Progress Report: Congestion Control Implementation

9th NDN Retreat

Klaus Schneider, Eric Newberry, Chavoosh Ghasemi, Beichuan Zhang

December 14, 2017

The University of Arizona

Motivation: Why Congestion Control Is Important

Crucial part of **Application Performance**

Examples:

- Hadoop on NDN

Motivation: Why Congestion Control Is Important

Crucial part of **Application Performance**

Examples:

- Hadoop on NDN
- Frequent questions about **ndnchunks** (mailing list)

Motivation: Why Congestion Control Is Important

Crucial part of **Application Performance**

Examples:

- Hadoop on NDN
- Frequent questions about **ndnchunks** (mailing list)
- Wireless networks, data center, testbed etc.

Motivation: Why Congestion Control Is Important

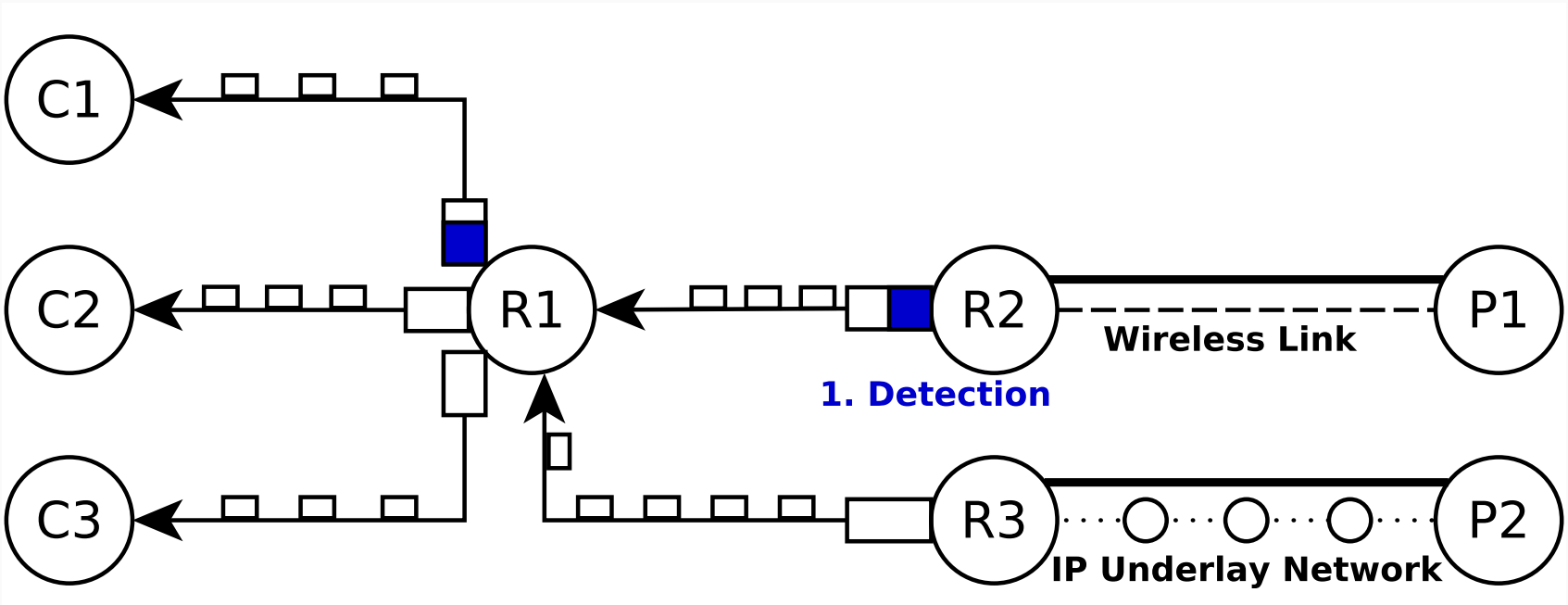
Crucial part of **Application Performance**

Examples:

- Hadoop on NDN
- Frequent questions about **ndnchunks** (mailing list)
- Wireless networks, data center, testbed etc.
- Applications: File transfer, video streaming/conferencing

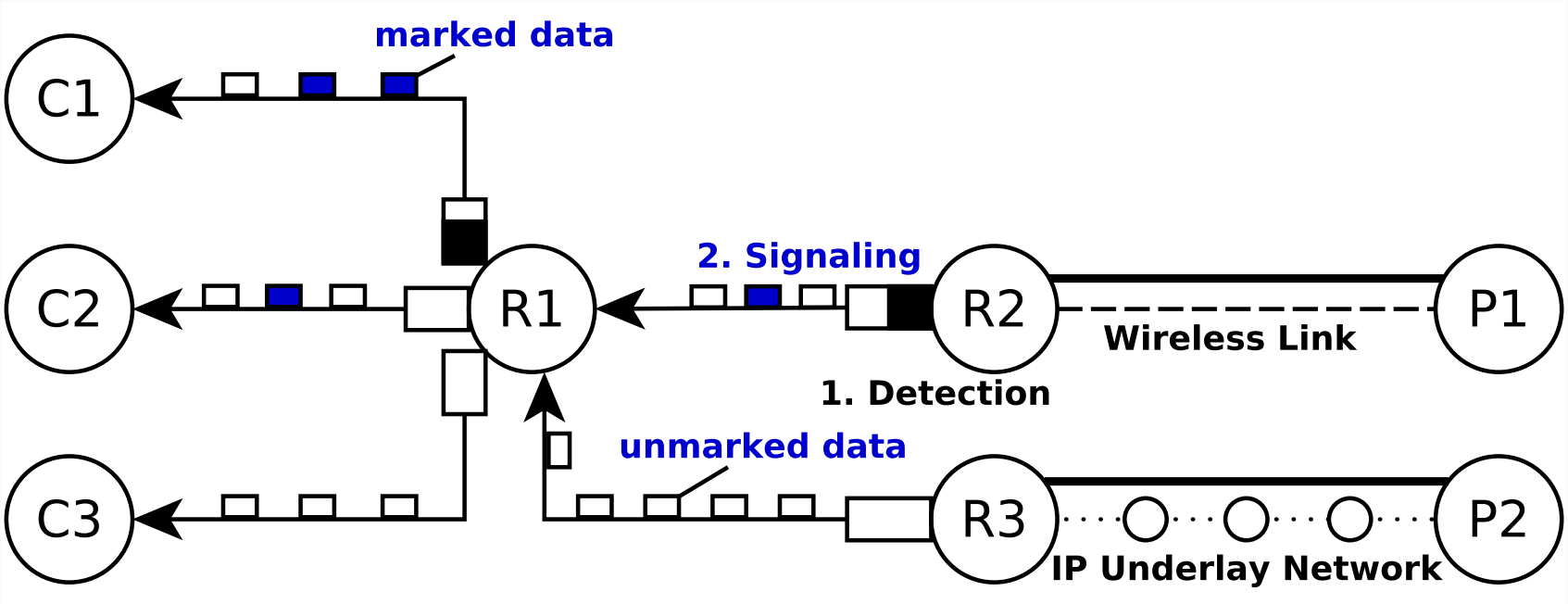
Implementation Overview

From PCON paper [1]:



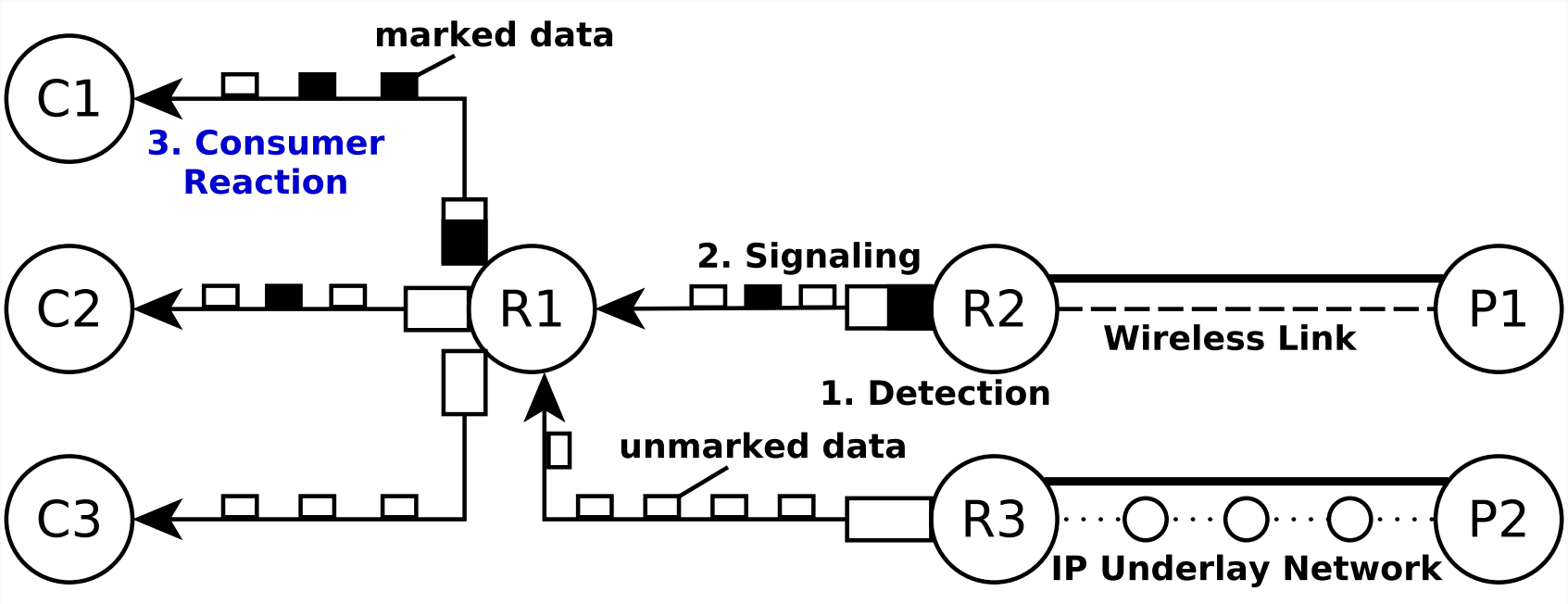
Implementation Overview

From PCON paper [1]:



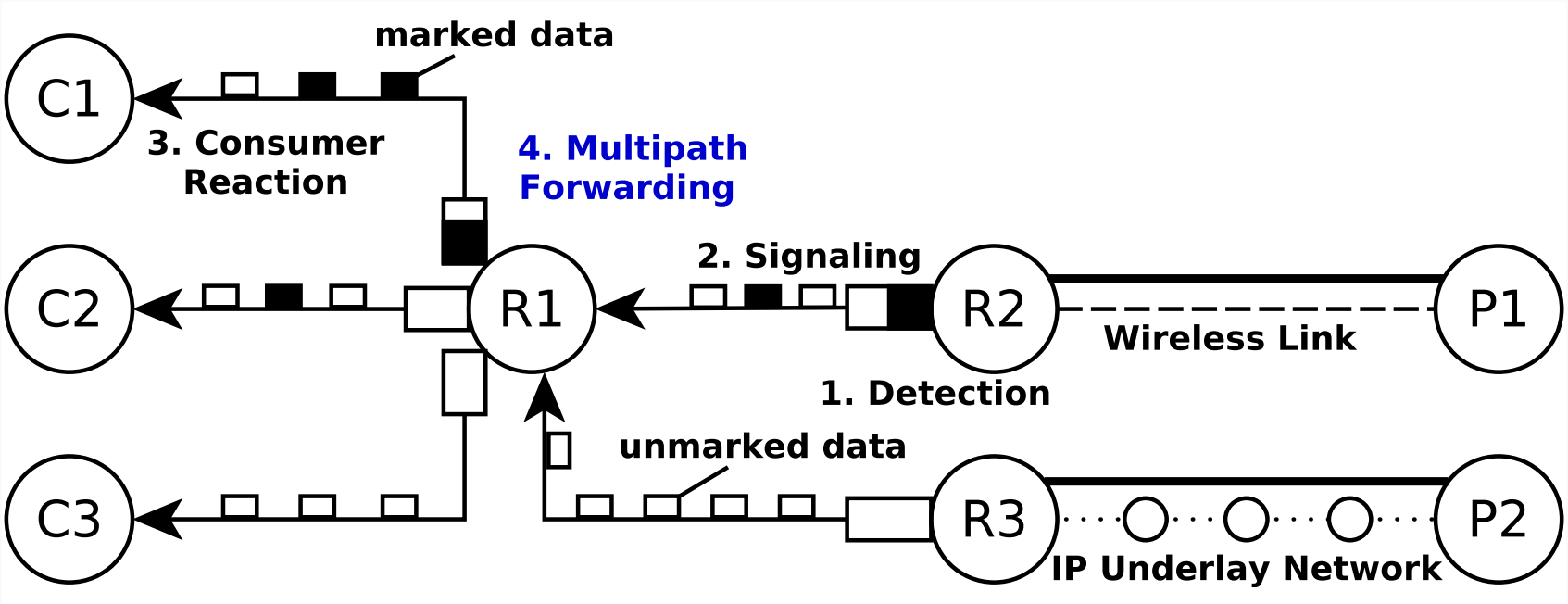
Implementation Overview

From PCON paper [1]:



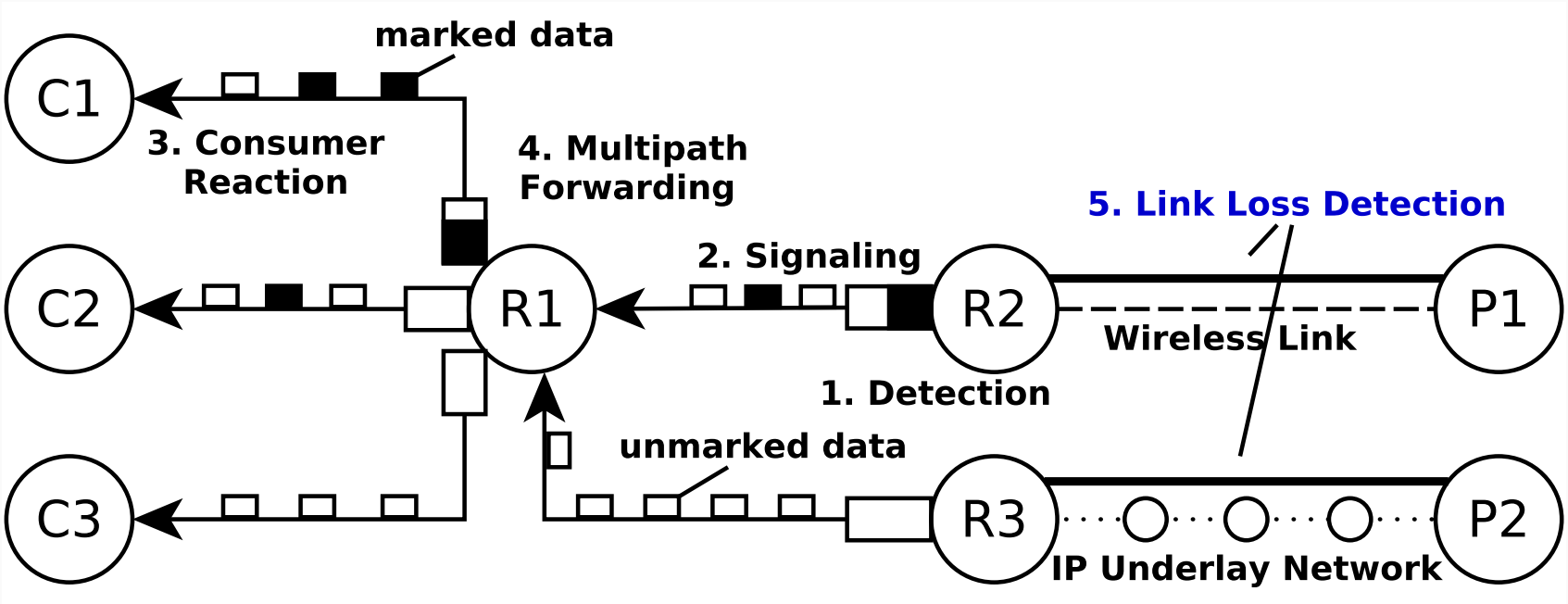
Implementation Overview

From PCON paper [1]:



Implementation Overview

From PCON paper [1]:



Implementation Overview: Redmine

Design and Implement Congestion Control

Added by Junxiao Shi over 3 years ago. Updated 9 days ago.

Status:	New	**Start date:**	
Priority:	High	**Due date:**	
Assignee:	Klaus Schneider	**% Done:**	38%
Category:	Forwarding	**Estimated time:**	(Total: 6.00 h)
Target version:	-		

Description Quote

Design a congestion control scheme.

design-20160229.pdf (138 KB)		Jeff Burke, 03/06/2016 09:37 AM
draft_own_cong_marks.pdf (816 KB)	data for note 5	Jeff Burke, 03/13/2016 06:37 PM
draft_multi_for_bic3.pdf (1.06 MB)	TCP BIC Performance	Klaus Schneider, 03/29/2016 11:22 PM
draftmulti_for_aimd3.pdf (1.07 MB)	TCP Reno Performance	Klaus Schneider, 03/29/2016 11:22 PM

Subtasks Add

~~Feature #3797~~: Congestion Control: generic congestion marks	Closed	Eric Newberry
~~Feature #3823~~: Congestion Control: design Local Link Loss Detection	Closed	Eric Newberry
ndn-tools - ~~Feature #4289~~: ndncatchunks: React to congestion marks	Closed	Chavoosh Ghasemi
Feature #4327: Congestion mark integration test case	In Progress	Eric Newberry
Feature #4362: Congestion Detection by observing router queues	New	
Task #4363: Adjust Multipath Forwarding Strategy based on Congestion Marks	New	
Feature #4364: Create Consumer API for Congestion Control	New	
Task #4391: Congestion Control: Test Local Link Loss Detection	Feedback	Eric Newberry

What We Accomplished since last Retreat

Thanks to Eric, Davide, Chavoosh, Junxiao, and others.

What We Accomplished since last Retreat

Thanks to Eric, Davide, Chavoosh, Junxiao, and others.

1. Generic Congestion Marks
    - Defined in NDNLP
    - Simple API to set and get congestion marks.

What We Accomplished since last Retreat

Thanks to Eric, Davide, Chavoosh, Junxiao, and others.

1. Generic Congestion Marks
    - Defined in NDNLP
    - Simple API to set and get congestion marks.
2. Consumer Congestion Adaptation
    - Catchunks: React to congestion marks
    - Catchunks: AIMD adaptation, reduced version discovery timeout, Conservative (SACK) window adaptation, printSummary

What We Accomplished since last Retreat

Thanks to Eric, Davide, Chavoosh, Junxiao, and others.

1. Generic Congestion Marks
   - Defined in NDNLP
   - Simple API to set and get congestion marks.
2. Consumer Congestion Adaptation
   - Catchunks: React to congestion marks
   - Catchunks: AIMD adaptation, reduced version discovery timeout, Conservative (SACK) window adaptation, printSummary
3. NDNLP: Local Link Loss Detection
   - Detect lost packets (via gap in SeqNr or ACK Timeout)
   - Signal to forwarding strategy **onLostInterest()**.

Future Work and Timeline

1. **Integration tests** – timeline: 2 months
    - Check if current functionality works as expected

Future Work and Timeline

1. **Integration tests** – timeline: 2 months
    - Check if current functionality works as expected
2. Congestions Detection based on **queue backlog** (NIC, kernel, socket queue) – timeline: 6 months
    - To work on TCP/UDP Tunnels, Ethernet, Wireless
    - $\Rightarrow$ See our **Hackathon Project!**

Future Work and Timeline

1. **Integration tests** – timeline: 2 months
    - Check if current functionality works as expected
2. Congestions Detection based on **queue backlog** (NIC, kernel, socket queue) – timeline: 6 months
    - To work on TCP/UDP Tunnels, Ethernet, Wireless
    - $\Rightarrow$ See our **Hackathon Project!**
3. **Consumer/Producer API** – timeline: 9 months
    - Look at Ilya's work and Cisco's libcnet API

The End

Any Questions?

Klaus Schneider
klaus@cs.arizona.edu
https://www.cs.arizona.edu/~klaus/

References i

[1] Klaus Schneider, Cheng Yi, Beichuan Zhang, and Lixia Zhang.
A practical congestion control scheme for named data networking.
In *Proceedings of the 2016 conference on 3rd ACM Conference on Information-Centric Networking*, pages 21–30. ACM, 2016.