Binder: A System to Aggregate Multiple Internet Gateways in Community Networks
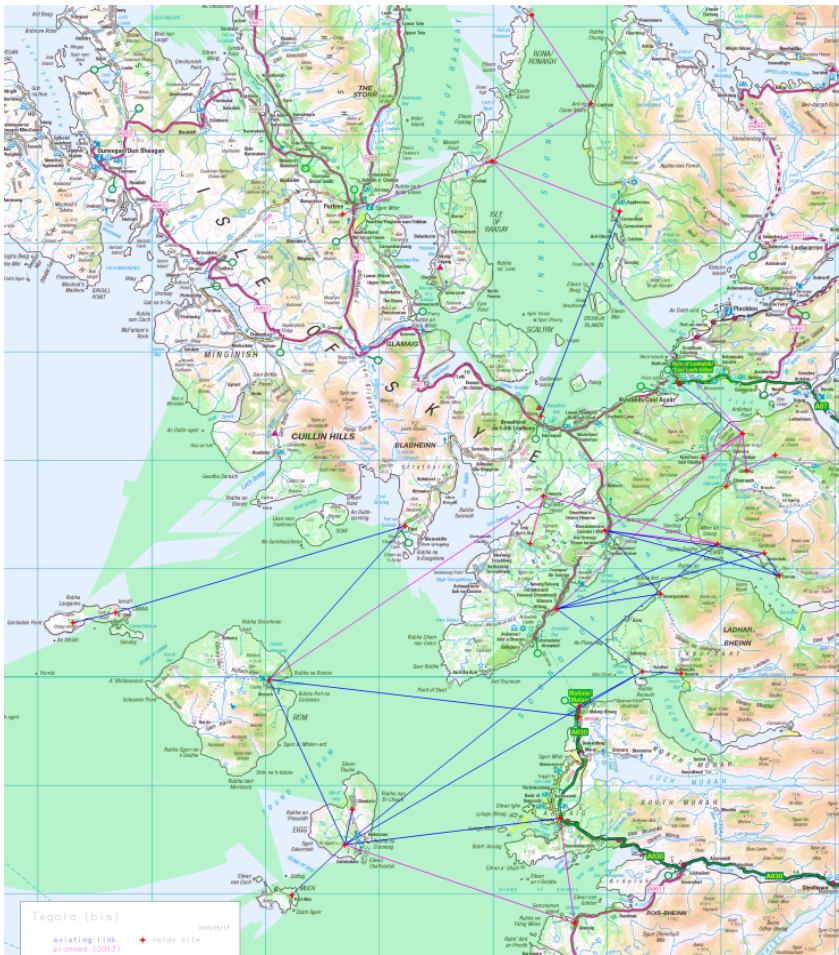
Marwan Fayed

Luca Boccassi (Cisco)
and Mahesh Marina

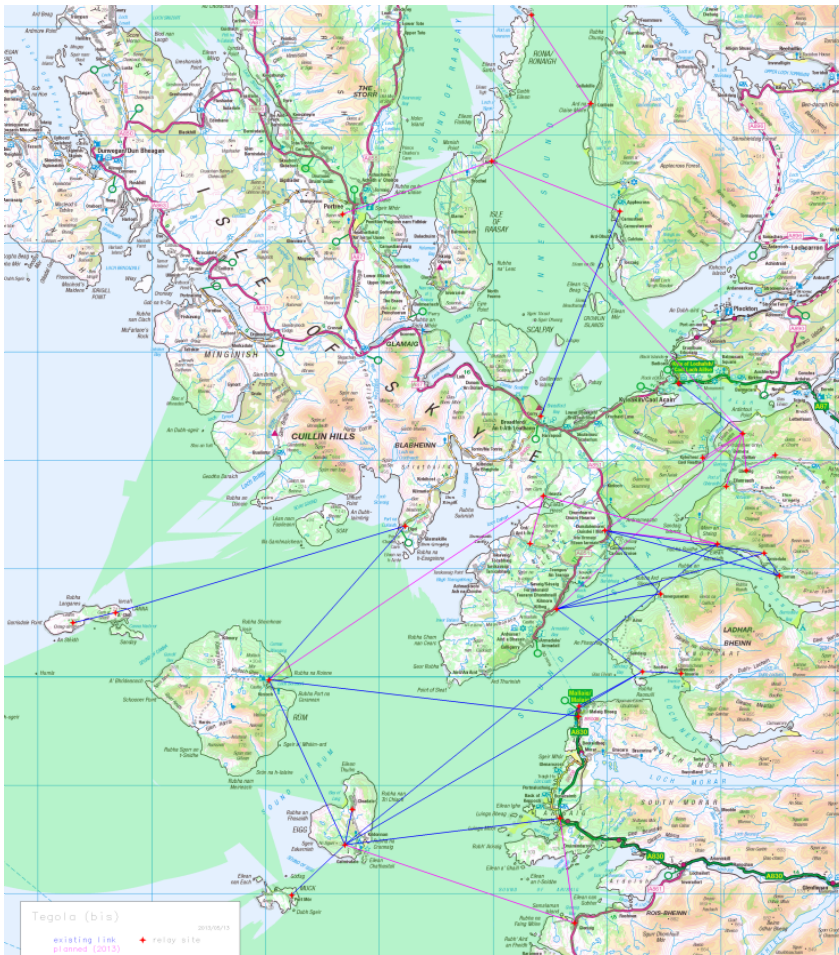# How to solve our research issues?

Start your own ISP!

HUBS: Rural Broadband 'Co-op' ISP

- No real technical obstacles BUT

- Plenty of technical opportunities

- Data, data, data.

with Peter Buneman, Michael Fourman, Richard Simmons, William Waites
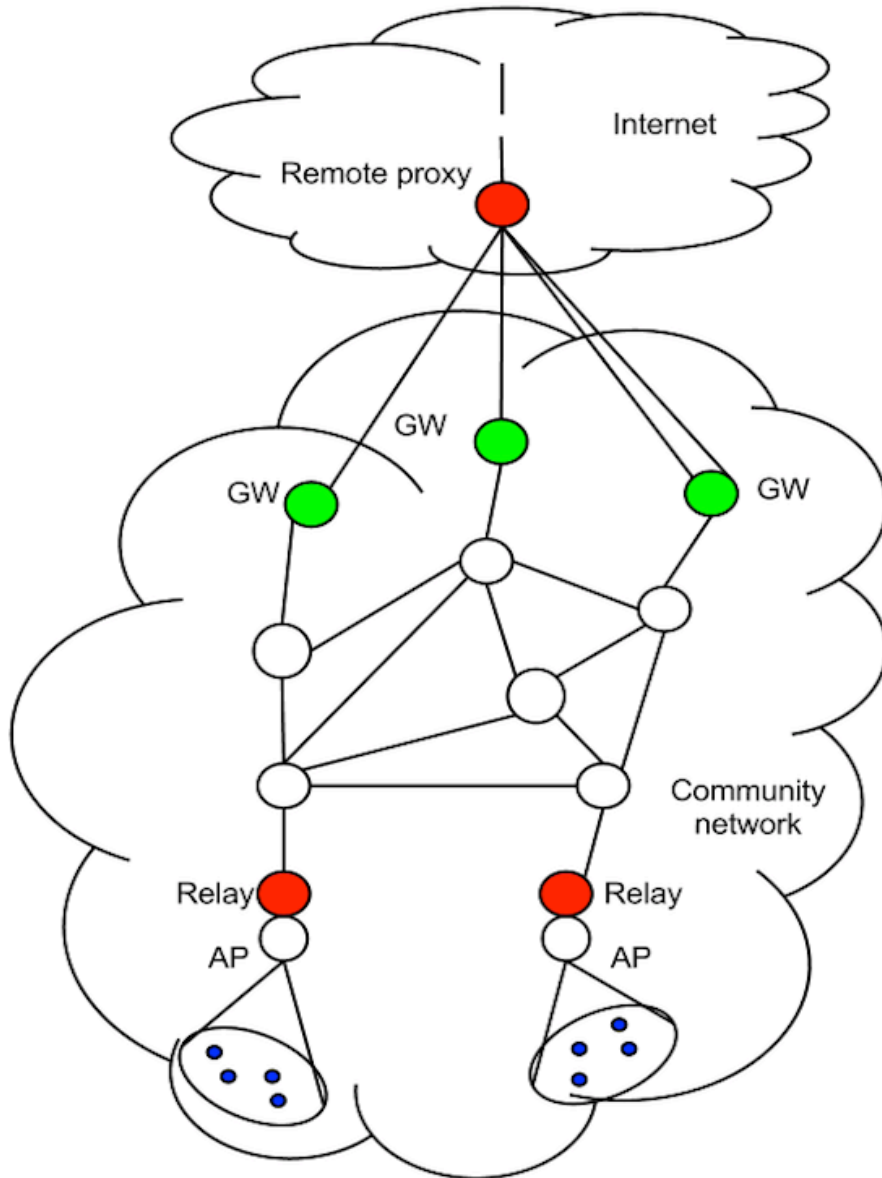
Gateway Aggregation (Today)

- Packet re-ordering

- Flow-to-pipe assignment

- Assume co-location
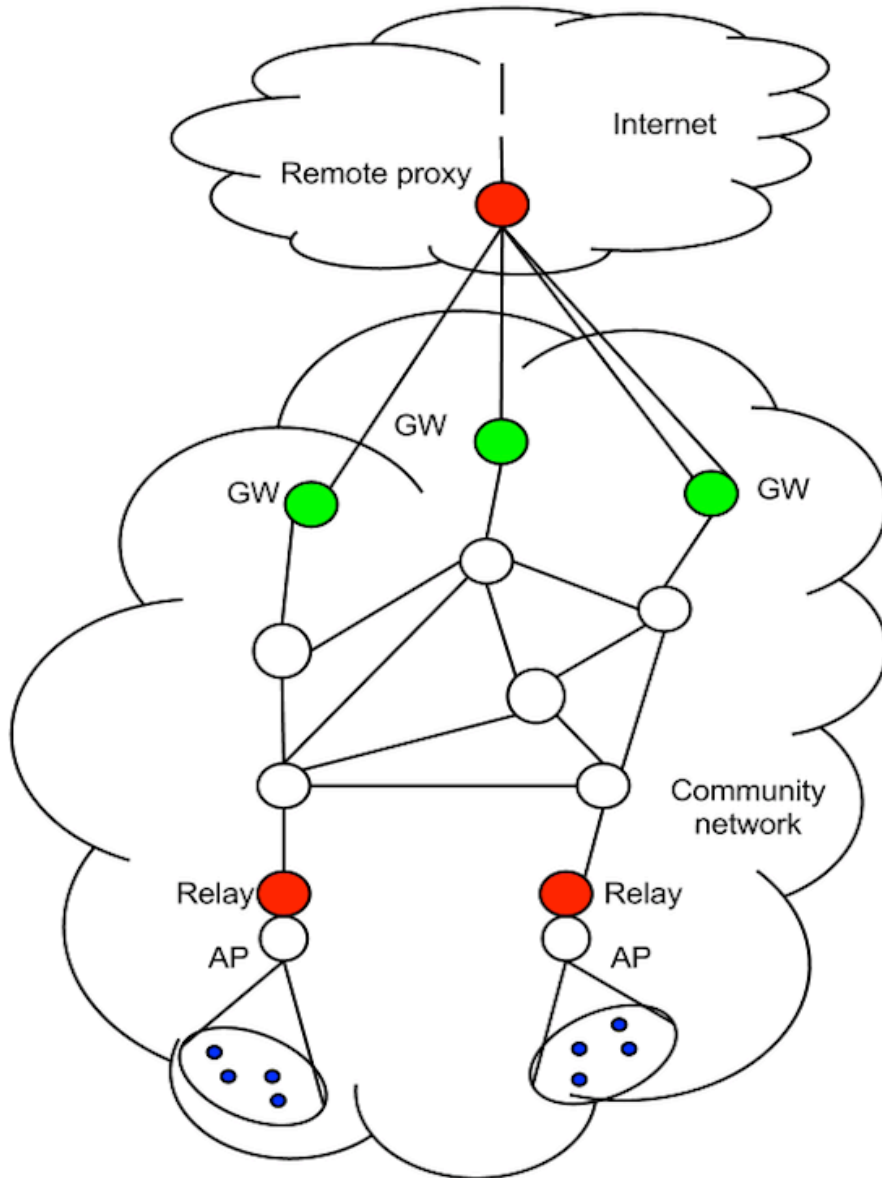
- Research-oriented

(Our) Constraints

- Simple

- Deployable

- Resilient

- Managed by Tom, or Diana, or Harry, etc
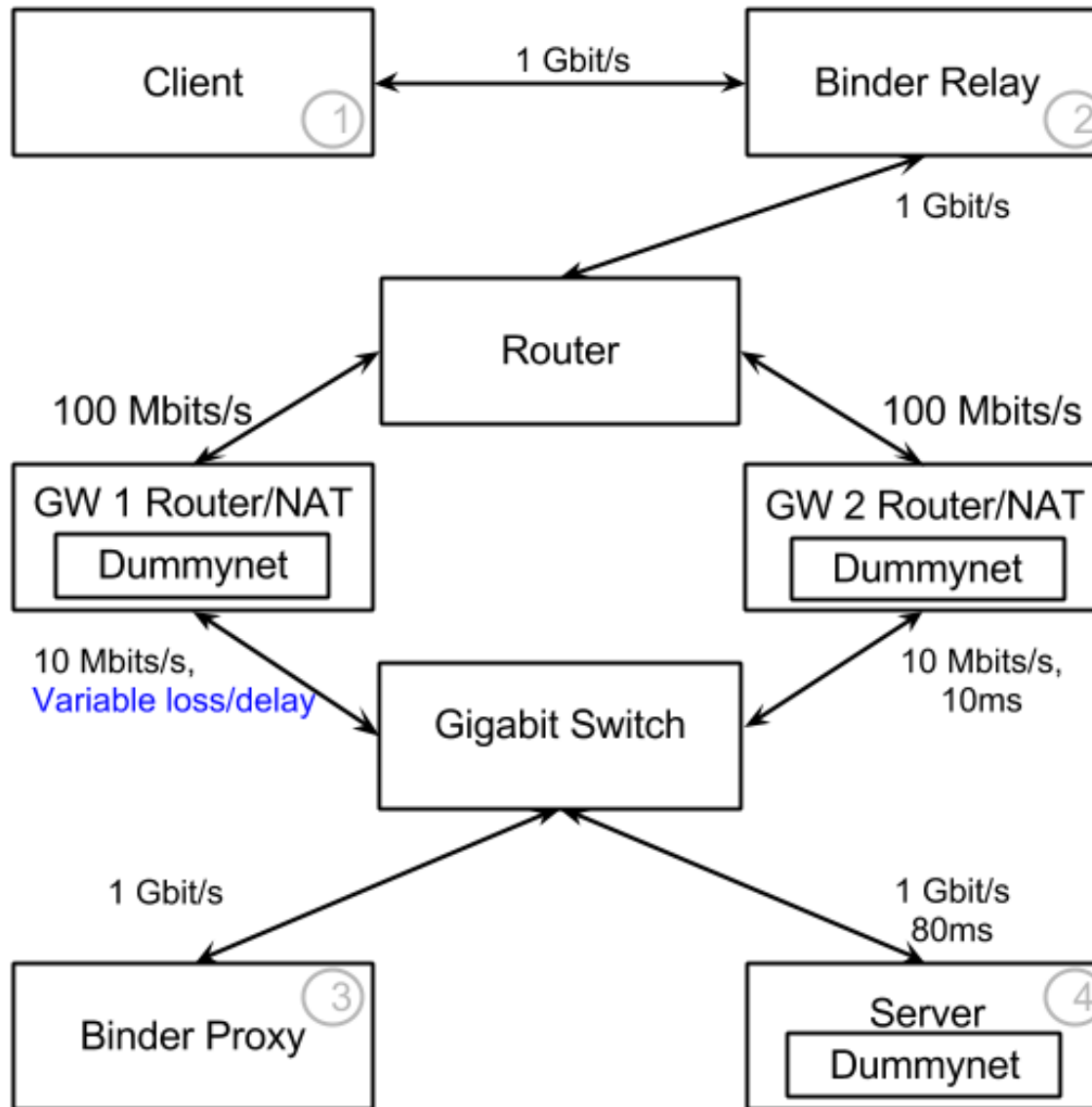
Binder Architecture

- Packet capture & redirection

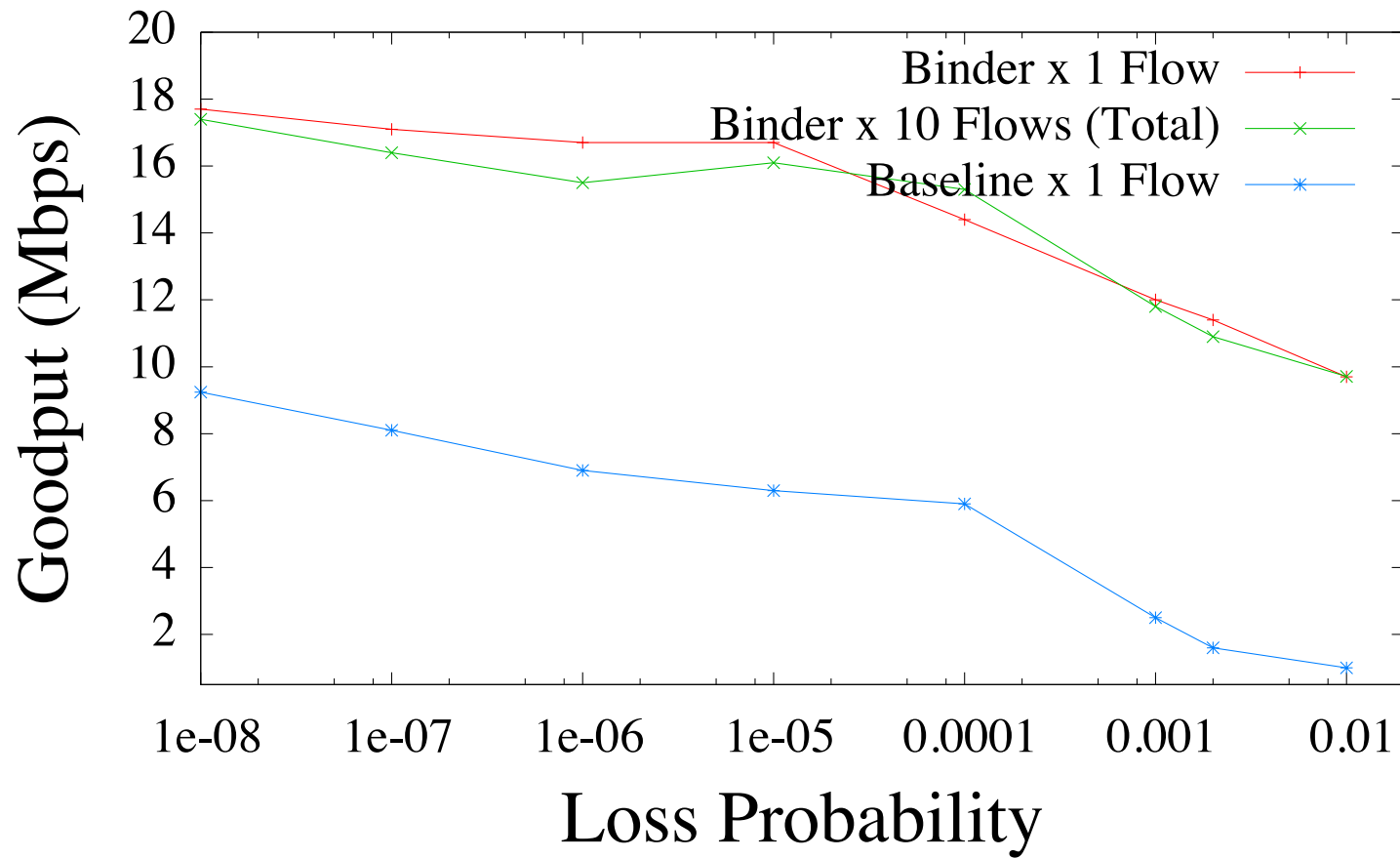- Multipathing

- Aggregation

Binder Implementation

- Tunneling via OpenVPN

- MP-TCP

- IP Source Routing Implementation

Emulation Testbed

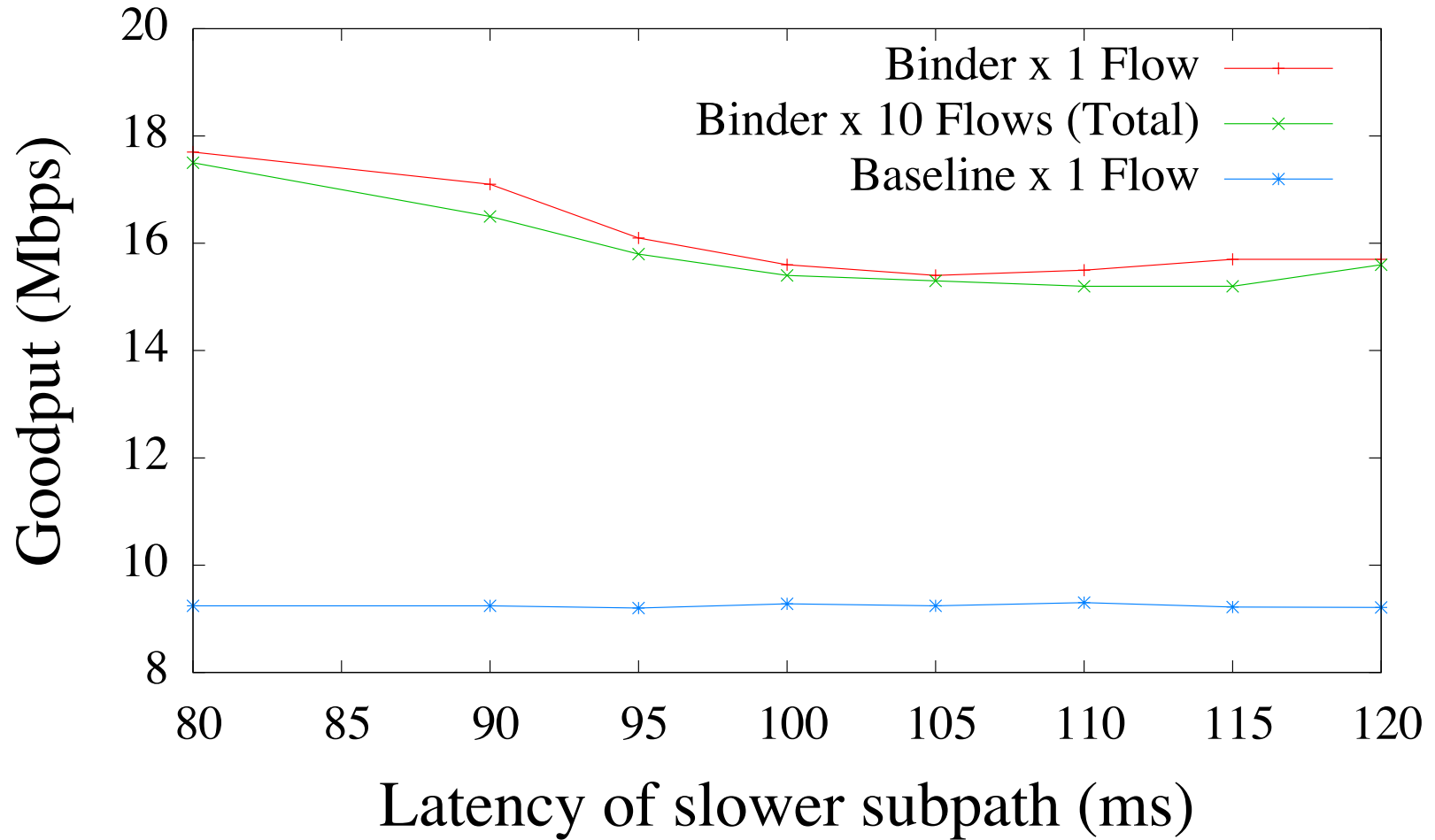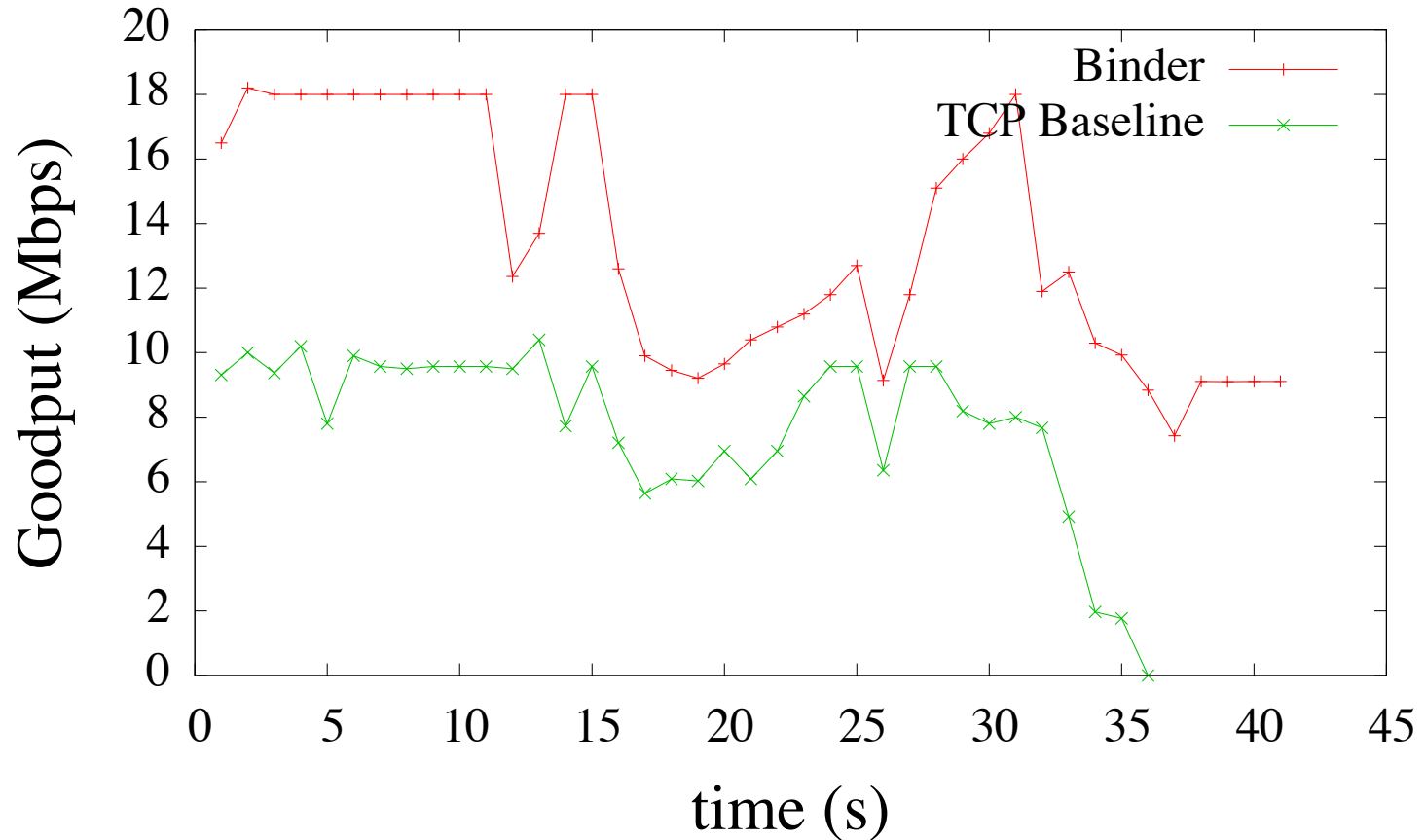| Src - Dst	min	avg	max	mdev
(i) default	2.32	3.69	8.43	1.08
(ii) alternate	6.93	15.88	71.17	11.22
(iii) remote host	23.28	25.35	37.96	2.88

Initial Results - loss

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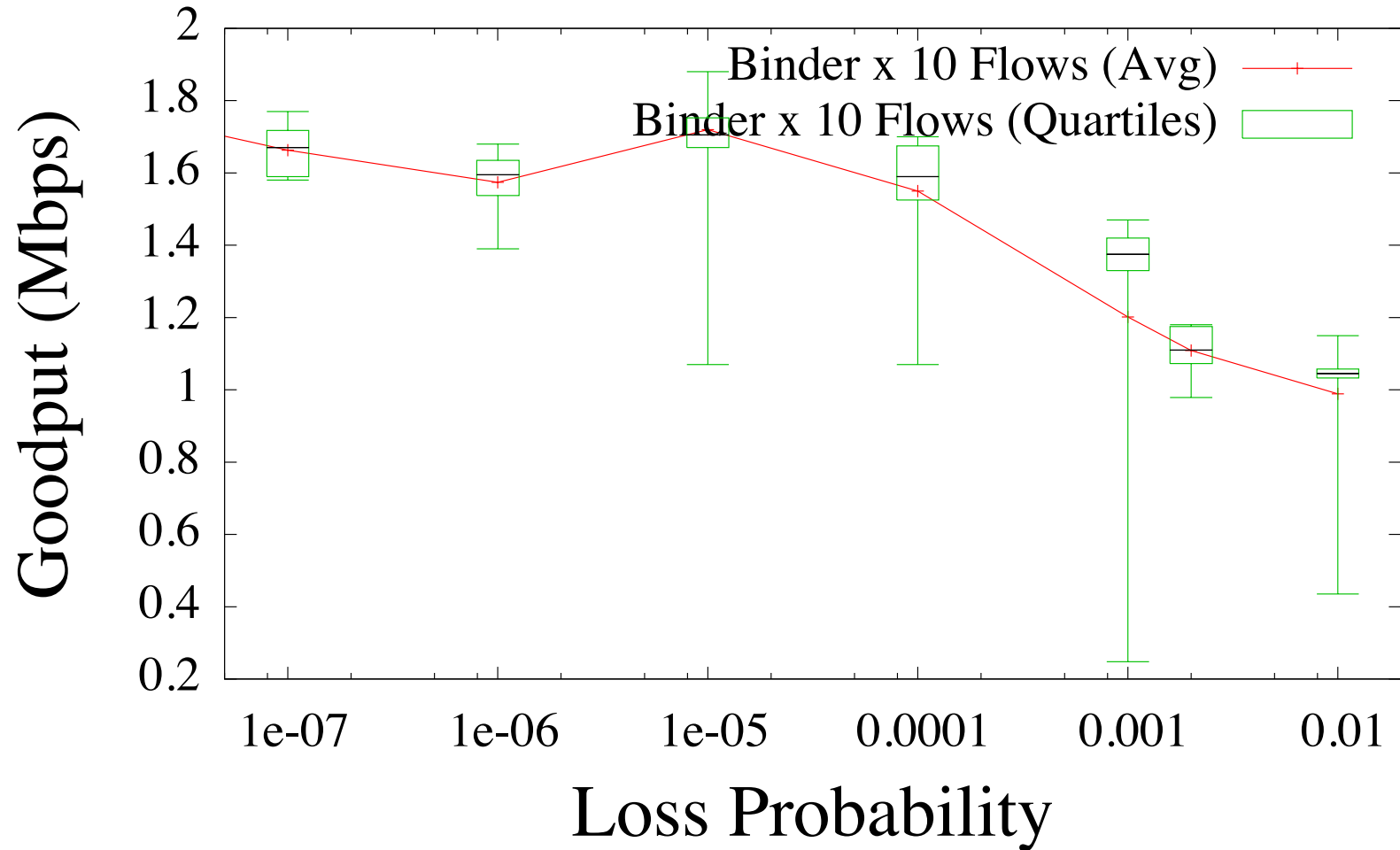
Initial Results - latency

Initial Results – hell to pay

Time (s)	High RTT path (ms)	Loss Prob.
0	85	1e-07
3	90	1e-06
6	95	1e-05
9	100	1e-04
12	105	1e-03
15	85	1e-07
18	90	1e-06
21	95	1e-05
24	100	1e-04
27	105	1e-03
33	110	1e-02
36	110	1

Questions