

Managing Resources of Network Nodes Using Append-Only-Logs

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July 12, 2022

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- > TinySSB
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Motivation

- > Solar Community Network

Initial Goals

- › Affordable Hardware
- › Long Transmission Range (Wireless)
- › Resilient Communication Protocol
 - › Low Storage Usage
 - › Low Power Consumption
- › Hardware + Software → Proof-of-Concept

Thesis Focus

- › Affordable Hardware
- › Long Transmission Range (Wireless)
- › **Resilient Communication Protocol**
 - › Low Storage Usage
 - › Low Power Consumption
- › **Hardware + Software → Proof-of-Concept**

Resilient Communication Protocol

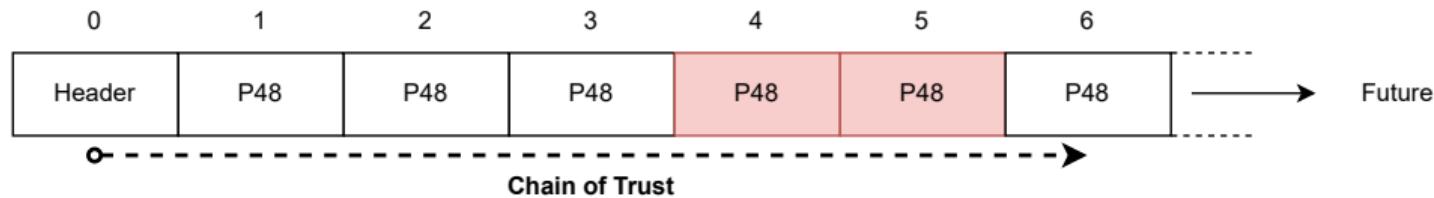
› TinySSB

- › Tiny Version of Secure Scuttlebutt (Peer-to-Peer Communication Protocol)
- › Append-Only-Logs
- › Nodes Replicate Feeds (Packet Requesting)
- › Signed Packets
- › Trust Anchors and Chain of Trust (Authenticity, Integrity)

Feeds

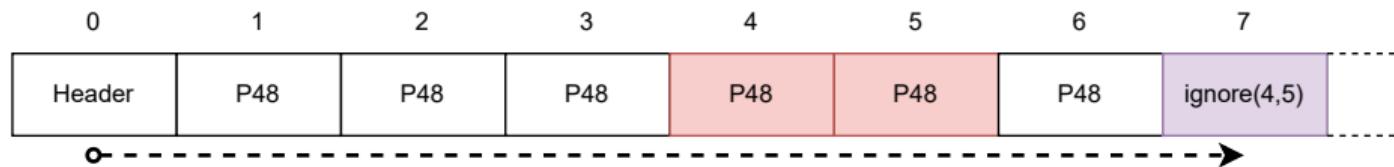
- > Everything Stored in Feeds
- > Child Feeds
- > Continuation Feeds

Limitation: Reverting Packets



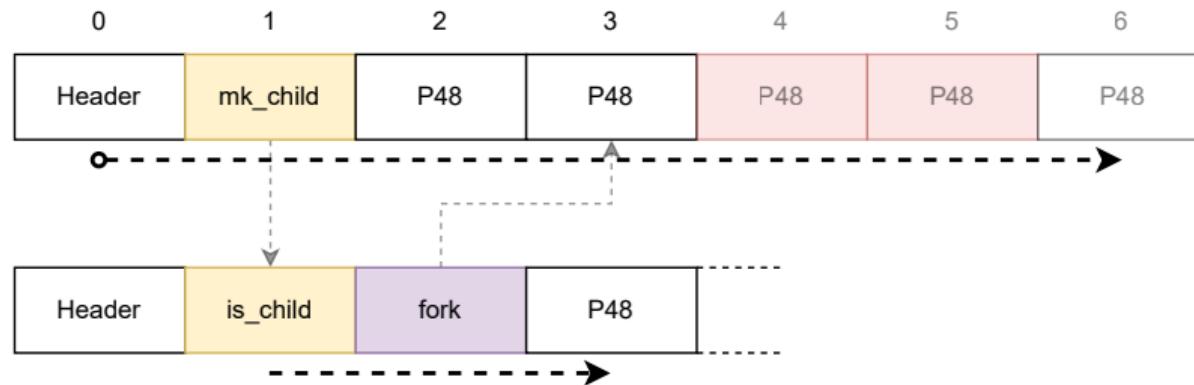
- E.g. Update Feed (Old packets are still of importance)

Simple Fix



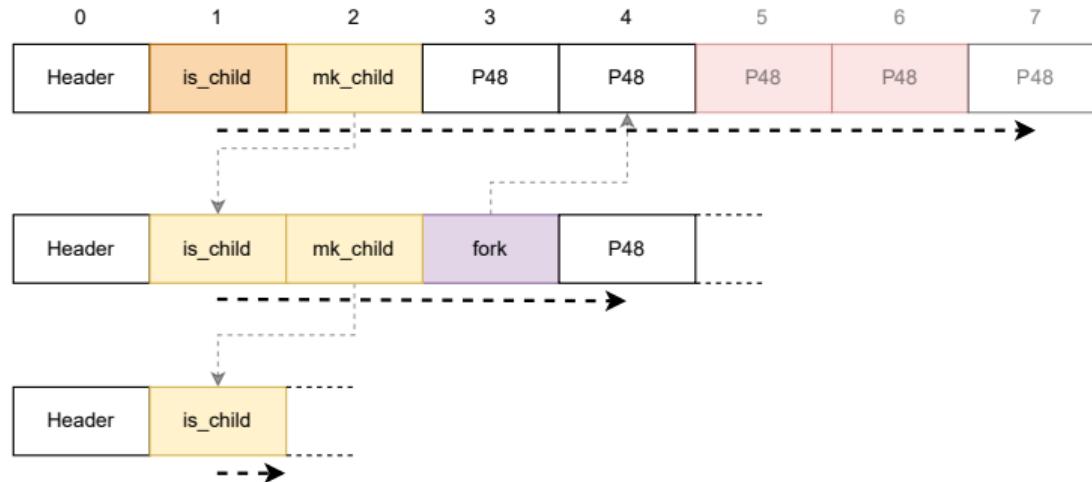
- › (+): faulty packets are ignored, simple data structure (feed)
- › (-): faulty packets still in storage and included in chain of trust

Fork



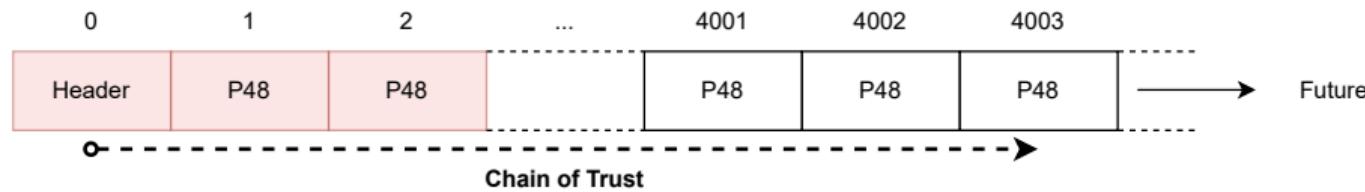
- (+): defined fork position, old feed can stop requesting packets, faulty packets can be deleted
- (-): only one time emergency feed

Solution: Fork Tree



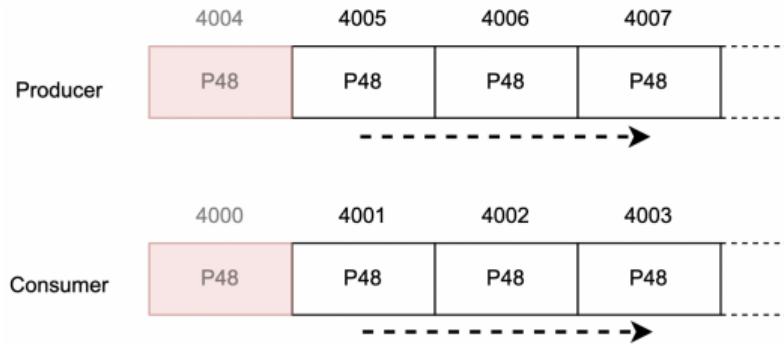
- › (+): no emergency feed limit
- › (-): more complex data structure (some storage and requesting overhead compared to single feed)

Limitation: Deleting Old Packets



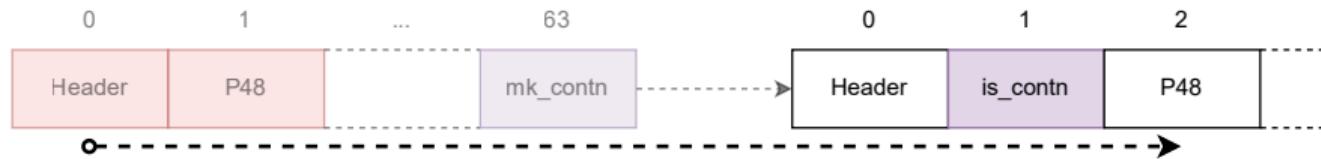
- E.g. Weather Data (Packets not depending on previous packets)

Quick Fix



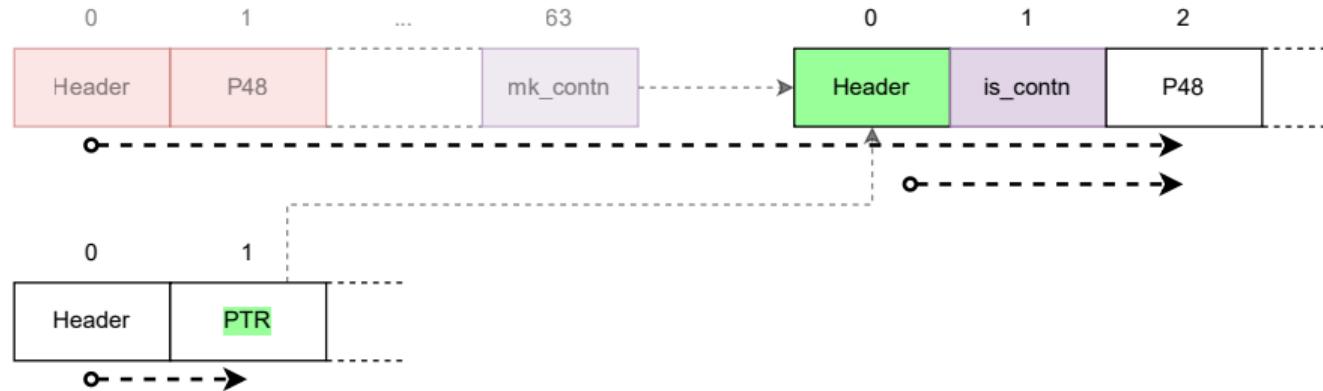
- › (+): Storage problem solved on producer node
- › (-): Consumer may lose chain of trust

Continuation Feeds



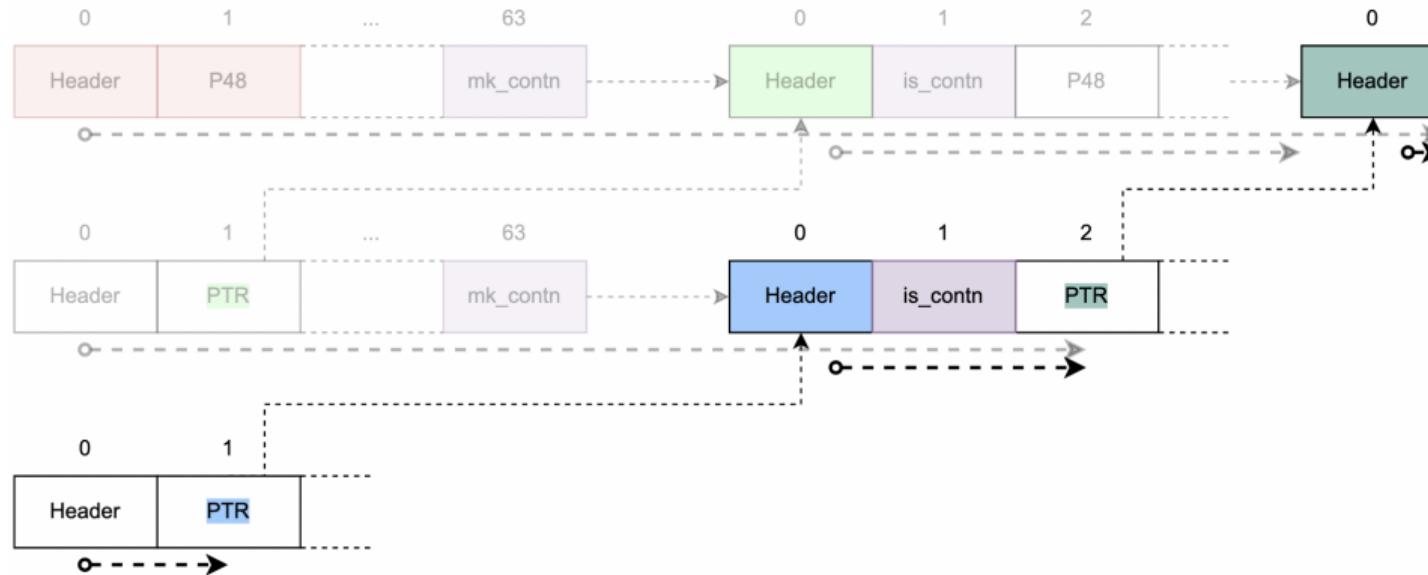
- › (+): Storage problem solved on producer node
- › (-): Consumer may lose chain of trust

Deleting Old Feeds

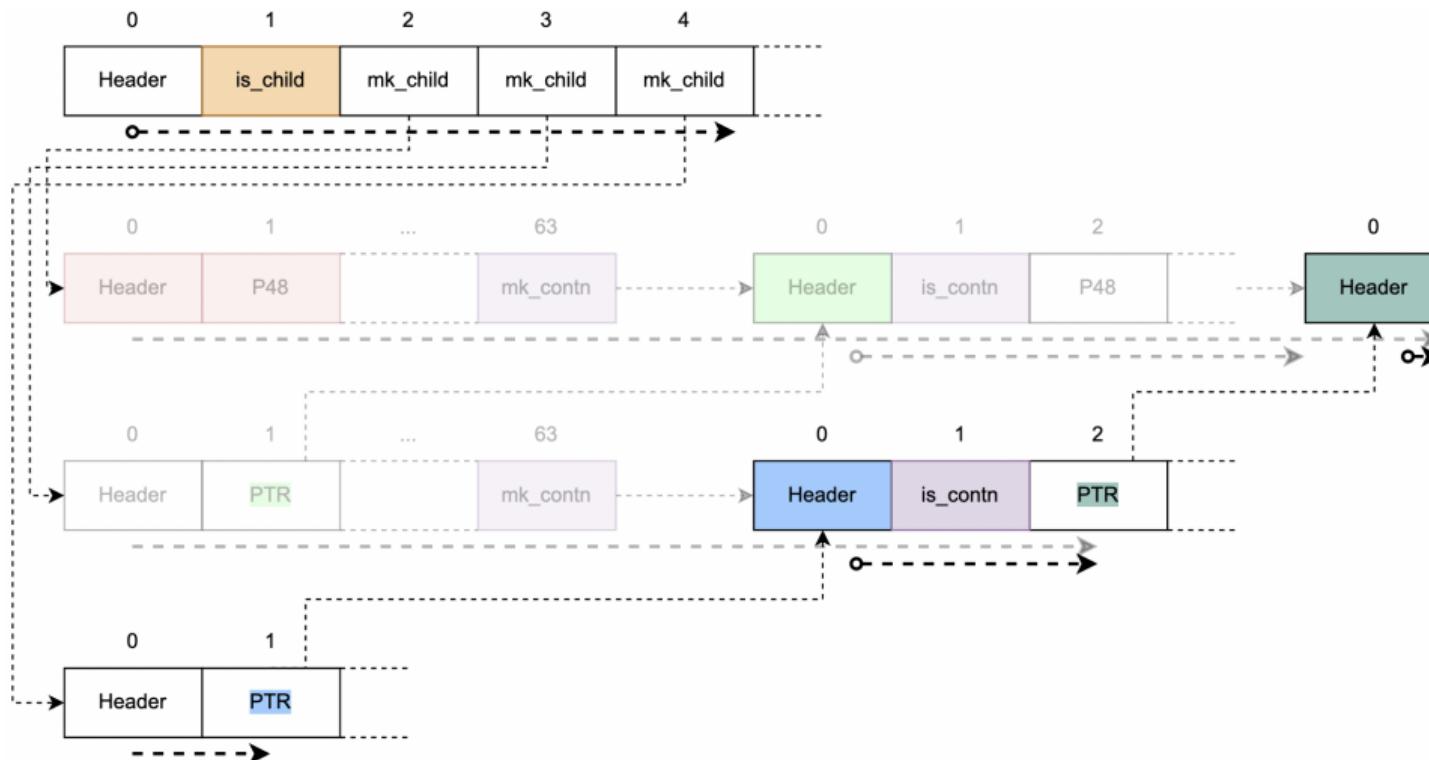


- › (+): Old feeds can be deleted, Consumer reaches new feeds
- › (-): More complex data structure, Pointer Feed can get large

Solution: Session-Tree



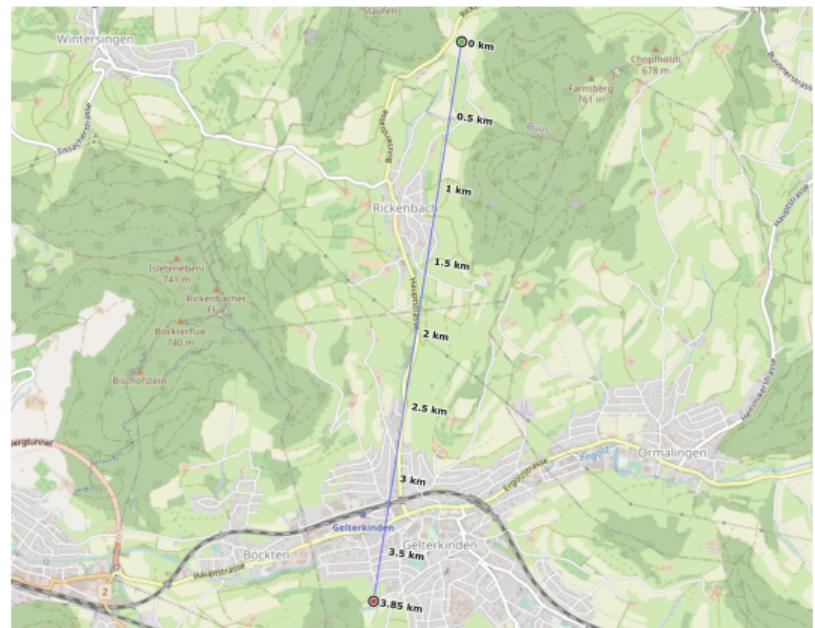
Solution: Session-Tree



Storage and Energy Usage

- › Trees have different storage limitation strategies
- › Energy consumption reduced with efficient packet requesting / handling

Real Life Test



Demo over UDP

- > Fork-Tree
- > Session-Tree