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

Wes Hardaker
<hardaker@isi.edu>
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John Heidemann
<johnh@isi.edu>

Robert Story
<rstory@isi.edu>

Michael Elkins
<elkins@isi.edu>

Yuri Pradkin
<yuri@isi.edu>

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?

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- What effect does TTL caching have on authoritative servers?

- How does the roll out of caching effect operational traffic?

- What are the regional differences in traffic patterns?

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- How is Internet usage shaped over days, weeks, months and years?

- How are DNS services affected by cloud deployments? IoT deployments? New mobile networks?

- …

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

Overview

- Challenges in today's DNS research

- Our solution to battle ossification

- Architectural overview of DIINER

- Plans and Timeline

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"

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
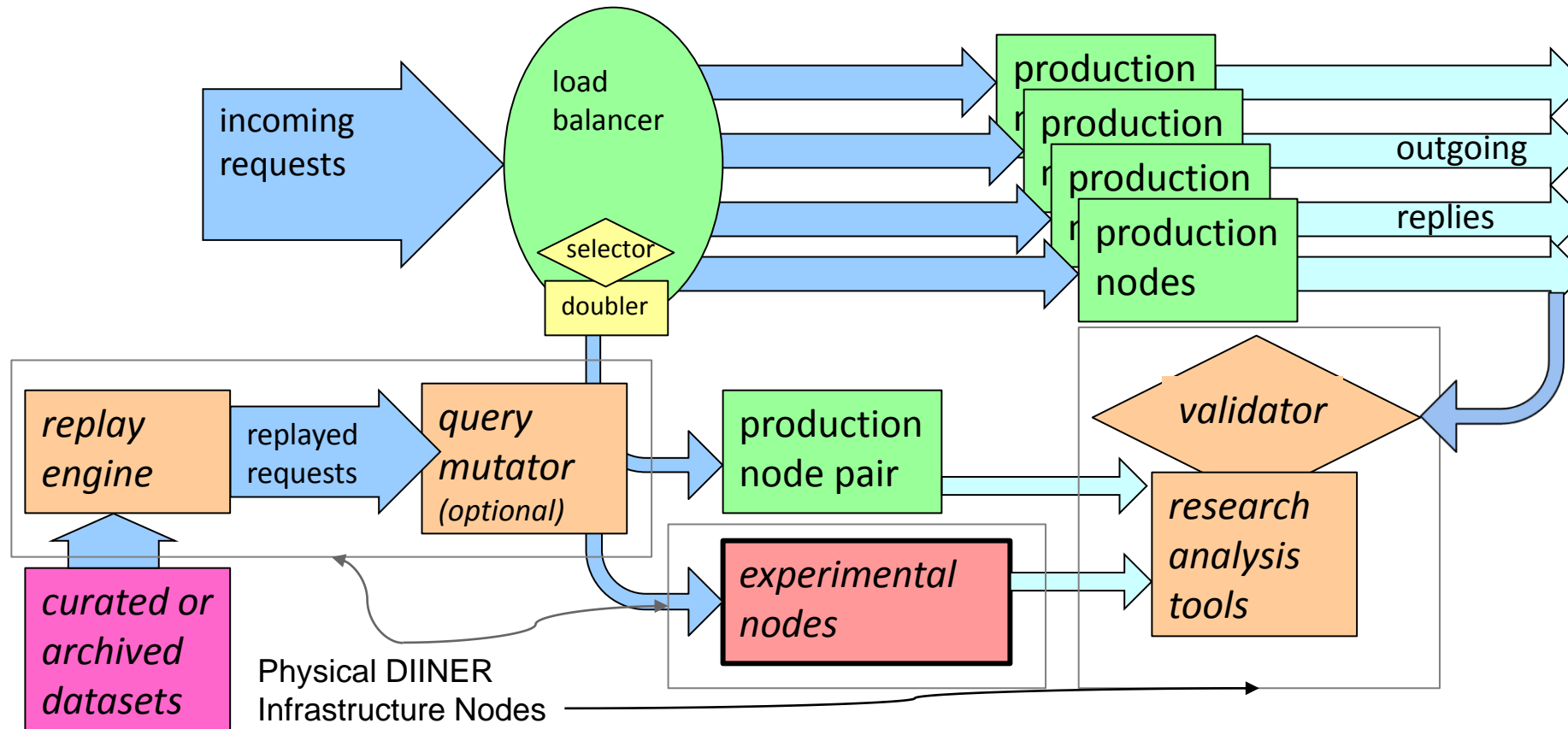- Building on b.root-servers.net, Resolvers and Authoritative servers
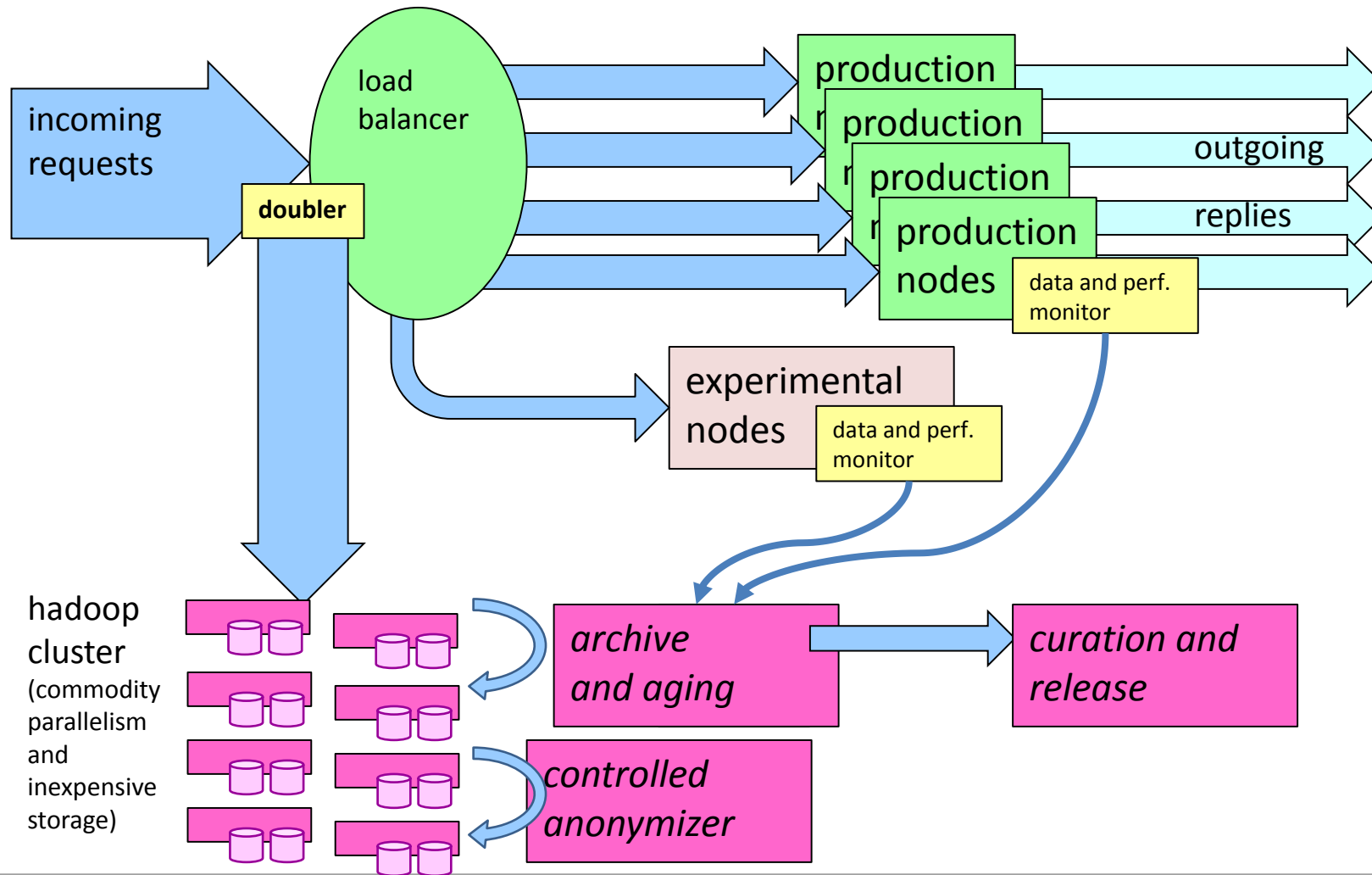
b.root-servers.net (and others) today
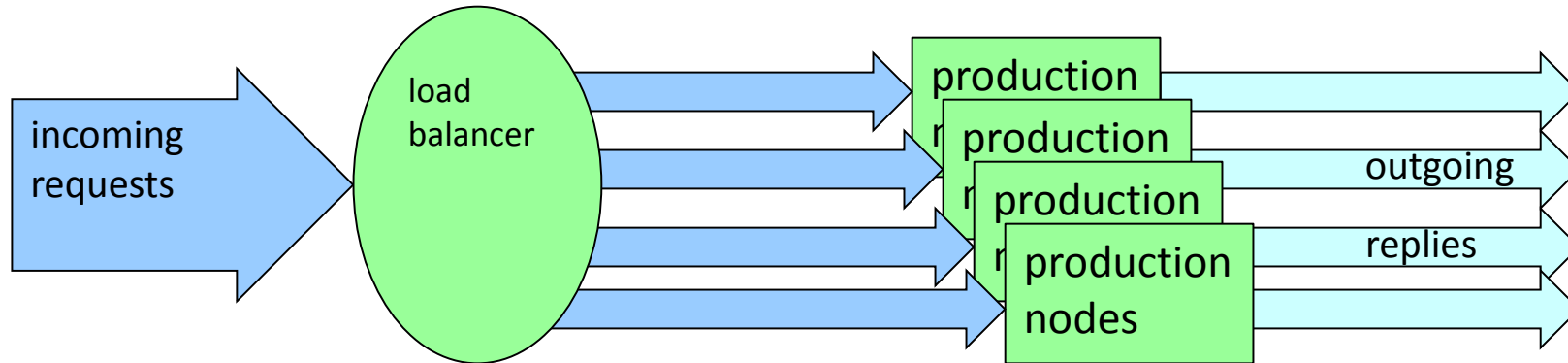
Enabling Live Experiments
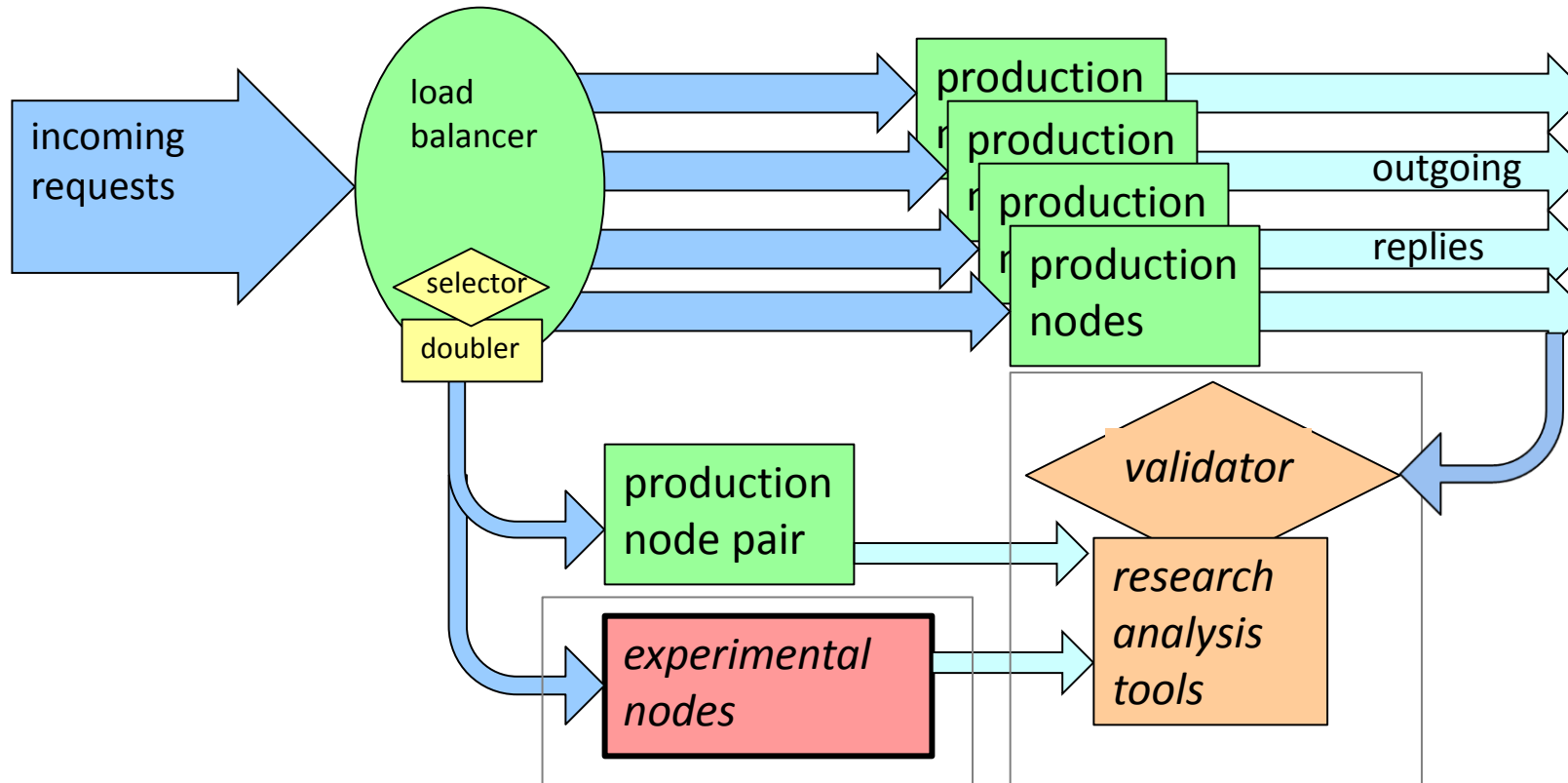
Enabling Repeatability

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
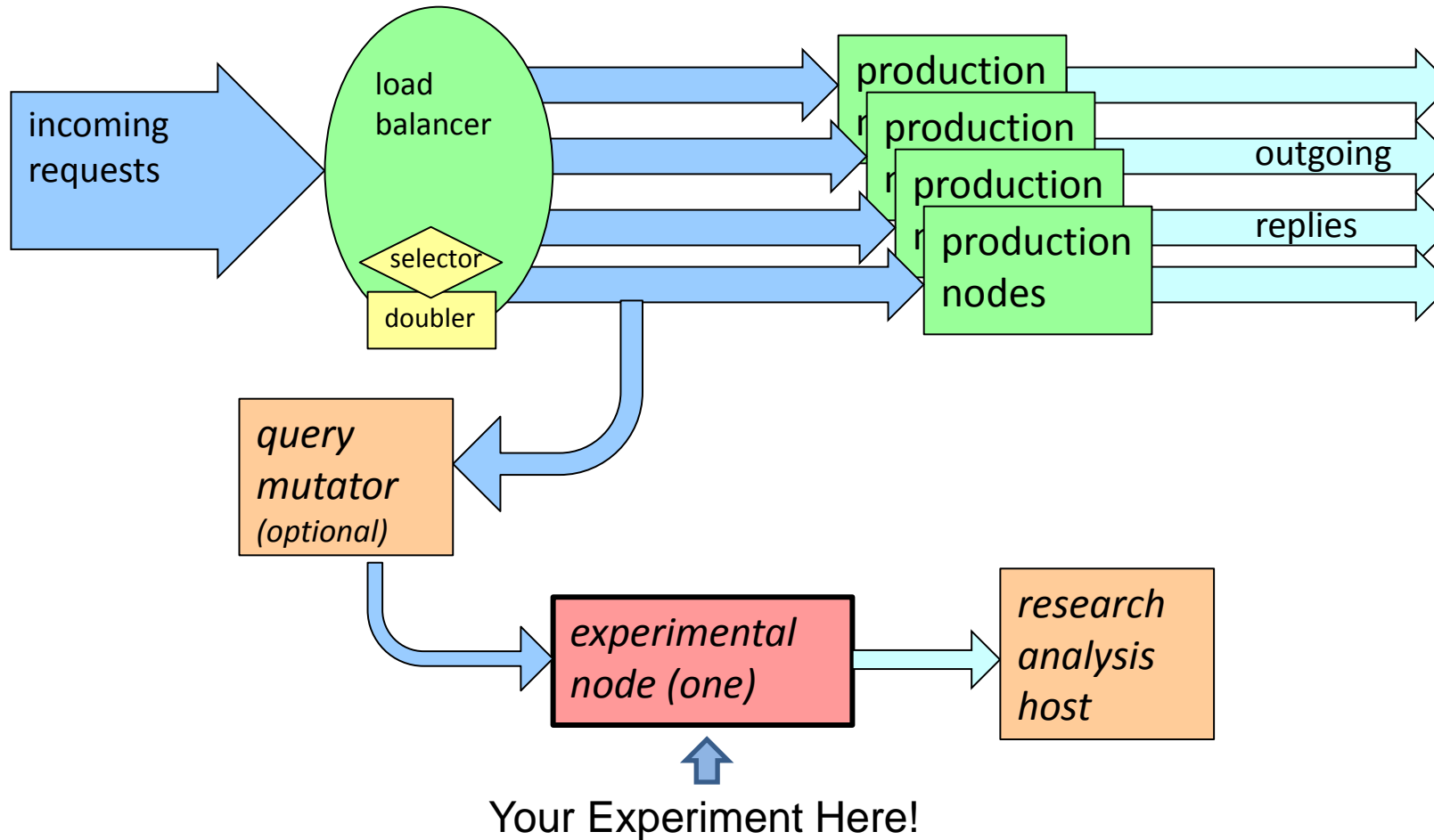
Plans and Timeline: Collaboration

- ## 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   *(DNS-OARC!)*

    – 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)
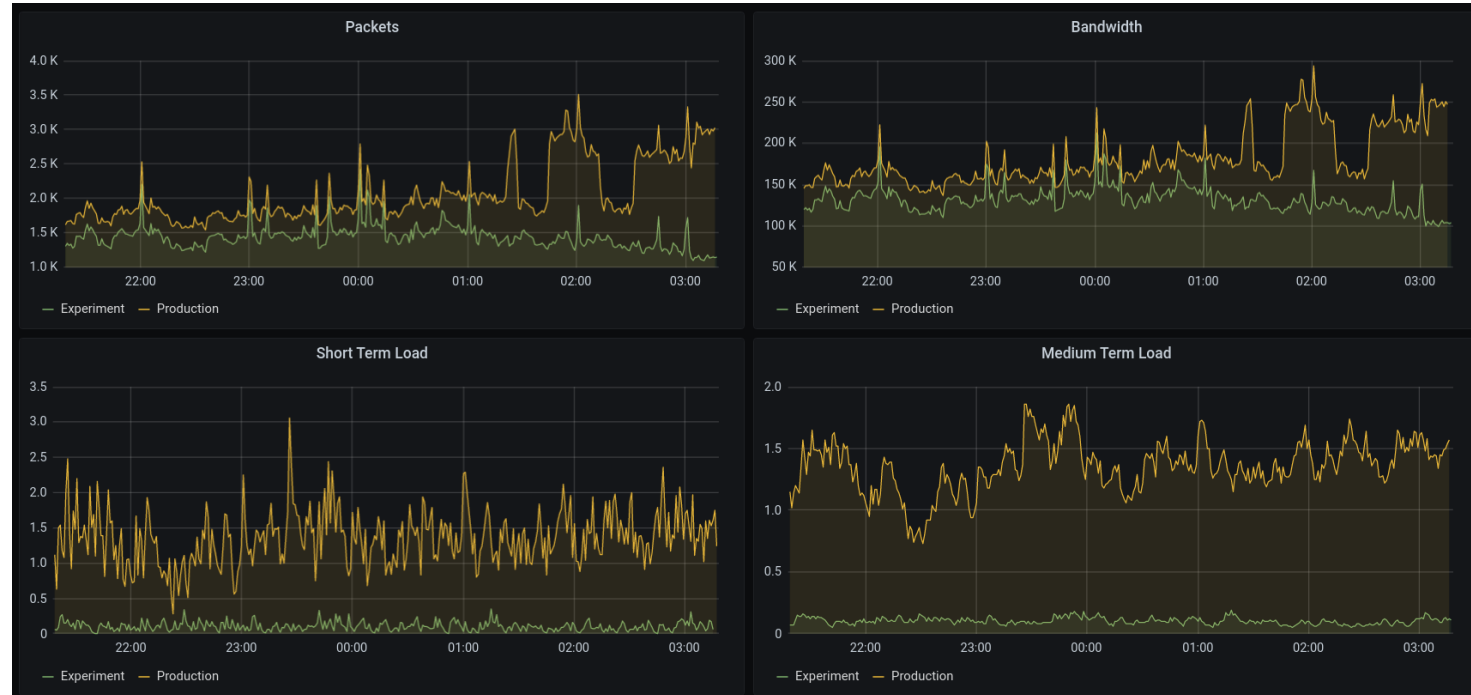
Join Us

- 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
  - **https://ant.isi.edu/diiner**