

→ Cloud of Cards Kit

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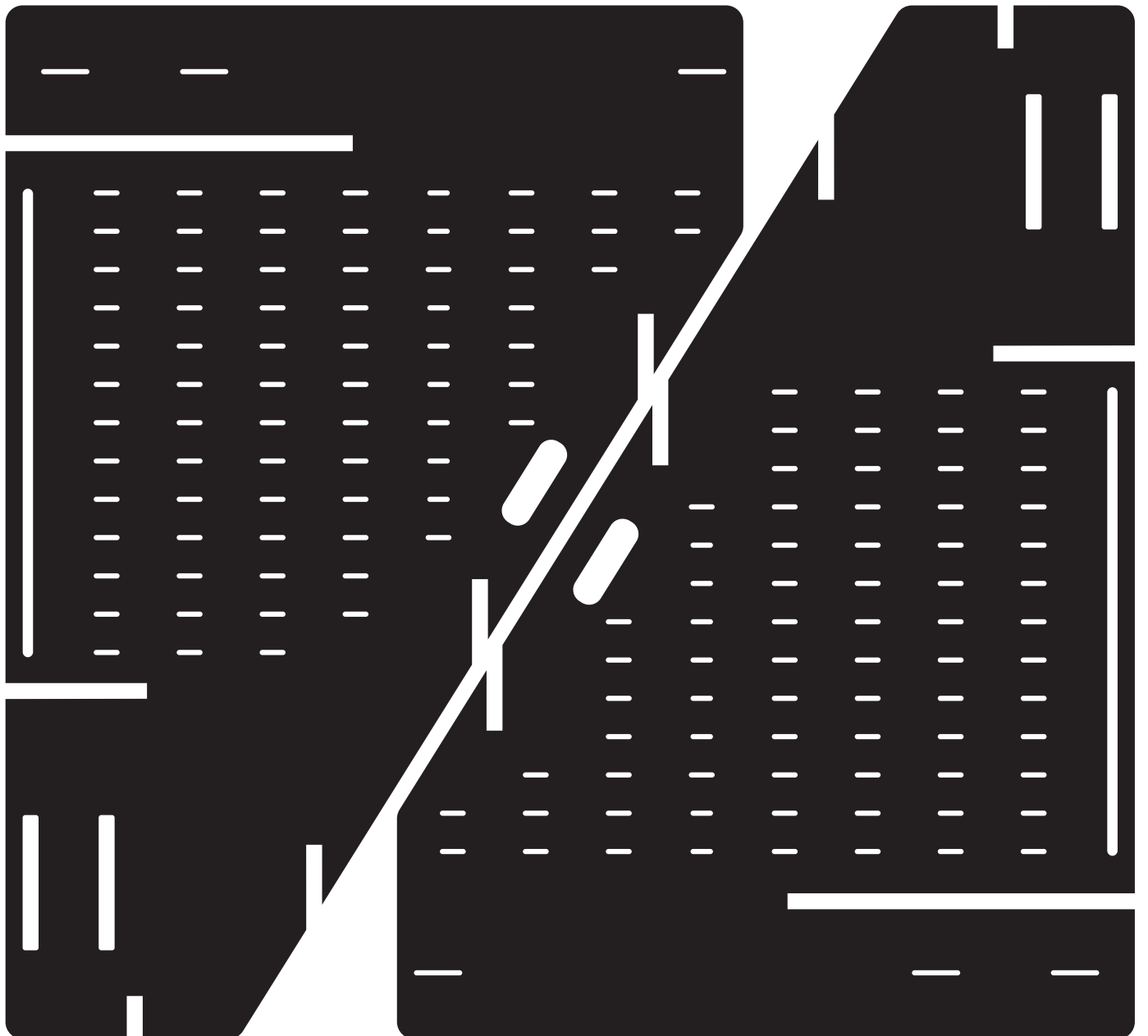
Blueprints, assembly manual and recipe

19" Living Rack (A)

Processing Library (B)

5 Folders Cloud (C)

5 Connected Objects (D)



19" Living Rack

- Base
- Office
- Home
- Garden

Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

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The 19" Living Rack is an open-source variation of the standardised 19" computer server rack (or cabinet). It is designed to be distributed in domestic environments for personal or small-scale community use, and can be combined with additional functions to address the needs of this new context (small office/home office).

In a clear reference to the famous Eames toy, the modular House of Cards project, the 19" Living Rack comprises a technical 'Base' that can then be combined and customised into three different formats: 'Office', 'Home' and 'Garden', to create a personal and somehow undersized data centre.

In each configuration, air flows have been taken into consideration both as factors of design and constraints of functionality: The air in the front part of the rack remains temperate before entering the rack and cooling the servers, while the back and top air flows are warmed and dried up due to the heat generated by the computers. 'Office' functions therefore take place mainly in the front part of the rack, 'Home' at the back where elements can be warmed and dehumidified, while 'Garden' functions are located at on the top, where there are humid plants which clean, re-humidify, perfume and cool the air.

Project developed
by Léa Pereyre.

The different versions of the 19" racks were produced as part of Inhabiting and Interfacing the Cloud(s), a joint design research project and form part of the Cloud of Cards kit.

This research project was led by Prof Patrick Keller (ECAL) and Nicolas Nova (HEAD – Genève).

www.cloudofcards.org ECAL, HEAD, EPFL+ECAL Lab, HES-SO

→A small-scale domestic data centre configuration that uses the 19" Living Rack 'Base', with additional 'Home' and 'Garden' extensions. Four servers are hosted in the racks while, at the back, the 5 Connected Objects can be connected to the 5 Folders Cloud hosted by these servers, or by the remote Cloud of Cards network, somewhere else...



19" Living Rack

Further information about the 19" Living Rack can be accessed directly via the research blog.

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Quick recipe

- ① Download and read the manual. Decide how many servers you need to install (this might affect the number of racks you have to assemble).
- ② Download the 19" Living Rack full pack (ZIP), choose your preferred configuration:
 - ('Base' alone)
 - ('Base' + 'Office')
 - ('Base' + 'Home')
 - ('Base' + 'Garden')
- ③ Check the files and then use a CNC to prepare the elements you need in the plywood (18mm) that you have previously selected and ordered.
- ④ Purchase any additional material required (straps, plants, etc.)
- ⑤ To configure the 'Base' + 'Garden' extension, you can choose from the following plants for your rack: peace lily, florist chrysanthemum, spider plant, bamboo palm or red-edged dracaena. They are all best for cleaning the air (according to the NASA Clean Air Study). Note that one side effect of this cleaning is that their leaves are toxic if eaten by cats, dogs and ... humans).
- ⑥ Assemble the entire rack base and extension according to the instructions in the manual. Secure your assembly tightly with 5cm straps.
- ⑦ Add 2.5cm straps to your rack to attach your choice of servers, computers, screens and other equipment.

Related downloads & utilities:

- Download assembly manual and recipes for the technical 'Base', 'Office', 'Home' and 'Garden' extensions (PDF)
- Download 'all-in-one' 19" Living Rack full pack (ZIP). It contains all the blueprints (DXF) which are to be individually cut out (on the CNC), an assembly manual and recipes for the 'Base', and also the 'Office', 'Home' and 'Garden' extensions (PDF)

19" Living Rack

(A)

→ Base

Further information about the 19" Living Rack can be accessed directly via the research blog.

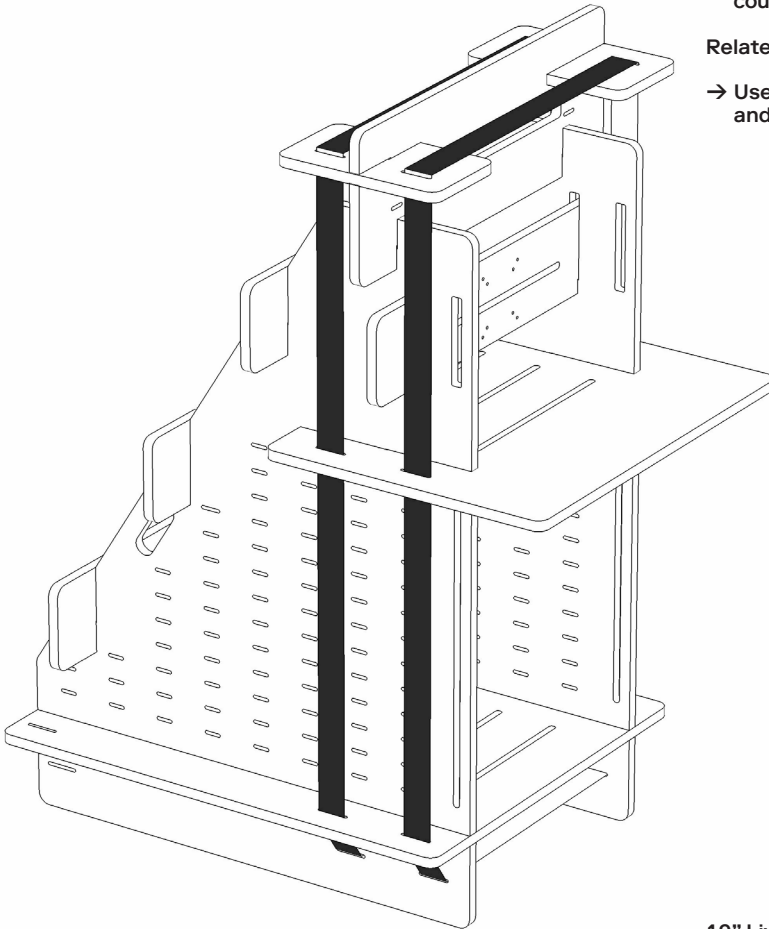
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Ingredients:

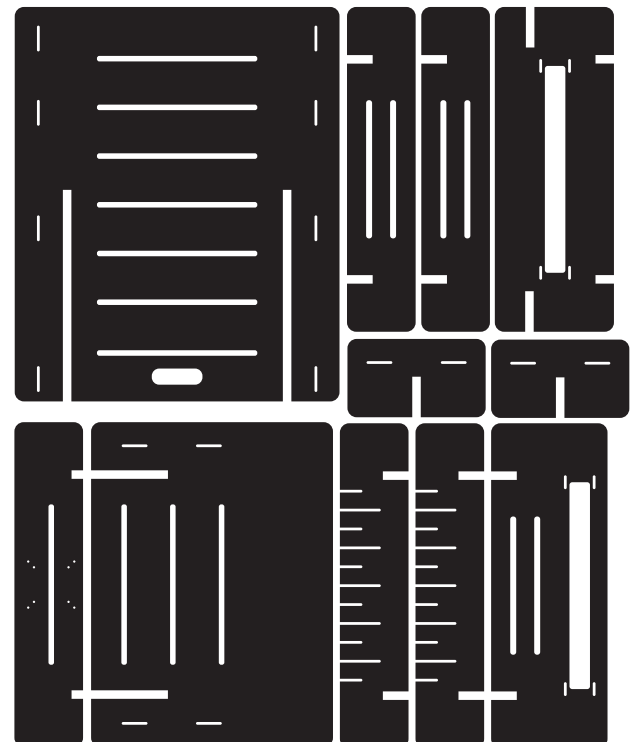
- 1 Plywood board – 1500 × 3000 × 18mm (natural or coloured) for the 'Base' configuration.
- 2 × 50mm straps.
- For each server that you add to your rack, count a minimum of 3 × 25mm straps.

Related blueprint:

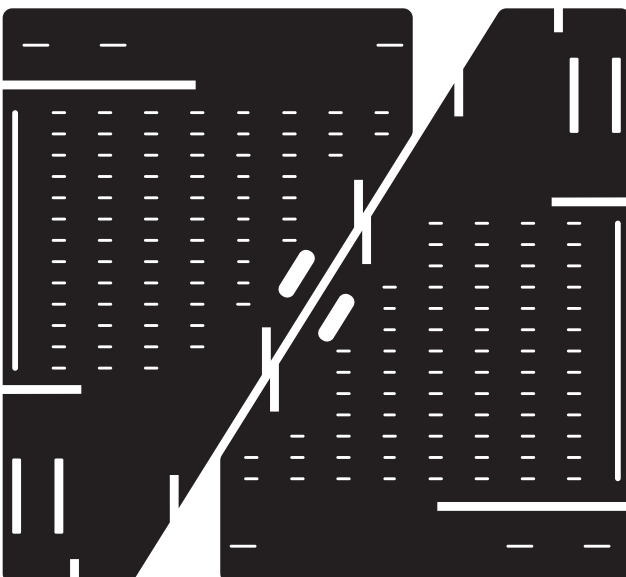
- Use the base.dxf file from the 'all-in-one' pack and cut it using a CNC with a 6mm drill bit.



19" Living Rack (A) → Base 2



→ 19" Living Rack (A) → Base 1



19" Living Rack

→ Base

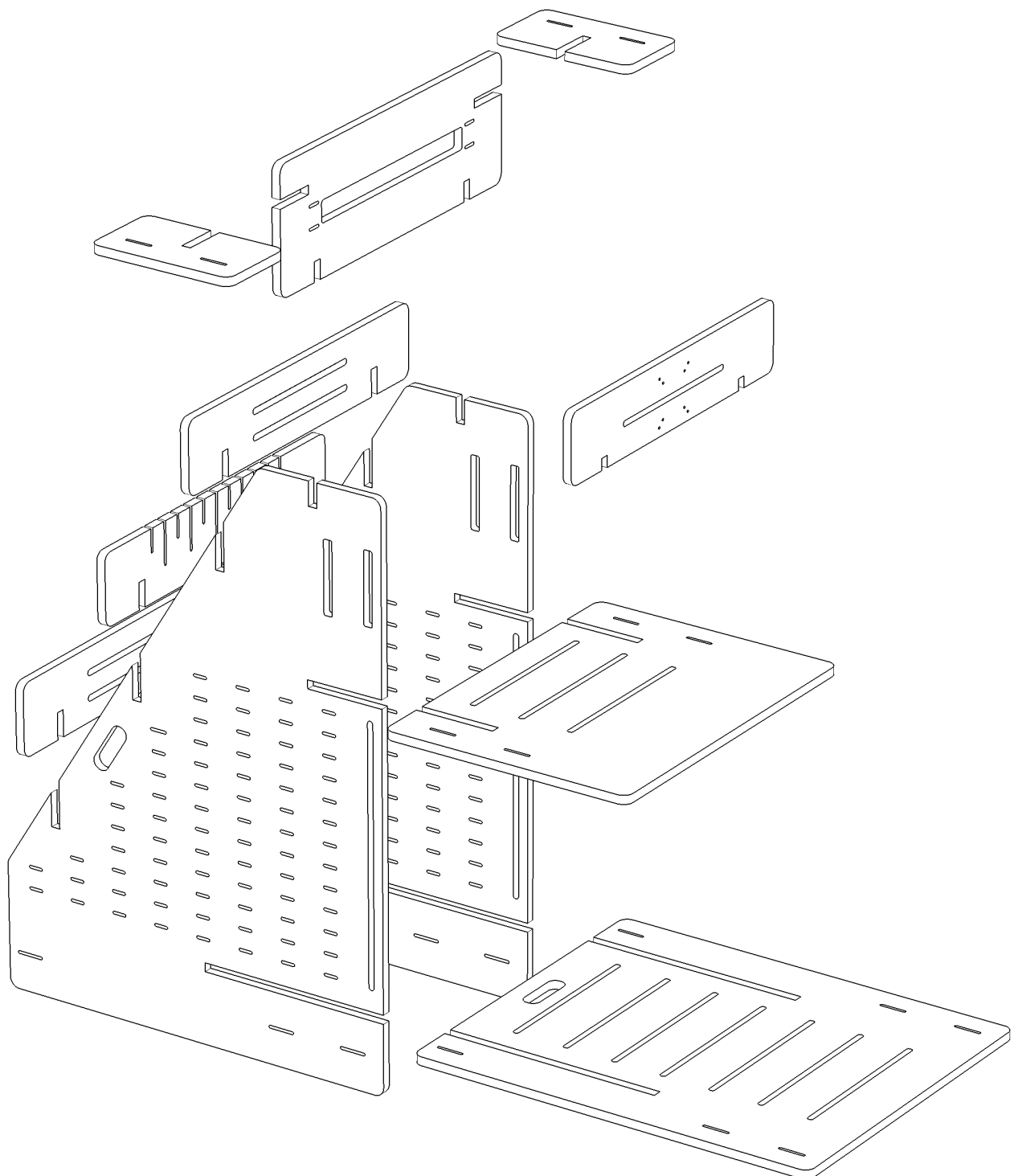
Further information about the 19" Living Rack can be accessed directly via the research blog.

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Assembly guide:

- ① Once all the wooden parts for the 'Base' have been cut by CNC, check them and choose which ones to use (NB: there are more plywood boards than necessary. This will give you some choice in customising your assembly).
- ② Assemble the chosen parts in accordance with the assembly details below.
- ③ Tightly bind and secure your 19" Living Rack / Base with 50mm straps.
- ④ Add additional equipment of your choice to your rack with the 25mm straps as described. Connect.



19" Living Rack

→ Base

Further information about the 19" Living Rack can be accessed directly via the research blog.

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How to use:

→ Use 25mm straps (marked in orange on these images) to attach each of your server bays. The number of straps you will use will depend on the weight and the size of the bays. The longer bays should be placed at the bottom with the shorter in the upper half, given the shape of the rack 'Base'.

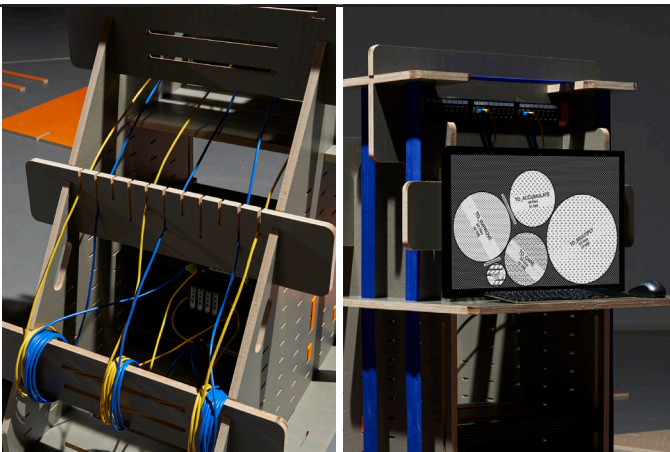
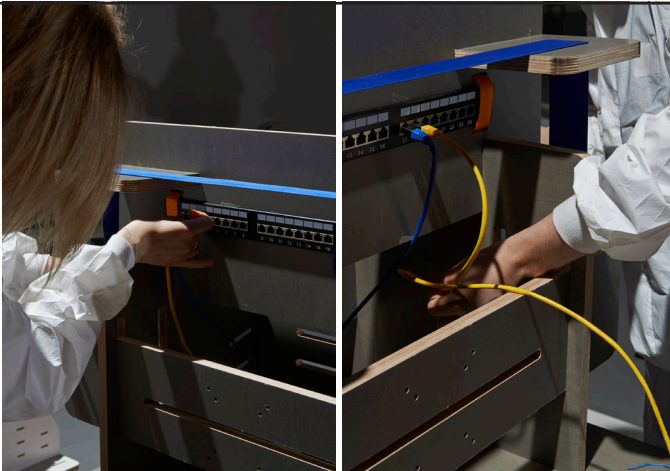
→ The straps should pass around the server bays (in black on these images) and outside the side panels of the rack, using the 25mm slots to ensure that they are securely fastened.

→ A place is set aside for a RJ45 hub on the top of the rack, and you can use additional plywood boards to attach a power strip and other utilities.

→ You can use the distribution elements at the back of the rack to plug in your cables and run them along your rack to each server.

→ Now that your 'Base' rack is ready, you can install the Cloud of Cards Processing Library addon on your servers. For the convenience of your cloud system administrator, you can use a particular plywood part to set up a screen on the front part of the cabinet.

→ You can then run your 5 Folders Cloud and/or any other ownCloud items and enjoy its services from your different devices.



19" Living Rack → Office

Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

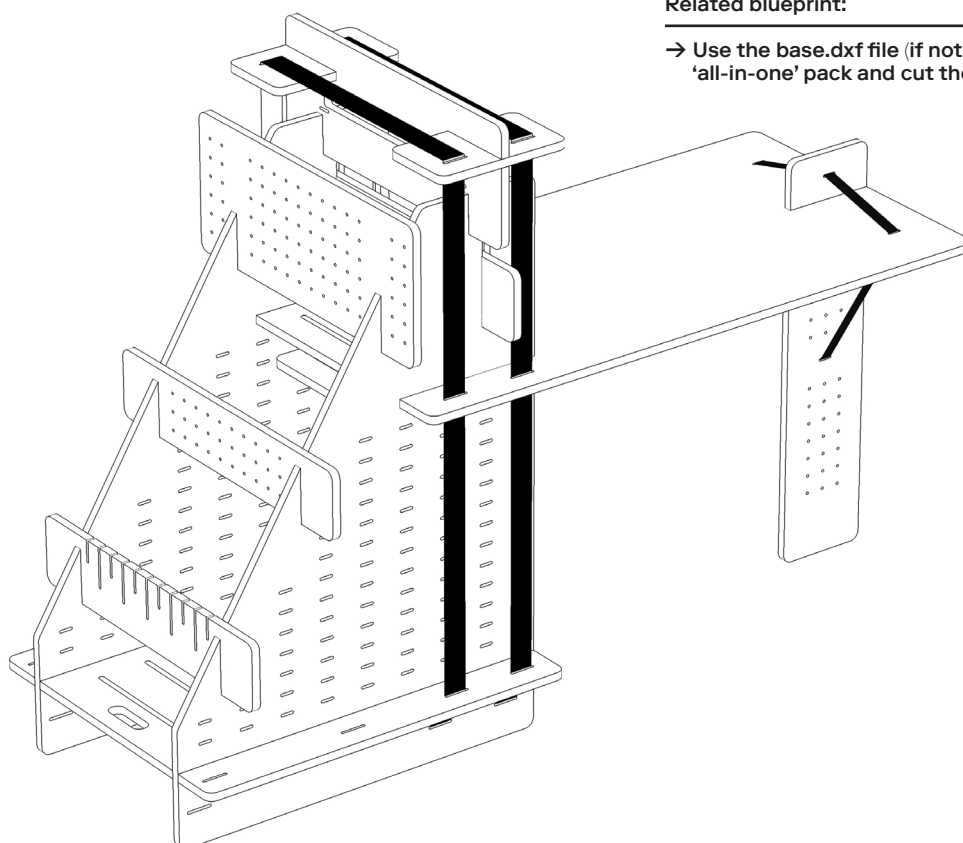
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Ingredients:

- 2 Plywood boards – 1500 × 3000 × 18mm (natural or coloured) for 'Base' + 'Office' extension.
- 2 × 50mm straps.
- 1 × 25 mm straps.
- For each server that you add to your rack, count a minimum of 3 × 25mm straps.

Related blueprint:

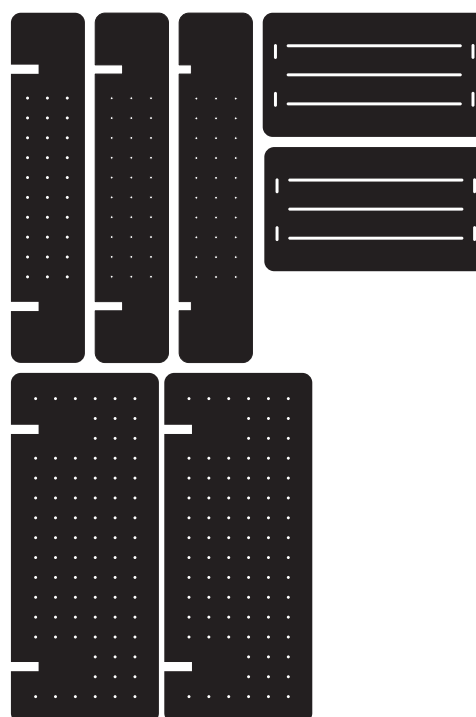
- Use the base.dxf file (if not already cut) + office.dxf from the 'all-in-one' pack and cut them using a CNC with a 6mm drill bit.



19" Living Rack (A) → Office 1



19" Living Rack (A) → Office 2



19" Living Rack

→ Office

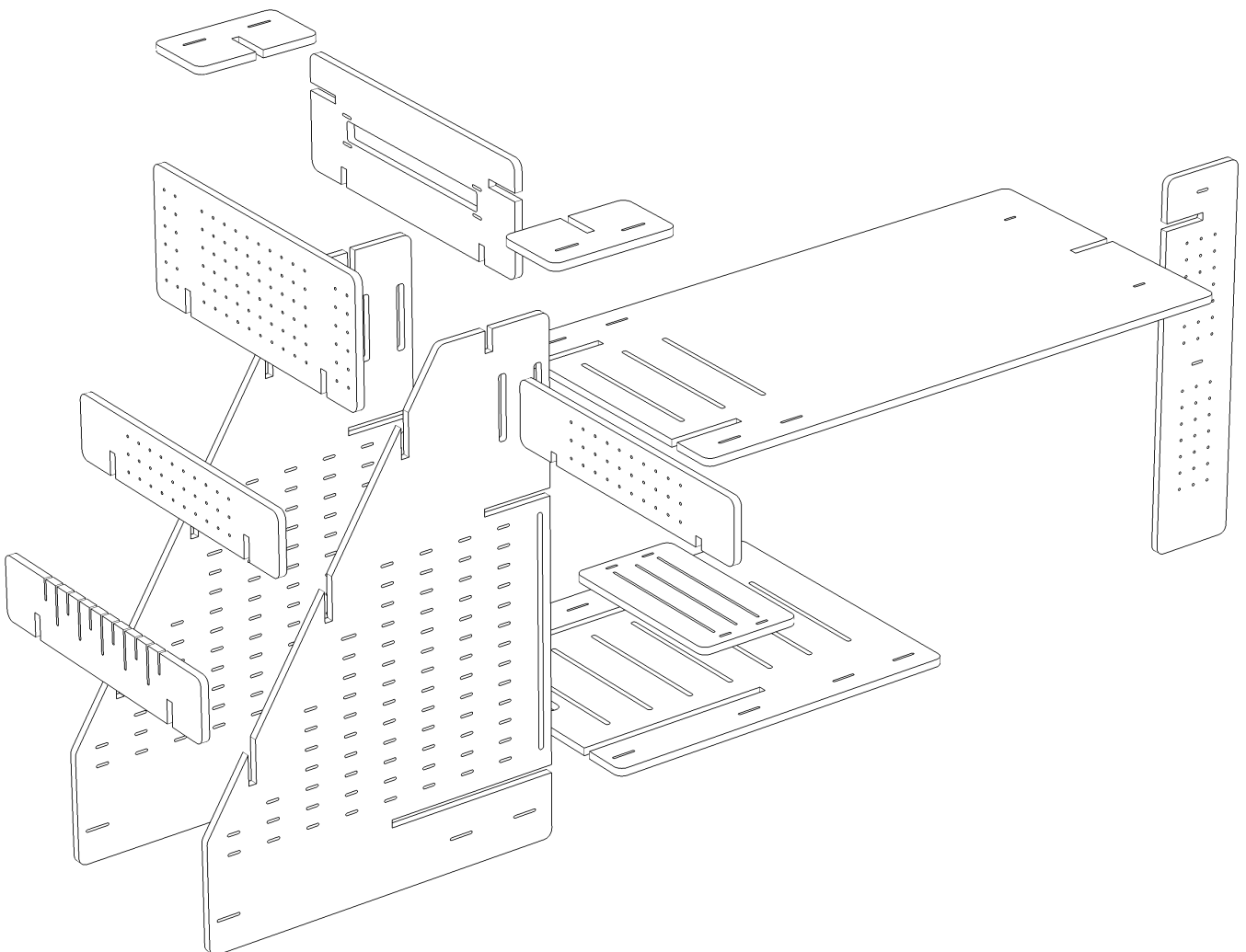
Further information about the 19" Living Rack can be accessed directly via the research blog.

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Assembly guide:

- ① Once all the wooden parts for the 'Office' (in addition to the 'Base') have been cut by CNC, check them and choose which ones to use (NB: there are slightly more boards than necessary from which to choose).
- ② Assemble the chosen parts in accordance with the assembly details below.
- ③ Bind and secure your 19" Living Rack / Base + Office with two 50mm straps and use the 25mm strap for the table.
- ④ Further equip your rack with equipment of your choice. Connect.



19" Living Rack

→ Office

Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

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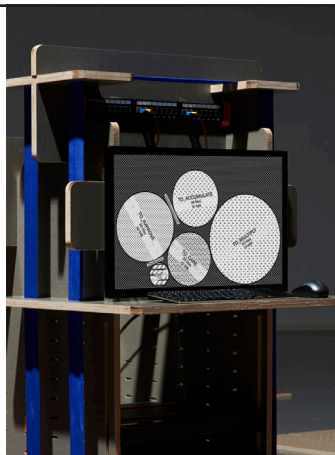
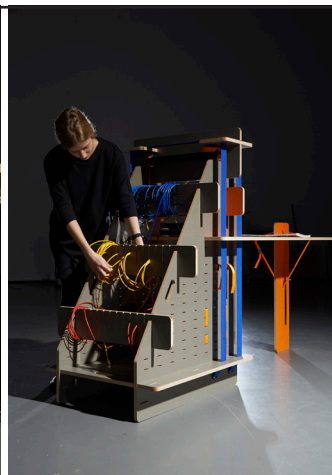
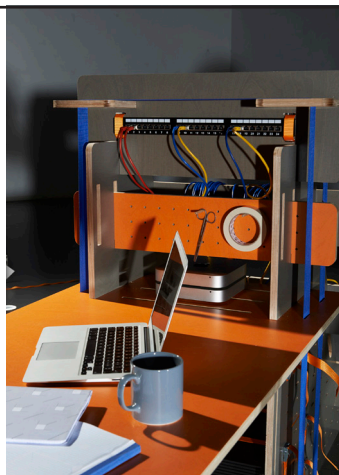
How to use:

→ Use 25mm straps (marked in orange on these images) to attach each of your server bays. This should be done in the same way as for the regular 'Base' (described above).

→ A place is set aside for a RJ45 hub on the top of the rack, and you can use additional plywood boards to attach a power strip and other utilities.

→ Other elements are included to help you hang or place the items you need for a small office, and a work table.

→ You can use the distribution elements at the back of the rack to plug in your cables and run them along your rack to each server.



→ Now that your 19" Living Rack with 'Office' extension is ready, you can install the Cloud of Cards Processing Library addon on your servers, then run your 5 Folders Cloud and/or any other ownCloud items and enjoy.

19" Living Rack

→ Home

Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

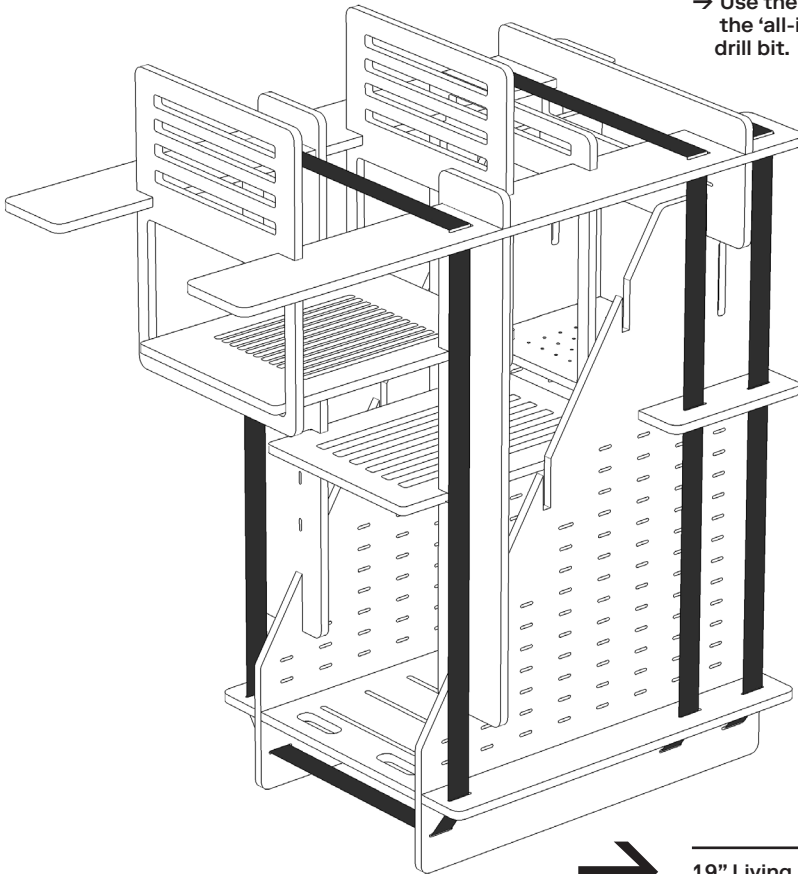
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Ingredients:

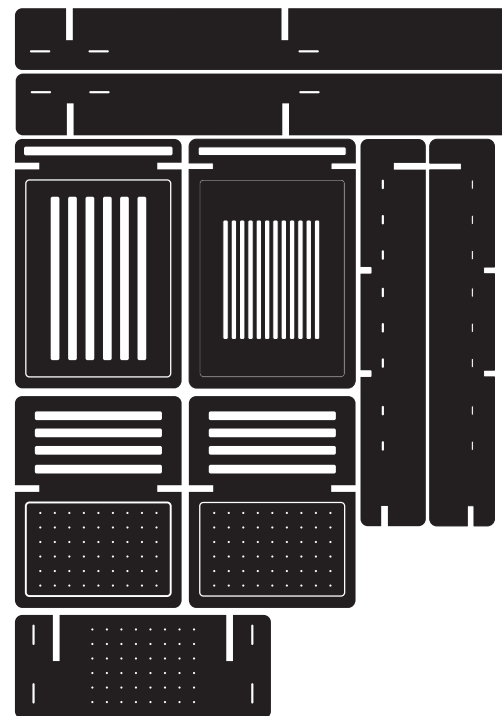
- 2 plywood boards – 1500 × 3000 × 18mm (natural or coloured) for the 'base' + 'home' extension.
- 3 × 50mm straps.
- For each server that you add to your rack, count a minimum of 3 × 25mm straps.

Related blueprint:

- Use the base.dxf file (if not already cut) + home.dxf from the 'all-in-one' pack and cut them using a CNC with a 6mm drill bit.



19" Living Rack (A) → Home



19" Living Rack

→ Home

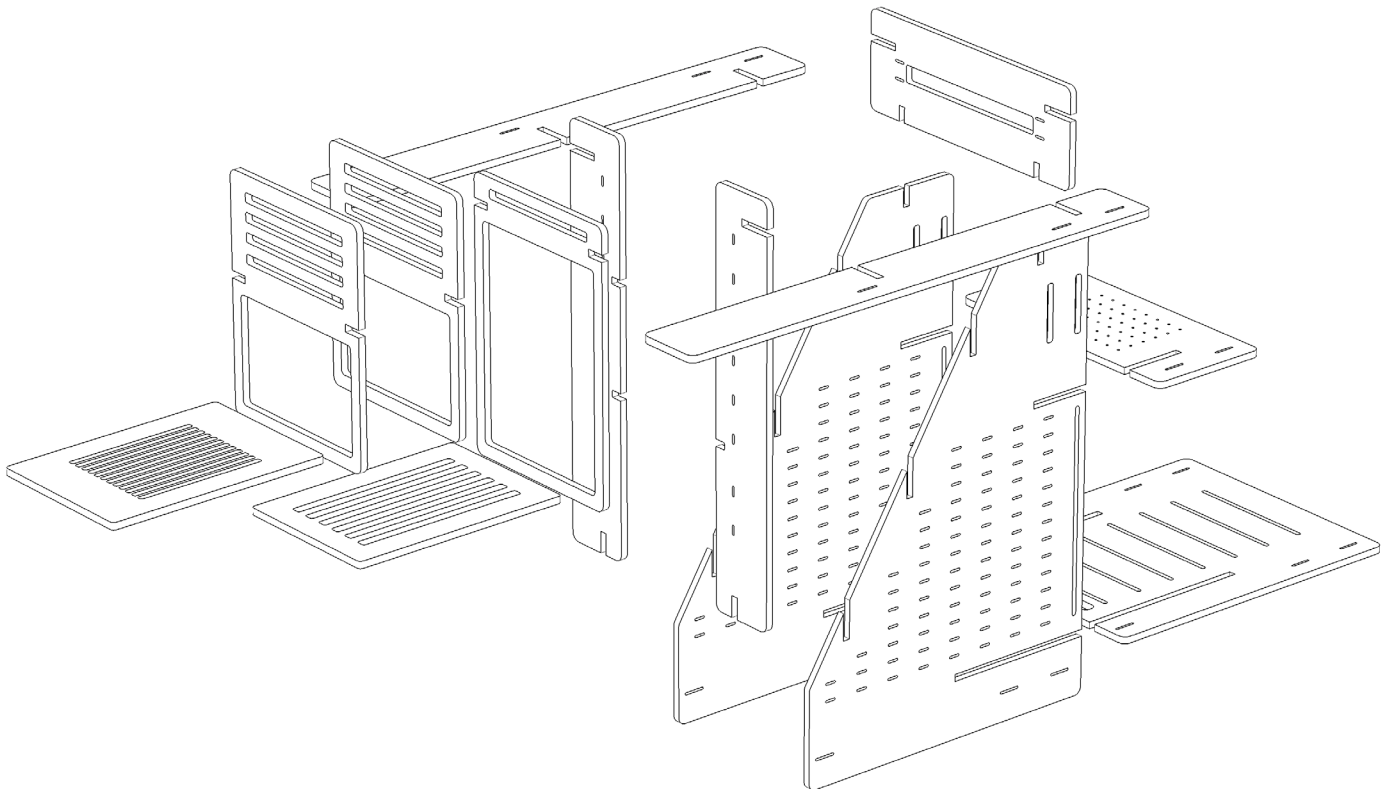
Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

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Assembly guide:

- ① Once all the wooden parts for the 'Home' (in addition to the 'Base') have been cut by CNC, check them and choose which ones to use (NB: you may choose to use some boards or not, according to your particular needs).
- ② Assemble the chosen parts in accordance with the assembly details below.
- ③ Bind and secure your 19" Living Rack / Base + Home with three 50mm straps.
- ④ You can further equip your rack with a selection of items (add wood and aromatic herbs to dry, put rugs, pyjamas, slippers to warm, etc.) and play about with different configurations. Connect.



19" Living Rack

→ Home

Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

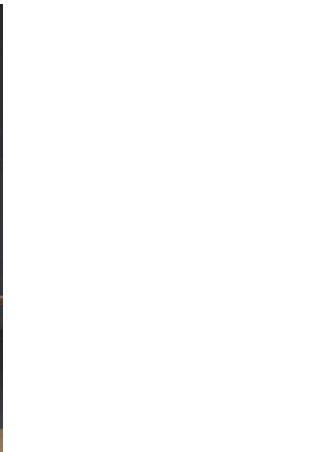
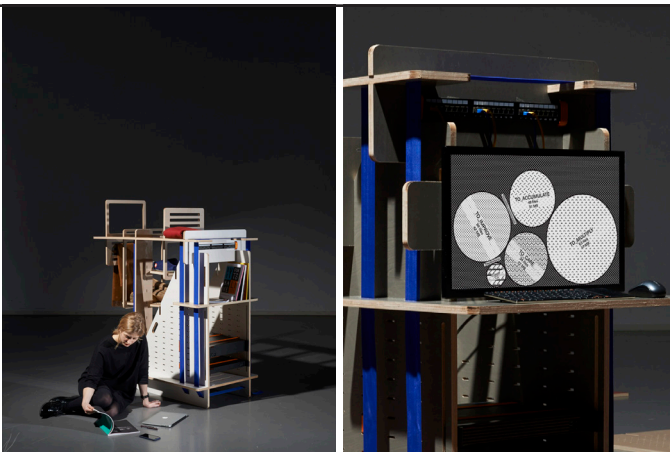
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How to use:

→ Use the 25mm straps (marked in orange on these images) to attach each of your server bays. This should be done in the same way as for the regular 'Base' (described above). The vertical boards at the back of the rack are movable. Use the horizontal ones to organise your personal belongings as shown below.

→ A place is set aside for a RJ45 hub on the top of the rack, and you can use additional plywood boards to attach a power strip and other utilities. You can add a variety of items to take advantage of the heating and drying provided by the servers (you can, for example, store wood, or put your slippers to get warm. You can use the distribution elements at the back of the rack to plug in your cables and organise them.

→ Now that your 19" Living Rack with 'Home' extension is ready, you can install your Cloud of Cards Processing Library add-on on your servers, then run your 5 Folders Cloud and/or any other ownCloud items and enjoy.



19" Living Rack

→ Garden

Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

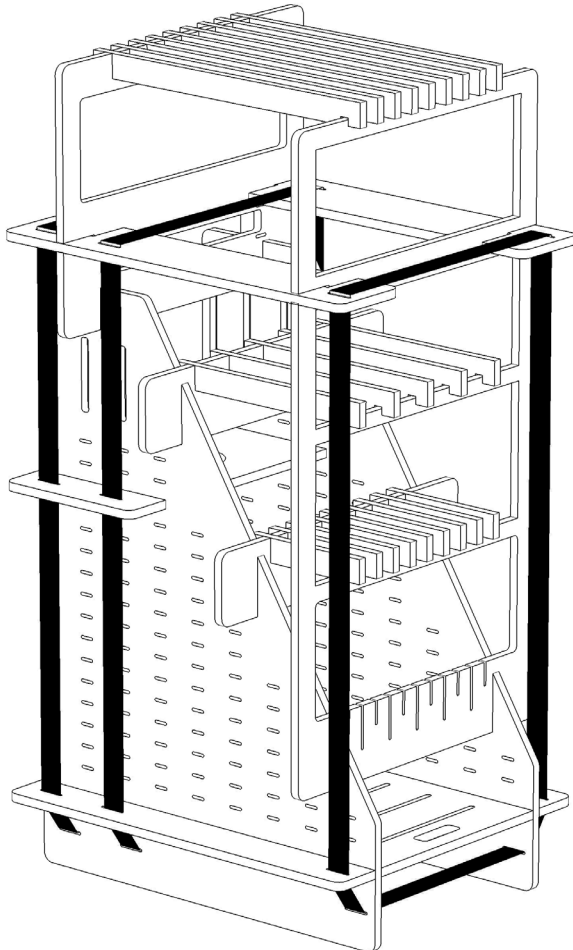
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Ingredients:

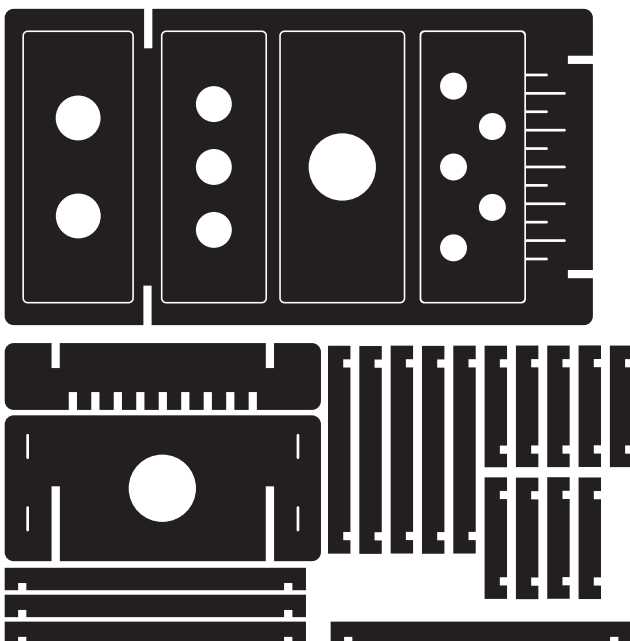
- 2 Plywood boards – 1500 × 3000 × 18mm (natural or coloured) for 'Base' + 'Garden' extension.
- 3 × 50mm straps.
- For each server that you add to your rack, count a minimum of 3 × 25mm straps. You can choose from the following plants: peace lily, florist chrysanthemum, spider plant, bamboo palm or red-edged dracaena. They are all best for cleaning the air (according to the NASA Clean Air Study). Note that one side effect of this cleaning is that their leaves are toxic if eaten by cats, dogs and ... humans).

Related blueprint:

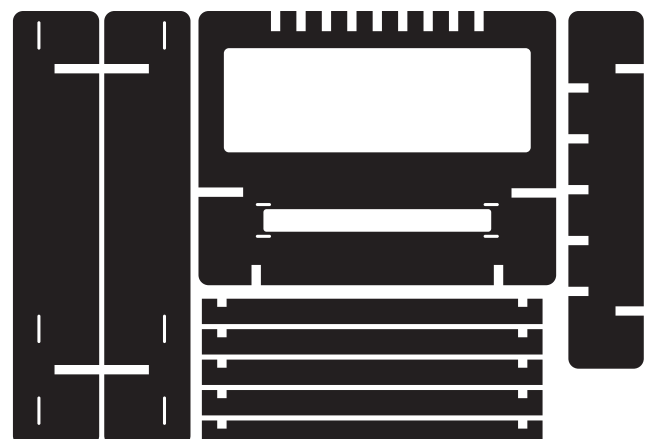
- Use the base.dxf file (if not already cut) + garden.dxf from the 'all-in-one' pack and cut them using a CNC with a 6mm drill bit.



19" Living Rack (A) → Garden 1



19" Living Rack (A) → Garden 2



19" Living Rack

→ Garden

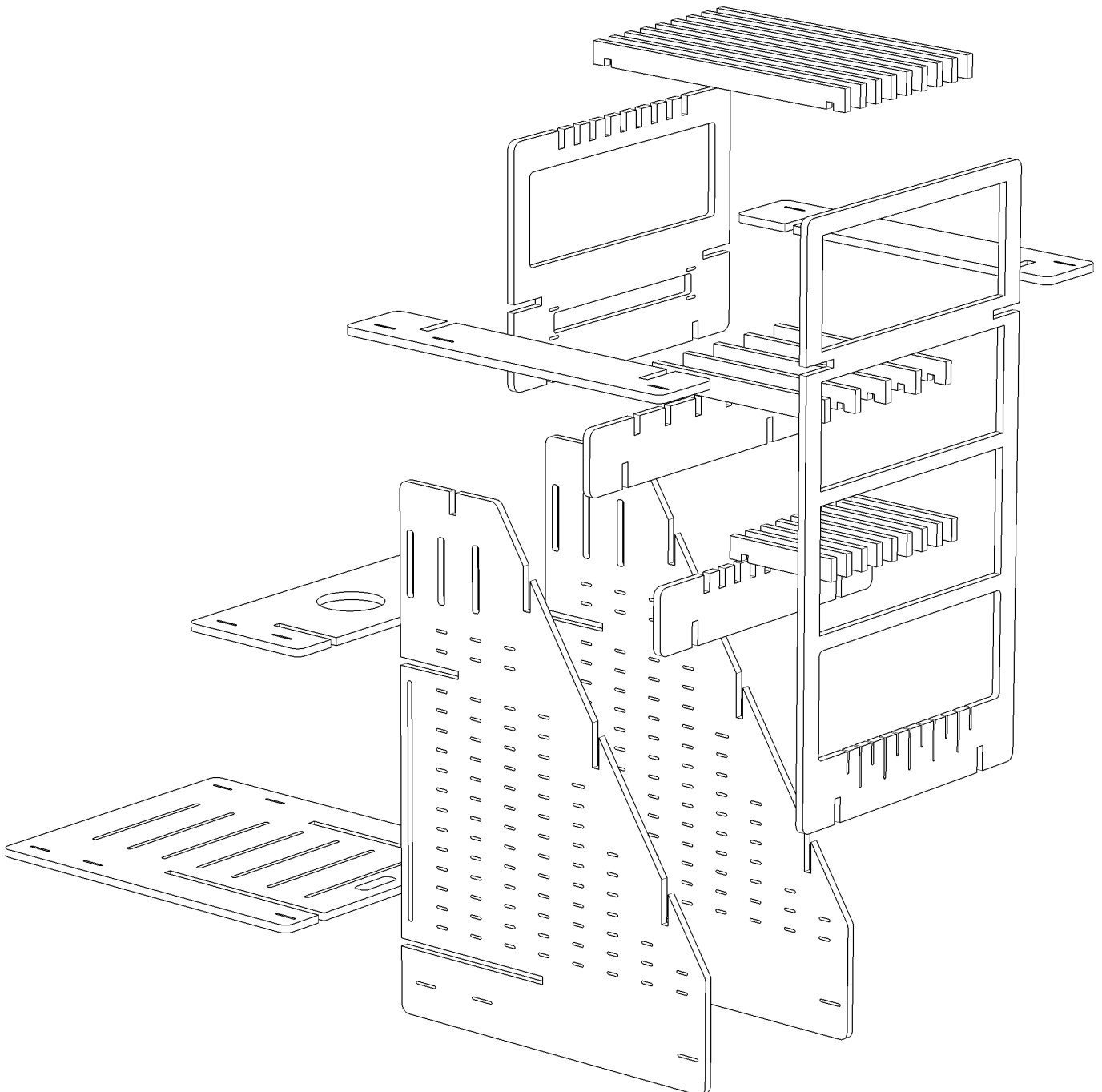
Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

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Assembly guide:

- ① Once all the wooden parts for the 'Garden' (in addition to the 'Base') have been cut by CNC, check them and choose which ones to use (NB: there are slightly more boards than necessary).
- ② Assemble the chosen parts in accordance with the assembly details below.
- ③ Bind and secure your 19" Living Rack / Base + Garden with three 50mm straps.
- ④ Further equip your rack with your choice of air humidifying + cleaning plants (see Ingredients). Connect.



19" Living Rack

→ Garden

Further information about the 19" Living Rack can be accessed directly via the research blog.

(A)

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How to use:

→ Use the 25mm straps (marked in orange on these images) to attach each of your server bays. This should be done in the same way as for the regular 'Base' (above).

→ A place is set aside for a RJ45 hub on the top of the rack, and you can use additional plywood boards to attach a power strip and other utilities.

→ Additional wooden parts are included to help you create a small 'winter garden'. Equip it with air-cleaning plants.

→ You can use the distribution elements at the back of the rack to plug in your cables and run them along your rack to each server.

→ Now that your 19" Living Rack with 'Garden' extension is ready, you can install your Cloud of Cards Processing Library addons on your servers, then run your 5 Folders Cloud and/or any other ownCloud items and enjoy.



Processing Library

Additional information about the Cloud of Cards Processing Library can be accessed directly on the research blog

(B)

Ingredients	P. 01/02
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Cloud of Cards Processing Library consists of the unification of three different APIs dedicated to online file and folder manipulation and the development of a fourth additional API specific to the needs of the Cloud of Cards kit and the Inhabiting and Interfacing the Cloud(s) research project. The final overall package has been adapted to the development language Processing and linked to ownCloud open-source cloud software. Additional behaviours have been included that can also be used with ownCloud (or Nextcloud), in both its server and clients. These additional functions are the result of implementing the findings of the design research process and of an ethnographic study about cloud user experience.

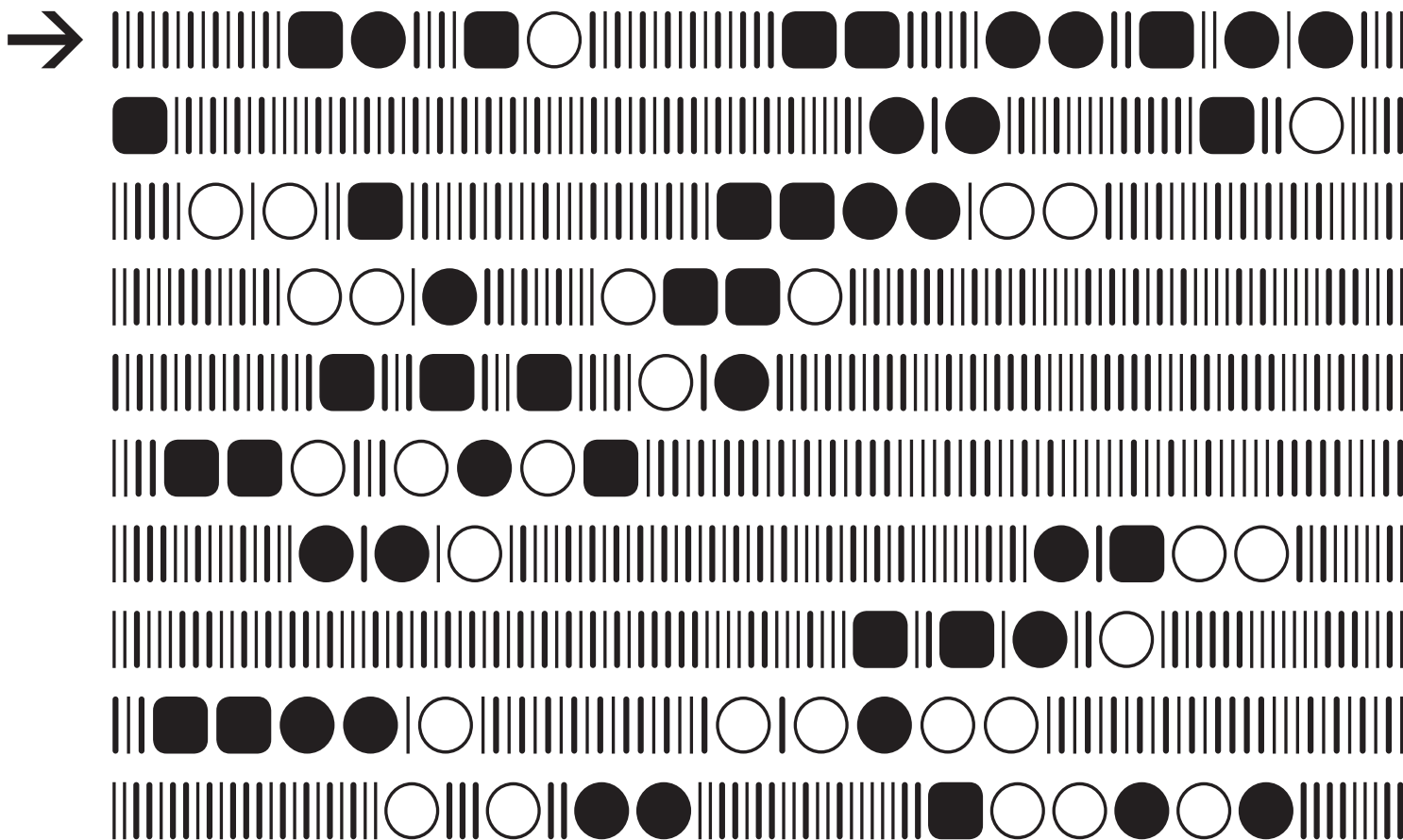
This new library written in Processing and linked to other open-source tools now makes it easier for a wider public to experiment, sketch and develop alternative interfaces and visual or physical applications for the cloud. It is of particular use to communities of designers and makers acquainted with Processing as a programming language.

Project developed by Christian Babski (fabric | ch).

The library has been produced in the context of the Inhabiting and Interfacing the Clouds joint design research project and is part of the Cloud of Cards kit.

This research project was led by Prof Patrick Keller (ECAL) and Nicolas Nova (HEAD – Genève).

www.cloudofcards.org ECAL, HEAD, EPFL+ECAL Lab, HES-SO



Processing Library

Additional information about the Cloud of Cards Processing Library can be accessed directly on the research blog

(B)

Ingredients	P. 01/02
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Ingredients:

hardware

→ 1 server (Linux, MacOS & Apache), or more than one ...

software

- The installation pack for ownCloud (or Nextcloud, optional)
- The latest version of Processing
- The current version of the Cloud of Cards Processing Library addon, to be installed beside your ownCloud/NextCloud server installation and/or on your personal computer for development purposes.

Assembly guide:

- ① Install your own copy of the ownCloud or Nextcloud server. This step is optional as you can also connect directly to a pre-installed ownCloud or Nextcloud server. The server chosen must also have the Cloud of Cards Processing Library addon COMMENT ? > 5 Folders ?. If you want to know if an ownCloud/Nextcloud server has this feature, you should be able to access URL `http(s)://the-chosen-owncloud-server/cloudofcards/` and create an account.
- ② Install Processing on your computer.
- ③ Download the Cloud of Cards Processing Library onto your computer.
- ④ Launch Processing and create a new project.
- ⑤ Add the downloaded Cloud of Cards Processing Library (cloudofcards.jar file) to your project via the 'Sketch > Add File...' menu.

How to use:

To connect to the ownCloud server from Processing, the first step is to create an OCServer object and use it to connect to your ownCloud account. In your Processing project, it should basically read as follows:

```
import ch.fabric.processing.owncloud.OCServer;
```

```
// My main access to the ownCloud server
OCServer _myOCServer;

void setup() {
  // --- Create a new access to an ownCloud server
  _myOCServer = new OCServer(this);

  // --- Define the targeted ownCloud server
  boolean resServer = _myOCServer.setServer("YOUR_OWNCLOUD_ADDRESS");
  if (resServer) {
    boolean resLogin = _myOCServer.setAccess("YOUR_LOGIN","YOUR_PASSWORD");
    print("[Processing setup()] - SUCCESS - Successfully connected to ownCloud, let's work!");
  } else {
    print("[Processing setup()] - ERROR - Cannot connect to ownCloud server");
  }
}
```

OCServer is the only object that you can use. All actions are invoked through this object. You can refer to detailed documentation or online examples if you want to see how to get the file listing of a directory, the CPU usage of the ownCloud server, etc.

5 Folders Cloud

Additional information about the 5 Folders Cloud can be accessed directly on the research blog.



Quick recipe	P. 02/04
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How to use	P. 04/04

5 Folders Cloud is one of many possible examples of software implementation using the Cloud of Cards Processing Library and exemplifies its use, server and software side. It is a version of ownCloud with automated behaviours and event cascades, in particular when linked to the associated 5 Connected Objects. In effect, this variation on the cloud combines client-server architecture with a distributed, almost horizontal peer-to-peer approach.

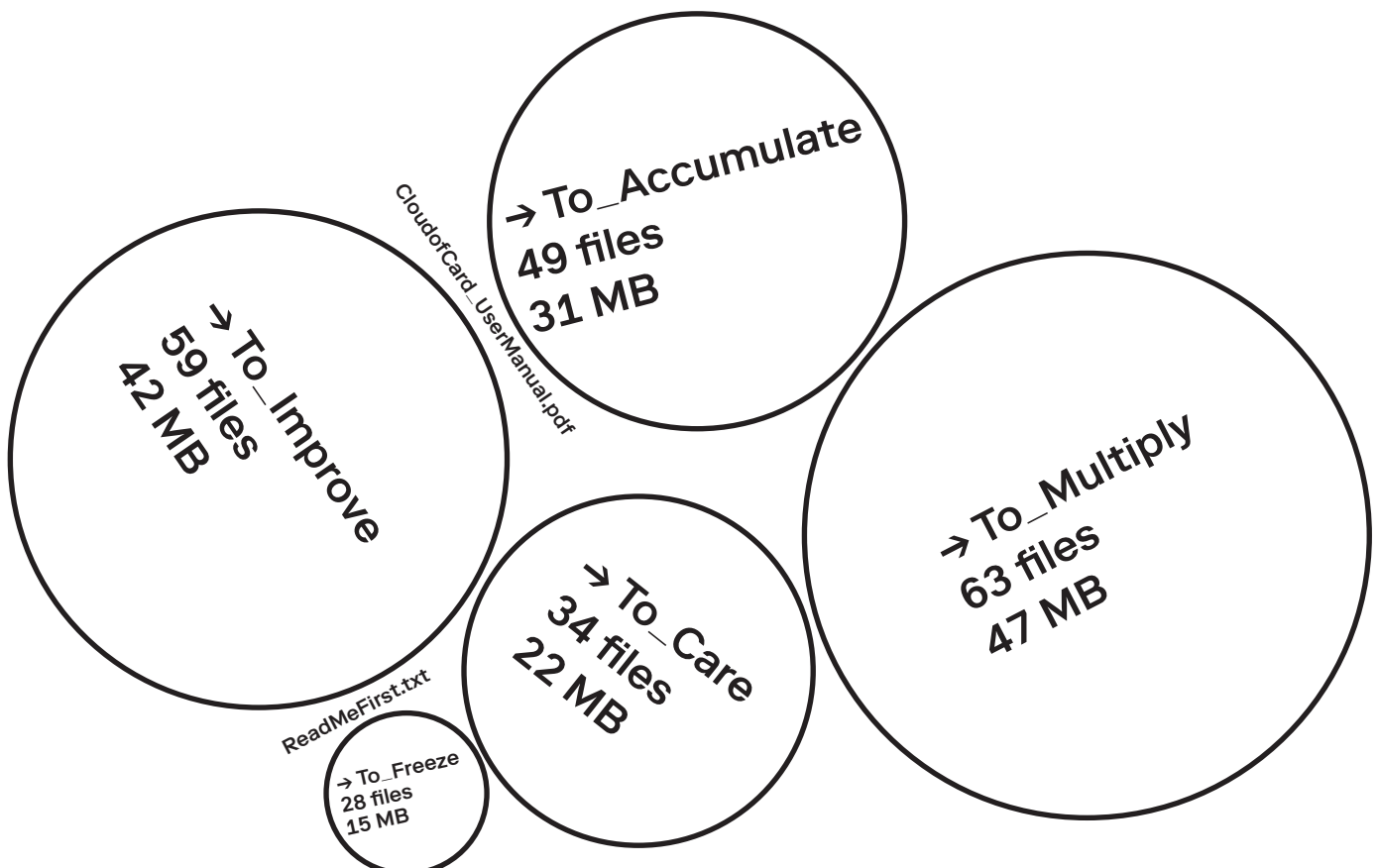
5 Folders Cloud is informed by the results of the research project's ethnographic research into the uses of the cloud, and uses five action verbs to translate a number of motivations that have been identified as potentially prompting users to drop files and data into this technological setup. These verbs in turn are used to refer to the main functions and names of five synchronised cloud folders that serve the various file interactions. Each folder automates digital procedures related to these motivations.

Project developed
by Christian Babski (fabric | ch).

The library has been produced in the context of the Inhabiting and Interfacing the Clouds joint design research project and is part of the Cloud of Cards kit.

This research project was led by Prof Patrick Keller (ECAL) and Nicolas Nova (HEAD – Genève).

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5 Folders Cloud

Additional information about the 5 Folders Cloud can be accessed directly on the research blog.



Quick recipe	P. 02/04
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Quick recipe

- ① Download and install ownCloud client (for Mac, Windows, Linux, iOS, Android).
- ② If you are not an administrator of a 5 Folders Cloud server yourself, look for existing ones and subscribe to one or more via the usual online procedure.
- ③ Read the instructions located in the root folder of your 5 Folders Cloud to discover how this cloud works, and become one of its personal users.
- ④ Participate in the 5 Folders Cloud community at the same time.

The screenshot shows the ownCloud web interface. The browser address bar displays 'data.iclouds.org'. The interface includes a search bar, a user profile 'dummy_user', and a navigation sidebar with icons for Files, Activity, Documents, Pictures, Calendar, and Contacts. The main content area shows a file browser view of a folder named 'CLOUD_OF_CARDS'. The folder contains five sub-folders: 'TO_ACCUMULATE', 'TO_CARE', 'TO_FREEZE', 'TO_IMPROVE', and 'TO_MULTIPLY', and two files: 'FiveFoldersCloud_UserManual.pdf' and 'ReadMeFirst.txt'. A summary row at the bottom indicates '5 folders and 2 files' with a total size of '302.6 MB'.

Name	Size	Modified
TO_ACCUMULATE	56 MB	10 minutes ago
TO_CARE	95 MB	4 minutes ago
TO_FREEZE	12.4 MB	13 minutes ago
TO_IMPROVE	872.7 kB	35 minutes ago
TO_MULTIPLY	136.9 MB	8 minutes ago
FiveFoldersCloud_UserManual.pdf	1.5 MB	last year
ReadMeFirst.txt	369 B	57 minutes ago
5 folders and 2 files		302.6 MB

Related downloads & utilities:

- Install ownCloud client
- Look for, subscribe to and syndicate to one or more 5 Folders Cloud (recipes, how-to & instructions included)

5 Folders Cloud

Additional information about the 5 Folders Cloud can be accessed directly on the research blog.



Quick recipe	P. 02/04
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Ingredients:

- 1 Personal Computer.
- 1 ownCloud client for Mac, Windows or Linux (OS related).
- 1 ownCloud server, already installed and set up with the Cloud of Cards Processing Library addon, to which you can connect.

Assembly guide:

- ① Make sure that your personal computer is set up correctly with the OS of your choice. Also ensure that all necessary updates have already been installed.
- ② Go to [http\(s\)://your-owncloud-server/cloudofcards/](http(s)://your-owncloud-server/cloudofcards/) and fill out the form it provides. You should provide a valid email address, as you will receive notifications about your Cloud of Cards account (creation, notes, etc.) to this address.
- ③ Wait for email notification that your 5 Folders Cloud account is ready. At this point, you can verify your account by accessing it through the ownCloud web interface (a direct link will be included in the email).
- ④ Install the complementary ownCloud client on your personal computer. When you do this, specify your ownCloud account credentials (the ones that you gave in step 3). This will allow you to access your 5 Folders Cloud through a regular File Explorer interface.
- ⑤ Once synchronised, you should be able to see and use the folder structure for the 5 Folders Cloud community, either on the ownCloud server's web user interface or on your OS File Explorer (see above).
- ⑥ If you wish to add additional, and indeed unusual, functionalities to your 5 Folders Cloud, all you have to do is link it with the 5 Connected Objects.

5 Folders Cloud

Additional information about the 5 Folders Cloud can be accessed directly on the research blog.



Quick recipe	P. 02/04
Ingredients	P. 03/04
Assembly guide	P. 03/04
How to use	P. 04/04

How to use:

→ Once connected to an existing Cloud of Cards system through the dedicated 'Subscribe' webpage (your own server, or that of a different administrator), it will automatically generate a set of five new folders under your 5 Folders Cloud root directory. This root directory is labelled CLOUD_OF_CARDS as in the image below.

→ Any folders that you add outside of this CLOUD_OF_CARDS directory will function in a conventional cloud-computing way (see, for example, OtherFolder1, OtherFolder2 and OtherFolder3, etc. in the 'dummy' example above).

A set of 5 additional folders is automatically created inside this new CLOUD_OF_CARDS root folder, most of which have dedicated automated functions: TO_ACCUMULATE, TO_CARE, TO_FREEZE, TO_IMPROVE, TO_MULTIPLY.

→ Do not place any other new folder under CLOUD_OF_CARDS, only files within the five new directories.

→ TO_ACCUMULATE

takes the place of a conventional cloud folder in which one stores things, collects or 'accumulates' heterogeneous data and then just forgets them ...

It is a regular cloud folder, with no other particular function (until you connect it to the 5 Connected Objects). It is a digital place where users can 'dump' files and synchronise them over several devices, as they would probably do in any regular cloud.

→ TO_CARE

Whenever a new file is uploaded into the TO_CARE folder, a copy (or 'backup') is created automatically. This folder ensures that there are redundant files, should you make an error... It acts as a kind of security or backup.

Each duplicated file has the same name as the original, in addition to the '_copy1' suffix. If the copy file is deleted, it will be generated again at a later point. If the original file is deleted, its copy will remain until the user decides to delete it.

→ TO_FREEZE

Files placed in this folder are automatically compressed (zip function) and stored privately.

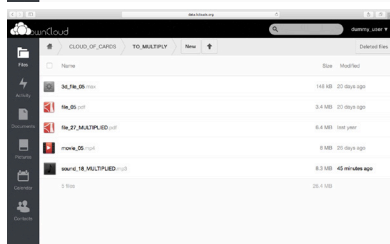
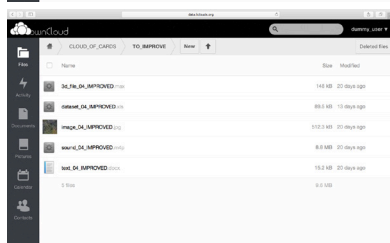
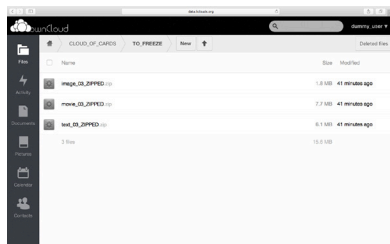
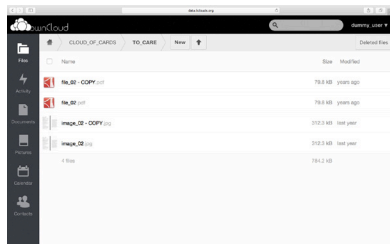
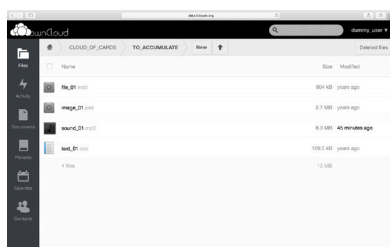
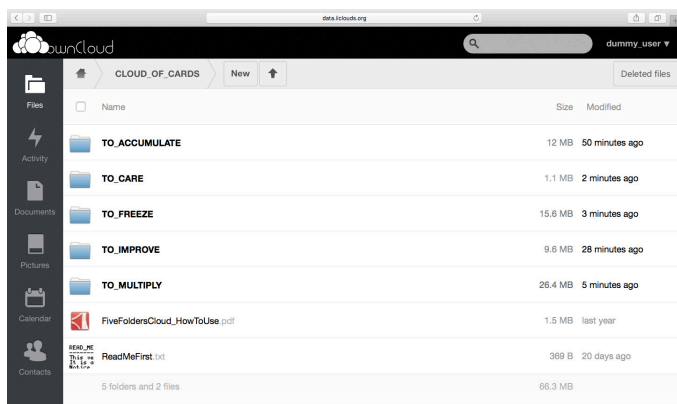
This compression is the default. The main function of the folder is to automatically 'freeze' files and data and keep them stored and hidden.

→ TO_IMPROVE

functions by sampling the content of files placed in this folder (text: pdf, audio: mp3, images: jpg) and then producing a shortened, summarized or analytical version of that file as a copy. This "improved" version of the files contains the "_IMPROVED*" extension. TO_IMPROVE works as a proof of concept about automated file treatment in the cloud.

→ TO_MULTIPLY is a fully shared folder, almost public. Any file added to this folder is copied and shared with all users that belong to a particular Cloud of Cards ecosystem, and stored in their corresponding folder.

In principle, all participants are able to see all added files within this shared folder, and download, delete or rename them. In doing so, TO_MULTIPLY operates somewhat like a peer-to-peer system. Owners of original files do not retain any particular control or ownership of their shared files once they are dropped into that folder.



5 Connected Objects

- To_Improve
- To_Accumulate
- To_Care
- To_Freeze
- To_Multiply

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick Recipe	P. 02/21	To_Care	P. 10/21
All Ingredients	P. 03/21	To_Freeze	P. 13/21
To_Improve	P. 04/21	To_Multiply	P. 16/21
To_Accumulate	P. 07/21		

5 Connected Objects is one of many possible physical implementations of the Cloud of Cards Processing Library and exemplifies its use, client side. Linked to the 5 Folders Cloud (both server and software sides), the five physical objects work exclusively as complements to it and have no independent digital functions of their own. They seek to offer a form of interface based on natural gestures ('clients' for the cloud) to enable users to locally access, monitor and manipulate their data or files in the distant cloud, with a Cloud of Cards twist...

Indeed, the purpose of 5 Connected Objects, which is directly linked to our design research findings and an ethnographic field study into the uses of the cloud, is to materialise the 'ghostly' presence of a user's distant data in everyday environments. It also seeks to embody the 'digital anxiety' caused by mishaps that can happen to personal files and data when dropped into a distant cloud (fear of losing files, anxiety about deleting versions, sharing with the wrong people, misunderstandings over access rights, having private files openly published, undesired updates, hacking, etc.)

As a consequence, these objects, particularly when they are physically manipulated, can trigger automated procedures related to these potential problems...

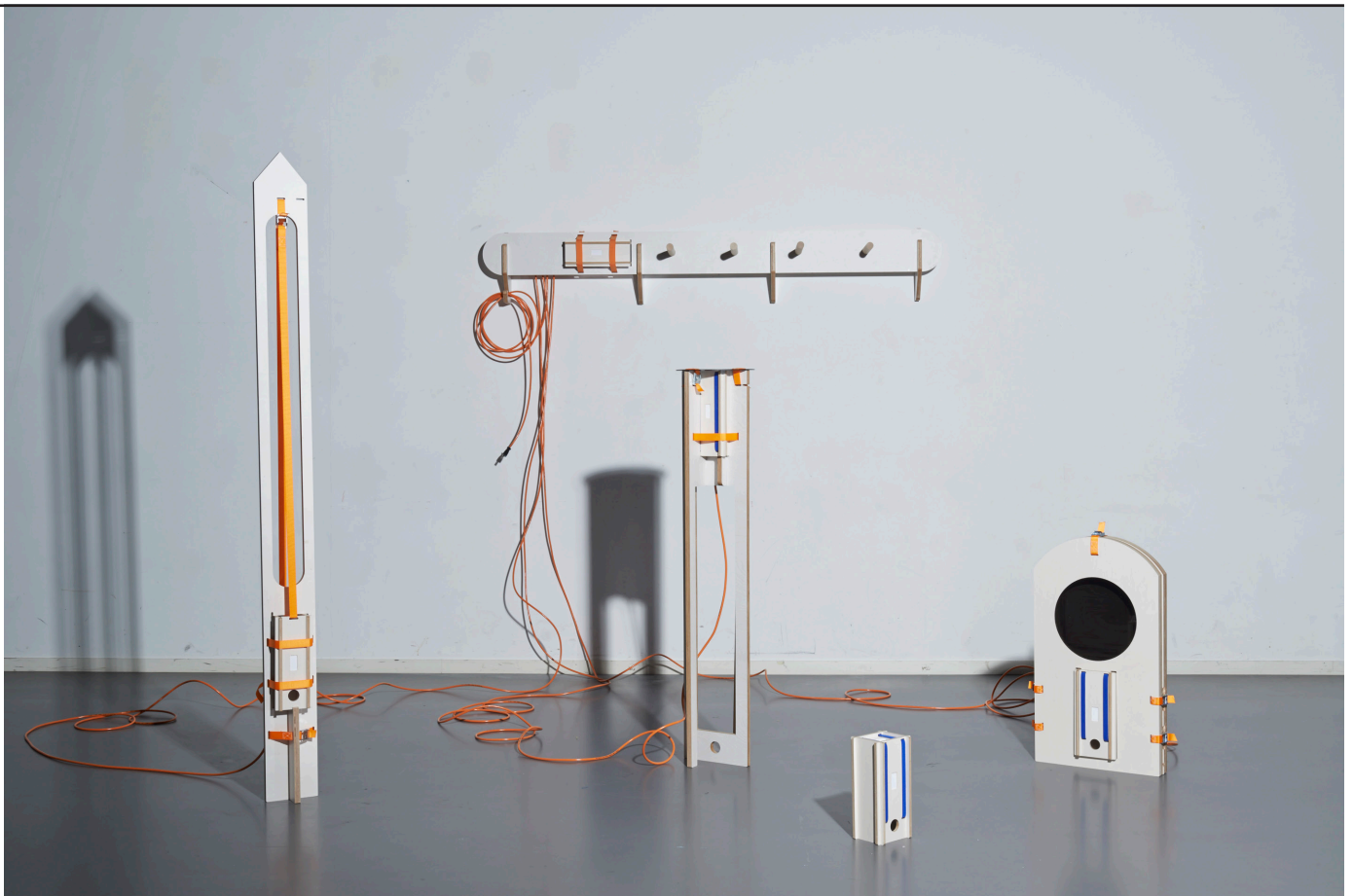
Project developed by Lucien Langton (ECAL, Cyberschnaps).

The connected objects were produced in the context of the Inhabiting and Interfacing the Clouds joint design research project and are part of the Cloud of Cards kit.

This research project was led by Prof Patrick Keller (ECAL) and Nicolas Nova (HEAD – Genève).

www.cloudofcards.org ECAL, HEAD, EPFL+ECAL Lab, HES-SO

→ 5 Connected Objects, to give a physical presence to five distant digital folders located in the Cloud (the 5 Folders Cloud). Each one of these objects maintains a special connection and automated behaviours with the files and data to which it is networked. Each acts as some kind of data controller.



5 Connected Objects

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick Recipe	P. 02/21	To_Care	P. 10/21
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To_Improve	P. 04/21	To_Multiply	P. 16/21
To_Accumulate	P. 07/21		

Quick recipe

- ① Install, then configure the five Raspberry Pis (Pi 2 and above) with a Dexter Industries image or a Raspbian for Robots distro. Once up and running, install Processing for Raspberry Pi and prepare the electronic elements as described in the blueprints.
- ② Download the Cloud of Cards blueprints and the code for the 5 Connected Objects, then prepare the parts that will be needed, and their wooden and electronic elements.
- ③ Assemble the 5 main wooden parts ('boxes') with their electronic components in accordance with the instructions.
- ④ Assemble all other wooden elements as described and then combine them with the 5 'boxes' to produce the final 5 Connected Objects.
- ⑤ Fix the 'To_Improve' element to a solid wall and suspend 'To_Accumulate', 'To_Care', 'To_Freeze' and 'To_Multiply' from it.
- ⑥ Connect all the objects to electricity...
- ⑦ Remove or suspend the objects from 'To_Improve' to activate or deactivate the single system composed of the 5 Folders Cloud and the 5 Connected Objects.

Related downloads & utilities:

- Download list of electronic ingredients, assembly manual and recipes for the 5 Connected Objects (PDF)
- Separately download the five Processing codes from Cloud of Cards for the electronic parts (ZIP).
- Download the full 'all-in-one' pack for 5 Connected Objects (ZIP). It contains all blueprints (DXF) to be separately cut out (at the CNC), assembly manual and recipes (PDF), code (ZIP).

CoCPL_manual.pdf
5CO_code.zip
5CO_all-in-one.zip

5 Connected Objects

Additional information about the 5 Connected Objects can be accessed directly on the research blog.



Quick Recipe	P. 02/21	To_Care	P. 10/21
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To_Improve	P. 04/21	To_Multiply	P. 16/21
To_Accumulate	P. 07/21		

Ingredients:

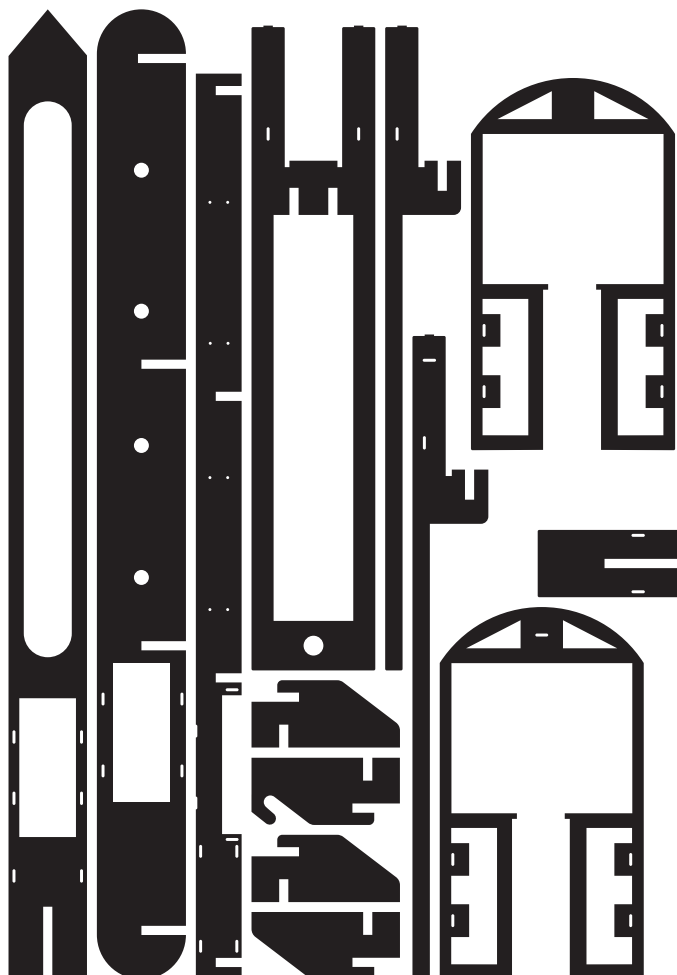
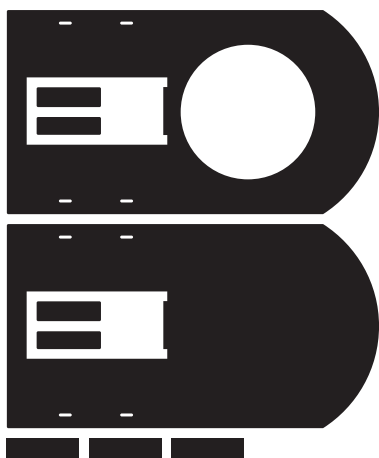
- 1 x Plywood board – 1500 × 3000 × 18 mm (natural or white)
- 1 x Plywood board – 1500 × 1500 × 9 mm (natural or white)
- 17 × 25mm straps
- 10 × 15mm velcro straps

Related blueprints (all):

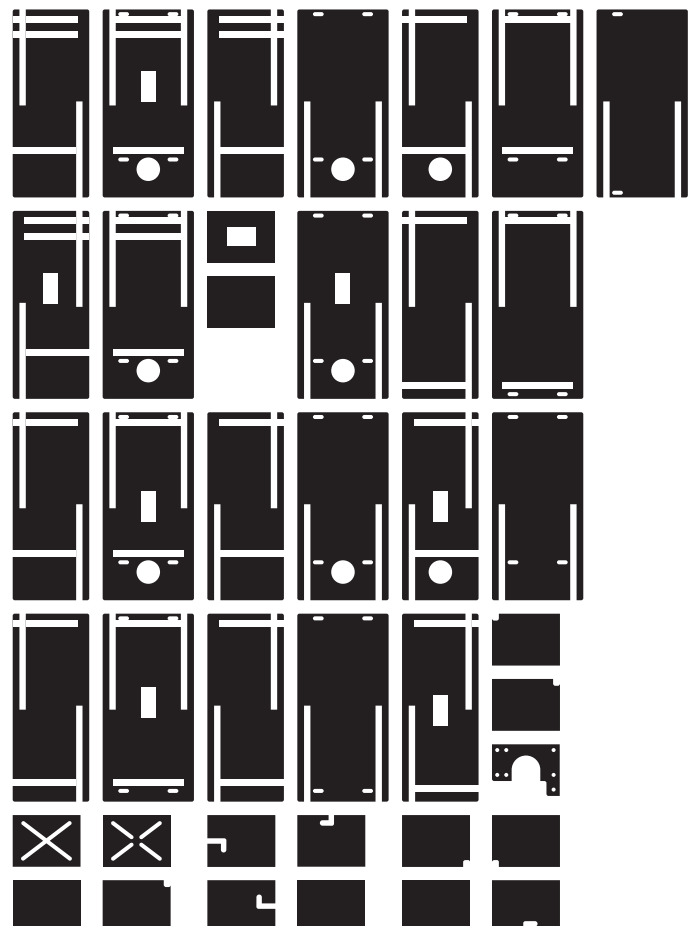
- Use the plywood_18mm.dxf & plywood_9mm.dxf from the 'all-in-one' 5 Connected Objects pack (ZIP). Use them for CNC plywood cutting.
- Use the plexiglass_care.dxf & plexiglass_multiply.dxf files from the same pack for further CNC plexiglass cutting.



5 Connected Objects



5 Connected Objects



5 Connected Objects

→ To_Improve

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick recipe
Ingredients
Assembly guide

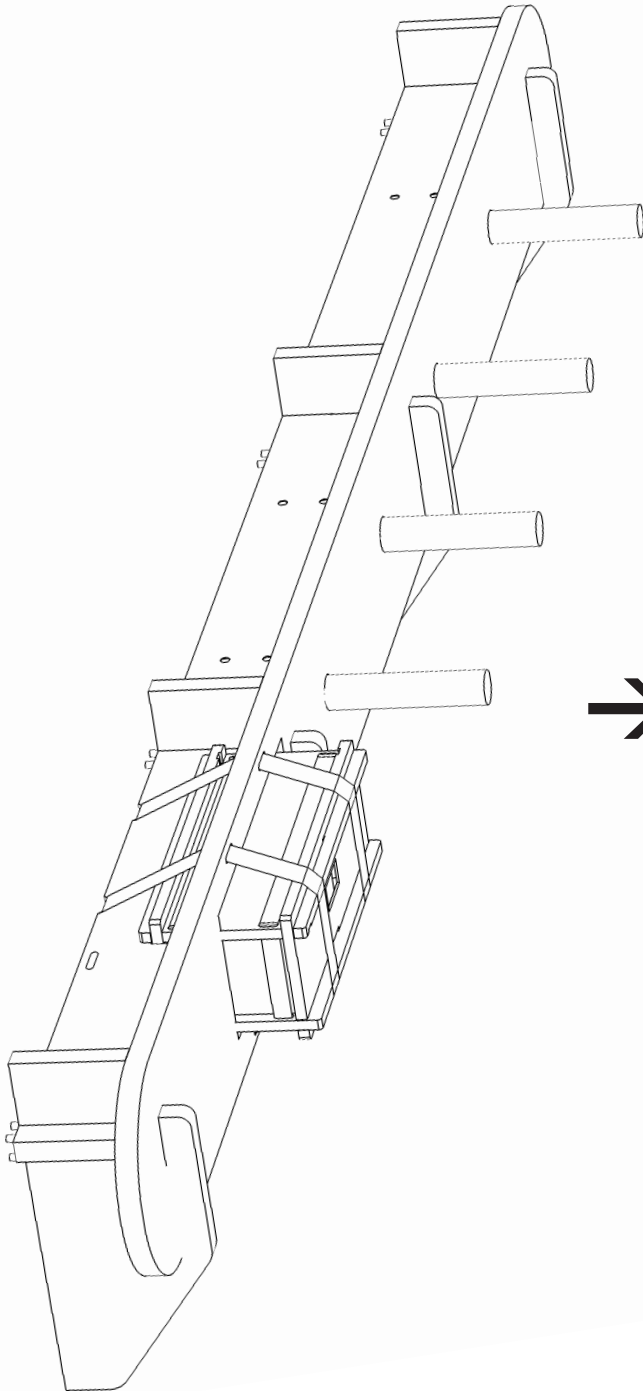
P. 02/21
P. 04/21
P. 05/21

Ingredients, physical parts (use coloured parts below):

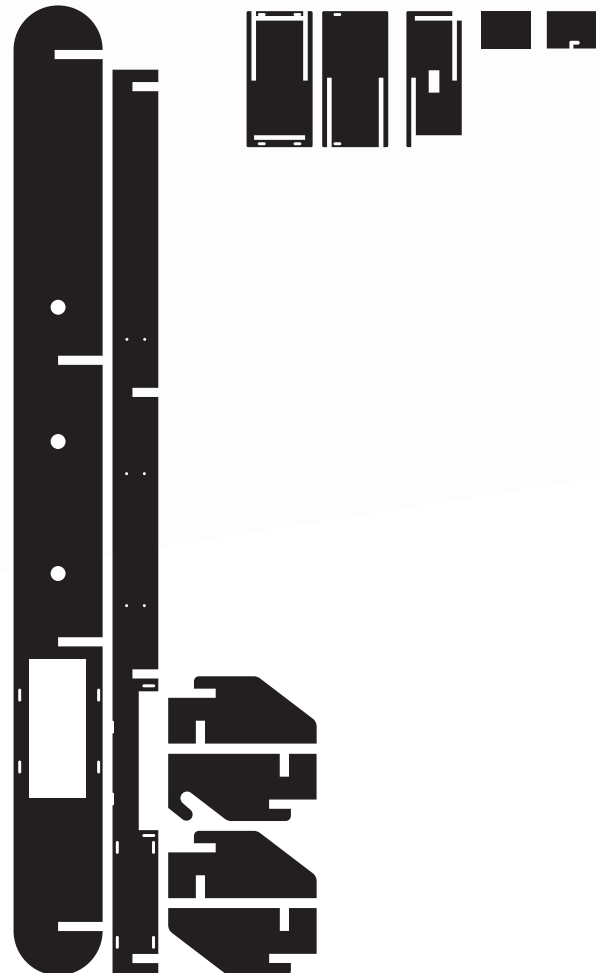
- 4 wall-mounts parts
- 8 wood screws M4 × 16mm
- 8 wood screws M4,5 × 30mm
- 8 × 6mm in diameter wooden pins
- 4 × 30mm wooden pegs
- 2 × 25mm straps
- 2 × 15mm velcro straps

Ingredients, electronics & Processing code:

- 1 x RaspberryPi 2 or later, installed (with charger + Wi-Fi dongle if needed)
- To_Improve.pde Processing code from the 'all-in-one' pack
- 1 x multiple socket power strip (5 outlets minimum)
- 1 x PaPiRus e-paper 2.0" (with HAT for RaspberryPi)
- 1 x GrovePi HAT
- 1 x Grove+ Buzzer
- 1 x T-Cobbler
- 1 × 8m power cord with 1 female and one male socket



Related blueprints



5 Connected Objects

→ To_Improve

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick recipe
Ingredients
Assembly guide

P. 02/21
P. 04/21
P. 05/21

Assembly guide:

1/2

- ① Assemble the long horizontal part with 4 laterally placed vertical wall-mounting elements
- ② Use this part to make marks for the screws by using the metal angles fixed to the 4 vertical wall mountings (Fig. 1-3).
- ③ Once fixed to the wall, slide in the long frontal pane (Fig. 4).
- ④ Once assembled, slide in the 4 wooden pegs and secure with the wooden pins. (Fig. 5)
- ⑤ Attach the power strip. Strap it under the object (left of the box) – a space has been left specifically for the power strip.
- ⑥ Finally, slide the box with its electronics and installed code inside, then secure it all with the straps as shown on the images. (Figs. 6, 7 and 8)

Fig. 1

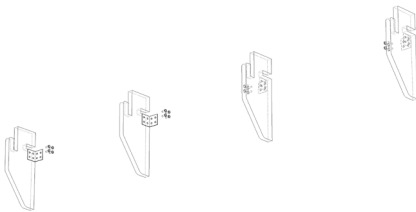


Fig. 2

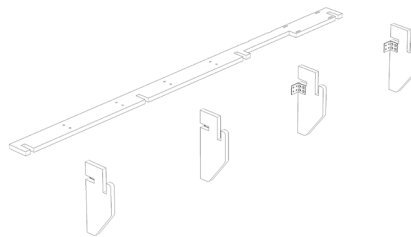


Fig. 3

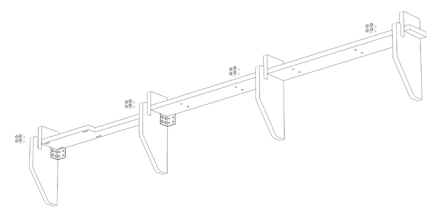


Fig. 4

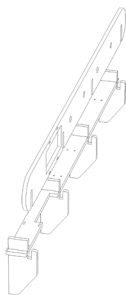


Fig. 5

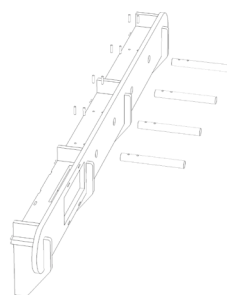


Fig. 6

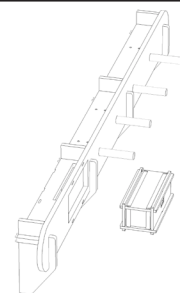


Fig. 7

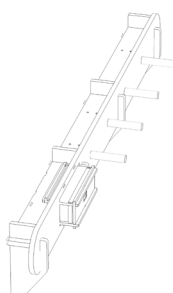
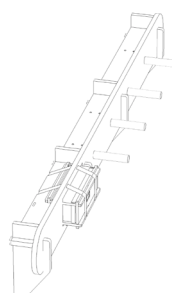


Fig. 8



5 Connected Objects → To_Improve

Additional information about the 5 Connected Objects can be accessed directly on the research blog.



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Ingredients	P. 04/21
Assembly guide	P. 05/21
How to use	P. 06/21

Assembly guide: 2/2

Assembly details – box for electronics

Fig. 9

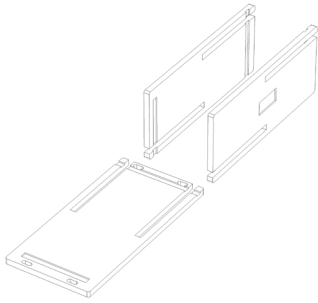


Fig. 10

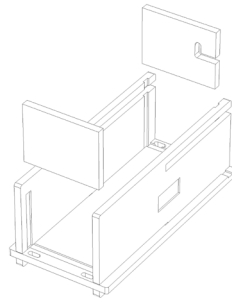


Fig. 11

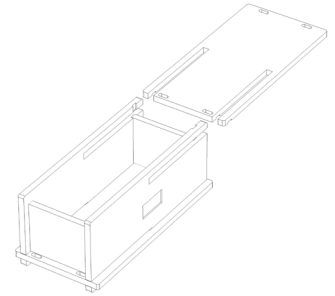


Fig. 12

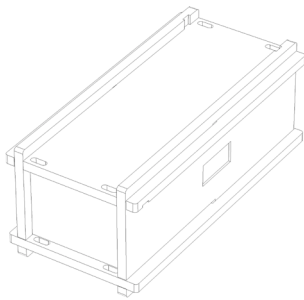
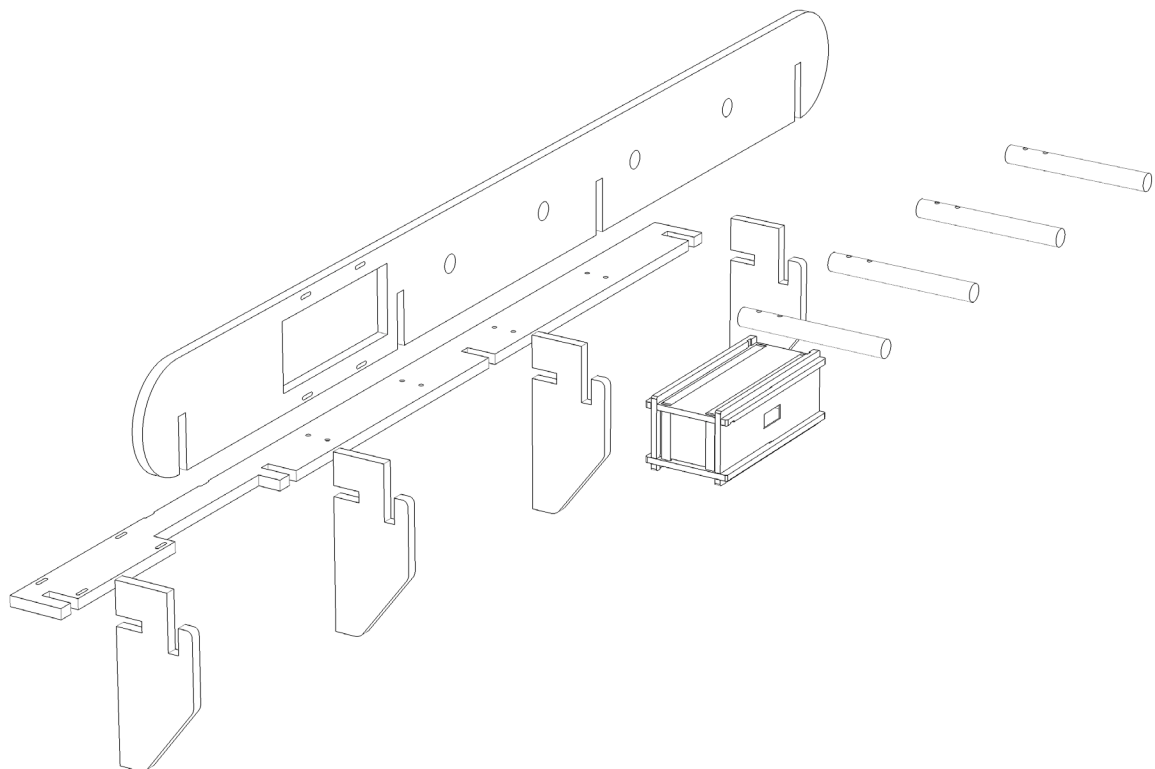
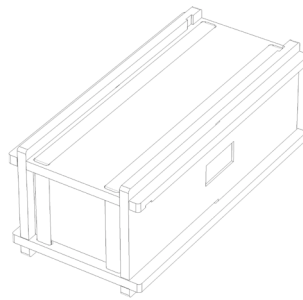


Fig. 13



5 Connected Objects

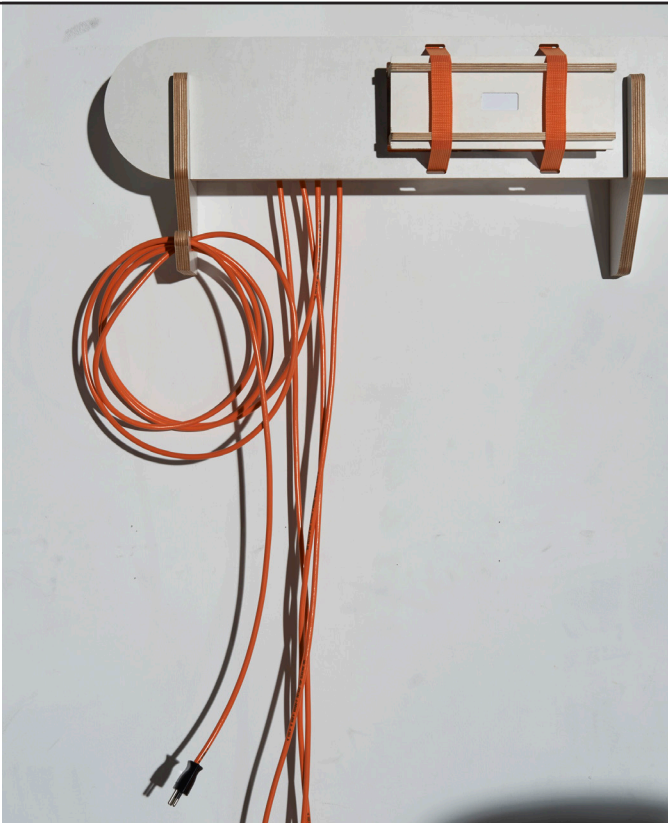
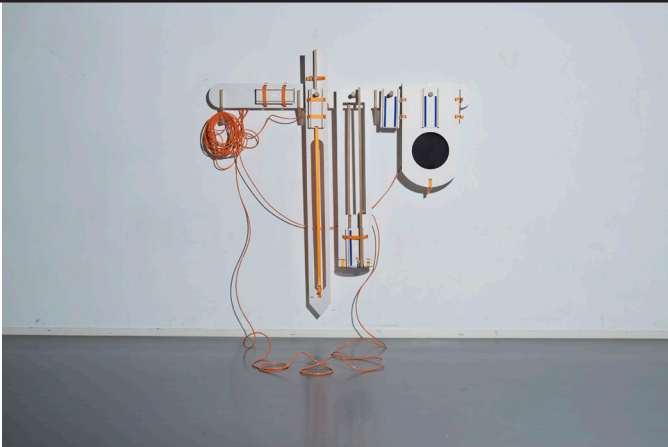
→ To_Improve

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

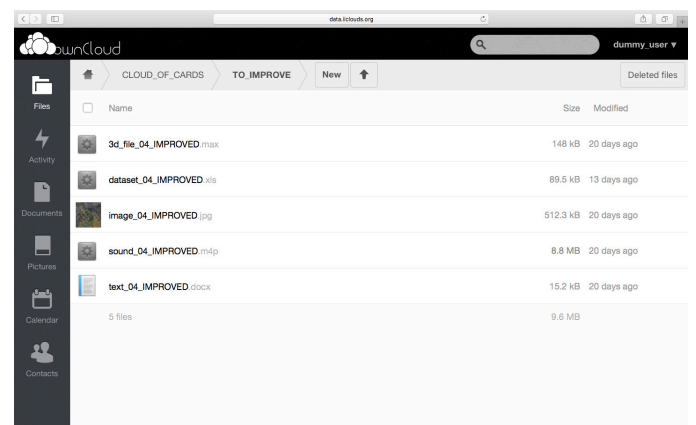
Quick recipe	P. 02/21
Ingredients	P. 04/21
Assembly guide	P. 05/21
How to use	P. 06/21

How to use:



→ General: in addition to outputting power to the other four connected objects described below, TO_IMPROVE also has a status of its own. Like the other four objects, it has an active state and a disabled one. When all the other objects have been dispatched to the space around it, it becomes active. However, when they are all hooked up and disabled, TO_IMPROVE is disabled as well.

→ When all connected objects are disabled, the overall system functions almost like a conventional cloud. Yet when activated, the whole *5 Folders Cloud* version of the cloud (ownCloud) automates meaningful and sometimes disturbing digital behaviours. These are linked to the physical interactions described below.



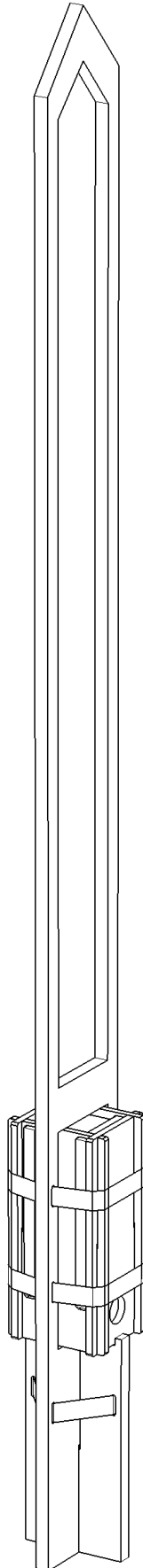
→ Electronics:

once you have installed the software on the *Raspberry Pi* (Dexter for Robots + Processing), connect the power cord to the socket on one side and, on the other, connect the box with the charger and electronics. The *PaPiRus* screen should be visible through the opening of the box. It displays the number of files listed in the corresponding *5 Folders Cloud* directory.

→ *5 Folders Cloud* (ownCloud) connection: when active, TO_IMPROVE improves (tbd) your files (.pdf, .jpg & .mp3 format supported only). When inactive, the folder resumes its normal activity.

5 Connected Objects

→ To_Accumulate



Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick recipe	P. 02/21
Ingredients	P. 07/21
Assembly guide	P. 08/21
How to use	P. 10/21

Ingredients, physical parts (use coloured parts below):

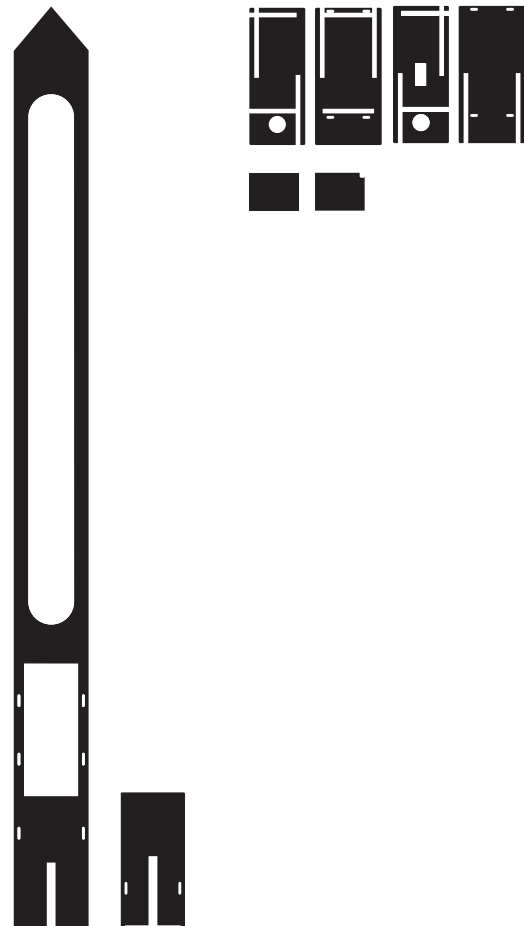
- 3 × 25mm straps
- 2 × 15mm velcro straps

Ingredients, electronics & Processing code:

- 1 x Raspberry Pi 2 or later, installed
(with charger + Wi-Fi dongle if needed)
- To_Improve.pde Processing code from the 'all-in-one' pack
- To_Accumulate.pde Processing code from the 'all-in-one' pack
- 1 x PaPiRus e-paper 2.0" (with HAT for RaspberryPi)
- 1 x GrovePi HAT
- 1 x Grove + 3 axis Gyro sensor
- 1 x Grove+ Buzzer
- 1 x T-Cobbler



Related blueprints



5 Connected Objects

→ To_Accumulate

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick recipe	P. 02/21
Ingredients	P. 07/21
Assembly guide	P. 08/21
How to use	P. 10/21

Assembly guide: 1/2

- ① Assemble the long horizontal part with 4 laterally placed vertical wall-mounting elements
- ② Use this part to make marks for the screws by using the metal angles fixed to the 4 vertical wall mountings (Fig. 1-3).
- ③ Once fixed to the wall, slide in the long frontal pane (Fig. 4).
- ④ Once assembled, slide in the 4 wooden pegs and secure with the wooden pins. (Fig. 5)
- ⑤ Attach the power strip. Strap it under the object (left of the box) – a space has been left specifically for the power strip.
- ⑥ Finally, slide the box with its electronics and installed code inside, then secure it all with the straps as shown on the images. (Figs. 6, 7 and 8)

Fig. 1



Fig. 2



Fig. 3



Fig. 4



5 Connected Objects → To_Accumulate

Additional information about the 5 Connected Objects can be accessed directly on the research blog.



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Assembly guide: 2/2

Assembly details – box for electronics

Fig. 9

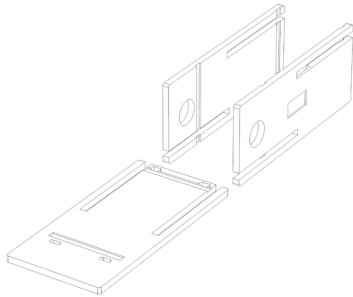


Fig. 10

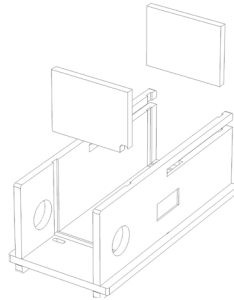


Fig. 11

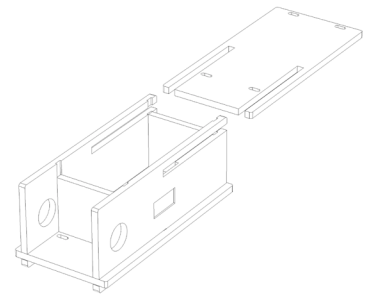


Fig. 12

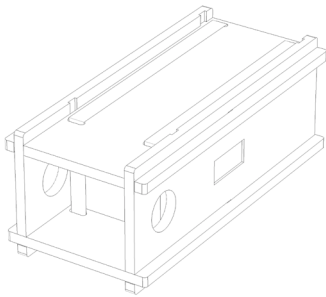
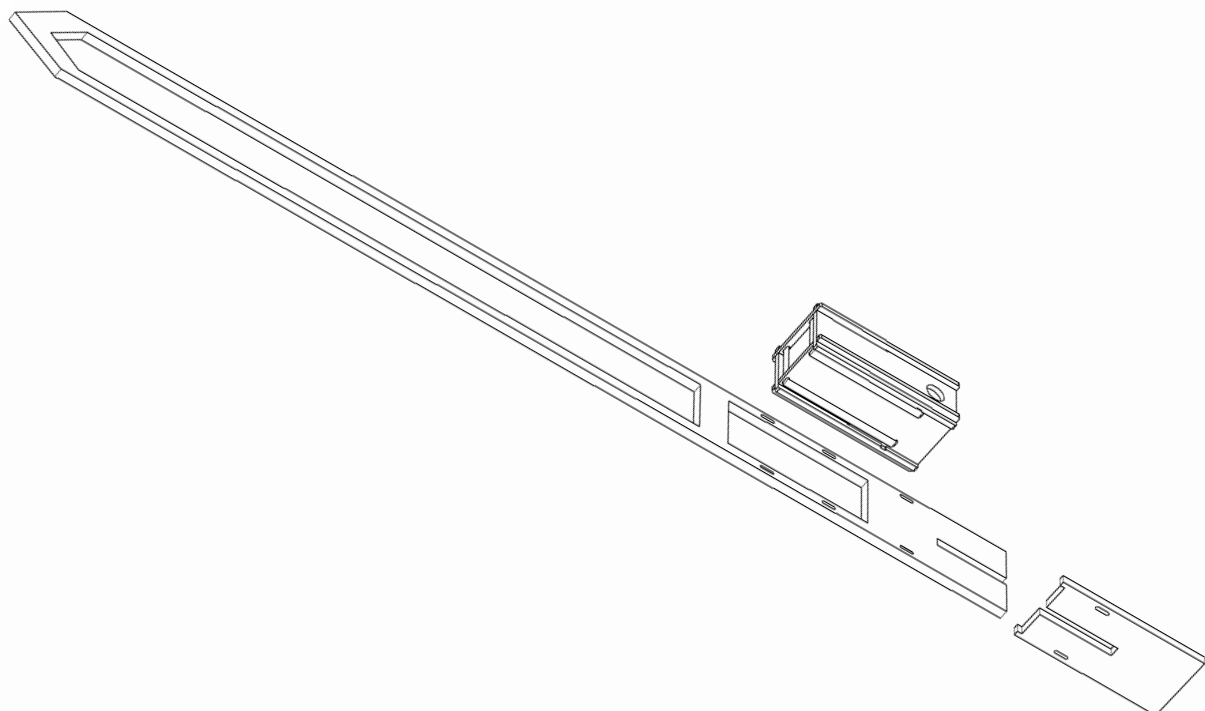
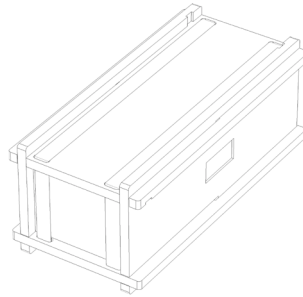


Fig. 13



5 Connected Objects

→ To_Accumulate

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick recipe	P. 02/21
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How to use	P. 10/21

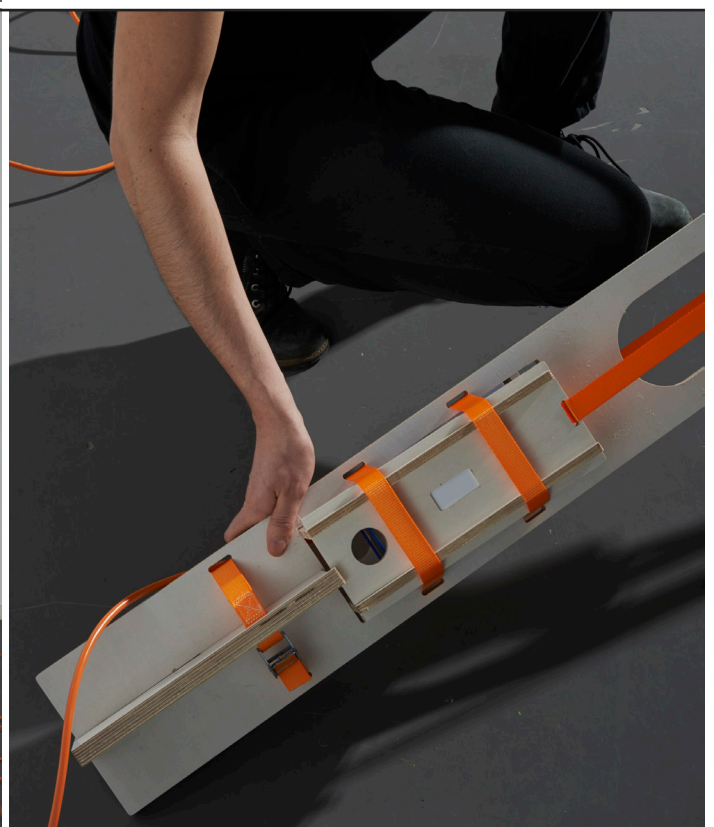
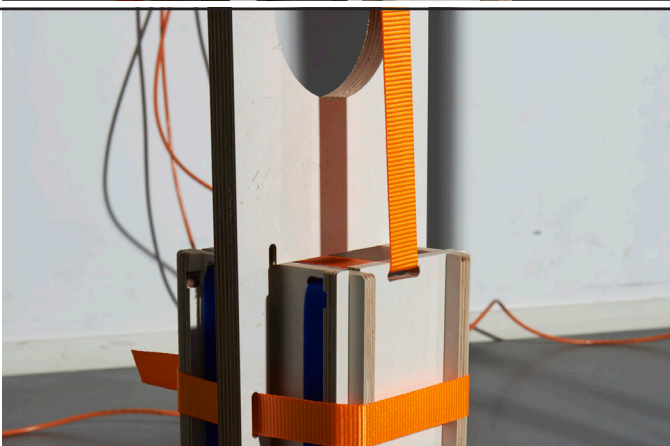
How to use:

→ General: TO_ACCUMULATE has an active state and a disabled state. When standing in upright position, it is active and enables the corresponding *5 Folders Cloud* (ownCloud) folder to offer 'limitless' file storage. However, if TO_ACCUMULATE were to fall, all your files would be deleted... So, keep an eye on it and be careful!

→ When the object is upside down (hooked onto the TO_IMPROVE connected object) it is disabled and your files cannot be deleted by manipulation of the object-controller.

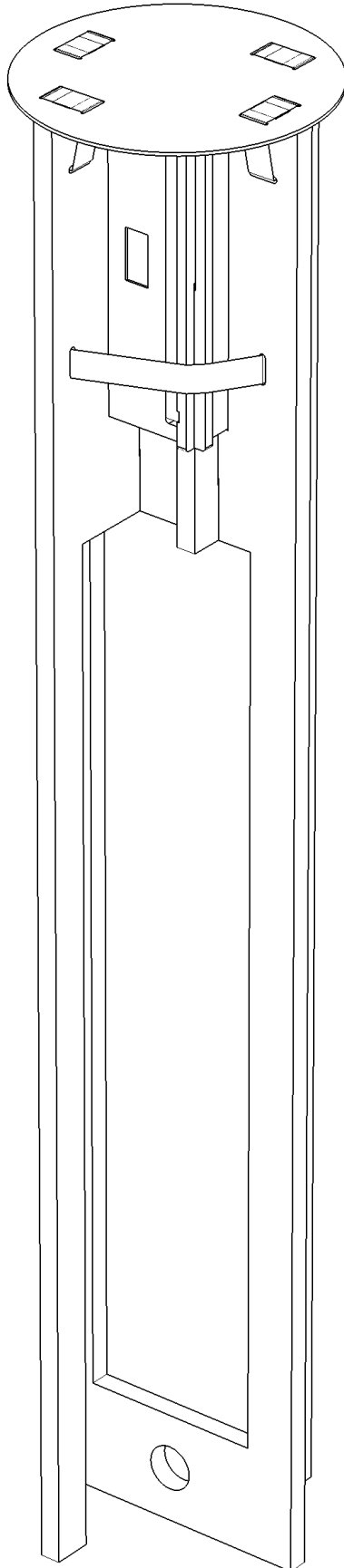
→ Electronics: TO_ACCUMULATE needs to be constantly plugged in (into TO_IMPROVE) to function properly. The *PaPiRus* e-paper screen should first be set in the box facing the corresponding opening, and then the remaining equipment should be inserted. Be careful not pull on the power cable while hanging ACCUMULATE upside down.

→ *5 Folders Cloud* (ownCloud) connection: when the object is in active state, the corresponding folder allows 'limitless' file storage. However, if the object were to fall—which could happen as it is slender and tall—all the stored files will be deleted and lost!



5 Connected Objects

→ To_Care



Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick recipe	P. 02/21
Ingredients	P. 11/21
Assembly guide	P. 12/21
How to use	P. 14/21

Ingredients, physical parts (use coloured parts below):

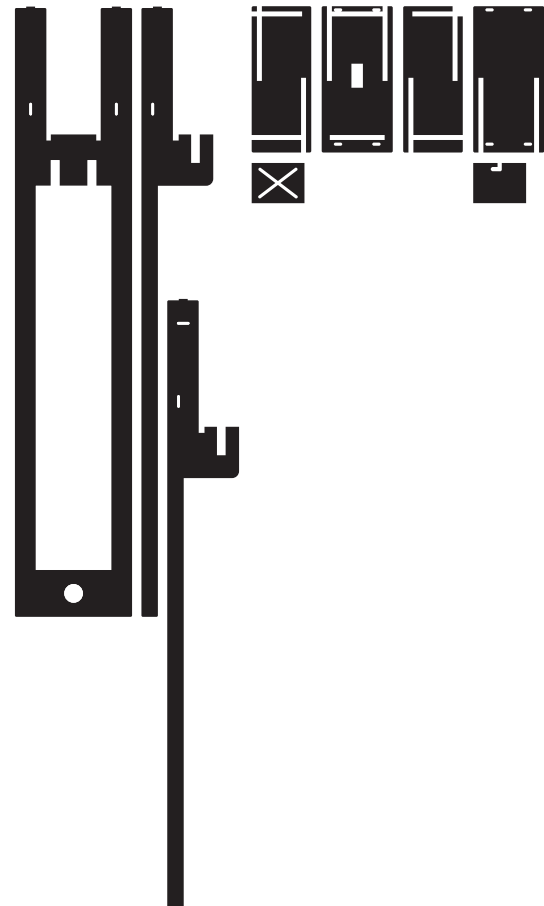
- 5 × 25mm straps
- 2 × 15mm velcro straps
- 1 x smoked plexiglass (3mm thickness)
- 8 × 6mm in diameter wooden pins
- 4 × 30mm wooden pegs
- 2 × 25mm straps
- 2 × 15mm velcro straps

Ingredients, electronics & Processing code:

- 1 x Raspberry Pi 2 or later, installed
(with charger + Wi-Fi dongle if needed)



Related Blueprints



5 Connected Objects → To_Care

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

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Assembly guide: 1/2

- ① Assemble the three vertical parts to form the stand (Figs 1-2).
- ② Slide the assembled box containing the electronics into the central upper space in the stand (Fig. 3). You might have to push for the box to fit.
- ③ Position the plexiglass plateau over the box and the stand (Figs 4-5), it should fit perfectly.
- ④ Finally, secure everything with the straps (Fig. 6).

Fig. 1

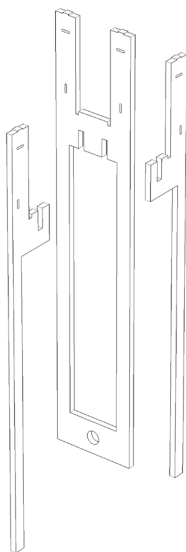


Fig. 2

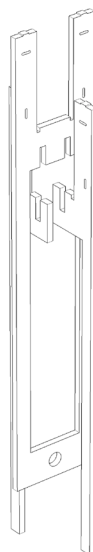


Fig. 3

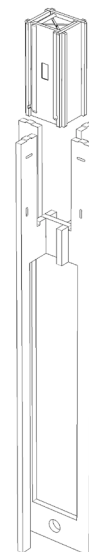


Fig. 4

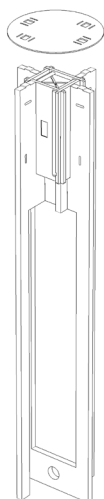


Fig. 5

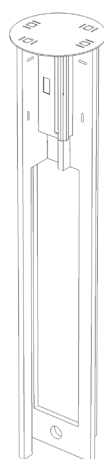


Fig. 6



5 Connected Objects → To_Care

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

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Assembly guide:

2/2

Assembly details – box for electronics

Fig. 9

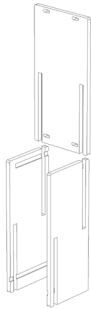


Fig. 10

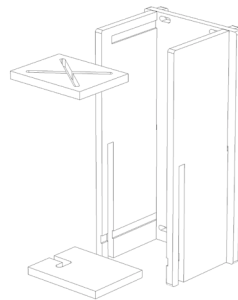


Fig. 11

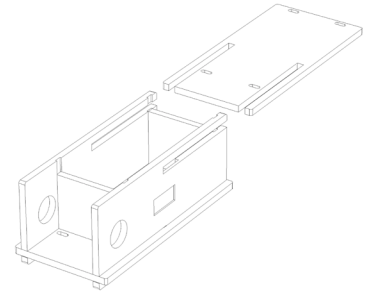


Fig. 12

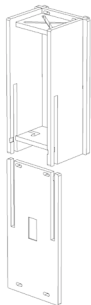


Fig. 13

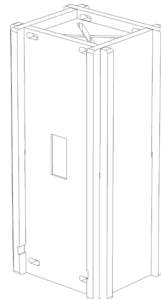
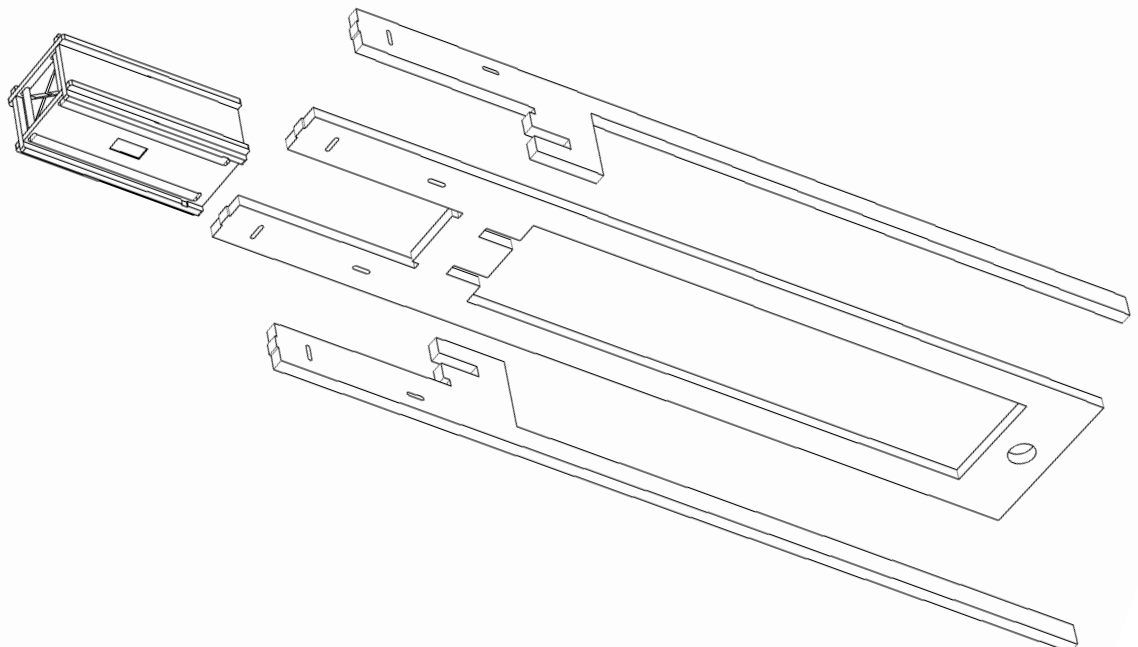
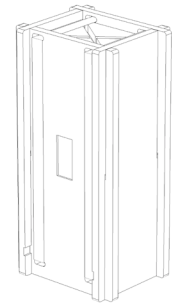


Fig. 11



5 Connected Objects → To_Care

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

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How to use:



→ General:

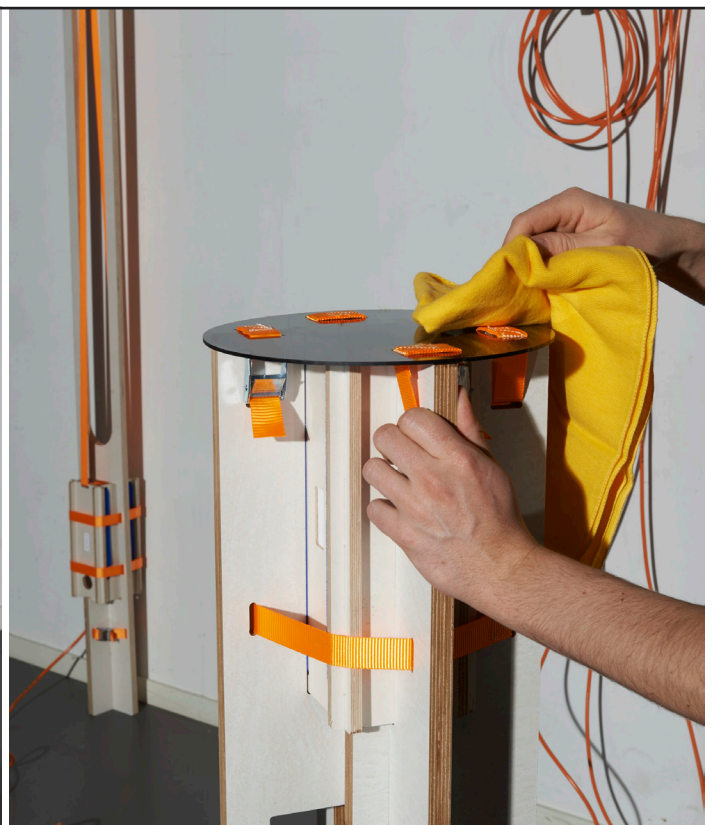
TO_CARE is active when standing in an upright position and disabled when suspended upside down from its hook (attached to the TO_IMPROVE object).

→ When standing, the plexiglass attracts dust on account of increased electromagnetism. You should keep the surface clean by regular dusting. If you do so, the TO_CARE object will indeed help 'take care' of your files and data, by making backup copies of your files and saving them to the corresponding folder of your *5 Folders Cloud*. If you forget to do so, it will start deleting these copies until the original files are moved to the TO_ACCUMULATE folder, where they could be permanently deleted.

→ Electronics:

TO_CARE needs to be plugged (TO_IMPROVE). Isolate the negative ion generator properly from your *Raspberry Pi* by using a plastic box for the generator and the regular plastic sheet supplied with your *Raspberry Pi*. The Generator output should be in contact with the inner face of the plexiglass using the 2 metal conductors.

→ *5 Folders Cloud* (ownCloud) connection: when in active mode, TO_CARE creates backup copies of your files. If TO_CARE goes to 'neglected' (disabled), mode the backup files will gradually be deleted until the originals are finally moved into TO_ACCUMULATE, where they risk being permanently deleted due to the particular behaviour of this connected object.



5 Connected Objects

→ To_Freeze

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

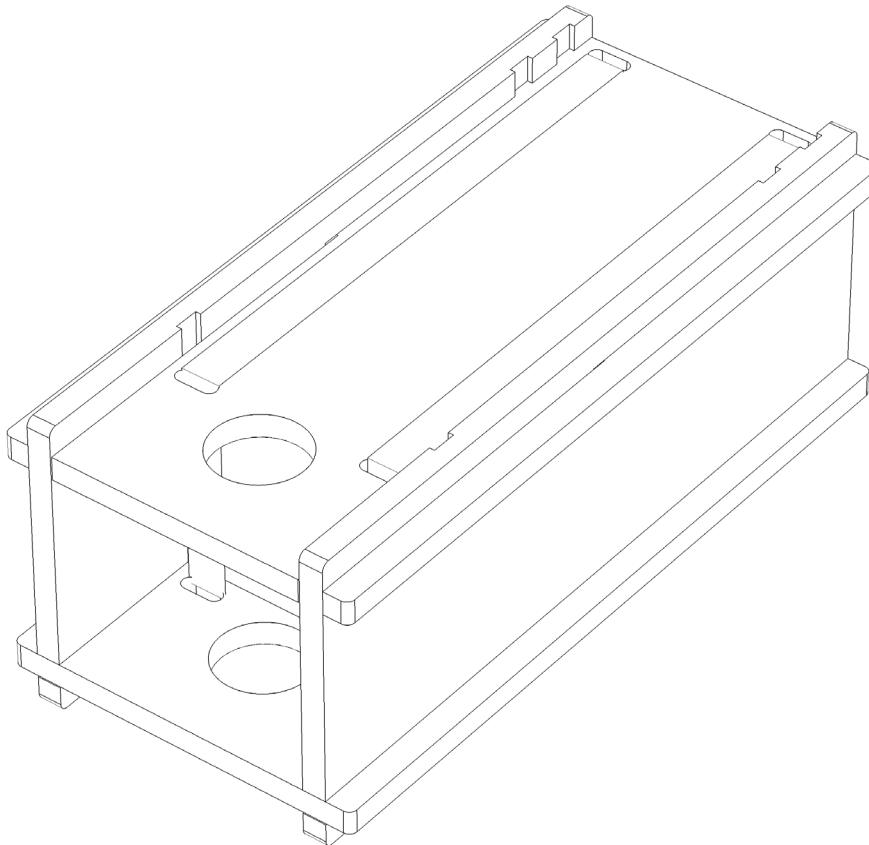
Quick recipe	P. 02/21
Ingredients	P. 16/21
Assembly guide	P. 17/21
How to use	P. 18/21

Ingredients, physical parts (use coloured parts below):

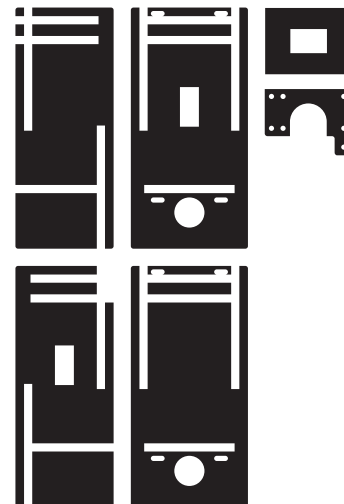
- 2 × 15mm velcro straps
- 1 female power socket

Ingredients, electronics & Processing code:

- To_Freeze.pde Processing code from the 'all-in-one' pack
- 1 x PaPiRus e-paper 2.0" (with HAT for Raspberry Pi)
- 1 x GrovePi HAT
- 1 x Grove+ 3 axis Gyro sensor
- 1 x Grove+ temperature sensor
- 1 x Grove+ Buzzer
- 1 x T-Cobbler
- 1 x USB battery pack 20'000mA (with charger)
- 1 × 4m power cord mounted with male sockets at both ends (stays plugged into To_Improve)



Related blueprints



5 Connected Objects → To_Freeze

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

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Assembly guide:

- ① Assemble the box (Figs 1-4).
- ② Once assembled, the electrical socket should fit into a square space in the upper part . The power adapter for the battery should be attached to the inner part which has a circular opening. Use ties to prevent components from moving around in the box.
- ③ First place the rest of the electronics with the screen facing down.
- ④ The battery should be inserted last over the electronic components.

Fig. 1

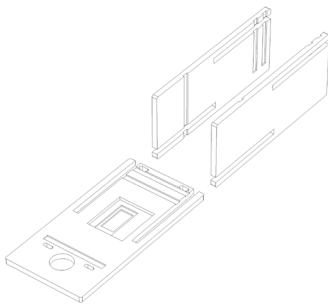


Fig. 2

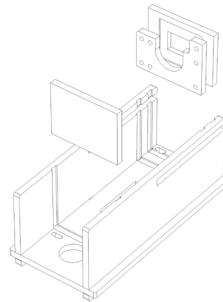


Fig. 3

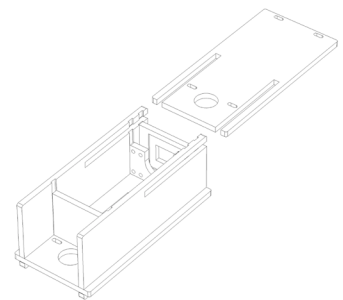
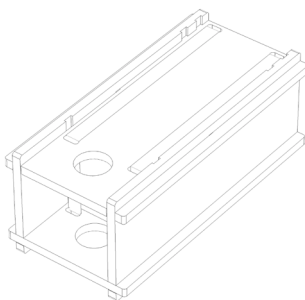


Fig. 4



5 Connected Objects

→ To_Freeze

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick recipe	P. 02/21
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How to use:



→ General:

TO_FREEZE is active as long as it is maintained between 2° and 15°C ... (it should be kept stable in a relatively cold place, such as a cellar or maybe a fridge). It can remain outside this temperature range and over this limit for up to 24 hours, which is the time it takes to recharge its battery).

→ As long as it is 'active', it will compress (ZIP) and privately archive every file in the corresponding 5 Folders Cloud (ownCloud) folder. If it gets warmer, it changes to 'Melted' mode (disabled), in which case it extracts and ultimately moves every extracted file to the TO_MULTIPLY folder.

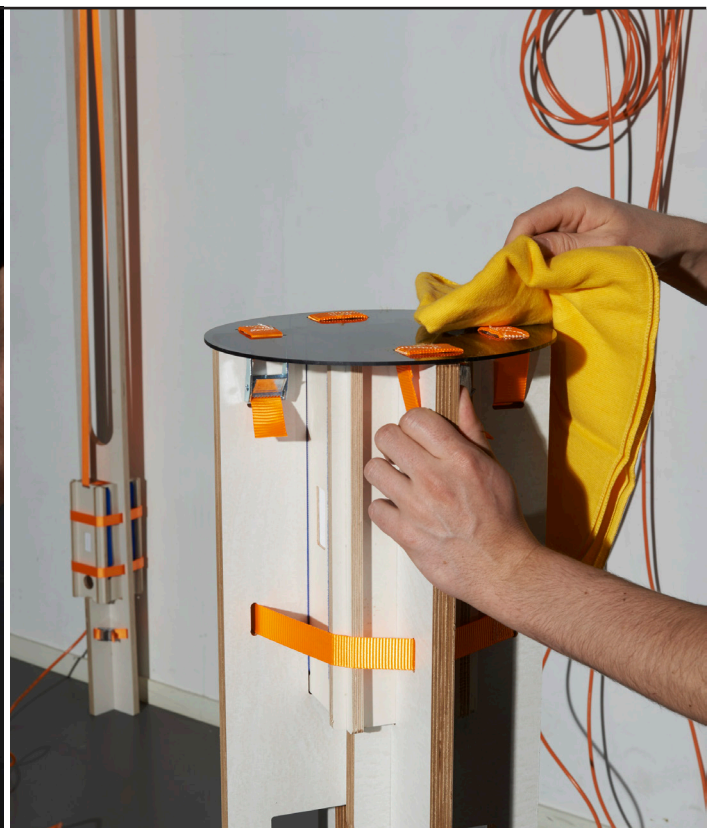
→ Files and data moved into this folder will be publicly shared among the *Cloud of Cards* community, and may be duplicated, moved, renamed or deleted by a fellow user.

→ Electronics:

the *PaPiRus* e-paper screen, corresponding hat and *Raspberry Pi* all have to be placed facie down in the box with the battery pack added last before the lid is slid shut. Be careful to secure the electrical socket safely to the battery pack charger. If needed, use zip ties to secure contents in place. Plug in the power supply last.

→ 5 Folders Cloud (ownCloud) connection: every file located in the TO_FREEZE folder will be compressed into an archive as long as the temperature is maintained between 2° - 12°C. After 24 hours above this limit, all files will be extracted and the archives deleted.

→ Every extracted file will finally be sent to the TO_MULTIPLY folder, where they will eventually be shared with other and sometimes unknown users.



5 Connected Objects

→ To_Multiply

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

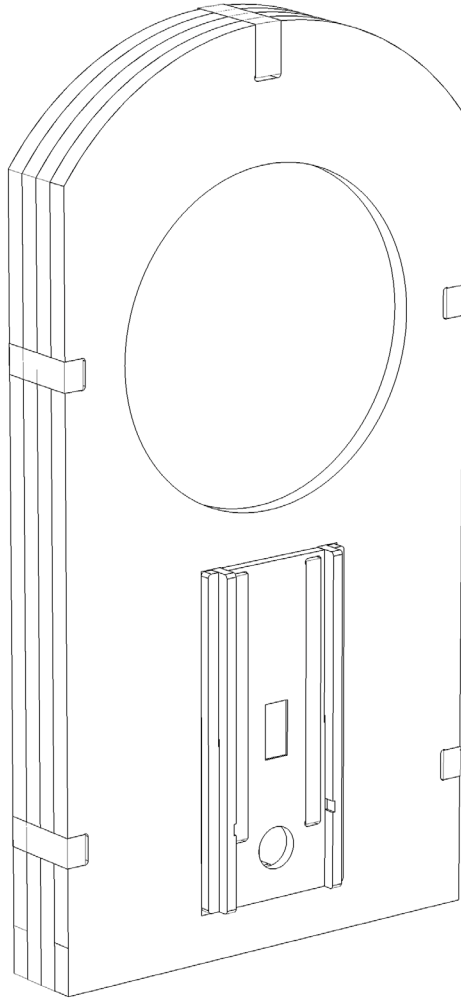
Quick recipe	P. 02/21
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How to use	P. 21/21

Ingredients, physical parts (use coloured parts below):

- 3 × 25mm straps
- 2 × 15mm velcro straps
- 1 x smoked plexiglass (3mm thickness)

Ingredients, electronics & Processing code:

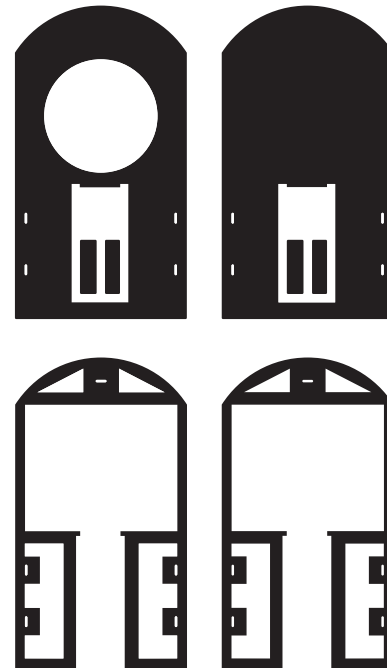
- 1 x RaspberryPi 2 or later, installed
(with charger + Wi-Fi dongle if needed)
- To_Multiply.pde Processing code from the 'all-in-one' pack
- 1 x PaPiRus e-paper 2.0" (with HAT for RaspberryPi)
- 1 x GrovePi HAT
- 1 x Grove+ 3 axis Gyro sensor
- 1 x Grove+ Buzzer
- 1 x T-Cobbler
- 1 × 17" 4:3 monitor with HDMI connection
- 1 × 8m power cord with 1 female and one male socket



Related blueprints



plexigalss-multiply.dxf



5 Connected Objects

→ To_Multiply

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

Quick recipe	P. 02/21
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Assembly guide:

- ① Assemble the first two inner layers and slide them into the assembled box (Figs 1, 2 and 3).
- ② Attach the back layer from behind (Fig. 4).
- ③ Add the monitor (4:3 ratio) to the square space left inside (do not forget to make sure that the HDMI comes out of your box when you connect it).
- ④ Close the object by sealing it with the plexiglass circular screen and front pane (Fig. 5).
- ⑤ Finally, secure it all with the straps (Fig. 6).

Fig. 1

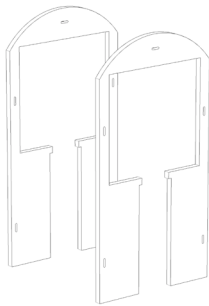


Fig. 2

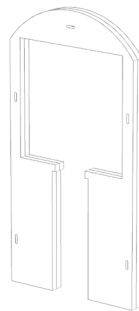


Fig. 3

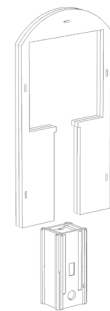


Fig. 4

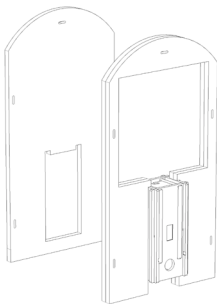


Fig. 5

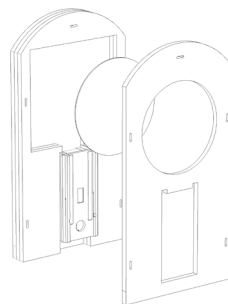
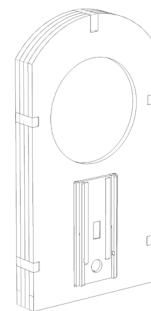


Fig. 6



5 Connected Objects

→ To_Multiply

Additional information about the 5 Connected Objects can be accessed directly on the research blog.

(D)

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How to use:

→ General:

TO_MULTIPLY is an information display and shows every shared file listed in the corresponding *5 Folders Cloud* shared directory. It displays their respective sizes in a dynamic pie chart. All files listed in the folder are automatically shared with every syndicated user of the *5 Folders Cloud* (ownCloud) installation. Each user has the right to add and delete files in this specific folder.

→ Electronics:

the *PaPiRus* screen should first be placed face down against the corresponding opening in the box, followed by the multiple power outputs powering the *Raspberry Pi* and the monitor. Leave the HDMI output out of the box so that you can plug in the monitor. The screen should turn on automatically when the object is plugged into TO_IMPROVE.

→ *5 Folders Cloud* (ownCloud) connection: every file listed in the TO_MULTIPLY folder will be automatically shared and accessible to every user of the syndicated ownCloud installation which has been extended by the *Cloud of Cards Processing Library* functionalities.

