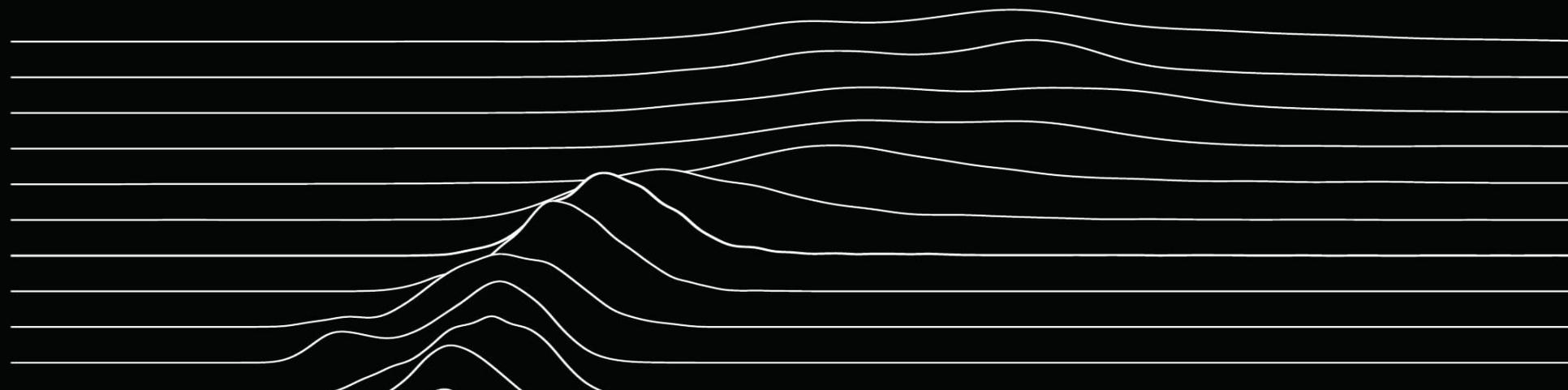


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Device Based Measurement

Chris Ritzo, Ross Schulman, and Simone Basso

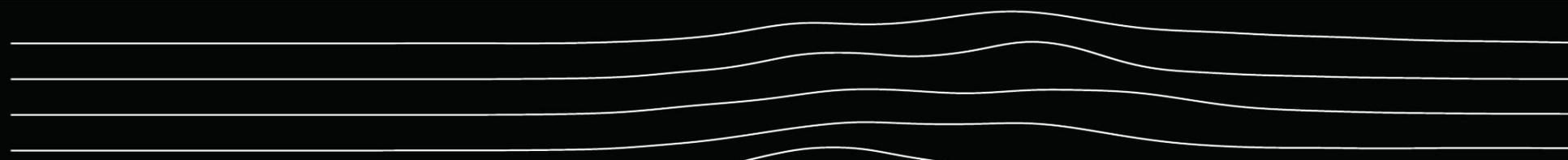


Measurement via Devices

Automating measurement from a small computers, routers, or other consumer devices allows researchers, product developers, and public institutions to:

- Use M-Lab and other network measurement tests from specific vantage points
- *Measurement Kit C++* library has enabled easier integration and use
- IoT driven measurement within schools & libraries
- *Murkami* builds *Measurement Kit* for ARM devices for individual use

We'll be talking about building and using *Measurement Kit* to do device-based, automated measurement, and showing examples from our pilot projects.

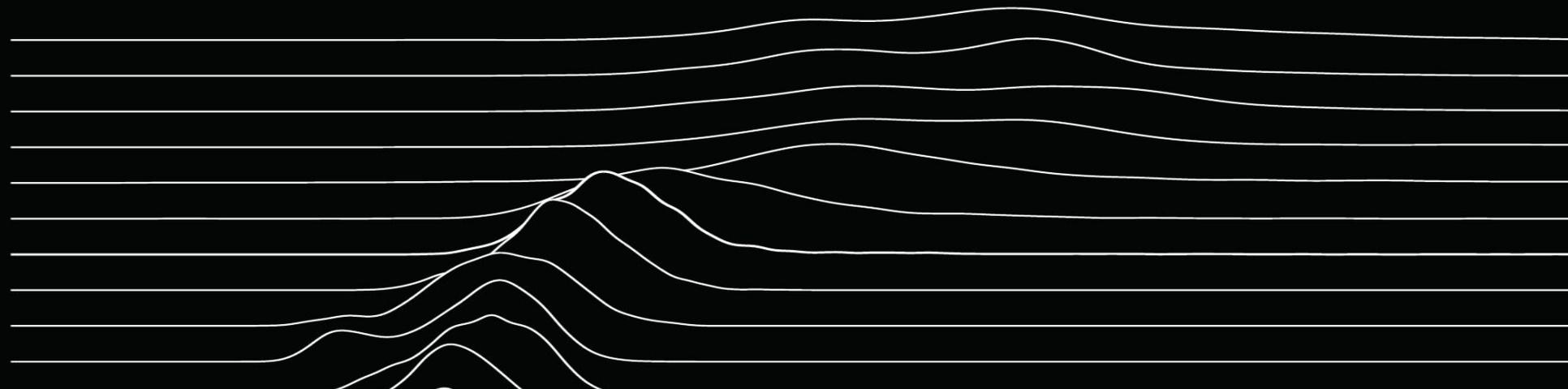


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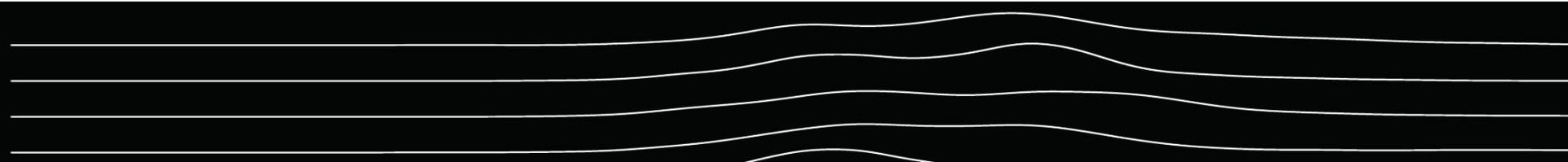
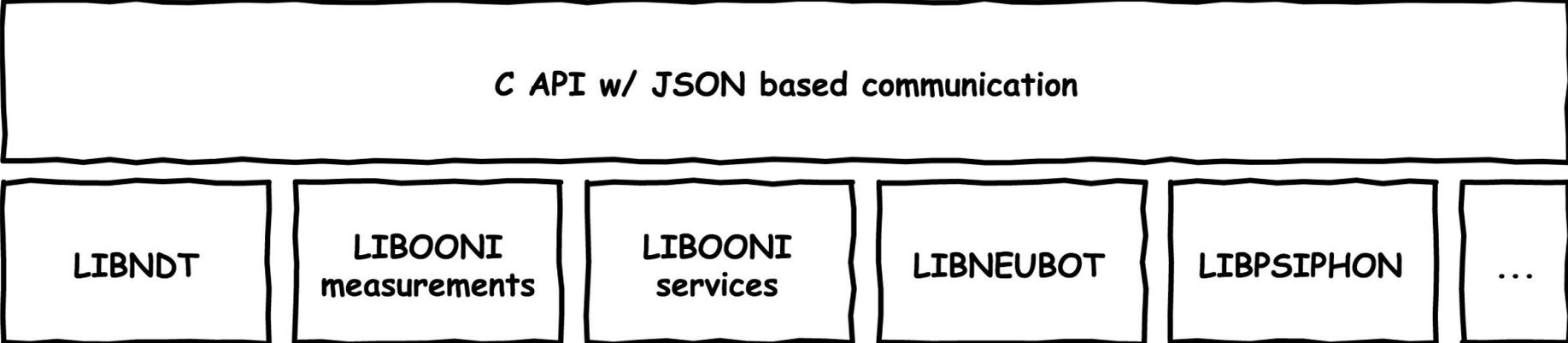
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Measurement Kit

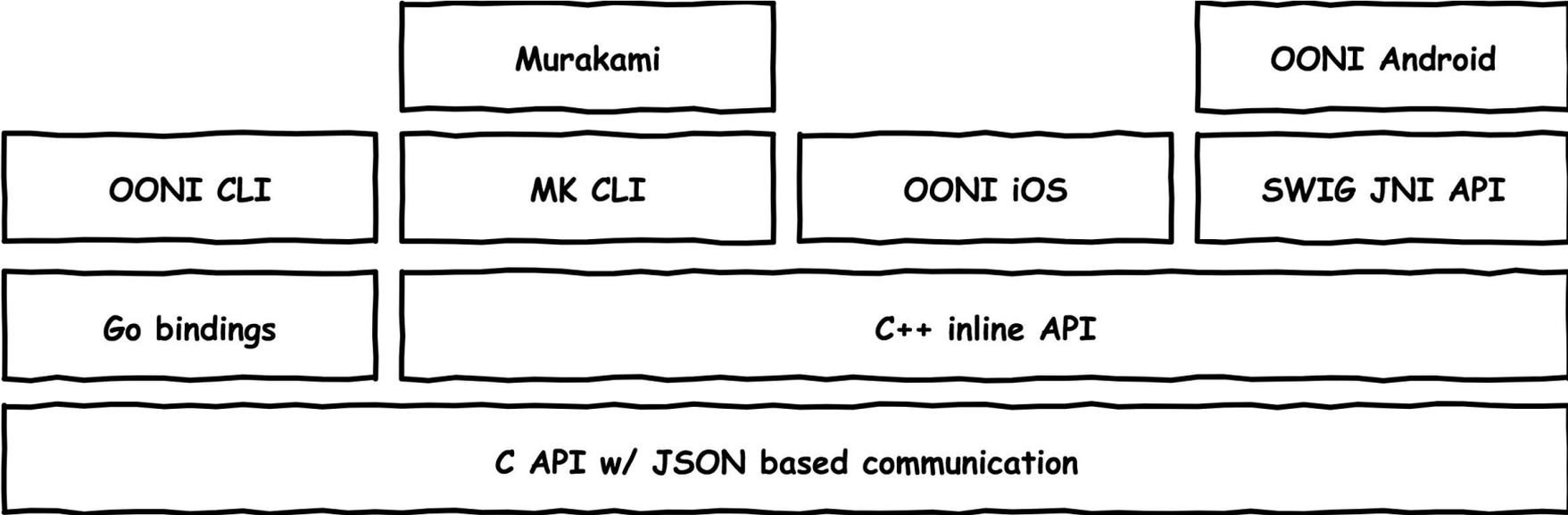
C++ Library for Software Integrations | Simone Basso



MK for developers



MK for users

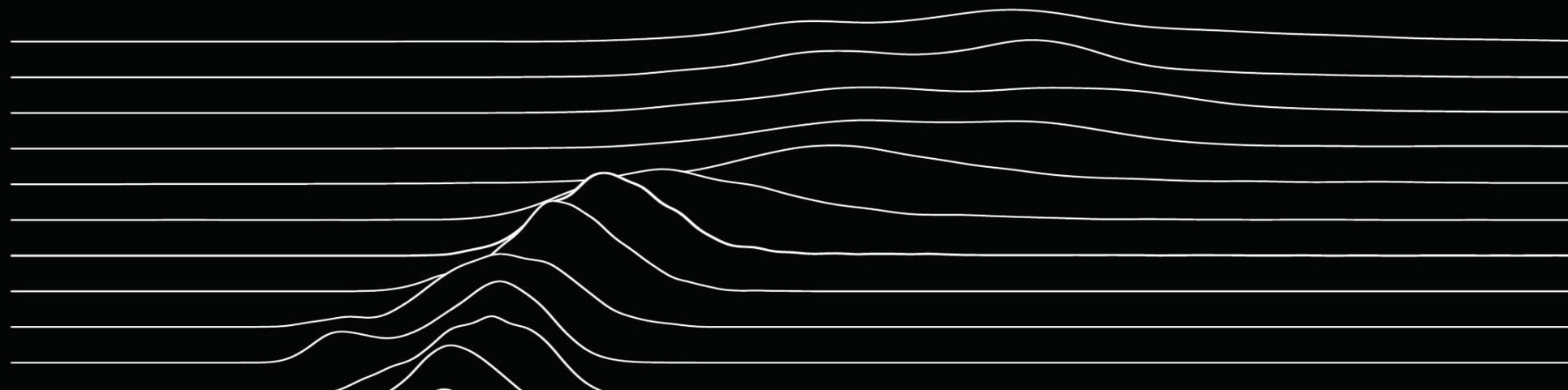


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Initial Pilot & Research

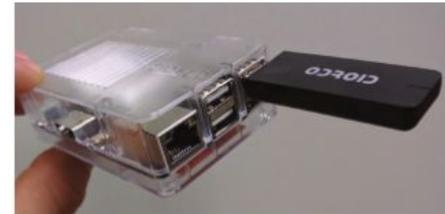
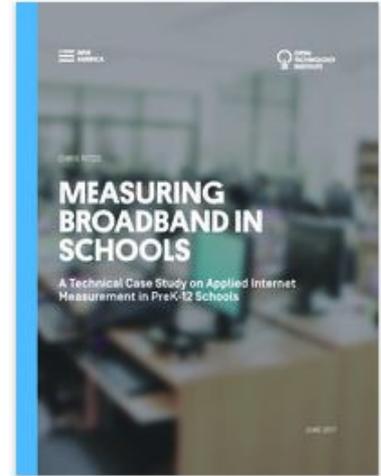
Measurement in Schools and Libraries | Chris Ritzo



Measuring Broadband in Schools

Field research pilot conducted in Alexandria, VA

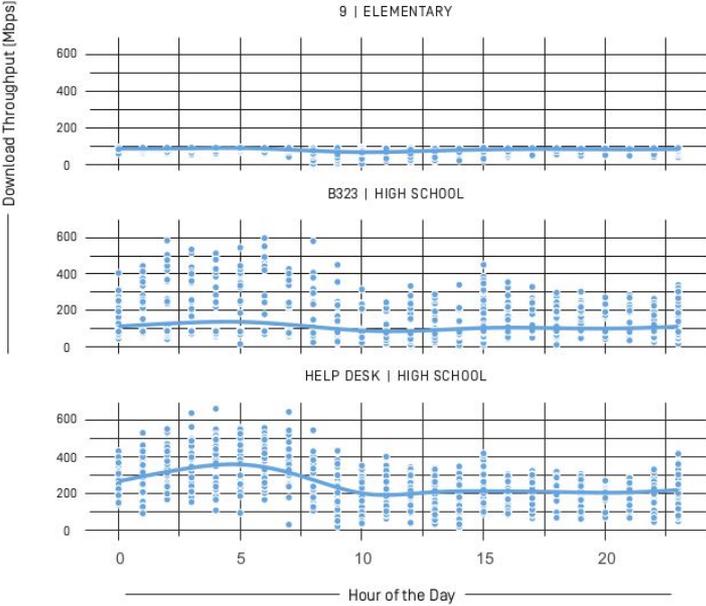
- Used small computers to automate M-Lab NDT tests
- Goals were to:
 - test methods for running automated, randomized tests
 - develop analysis and visualization methods
 - uncover deployment issues and scaling problems
- Placed within classrooms at the point of student and instructor use, to measure actual performance to the internet over time



Measuring Broadband in Schools

Each device ran NDT test throughout the day, using a randomly generated testing schedule.

Analysis included diurnal measured speeds and latency, by school type, and classroom.



Measuring Broadband in Schools

Implementation and deployment challenges

- Device provisioning & management
 - Manual setup & updates for small number of devices
- IT support
 - Remote access, static IPs, ethernet ports not active
 - WiFi connectivity, potential hardware driver issue
- Test requirements
 - NDT requires non-standard ports typically blocked in managed networks

Building a better system

Continuing work to address implementation and deployment challenges

- Manage devices and code using Resin.io
- Build and use Measurement Kit
- Push completed test data to Prometheus time-series database
- Visualize data in Grafana
- (future) Refactor NDT to use standard ports

Building a better system



Manage device provisioning, code deployment, updates and remote access with IoT platform, Resin.io

resin.io Getting Started Docs Status Chris Ritzo CR

Applications ?

DEVICE TYPE
Raspberry Pi 3

APPLICATION NAME
The application name should be at least 4 characters long. It can only contain letters and numbers.

CREATE NEW APPLICATION

MKodroidC1

TOTAL DEVICES
1

Online Configuring
Updating Offline
Post Provisioning

COMMIT: 43eb0fe8ba86 ARCHITECTURE: armv7hf APP ID: 720771

MKRpi

TOTAL DEVICES
1

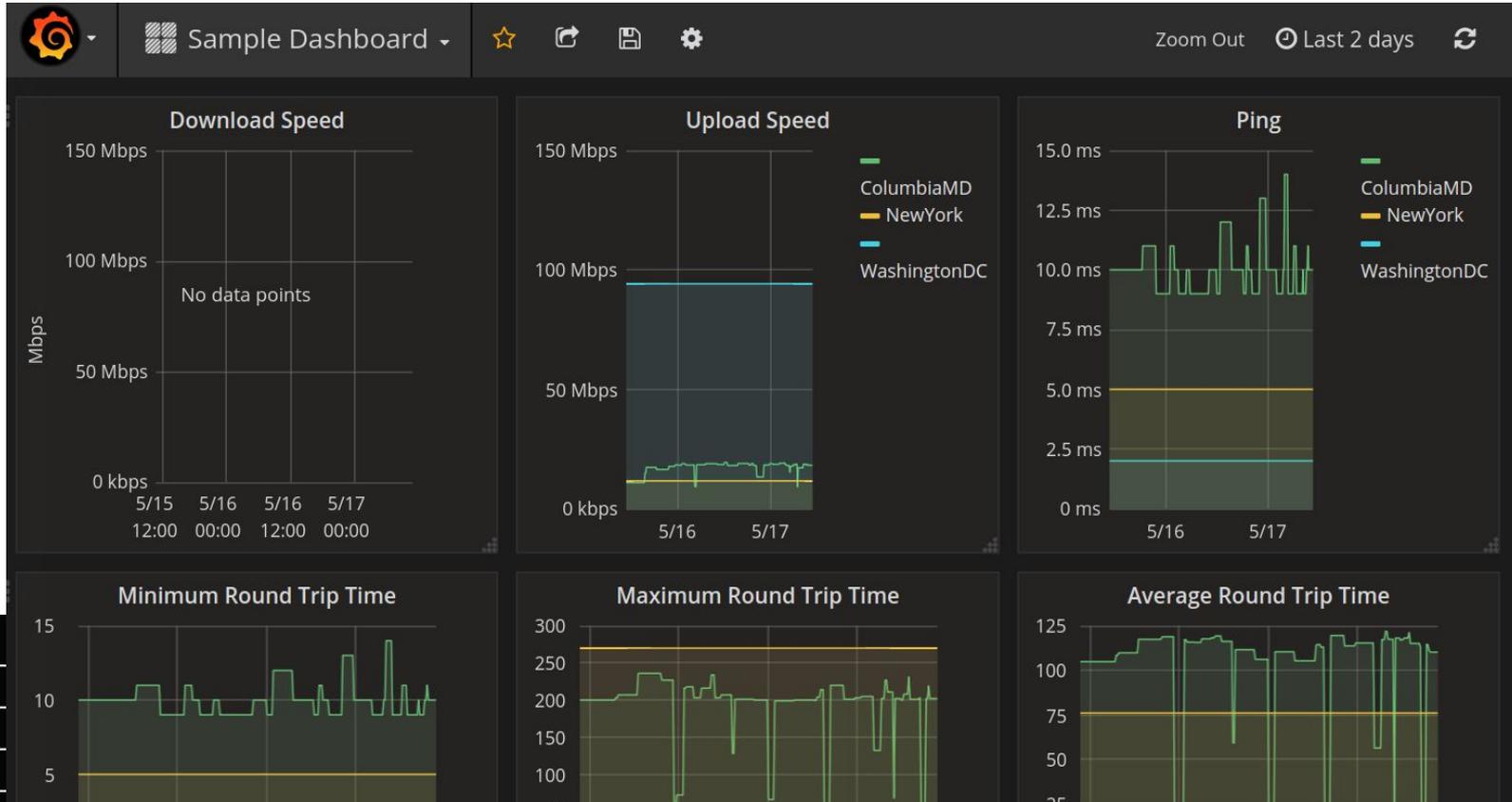
Online Configuring
Updating Offline
Post Provisioning

COMMIT: 293ecf092c32 ARCHITECTURE: armv7hf APP ID: 710233

Need help ?

Building a better system

Test data pushed to Prometheus, visualized with Grafana





LG-71-18-0110-18

Simmons College

Fiscal Year: 2018

Award: \$568,672.00

City: Boston

State: MA

Recipient Type: Library

Program:
National Leadership Grants for
Libraries

Program Categories:
National Digital Platform - Research

- <https://www.newamerica.org/oti/blog/supporting-broadband-measurement-libraries/>
- <http://slis.simmons.edu/blogs/mlbn/about/>

Simmons College, along with New America's Open Technology Institute, and Internet2, will examine how advanced broadband measurement capabilities can support the infrastructure and services needed to respond to the digital demands of public library users across the U.S. The project will gather quantitative and qualitative data from public libraries across the country to 1) understand the broadband speeds and quality of service that public libraries receive; 2) assess how well broadband service and infrastructure are supporting their communities' digital needs; 3) understand broadband network usage and capacity; and 4) increase their knowledge of networked services and connectivity needs. The project deliverables include an open source and replicable broadband measurement platform, training manual to help public librarians use that platform, and a final report on the project.

Project Proposals:

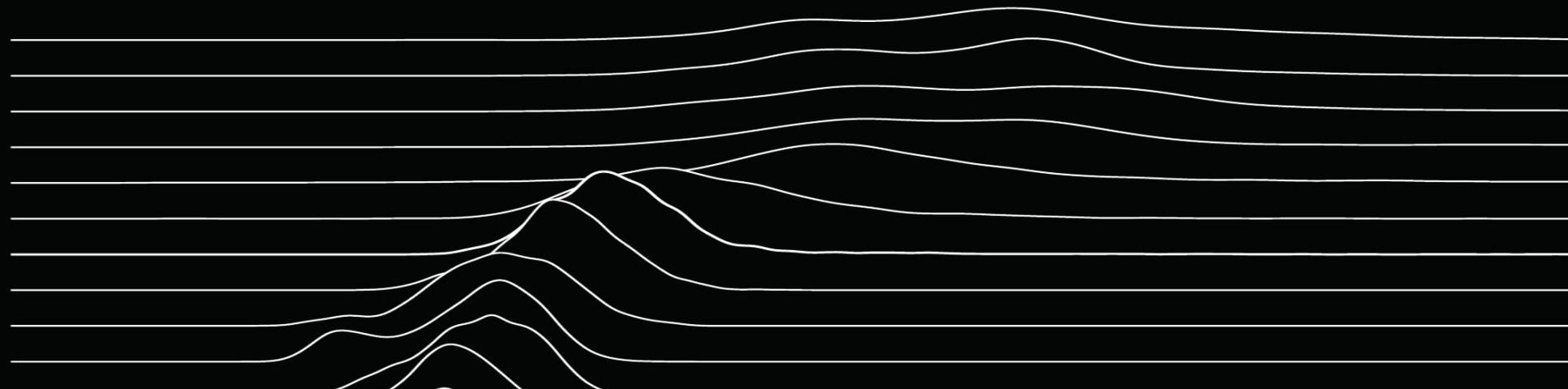
Attachment	Size
 Project Proposal LG-71-18-0110-18	365.37 KB
 Preliminary Proposal LG 71-18-0110-18	72.54 KB

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MURAKAMI

Simple Measurement on Cheap Devices | Ross Schulman

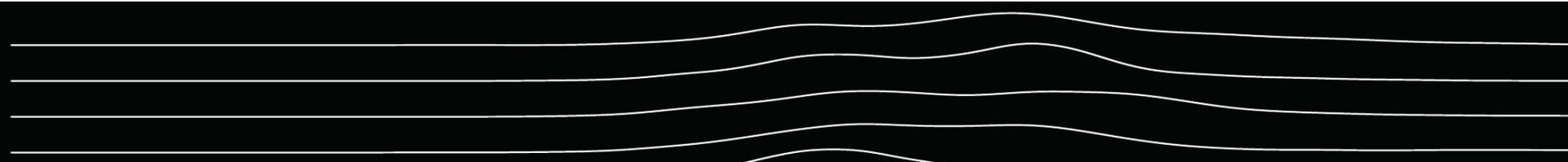


Murakami Architecture

A docker container built for ARM architecture and designed to run on a small device such as Raspberry Pi

Uses Measurement Kit to run NDT tests every 12 hours on average

Stores test results locally for later analysis



Murakami Dashboard

Future work:

A dashboard accessible via web browser showing...

- Graphs of network bandwidth over time
- Comparisons to tests from others in the region
- And many other fancy visualizations!

