Technical and financial recommendations for the Nautic Lib installation

Nota Bene : the use of the NauticLib trademark cannot be made outside the administrative territory of the Brittany Region. It is recommended that devices or services designed on the basis or from the present document include the following mention "based on an original idea of the Brittany Region".

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Developments		
Revisions	**Description**	**Date**
-	Creation of the document	30/04/2021

Technical and financial specifications

CAPITEN project

I. PRESENTATION OF THE PROJET

1. General presentation

Nautic Lib is a project led by the Brittany region, within the framework of the European project CAPITEN (Atlantic Cluster for Technological and Economic Innovation in the Boating Sector). It is designed to promote economic development and job creation within the boating sector of the Atlantic arc (United Kingdom, Ireland, France, Portugal and Spain) around three poles: tourism, industry and pleasure craft.

The CAPITEN project is organised around five main areas:

➢ The design of innovative nautical products
➢ The Atlantic Tour Event to present, test and raise public awareness of these innovative products during public events
➢ Industrial innovation for sustainable development
➢ The definition of a network of inshore and seagoing navigation
➢ The service offer of marinas

The Nautic Lib project is part of the "Innovative Product" axis. Its objective is to democratise the practice of water sports by offering different water sports equipment on a self-service basis (paddleboards, surfboards, kayaks, bodyboards, etc.), to develop the service offer in isolated areas with little or no tourist leisure facilities, and also to enable water sports professionals to diversify their offer.

An initial prototype was tested during the summer of 2019 with a mobile version of the Nautic Lib (a mobile trailer that can be towed with a Type "B" driver's license), which enabled 200 people to trial the concept on different sites (coastal beaches, inland waterways and public water sports events).
There was strong interest, with 77% of people satisfied.
A market study, carried out in 2020 among 310 professionals of nautical structures in Brittany offering stand-up paddleboarding, bodyboarding, surfing, kayaking, kite surfing and diving activities in Brittany, provided an opportunity to define their needs and expectations. Some 41% of the 44 professionals who responded to the study confirmed a real interest in the project.

2. Project target audience

The Nautic Lib project will be aimed particularly at young people aged 14-25 who have never or rarely taken part in water sports activities.

A market study was conducted in 2020. It is based on several surveys of the target audience:

➢ A first survey on the sporting leisure activities of 16-25 year olds carried out by Credoc in 2017 among 1,000 young people.
➢ A second survey on the tourist behaviour of 18-27 year olds and their expectations carried out by CRT Bretagne among 6,000 young people at the end of November 2017.

3. Purpose of the document

The purpose of this document is:

To guide technical choices in the face of the problems encountered
To estimate the budgets for developing and implementing the proposed installations

Following the completion of the test prototype in 2019 and the completion of the market study in 2020, two configurations are being considered:
➢ A fixed container-type installation (approximately 20 feet)
➢ A mobile rental trailer-type installation (GVW<750Kg), towable behind a vehicle with a Type "B" driver's licence

The main objective to be considered for the analysis is:
The design principles adopted must allow for the integration of a maximum amount of nautical equipment in each solution in relation to format capacity.
The more nautical equipment, the more profitable the system.

II. TECHNICAL SPECIFICATIONS FILE

List of nautical equipment covered by our analysis

(Data: Mille Bleu Conseil)

Name	Equipment	Length	Width	Height/Thickness	Weight
BIC – Bilbao	Kayak	3000mm	780mm	350mm	21kg
RTM – Ocean duo	Kayak	3700mm	880mm	330mm	29kg
SIC – Mahui	Rigid paddleboard	3350mm	740mm	384mm	13kg
Nahskwell	Rigid paddleboard	3650mm	760.2mm	393.7mm	14kg
Tahé – Beach Sup YAK	Inflatable paddleboard	3200mm	860mm	378.6mm	11kg
Tahé – Magnum	Surfboard	2540mm	590mm	310.6mm	8kg
Olaian – Bodyboard	Bodyboard	1140mm	620mm	60mm	1kg

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Objective and principles retained

The objective of the technical specifications file is to propose solutions in response to the requirements and problems encountered so that the installation can eventually be developed and implemented.

<u>Design principles</u>:

The analysis of the installation covers two deployment versions:

➢ Mobile version
➢ Fixed version

Each version will be available in two variants:

➢ Stand-alone version (integrated energy management)
➢ Connected version (230V mains connection)

Each version will be available in two orientations:

➢ Traditional orientation: Paddleboard / kayak / bodyboard
➢ Surfing orientation: Surfboard / bodyboard

A "low-cost" version that does not include any locker management functions (padlocking) will also be costed for the container version.

<u>Technical details</u>:

The Nautic Lib will consist of individual lockers for storing nautical equipment.

These lockers will have a bottom for sliding nautical equipment in or out.

To prevent nautical equipment from shifting from one locker to another (from the inside), lockers will be separated by partitions, enabling users to store their personal belongings during the rental period. <u>NB: this feature will have to be validated in the final design of the installation, as the operator would incur liability in case of theft with this solution</u>.

The lockers will be equipped with a door with electronically controlled opening.

These doors will be designed to limit the risk of burglary.

Users will be able to connect to the Nautic Lib installation in two ways:

➢ Mobile phone (via a special app)
➢ Directly to the installation screen (integration of two screens possible for fixed versions).

The app will also let operators administer and monitor the operation of the tool.

The installation will be designed to operate in two modes:

➢ Energy self-sufficiency
➢ Connected to the 230V mains.

In energy self-sufficiency mode, it will be equipped with solar panels and batteries. To simplify deployment of the installation, we have adopted a common configuration for the solar energy system. In both cases, the panels will be laid flat on the roof of the installations. The number of panels and the capacity of the batteries will be oversized to take into account the horizontal installation and the variations in sunlight depending on the deployment areas. The installation will also be equipped with a 220V mains connection.

In mains mode, the installation will be directly connected to the 230V mains.

For the control and management of the installation (app), it will be linked to the Internet via a GSM connection.

Please note that operation will only be guaranteed if there is onsite GSM coverage. Site coverage and the operator to be chosen can be determined via the website www.cartoradio.fr.

The installation will be equipped with an RFID device allowing operators to analyse the presence of the nautical devices and conduct remote inventories (each piece of nautical equipment will be equipped with a specific RFID tag). 868Mhz RFID network.

Life jackets (required for certain types of equipment: paddleboards/kayaks) will be stored directly in the lockers with the equipment concerned. They will be part of the inventory to be completed during rental pick-up and return.

To cover the user size factor, life jackets will be available in two sizes (M and L).

Our analysis will focus on the following three sections:

Mechanical section

Definition of the design principles and technological choices to be implemented depending on the configuration

Electronic / electrical section

Definition of an operating principle (power management and man/machine interface management)

App / administration section

Definition of the user interface principle (mobile application) and definition of a principle for the installation administration interface (interface exclusively for the operator)

1. Mechanical section

Preamble: The main objective of the installation's mechanical design is to ensure that each configuration contains a maximum amount of nautical equipment.

Indeed, the installation's profitability is closely related to the amount of equipment available for rental.

Definition of locker formats:

In view of the list of proposed nautical equipment, we have superimposed the formats in order to harmonise and define three types of lockers.
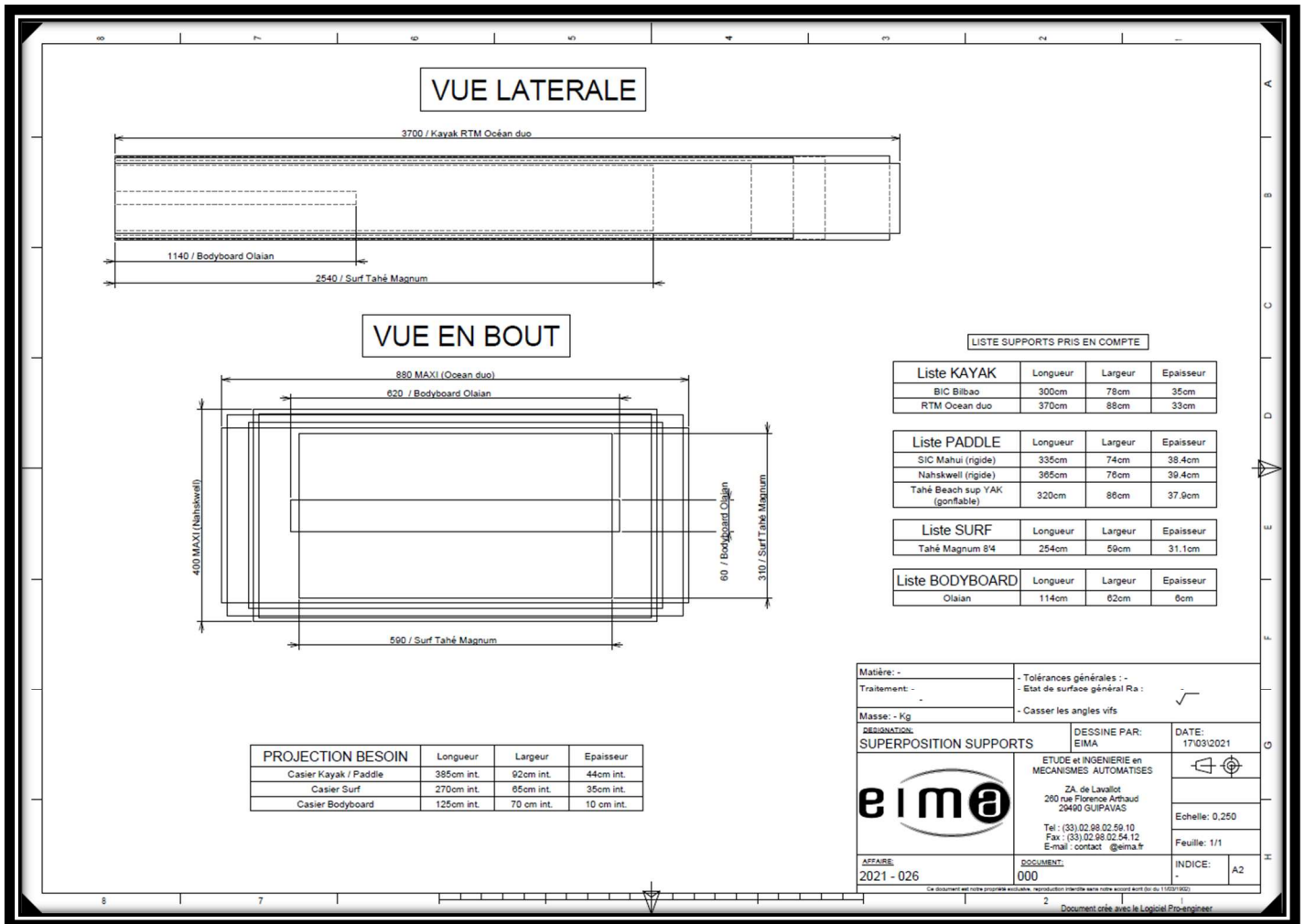
Overview of the three formats chosen:

Locker format	Locker length	Locker height	Locker depth
Paddleboard / Kayak	920mm	440mm	3850mm
Surfboard	650mm	350mm	2700mm
Bodyboard	700mm	100mm	1250mm

Comparison of mobile / fixed versions:

Fixed version:

To ensure a maximum amount of nautical equipment, we assumed that we would use a 20-foot shipping container with double doors.

This makes it possible to instal lockers at both ends of the container. Using a shipping container lets us start with a standard, solid and relatively widespread base (reasonable budget) that complies with transport and handling guidelines.

What is more, the original doors feature the added advantage of a secure closure in addition to the locker doors (the installation can be closed and locked in the evening or when not in use or in storage).

Depending on the location, this configuration may require a request for a parking permit.

Mobile version:

The advantage of this configuration is mobility: you can position yourself as close as possible to demand (even right on the beach) or according to weather conditions.

To be able to move this installation without necessarily having a specific permit, the main technical problem is therefore not to exceed the Total Allowable Loaded Weight (GALW) of <u>750kg</u>, taking into account all the trailer components (frame, frame, nautical equipment, etc.).
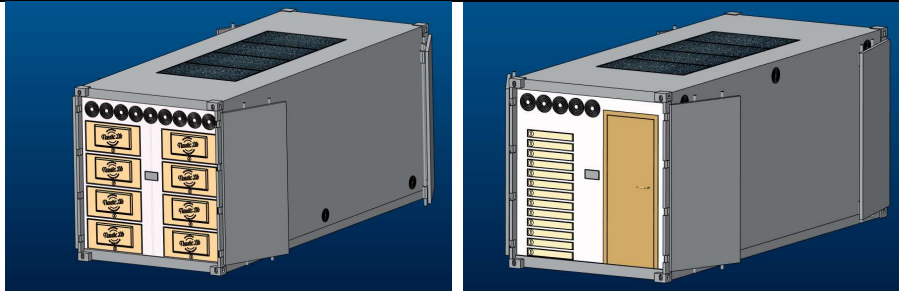
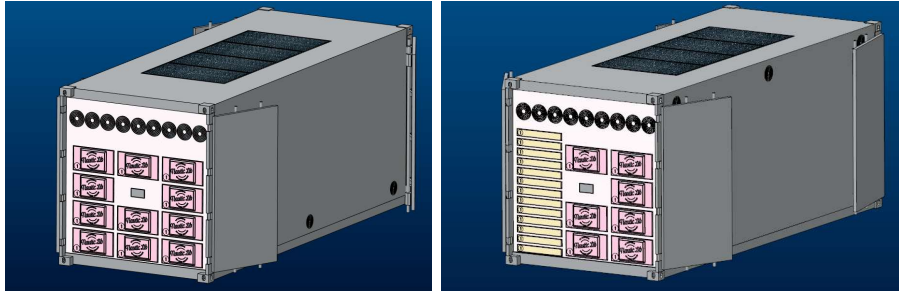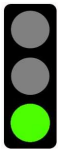## Analysis of storage capacity by configuration:

In view of the three formats defined, we have analysed all the possible combinations in order to keep only those which seem useful for rental.

For the analysis of the combinations, the following assumptions and dimensions were used:

- ➢ Trailer: width less than the imposed road size for a trailer: max width: 2550mm
- ➢ Double door container, internal dimensions: length 5844mm / width 2350mm / height 2393mm.
- ➢ Objective: integration of nautical equipment:
  - o Prioritise heavy equipment (kayaks / paddleboard) in the lower parts of installations.
  - o Limit the level of the upper lockers to facilitate access to equipment
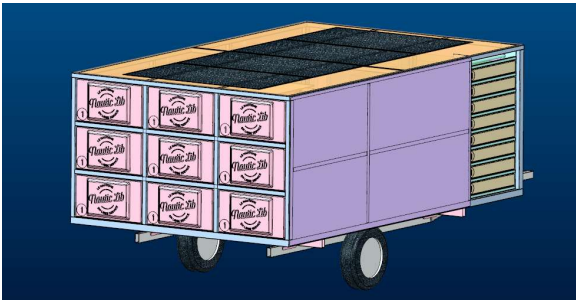
ANALYSIS OF STORAGE CAPACITY				
Fixed container version				
Orientation	Equipment	Quantity		Profitability vision
Traditional	Kayak / paddleboard	8		
	Surfboard	0		
	Bodyboard	13		
Note: in this configuration, we are very limited by the length of kayaks and paddleboards. Their quantity is therefore limited and can only be associated with bodyboard rental. The amount of bodyboards could have been larger (doubled), but this seems to us to be too large a volume. We therefore preferred to focus on service by including a changing area for users.				
Surfing	Kayak / paddleboard	0		
	Surfboard	18		
	Bodyboard	13		

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ANALYSIS OF STORAGE CAPACITY				
Mobile trailer version				
Orientation	Equipment	Quantity		Profitability vision
Traditional	Kayak / Paddleboard	4		
	Surf	0		
	Bodyboard	6		
Surfing	Kayak / Paddleboard	0		
	Surfboard	9		
	Bodyboard	8		

Problems and related technical solutions:

In the table below, we will list all the problems and technical constraints encountered in the implementation of the installation and combine them with proposals for technical guidance.

We will detail the advantages and disadvantages of each solution.

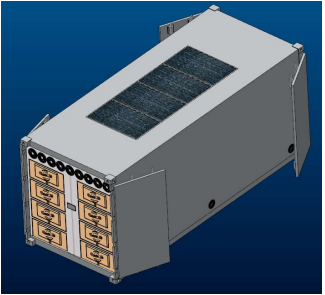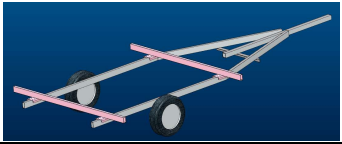| Proposal for technical solutions			
Common analysis: Fixed version / Mobile version			
Problems	Proposed technical solutions	Advantages	Disadvantages
Construction of locker doors. (3 different formats)	With a view to creating a technically and visually accomplished installation, we decided to make the door panels from roto-moulded polyethylene. The thickness envisaged is 5mm. Example:	This technology makes it possible to produce customised panels by integrating the hinge function in the thickness (through-hole for stainless steel pin). Possibility of making the panels rigid enough to limit the risk of vandalism. Attractive visual appearance with the option of integrating the Nautic Lib logo in the panel. The panels will be dyed in the mass (multiple choice of colour possible, resistance to UV). Reduced weight	This technology requires specific moulds to be made for each format (budget to be taken into account in the development costs). In order to obtain reasonable production rates, the panels should be launched in production runs of at least 50 pieces.
Problems	Proposed technical solutions	Advantages	Disadvantages

Technical and financial specifications
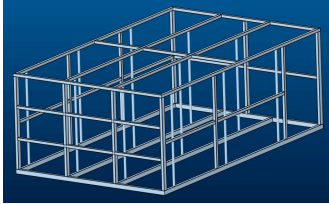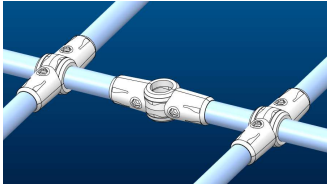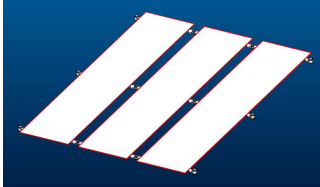
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Locker opening and locking management	To manage this function, we have chosen an electric lock specifically developed for locker management. The reference chosen is: ABIOLOCK ABKR S98A (from ABIOVA), this lock is designed to consume as little energy as possible (specifically for app powered by solar panels) (technical data sheet attached)	6Vdc power supply possible. Protection class IP65 (waterproof) Operating temperature: -40 /+ 75°C Open or closed position detection (dry contact). Stainless steel housing 340	Stainless steel 340 is a little light for corrosion given its use in the marine environment. However, we have not found a more suitable product. Regular maintenance and lubrication can limit the risk of corrosion.
Solar panels power supply	We decided on the integration of fixed flexible solar panels. Flat mounting at the top of the devices	As they are slim, they limit the visual impact and allow for an integrated and discreet mounting. No need for adjustment to orientate the panels. The weight is very limited (important for the towed version)	The flat mounting limits the efficiency of the box; to take this factor into account, we have oversized the installation and planned the integration of four panels per system.

Specific analysis: Fixed version			
Problems	**Proposed technical solutions**	**Advantages**	**Disadvantages**
Construction of a solid installation	Built on the basis of a 20-foot double-door container. Use of a "first trip" container	Possibility of integrating lockers at both ends of the installation. Complies with transport and handling standards. Quite common, so the price is reasonable. Possibility of using the existing doors of the container to prevent access to the lockers and to secure the installation when not in use or in storage.	There are some inscriptions on the container related to the maritime transport; complete painting will be necessary (see below)
Adaptation work will be required to adapt the base of the container as need be. We recommend the following changes: ➢ to protect the base of the existing wooden floor, we suggest applying a smooth protective resin. ➢ to guarantee the evacuation of run-off water (return of wet nautical equipment) and to facilitate rinsing of the premises, we recommend the addition of two floor drains with stainless steel grids (evacuation outlet under the container) ➢ to guarantee safety when using the Nautic Lib, we recommend the installation of door blocks to lock the container doors in the open position. ➢ to limit the risk of condensation/mould: we recommend the integration of ventilation grilles on each side of the container. ➢ Complete exterior painting (thickness 80 microns / choice of colour possible).			
Supporting structure racks	Use of modular systems on the market to create a suitable, easy-to-design supporting structure.	Fairly widespread products (reasonably priced)	The connecting parts are made of steel (risk of corrosion) > we recommend the use of

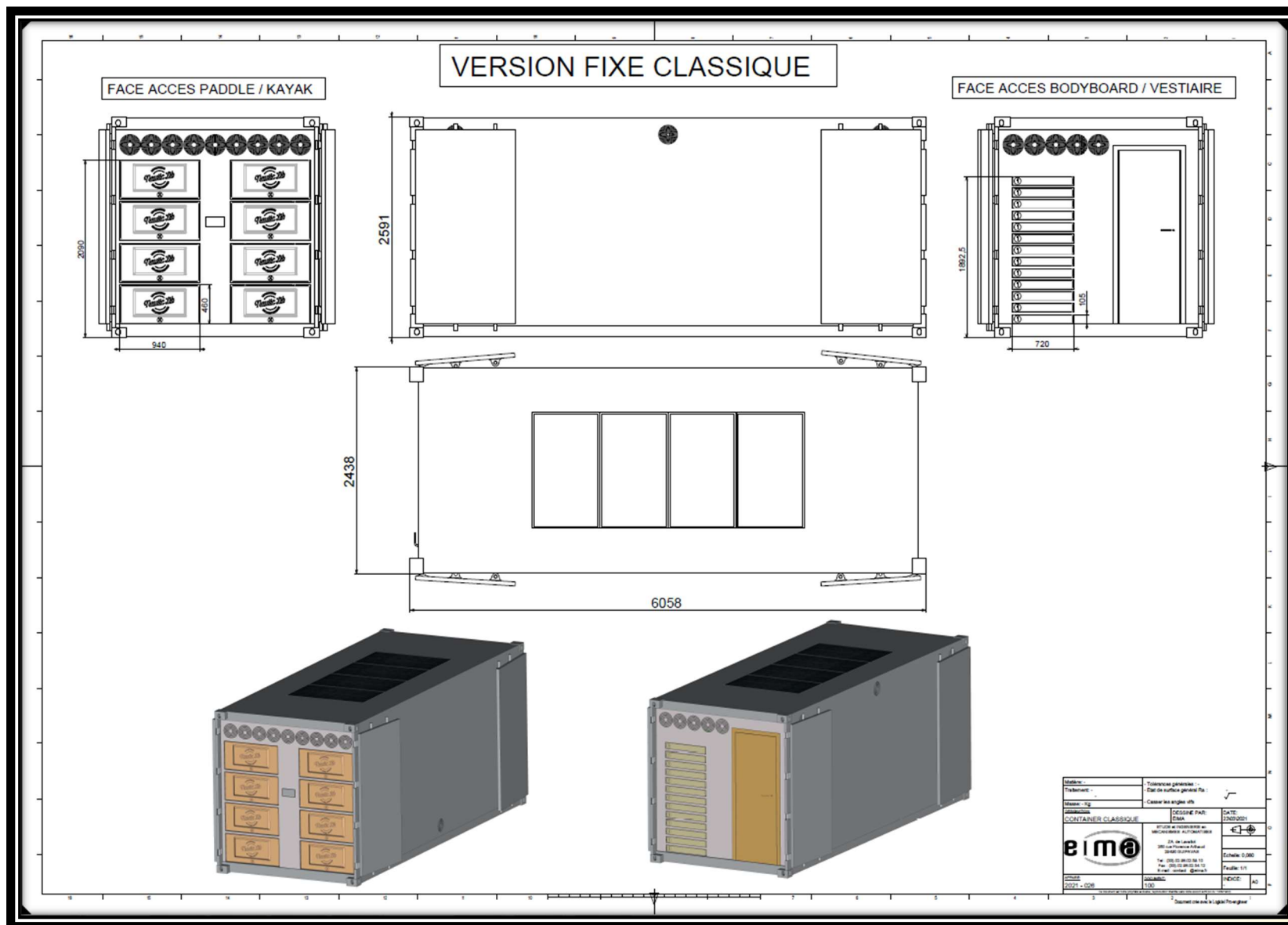|			parts with double galvanisation treatment. Lubrication of the clamping screws is essential during installation.
	Due to the low weight of the nautical equipment, we used 26.9mm diameter tubes. For the connecting tubes, we recommend the use of 316L D26.9 / 1.6mm thick stainless steel tubes.		
Bottom of the lockers	We recommend that the installation plans for the products be made of HDPE plastic, thickness 8. These panels will be fixed to the supporting structure.	No risk of rot or mould.	
Partition walls between lockers	We recommend the use of steel mesh panels to vertically separate the rows of nautical equipment. These panels will be galvanised.		

Specific analysis: Mobile version			
Problems	Proposed technical solutions	Advantages	Disadvantages
Road transport	To limit development and manufacturing costs, we used a commercially available trailer base (750kg GVW / galvanised steel).	Compliant with regulations	
Box frame	To limit the impact on weight, we recommend a custom-made box structure made of welded aluminium tubes. To guarantee the overall aesthetics of the equipment, we recommend protecting it with thermo-lacquering paint.	Reduced weight. Limited risk of corrosion	
Supporting structure racks	Use of modular systems on the market to create a suitable, easily designed supporting structure. In view of the overall weight objective, we decided to use plastic connecting parts. For the connecting tubes, we recommend using 1.6mm thick / D268.7 aluminium tubes.	Fairly widespread products, reduced weight	This type of connection is delivered with steel screws, which we recommend replacing with A4 stainless steel screws. Lubrication of the clamping screws is essential during installation.
Bottom of the lockers	For the laying plans for the products, we recommend using Foamlite plastic, thickness 6 (density 0.6) (technical data sheet attached). These panels will be fixed to the supporting structure.	No risk of rot or mildew. Reduced weight	Plastic not widely used
Partition walls between lockers	We recommend using plastic panels (weight limitation).	Reduced weight	Plastic not widely used

	Material: Foamlite ep.6		
Casing and roof enclosures	The closing panels will be made of 1.5mm thick aluminium. Fixing to the frame by aluminium riveting.	Reduced weight. Possibility of using the surfaces of the side and front panels for communication covering.	

Estimated trailer weight table with the above assumptions	
Traditional version	
Nautical equipment onboard (1 kayak / paddleboard: 1 rigid, 2 inflatable / 6 bodyboards + life jackets)	Assumption 100kg
Trailer base GVW 750kg	150kg
Mechanical assembly (frame / support / locker doors)	380kg
Electronic part (battery / solar panels / wiring / locks, etc.)	70kg
TOTAL	**700kg**
Surfing version	
Nautical equipment onboard (9 surfboards / 8 bodyboards)	Assumption 110kg
Trailer base GVW 750kg	150kg
Mechanical assembly (frame / support / locker doors)	400kg
Electronic part (battery / solar panels / wiring / locks, etc.)	70kg
TOTAL	**730kg**

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VERSION FIXE CLASSIQUE

FACE ACCES PADDLE / KAYAK

FACE ACCES BODYBOARD / VESTIAIRE

VERSION FIXE SURF

FACE ACCES SURF

FACE ACCES SURF / BODYBOARD

VERSION MOBILE CLASSIQUE

FACE ACCES PADDLE / KAYAK + BODYBOARD

ECRAN UTILISATEUR

3500
2101
1535

1983
1891
1606
1116
626

Technical and financial specifications

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VERSION MOBILE SURF
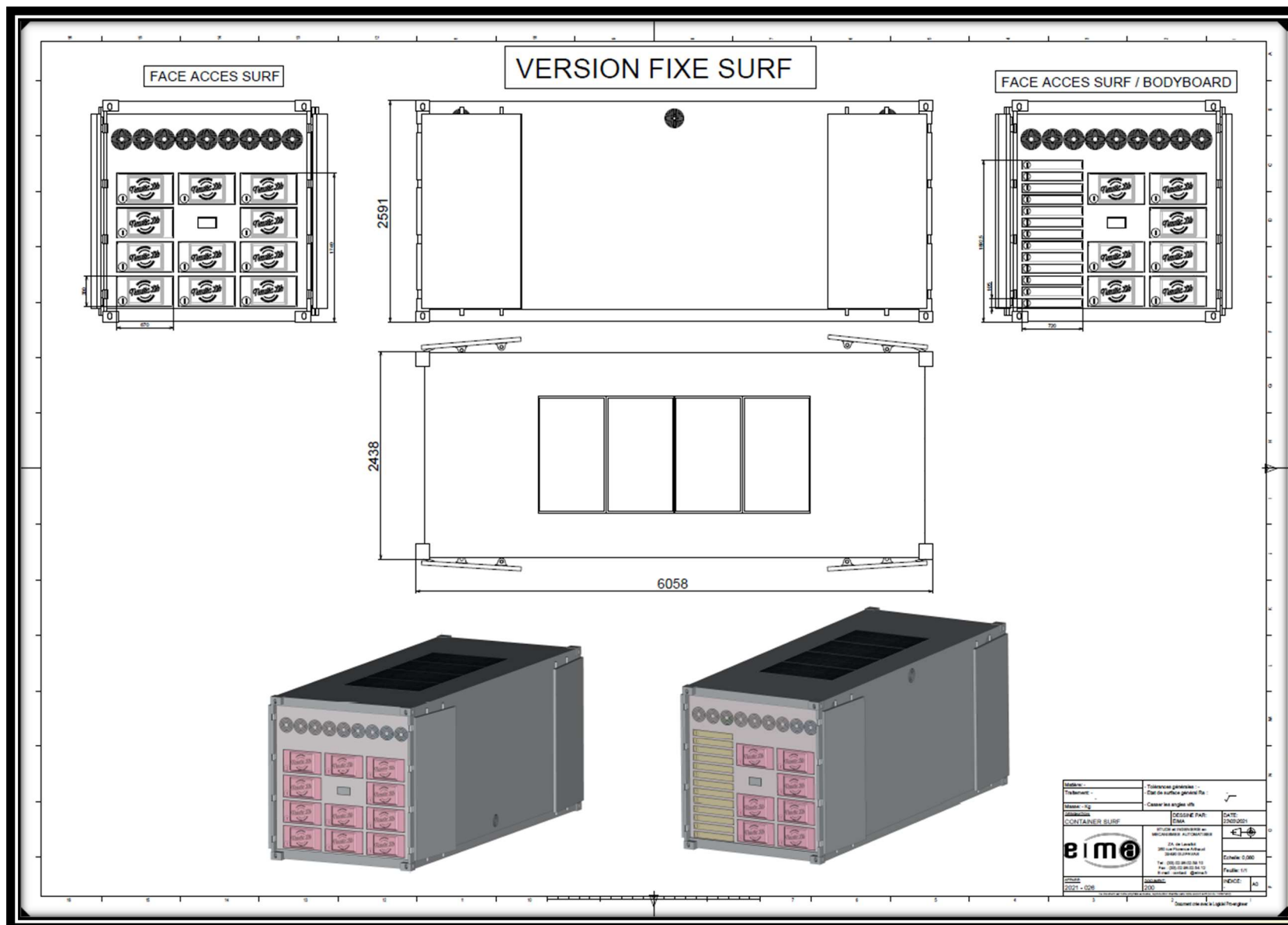
2. Electronic / electrical section

a. Energy management (Module No. 1)

1) Battery and energy management:

In order to optimise the energy expenditure of the trailer as much as possible, we propose developing a modular energy management module (Module No. 1), with 4 inputs for flexible 12V solar panels and 4 outputs to lithium iron phosphate 3.2V or lithium ion 3.7V battery packs.

As the peak power consumption of the whole system is very low (estimated at 15W at peak), a low voltage of 3.2V is not a problem.

Using such a low battery voltage allows the main components of the Nautic Lib to be powered by specialised regulators for the supply of battery-powered equipment over long periods. Their main characteristic is a very low leakage current (20nA), making it possible to significantly reduce energy losses during inactive phases.

The disadvantage of this type of regulator is that it is designed to regulate the voltage of a single lithium cell or two to three alkaline cells.
The input voltage range is then reduced (2.5-5.5V).

See microchip MCP1810:
https://ww1.microchip.com/downloads/enDeviceDoc/20005623B.pdf)

In addition to these advantages, lithium technology lets you divide the size by 2 or even 3 compared to lead-acid batteries for the same energy and has a much higher number of charge and discharge cycles and no memory effect.

2) Solar panels:

To recharge these batteries, we propose using flexible solar panels, which are slightly less efficient than rigid solar panels and have a shorter lifespan but are much lighter than conventional solar panels.
https://www.h2r-equipements.com/panneau-solaire-12v-pour-bateau/3881-energie-mobile-x-flex-220-w-panneau-solaire.html

These panels will be mounted flat, but to our knowledge there is no manufacturer's data on the performance of this type of panel in a flat position.
This is a function that will have to be tested in a real-life situation.

3) Energy performance

The complete electronic system should consume an average of 10W continuously during active phases with brief peaks of up to 15W during lock operation or communication via GSM.

If we want to make the system operational for 12 hours a day and we want to store the energy necessary to operate Nautic Lib for 20 days without the possibility of recharging via the solar panels (breakdown, maintenance, bad weather), we need to store 10Wh * 12 * 20 = 2400Wh.

This capacity is achieved by using 8 x 100Ah 3.2V lithium cells.

For recharging these battery packs, there is a tool that calculates the performance of a solar energy system taking into account the inclination of the panels, the geographical location, the consumption of the system, the capacity of the batteries and the peak power of the solar panels installed.

(https://re.jrc.ec.europa.eu/pvg_tools/fr/tools.html)

In Brest, with the proposed equipment and by applying a discharge limit of 30% of the batteries, the system keeps the batteries charged even in the most unfavourable months (December and January).

After an experimentation phase, we can consider reducing the peak power of the solar panels and the capacity of the batteries, with a view to reducing the cost of the equipment.

b. Nautic Lib controller (Module No. 2)

1) Microcontroller – Programming

The Nautic Lib controller is the brain of the system. Its main functions will be:

- Power supply via Module 1 and/or via AC/DC converter 12V/24V
- Communication with Modules 1 and 3
- Communication with the user application via the GSM module
- Communication with the RFID module
- Control of a TFT touch screen
- Decision-making according to orders received via GSM and/or touch screen (displaying information on the TFT screen, unlocking a locker, telemetry, etc.)

A communication protocol will have to be written to ensure that all the modules interact with each other. We propose using a CAN bus type transport layer for its simplicity and robustness and writing the software layer based on a protocol like NMEA2000. This will allow system upgrading if necessary and the use of NMEA2000 connectors, which are common in the nautical sector.

This module should be able to switch to standby and disconnect power to all other modules in case of inactivity in order to save energy.

In order for the standby output to be instantaneous on a human scale (less than 100ms), we propose basing this module on a 16- or 32-bit microcontroller such as Microchip PIC24EP512GP8XX or Cortex M0 from ST Micro electronics.

https://ww1.microchip.com/downloads/en/DeviceDoc/70616g.pdf
https://www.st.com/resource/en/datasheet/stm32f072vb.pdf

These microcontrollers can be programmed in C language and perform all necessary tasks without an operating system.
This allows for a system without software maintenance and with a much lower risk in terms of IT security.
This way of proceeding allows to be operational in less than 100ms after a wake-up by the GSM module for example.

2) GSM modem - Communication with the app

To communicate with the app, the system will need to be connected to a mobile network. Please note that, depending on the location of the device, it will be necessary to select the telecom operator to ensure good coverage.

This functionality could be supported by a module such as Telit GL865-QUAD V3: https://y1cj3stn5fbwhv73k0ipk1eg-wpengine.netdna-ssl.com/wp-content/uploads/2017/09/Telit_GL865-QUAD_V3_Datasheet.pdf

This module is ideal for a low-power connected object and includes several types of communication protocols in its embedded TCP/IP stack (TCP, UDP, FTP, SMTP, etc.).

This module can be placed in standby mode while remaining registered on the network (consumption of 9mA) and wake up the microcontroller of module 2 via its serial link.

3) RFID material tracking

In order to take stock of the equipment present in the system, we recommend using UHF RFID. The frequency band for France is around 865.6 - 867.6 MHz and allows a maximum apparent radiated power of 500mW. With the right antenna/TAG balance, this enables a range of several meters compatible with use on Nautic Lib.

This RFID technology also allows the use of TAGs in the form of very inexpensive RFID tags and simultaneous multi-TAG detection (EPCglobal Gen 2 protocol).

Some RFID readers allow the use of two antennas, but the RFID functionality will need to be tested in real-life conditions for development. It will be necessary to find the right compromise between the number of readers, the quantity of antennas, their position and the power (adjustable from 0 to +27dBm).

See ThingMagic Nano M6E:

https://www.components-store.fr/datasheets/10/M6E-NANO.pdf
https://www.components-store.fr/datasheets/23/M6E-NANO-DEVKIT.pdf

4) IHM – TFT screen

There are now industrial grade resistive touchscreens such as those from Riverdi or Nextion. These displays have an integrated controller, making it possible to reduce the load on the main microcontroller and/or select a more modestly powered and less energy-intensive controller.

This touch panel will be driven directly by the controller of module 2 and will display a reduced version of the app interface.

It will be possible to view the stock of equipment contained in Nautic Lib and to unlock the corresponding locker to pick up or return equipment.

Rental payment will have to be made exclusively through the mobile app.

Use of the touch panel will be combined with the alarm clock via the GSM module and/or a proximity sensor.

c. Lock controller (Module No. 3)

The role of the lock controller will be to actuate the unlocking of a door on the command of module 2.

It will be able to interpret the end-of-travel signal of the lock to ensure the position of the lock (closed locker).

The manufacturer offers a suitable card, but it is necessary to ensure that the manufacturer's card cuts off the power supply completely after locking.

Indeed, our measurements indicate a residual consumption of several milliamperes per lock, whereas a complete cut of the energy of the lock is possible without losing the power of closing.

This card can be controlled via an Ethernet or RS485 link.

If the residual power consumption is too high, we suggest integrating this functionality into module 2 by means of a MOSFET or an electronic switch.

Whatever the technical solution adopted, this module can be moved close to the lockers to facilitate wiring.

Synopsis
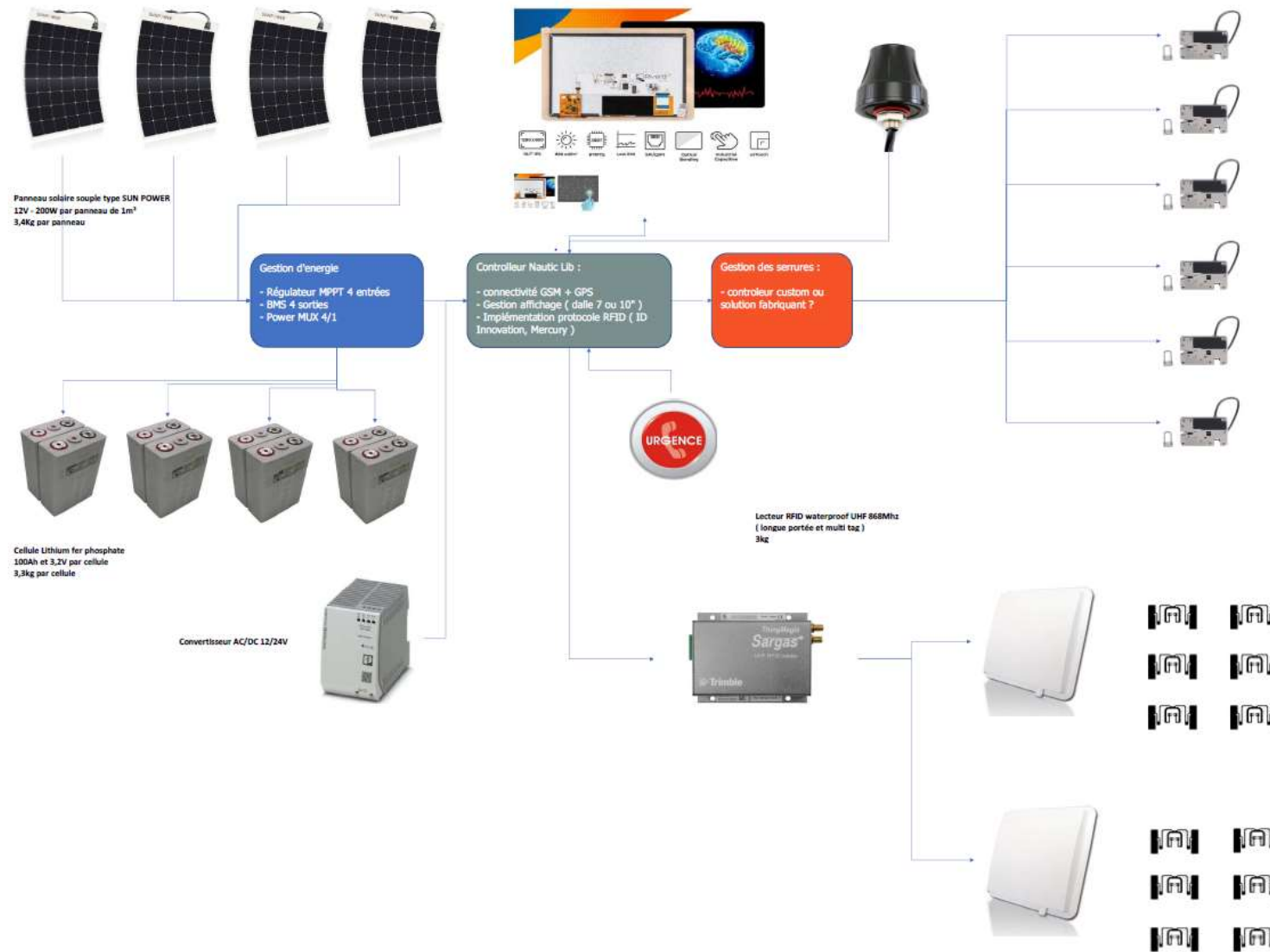
3. App / administration section

a. Description of the app

1) Consumer booking process only via a mobile device or the screen located on the Nautic Lib

<u>Booking:</u>
● 2 rental booking possibilities only when the consumer is in front of the Nautic Lib: the integrated screen on the Nautic Lib and the rental company's mobile.
● Bookings cannot be accessed in advance
● Downloading of the app via the Play Store or via QR code positioned on the Nautic Lib
● Creation of the consumer's account: name, first name, email address, telephone, postal address of residence.
● Verification of the authentication of the phone number
● View of the availability of the Nautic Lib in real time
● If no availability: proposal of the availability of the Nautic Lib near its current geographical location within a geographical radius to be defined
● Selection of the equipment and the size of the brace if necessary for renting the equipment
● Online payment
● Opening of the locker
● Confirmation of the condition of the equipment and the inventory of the items in the locker
● Booking of the locker for a minimum of one hour and then charged per additional minute; closing the locker triggers the counter.

<u>Conditions before booking validation:</u>
• I declare that I have read and accept the conditions of reservation and rental of the Nautic Lib equipment
• I have read the weather and safety conditions
• I declare in all sincerity the state of the equipment before and after use

Online payment and deposit:

● Enter bank details (credit card), or use various online payment methods such as PayPal, ApplePay and others.

● Deposit on the preauthorisation and confirmed payment allows the validation of the reservation and the opening of the locker. The amount of the deposit is set by the operator and can vary depending on the equipment. By default, the deposit is set at 40€ for a bodyboard and 100€ for a surfboard, paddleboard or kayak.

Confirmation of the booking:

● As soon as the online payment is confirmed and the deposit is taken by credit card or other online payment methods, the locker opens automatically.

● Notification to the consumer of the confirmation of his booking and summary of the service hired.

Opening of the locker:

Once all booking steps have been completed, the locker opens automatically.

2) Picking up equipment

● The consumer removes his equipment from the locker

● The consumer confirms the inventory and condition of the equipment in the locker before closing the locker after removing the equipment:
In locker 5, the equipment is as follows:
- 1 paddleboard
- 1 life jacket
- 1 paddle

I declare that the material is in good/poor condition:
- The equipment is not in very good condition and is usable
> The consumer describes the problem, which generates an alert to the operator
● The consumer drops off his personal belongings and picks up the equipment to benefit from the rental.

- The equipment is in poor condition and is not usable; the consumer describes the condition of the equipment, with a photo if need be. This action will send an alert to the operator and cancel the booking as the equipment is unusable. The equipment is returned to the locker, and the locker is locked.
- The equipment has been damaged (e.g. a scratch) and is still usable; the consumer describes the condition of the equipment and takes a photo. This action alerts the operator that the equipment had a scratch prior to use by the consumer.
● The consumer places his personal belongings in the locker and closes the locker, which locks.

3) Returning equipment

● Enter the opening code on your mobile or on the Nautic Lib screen
● The consumer confirms the condition of the equipment:
I declare and confirm that:
- The equipment is in good condition
- Whether or not the equipment has been damaged and, if so, what the damage or loss was.
- All personal belongings were taken back
- Inventory of returned equipment:
1.   1 paddleboard
2.   1 paddle
3.   1 life jacket size M/L

● Deposit of the equipment in the locker
The deposit will be returned after validation by the operator or automatically after X days, according to damage and/or loss.
Manual locker closure and automatic locker locking
The locker can only be locked if the equipment is inside by a detection system.
● Counter is stopped to confirm the rental time and lock the locker as soon as the locker is closed with the equipment detected inside. The consumer receives an invoice.

4) Equipment availability alert by SMS

A customer is unable to rent due to lack of equipment availability and wishes to be alerted as soon as equipment is returned:
- Downloading of the app
- Creation of an account
- Verification of the authenticity of the phone number
- Choice of equipment and confirmation of the "availability alert
- As soon as a locker detects the corresponding equipment: automatic alert on the first account created waiting for an "availability" alert for this equipment.

5) Payment: Automatic invoicing via email

Debit of the total amount of the rental + deposit according to the operator's choice: 3 options:
● Actually debit the preauthorised amount,
● Cancel the preauthorisation and thus release the preauthorised amount,
● Use part of the sum and release the balance.

Transaction fees vary depending on the payment system, total amount, currency and payment method.
Financial flows are centralised by the selected company and redistributed to the operator's bank account on average 3 days after the customer's payment.
Automatic invoicing by e-mail with the operator's logo, the operator's VAT, the operator's contact details and the operator's mandatory legal information for invoicing.

6) Operator back office

Management solution in SaaS mode
● Equipment management:
Equipment list: when using NFC tags, the operator scans the tags, which are stuck on the individual unit. Each piece of equipment is entered so it can be listed in the management system.
- Equipment reference
- Equipment title
- Status: on the water, in the container, under repair, in stock
- Locker number
- Booking information
- Locker open/close button
- Management of notifications and alerts: sms/emails from customers

● Management of rental booking: lets you track the steps of booking validation in case of problems with a consumer
- Name of customer
- Name of equipment rented
- Status: booking stage (in progress, paid, on the water, completed)
- Locker number
- Timer: rental duration
- Locker opening and closing

● Remote locking/unlocking of the container and opening and closing of the lockers either individually or in their entirety.
● Customer management:
- NAME / FIRST NAME
- Email

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- Phone
- Rental name
- Invoice

● Statistics:
- Dashboard of bookings by name, date, equipment: extraction of all data.
- Utilisation rate per day
- Dashboard for tracking equipment use and condition:
Ex: Hours reserved for paddleboard No. 4/ no repair
> objective: be able to measure equipment depreciation
- Dashboard of total turnover and by piece of equipment: by day, week, month, year

Features in detail

User features	Description
Login	User/customer login: email, name, phone, password,
OTP verification	Verification of phone number by sending an SMS
Profile creation	Creation of a customer profile: postal address + access to the history of rental booking and invoices
KYC	Customer bank verification procedure
GPS location of container	Geolocation of container
Geographic map (option)	Location on map
QR Code	The user scans the app on the container to find out the availability of the equipment and pay for the equipment rental
Choice of equipment	Choice of equipment
Availability	The user checks the availability and books the available material immediately
Rental booking	The user can book his equipment rental by hour, day according to immediate availability - Impossible to book in advance

Payment	The user pays online via the app when he books the equipment rental
Confirmation	The user receives a booking confirmation by email and SMS
Cancellation	The user may cancel the booking due to defective equipment
Return	The user returns his equipment and as soon as it is detected by the container, the deposit is returned within X days (to be defined)
Notification	The user receives notifications during the return of the equipment to validate or not the good condition of the returned equipment.
Alerts	The user can programme an alert for information on the availability of equipment Equipment in poor condition
Equipment	The user has access to the online guide (FAQ)/online chat
Review (optional)	The user receives a notification to submit a review (satisfaction survey with stars)

Operator administration	Description
Pricing	The operator can set prices
Reductions	The operator can set reductions
Chat support	The operator can interact with the online chat / customers
Review (optional)	The operator can moderate reviews
Bookings	The operator can manage rental bookings
Notifications	The operator can manage notifications
Equipment management	The operator can add, modify and manage equipment
Monitoring of equipment rented	Monitoring of rented equipment and tracking of unreturned equipment

Dashboard	Description
Equipment	Equipment availability
Emergencies/alerts	Alerts: "Equipment in poor condition"/"Problem w/ container"/"Bad weather conditions "
Equipment rental	Monitoring of equipment rental bookings by time, day, week, selected periods and extraction
Users	Visibility of customer lists, contact details, equipment rented
Statistics	Analysis of financial data, rental booking rate per unit of equipment, per given period. Extraction.

Online payment solutions

	Stripe	MangoPay	LemonWay	PlugPlay
Details of European card fees* (additional fees with payments outside Europe)				
Fee per transaction %	1.40%	1.80%	1.20%	1.20%
Fixed fee per transaction	0.25 €	0.18 €	0.18 €	0.25 €
Subscription	0.00 €	0.00 €	??	10 €
Preauthorisation	yes	yes	??	no
Marketplace	yes	yes	??	no
Verification of a natural person (KYC)	free	free	??	no
Verification of a legal entity (KYB)	3.00 €	2.50 €	??	no
Additional cost of API integration	0.00 €	3 500.00 €	3 500.00 €	3 500.00 €

ADDITIONAL INFORMATION:

Special features of the Nautic Lib screen:

The app will be the same, and the flow will be different at the start on the home page and at the payment stage, because PayPal, Google Pay and Apple Pay will not be possible via the screen.

It should also be noted that when booking a rental via the screen, the customer will have to go back and forth between the screen and the locker to take inventory after opening the locker + confirm the state of the equipment.

Constraints:

- The app must remain active throughout the booking process: check the energy consumption.
- The booking process will take longer
- Someone wishing to return equipment will have to wait until the screen is available to have access and return the equipment.
- Before starting a booking: advise the customer to bring a phone to validate the verification of their telephone number.
- It is not possible to take photos of damaged equipment.
- Question: In the case of a simultaneous booking, who has priority in the booking process: the person making the booking via mobile phone or on the screen?

b. Presentation of the app

Votre Nautic Lib

Le loueur approche son téléphone du QRCODE dessiné sur le Nautic Lib et obtient la disponibilité du matériel de ce Nautic Lib .

ou

Autre possibilité

Utilise l'écran positionné sur le Nautic Lib pour faire sa recherche de disponibilité de matériel :

Liste du matériel du Nautic lib

Le loueur a accès à la liste du matériel du Nautic Lib à côté duquel il est situé.

Le disponibilité est précisée en temps réel.

Liste des Nautic Lib dans un rayon de X Kilomètres autour de celui-ci

Dans le cas de non disponibilité sur le Nautic Lib, l'application propose les Nautic Lib les plus proches proposant de la disponibilité.

Informations sur le produit sélectionné par le loueur

Le loueur loue en exemple un paddle

Puis clique sur « Conseil pour votre pratique »

Afin de lire des informations liées à la pratique de cet équipement.

Réservation et acceptation des conditions

Récapitulatif de la liste de l'équipement pour le matériel sélectionné.

Le loueur doit cocher les 3 conditions afin de poursuivre sa réservation de location de matériel.
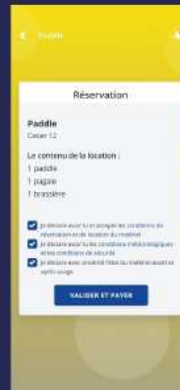
Paiement

Possibilité de payer par tout mode de paiement via l'application, et

Par carte bancaire via l'écran du Nautic Lib

Affichage du code pour l'ouverture du casier

Le code est automatiquement généré en fonction de la date de naissance du loueur afin de faciliter la mémorisation du code.

Saisie du code pour ouvrir le casier de la location validée

Le loueur saisie son code pour ouvrir son casier.

Constat de l'état du matériel, inventaire et fermeture du casier

Le loueur confirme l'état du matériel, confirme la présence des différents équipements dans le casier et sélectionne la taille de brassière puis active la fermeture du casier.

Le casier se verrouille automatiquement.

En cas de matériel défectueux et utilisable pour la pratique

Le Loueur a 2 possibilités :

1- Le matériel est utilisable malgré une dégradation constatée :

Le loueur déclare le matériel défectueux, donne un descriptif et peut ajouter des photos

> l'exploitant reçoit la notification d'un matériel défectueux et utilisable.
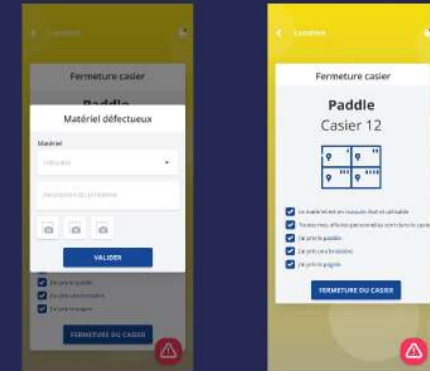
En cas de matériel défectueux et inutilisable

2- Le matériel est inutilisable au vu de la dégradation constatée :

Le loueur déclare le matériel défectueux, donne un descriptif et peut ajouter des photos.

> l'exploitant reçoit la notification d'un matériel défectueux et inutilisable ce qui annule automatiquement la réservation de location.

Le loueur remet le matériel dans le casier et peut refaire une réservation.
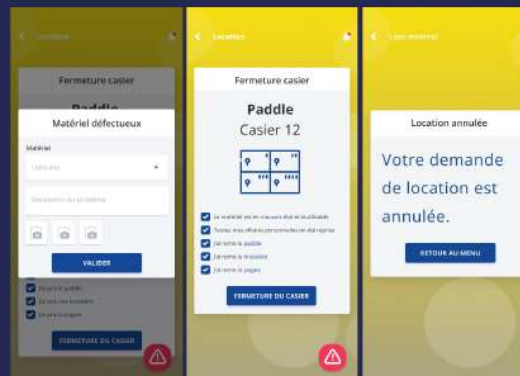
Déclenchement du chronomètre à la fermeture du casier

Le casier refermé, le chronomètre se déclenche automatiquement pour calculer le temps de location jusqu'à l'ouverture du casier.

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Retour du matériel

Le loueur saisie son code d'ouverture de casier à son retour, soit sur le téléphone soit sur l'écran situé sur le container.
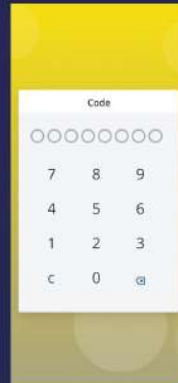
Déclaration de l'état du matériel

Le loueur déclare retourner le matériel en bon état ou déclare une dégradation ou perte et précise les informations par un descriptif et photos.
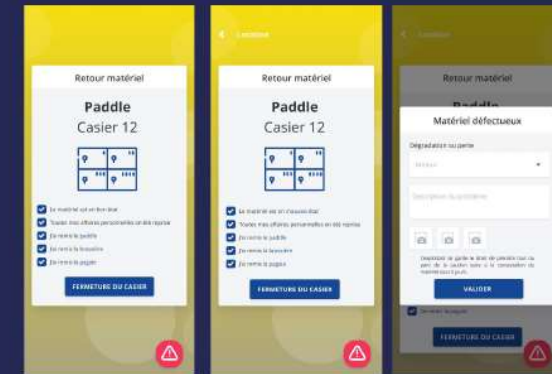
Confirmation de l'arrêt du temps de location

Durée : 01:12:00

Prix : 52,05€

Caution :

➢ restituée sous X jours (si matériel en bon état)

➢ Restituée sous X jours si besoin de constatation exploitant.

Ecran de l'application exploitant

L'exploitant peut ouvrir et fermer les casiers individuellement

Et

Verrouiller et déverrouiller le container (matin et soir par exemple)

Les icones donnent l'information du statut du matériel, soit sur l'eau soit dans le container.

Tableau de bord

Données chiffrées (CA) de l'activité du Nautic Lib de l'exploitant.

Représentation graphique des données chiffrées selon les dates, le matériel, taux de remplissage.
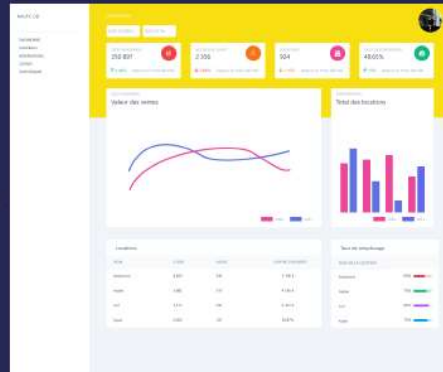
Matériel

Suivi de l'état du matériel :

- Référence du matériel
- Intitulé du matériel
- Statut : sur l'eau, dans le container, en réparation, en stock.
- Numéro de casier
- Information sur la réservation
- Bouton d'ouverture et fermeture du casier

Tableau de suivi des réservations :

- Nom du client
- Nom du matériel loué
- Statut : étape de la réservation (en cours, paiement, sur l'eau, terminé)
- Numéro du casier
- Chronomètre : durée de la location
- Ouverture et fermeture du casier

Liste des clients du Nautic lib

- NOM / PRENOM
- Mail
- Téléphone
- Nombre de location
- Facture

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III. FINANCIAL ANALYSIS - PROJECTED OPERATING COSTS

We have broken down this analysis into two parts:

> Part 1 – Analysis of installation development costs
>   o Mechanical study budget *
>   o Electrical / electronic study budget
>   o Study and app implementation budget

* As far as mechanical development is concerned, we have calculated a common core for each version (fixed or mobile), with the application of a surplus value for the addition of a second configuration (basic or surfing).

These are non-recurring costs, the financing of which can be envisaged in two ways at the time of marketing:

> Solution 1: assumption of these costs independently.
> Solution 2: integration of these costs over the first 20 projects (i.e. estimated cost below + pro rata participation in development).

> Part 2 – Analysis of implementation costs
>   o 2-1: Estimated budget for traditional fixed configuration
>   o 2-2: Estimated budget for surfing fixed configuration
>   o 2-3: Estimated budget for implementing traditional mobile configuration
>   o 2-4: Estimated budget for implement surfing mobile configuration

<u>**NB: in view of the major price variations at the moment (e.g. steel +30% since January) and supply concerns, the prices shown cannot be valid for more than one month.**</u>

1. Part 1 – Analysis of system development costs

Item	Budget excl. VAT
Piloting of the project	5 000€ excl. VAT
Mechanical study	
Mechanical design / Production of the definition file (production drawings, mechanical parts lists, etc.)	
Common core fixed configuration (container)	7 800€
➢ added value basic fixed configuration variant	4 500€
➢ added value surfing fixed configuration variant	4 500€
Common core mobile configuration (trailer)	10 200€
➢ added value basic mobile configuration variant	4 500€
➢ added value surfing mobile configuration variant	4 500€
Specific developments and tooling related to roto-moulded doors	
➢ study and construction of a moulded door for kayaks / paddleboards	9 000€
➢ construction of a prototype door for kayaks / paddleboards for design validation	250€
➢ study and construction of a moulded door for surfboards	8 000€
➢ construction of a prototype door for surfboards for design validation	210€
➢ study and construction of a moulded door for bodyboards	5 900€
➢ construction of a prototype door for bodyboards for design validation	150€
__Total mechanical (w/ all variants)__	64 510€ excl. VAT

Electrical / electronic study	
Study and development of Module 1 "Energy management"	4 500€
Study and development of Module 2 "Nautic Lib controller"	25 000€
Study and development of Module 3 "Lock management"	1 875€
Integration of prototype	2 500€
__Total electrical / electronic__	33 875€ excl. VAT
Option of developing card implementation for managing a second screen	4 900€ excl. VAT

Study of Nautic Lib app	
Project study, pre-production mock-ups for mobile and tabletop versions of the Nautic Lib app	5 200€
Drafting of a protocol for connecting the app to the system	2 100€
User interface design (for mobile and HMI screens)	3 575€
Design creation, administration and dashboard features	1 950€
Back-end coding and integration with payment APIs * Depending on the choice of the payment centralisation company, an additional development cost may be charged.	22 750€
Documentation: integration of an online guide	1 950€
Testing:	6 250€

- App functionality test: booking process, cancellation, declaration of the state of the equipment, sending of alerts, automatic invoices and all other features - Test of the data feedback in the dashboard: turnover, rental statistics, etc. - Login test for locking/unlocking and opening/closing lockers	
Total app development	**43 775€ excl. VAT**

Total development budget (w/ all options)	**152 060€ excl. VAT**

2. Part 2 – Analysis of implementation costs

NB: production budgets are based on the production of a minimum quantity of 10 installations (all variants included)

Budget for implementation of traditional fixed configuration	
Mechanical implementation	

Supply and adaptation of a double door container
- Supply of 20ft dry "first-trip" double-door container
- Application of a smooth resin coating to the floor
- Installation of two floor drains with stainless steel grid
- Installation of door blocks in open position on original door
- Making and fitting of ventilation grilles (4x)
- Painting
  • high pressure stripping, washing
  • - 80 micron paint coat of your choice in standard RAL
	13 585€ exc. VAT

Interior fittings (supporting structure / partition grid / intermediate floors)	24 290€
Locker doors (21) and hinge devices	4 361€
Electronic locks	1 176€
Mechanical assembly / integration	2 200€
Delivery charges	To be defined according to the delivery site
Sub-total	**45 612€ excl. VAT**
Electrical/electronic implementation stand-alone variant	
Specific electronic implementation (module 1 / 2 / 3 card)	2 380€
Industrial supplies (solar panels / batteries / GPRS antenna / AC/DC converter / 1 TFT screen / RFID management)	5 370€
Wiring / integration / app implementation	1 950€
Sub-total	**9 700€ excl. VAT**
Electrical/electronic 230V mains variant	
Specific electronic implementation (module 2 / 3 card)	1 430€
Industrial supplies (GPRS antenna / AC/DC converter / 1 TFT screen / RFID management)	2 250€
Wiring / integration / app implementation	1 300€
Sub-total	**4 980€ excl. VAT**
Total budget implementation of stand-alone variant	55 312€ excl. VAT + delivery
Total budget implementation of 230V mains variant	50 592€ excl. VAT + delivery
Total budget implementation of low-cost version (lockers w/ padlocks)	45 612€ excl. VAT + delivery

Options	
Added value for adding a second display (including the addition of two customised slave cards)	1 260€ excl. VAT

2.2 Budget for implementation of surfing fixed configuration	
Mechanical implementation	

Supply and adaptation of a double-door container
  - Supply of 20ft dry "first-trip" double-door container
  - Application of a smooth resin coating to the floor
  - Installation of two floor drains with stainless steel grid
  - Installation of door blocks in open position on original door
  - Making and fitting of ventilation grilles (4x)
  - Painting
    • High pressure stripping, washing
    • 80 micron paint coat of your choice in standard RAL
	13 585€ excl. VAT

Interior fittings (supporting structure / partition grid / intermediate floors)	26 215€
Locker doors (31) and hinge devices	6 741€
Electronic locks	1 736€
Mechanical assembly / integration	2 800€
Delivery charges	To be defined according to the delivery site
Sub-total	51 077€ excl. VAT
Electrical/electronic implementation stand-alone variant	
Specific electronic implementation (module 1 / 2 / 3 card)	2 380€
Industrial supplies (solar panels / batteries / GPRS antenna / AC/DC converter / 1 TFT screen / RFID management)	5 370€
Wiring / integration / app implementation	1 950€
Sub-total	9 700€ excl. VAT
Electrical/electronic 230V mains variant	
Specific electronic implementation (module 2 / 3 card)	1 430€
Industrial supplies (GPRS antenna / AC/DC converter / 1 TFT screen / RFID management)	2 250€
Wiring / integration / app implementation	1 300€
Sub-total	4 980€ excl. VAT
Total budget implementation of stand-alone variant	60 777€ excl. VAT + delivery
Total budget implementation of 230V mains variant	56 057€ excl. VAT + delivery
Total budget implementation of low-cost version (lockers w/ padlocks)	51 077€ excl. VAT + delivery

Options	
Added value for adding a second display (including the addition of two customised slave cards)	1 260€ excl. VAT

2.3 Budget for implementation of traditional mobile configuration	
Mechanical implementation	
Supply of a trailer base with an approved GVW of 750kg	2 100€ excl. VAT
Construction of trailer block / interior fittings (supporting structure / foamlite separation / intermediate floors)	16 940€
Locker doors (10) and hinge devices	2 086€
Electronic locks	560€
Mechanical assembly / integration	1 750€
Delivery charges	To be defined according to the delivery site
Sub-total	23 436€ excl. VAT
Electrical/electronic implementation stand-alone variant	
Specific electronic implementation (module 1 / 2 / 3 card)	2 380€
Industrial supplies (solar panels / batteries / GPRS antenna / AC/DC converter / 1 TFT screen / RFID management)	5 370€
Wiring / integration / app implementation	1 950€
Sub-total	9 700€ excl. VAT
Electrical/electronic 230V mains variant	
Specific electronic implementation (module 2 / 3 card)	1 430€
Industrial supplies (GPRS antenna / AC/DC converter / 1 TFT screen / RFID management)	2 250€
Wiring / integration / app implementation	1 300€
Sub-total	4 980€ excl. VAT
Total budget implementation of stand-alone variant	33 136€ excl. VAT + delivery
Total budget implementation of 230V mains variant	28 416€ excl. VAT + delivery

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2.4 Budget implementation of surfing mobile configuration	
Mechanical implementation	
Supply of an approved trailer base with a maximum weight of 750kg	2 100€ excl. VAT
Construction of trailer block / interior fittings (supporting structure / foamlite separation / intermediate floors)	19 460€
Locker doors (17) and hinge devices	3 654€
Electronic locks	952€
Mechanical assembly / integration	2 200€
Delivery charges	To be defined according to the delivery site
Sub-total	28 366€ excl. VAT
Electrical/electronic implementation stand-alone variant	
Specific electronic implementation (module 1 / 2 / 3 card)	2 380€
Industrial supplies (solar panels / batteries / GPRS antenna / AC/DC converter / 1 TFT screen / RFID management)	5 370€
Wiring / integration / app implementation	1 950€
Sub-total	9 700€ excl. VAT
Electrical/electronic 230V mains variant	
Specific electronic implementation (module 2 / 3 card)	1 430€
Industrial supplies (GPRS antenna / AC/DC converter / 1 TFT screen / RFID management)	2 250€
Wiring / integration / app implementation	1 300€
Sub-total	4 980€ excl. VAT
Total budget implementation of stand-alone variant	38 066€ excl. VAT + delivery
Total budget implementation of 230V mains variant	33 346€ excl. VAT + delivery

Annual app fee per operator for one installation	
Fee based on a minimum deployment of 10 installation	
Annual OVH hosting fee	360€
App maintenance and upgrades	375€
Sharing of the costs of distributing the app on Apple Store / Play Store	20€
Data storage and protection costs	60€
Sub-total	815€ yearly excl. VAT
Option: Operator training in the use of the app (up to 15 trainees) (OPCO coverage)	1 600€ excl. VAT

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