

# BattleMesh v15 report



## **Abstract**

This report serves as the last document and communication related to the Wireless BattleMesh v15 event. It was motivated, specially because of the compromise acquired with RIPE NCC, one of the sponsors, to generate a report of the event. But it also serves as a valuable source of information for the rest of sponsors, related entities, participants and organizers of the BattleMesh event.

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tasks for its completion:

## 1 Introduction

### 1.1 The BattleMesh

The Wireless BattleMesh is a non-commercial, volunteer-organized annual convention.

The convention features a variety of talks and workshops on technical and political issues related to mesh networking, wireless community networks and OpenWrt firmware development.

The purpose of the event is to foster discussion on topics such as the right to connectivity, community-owned infrastructure and related free open source projects.

The BattleMesh has organized events for 15 years in various European countries, as shown in the map. In this edition, we took the opportunity to visualize it through their coordinates (see Figure 1).

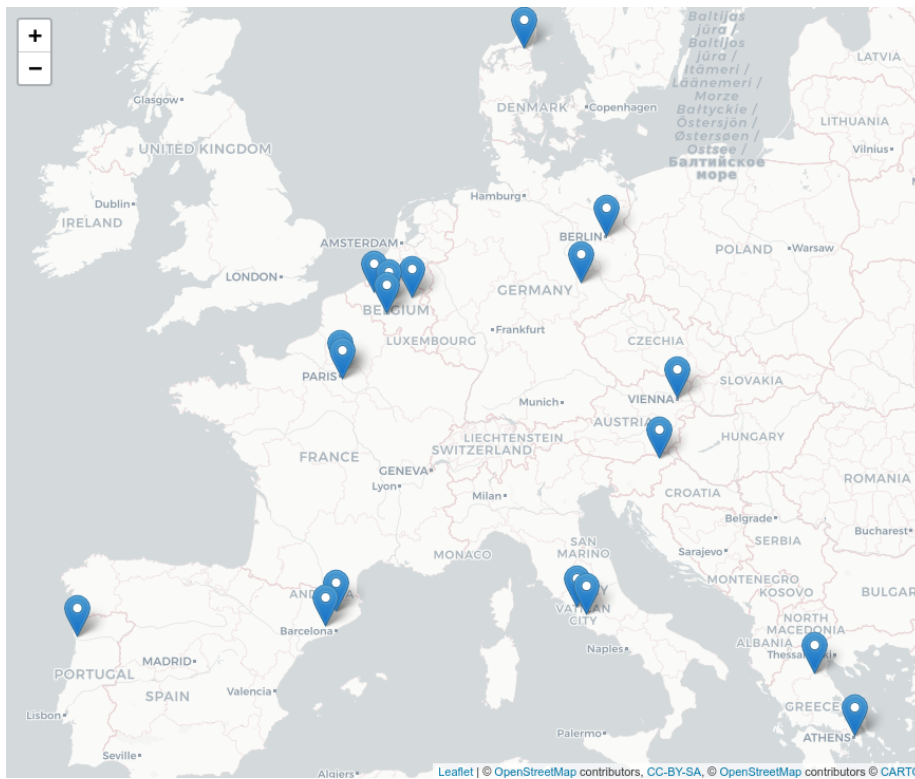


Figure 1: Map with previous BattleMesh locations

And this is the script that generated the map<sup>1</sup>

This year's edition has been held in Calafou, Vallbona d'Anoia, Barcelona, between May 8 and May 14, 2023.

## 1.2 The venue: Calafou

Calafou is a former textile factory and colony about 50 km outside of Barcelona. Today, it is home to a self-organized project that includes spaces for industrial, craft and creative activity, common infrastructures for meetings and various activities, and housing.

The project is self-managed by a local cooperative. More information is available on Calafou's website<sup>2</sup>.

### 1.2.1 Calafou collective kitchen service

The Calafou collective kitchen service is a catering project for Calafou events that aims to generate networking and dynamism for the community while providing a source of income and sustainable working conditions for the people who work there. They offer and facilitate the cooking service for the participants with a political objective of promoting food sovereignty in the territory, with local suppliers and related alternative projects, while offering healthy meals at affordable prices. Where possible, they incorporate fair trade, km0, organic and seasonal products. They want to introduce the vegetarian and vegan diets in greater proportion to choose more ethical and responsible options.

They recently started the project and they are excited to offer BattleMesh a catering suitable to the demands and possibilities. For this reason, they made a proposal with seasonal products from the local organic garden, vegetables, and recycled organic Natursoy products, among others. One of the daily meals was exclusively vegan and the rest was vegetarian with omnivorous options. They guaranteed the vegan diet, gluten-free and other possible allergies to people who require it. Along these lines, they also wanted to offer options for refreshments and drinks during the event in the same political line, with beers from the Calafou's craft beer cooperative Subversiva coop, as well as from other alternative producers such as Altercola.

Above was the text as it was placed in Catering package section, in BattleMesh wiki<sup>3</sup>

See the big paella in Figure 2.

## 1.3 The Orga team

BattleMesh's international organizers team for v15 consisted of about 10 people total, one third forming part of the local team in/near Calafou, one third regular remote participants, and the rest contributors to specific tasks.

<sup>1</sup>[https://www.battlemesh.org/BattleMeshV15?action=AttachFile&do=view&target=battlemesh\\_places\\_more\\_compact.r](https://www.battlemesh.org/BattleMeshV15?action=AttachFile&do=view&target=battlemesh_places_more_compact.r)

<sup>2</sup><https://calafou.org/web/index.php/sobre-calafou#eng>

<sup>3</sup>[https://battlemesh.org/BattleMeshV15#Catering\\_package\\_service\\_introduction](https://battlemesh.org/BattleMeshV15#Catering_package_service_introduction)



Figure 2: Photo of the big paella event on Saturday lunch

Work for the orga team started only weeks after the end of the v14 edition of BattleMesh, when a wiki page for v15 was created, and the first orga team online meeting was held. Local organizational activity ensued. This included visits to the event location in Calafou and promotion in local circles. Regular, roughly two-weekly, online orga meetings were held from January 2023 on. 14 such meetings were held, typically including 4-6 people for 1.5 hours (overall about 100 work hours). Additional smaller work meetings were held as the workload required, both online and offline/locally.

In preparation of the event, the orga team handled the following tasks: coordination with the venue, operation of communication infrastructure (wiki, mailing list, etherpad, video conferencing system, cloud/groupware), contact to potential sponsors, managing participants registrations (including visas, travel scholarships), handling of payments, community involvement (call for participation, call for contributions, wiki gardening, announcements on mailing list, BattleMesh chat), information management and documentation, installation of a new internet-providing network in the venue, as detailed below.

#### 1.4 The sponsors

Thanks to the sponsors for making this v15 edition possible!

*Freifunk*<sup>4</sup>, *Chaos Computer Club*<sup>5</sup> and *RIPE NCC*<sup>6</sup> contributed giving us funding that helped in making the event free of charge and open to everybody interested in joining

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<sup>4</sup><https://freifunk.org/>

<sup>5</sup><https://www.ccc.de/>

<sup>6</sup><https://www.ripe.net/>

it. *Association for Progressive Communications*<sup>7</sup> (APC) helped with some of the travel scholarships. *Ninux*<sup>8</sup> hosts some of the infrastructures that make the BattleMesh reachable over the internet such as web hosting, mailing list and wiki. *Associació Expansió de la Xarxa Oberta*<sup>9</sup> (eXO) sponsored as being our fiscal host among other infrastructure services, *Universitat Politècnica de Catalunya*<sup>10</sup> (UPC) sponsored us allowing their devices' usage for the testbed, *Universität Wien*<sup>11</sup> helped with video equipment for streaming and recording and *OpenWISP*<sup>12</sup> as the platform for controlling the testbed.



Figure 3: Sponsors

## 2 Number and distribution of participants

### 2.1 Geographical distribution

BattleMesh is an international event, and this is possible also thanks to the travel sponsorships that we can grant using funding from the sponsors.

In this edition we had 37 registered participants, and below there is a table of their country of residence.

Table 1: Country of residence

Country of residence	Participants
Argentina	1
Austria	1
France	3
Germany	14
Greece	1
Italy	3
Netherlands	2

<sup>7</sup><https://www.apc.org/>

<sup>8</sup><https://ninux.org/>

<sup>9</sup><https://exo.cat/>

<sup>10</sup><https://www.upc.edu/>

<sup>11</sup><https://www.univie.ac.at/>

<sup>12</sup><https://openwisp.org/>

Country of residence	Participants
Portugal	2
Serbia	1
Spain	7
Türkiye	1
United States	1

## 2.2 Gender identity distribution

The classification of the gender identity of the participants does not pretend to be accurate, it has been done with the sole scope of following the evolution of the diversity from event to event. For having a usable metric of gender diversity, the non-binary people have been fitted to either of the genders. In order to avoid this classification to be so rough, for next editions we will consider sharing to participants a survey including also a question about the gender identity.

Table 2: Gender identity distribution

Description	Women	Men
Total participants	8 (22 %)	29 (78 %)
Speakers and workshop runners	5 (21 %)	19 (79 %)
Organizers who attended the event	2 (29 %)	5 (71 %)

Additionally, two families brought one child each.

## 3 Event agenda

The event aims to provide for various scheduled activities such as talks, workshops and panel discussions. At the same time, collaborative work is a key goal to foster information exchange and learning. Each day, the morning hours until lunch were blocked on the official schedule and reserved for collaborative work.

Moreover, the social aspect of the event is a key component. Multiple social events (such as excursions and group meals) are built into the agenda to foster mingling and social interactions between the participants.

Also, part of the agenda is the construction of a wireless testbed to be able to run test cases and compare the performance of mesh routing protocols with each other.

### 3.1 Employed technology

As a point of coherence with the open networks promoted by the event, we decided to use as much as possible open source software for every software-mediated task.



Table 3: Employed technology

Function	Description	Tool	Provider
wiki	all public info about the event	Moinmoin wiki (moinmo.in)	Ninux
pad	meeting minutes notes	Etherpad, Hedgedoc	Riseup, eXO
videoconferences	remote meetings	jitsi.org	eXO
mailing list	communication through email	Mailman (list.org)	Ninux
v15 email alias	registration and email between coordinators of v15	Postfix	Ninux
groupware	shared files, calendar, collaborative documents	nextcloud.org	eXO
forms	restaurant event and travel scholarships forms	liberaforms.org	eXO + Liberaforms
chat	ephemeral communication	matrix.org	federated/decentralized
streaming app	standalone program installed in a laptop	Obs Studio (obsproject.com)	UniVie
video/streaming platform	recorded talks and workshops	Peertube (joinpeertube.org)	eXO
internet coverage	local and internet network connection	routers' firmware LibreMesh (libremesh.org/)	Calafou

Extracted from BattleMesh v15 wiki section<sup>13</sup>.

The pad notes were exported to PDF using this hedgedoc-export script<sup>14</sup>.

### 3.2 Talk and workshops

In this edition, we used Nextcloud calendar sharing to prepare the agenda before the event and to facilitate edits. On previous editions, this was handled changing the Moinmoin wiki table. This was difficult to update as it either required setting up wiki user accounts (cumbersome for admins), or unlocking the page to public edits (problems with spambots). During the event itself, we used a blackboard as a primary agenda, syncing every day to the online agenda for the remote viewers.

<sup>13</sup>[https://battlemesh.org/BattleMeshV15#Digital\\_tech\\_used\\_to\\_run\\_the\\_event](https://battlemesh.org/BattleMeshV15#Digital_tech_used_to_run_the_event)

<sup>14</sup><https://codeberg.org/pedroberg/hedgedoc-export>

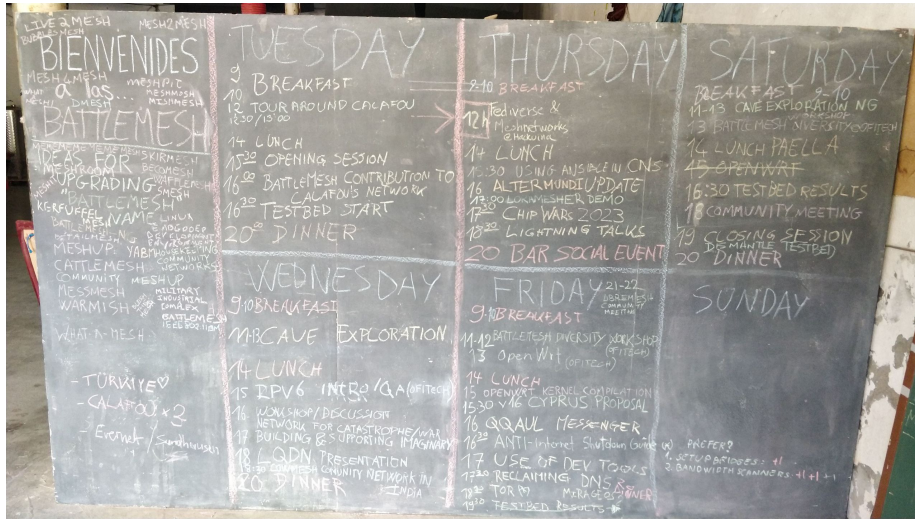


Figure 4: Snapshot of the blackboard

Mon 5/8/2023	Tue 5/9/2023	Wed 5/10/2023	Thu 5/11/2023	Fri 5/12/2023	Sat 5/13/2023
9:00 AM - 12:00 PM Collaborative Setup	9:00 AM - 11:00 AM Self Service Breakfast	9:00 AM - 10:00 AM Self Service Breakfast	9:00 AM - 10:00 AM Self Service Breakfast	9:00 AM - 10:00 AM Self Service Breakfast	9:00 AM - 10:00 AM Self Service Breakfast
		11:00 AM - 1:00 PM cave exploration	12:00 PM - 1:00 PM Fediverse & mesh networks		11:00 AM - 1:00 PM cave exploration + calafou tour
2:00 PM - 3:00 PM lunch	2:00 PM - 3:00 PM lunch	2:00 PM - 3:00 PM lunch	2:00 PM - 3:00 PM lunch	2:00 PM - 3:00 PM lunch	2:00 PM - 3:00 PM lunch: big paella
	3:30 PM - 4:00 PM - Opening session 4:00 PM - 4:30 PM - talk: battlemesh 4:30 PM - 5:00 PM - talk: testbed start	4:00 PM - 5:00 PM network for catastrophes/war 5:00 PM - 6:00 PM building and supporting imaginaries 6:00 PM - 6:30 PM - LQDN presentation 6:30 PM - 7:00 PM - community network in india	3:30 PM - 4:00 PM - Using Ansible in Community 4:00 PM - 5:00 PM talk: altermundi update, typescript, new 5:00 PM - 5:30 PM - LollaMasher demo 5:30 PM - 6:30 PM Chip Wars 2023 6:30 PM - 7:30 PM lightning talks	3:30 PM - 4:00 PM - talk: OpenWrt kernel 4:00 PM - 4:30 PM - talk: cyprus location 4:30 PM - 5:00 PM - talk: ANTI Internet 5:00 PM - 5:30 PM - talk: use of developer tools 5:30 PM - 6:30 PM talk: How to reclaim DNS as a commons	3:30 PM - 4:00 PM - talk: testbed results 4:00 PM - 7:00 PM Community Meeting
8:00 PM - 9:00 PM dinner	8:00 PM - 9:00 PM dinner	8:00 PM - 9:00 PM dinner	8:00 PM - 9:00 PM dinner: bar social event	8:00 PM - 9:00 PM dinner 9:00 PM - 10:00 PM Ibremesh community meeting	8:00 PM - 9:00 PM dinner

Figure 5: Talks schedule

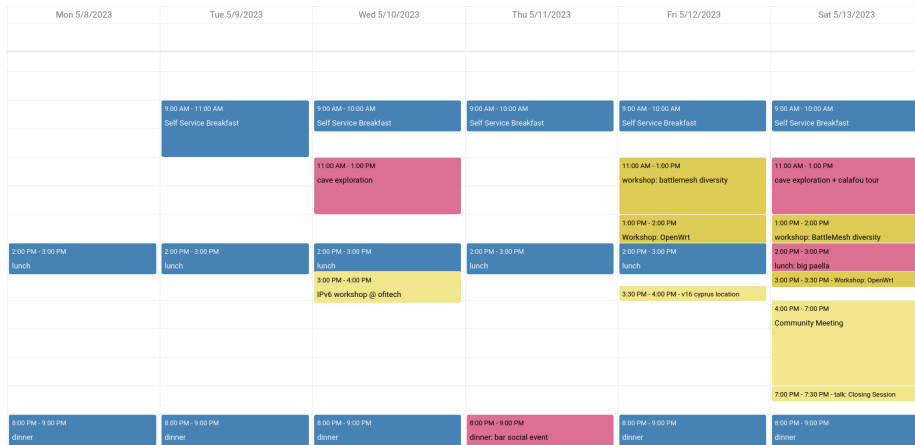


Figure 6: Workshops schedule

Some of the talks/sessions we had, included a talk on the resistance of networks to disaster situations, the network infrastructure of Calafou, its history, its topology and how to make a network resilient for a community, the presentation of OpenWISP, a tool to configure and set up network infrastructure as you would through Ansible, that was used to set up the test infrastructure used during the whole event, the Ansible recipes to set up and monitor the wireless infrastructure of rural farmers<sup>15</sup> in the mountains in Bologna, an introduction to IPv6, a discussion on how we could use mesh networks to help people during wars or natural disasters, a report from Altermundi community, that has developed a mesh system searching for a new solution, a talk about how Community Owned Wireless (COW) managed their network, a collective discussion on how to have a more inclusive community, the need for a code of conduct, the presentation of Qaul, a similar application to Briar, using the possibilities of mesh through Bluetooth, a presentation of tools and techniques to bypass Internet censorship, the results of the tests that took place during the week using the testbed.

We also had social events as the visit to a local cave, descending a tortuous network with rocks, a big paella shared with Calafou inhabitants and a dinner in a local restaurant. Apart from many spontaneous chats about many different topics.

### 3.3 Notes on the talks and workshops

Nono from La Quadrature du Net wrote a report about his experience at BattleMesh<sup>16</sup>.

During the event, some notes were taken collaboratively between all the participants<sup>17</sup>.

<sup>15</sup><https://www.campiaperti.org/>

<sup>16</sup><https://md.lqdn.fr/s/AqD6kZ7p8#english-version--battlemesh-report>

<sup>17</sup><https://www.battlemesh.org/BattleMeshV15?action=AttachFile&do=view&target=WBMv15.pdf>

### 3.4 Workshops on diversity

A discussion in the mailing list about this year's event logo<sup>18</sup> triggered a talk about Building and supporting imaginaries<sup>19</sup>, and after that talk, another two workshop sessions were done about building a community based on diversity.

See Figure 7 for the whiteboard notes.

One person has been put in charge of activating, on the mailing list, the discussions that were left open during the workshops.

The log of the discussions held during these workshops was put in a pad with all the notes<sup>20</sup>.

### 3.5 Streaming and video recordings

During the event, we had a streaming service available for the talks that were placed in hackuina and wanted to be shared to the public.

Most of the talks were streamed live as video, some as audio-only (according to the speaker's preference), some were only recorded due to a temporary fault of the network.

The recordings are available here<sup>21</sup> in the form of a timeline playlist

Additionally, some participants got interviewed by a radio show hosted at the venue, here is the video<sup>22</sup>

The same radio also interviewed two of the organizers, the video is available, in Spanish, here<sup>23</sup>

### 3.6 Testbed

The testbed is a small mesh network set up in order to benchmark different routing protocols in a real setup. This allows the participants to see which, of the existing routing protocols, manages better some complex situations with real-world radio noise and hardware.

The testbed firmware had been prepared before the event began, in collaboration with OpenWISP.

UPC allowed us, one time more, to use their devices for this purpose; and, during this edition, Federico from OpenWISP helped us on facilitating testbed controlling platform.

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<sup>18</sup><https://ml.ninux.org/pipermail/battlemesh/2023-April/012274.html>

<sup>19</sup><https://media.exo.cat/w/rrdmEoKJL5s8qMhW56skx9>

<sup>20</sup><https://www.battlemesh.org/BattleMeshV15?action=AttachFile&do=view&target=WBMv15.pdf>

<sup>21</sup><https://media.exo.cat/my-library/video-playlists/feffe4c9-ed8d-412d-b26e-9045eb35c276>

<sup>22</sup><https://fediverse.tv/w/14EnEbYR5sYgJpjnPeaZgL>

<sup>23</sup><https://fediverse.tv/w/p/uUEv55NNZ64Jow8vmsJeU9>

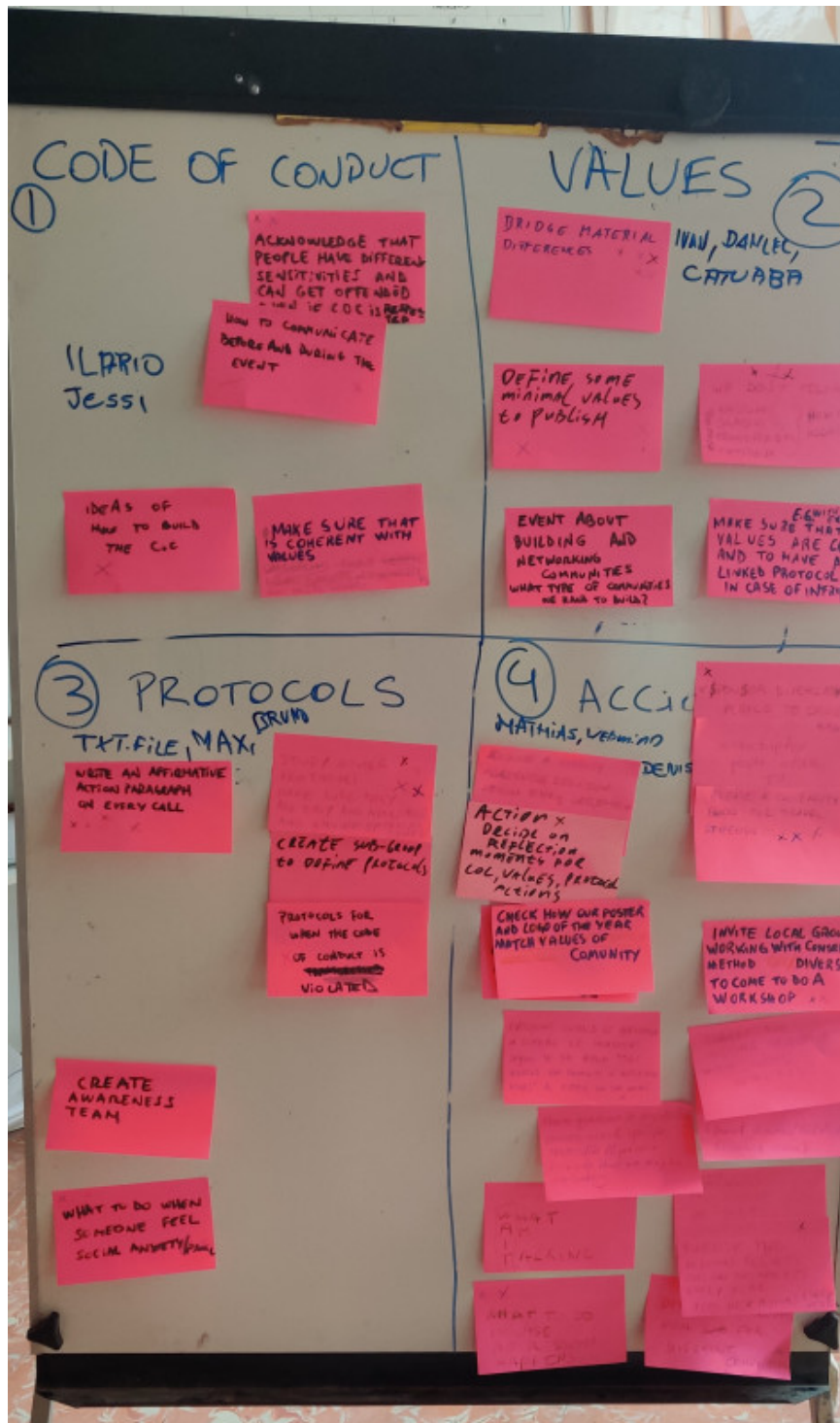


Figure 7: Whiteboard notes from the diversity workshop



Figure 8: Testbed being unpacked in Centre Social to start the testing

### 3.7 BattleMesh proposed names

The “Battle” part of the BattleMesh name has raised some discomfort over the past years, and this year the discussion about changing the event’s name has been finally opened.

A brainstorming for finding a new name was run over the event and the participants wrote their ideas on a blackboard.

The discussion did not result in a final decision yet.

See in Figure 9, how the welcome blackboard looked at the end of the event.

## 4 Promotional material and pictures of the event

### 4.1 Logo

As usual, the BattleMesh logo was adapted for the current edition. This year’s logo shows a traditional Catalanian “human tower” or *Castell*. The *enxaneta* (person on top) carries on their shoulders a large microwave dish as seen in previous BattleMesh logos.

The *castell* concept has been chosen as it is the result of the coordinate effort of an open community. The higher the *castell* goes, the bigger and sounder the base (i.e., the *pinya*) needs to be. This requires lots of people supporting the tower from the bottom. Even in the most signified *castells* competitions, which occur regularly, it is common practice

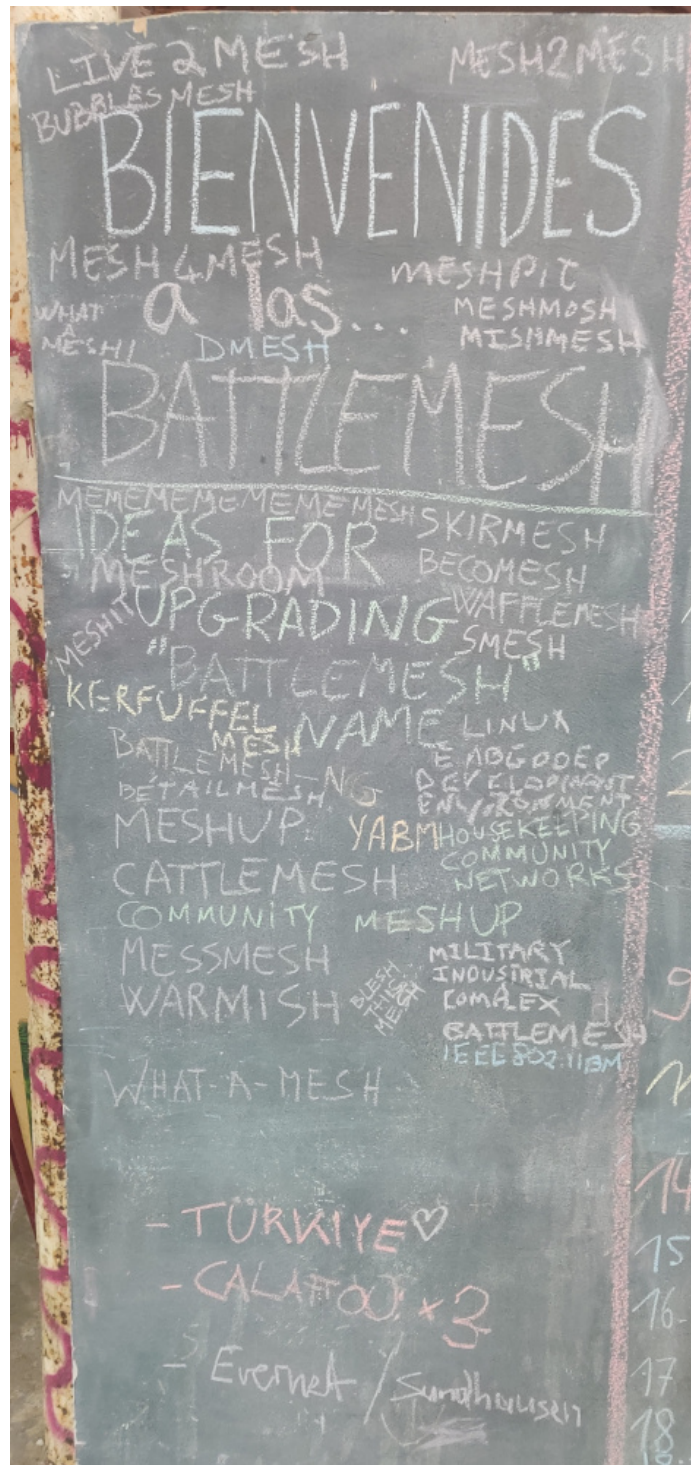


Figure 9: Final state of welcome blackboard

that members from one *colla casteller* (group, plus friends, family, supporters) help a competing *colla casteller* to *fer pinya*<sup>24</sup> (constitute the base of the *castell*), so that all the *castells* that are built during the event become more solid, robust and safe.

This is a nice parallel to BattleMesh, where we improve our many different projects by collaboration of all participants.

## 4.2 T-Shirt

The front of the t-shirt represents the event logo, and the back included a list of all the previous events' dates and locations. The color of the t-shirt was decided with a vote proposed on the mailing list.

The t-shirt screen printing has been performed by a local collective from *Los Blokes Fantasma*.



Figure 10: T-shirt front

## 4.3 Stickers

With the same logo of the event, and a tint of the t-shirt color, 250 A8 outdoor-proof stickers were bought.

These stickers were distributed to the participants and have been attached to the routers permanently installed in the venue, see “Contributions to the hosting venue”.

Below, a picture of the stickers sharing board, where participants contributed with material from their local projects.

See the stickers at Figure 12.

<sup>24</sup>[https://castellscat.cat/ca/descarregar/fem-pinya/CCCC\\_Fem\\_Pinya\\_2019.pdf](https://castellscat.cat/ca/descarregar/fem-pinya/CCCC_Fem_Pinya_2019.pdf)



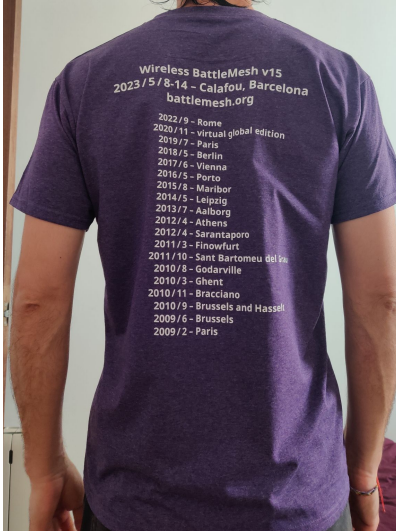


Figure 11: T-shirt back



Figure 12: Stickers available at the event

#### 4.4 Pictures of the event

The main room for BattleMesh event. Primary hacking and tinkering space for the BattleMesh. Here is also where the kitchen cooks and where breakfast, lunch and dinner took place.

See main room for BattleMesh event at Figure 13.



Figure 13: Main room for BattleMesh event

Hackuina was one of the rooms where the talks took place.

See hackuina at Figure 14.

Calafou is in the countryside, and sometimes you can find unexpected company.

See a bench in Calafou at Figure 15.

## 5 Contributions to the hosting venue

Before and during the event, the BattleMesh community build a new permanent network in the venue.

This was done as a contribution to the space, as the legacy network suffers from Spanning Tree Protocol failures<sup>25</sup>, failing hardware, and indoor cables passing over construction sites.

A detailed documentation is available here<sup>26</sup>.

<sup>25</sup>during the event, it was reported that some people helped on solving this issue

<sup>26</sup><https://github.com/libremesh/network-profiles/tree/master/calafou>



Figure 14: Hackuina



Figure 15: A bench in Calafou



advantages, we decided to run the free, libre, open-source *LibreMesh* firmware on all the nodes.

All the employed Ethernet cables have been specifically bought and are outdoor Cat 6 and Cat 7 ones.

All the documentation about the specific configurations and tweaks employed for the event can be found on here<sup>28</sup>



Figure 17: Router A placement

Router A. The outdoor routers are PlasmaCloud PA1200 dual-band sector routers with an aperture angle of 120 ° and two gigabit ethernet ports.

Router B. All the outdoor routers have been installed in places carefully chosen for being mostly shadowed. This has been done for helping the routers to endure the outdoor conditions for longer.

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<sup>28</sup><https://github.com/libremesh/network-profiles/tree/master/calafou>



Figure 18: Router B placement



Figure 19: Router D placement

Router D. The indoor routers are Xiaomi Mi Router 4A Gigabit Edition, omnidirectional with 3 gigabit ethernet ports.

## 5.2 LibreMesh Firmware Contribution

The LibreMesh firmware has been specifically updated to support OpenWrt 22.03, as the previously supported OpenWrt 19.07 was not compatible with the chosen routers. This work started around the end of July 2022, even before BattleMesh v14 in Rome, and went on even during the event, fixing issues observed during in the new network installed in Calafou when put under stress by the BattleMesh streaming and participants. An overview of the process can be seen on the lime-packages repository in the period from July 2022 until May 2023<sup>29</sup>

## 5.3 Monitoring

As all routers deployed in this new network has Prometheus module installed by default, we configured them to propagate the data collected by this module. In a Raspberry Pi 3 was installed Grafana<sup>30</sup> and Prometheus<sup>31</sup> services using Docker images, to collect and plot the network data. The graph plotted was inspired by the templates used by AlterMundi<sup>32</sup> and Lattuga<sup>33</sup>.

# 6 Budget expenses

The funding received from our sponsors (listed in the introduction) has been employed for the following items (excluding VAT except on travel expenses):

Table 4: Budget expenses

Concept	Expenses (EUR)
Paying 2023-05-11 social dinner for all participants <sup>34</sup>	588.59
Reimbursing travel expenses for 7 participants	1612.04
Paying the rent of the venue	2904
Buying the BattleMesh stickers	22.51
reserve for paying bank fees	26.5
<b>Total</b>	<b>5153.64</b>

<sup>29</sup><https://github.com/libremesh/lime-packages/graphs/contributors?from=2022-07-01&to=2023-05-15&type=c>

<sup>30</sup><https://grafana.com/>

<sup>31</sup><https://prometheus.io/docs/introduction/overview/>

<sup>32</sup><https://grafana.altermundi.net/>

<sup>33</sup>[https://git.lattuga.net/antennine/grafana\\_dashboard](https://git.lattuga.net/antennine/grafana_dashboard)

<sup>34</sup>At a local restaurant (KALA Piscina)

## **7 Lessons learned in the preparation of v15**

### **7.1 Create an orga mailing list, not an email alias**

Problem: The organizers' v15 email alias caused bounces etc. with some of our email providers as it sends emails from its own domain but the mails themselves are FROM their original domains. Secondary effects: People who want to get in touch or register receive error messages, maybe messages get lost, etc.

Proposed solution: Create a mailing list like `battlemesh@` on the Ninux lists server. Specifically, create *one* mailing list and just add/remove people as time goes by. This hopefully distributes the admin load, and also keeps a consistent history of orga mails.

### **7.2 Hand out individual payment IDs**

Problem: Some people pay for accommodation packages via their personal accounts, but we don't know their legal names. Other people pay via other people's accounts, so the name never matches. (Other problematic situations like these are conceivable.)

Proposed solution: Hand out individual payment IDs for everybody. That's not perfect because it enforces some kind of round-trip: Attendee decides to come, must reach out to orga to get a payment ID, only then can pay.

### **7.3 Ask to the sponsors which sponsorship details we can publish**

Problem: While some sponsors have clear ideas about advertisement (e.g. "put up posters at the entrance", "mention our name in the opening and closing talks"), others do not. It is a difficult call for us whether and how we should advertise these sponsors, but we don't want to hide their contributions either.

Proposed solution: Use the same approach that we use for the public list of participants. Ask sponsors how we should treat them, ideally by proposing a small number of useful options. These could include: (1) Level of publicity ("mention on the wiki", "mention in the report", "mention as 'other sponsors'"), (2) Level of detail ("mention exact type/amount", "generic mention").

### **7.4 Registration through email is very harmful for the organizers**

Problem: It takes countless hours and effort to validate and parse the free formatted information through email

Proposed solution: Use forms!

### **7.5 Facilitating the opting-in or out for appearing in pictures**

Problem: There is relevant privacy awareness on BattleMesh community, and there is more people that don't want to be in photos; people that want to make photos don't know if they can shoot or not.



Proposed solution: Provide an opt-in symbol such as a special sticker or name badge ribbons (usually found in conferences) for participants that want to appear in photos. Such badges could also have fillable fields for other useful information (e.g. pronouns).

## **7.6 Suggest license for participant contributions**

Problem: People give presentations, take photos, write summaries, take network measurements etc. and we don't know who they were or whether it is explicitly OK to use their material for reports or for other things (possibly external to BattleMesh).

Ideas: (1) Provide licensed folders, (2) Signal the licensing in the material, (3) Mention the licensing problem between sessions and agree on something that works for everybody, (4) Hold a license workshop.

## **8 Conclusions**

After this edition of Wireless Battle of the Mesh, for the first time in Calafou, we can conclude that the event was a great success. First, it was possible to promote again an international meeting of OpenWrt developers, communities and end users of wireless mesh networks. On the other hand, there were fewer participants than expected, particularly from the local side.

Thanks to the location facilities being in the countryside, there was a great interaction between the participants. The comprehensive talk sessions allowed a deep level of discussion and sharing new ideas, with relevant announcements being done during the event.

Finally, the general opinion of the participants is that this edition was the best so far, with the participants been very impressed with the event achievements and looking forward to the next edition.

## **9 Epilogue: Towards a permanent testbed for community networks**

After the event, and considering the huge effort required for building a testbed during each Wireless BattleMesh event, some members of the local organization team together with other BattleMesh participants started building a permanent testbed in Barcelona.

In such test environment, will be possible to develop and run tests and benchmarks, to develop the testbed software itself, and to test different firmwares employed in real community mesh networks. This way, we believe that the testbed overhead work will be moved out of the in-person BattleMesh, leaving more time for interesting research during the event. Additionally, the network will be available to other collectives willing to test novel communication technologies over a mesh network.

Until now, 17 *Wi-Fi 4* routers (TP-Link TL-WDR4300 v1) have been received from UPC (Universitat Politècnica de Catalunya) and 4 of them have already been deployed around Canòdrom - Center for Digital and Democratic Innovation, a -quite large- public space for “Open technologies, participatory democracy and digital culture”. Funds will be sought for adding some more recent Wi-Fi 5 and Wi-Fi 6 device.

All the resources, documentation, communication channels and links related to the Barcelona Testbed are available on the BattleMesh wiki<sup>35</sup>.

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<sup>35</sup><https://battlemesh.org/barcelona-testbed>