

# Managing Resources of Network Nodes Using Append-Only-Logs

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# Motivation

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- > Solar Community Network

# Initial Goals

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

# Thesis Focus

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

# Resilient Communication Protocol

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## › TinySSB

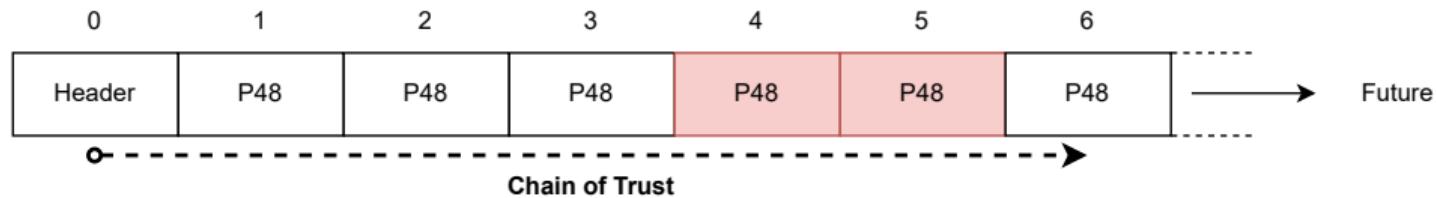
- › Tiny Version of Secure Scuttlebutt (Peer-to-Peer Communication Protocol)
- › Append-Only-Logs
- › Nodes Replicate Feeds (Packet Requesting)
- › Signed Packets
- › Trust Anchors and Chain of Trust (Authenticity, Integrity)

# Feeds

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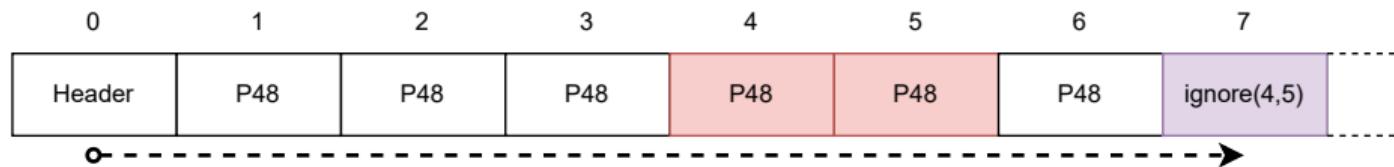
- > Everything Stored in Feeds
- > Child Feeds
- > Continuation Feeds

# Limitation: Reverting Packets



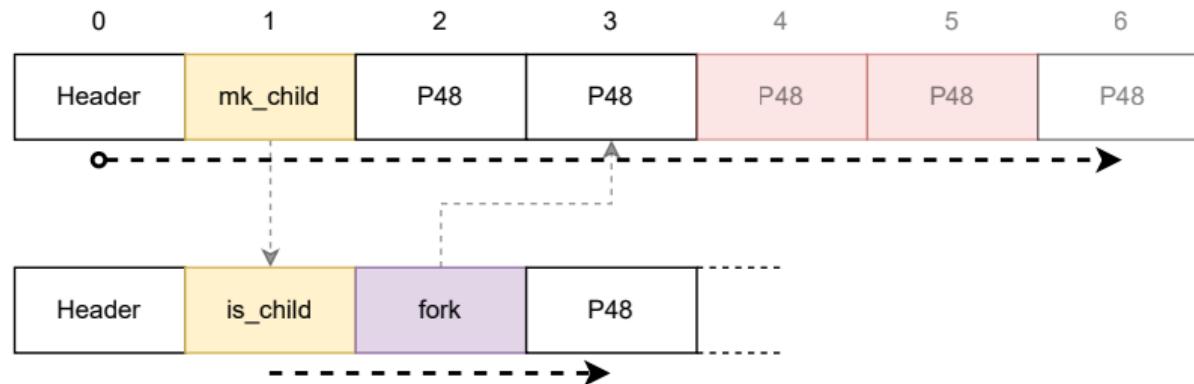
- E.g. Update Feed (Old packets are still of importance)

# Simple Fix



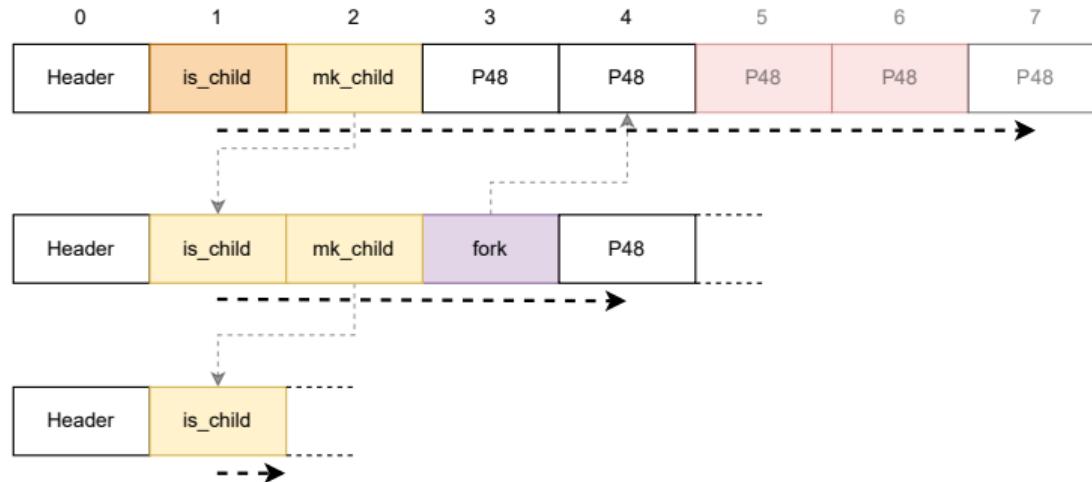
- › (+): faulty packets are ignored, simple data structure (feed)
- › (-): faulty packets still in storage and included in chain of trust

# Fork



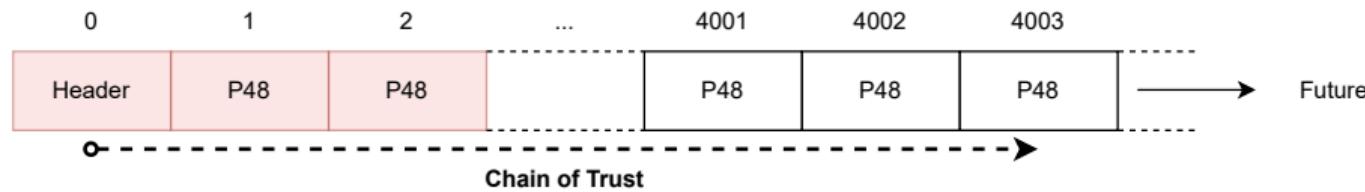
- (+): defined fork position, old feed can stop requesting packets, faulty packets can be deleted
- (-): only one time emergency feed

# Solution: Fork Tree



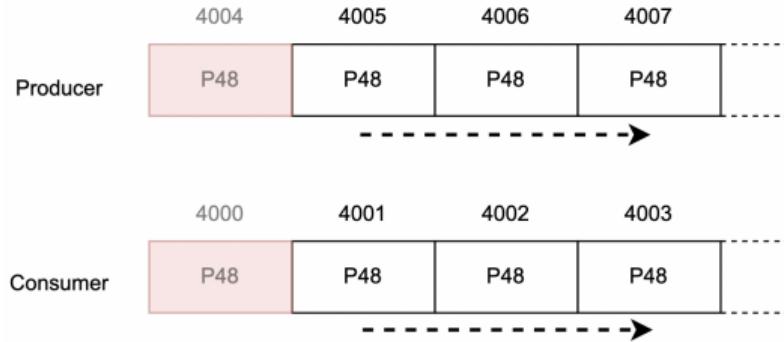
- › (+): no emergency feed limit
- › (-): more complex data structure (some storage and requesting overhead compared to single feed)

# Limitation: Deleting Old Packets



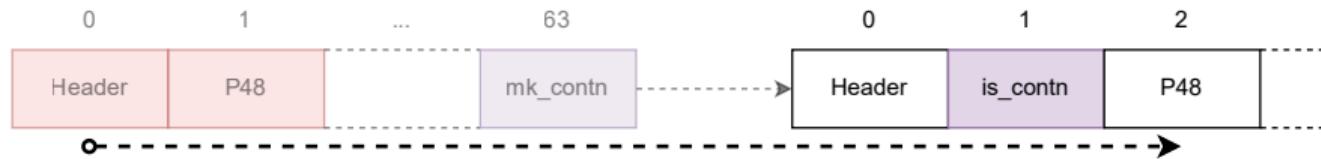
- E.g. Weather Data (Packets not depending on previous packets)

# Quick Fix



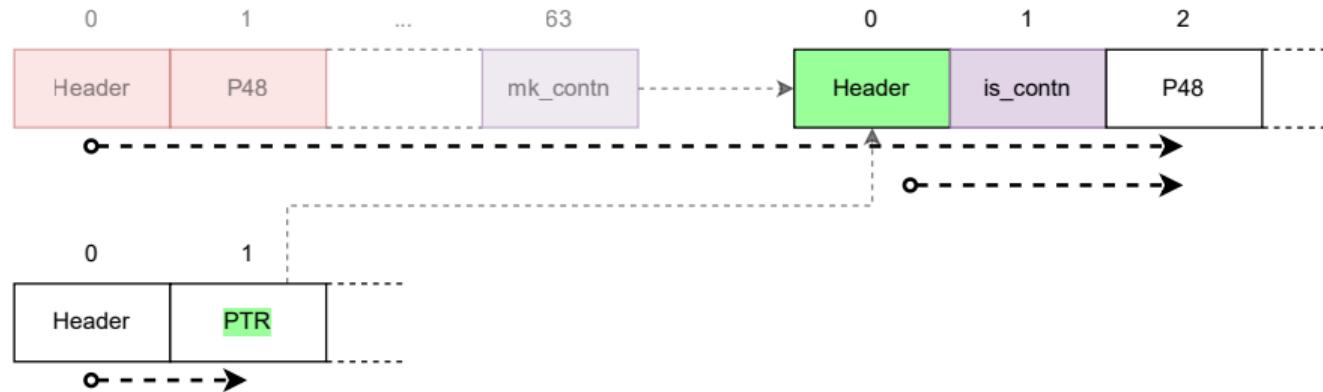
- › (+): Storage problem solved on producer node
- › (-): Consumer may lose chain of trust

# Continuation Feeds



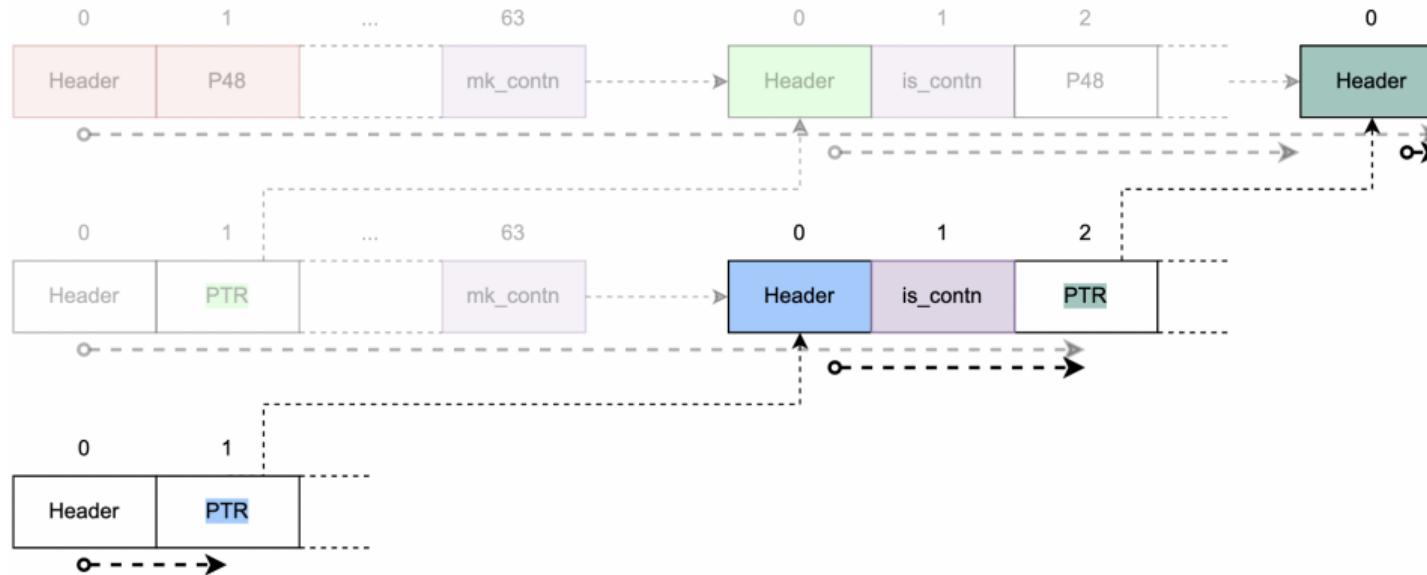
- › (+): Storage problem solved on producer node
- › (-): Consumer may lose chain of trust

# Deleting Old Feeds

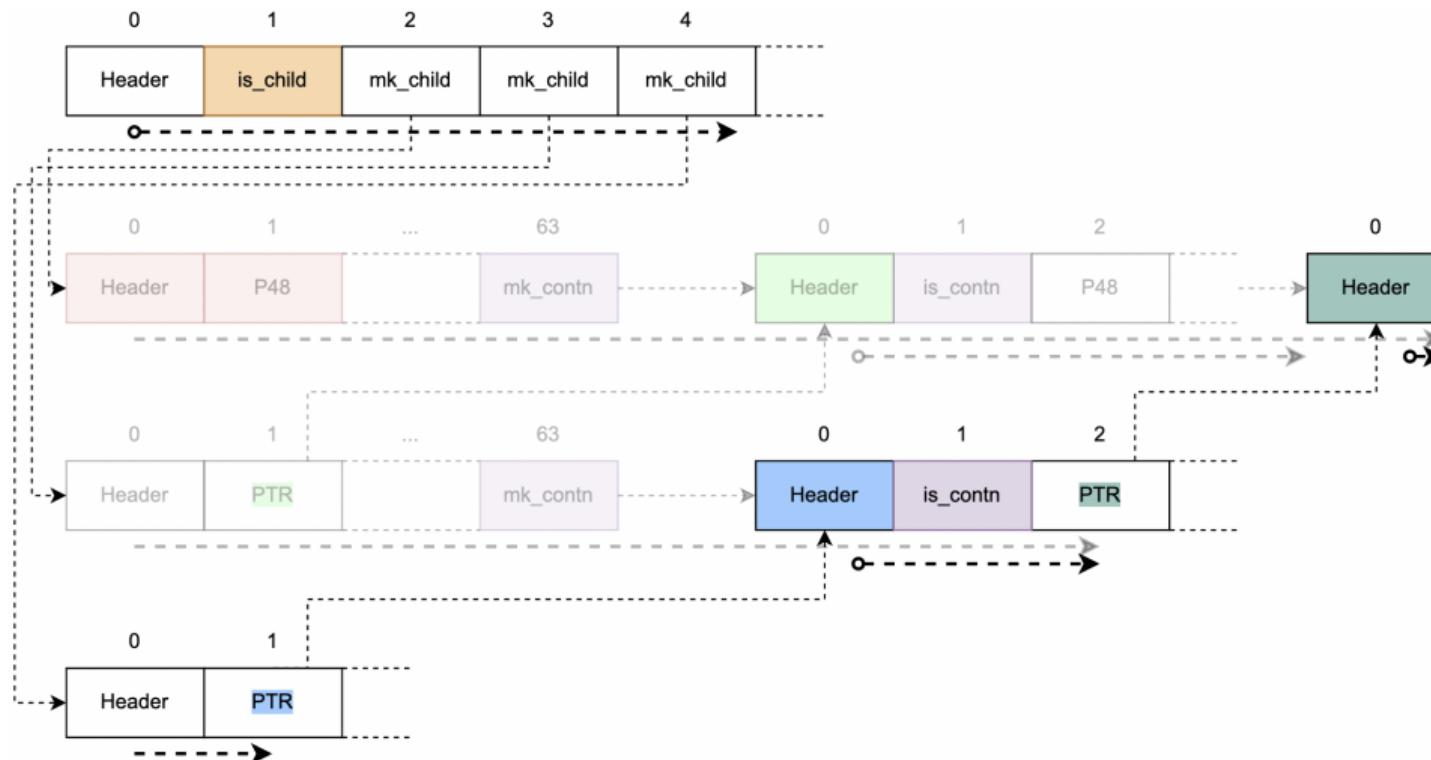


- › (+): Old feeds can be deleted, Consumer reaches new feeds
- › (-): More complex data structure, Pointer Feed can get large

# Solution: Session-Tree



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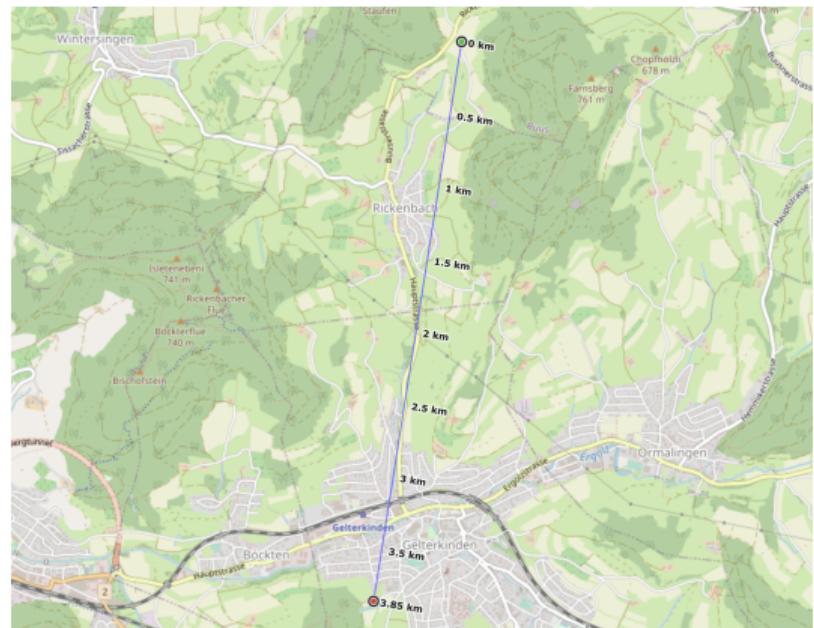


# Storage and Energy Usage

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

# Real Life Test



# Demo

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- > Fork-Tree on LoPy 4
- > Session-Tree over UDP