

DNS, Identity, and Internet Naming for Experimentation and Research (DIINER)

Robert Story
<hardaker@isi.edu>
26 Oct 2020

John Heidemann
<johnh@isi.edu>

Robert Story

Michael Elkins
<elkins@isi.edu>

Yuri Pradkin
<yuri@isi.edu>



Copyright © 2020 by Wes Hardaker
Release terms: CC-BY-NC 4.0 international

Overview

- Challenges in today's DNS research
- Our solution to battle ossification
- Architectural overview of DIINER
- Plans and Timeline

Is DNS Fully Cooked?

- How do new versions of software compare?
- Does running software on a line-card really work?
- Are there DDoS defenses still to be studied? Which are best?
- What if all DNS went over IPv6? Or over TCP? Or QUIC?
- Are there better load-sharing techniques specific to DNS?
- What if clients asked multiple questions at once?

Reality: the Internet's landscape keeps changing – DNS will always have to keep up with current trends

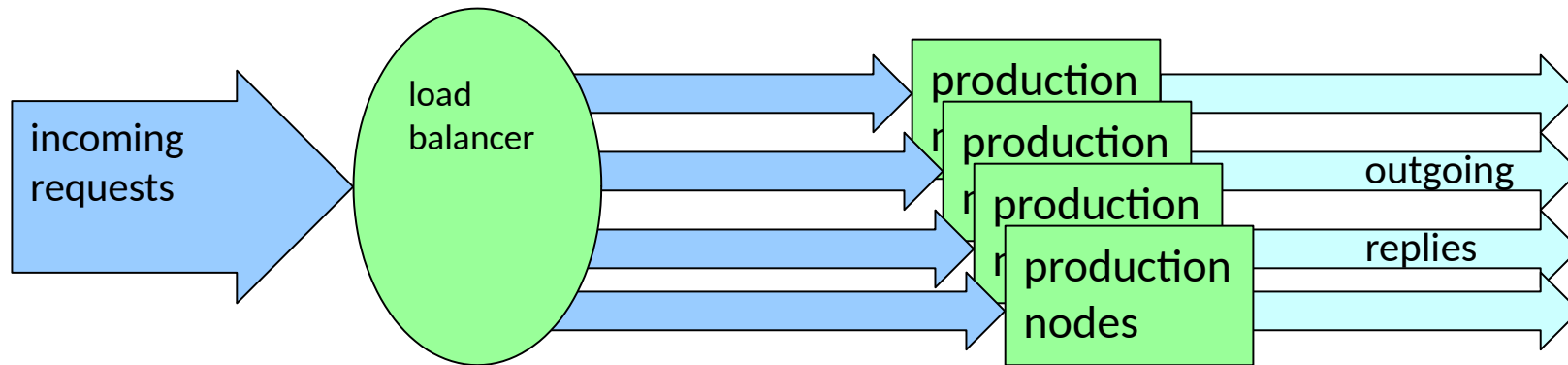
DIINER

- 3 year, NSF funded research project
- Create academically accessible, **collaborative** infrastructure
 - *Thank you to those that supplied letters of collaboration!*
- Join research and operational communities
- Enable testing of new research in an operationally safe manner
- Safe and privacy protected data sharing of operational DNS data
- Building on b.root-servers.net, Resolvers and Authoritative servers

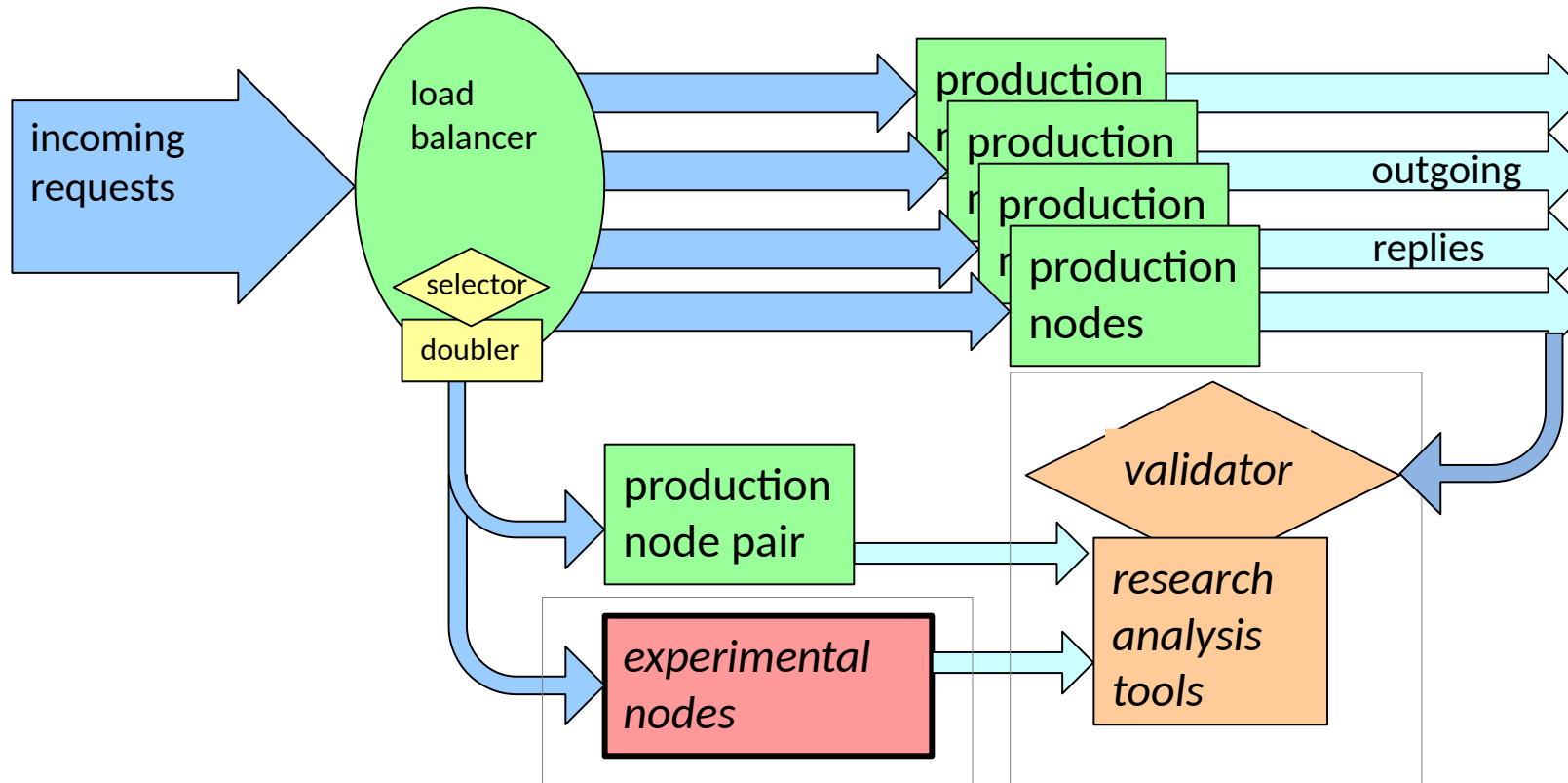
Why DIINER?

- Originally, DNS was an experimental replacement to static hosts
- Now, the world's economy relies on its “perfect” performance
- This makes innovation in **naming and identification** difficult
- Academic research relegated to studying without modification
- “DNS 2.0 will never happen”

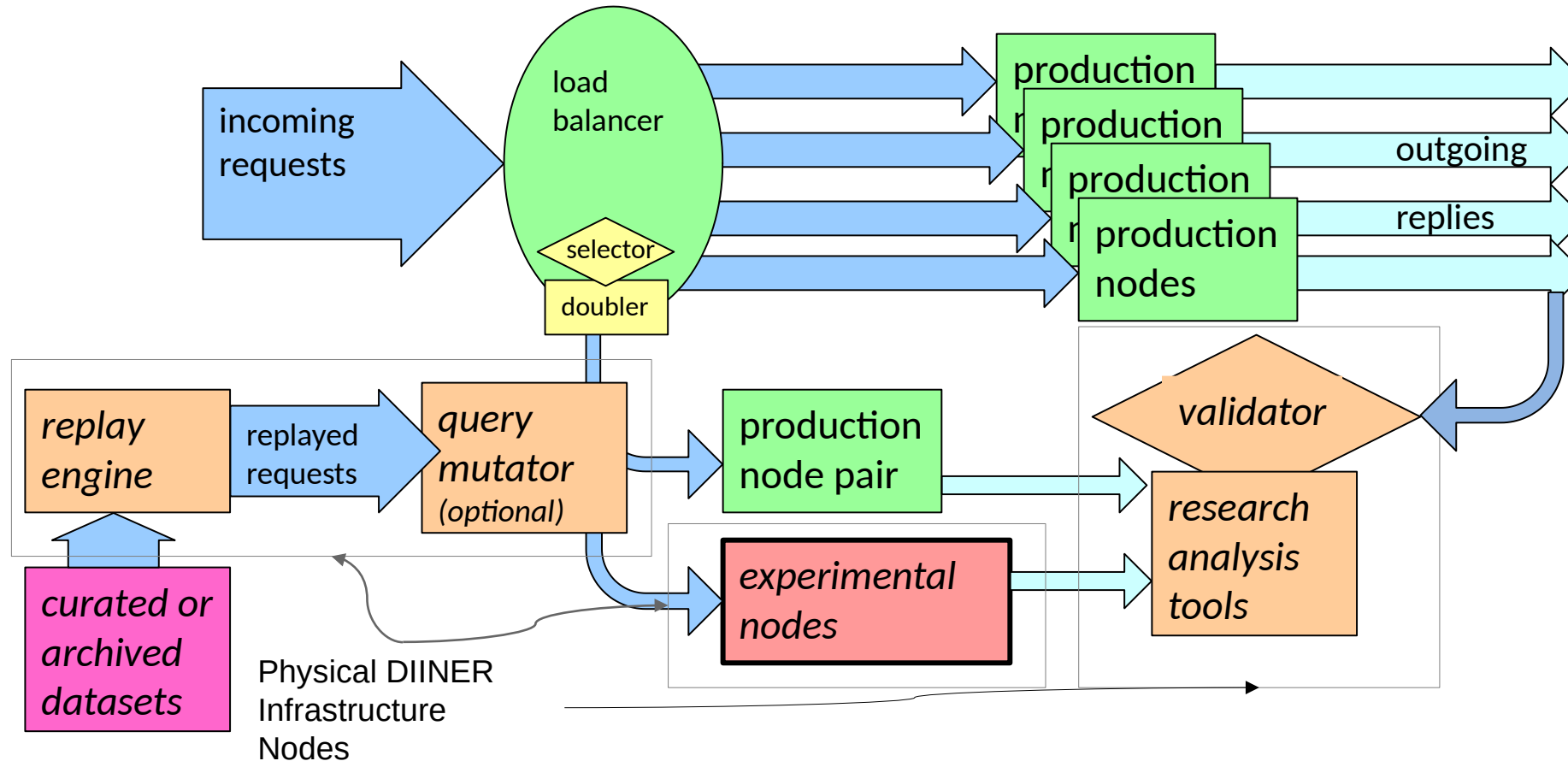
b.root-servers.net (and others) today



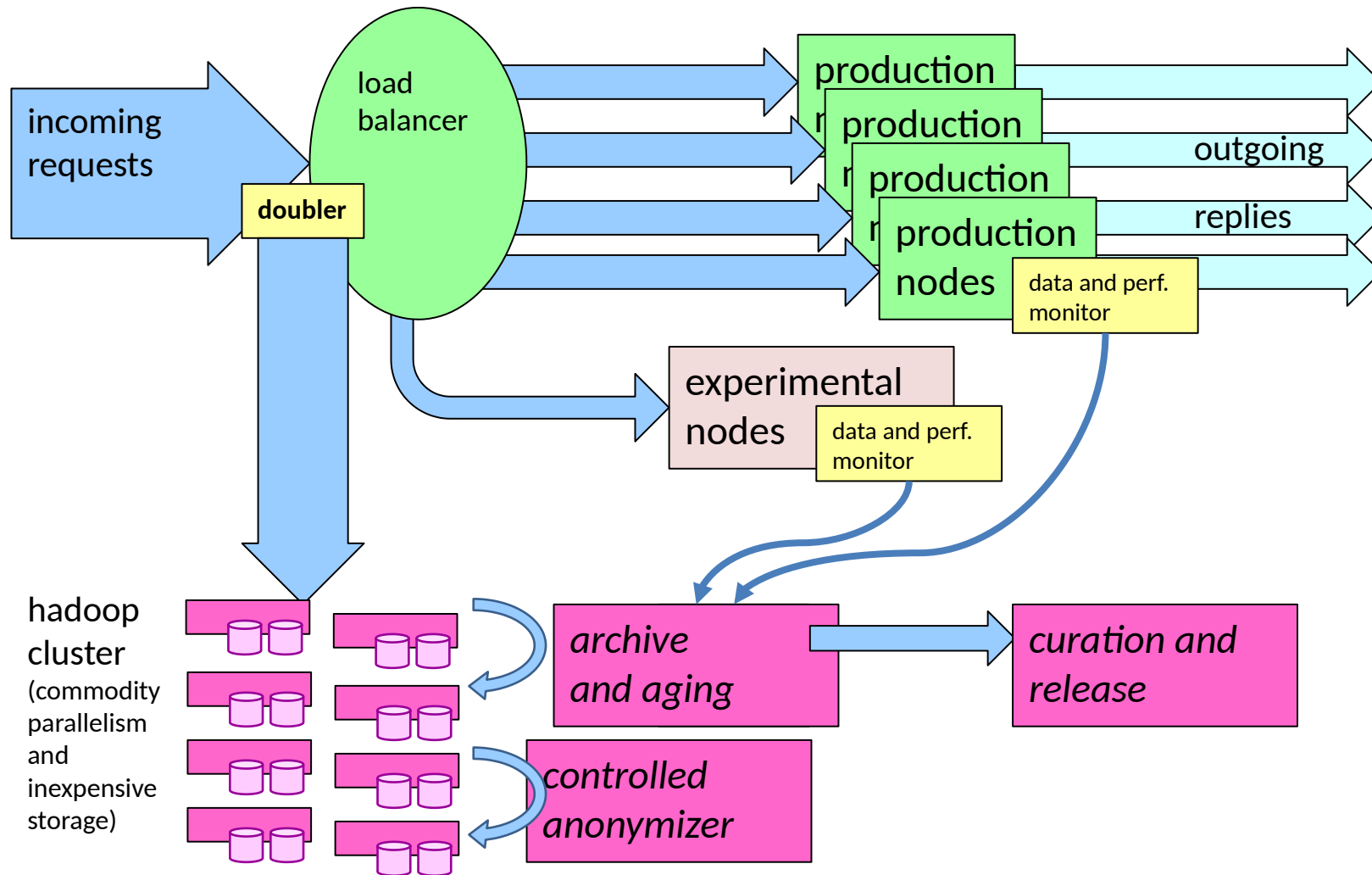
Enabling Live Experiments



Enabling Repeatability



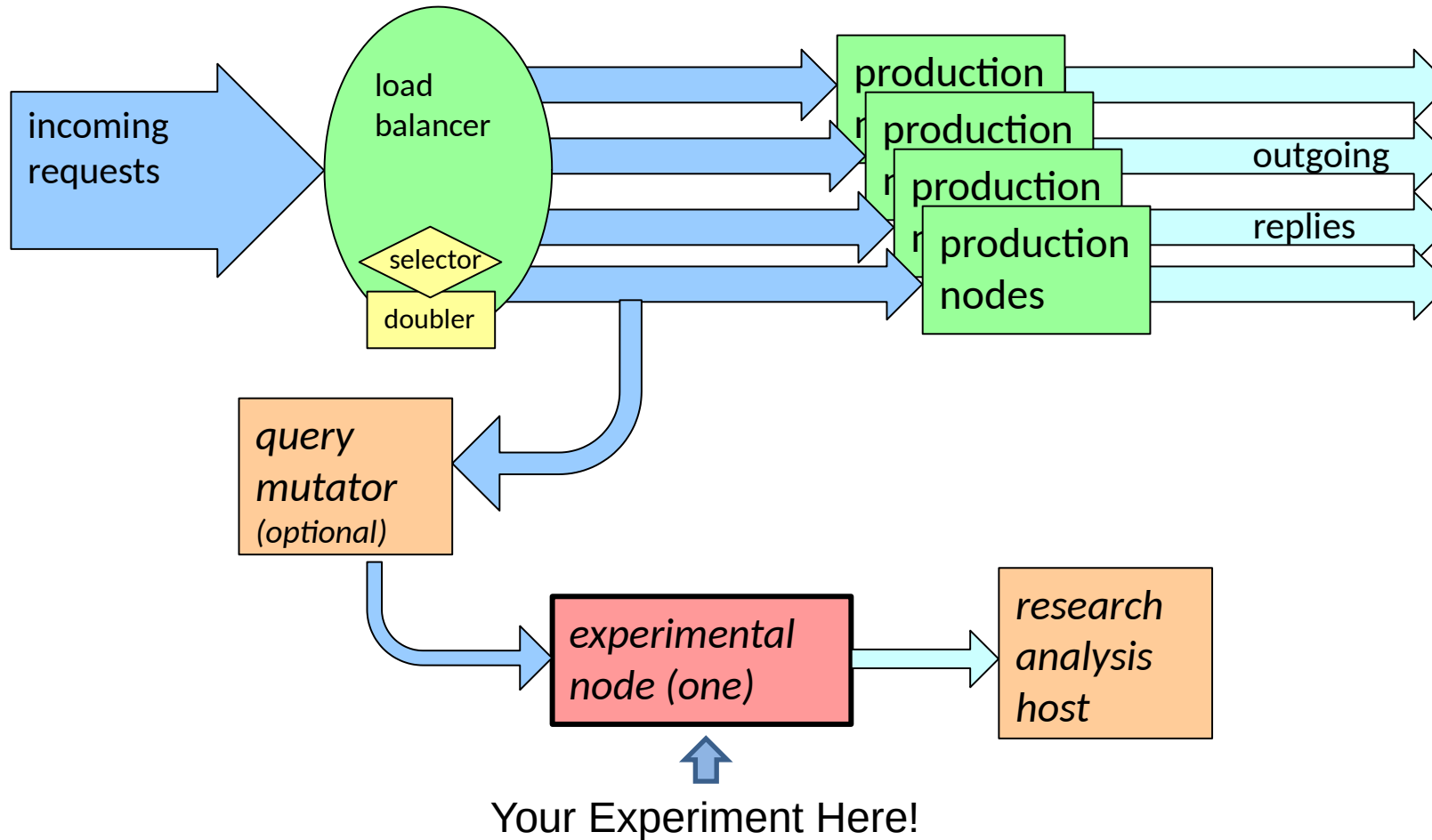
Data Capture and Curation



Plans and Timeline: Infrastructure

- Near-term:
 - Clone a B-Root production stream as a parallel test system ✓
 - Simultaneous monitoring of production vs test ✓
 - Installed stream replay and performance tools ✓
- Long-term:
 - Automatic result curation and packaging
 - Query mutating
 - Bring your own DNS (anycast, zones, resolvers, etc)
 - Real-vs-production comparison engine
 - Hardware expansion
 - Web-based console for project and experimentation management

Our Current Early-Setup

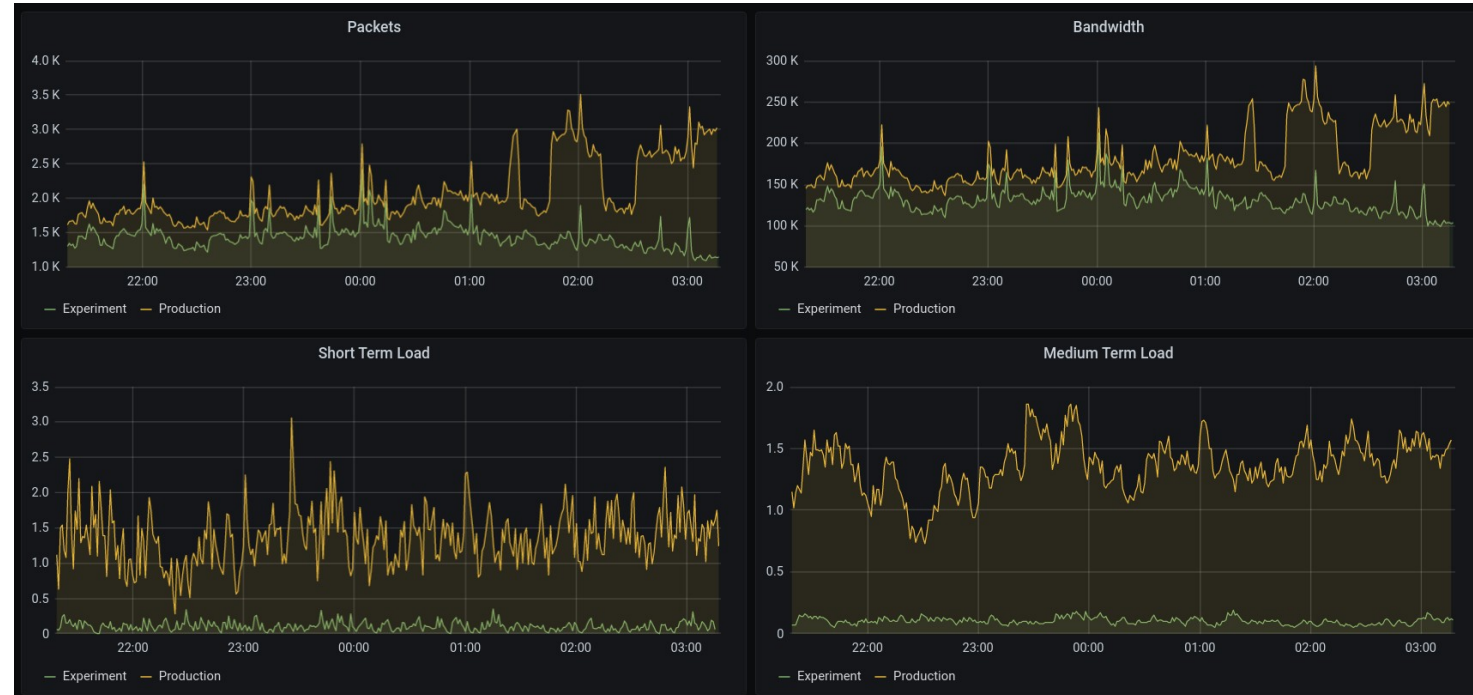


Plans and Timeline: Collaboration

- Near-term:
 - Hold a (virtual) workshop to discuss future needs and plans [22 July 2020]
 - Work closely with some early-adopters
- Long-term:
 - Increase the number of participants we can support
 - Coordinate and collaborate with external research organizations
 - Hold annual workshops for collaboration

First Experiment Results

- Goal: demonstrate the mirrored approach
- Production systems: ISC's Bind
- DIINER test backend: Knot
- Top (orange): Production
- Bottom (green): Experiment
- Note: No TCP passed (yet)



Join Us

- DIINER consists of:
 - A goal of **promoting DNS and naming research**
 - New DNS experimentation infrastructure
 - **Collaboration** events
 - Partnerships with existing organizations like DNS-OARC
- **We need you!**
 - Seeking a few early adopters
 - Mail: Wes Hardaker <hardaker@isi.edu> or John Heidemann <johnh@isi.edu>