

# Forming mesh mobs multicast optimizations for batman-adv

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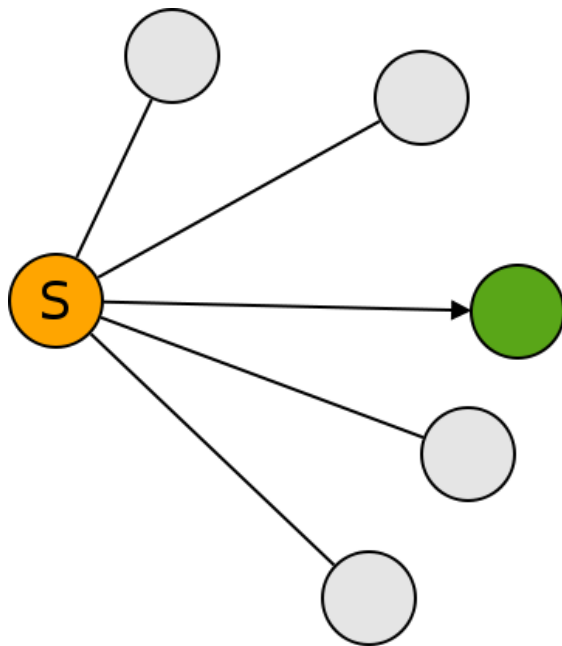
# Outline

1. Introduction to Multicast
2. Multicast in Mesh Networks
3. Multicast in BATMAN-adv
4. Experimental Platform

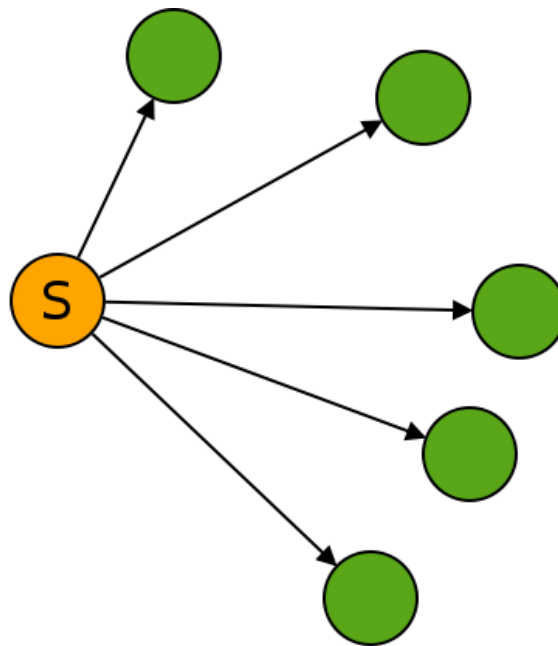
# Multicast Introduction

## Classification

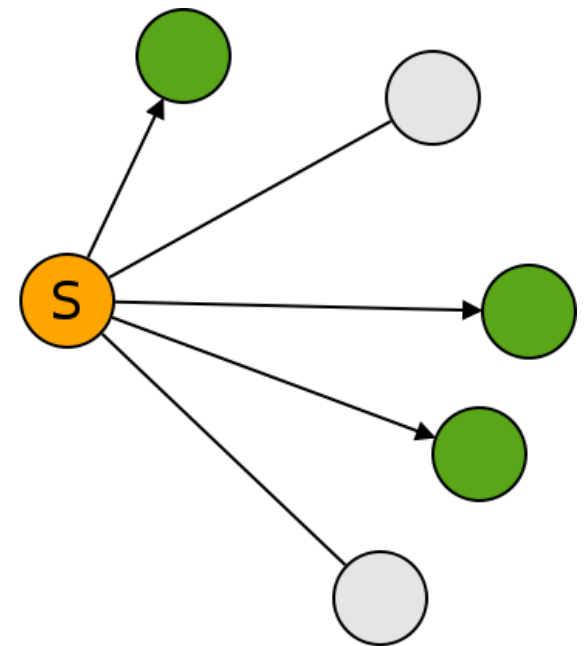
- Communication schemes



Unicast



Broadcast



Multicast

# Multicast Introduction

## Applications

- Multimedia Streaming: Audio, Video
- Broadcasting of TV or Radio content (IPTV etc)
- Monitoring Systems (Sensors etc)
- Conferencing Systems
- ZeroConf/MDNS (Bonjour, Avahi ...)
- Your application?

# Multicast Introduction

## Forming Groups

- Network nodes must announce their membership of multicast groups
- IGMP (Internet Group Management Protocol) is used by IPv4 nodes to join or leave groups
- For IPv6, MLD (Multicast Listener Discovery) is used

# Multicast Introduction

## Addressing (1)

- Source IP/MAC addresses are always [tm] from the sending host, destination addresses depend on the communication scheme
- **Unicast:** Use IP address (Layer 3) and MAC address (Layer 2) in the destination field
- **Broadcast:** Use last IP address of the subnet (Layer 3) or Broadcast MAC address (like FF:FF:FF:FF:FF:FF) in the destination field

# Multicast Introduction

## Addressing (2)

- **Multicast:** Use Group IP address (one out of 224.0.0.0/4) and according MAC address (01:00:5E:xx:xx:xx)
- Other addresses (e.g. for IPv6 or Cisco) exist

IPv4 address:

239	255	42	12
ef	ff	0c	2a
111011111	1111110000110000011010		

MAC address:

01	00	e5	7f	0c	2a
000000001000000000	111001010	1111110000110000011010			

IPv4 Multicast Prefix

last 23 bits

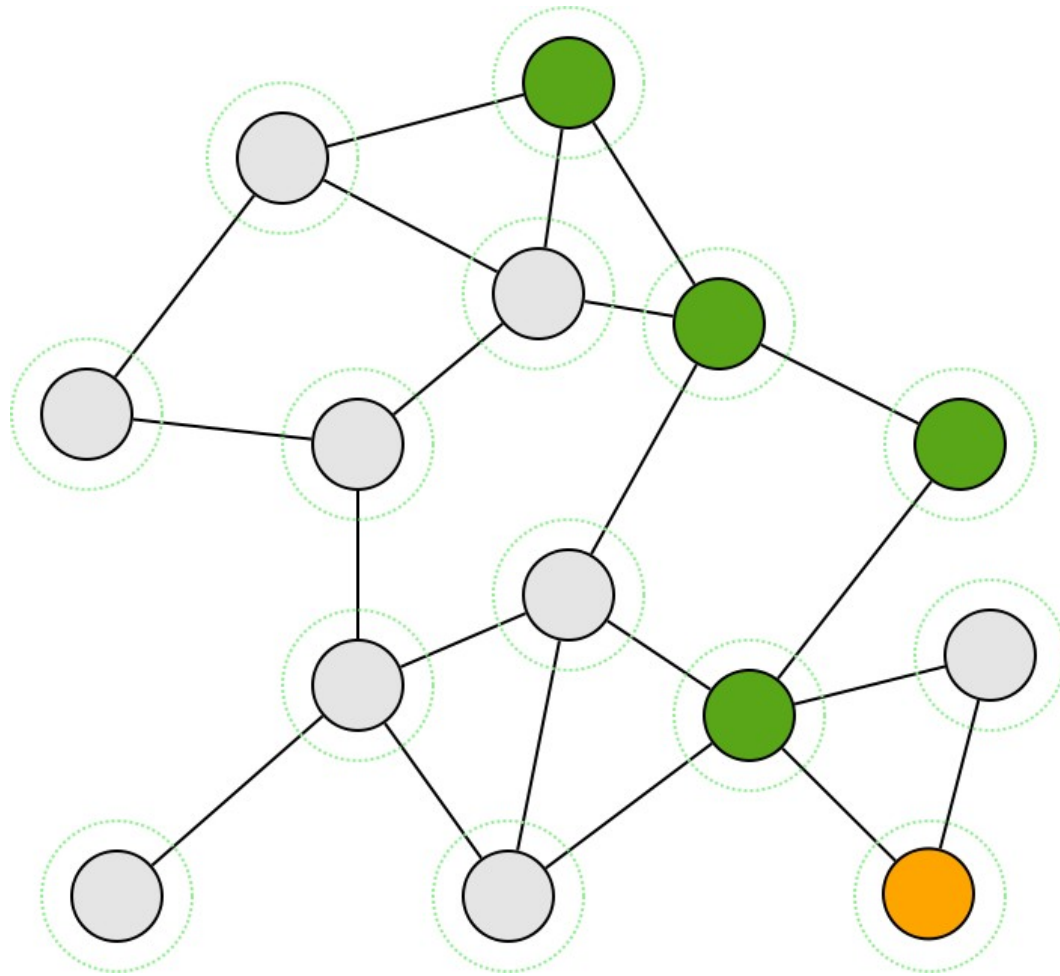
# Multicast in Mesh Networks

- Mesh networks support unicast, some support broadcast (batman-adv does)
- Multicast can always be “emulated” by Broadcasting (nodes which are not members should drop)
- Most simple scheme is “Classic Flooding” - a node repeats a broadcast packet when it receives the packet **the first time**



# Multicast in Mesh Networks

## Classic Flooding

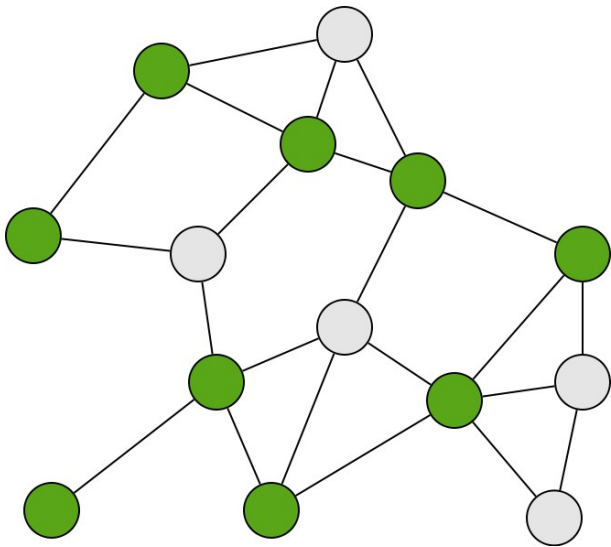


# Multicast in Mesh Networks

## Optimized Algorithms

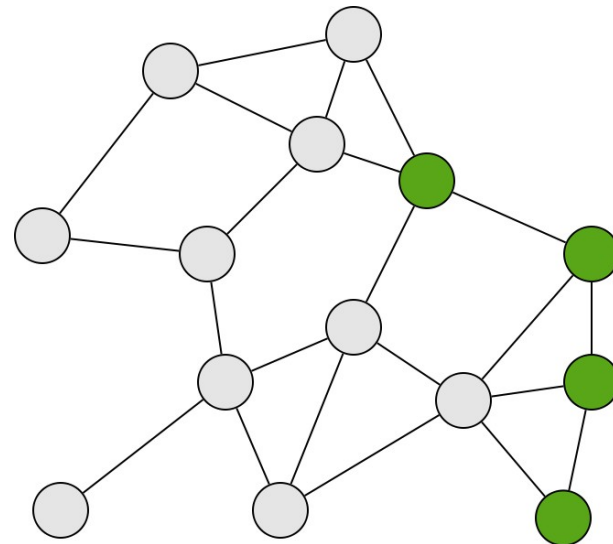
### Dense networks

- Group size > 50% of Mesh
- Special Nodes only Forward (MPR)
- Examples: OLSR/MPR, CDS



### Sparse networks

- Group size < 50% of Mesh
- Build Distribution Infrastructure
- Only nodes on this infrastructure forward packets



# Multicast in batman-adv



- Initial implementation has been developed at saxnet for a customer
- Batman-adv already supports multicast by handling it as Broadcast through Classic Flooding
- Our multicast optimizations are designed for sparse networks
- Communication infrastructure is pro-actively built

# Multicast in batman-adv

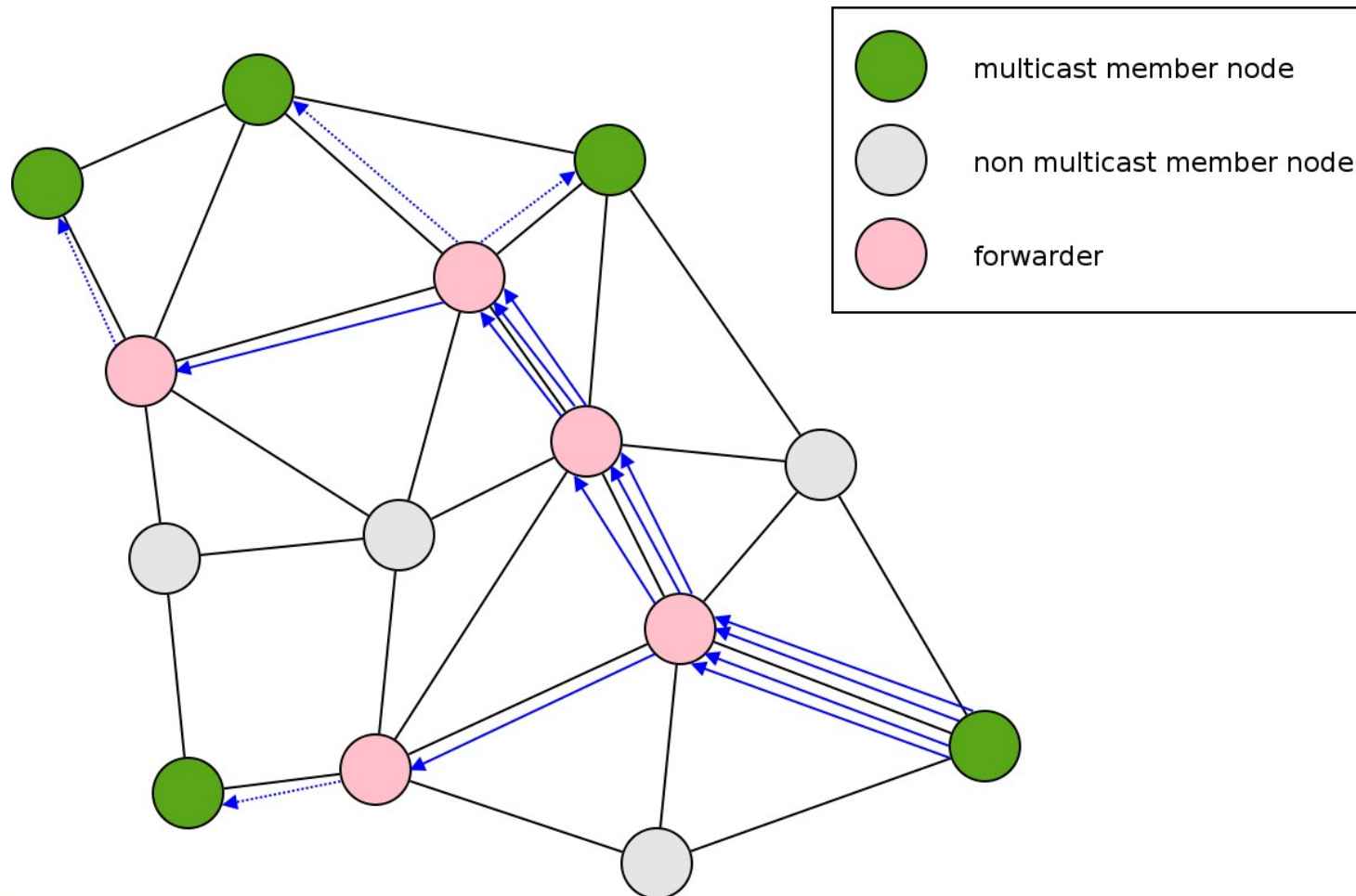
## Membership Announcements

- OGMs are periodically flooded through the network
- Group membership is “sniffed” on the local host
- These MAC addresses are then announced with OGM packets

# Multicast in batman-adv

## Tracker packets

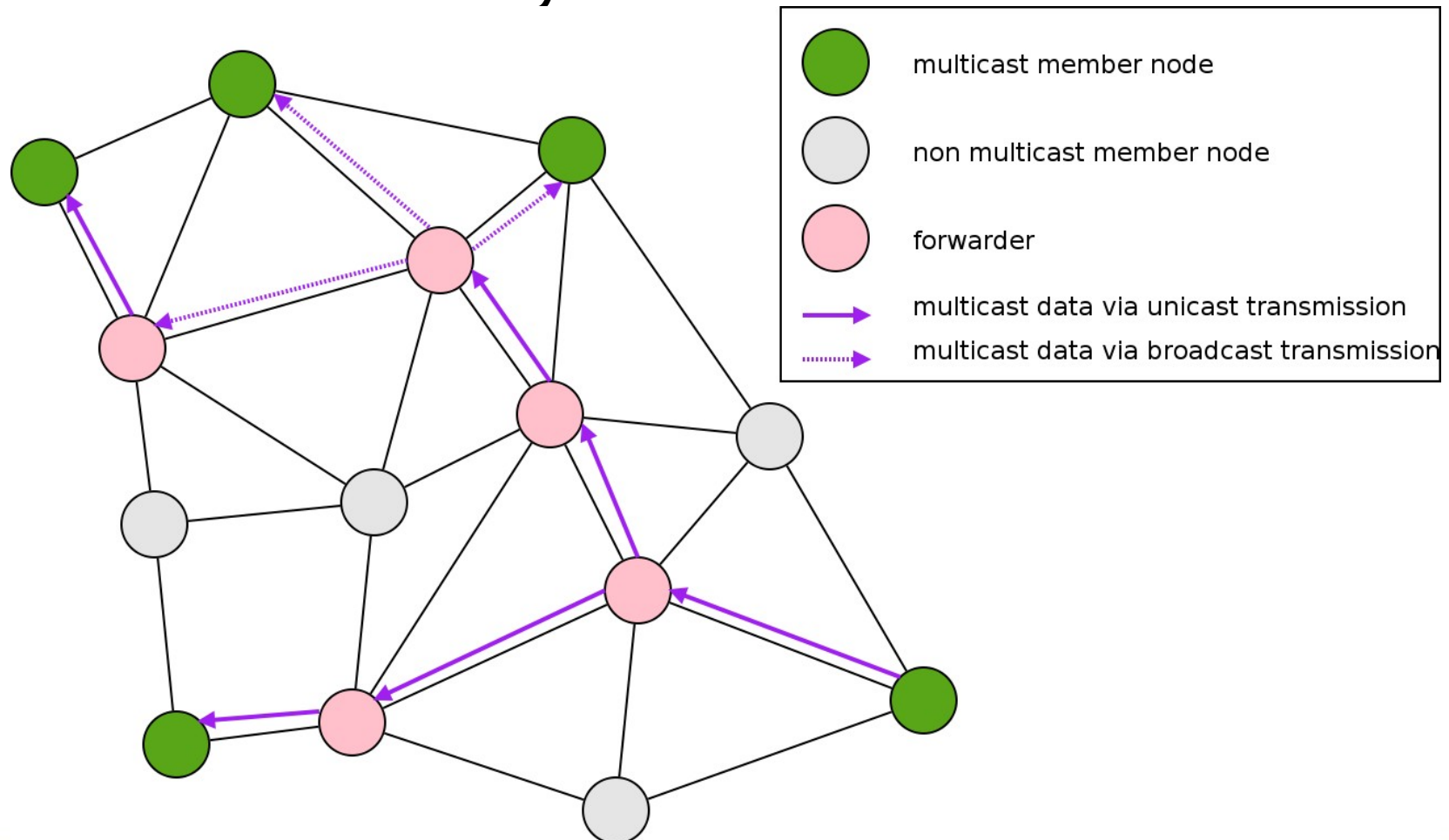
- Establish distribution infrastructure using tracker packets



# Multicast in batman-adv

## Payload packets

- Send Multicast Payload via the infrastructure



# Multicast in batman-adv

## Advantages

- Builds upon batman-adv unicast routing
- Last node on in a tree does not rebroadcast
- Therefore, massive decrease of duplicates when all nodes are in one hop range
- Packets are only sent to members – useful for local groups

# Multicast in batman-adv

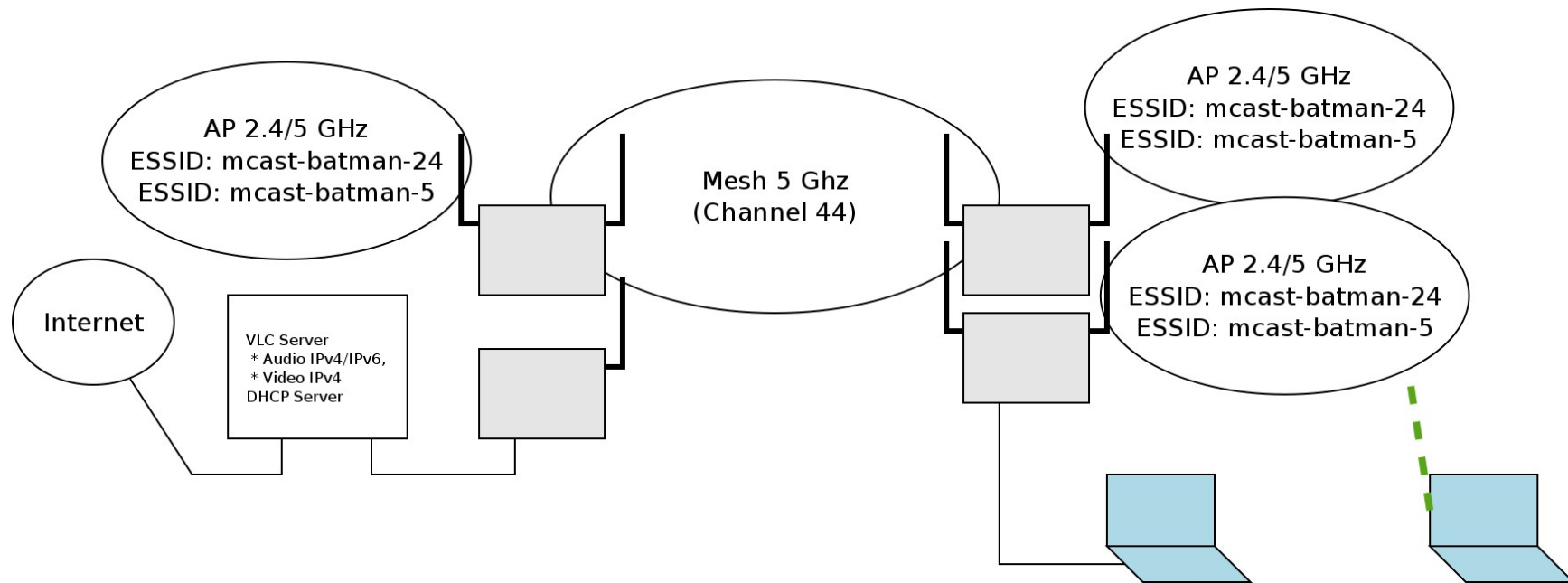
## Limitations

- Not designed for “big” groups (dense multicast networks) or as general broadcast replacement (overhead too high)
- Current implementation does not distinguish between “senders” and “receivers” (to be done)
- Current implementation only reads local multicast memberships, IGMP/MLD snooping is currently worked on



# Experimental Platform

- We have set up a platform for the Workshop
- Nodes are used to distribute multicast data
- A VLC streaming server for voice and video data



# Experimental Platform Instructions

- You may connect with your laptop to Ethernet or ESSID 'batman-mcast-5' or 'batman-mcast-24' and use VLC to view:
  - IPv4 audio: `vlc rtp://239.255.12.42`
  - IPv6 audio: `vlc "rtp://@[ff12::123%wlan0]"`
  - IPv4 video: `vlc rtp://239.255.12.42:1234`

