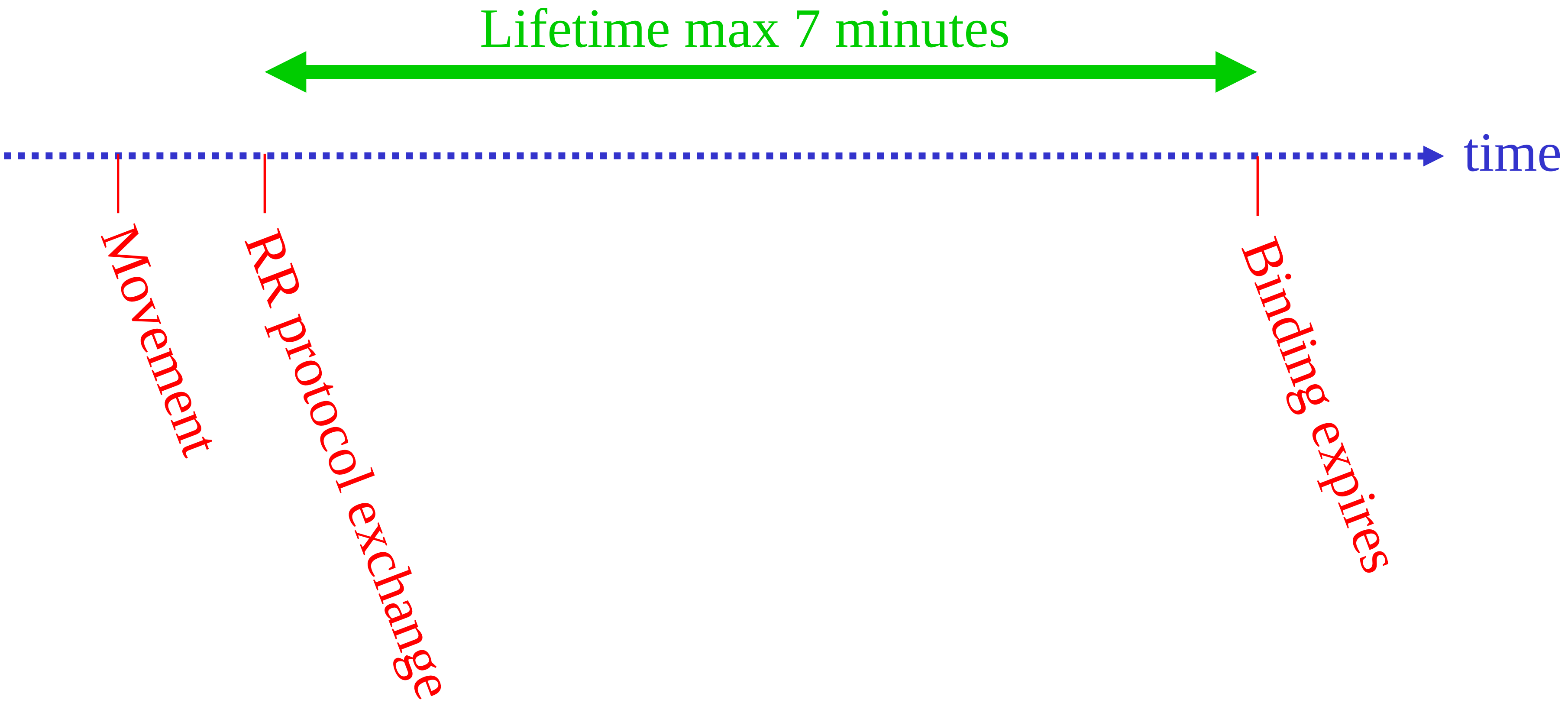
time

Movement

RR protocol exchange

Binding expires

RFC 3775 Approach to Lifetimes



Why Have the Max Limit?

- It limits so called *time shifting* attacks
- If there was no limit, I could visit your network *today* and launch an amplified DoS attack on it *next month*
- With current RR, you have to have very recent *physical presence* to do it

Our Proposed Alternative Approach

The Basic Idea

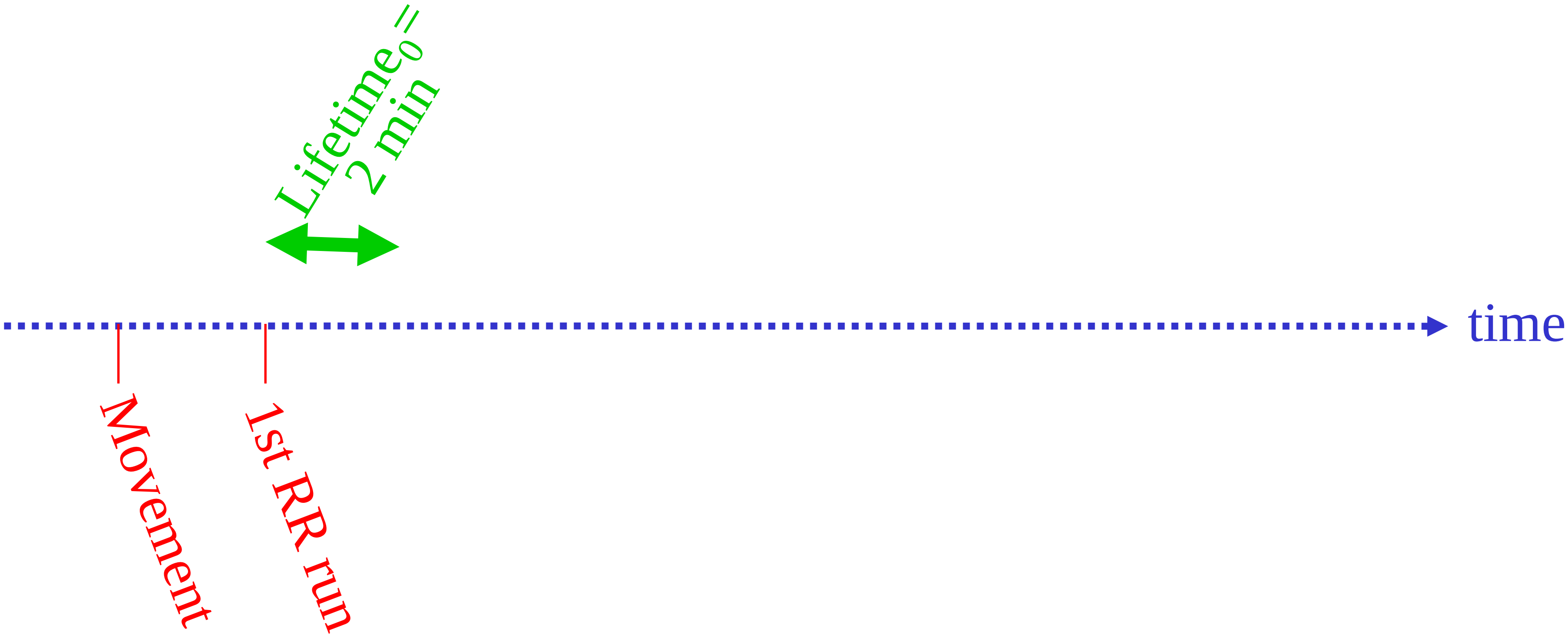
- RFC 3775 rationale for limiting lifetimes is valid but there are other ways to do it besides the fixed limit
- We apply a "lifetime credit" based limit
- A node that just appeared for the first time gets a very short lifetime
- A node that has been on the same place for a long time will get a longer lifetime

The Exponentially Growing Lifetime

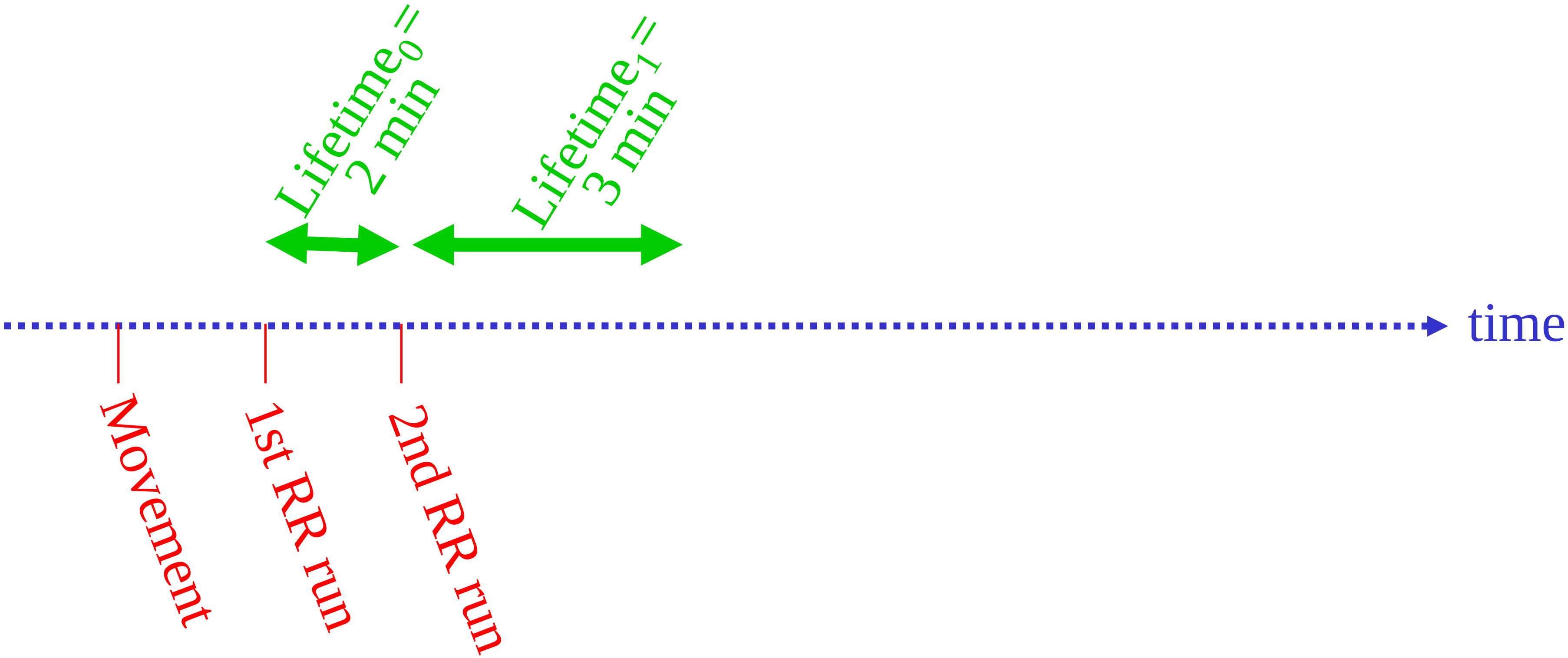
time

Movement

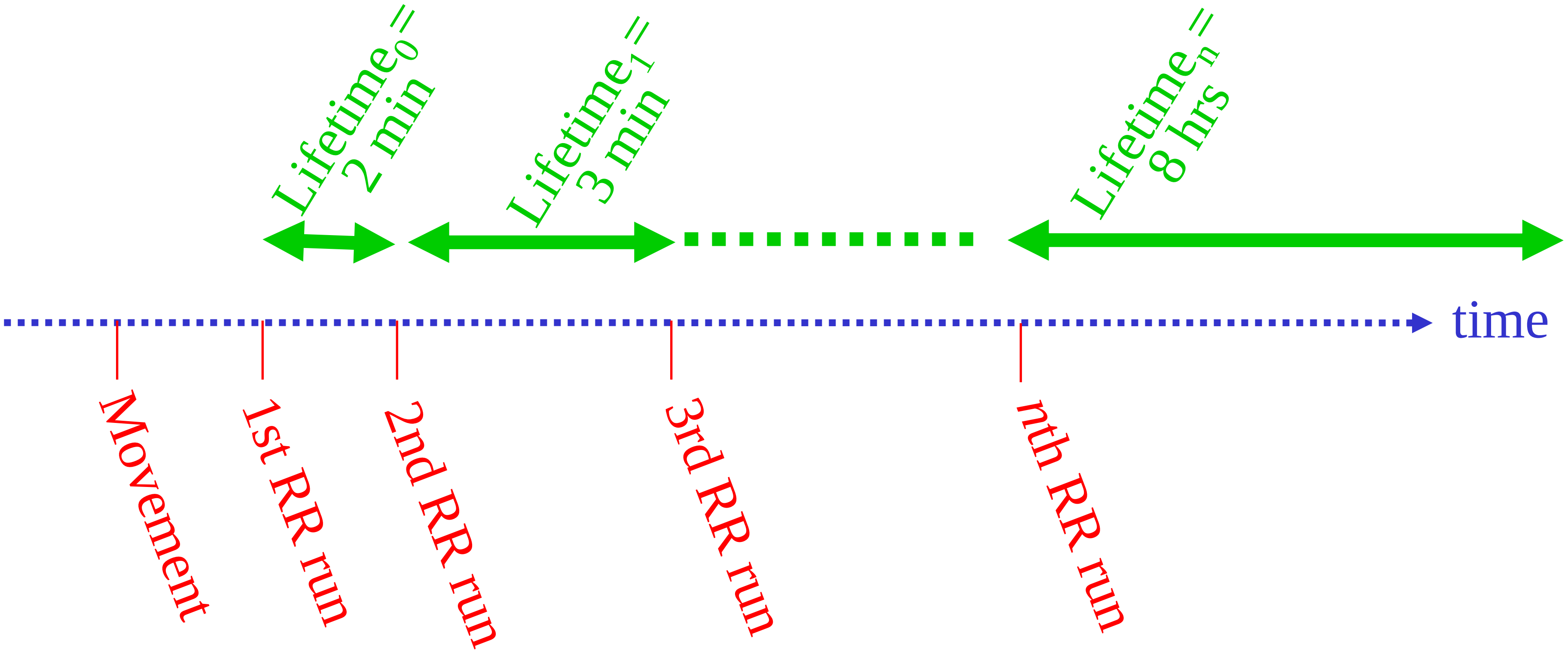
The Exponentially Growing Lifetime



The Exponentially Growing Lifetime



The Exponentially Growing Lifetime



Protocol Details

- The Lifetime Credit Authorization mobility option (inside a BU) carries the request for using this type of lifetimes
- Includes an authenticator which shows knowledge of all past Kbm values at this location
  - Kcredit = hash(KbmN | hash(KbmN-1 | …))
- Movement resets the lifetime back to its initial value

Analysis

Security

- We argue that this lifetime assignment -- even if different from RR -- is at least as fair and secure as in RR
  - First binding(s) after a movement have smaller lifetime than in RR -- less exposure to time shifting attacks
  - Subsequent bindings can have a large (up to 8 hrs) lifetime
  - But the involved nodes must have “invested” physical presence on the link to achieve this for much longer time (at least 24 hrs)

Efficiency

- For seldomly moving mobile nodes, there is less signaling
- 70-fold improvement in the steady state (from 7 bits/s to 0.1 bits/s)
- Nodes that expect to stay in one place at most 7 minutes should use the RFC 3775 method

Questions?