



Review 9th Open call:"SME and NGI Cascaded Experiments" - F4Fp-SME-COD210601

Esther Payne
Librecast Project

Librecast: IoT Software Updates over IPv6 Multicast

Proposal number: F4Fp-SME-COD210601-05

Virtual Review FEC11
11/05/2022

Concepts and Objectives

RFC 3270 states that: “IP Multicast will play a prominent role on the Internet in the coming years. It is a requirement, not an option if the Internet is going to scale.”

- ▶ All software requires updates for bugs/security updates

Concepts and Objectives

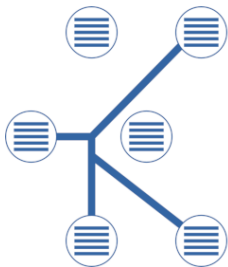
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- ▶ All software requires updates for bugs/security updates
- ▶ Currently these are served via unicast with massive infrastructure to serve millions+ nodes
- ▶ IPv6 Multicast would be a more efficient way of updating any device
- ▶ The experiment series aimed to compare Unicast v Multicast

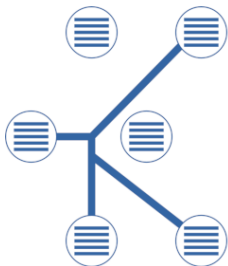


Distributed Applications with IPv6 Multicast

FOSS Project funded by NGI Zero

 Native IPv6 multicast not supported on wider internet

Librecast aims to provide tools for developers to use multicast.



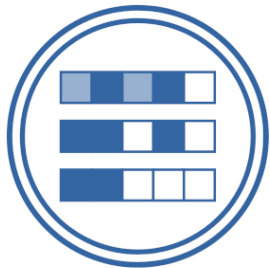
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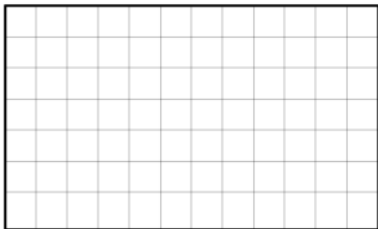
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IoT Update client and server

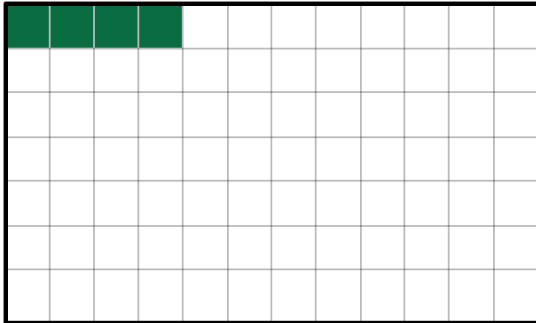
Proof of concept demonstration of IoT updates over multicast

Receiving a File

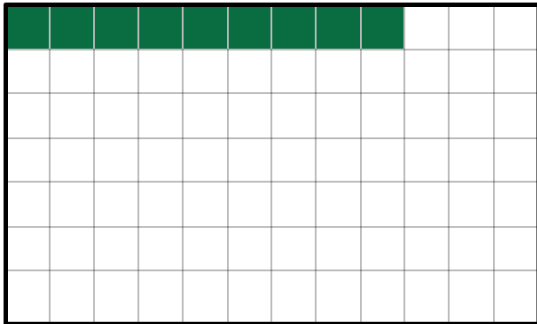


Server sends the file continuously on a loop
Size, offset and checksum data embedded in each packet.
If no receivers are joined to the channel.
All traffic is dropped by the first hop router (or switch with MLD),

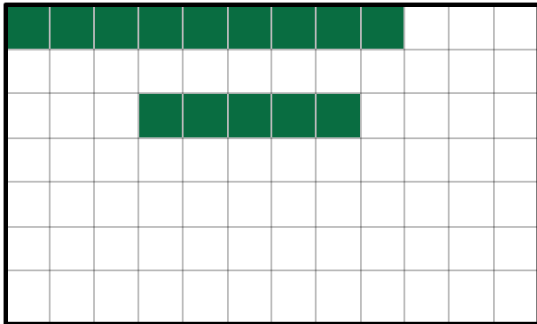
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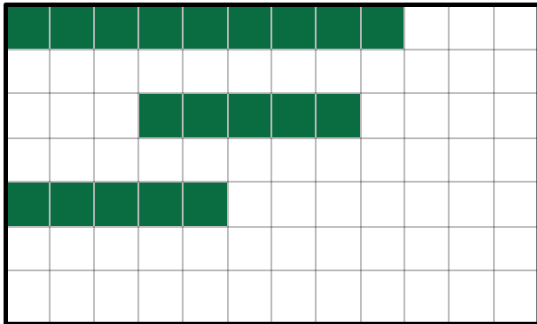
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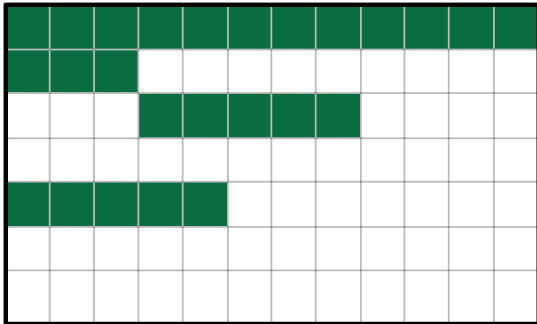
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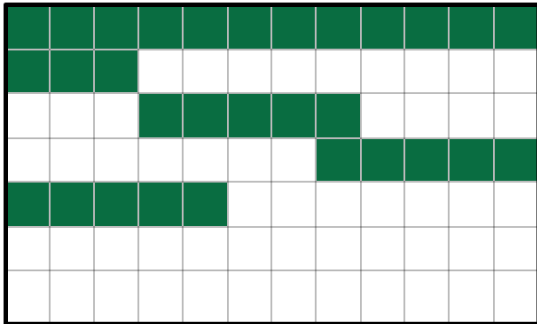
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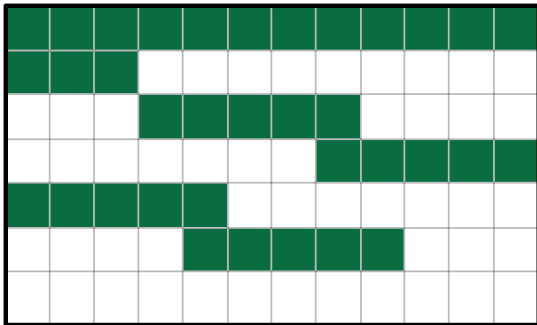
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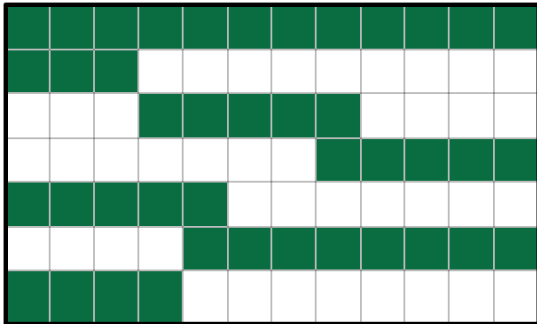
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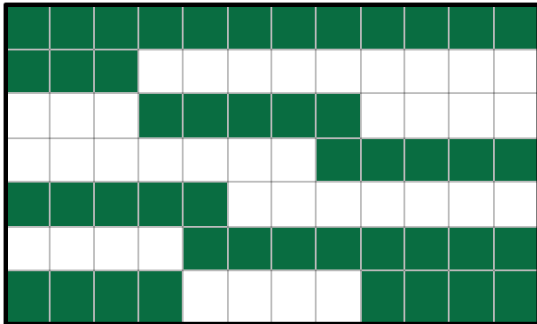
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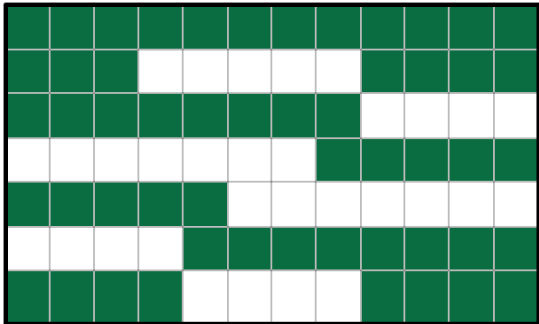
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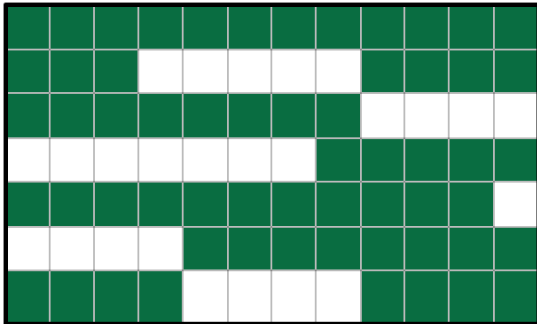
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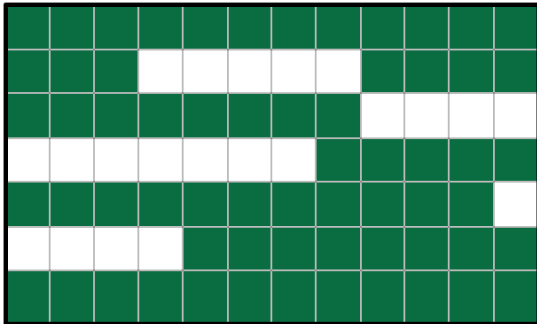
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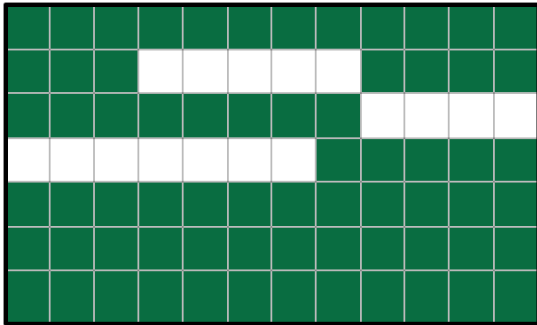
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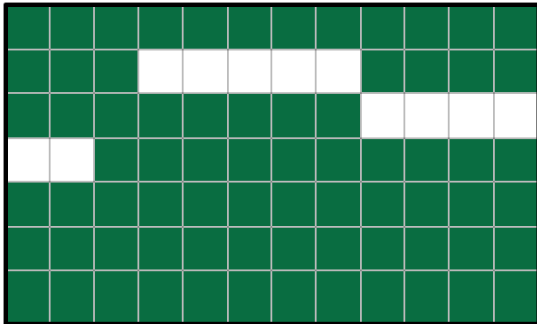
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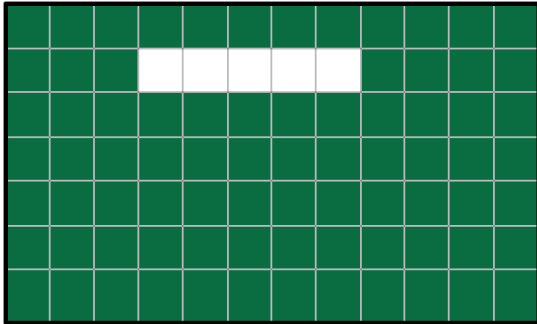
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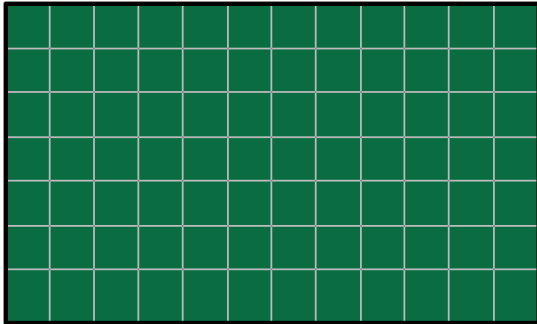
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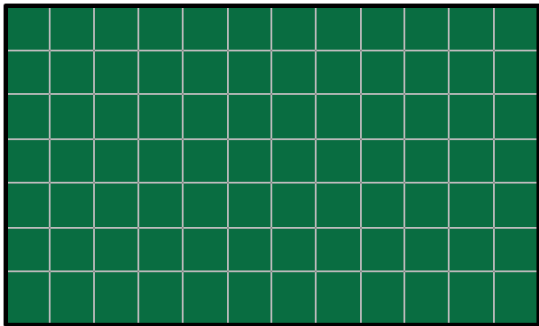
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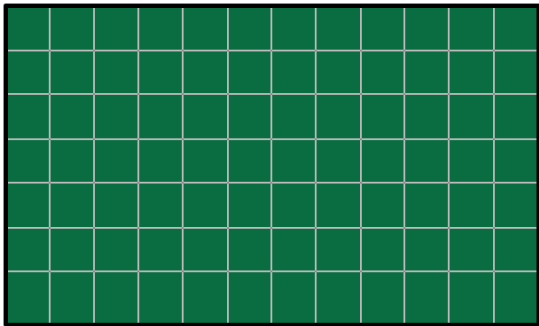


Receiving a File



Data received: 100%

Receiving a File



Data received: 100%

Checksum match

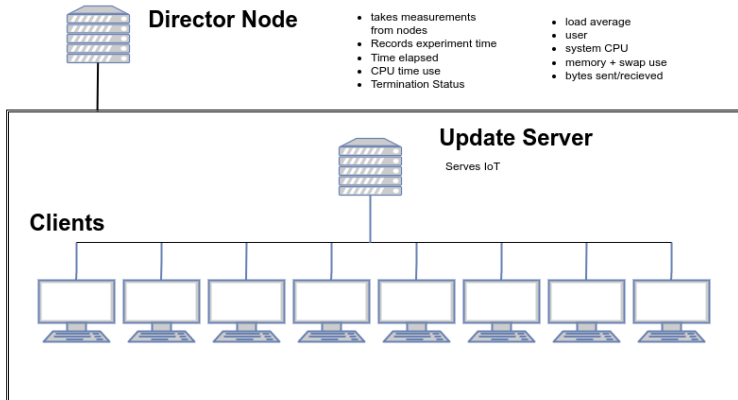
Experiment Testbed setup on Virtual Wall 1

Methods of syncing

- SCP
- TCP
- UDP (using Unisync)
- Multicast (IoT updater)

Timing Schedules

- immediate
- random
- random 2 (x2 waiting)



Experiment Topology Examples



Base experiment topology:
Network with 8 clients on a single LAN



2 LANS topology: Network with 8
clients, 1 router



Network with 8 clients 4 clients per
LAN, 3 Routers



Network with 8 clients 2 clients per LAN, 7
Routers

Project Results

Measurements, logged by lwmon

- ▶ During the experiment: load average, user + System CPU, memory + swap use, bytes sent/received

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- ▶ Unicast servers logged: request timestamp, response timestamp

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- ▶ Multicast requires fewer server resources for the same number of clients, which could lead to financial and environmental benefits.
- ▶ Multicast appears to be more scalable
- ▶ MLD Snooping can be used in server implementations to trigger software downloads.

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Post Mortem

- ▶ Test across multiple labs

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Post Mortem

- ▶ Test across multiple labs
- ▶ Access with ability to switch on MLDv2 on Hardware routers
- ▶ Further experimentation is required to quantify the financial and environmental benefits.
- ▶ Increase scale of experiment to thousands of nodes

Why Choose Fed4Fire +

- ▶ Established Testbed Framework

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- ▶ Marketing for the Librecast Project
- ▶ Credibility for the project via interaction with EU funded initiative as well as NGI ZERO

How did Fed4fire benefit the Project

- ▶ Getting to know the labs in the testbed

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- ▶ Gaining the knowlege of how to find available testbeds
- ▶ Sped up development of lcroute and also other project code
- ▶ Implementation of MLD v2 in Librecast code.

Business Impact

- ▶ Funding for the project to test Proof of Concept

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- ▶ Creating a framework of experiments to test efficiency of multicast v unicast
- ▶ Being able to show a usecase for multicast that isn't streaming locally

Value Percieved

- ▶ Colaboration between the team member's individual projects (lwmon and librecast)

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- ▶ Being able to test funded code on outside infrastructure
- ▶ Being funded for the team's time testing the code

Feedback

Resources : LABS

- ▶ Virtual Wall 1

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- ▶ Grid 5000

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- ▶ Getting onboarded was complex due to documentation focus on jfed GUI
- ▶ Main onboarding document not accessible.
- ▶ JFED client interacts with other LABS in unpredictable ways

Process feedback

- ▶ Onboarding Process needs to be more explicit (Proper written confirmation for LABS)
- ▶ Support for issues was patchy and often required chasers
- ▶ No real process around which issues to send to which lab (for example routers)
- ▶ Documentation for interacting with other labs limited
- ▶ New framework needed EU wide for future testbeds.

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Value of Fed4fire

- ▶ Outside Resources to test code on POC
- ▶ Opportunity to connect with LABs
- ▶ Sped up development via needed improvements to code
- ▶ Large potential spread of LABS to test multicast on in the future



Co-funded by the
European Union



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Swiss Confederation

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THANK YOU FOR
YOUR ATTENTION

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