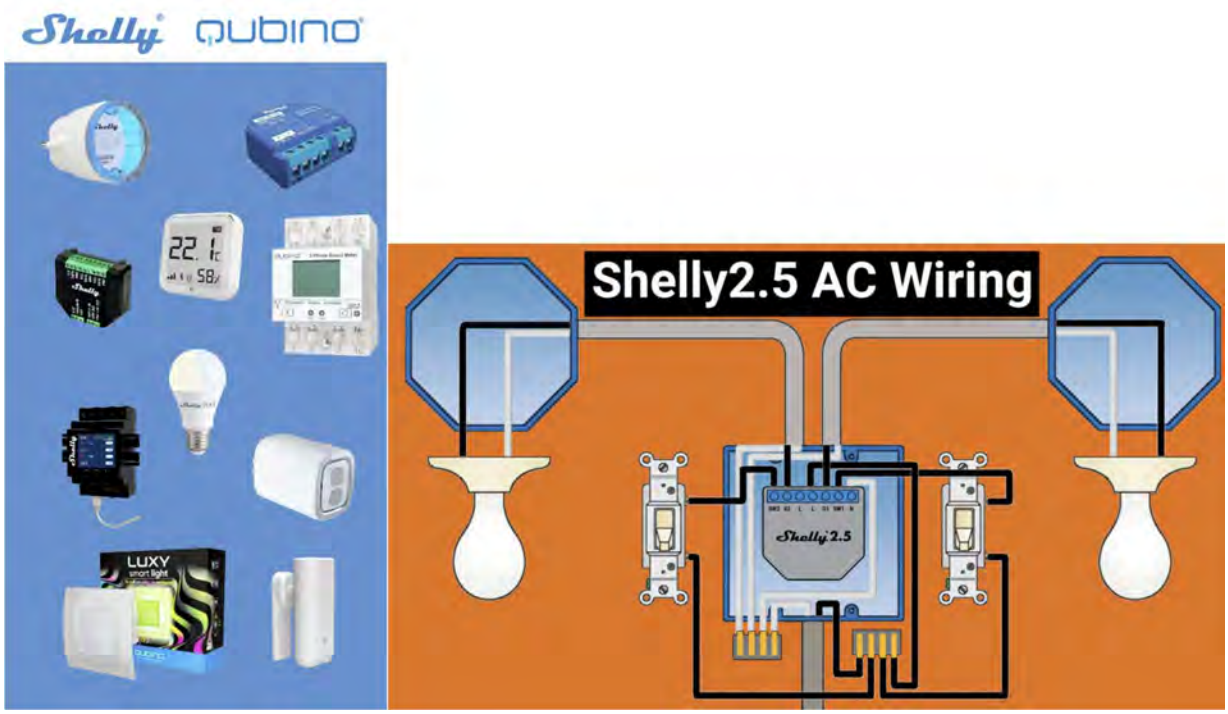
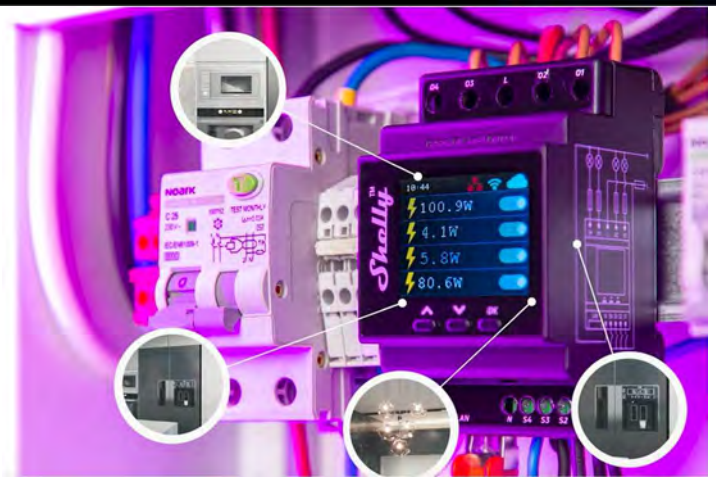
Shelly Group PLC (A4L):



https://www.youtube.com/watch?v=xbiQFFJl9A4

https://www.youtube.com/watch?v=2kRdCsIrCzo


Livingroom
23.5°C
Kitchen
23.9°C
Bedroom
20°C
Kids
22.9°C
Playground
Cabinet
21.3°C
Fitness
office
HOME
POOL
SAUNA
Total Current Consumption
Consumption By Appliance Type
Rooms current consumption
Total Consumption - Last 24 hours
56.65 kWh
11.29 BGN
Livingroom - Last 24 hours
103.72 Wh
0.03 BGN
Kitchen - Last 24 hours
70.41 Wh
0.02 BGN
Bedroom - Last 24 hours
78.64 Wh
0.02 BGN
8.79 W
20.51 W

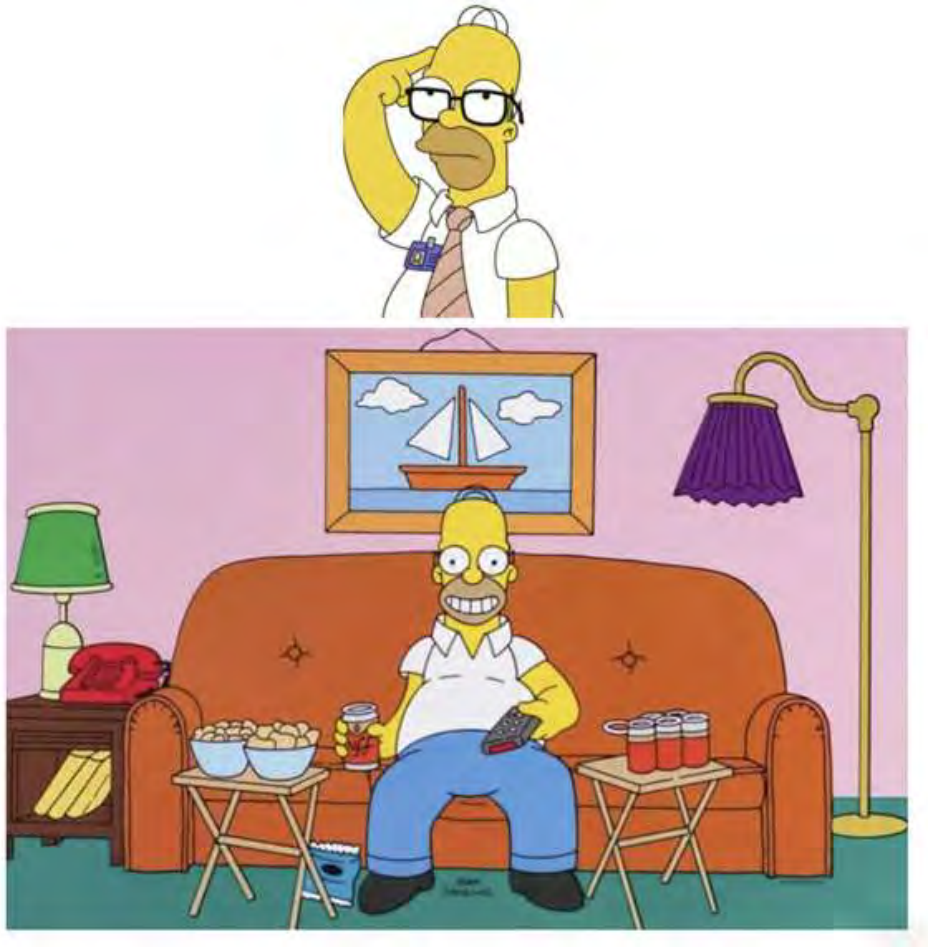

100.9W
4.1W
5.8W
80.6W

“As we go to a more autonomous future, the importance of entertainment and productivity [in cars] will become greater and greater. To the degree that if you’re just sitting in your car and the car is fully autonomous and driving somewhere, the car is essentially your chauffeur.”

“Tesla is a vehicle for creating and producing many useful products.”

“If it’s a new industry or untapped market… the standard is lower for your product or service. But if you’re entering anything where there is an existing marketplace against large, entrenched competitors, then your product or service needs to be much better than theirs. It can’t be a little bit better, because then you put yourself in the shoes of the consumer… you’re always going to buy the trusted brand unless there’s a big difference.”

--Elon Musk



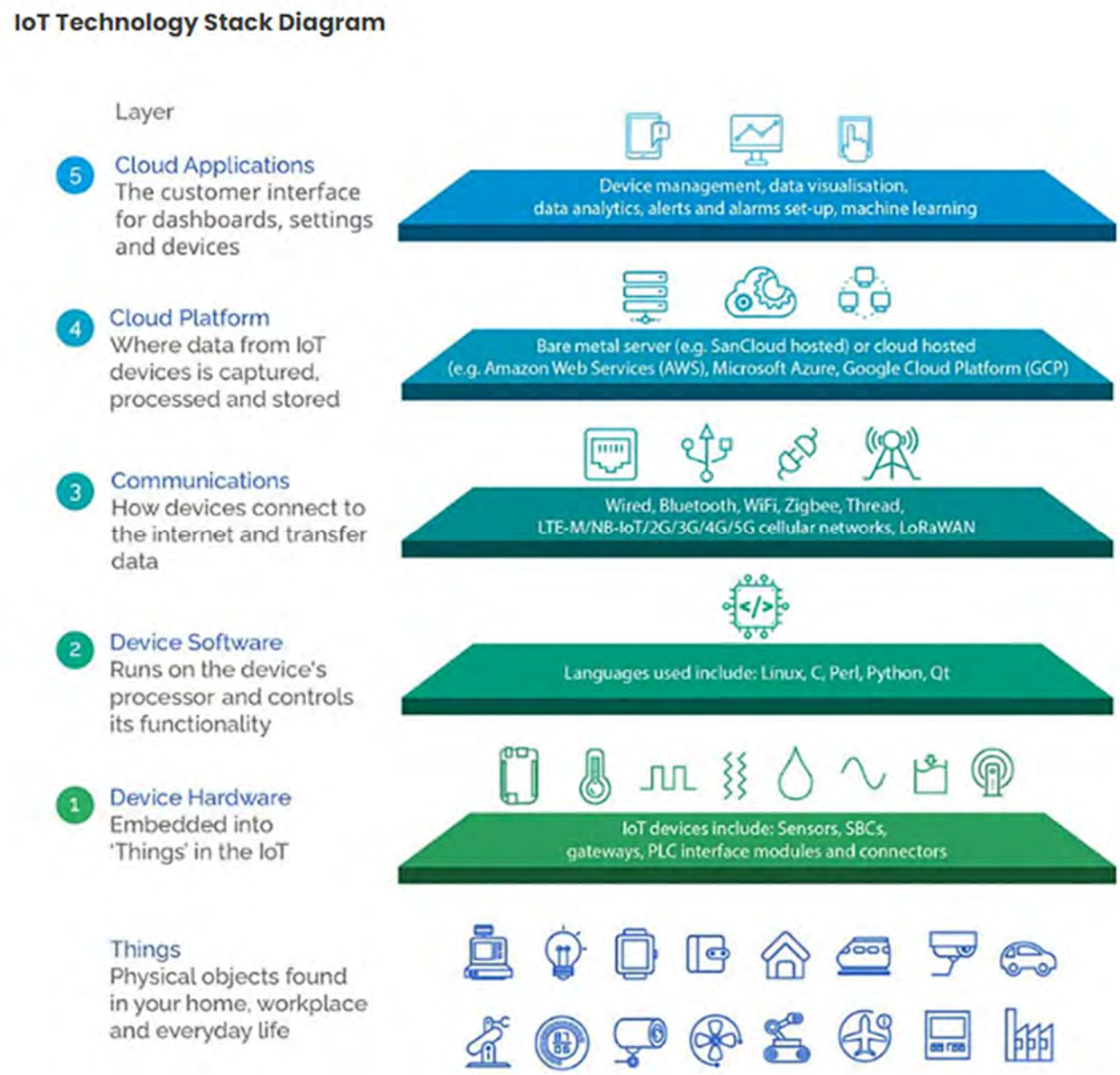
"Being a software company, because Allterco [predecessor to Shelly Group PLC], started in 2000 as a purely software company, having experience in processing large databases and a large amount of traffic in the cloud, the company has a unique experience that it transfers to Shelly. It is one of the big advantages - that the devices are multifunctional and have many more options than the others".

--Shelly CEO, Dimitar Dimitrov

Contents

Internet of Things (IOT) Tech Stack

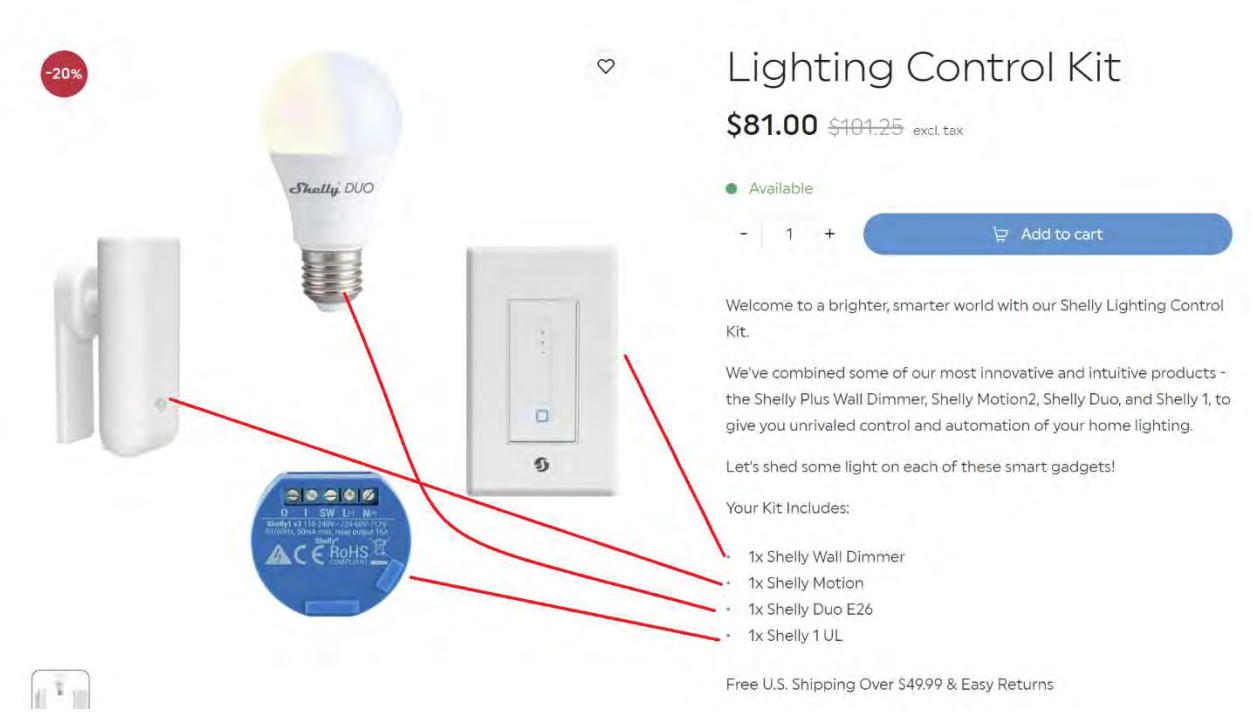
Shelly Group Plc is a Bulgarian IOT company that trades in both Germany and Bulgaria. Shelly creates products that automate homes, buildings, and other facilities. In this paper, I will explore how Shelly fits into the market for devices that control the flow of electricity to control the motion of physical things that do useful stuff for humans. The Internet of Things is a term for the network of physical objects (windows, doors, shades, robots, etc.) that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

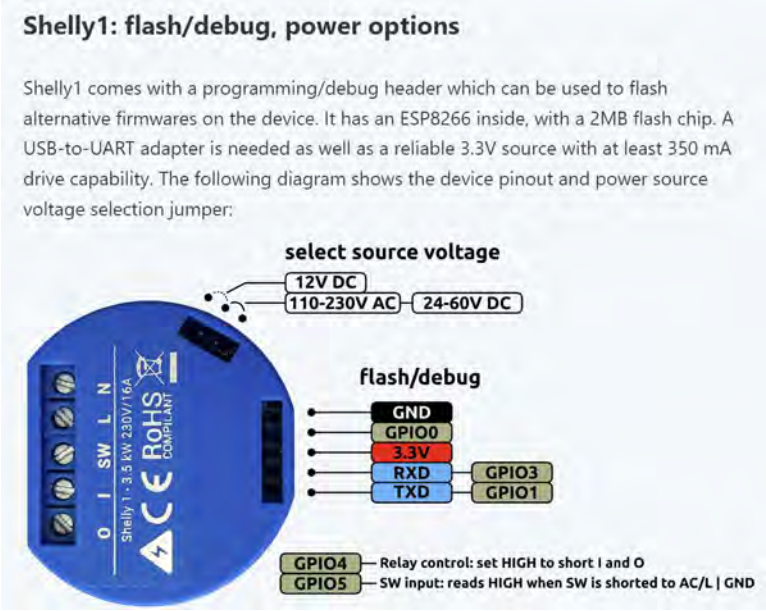


After understanding the various layers of the IoT tech stack, we will be able to better understand why Shelly is growing so fast, why Shelly is likely to continue to grow fast, and why Shelly's TAM is quite large.

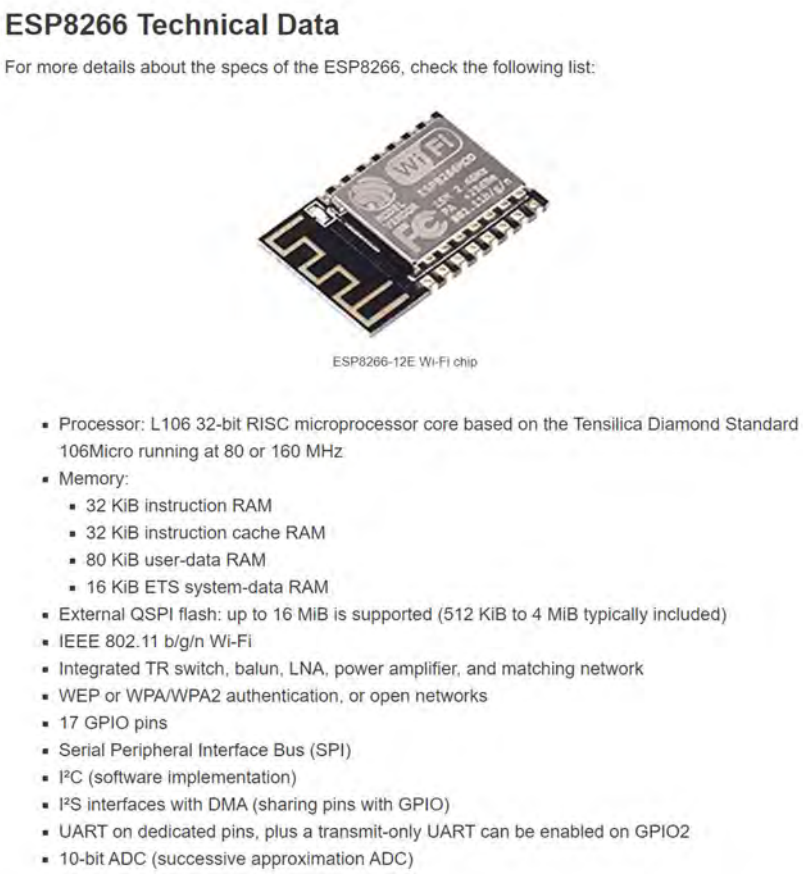
Device Hardware & Software Layers

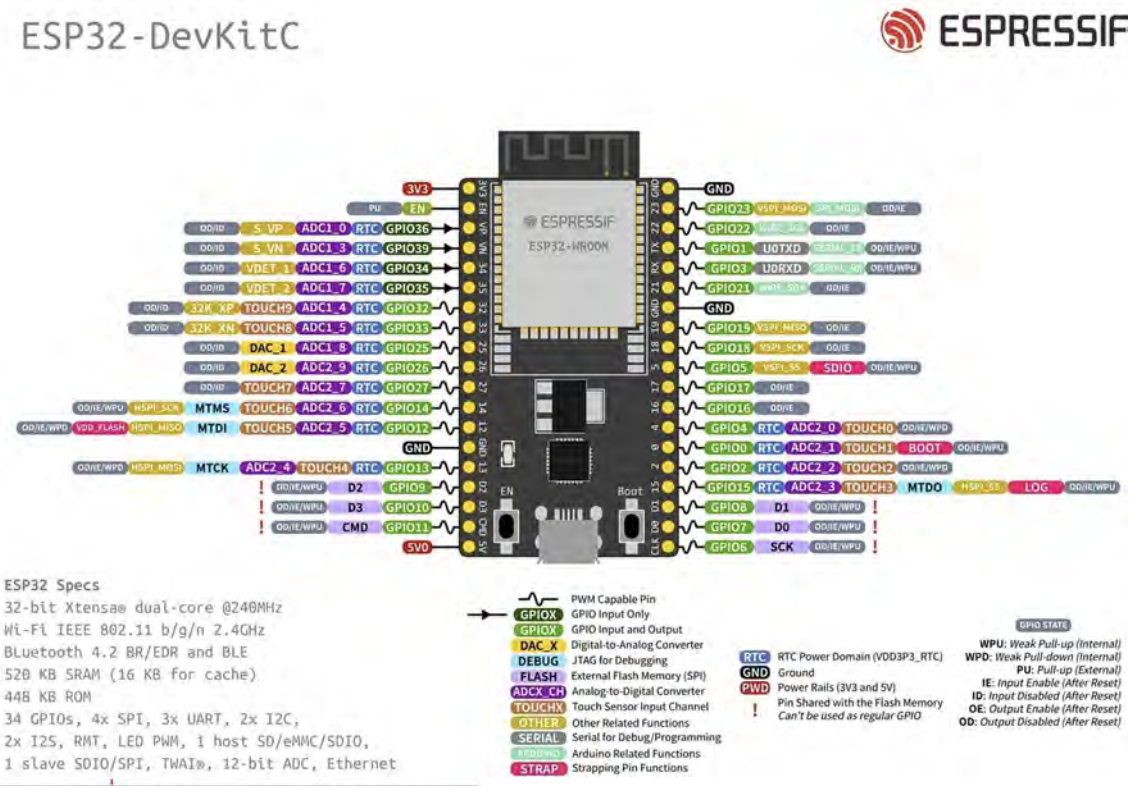
At the bottom of the tech stack is the device hardware. The hardware layer does not include things that ultimately do the stuff humans want such as lightbulbs providing illumination and windows controlling the flow of air—that's the things layer. But rather this layer includes microcontrollers, sensors, actuators (electrical and mechanical devices that control physical movements), and I/O components (such as buttons, displays, speakers, etc.) that are in turn used to control the useful things such as lightbulbs and windows. Below of things that Shelly connects to the internet.





The things have a microcontroller inside which is a small computer on a compact integrated circuit that governs specific operations. The core elements of a microcontroller are the central processing unit (CPU), memory, and I/O peripherals. Currently Shelly uses Espressif microcontrollers. Below are pictures of Espressif chips/microcontrollers.

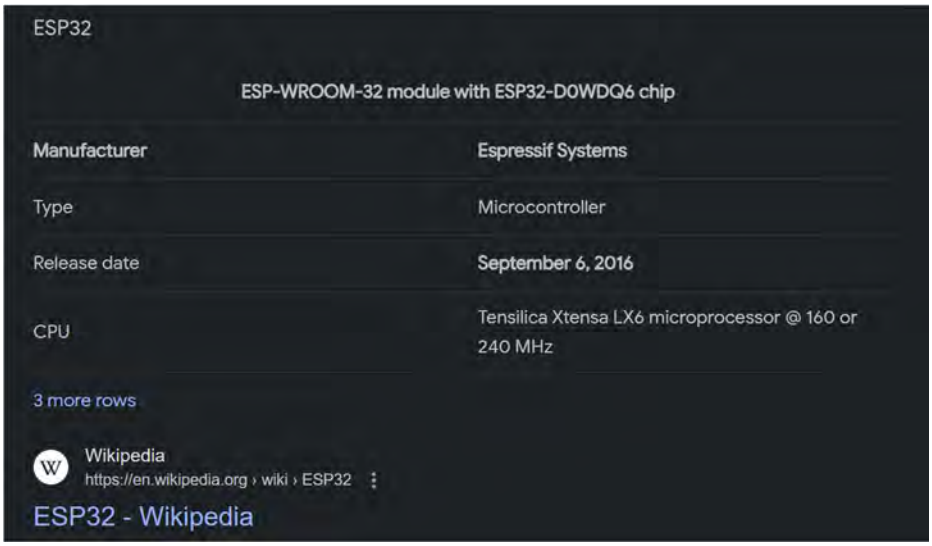




product name	ESP32 WIFI Bluetooth Development Board
Processing chip	ESP32- DOWDQ6 Built-in two Xtensa@ 32-bit LX6 MCUs ROM: 448KB, SRAM: 520KB Clock frequency: 80MHZ~240MHZ Integrated 4MB SPIFlash
Support output	Capacitive touch sensor, Hall sensor, Low noise sensor amplifier, SD card interface, Ethernet interface, high-speed SDIO, SPI, UART, 12C Motor control, ultrasonic steering gear, etc.
Download interface	Micro USB interface / automatic download without manual switching
Support programming	Support C/C++, compatible with Arduino IDE MicroPython, Mixly (Mi Siqi) graphical
Power supply	USB 5V or external 5V /500mA
size	49mmX 28.7mm

The device's software runs on the processor and controls functionality. The software consists of the operating system and application software. The OS manages the resources of the computer. It is the interface between the application software and the different parts of the computer. The OS allocates memory, CPU time, and other hardware resources; it is responsible for starting, stopping and managing programs; it manages memory; it provides a secure environment for the applications; it keeps track of time and resources by user or job; it organizes and manages files; it manages I/O devices and provides a user interface; it monitors performance; and the OS provides for backing up and recovering data.

The ESP32 was released in 2016. Dates are important as many new technologies were being released during the mid-2010s that allowed Shelly a window to establish its position in the market.



Espressif Announces the Release of ESP32-S2

Shanghai, China
Sep 3, 2019

ESP32-S2 is a highly integrated, low-power, 2.4 GHz Wi-Fi Microcontroller supporting Wi-Fi HT40 and having 43 GPIOs. Based on an Xtensa® single-core 32-bit LX7 processor, ESP32-S2 can be clocked at up to 240 MHz.

ESP32-S2 is a truly secure, highly integrated, low-power, 2.4 GHz Wi-Fi Microcontroller SoC supporting Wi-Fi HT40 and having 43 GPIOs. Based on an Xtensa® single-core 32-bit LX7 processor, it can be clocked at up to 240 MHz.

With state-of-the-art power management and RF performance, IO capabilities and security features, ESP32-S2 is an ideal choice for a wide variety of IoT or connectivity-based applications, including smart home and wearables. With an integrated 240 MHz Xtensa® core, ESP32-S2 is sufficient for building the most demanding connected devices without requiring external MCUs.

https://www.espressif.com/en/news/espressif-announces-%E2%80%A8esp32-s2-secure-wi-fi-mcu

Announcing ESP32-C6: a Wi-Fi 6 + Bluetooth 5 (LE) SoC

Shanghai, China
Apr 9, 2021

ESP32-C6 is Espressif's first low-power and cost-effective Wi-Fi 6 + Bluetooth 5 (LE) SoC, with a 32-bit RISC-V core, for securely connected devices. ESP32-C6 is already certified by the Wi-Fi Alliance.

On April 9th, 2021, Espressif Systems (Shanghai) Co., Ltd. (SSE: 688018.SH) announced the upcoming release of ESP32-C6, a new Wi-Fi 6 + Bluetooth 5 (LE) SoC. After successfully launching ESP32-C3, with Wi-Fi 4 and Bluetooth 5 (LE) capabilities, towards the end of 2020, we are proud to be taking our SoC offering to the next level with ESP32-C6, which adds Wi-Fi 6 capabilities to our product portfolio. **ESP32-C6 has already been** certified by the Wi-Fi Alliance.

ESP32-C6 is unique in that it packs 2.4 GHz Wi-Fi 6 (802.11ax) radio that also supports the 802.11b/g/n standard for backward compatibility. This Wi-Fi 6 support is optimized for IoT devices, and the SoC supports a 20MHz bandwidth for 802.11ax mode, and a 20/40MHz bandwidth for 802.11b/g/n mode. The 802.11ax mode supports a station interface, and it offers greater transmission efficiency and lower power consumption. Additionally, Bluetooth 5 (LE) radio supports long-range operation through advertisement extension and coded PHY. It also supports 2 Mbps of high throughput PHY.

In terms of CPU, memory and security features, ESP32-C6 is similar to ESP32-C3. ESP32-C6 has a single-core, 32-bit RISC-V microcontroller that can be clocked up to 160 MHz. It has a 384KB ROM, a 400KB SRAM, and works with external flash. It comes with 22 programmable GPIOs, with support for ADC, SPI, UART, I2C, I2S, RMT, TWAI and PWM.

SoC means system on a chip.

https://www.espressif.com/en/news/ESP32_C6

Espressif's Wi-Fi 6 SoC, ESP32-C6, Officially Available

Shanghai, China
Jan 6, 2023

Espressif's ESP32-C6 is now available on the market. ESP-IDF v5.1, currently in development, will include initial support for ESP32-C6.

ESP32-C6 is Espressif's Wi-Fi 6 SoC that combines 2.4 GHz Wi-Fi 6, Bluetooth 5 (LE) and the 802.15.4 protocol. It has been anxiously anticipated by the market since its first announcement, for it is our first Wi-Fi 6 SoC achieving an industry-leading RF performance, with reliable security features and multiple memory resources for AIoT products. Currently, the ESP32-C6 module and its development board are available to be ordered from Espressif's online store, and more products will soon become available on Adafruit (module and development board), Akizuki, Digikey, and Mouser.

ESP32-C6 consists of a high-performance 32-bit RISC-V processor which can be clocked up to 160 MHz, and a low-power 32-bit RISC-V processor which can be clocked up to 20 MHz. ESP32-C6 has a 320KB ROM, a 512KB SRAM, and works with external flash. It comes with 30 (QFN40) or 22 (QFN32) programmable GPIOs, with support for SPI, UART, I2C, I2S, RMT, TWAI, PWM, SDIO, Motor Control PWM. It also packs a 12-bit ADC and a temperature sensor.

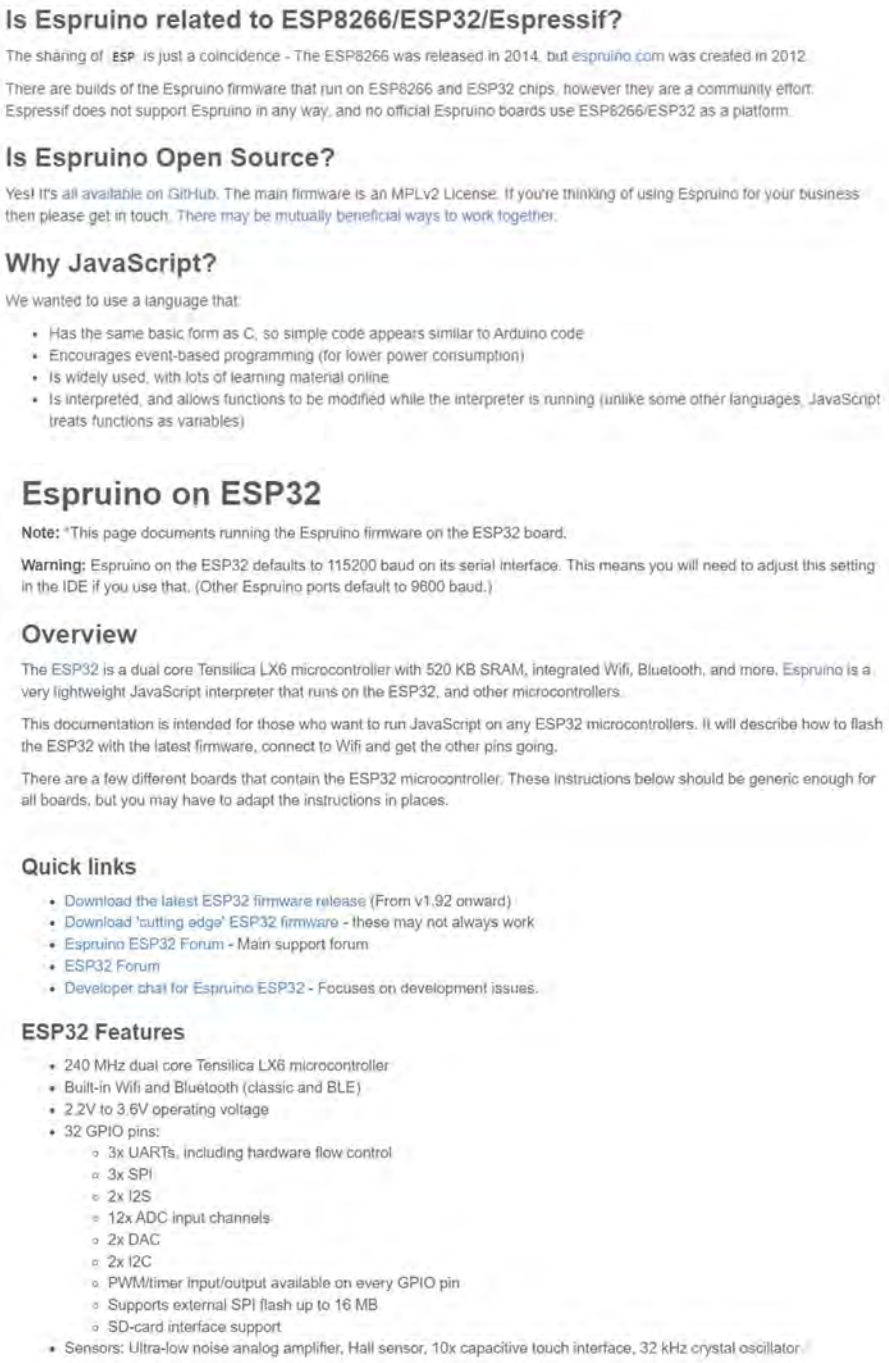
ESP32-C6's support for IEEE 802.15.4, Wi-Fi, and Bluetooth 5 (LE) connectivity, enables customers to build Matter-compliant, Wi-Fi- and Thread-end-point devices which, therefore, achieve interoperability in smart-home scenarios involving chips from multiple brands. Moreover, ESP32-C6 can be used in various Matter-related solutions, such as Matter Gateways, Thread Border Routers or Zigbee Matter Bridges.

https://www.espressif.com/en/news/ESP32-C6_Available

I highly recommend the following book for us non-CS people who want to know what computers do.

The ESP32 and ESP8266 chips use the JavaScript interpreter Espruino. Espruino translates the high-level JavaScript language into machine code (0s and 1s). Espruino was created in 2012 and released on the ESP8266 chip in 2014. The development of Espruino was important because JavaScript has many web developers and is also easier to use than C.

http://www.espruino.com/FAQ



Is Espruino related to ESP8266/ESP32/Espressif?

The sharing of `ESP` is just a coincidence - The ESP8266 was released in 2014, but espruino.com was created in 2012.

There are builds of the Espruino firmware that run on ESP8266 and ESP32 chips, however they are a community effort. Espressif does not support Espruino in any way, and no official Espruino boards use ESP8266/ESP32 as a platform.

Is Espruino Open Source?

Yes! It's all available on GitHub. The main firmware is an MPLv2 License. If you're thinking of using Espruino for your business then please get in touch. There may be mutually beneficial ways to work together.

Why JavaScript?

We wanted to use a language that:

- Has the same basic form as C, so simple code appears similar to Arduino code
- Encourages event-based programming (for lower power consumption)
- Is widely used, with lots of learning material online
- Is interpreted, and allows functions to be modified while the interpreter is running (unlike some other languages, JavaScript treats functions as variables)

Espruino on ESP32

Note: *This page documents running the Espruino firmware on the ESP32 board.

Warning: Espruino on the ESP32 defaults to 115200 baud on its serial interface. This means you will need to adjust this setting in the IDE if you use that. (Other Espruino ports default to 9600 baud.)

Overview

The ESP32 is a dual core Tensilica LX6 microcontroller with 520 KB SRAM, integrated Wifi, Bluetooth, and more. Espruino is a very lightweight JavaScript interpreter that runs on the ESP32, and other microcontrollers.

This documentation is intended for those who want to run JavaScript on any ESP32 microcontrollers. It will describe how to flash the ESP32 with the latest firmware, connect to Wifi and get the other pins going.

There are a few different boards that contain the ESP32 microcontroller. These instructions below should be generic enough for all boards, but you may have to adapt the instructions in places.

Quick links

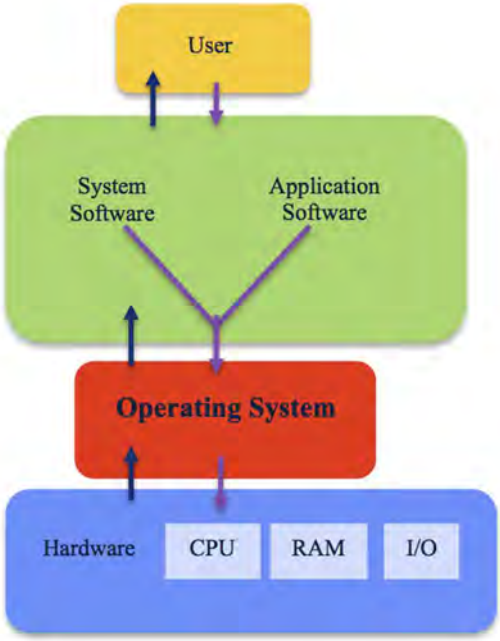
- Download the latest ESP32 firmware release (From v1.92 onward)
- Download 'cutting edge' ESP32 firmware - these may not always work
- Espruino ESP32 Forum - Main support forum
- ESP32 Forum
- Developer chat for Espruino ESP32 - Focuses on development issues.

ESP32 Features

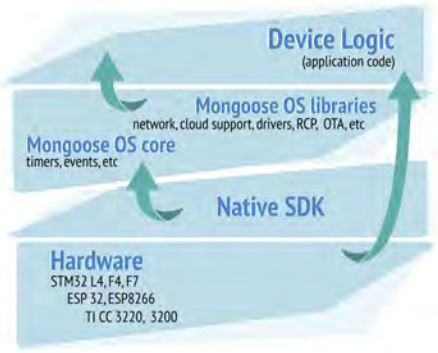
- 240 MHz dual core Tensilica LX6 microcontroller
- Built-in Wifi and Bluetooth (classic and BLE)
- 2.2V to 3.6V operating voltage
- 32 GPIO pins:
  - 3x UARTs, including hardware flow control
  - 3x SPI
  - 2x I2S
  - 12x ADC input channels
  - 2x DAC
  - 2x I2C
  - PWM/timer input/output available on every GPIO pin
  - Supports external SPI flash up to 16 MB
  - SD-card interface support
- Sensors: Ultra-low noise analog amplifier, Hall sensor, 10x capacitive touch interface, 32 kHz crystal oscillator

https://auth0.com/blog/amp/javascript-for-microcontrollers-and-iot-part-1/

https://www.youtube.com/watch?v=MuZfdmcplQA

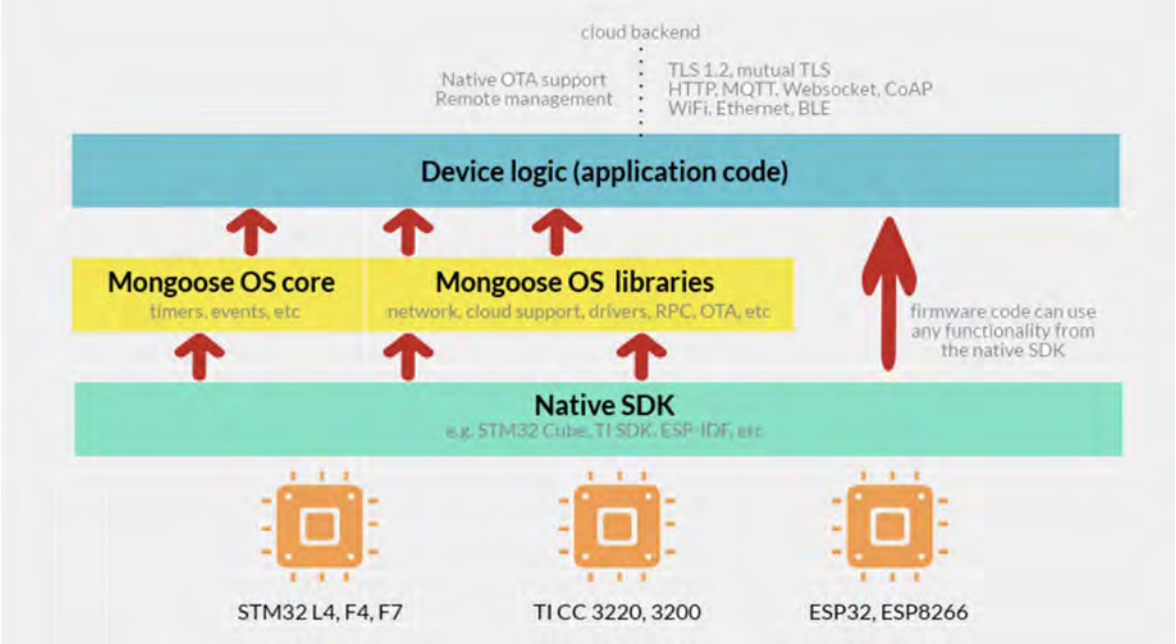


Shelly currently uses the Mongoose operating system. Mongoose was originally founded in 2015.



Notice Mongoose allows for remote procedure calls (RPC) that sends commands to devices and receives replies and over the (OTA) updates. These are two important features that we will see gave Shelly an opportunity to exploit competitor weaknesses and add much more functionality than other products on the market.

https://tracxn.com/d/companies/mongoose-os/__S9uBA_kXsyOCcoBb52Z5I8B_p0fVmEg_4Sn3YbCNpT8



https://mongoose-os.com/case-studies/shelly.html

Shelly is currently, however, developing its own operating system – Shelly OS. The new OS, along with a custom-made chip by Espressif, will allow Shelly to develop more complex software. The new functionality will include industry automation and a platform for other device manufacturers without software expertise. At the end of the paper, I will discuss how this is important to Shelly's long-term competitive strength. From June 1, 2023, Shelly devices will begin to use the new operating system. In September 2023, the platform will be available to clients.

Currently, Shelly specializes in creating application software that adds functionality to its hardware. Shelly creates the development environment along with JavaScript methods that make it easier to make Shelly devices do something. And what is a method? Well, glad you asked. JavaScript methods are actions that can be performed on objects—it is a property containing a function definition. And what are objects? An object is a collection of properties, and a property is an association between a name (or key) and a value. A property's value can be a function (a set of procedures that performs a task or calculates a value), in which case the property is known as a method. Got it. Yeah me neither but the developers at Shelly probably have a pretty good grasp on the subject.

Shelly APIs

`Shelly.call()`

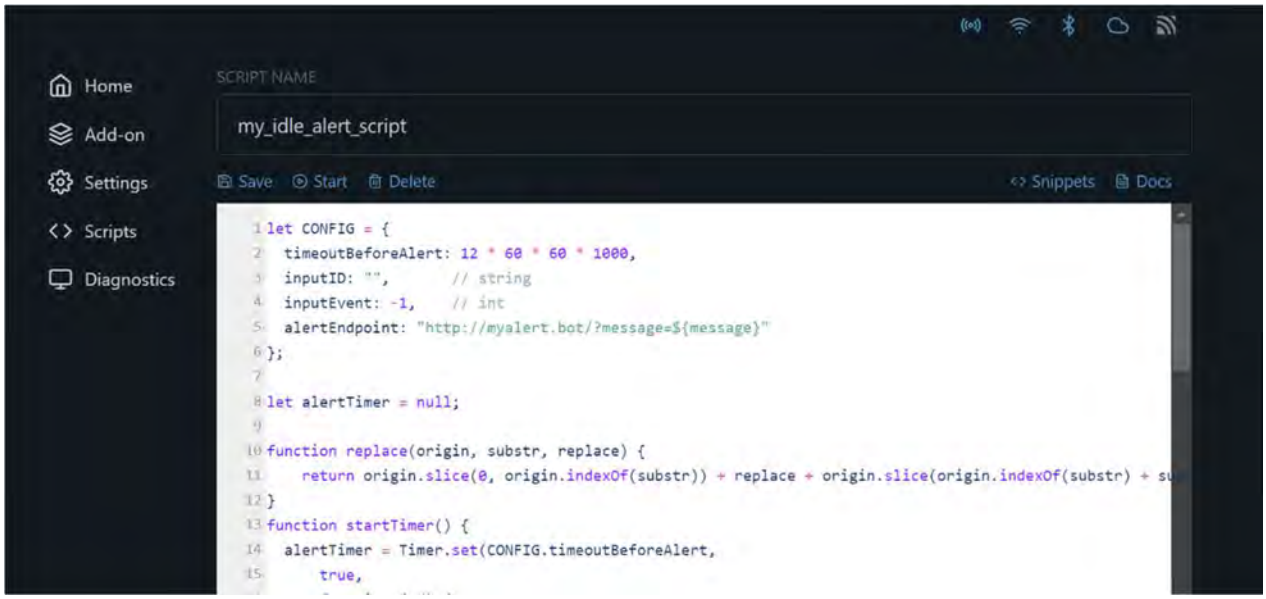
To interact with the local device, JS code can invoke RPC methods using a "local" RPC channel:

`Shelly.call(method, params[, callback[, userdata]]) -> undefined`

Property	Type	Description
`method`	*string*	Name of the method to invoke
`params`	*object or string*	Parameters

String encoding
- String literals
- Strings in JSON

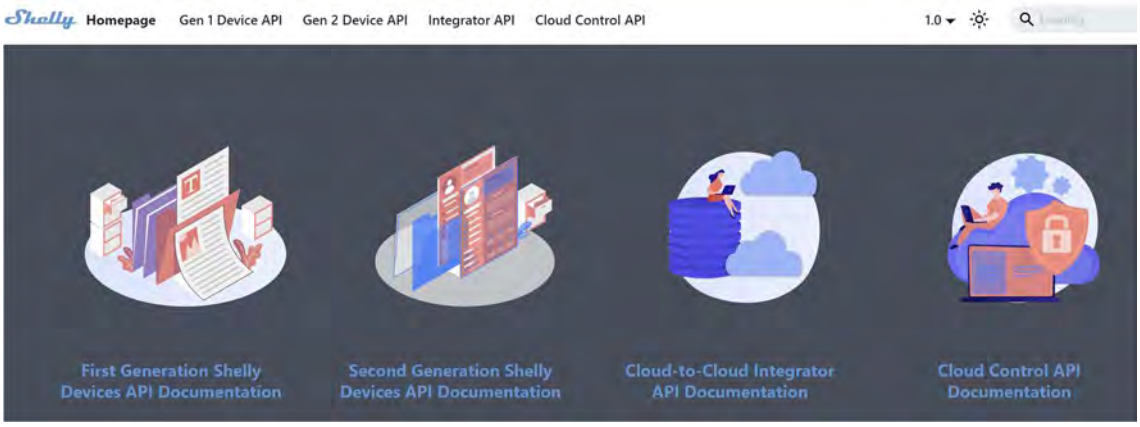
Shelly APIs
- `Shelly.call()`
- `Shelly.addEventHandler()` and `Shelly.addStatusHandler()`
- `Shelly.removeEventHandler()` and `Shelly.removeStatusHandler()`
- `Shelly.emitEvent()`
- `Shelly.getComponentConfig()`
- `Shelly.getComponentStatus()`
- `Shelly.getDeviceInfo()`
- `Shelly.getCurrentScriptId()`

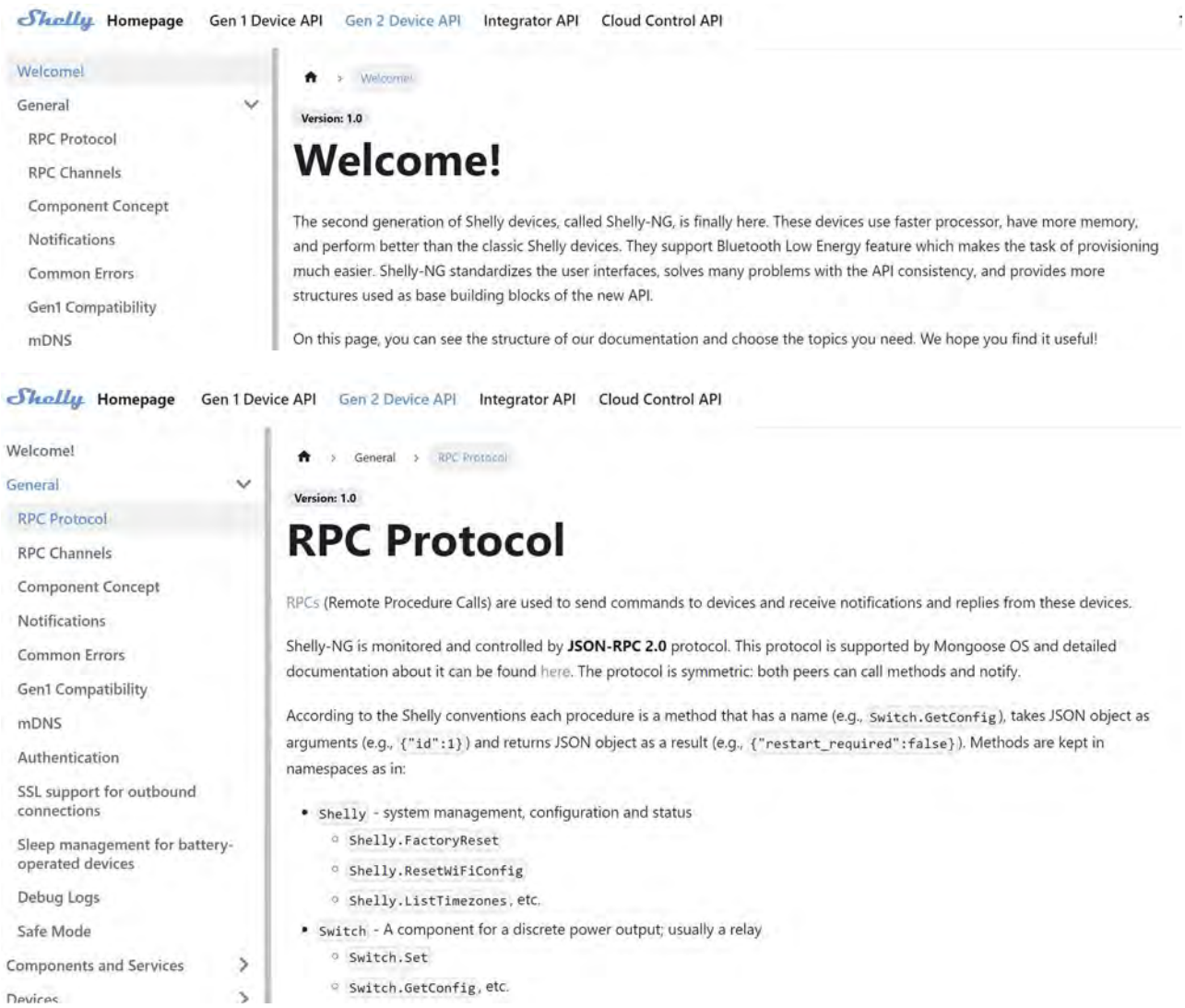


https://www.w3schools.com/js/js_object_methods.asp

https://shelly-api-docs.shelly.cloud/gen2/Scripts/Tutorial/

https://shelly-api-docs.shelly.cloud/





The application software uses the OS's interface to give the device its specific functionality. For example, an application might control a motor based on data received over the internet and data from sensors. Below is a software program using Shelly products to control watering a garden in Miami, Florida. There are many innovative features of this program (the language, written in web browser, & APIs) which will be covered later in the paper. But for now, note that the software uses special Shelly functions to control the actions of physical devices based on inputs that represent conditions in the physical world.

JS precipitation-irrigation.js > ...

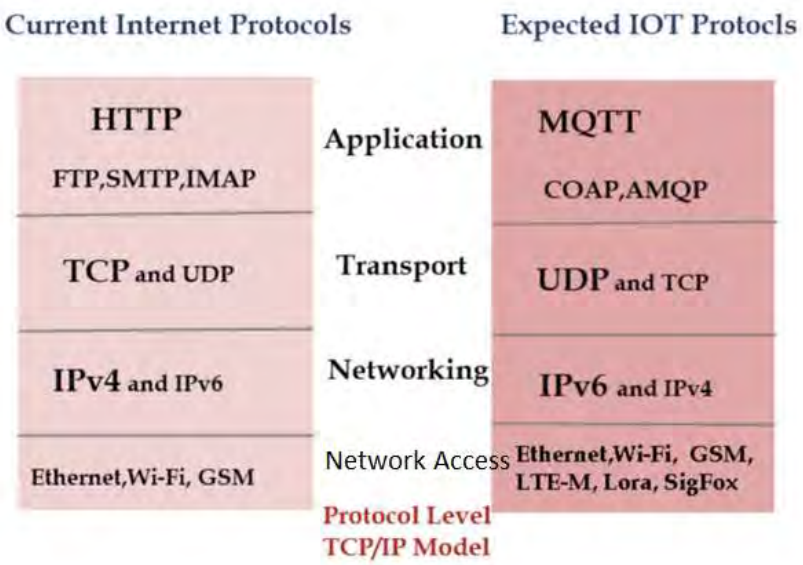
```
// With this script you can stop or limit watering your garden according to the rain
// that has fallen in the last 24 hours
// You can use any Shelly Plus 1/Pro1 ot Pro2 to control your irrigation system
// Don't forger to add AutoOFF for max Irrigation time and set a Schedule which start
// irrigation in device webUI.
// Configure Accuweather APIKEY and end points

let CONFIG = {
    accuWeatherAPIKEY: "YourACCUWEATHERKeyGoesHere",
    weatherCurrentEndpoint: "http://dataservice.accuweather.com/currentconditions/v1/",
    switchId: 0,
    // turn off, if rain in the last 24h was > 4.5mm
    rainMmValue: 4.5,
//  List of locations
    locations: {
        "Sofia": 51097,
        "Miami": 347936
    },
};

// Choose which location
let here = "Miami";
let location_id = CONFIG.locations[here];

function getWeatherURLForLocation(location_name) {
    return CONFIG.weatherCurrentEndpoint +
        JSON.stringify(CONFIG.locations[location_name]) +
        "?apikey=" +
        CONFIG.accuWeatherAPIKEY +
        "&details=true";
};

```

```
// This function read rain value in last 24h
function ReadRainHistory() {
    print("Check and Decide");
    Shelly.call(
        "http.get",
        {url: getWeatherURLForLocation(here)},
        function (response, error_code, error_message) {
            if (error_code !== 0) {
                // HTTP call to error service failed
                // TODO: retry logic
                return;
            }
            let weatherData = JSON.parse(response.body);
            let RainValue = weatherData[0].PrecipitationSummary.Past24Hours.Metric.Value;
            print("RainValue", RainValue);
            decideIfToIrrigate(RainValue);
        }
    );
};

// This function check are the rain in enough and switch off the valve
function decideIfToIrrigate(RainValue) {
    print(here, " Rain Last 24h - ", RainValue, " mm ");
    if (RainValue > CONFIG.rainMmValue) {
// Can be use to calculate irrigation time base of amount the Rain last 24h
    // let seconds_to_irrigate = (10 - RainValue) * 30;
    // Shelly.call("Switch.Set", {"id": 0, "on": true, "toggle_after": seconds_to_irrigate});

// Disable if you calculate irrigration time
        Shelly.call("Switch.Set", {"id": CONFIG.switchId, "on": false});
        print("Irrigration not needed");
    }
}

Shelly.addStatusHandler(function (e) {
    if (e.component === "switch:" + JSON.stringify(CONFIG.switchId)) {
        if (e.delta.output === true) {
            print("Switch is on, triggered source:", e.delta.source);
            ReadRainHistory();
        }
    }
});

```

Communications Layer

In the device and software layer, we saw that Shelly devices can be used to control physical things using software developed by Shelly (e.g. shelly.addStatusHandler() or shelly.call()—which are methods that allow JavaScript code to do something after of course being turned into machine code by Espruino and then having the OS use the machine code to control the microcontroller). The software is written using a web browser and gathers data from sensors and from other sources on the internet. The data then needs to be communicated with other devices and the cloud to make the functionality possible. This is where the communications layer comes in, and like most markets, the communication layer has been revolutionary in how customers evaluate and value electrical components and gadgets.

Before we proceed with our discussion of Shelly devices and the IoT, we need a (very) brief overview of the communications tech stack using the TCP/IP model.



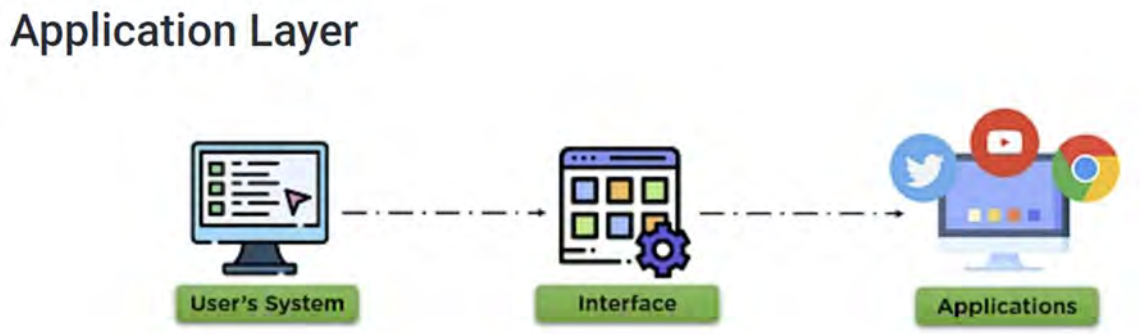
The Open Systems Interconnection Model

Layer name	Description
7 – Application	Graphical user interface; primary user interface with communication system.
6 – Presentation	Supports the functionality of the application layer by providing services such as formatting and translation of data.
5- Session	Maintains the transmission path by synchronizing packets and controlling access to the medium by the Application layer.
4 – Transport	Ensures the quality of transmission and determines the best route for transmission of data using the Network layer below.
3 – Network	Finds a route for transmission of data and establishes and maintains the connection between two connected nodes.
2- Data Link	Creates, transmits, and receives packets. Controls the Physical layer.
1- Physical	Converts data into bits for transmission and converts received bits into usable data for the layers above it.

http://www.steves-internet-guide.com/networking/

https://www.controleng.com/articles/Wi-Fi-and-the-osi-model/

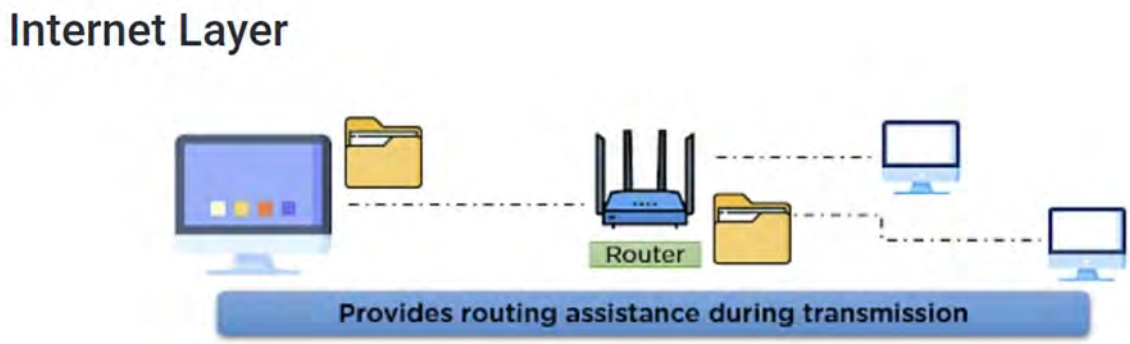
The application layer (application, presentation, and session in OSI model) allows the user to use the services of the network, develop network-based applications, and provides services such as login, naming, formatting, and file transfers. The application layer maintains a smooth connection between the application and the user for data exchange. The most common protocols in this layer are hypertext transfer protocol (HTTP) used for accessing the information available on the internet, simple mail transfer protocol (SMTP) and file transfer protocol (FTP).



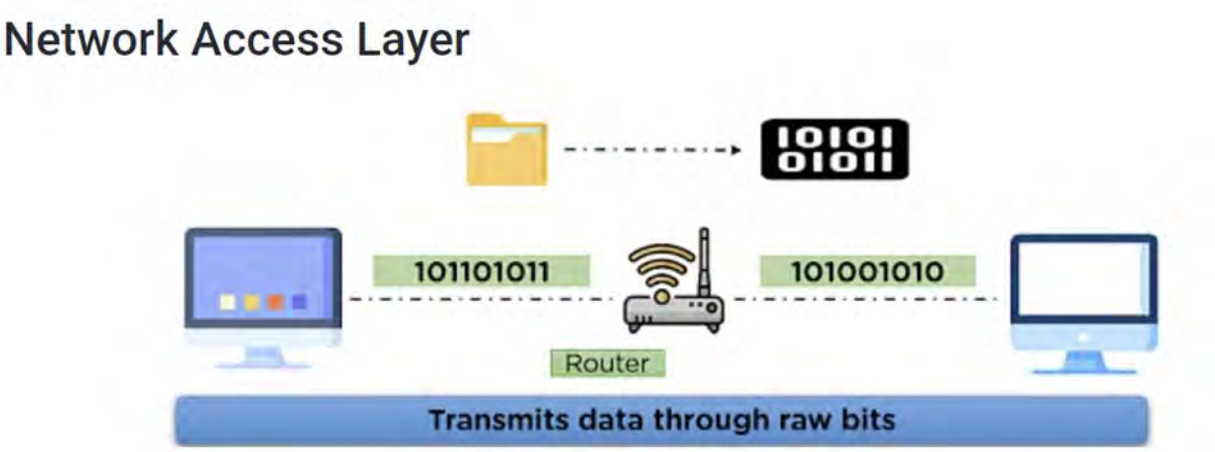
https://www.simplilearn.com/tutorials/cyber-security-tutorial/what-is-tcp-ip-model

The TCP/IP transport layer controls the flow of data exchange data receipt acknowledgments and retransmit missing packets to ensure that packets arrive in the right order and without error.

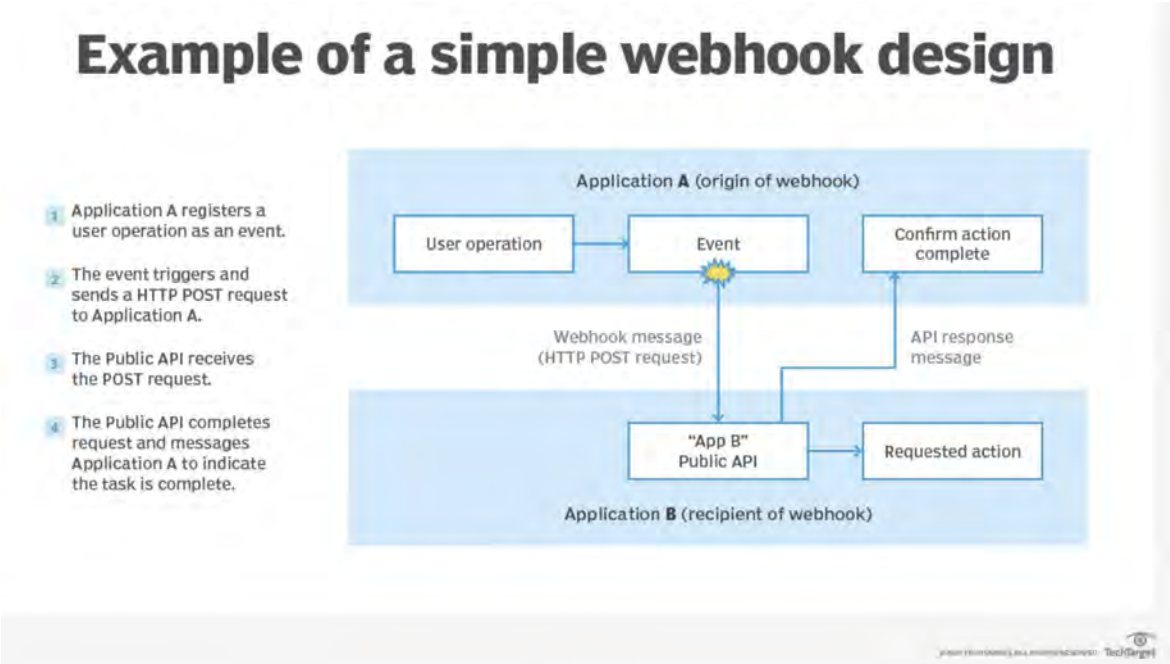
The network or internet layer controls the transmission of data over the network modes. This is the layer that routes data to the right address.



The network access layer (datalink and physical layers) is responsible for sending and receiving the data in raw bits over the physical modes of communication. This is how data is transferred (e.g. via an ethernet cord or wireless frequencies) and we will discuss this layer more as it is important to the home automation market.

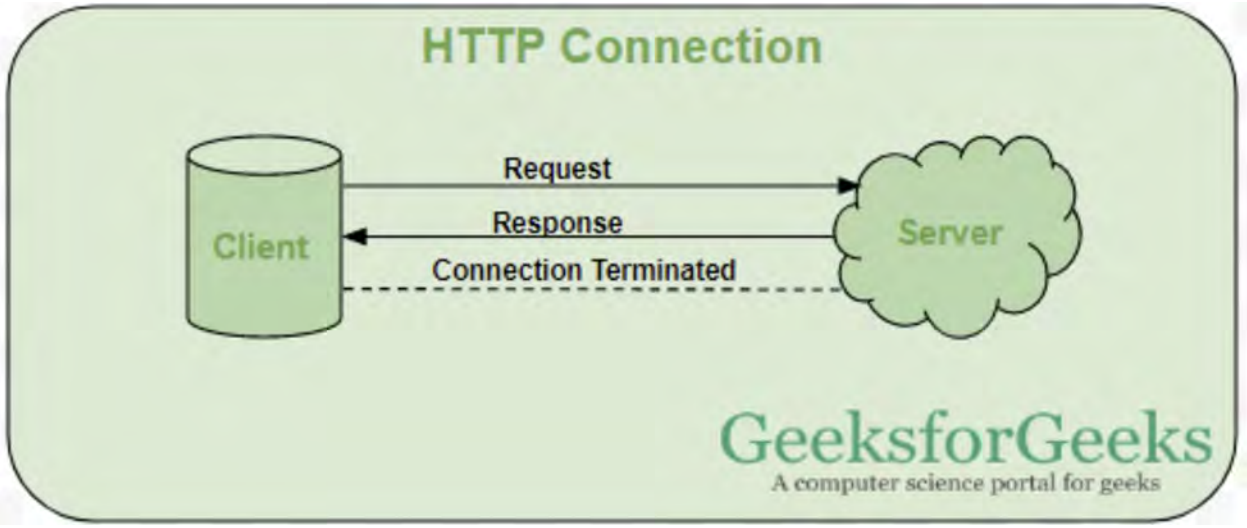


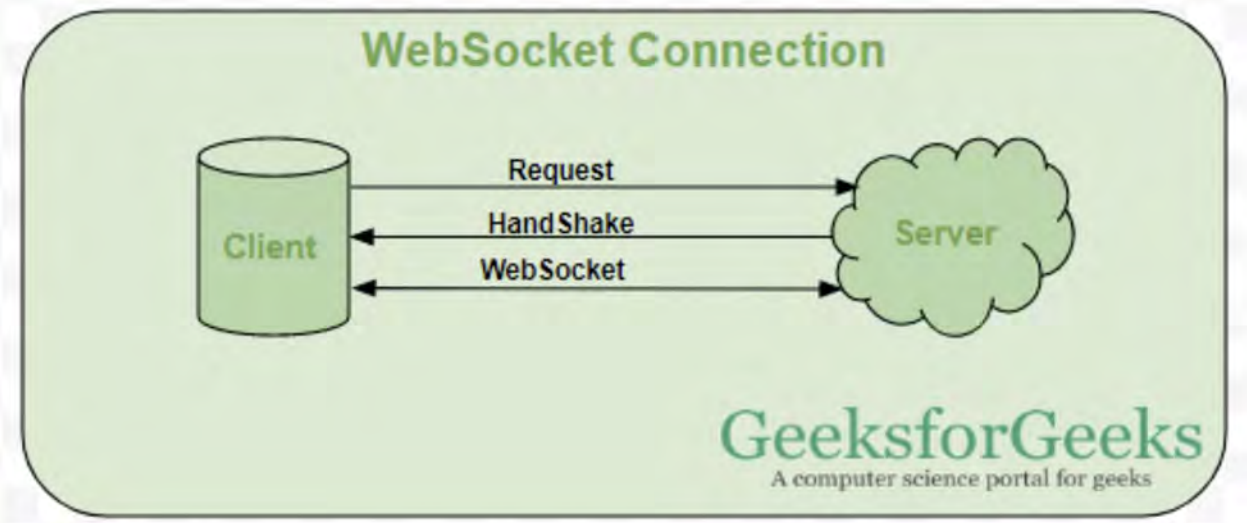
Shelly devices use webhooks which is an HTTP-based function that allows event-driven communication between two devices.



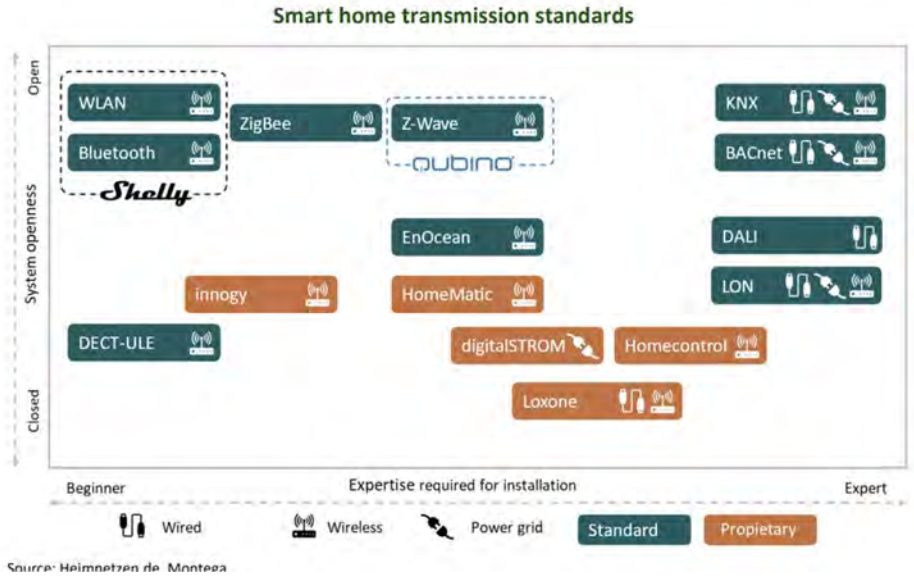
Shelly devices also use websockets (a communications protocol) to keep communication open.

Webhooks and Websockets are important technologies that Shelly uses to create functionalities that we will see shortly. Older technologies often do not have event-based actions or continuous communications. Further, incumbents have kludged together solutions to these problems, but they do not have the ease of use or range of actions available in Shelly products.





Below are network access (physical) protocols used in the home automation market.

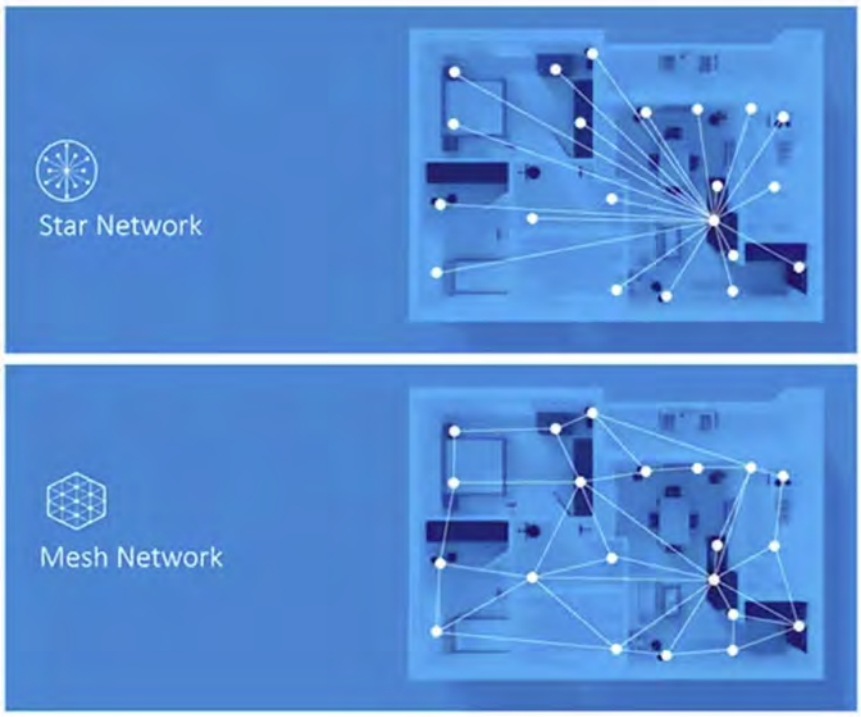


The most common home automation datalink (transmission) protocols are:

Z-Wave, Zigbee (Matter), Wi-Fi, and Bluetooth. Note in the upper right corner is KNX and Modbus (which isn't in the graph) as we will see these in later sections.

https://matscloud.blogspot.com/2017/02/understanding-iot-protocols-mqtt-coap.html

Z-Wave and Zigbee are low power wireless mesh network technologies. The mesh is needed because the signal is weak and can be interrupted by physical objects. These technologies are used in bulbs, sensors, plugs, controls, etc. and often require a hub so the physical objects can work together.



Z-Waves uses shorter 800-900 MHZ frequencies which gives it a greater non-line of sight range versus Zigbee which uses 2.4 GHz frequency. The shorter-range Z-Wave technology has the advantages of less interference from other devices and longer ranges (think AM versus FM). The shorter wavelength comes with the disadvantage of slower communication speeds. 1s and 0s are the spaces between the waves—more waves means more 1s and 0s. So, a 2.4 GHZ (billion per second) can send more data than 900 MHZ (million per second) because it has more cycles (waves) but cannot be sent as far (think 4G (up to ~6 GHZ) versus 5G (28-39 GHZ) also). The Z-Wave is also a proprietary technology and manufacturers must pay a fee to use the technology raising the usage cost whereas Zigbee is free. Also, the additional cost means Z-Wave has fewer partnerships than Zigbee.

Wi-Fi (Local Area Network-LAN) uses 2.4 GHZ but has a 100-meter range like Z-Wave. The big benefit from Wi-Fi is it is fast, cheap, easy to implement, the range can be extended, and is widely available. The negative is there could be interference as many other devices (including microwave ovens) use the same 2.4 GHz range. Also, Wi-Fi uses star topology which means for a device to connect to the internet it must be in range of the router.

This has historically been a problem but for Shelly devices this is no longer the situation. Shelly's non-battery devices can be set up as access points for a network (your router is an access point and your computer is a client). This added functionality extends the range of a Wi-Fi network. Shelly devices can communicate directly with other Shelly devices using HTTP protocol since they have webservers. Wi-Fi generally has the best interoperability as it is the only standard that is supported by Amazon, Apple, Google, Samsung, and other partners. As such it does not require a multi-tech hub.

https://shelly-api-docs.shelly.cloud/gen2/ComponentsAndServices/Wi-Fi/

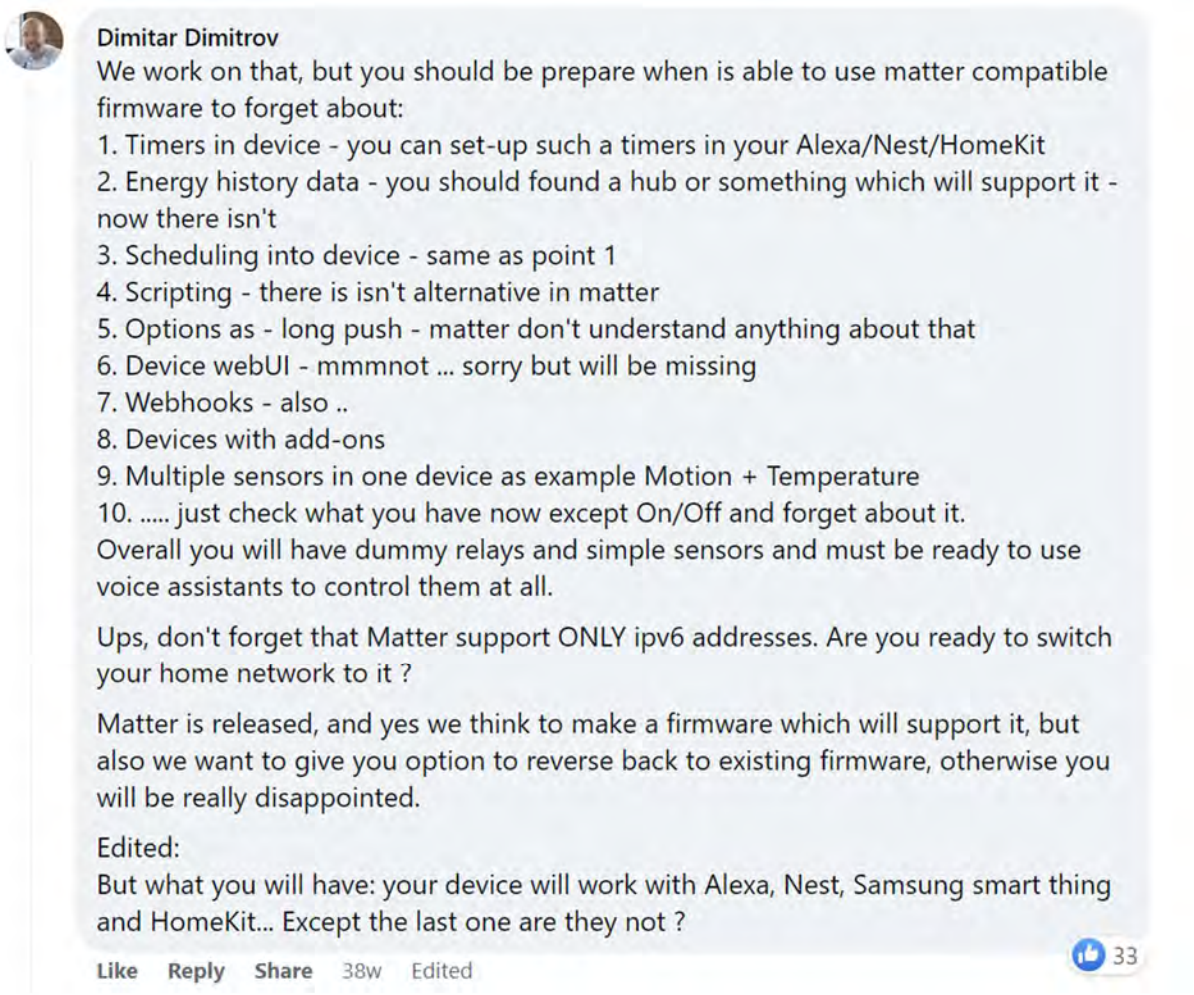
Bluetooth is used for device-to-device communication and allows small amounts of data to be transmitted. For example, Bluetooth is good for streaming music but not videos.

Criteria	Zigbee	Z-Wave	WiFi	Bluetooth	Bluetooth Low Energy
Range	Good due to inherent mesh networking	Good due to inherent mesh networking	Good if repeaters or WiFi mesh used	Not great	Not great
Power Use (in theory)	Low	Low	High	Medium	Low
Bandwidth	Poor	Poor	Excellent	Poor	Poor
RF Band	2.4 GHz	908.42 MHz	2.4 GHz/5 GHz	2.4 GHz	2.4 GHz
Needs hub?	Yes	Yes	No (router)	No (smart phones)	No
# of smart devices available	Moderate	Not many (apart from sensors)	Lots	Barely any	Not many, but growing
Price of smart devices	High	High	Low	Medium	Medium
Part of Matter?	Yes	No	Yes	Yes	Yes

https://www.smarthomepoint.com/zigbee-zwave-Wi-Fi-bluetooth-comparison/

Finally, for home automation Matter is emerging as an important specification on how devices should talk to each other. Matter is not a communications protocol. Matter is supported by a long list of companies including Amazon, Apple, Google, and Samsung. A key feature of Matter is that all devices can be controlled locally and do not require an internet connection. To use matter, you need a Matter controller (which is built into all major smart speakers and hubs).

Shelly will support Matter on its Plus and Professional devices with a firmware update at the end of Q2 2023. If the customer switches to Matter, however, some features will not be available including micro-JavaScript, webhooks, timers, energy history, and webUI, which are all need to provided high levels of device functionality. What Matter does is essentially give the big platform companies control over devices but at the cost of lower functionality.



https://www.theverge.com/23547154/matter-smart-home-new-devices-ces-2023

https://www.reddit.com/r/shellycloud/comments/10a8bk7/finally_confirmed_matter_support/

https://csa-iot.org/newsroom/matter-arrives/?fbclid=IwAR0wdVd4_izYg7lHQ1-7upFY_VvYVl46PkUg8vLNxXDSNLLIFKi-EUwKZxo

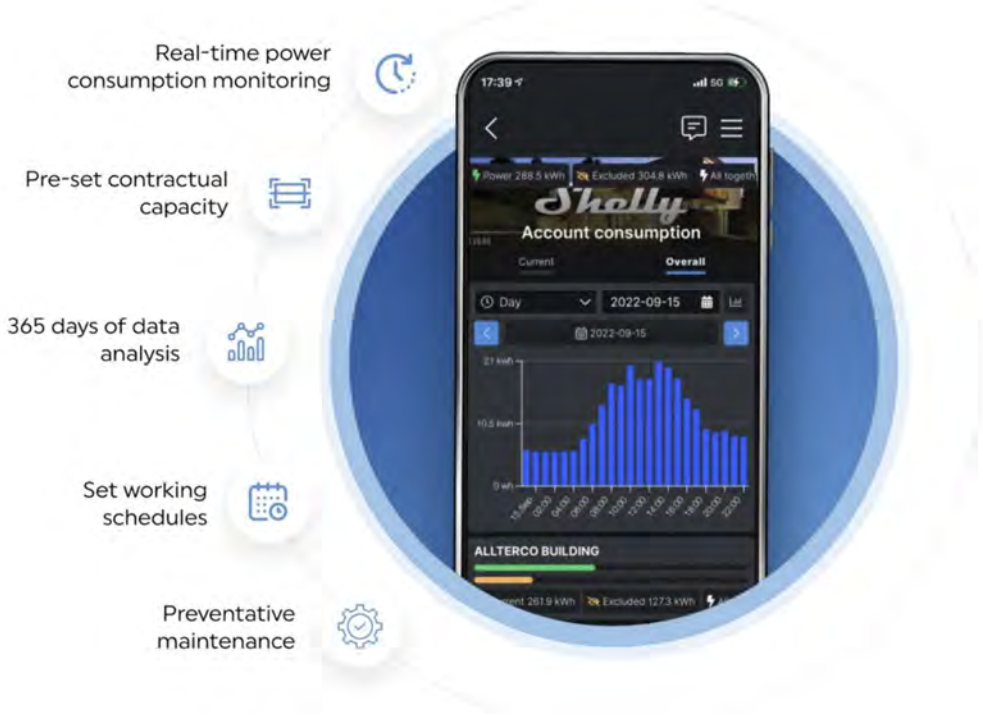
https://matter-smarthome.de/en/products/matter-updates-for-shelly-products/

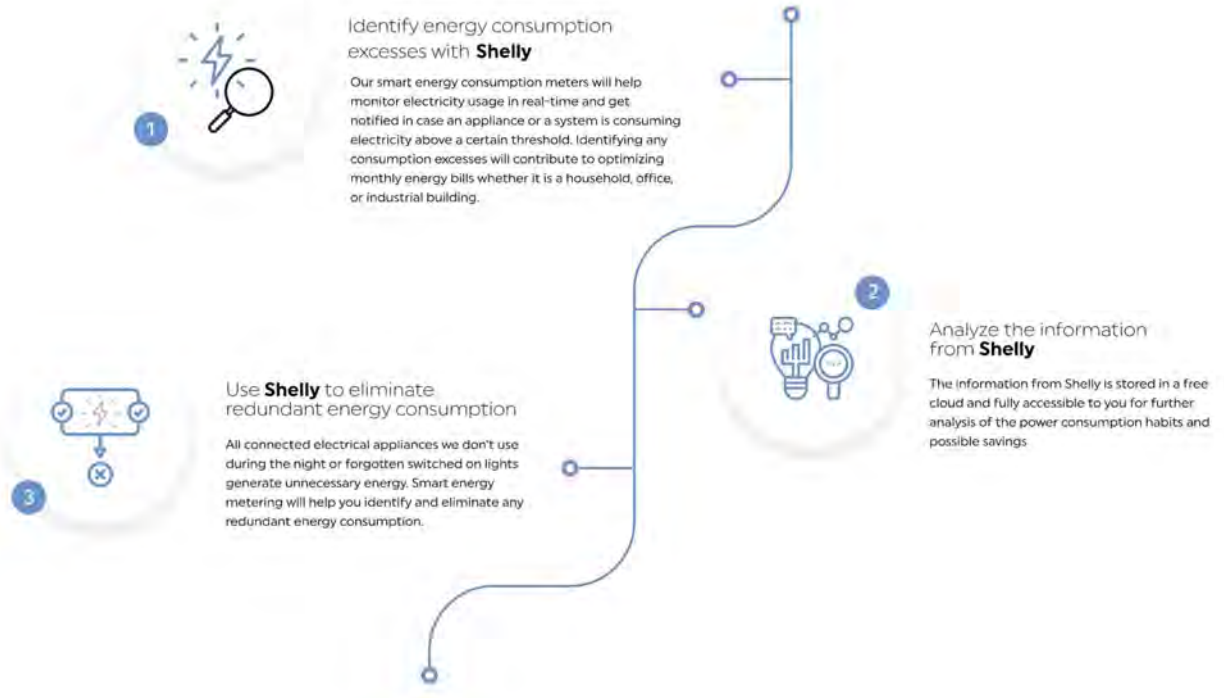
Cloud Platform and Applications Layers

After creating hardware and software to control physical devices, the IoT uses the communication layer to transfer data to either be analyzed, used to make decisions, and/or for controlling devices. To do all this, the cloud platform layer is used to capture, store, and process the data. This layer is provided by AWS or Microsoft Azure platforms for example.

The cloud application layer runs applications that allow the end user to interact with the IoT system. This layer usually includes dashboards, reporting suites, analytics, and AI modules which gather data from many devices and provide the data in easy to interpret and use form for humans. Shelly provides several ways to access the data including from a web browser, smartphone, and wall mount display.

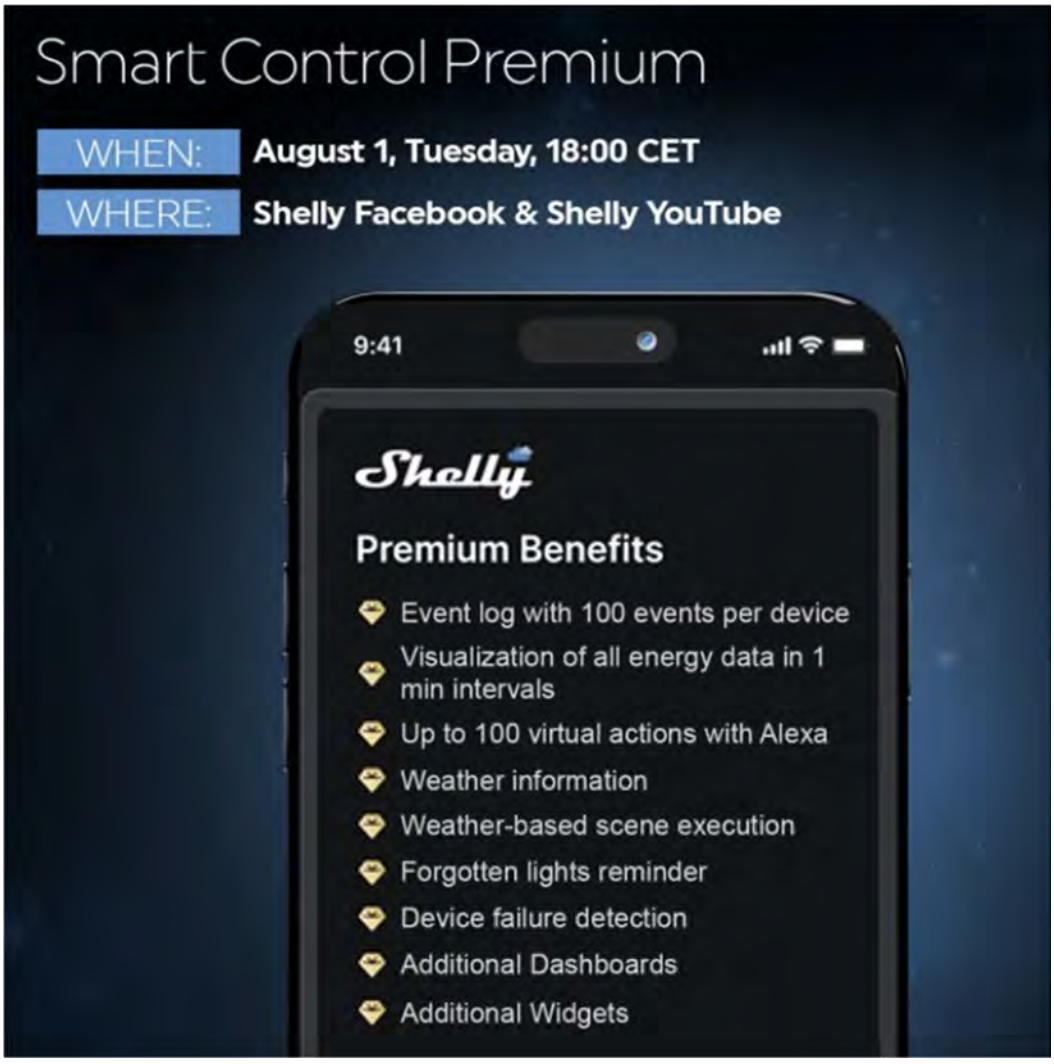
These dashboards can inform a home or building owner about energy consumption, water leaks, motion detection, gas leaks, and temperatures. With such data, an owner can be more energy efficient and make decisions on when and what to do. Shelly's cloud base applications enable owners to remotely control home appliances and mechanical devices (such as doors, windows, sprinklers, or blinds).



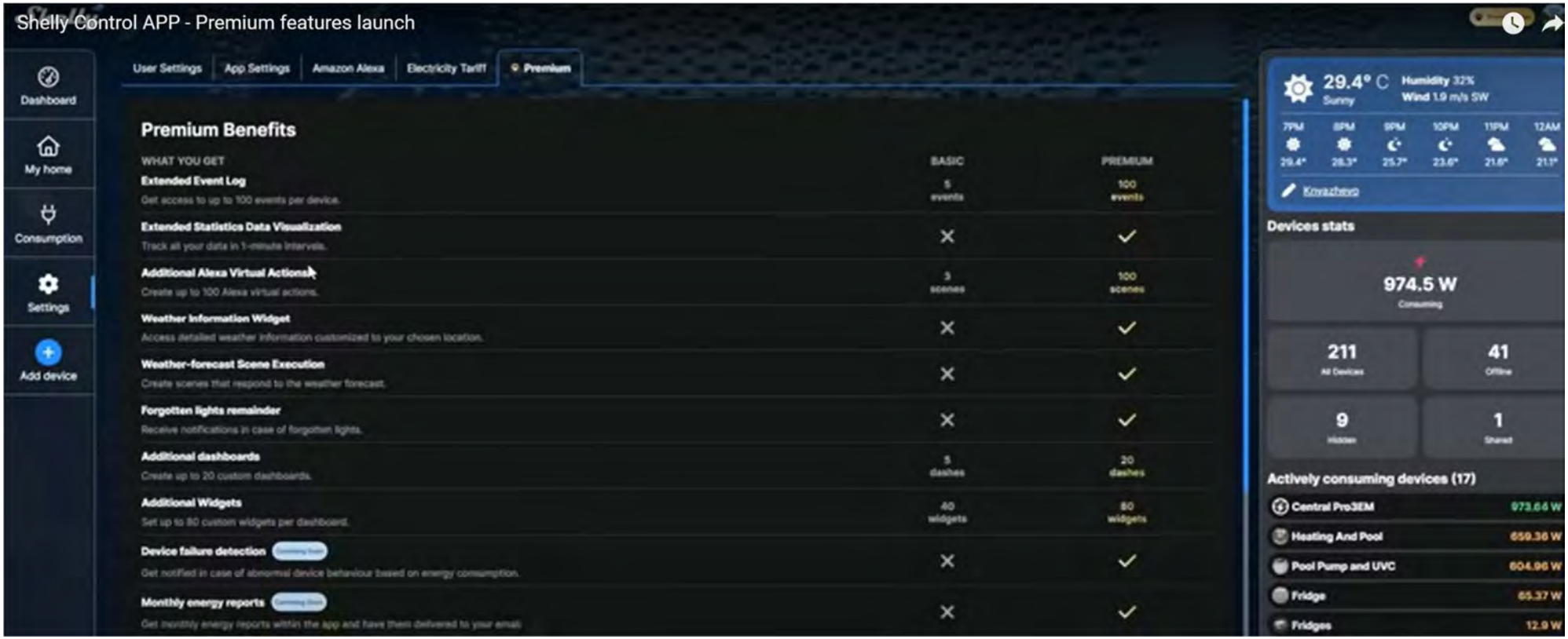


BTW, studies show that ~35% of home energy consumption in the U.S. is wasted energy.

Shelly is releasing a premium application that will cost around 4 euros per month. There are going to be a lot of screenshots in the next pages but screenshots are the only way to paint an accurate picture of the functionality, breadth, and depth of Shelly's products.

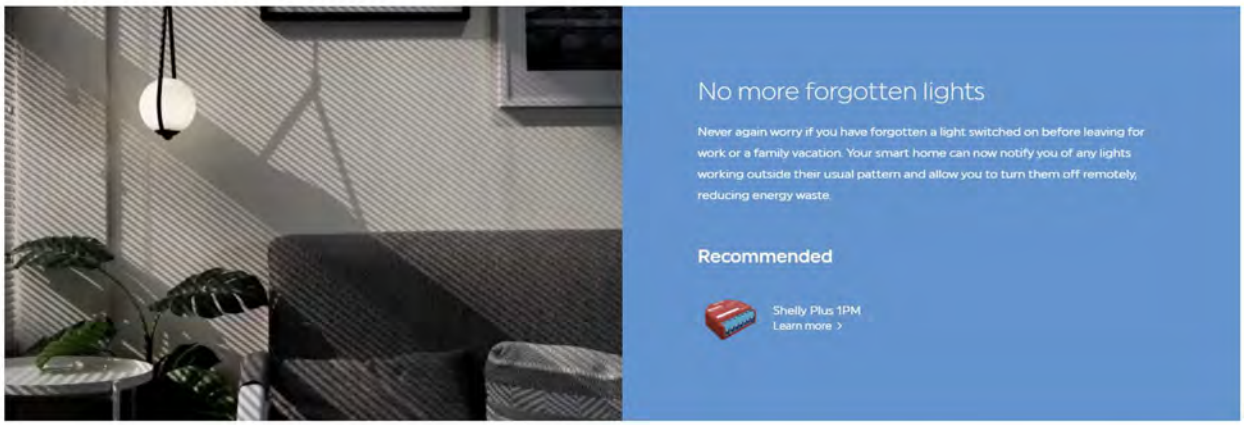


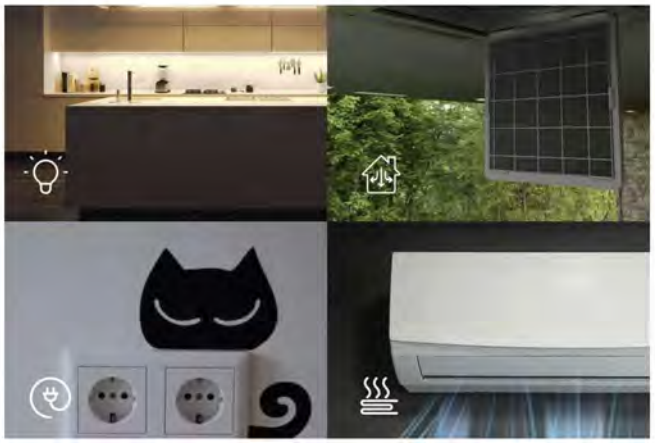
The premium app will offer extend event logs (more readings from Shelly devices, better data visualization, better weather information and weather-based actions, forgotten light reminder, additional dashboards (for many rooms or multiple buildings), and additional widgets (devices connected to the dashboard). Also, the premium application will have device failure predictions and monthly energy reports. Maybe you need to know that you need to change an air filter in your HVAC system or would like to know that your refrigerator is nearing the end of its life. Shelly can predict these things based on changes in energy consumption using its large dataset.



https://www.youtube.com/watch?v=5LUkJb0DJZk

Notice in the below scenarios, the different Shelly devices need to control the actions.





Ensure the most efficient work of your appliances

Many appliances, homes, and buildings use more energy than they actually need, leading to energy waste. Shelly's professional line can help reduce this waste and with it - the monthly energy bills. Install Shelly Pro 4PM inside the breaker box and monitor and control the power consumption of the electrical devices. Use smart schedules to set Shelly 4PM to turn off the power supply of all unused electrical devices after working hours so that there is no energy waste.

Recommended

Shelly Pro 4PM
Learn more >

Lights that follow your work schedule

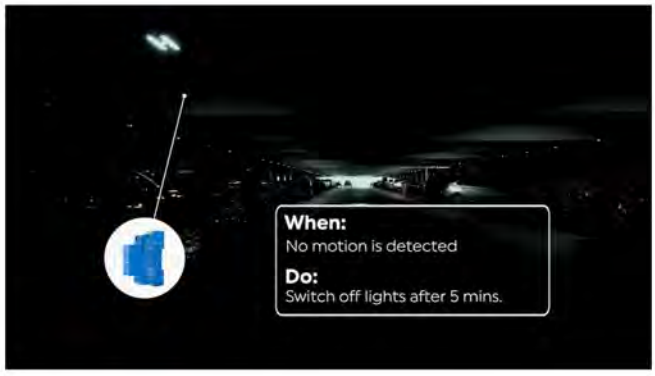
Automate the lights and optimise energy consumption through smart schedules, timers, and extended scripting functionalities. Shelly office automation solutions allow you to automate the lights on each floor separately and set custom schedules for each of them. Set the lights on the operational floors to switch off completely after the working day is over and switch back on only where it is necessary at 7.00 in the morning. This way, you will not have to worry about any forgotten lights and no energy will go to waste.

Recommended

Shelly Pro 1PM
Learn more >

Alternatives (other products)

Shelly Pro 2PM
Learn more >



Common space lights automation

Common spaces such as halls, garages, and storage rooms usually have their lights constantly switched on. However, that leads to inefficient usage of energy and unnecessary monthly costs. Shelly Motion2 will ensure the most efficient use of the lights in the common spaces. The motion sensor will switch on the lights when someone enters and will switch them off once the premises are empty.

Recommended

Shelly Pro 2PM
Learn more >

Shelly Motion 2
Learn more >

Alternatives (other products)

Shelly Pro 4PM
Learn more >

The above scenario uses an input to control an action. The Shelly premium app is making this very easy to accomplish.

Heating system based on the current weather

Ensure that no energy will go to waste and will be used most efficiently by automating the heating/cooling system to follow the current weather forecast thanks to Shelly Pro 1PM scripting functionalities. If the temperatures unexpectedly drop below preset degrees, Shelly Pro 1PM will turn on the heating to ensure a comfortable environment for the employees. Once the desired temperature is reached, Shelly Plus H&T will automatically switch off Shelly Pro 1PM, ensuring that no energy goes to waste.

Recommended

Shelly Pro 1PM
Learn more >

Shelly Plus H&T
Learn more >

Alternatives (other products)

Shelly Pro 2PM
Learn more >

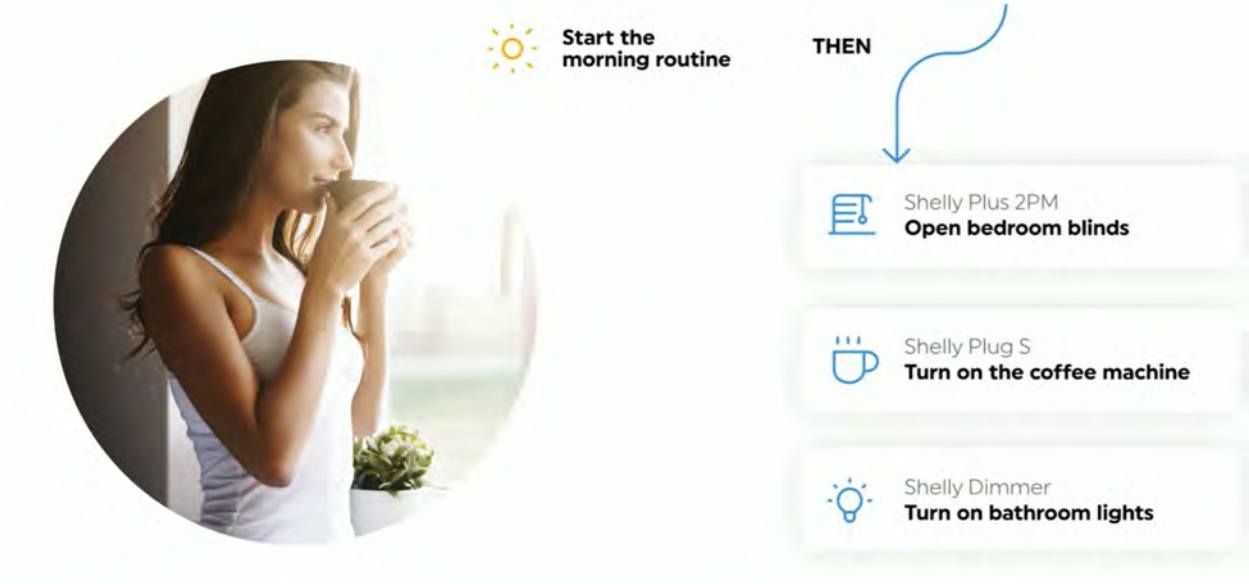
Dynamic control of the shades

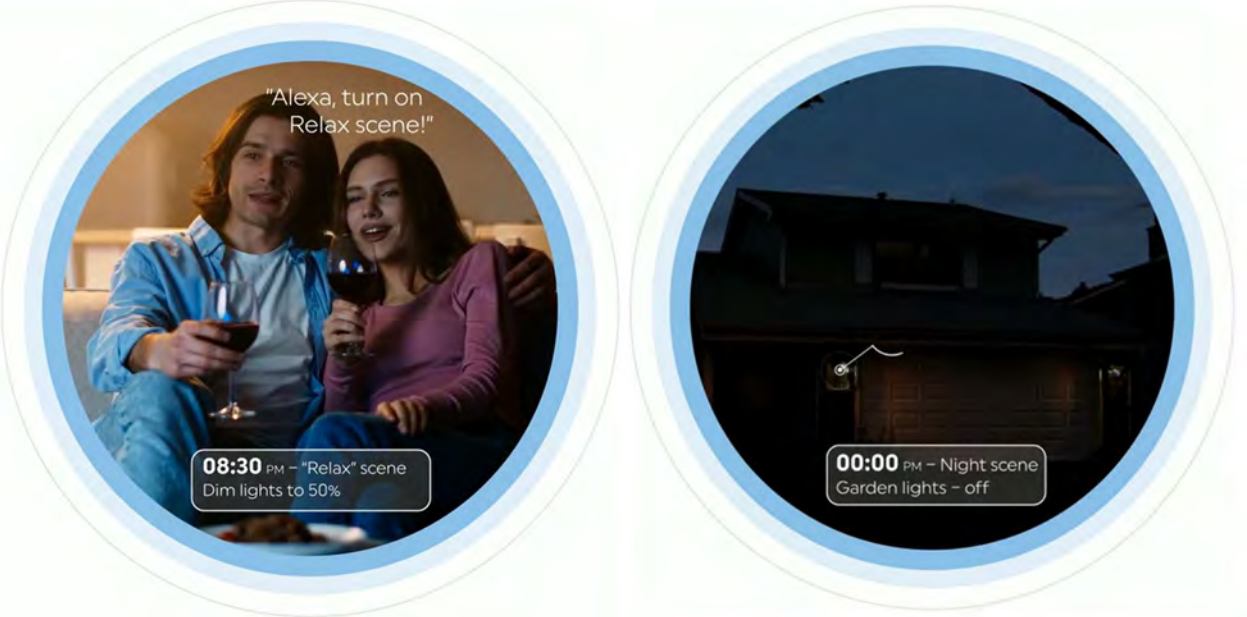
With advanced daily schedules and weather forecast data, you can optimize th daylight to save on artificial lighting and avoid excessive temperature variation by automating the shades. The dynamic control will help you optimize the worl of the HVAC system by setting the motorized blinds in different parts of the building to close when the sun is shining down directly and open again once th sun's position has changed. That way, neither the light nor the heat will bother the employees.

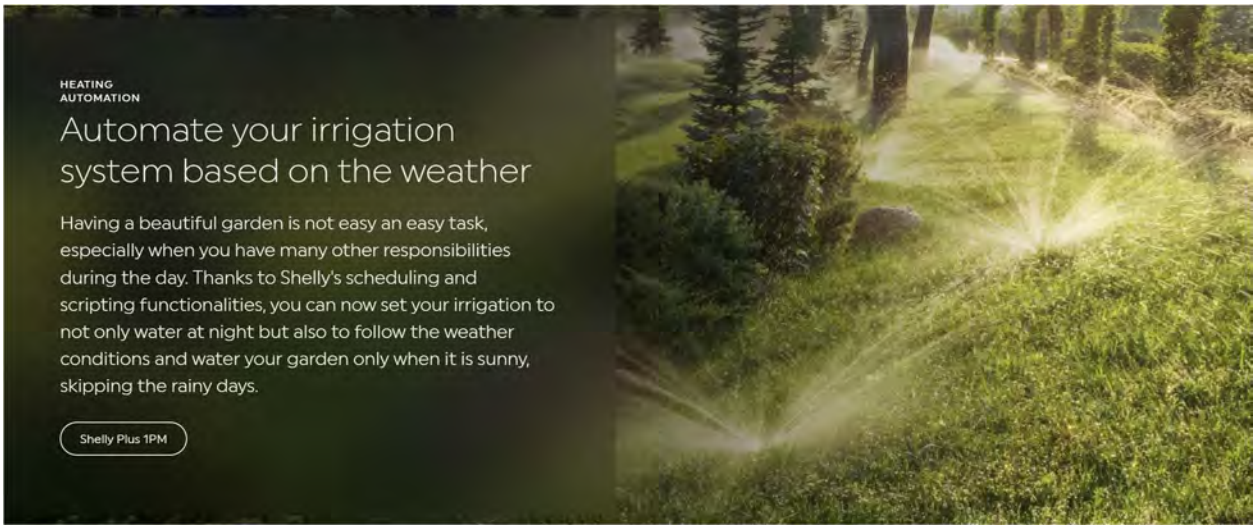
Recommended

Shelly Pro 2PM
Learn more >

Not only does Shelly help save energy but it also automates many functions. The list of automated functions can be very long but here are a few examples.







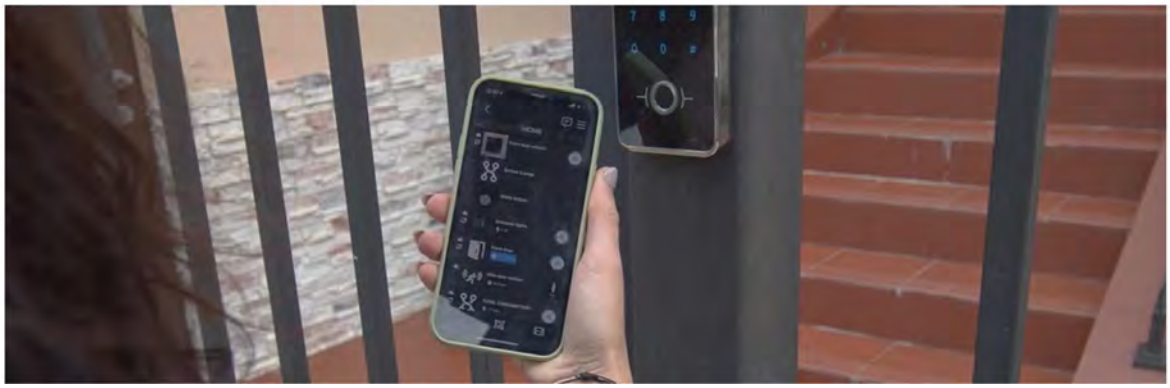
GATES

Motorized office gate

Most offices have their yard closed during non-working hours as a security precaution. Provide optimal comfort to your employees by automating the office gates using smart scheduling options. The gates will open right before the working hours every morning during the work week and will stay closed over the weekend.

Door lock control

Never again worry if you locked the front door before you leave. With **Shelly Plus 1** you can manage your door lock remotely! That way you will not have to rush home if your children are back from school before you've finished work, or if you've forgotten your keys inside while going out to run a quick errand. With just a press of a button, Shelly Plus 1 eliminates the need for your keys.



GARAGE DOORS

Remote control of the garage door

Connect Shelly Plus 1 to your existing garage door opener and control it from anywhere! Now, you can easily let your family or guests come through while you're cooking by just using your voice, or open it using Shelly Button1 or the app when you arrive home from work.

Recommended

Shelly Plus 1 UL
Learn more >

Shelly Button 1 - black
Learn more >

SAFETY

Protect your home from flood or gas leaks

Make sure your home is protected from possible adversities - such as flooding or gas leaks. Shelly Gas will notify you immediately in case it detects even the smallest leak - and together with the add-on, it can turn off the valve to avoid harm and property damage. Place Shelly Flood where leakage might occur - right under any water or heat pipes, fridges and freezers, washing machines, etc. Shelly Flood will notify you in case of the slightest leakage - even before a puddle forms.

Recommended

Shelly Gas CNG
Learn more >

Shelly Flood
Learn more >

One could easily imagine a future where insurance companies won't insure homes without such detectors.

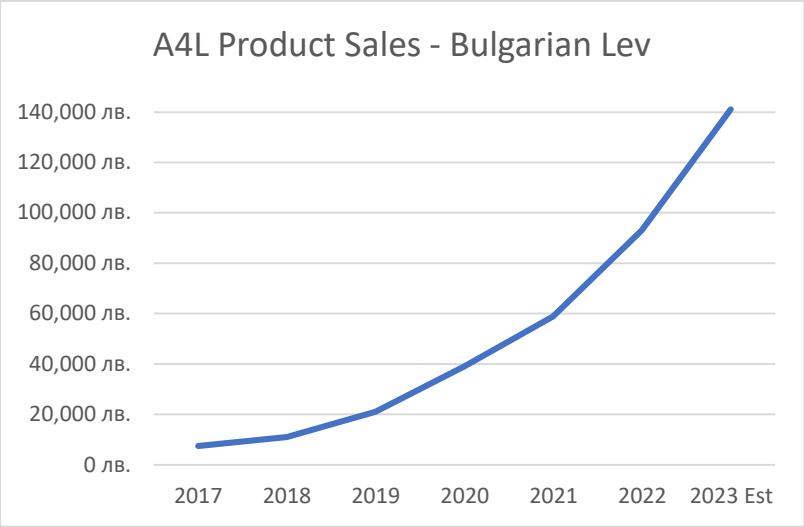
Growth Through Innovation

Shelly's Growth Overview

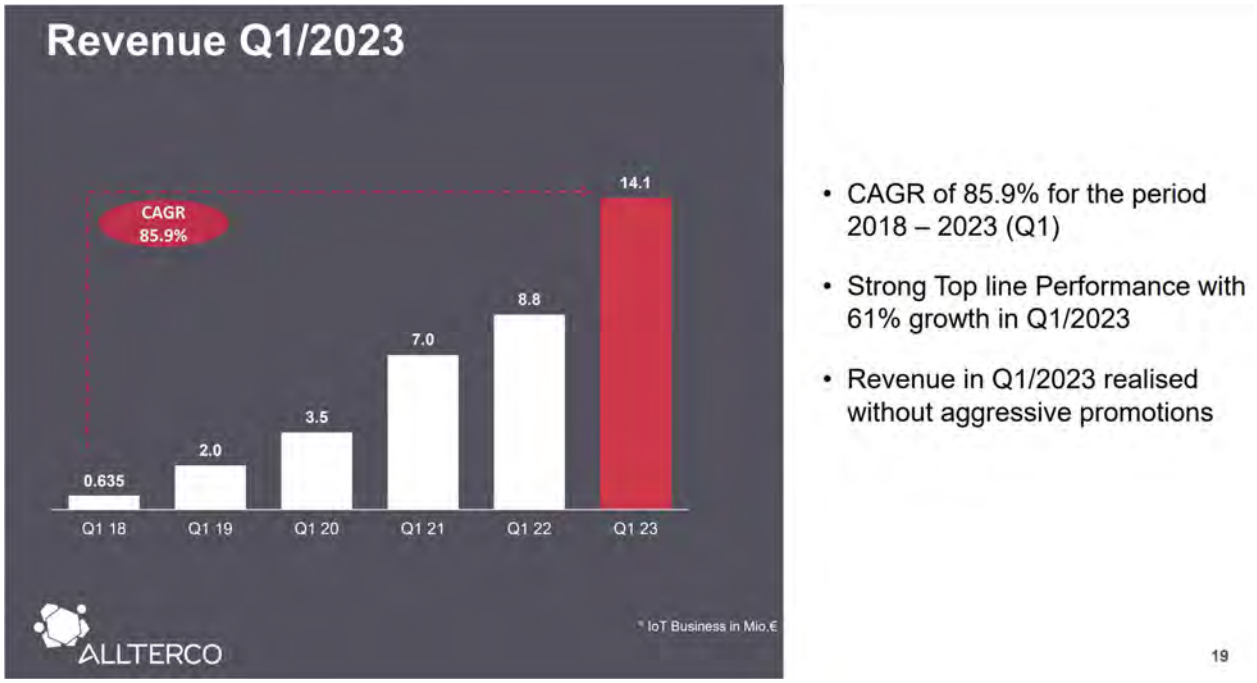
From the preceding section, we can see that Shelly is combining emerging technologies in the IoT stack to add functionality to products that have existed for years. Shelly's products either create greater efficiencies (allow us to do the same or more with less energy), automate functions that previously required humans to expend energy, or allow for new functions that were previously very difficult or impossible to implement. Yes, all the useful automation tasks just listed can be done with other non-Shelly solutions, but as we will see Shelly products are the easiest to use and offer the widest functionality.

Why is Shelly growing so fast? Because it is a ***software*** company taking market share from companies that traditionally were thought of as hardware companies while also bringing in new customers to the building automation market. As Marc Andreessen put it: "software is eating the world."

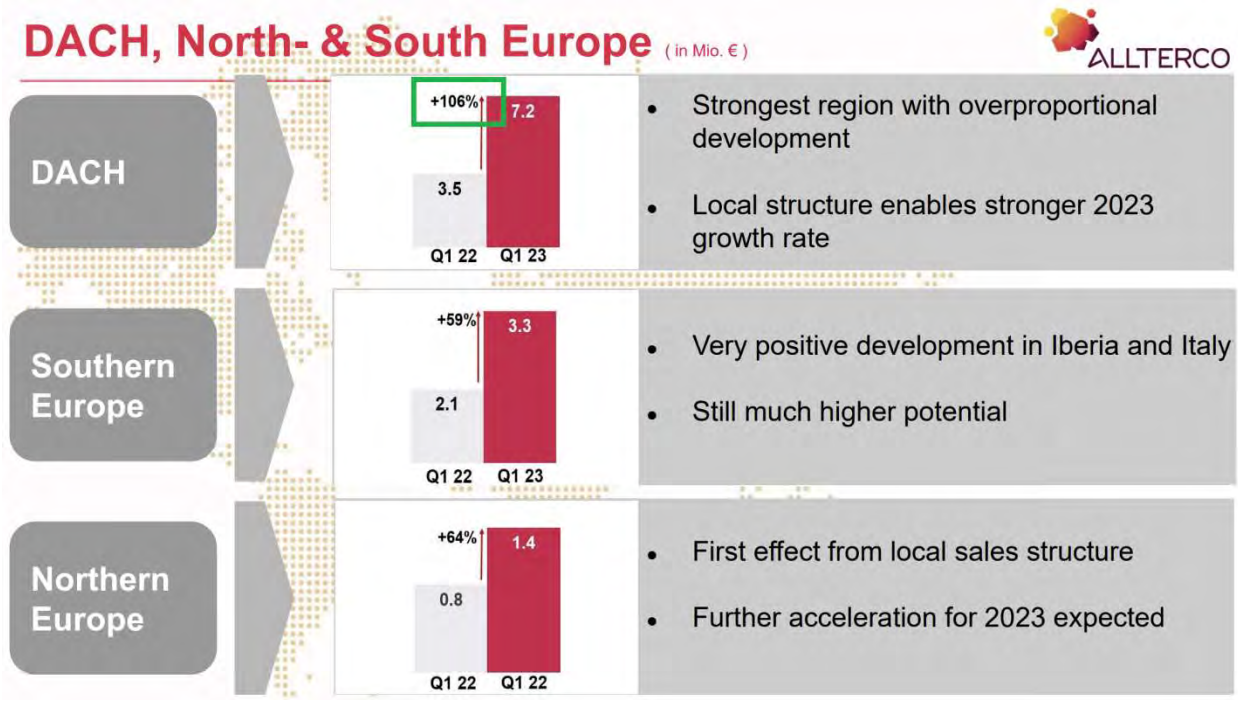
The first Shelly home automation products were launched in 2017. The graph below shows the rapid growth in A4L's sales of goods. Note this also includes sales from Shelly's (formerly Allterco) Myki line of smartwatches. However, Myki sales are now much smaller than Shelly revenues, so the graph does a good job of reflecting Shelly's rapid growth. 1 Bulgarian Lev = .51 Euros



	Year ended December 31, 2022	Year ended December 31, 2021
Revenue from sales of Shelly devices to B2B clients	72 309	46 621
Revenue from sales of Shelly devices to retail clients – through Internet	16 135	8 640
Revenue from sales of Myki devices to B2B clients	4 157	3 297
Revenue from sales of Myki devices to retail clients – through Internet	267	203
Revenue from sales of Shelly devices to retail clients – direct sales	91	28
Revenue from sales of Myki devices to retail clients – direct sales	48	42
Revenue from services and rent	171	678
Total:	**93 178**	**59 509**



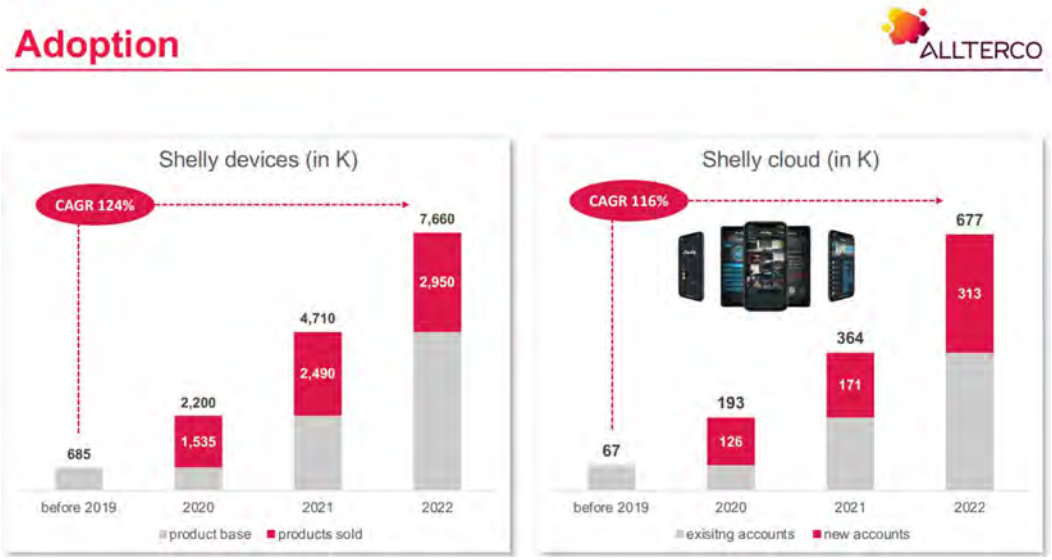
Note the above chart is in Euros.

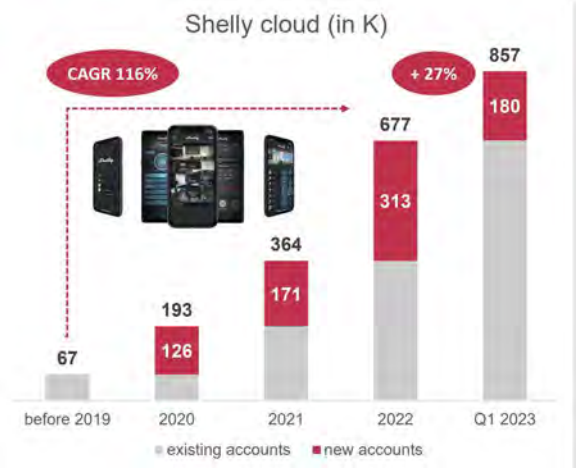


Growth accelerated in the DACH (Germany, Austria, Switzerland) region as this is the region is most developed by Shelly's salesforce and distribution strategy. A key part of Shelly's distribution strategy is not only training sales personnel but supporting technical schools that train technicians who install products.

Source: Company, Montega

While we can never be certain of the future, if growth in the other European regions match the path of growth in Germany, we should expect acceleration in other markets in 2024 and 2025.



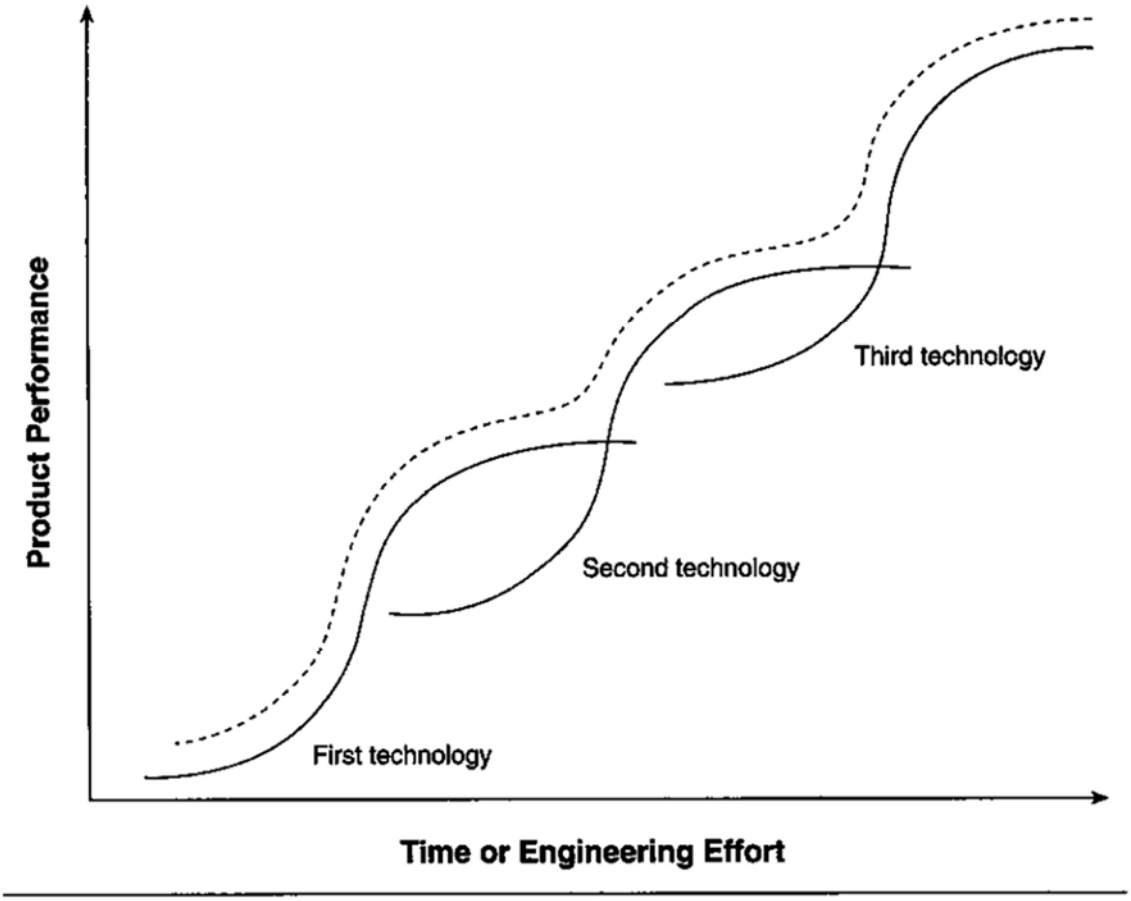


The Innovator's Dilemma

Shelly is growing very rapidly because it is disrupting many traditional hardware markets. To fully understand why this is happening and why it is likely to continue, we need to understand the difference between sustaining and disruptive technologies. Technology in this context means the processes by which an organization transforms labor, capital, materials, and information into products and services of greater value. Technology can mean anything from a transistor to a software language to a distribution strategy. And as we will soon see with Shelly, one of the most important disruptive technologies may be surprising.

IoT - Sustaining Technologies & Entrenched Competitors

In a given technology, early on innovation is slow and it takes a long time to develop incremental improvements to performance. After a certain length of time, however, development speeds up very rapidly and then as development matures the rate of performance improvement slows dramatically. To get more improvement along the Y-axis, we need a radical change in technology. This leads to another S curve. While performance might improve dramatically, it is still measured along the same dimension on the Y-axis (e.g. size, speed, safety, reliability, etc.).



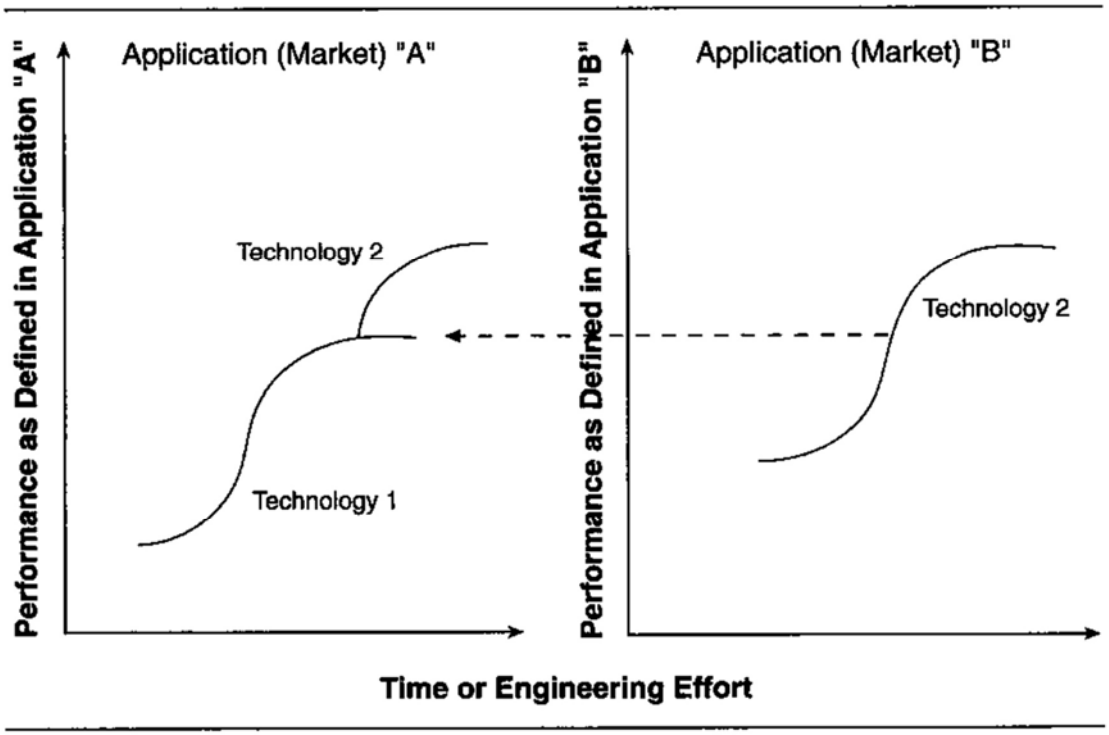
Source: Clayton M. Christensen, "Exploring the Limits of the Technology S-Curve. Part I: Component Technologies," *Production and Operations Management* 1, no. 4 (Fall 1992): 340. Reprinted by

In the building automation market, sustaining technologies have been measured on safety, reliability (e.g., failure rates per million), durability, and ability to get a replacement quickly (strength of the distribution channel). Secondary dimensions to consider have been software to create automation workflows and technical manuals to learn implementation techniques. Until very recently, these secondary dimensions were not considered important enough to change industry behavior as often it was just assumed automation implementation experts will go with the top brands who always led in safety, reliability, durability, and distribution strength. It is important to remember the building owner often does not make the decision on what switch or relay to use in an automation implementation. This decision is made by a specialist and as the old saying goes “no one ever got fired for going with IBM.” Also, these implementation specialists spent years building up their expertise in certain brands including Schneider and Siemens.

So, what do implementation specialists care about? Safety, reliability, durability, and distribution as their reputation depends on it. Also, they very often do not care about ease of use as more complex and time-consuming solutions mean more demand and higher earnings. One may be tempted to conclude that software is a disruptive technology. Historically, however, this was not the case as it did not change the dimensions of competition much. It may have added the dimension of being able to implement custom functions, but the large incumbents were able lead when software was based on closed systems that were not connected to the internet. If anything, custom software entrenched the incumbents due to lock-in with the installers (know how) and an installed base of products (switching is high due to the need to replace an entire system). Established distribution channels, an army of trained installers, and switching costs has created a very deep moat for incumbent IoT manufacturers.

Disruptive Technologies & Shelly

Disruptive technologies, as opposed to sustaining technologies (whether radical or incremental), change the performance dimensions a product or service is valued against. For example, under sustaining technologies, disk drive makers were measured against each other based on areal recording density per square inch. Disruptive technology (the Winchester Architecture for example) led to smaller drives and then drive makers were valued based on the overall size of the drive. The new technology usually then progresses along an S curve and eventually displaces the old technology.

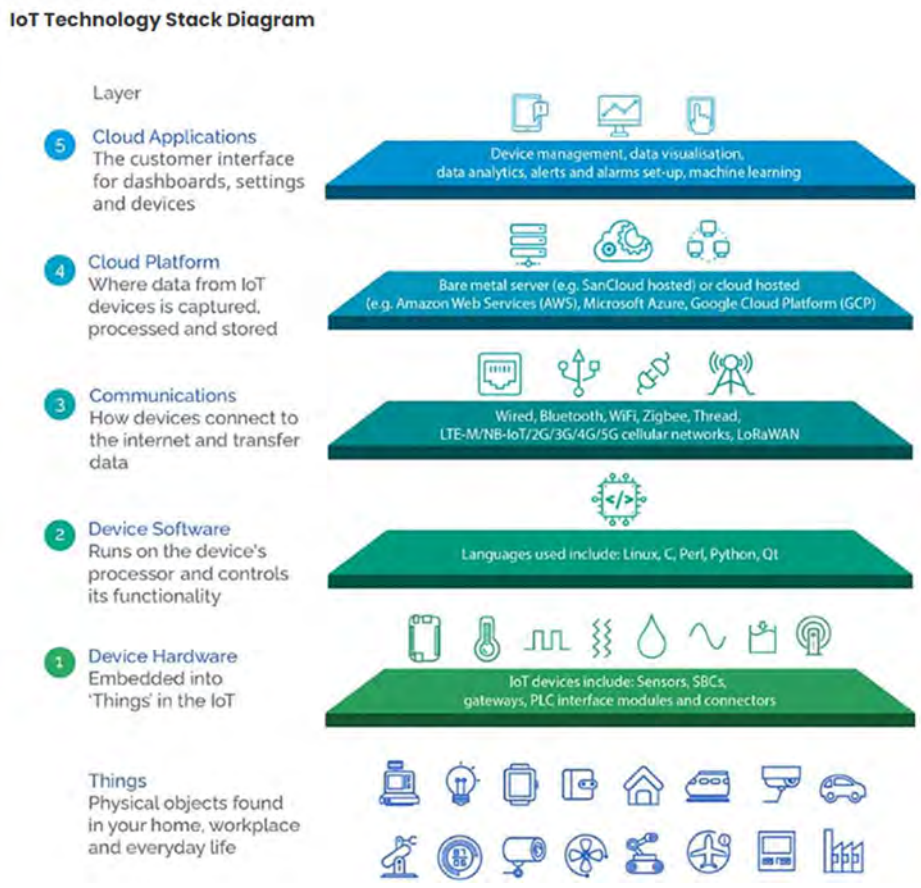


Source: Clayton M. Christensen, "Exploring the Limits of the Technology S-Curve. Part I: Component

So, what are the disruptive technologies in the IoT market?

1) Widely known scripting language – I.e., JavaScript
2) Device & Software IoT layers
    a. More advanced microcontrollers (e.g. the Espressif ESP32 and all its upgrades)
    b. Espruino JavaScript Interpreter – Write device code from a webpage, quickly implement code, wide base of developer knowledge.
    c. Embedded webserver – Webhooks, Websockets, OTA updates, ability to program the device in JavaScript from a web browser.
3) Communications IoT layer
    a. Wi-Fi
    b. IPv4 & IPv6
4) Cloud Applications IoT layer (Big Data and Remote Control)
5) Social websites
    a. GitHub, and countless tech forums (e.g. on Espruino, ESP chips, etc.)
    b. YouTube, Facebook, and LinkedIn
    c. Crowdfunding and large communities of developers

Social websites are not often thought of as inputs to the production of many physical products, but in fact they are now very critical to most businesses. The development of the above technologies has changed the performance dimensions that customers (often installation professionals) use to value IoT products.



Old Dimensions:

1) Safety
2) Reliability
3) Durability
4) Distribution Strength
5) Brand Name
6) Implementation Software (secondary as systems were closed and not easily customized)

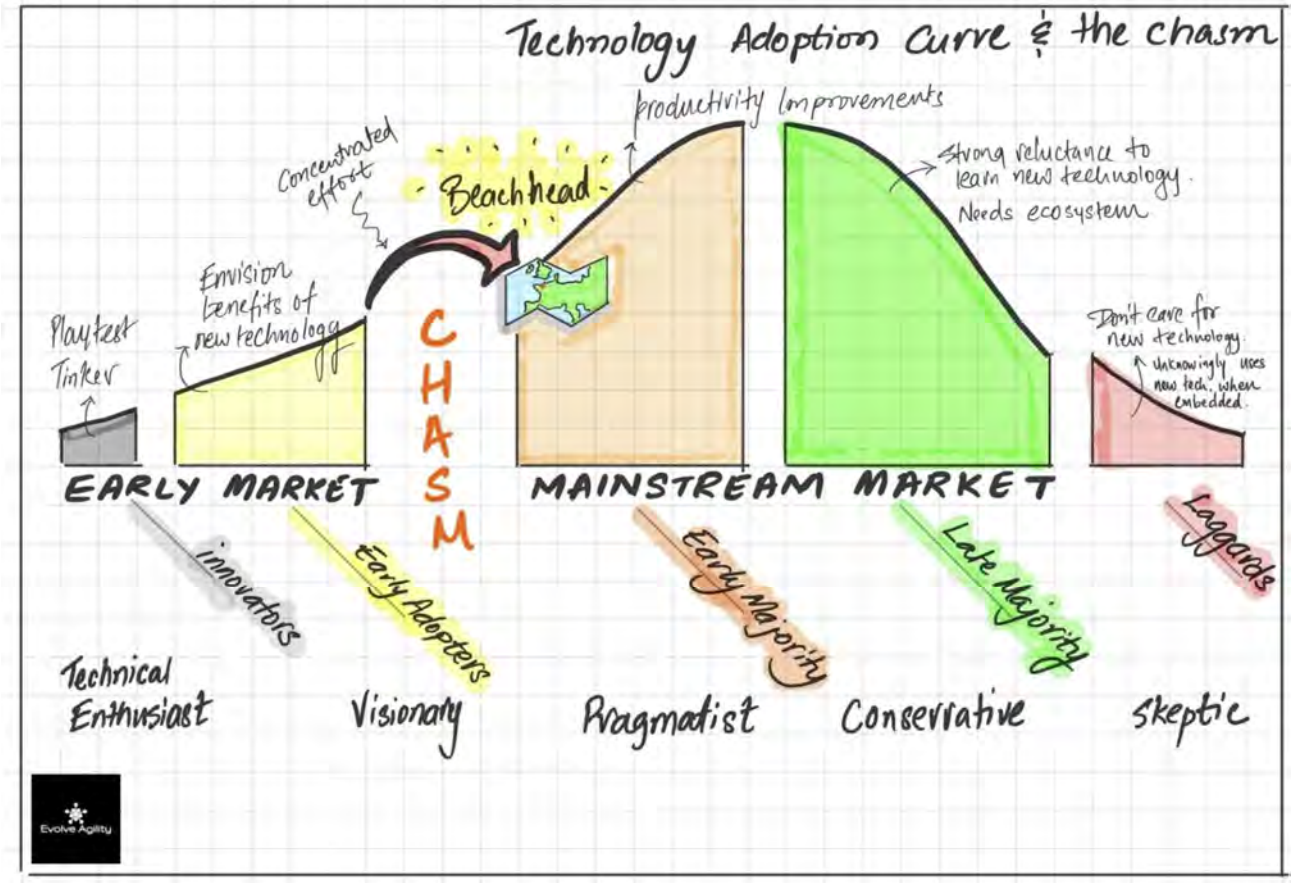
New Dimensions:

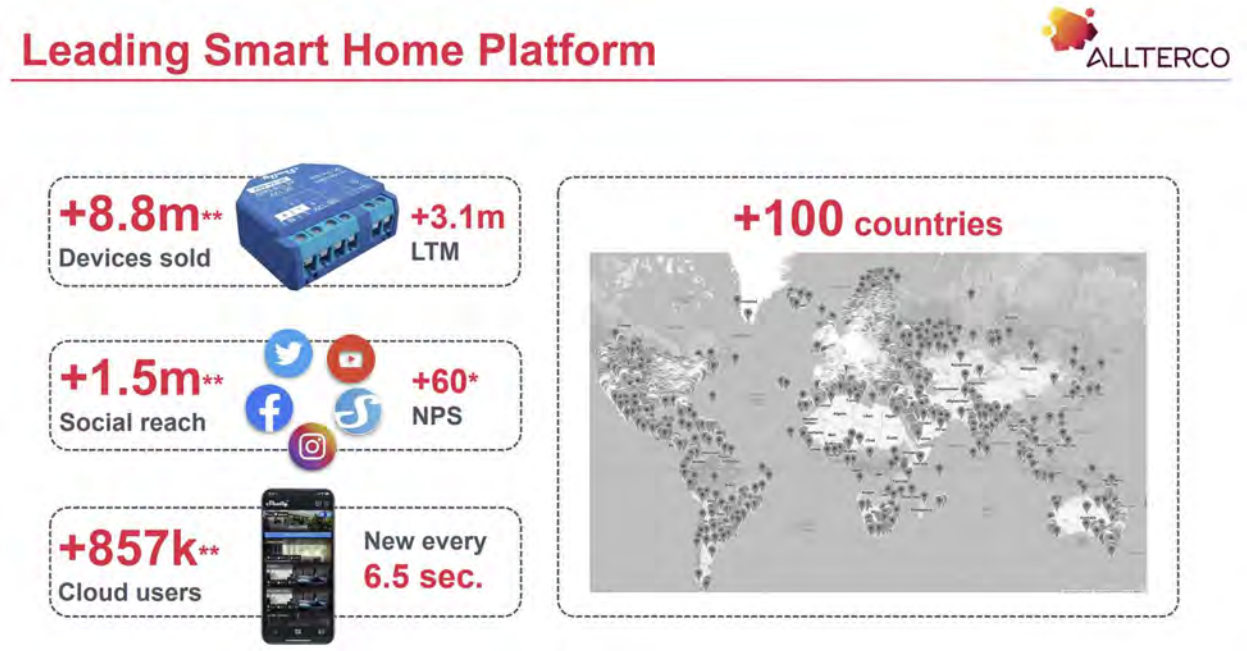
1) Code from anywhere
2) Analyze large data sets
3) Communication over the internet with other devices and websites
    a. Greater functionality
4) Ease / speed of implementation
    a. Number of available software applications already available
    b. Code / Software language knowledge base
    c. Ease of use of software (incumbent software was not evaluated based on ease of use but Shelly is changing that)

Ask yourself, how diffiuclt would it be for a competitor to replicate Shelly's social media presence today?

Shelly's Growth Strategy

Shelly's growth stragey was to first focus on home tinkers and to be the most open platform. Tinkerers are the people who know the difference betwee an Adruino and a Raspberry Pi. Shelly made products (plugs, switches, relays) that these tinkers could quickly and easily install and use for custom home automation projects. As the knowledge and code bases are building up, Shelly's products and services are now entering the mainstream and professional installer markets.





Each time a device is installed or a new user posts to a social media site, Shelly's competitive position is strengthen. An installed user base gives Shelly an opportunity to develop a long relationship with its customers and ecosystem partners that will last into the future.

On the sales side, you have signed contracts with Rexel in Finland and Lemvigh-Müller in Denmark, what do you expect from this and what is still in the pipeline in this regard?

Wolfgang Kirsch : Part of our medium-term strategy is to intensify the cooperation with professional plumbers and electricians. Here, Rexel is one of the leading wholesalers in Europe, while Lemvigh-Müller is the market leader in Denmark. The business relationship with the two wholesalers in Northern Europe is an essential step in the implementation of our strategy in this market segment. Together with these two partners, we have now trained over 1,000 installers and received a lot of positive feedback. Discussions in other regions are also ongoing. So far we have mainly sold to do-it-yourself customers, but the market for professional installers and electricians is much larger. It is important to develop this while remaining attractive to our loyal DIY customers.

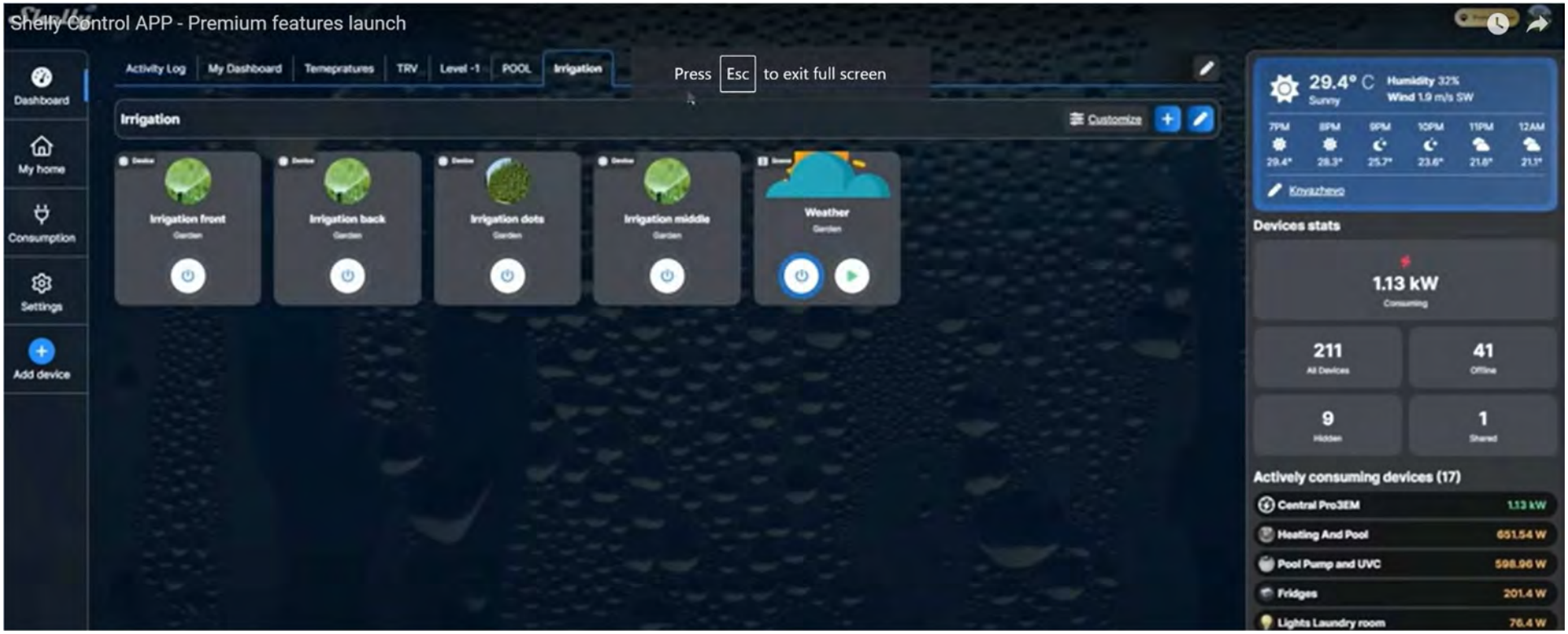
What are currently the most important distribution channels for Shelly products?

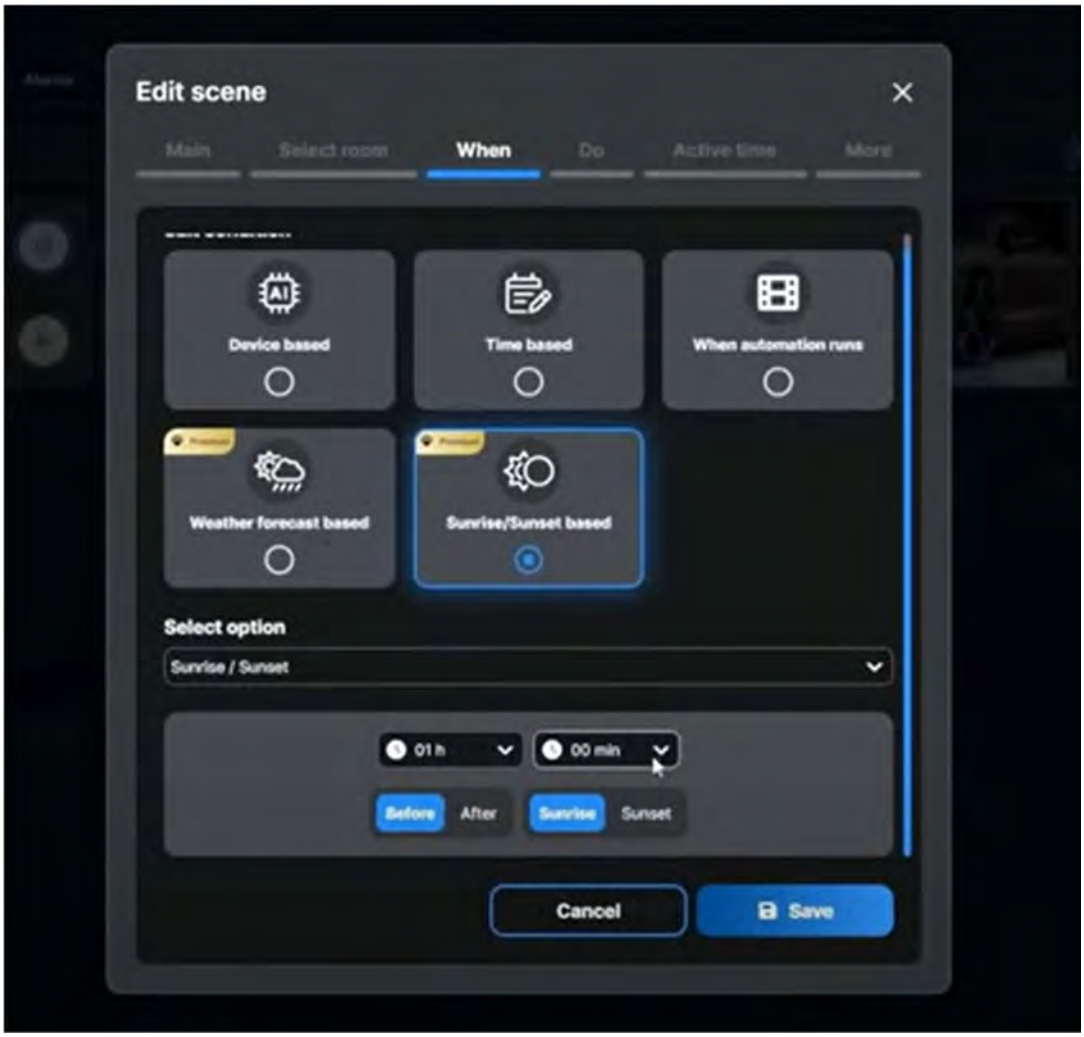
Wolfgang Kirsch: We currently generate around 80 percent of our sales in the B2B sector. Distributors in the individual countries handle the sale of our products and sell them to hardware stores, online shops, and electricians and network installers. Online trading is one of the most important sales channels for our products. Since many of our products have already been offered via Amazon Marketplace for some time, we decided last year to supply Amazon directly. This step pays off. The sales development at Amazon is extremely positive and at the same time we can control the flow of goods more efficiently. Overall, the area of electrical and network installation will continue to be the most important sales channel in the coming years.

The interview is with Wolfgang Kirsch, Shelly co-CEO, from March 2023.

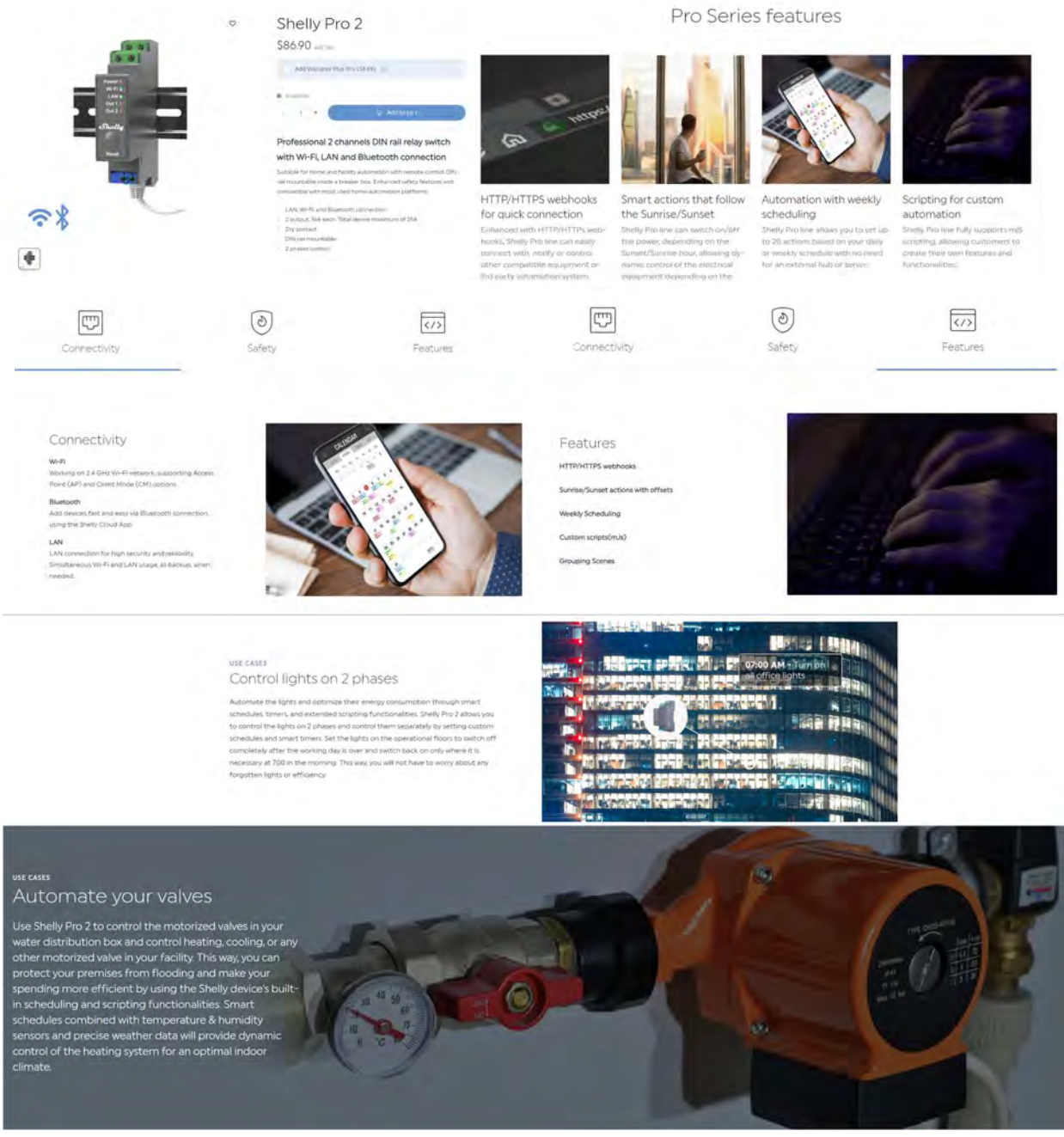
https://www.boersengefluester.de/allterco-wir-werden-viel-positives-zu-berichten-haben/

Many of Shelly's functions can be written in JavaScript which is very useful for the tinkerer and professional installer but are too difficult for the average person. However, these functions can now be more easily created with the premium application. Below is an irrigation setup using the premium application instead of JavaScript code.

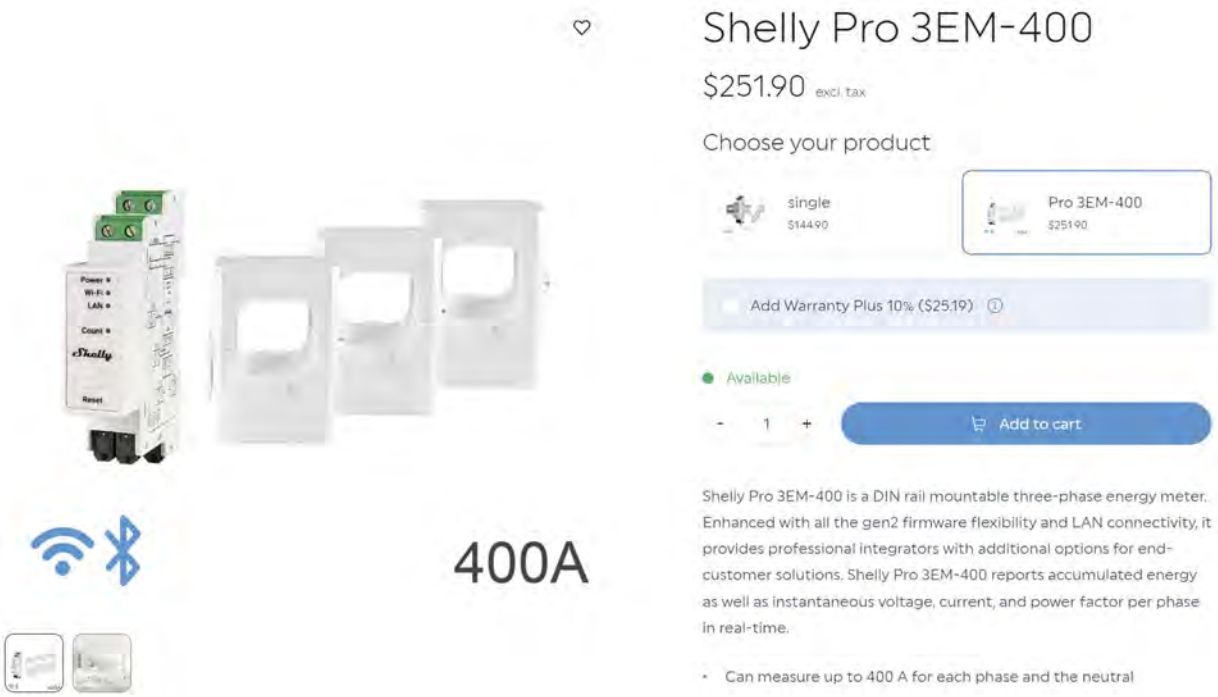



Edit scene
Main
Select room
When
Do
Active time
More
Device based
Time based
When automation runs
Weather forecast based
Sunrise/Sunset based
Select option
Sunrise / Sunset
01 h
00 min
Before
After
Sunrise
Sunset
Cancel
Save

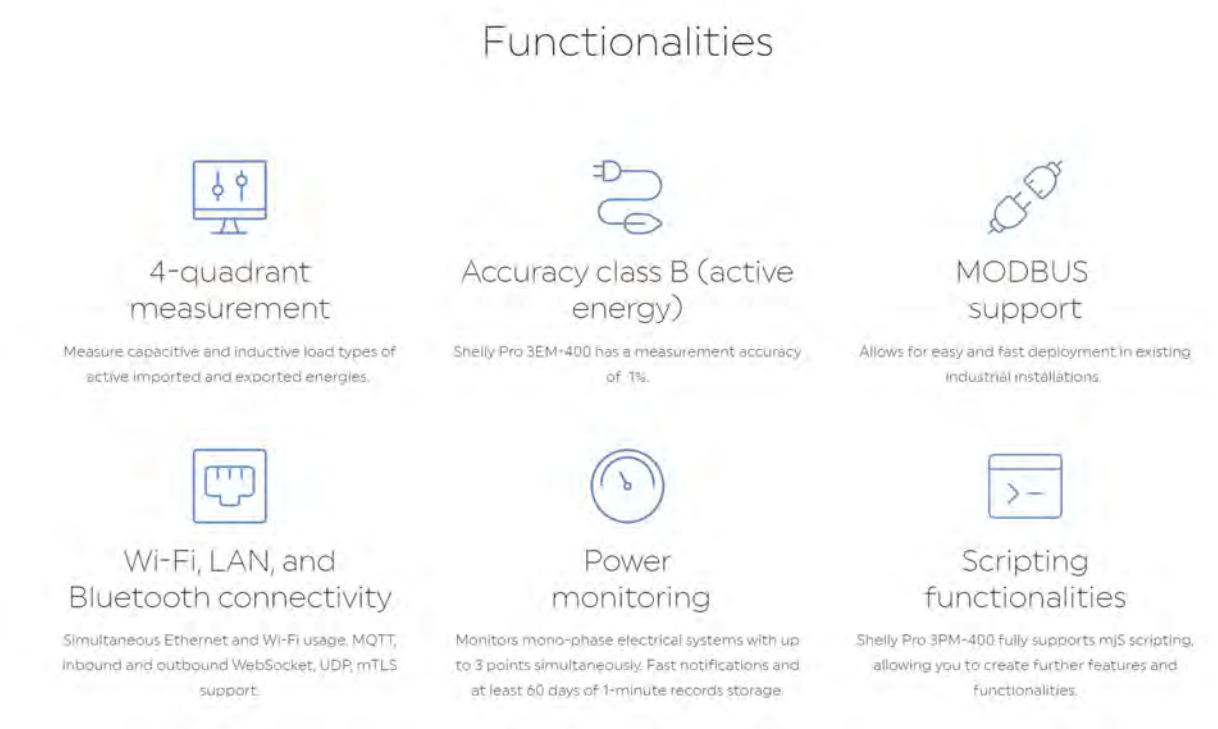
Notice, as Shelly moves into the Pro series, it touts its connectivity and scripting features. As you read the following sections on competitors compare their ease of use and versatility versus Shelly products. Connectivity and scripting will allow Shelly to enter the professional and industrial markets.



Shelly's industrial products also sell at a higher price point than home automation products.



Notice the MODBUS support as this opens industrial markets.



FEATURES

Industry-grade security

Shelly Pro 3EM-400 supports mTLS for MQTT, HTTP, and secure outbound WebSockets. Its industry-grade security allows for direct connections to your cloud infrastructure, reducing the cost of deploying complex networks and VPNs.

USE CASES

Industrial installations

Shelly Pro 3EM-400 brings support for MODBUS for voltage, current, power, and energies. You can accurately sample your energy usage and instantaneous values of voltage, current, and power. Our new firmware platform allows for custom implementation that can report as fast as every 100ms to your infrastructure.

USE CASES

2-way energy consumption monitoring

Monitor your home, office, or factory, and avoid additional expenses or drops in voltage that can damage your appliances and devices. Shelly Pro 3EM-400 can calculate 2-way consumption: produced and used energy for each of the three phases. The device can be configured to measure three separate circuits of a mono-phase electrical system. View the quality of your electricity network regarding active power, reactive power, voltage, and power factor.

USE CASES

Local control

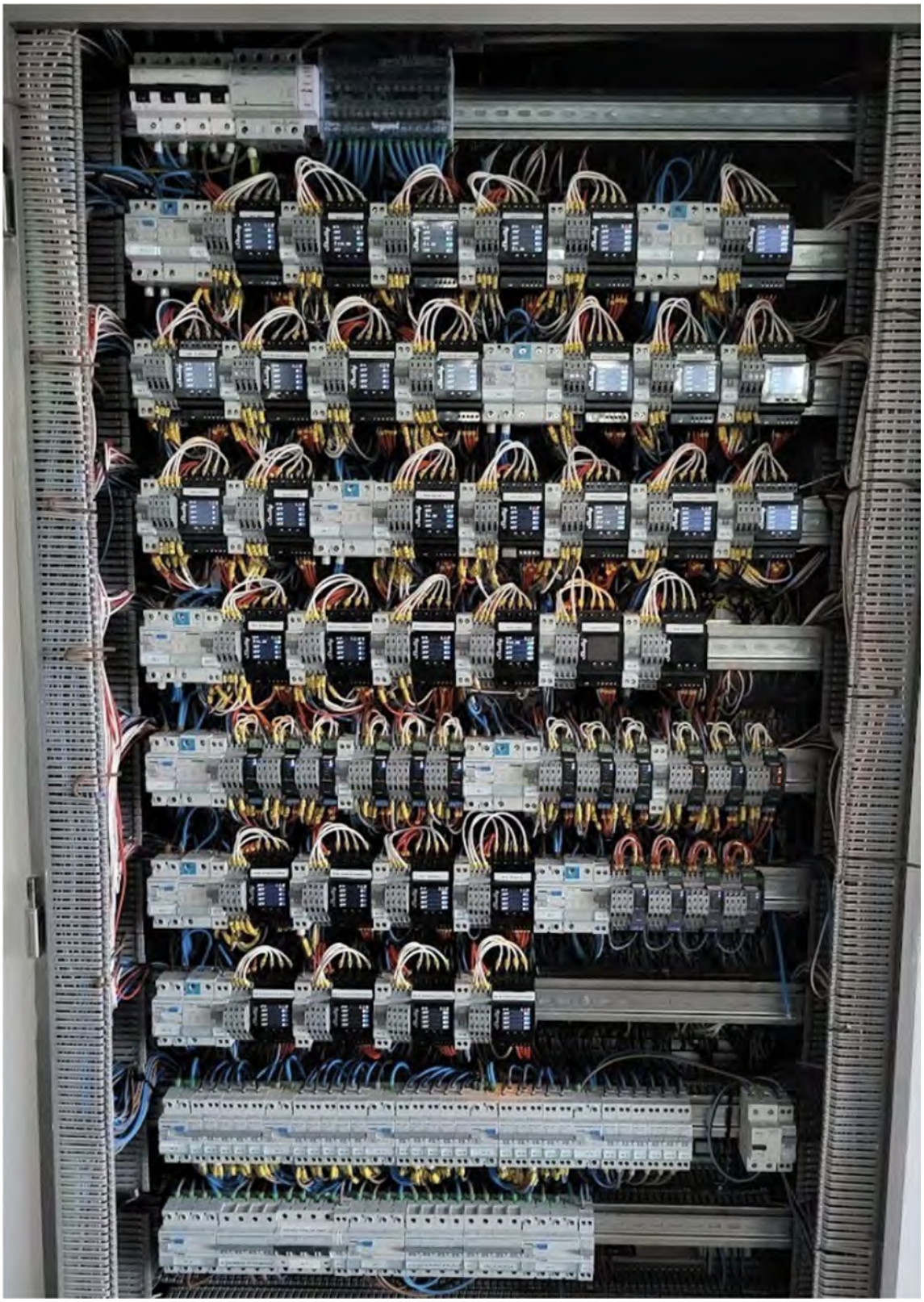
Thanks to Shelly Pro 3EM-400's scripting functionalities and webhooks, you can now easily control other Shelly or Wi-Fi devices on your local network. Use these capabilities to set exact parameters for heating, cooling, or electric vehicle charging based on PV production and have your devices automatically shed power usage. All these work without using a cloud.

USE CASES

Solar panels monitoring and control

Keep track of how much energy your solar panels or wind turbines are generating and save effortlessly. Shelly Pro 3EM-400 provides real-time information about the efficiency of the solar and wind energy system, as well as historical data on how much energy has been generated and consumed every minute for the past 60 days. This helps you control the energy flow, getting the most out of your solar panels and wind turbines. To take it a step further, connect Shelly Pro 3EM- 400 to your other Shelly devices and create scenes to trigger desired actions like turning off appliances or sounding alarms.

RADIO	
RF band:	2400 - 2495 MHz
Max. RF power:	<20 dBm
Wi-Fi protocol:	802.11 b/g/n
Wi-Fi Range:	Up to 30 m / 100 ft indoors and 50 m / 160 ft outdoors (Depends on local conditions)
Bluetooth Protocol:	4.2
Bluetooth Range:	Up to 10 m / 33 ft indoors and 30 m / 100 ft outdoors (Depends on local conditions)
MCU	
CPU:	ESP32-D0WDQ6
Flash:	16 MB
FIRMWARE CAPABILITIES	
Webhooks (URL actions):	20 with 5 URLs per hook
Scripting:	mJS
MQTT:	Yes
CoAP:	No

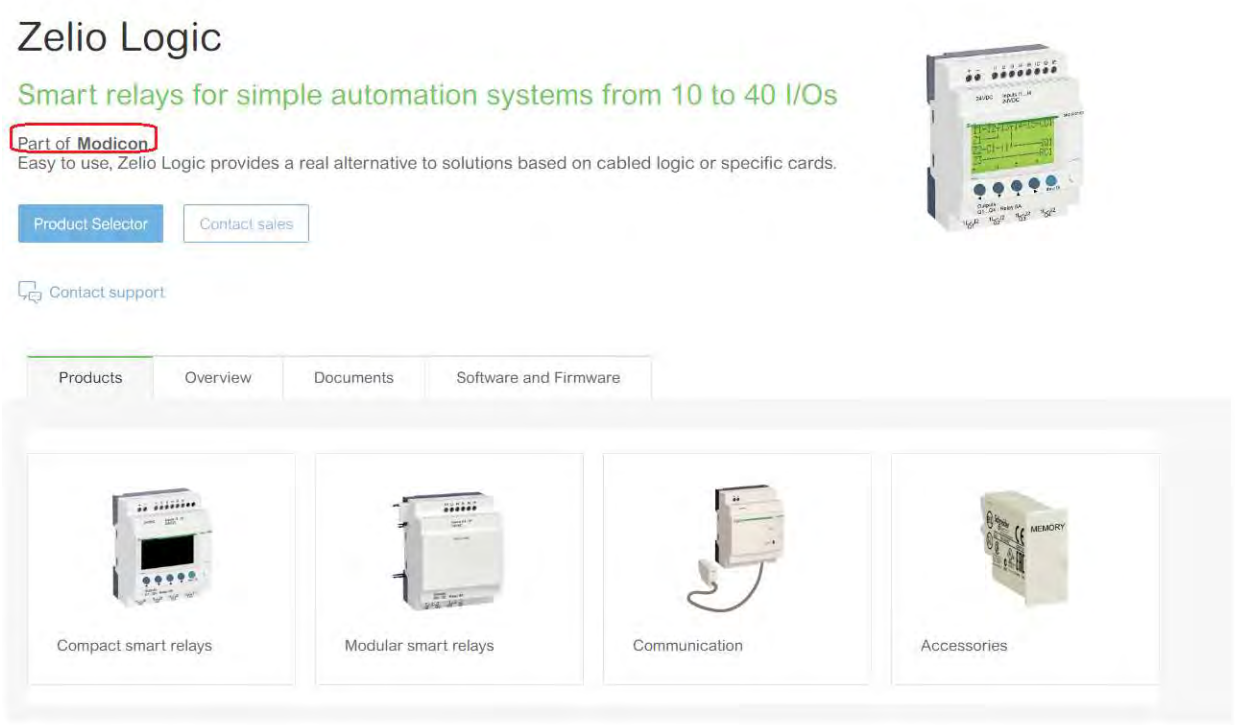


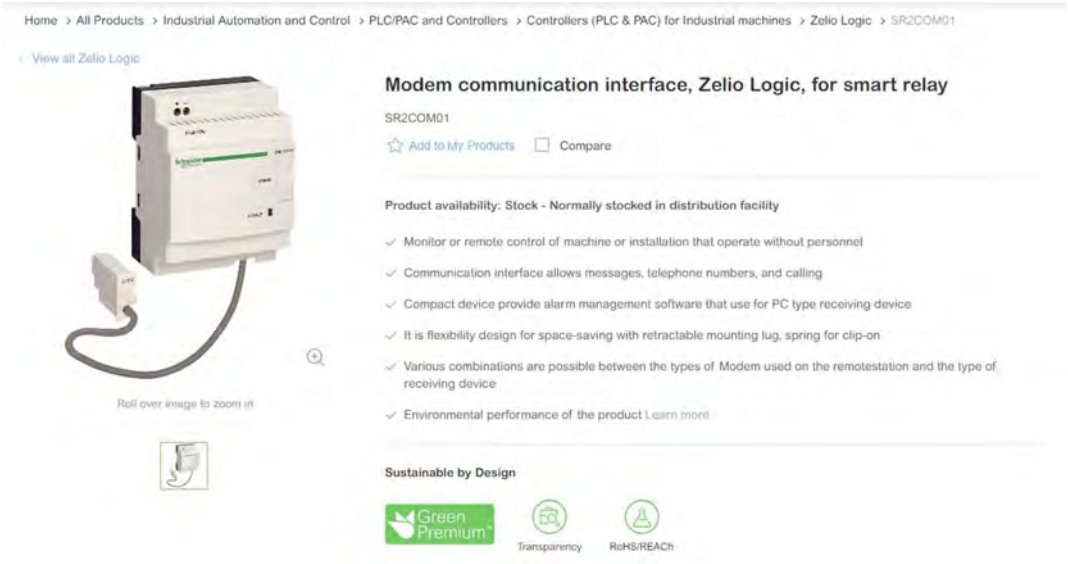
This use case would be for a very big house or more likely an office building or perhaps hotel.

Competitors

Schneider

For simple automation systems Schneider has the Zelio line of products which are part of the Modicon line of products which uses the Modbus communications protocol. Again, a lot of screenshots but the pictures speak a thousand words to how far behind the competition is compared to Shelly.





General

Zelio Logic
Smart relays for simple automation solutions

Advantages

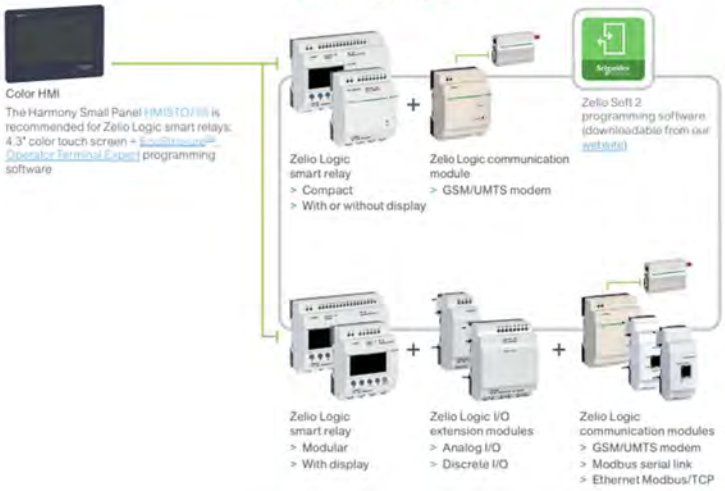
Higher performance
> Two times more programming memory and more function blocks by simply updating the firmware

Greater functionality
> PID function for HVAC applications and 2G/3G modems
> 24 VDC module inputs compatible with NTC temperature probes (programmable in FBD language)

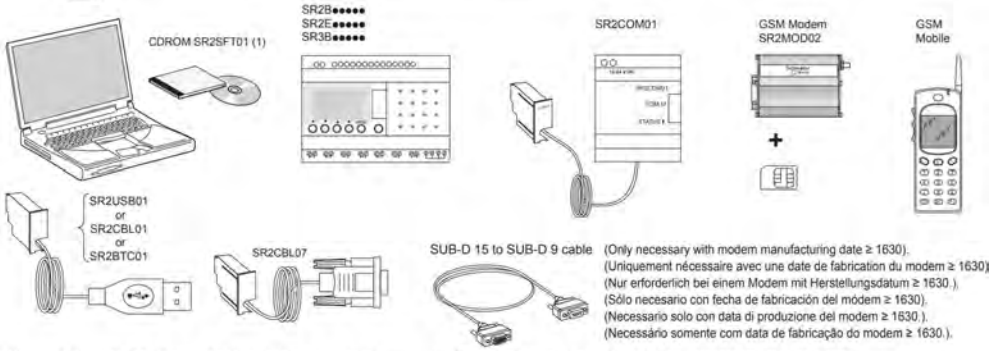
Greater efficiency, less engineering time
> Free software and firmware downloadable from the Schneider Electric website
> Get to grips with the software in less than an hour, simplified tool-free programming in ladder, FBD, and SFC languages for small applications
> Access to the program and modification of settings on integrated display

More flexibility - Easy design, maintenance, and commissioning
> Range of compact and modular smart relays and extension modules
> Programmable logic: a smart alternative to hard-wired logic or dedicated cards

System components



A **Required hardware / Matériel nécessaire / Erforderliche Hardware**
Material requerido / Hardware richiesto / Hardware necessário



(Only necessary with modem manufacturing date ≥ 1630).
(Uniquement nécessaire avec une date de fabrication du modem ≥ 1630)
(Nur erforderlich bei einem Modem mit Herstellungsdatum ≥ 1630.).
(Sólo necesario con fecha de fabricación del módem ≥ 1630).
(Necessario solo con data di produzione del modem ≥ 1630.).
(Necessário somente com data de fabricação do modem ≥ 1630.).

(1) Also available on the http://www.schneider-electric.com website.
(1) Egalement disponible sur le site web http://www.schneider-electric.com.
(1) Auch verfügbar auf der Website http://www.schneider-electric.com.
(1) También disponible en el sitio web http://www.schneider-electric.com.
(1) Disponibile anche sul sito Web http://www.schneider-electric.com.
(1) Também disponível no site http://www.schneider-electric.com.

Modbus

Widely used serial fieldbus for all applications

The transparent and open protocol communication

Contact Sales | Contact support

Overview | Documents | Software and Firmware

Features

Introduced in 1979 by Schneider Electric (Modicon), the Modbus® fieldbus is an essential, open communication standard, supported by a large number of products and vendors on the market today.
With over 7 million nodes in North America and Europe alone, Modbus is the de facto standard in multi vendor integration.
In a typical Modbus network, messages are sent over an RS232/RS485 serial communication link (EIA standard). The Modbus protocol is based on a master/slave principle, eg. the master sends a request and the addressed slave sends back a response.
As Modbus is a protocol which is independent of the physical network layer, Modbus serial line can be integrated seamlessly into Modbus TCP networks, using simple gateways. This is transparent for the Client application.

Technical characteristics:

- Up to 247 devices in one network
- Up to 1km network range
- Broadcast messaging supported
- Standard cabeling

Modbus is a data communications protocol originally published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs). Modbus has become a *de facto* standard communication protocol and is now a commonly available means of connecting industrial electronic devices.[1]

Modbus is popular in industrial environments because it is openly published and royalty-free. It was developed for industrial applications, is relatively easy to deploy and maintain compared to other standards, and places few restrictions on the format of the data to be transmitted.

The Modbus protocol uses character serial communication lines, Ethernet, or the Internet protocol suite as a transport layer. Modbus supports communication to and from multiple devices connected to the same cable or Ethernet network. For example, there can be a device that measures temperature and another device to measure humidity connected to the same cable, both communicating measurements to the same computer, via Modbus.

Modbus is often used to connect a plant/system supervisory computer with a remote terminal unit (RTU) in supervisory control and data acquisition (SCADA) systems. Many of the data types are named from industrial control of factory devices, such as ladder logic because of its use in driving relays: a single-bit physical output is called a *coil*, and a single-bit physical input is called a *discrete input* or a *contact*.

The development and update of Modbus protocols have been managed by the Modbus Organization[2] since April 2004, when Schneider Electric transferred rights to that organization.[3] The Modbus Organization is an association of users and suppliers of Modbus-compliant devices that advocates for the continued use of the technology.[4] Modbus Organization, Inc. is a trade association for the promotion and development of the Modbus protocol.[2]

Limitations [edit]

- Since Modbus was designed in the late 1970s to communicate to programmable logic controllers, the number of data types is limited to those understood by PLCs at the time. Large binary objects are not supported.
- No standard way exists for a node to find the description of a data object, for example, to learn that a register value represents a temperature between 30 and 175 degrees.
- Since Modbus is a client/server (formerly master/slave)[5] protocol, there is no way for a field device to get data by the event handler mechanism (except over Ethernet TCP/IP, called open-mbus) as the client node must routinely poll each field device and look for changes in the data. This consumes bandwidth and network time in applications where bandwidth may be expensive, such as over a low-bit-rate radio link.
- Modbus is restricted to addressing 247 devices on one data link, which limits the number of field devices that may be connected to a parent station (again, Ethernet TCP/IP is an exception).
- Modbus protocol itself provides no security against unauthorized commands or interception of data.[6]

Compare Modbus to the functionality of RPCs, OTAs, webhooks, websockets and the ability to grab information from the internet and use that in creating scripts and actions.

Zelio products use computer program languages Ladder and FBD. How many more people know how to use JavaScript versus Ladder or FBD? I am not sure, but my guess is quite a large number. Approximatley, 14 million people know how to use JavaScript.

Discover **Zelio** Logic SR2/SR3

About Zelio Logic Smart relays

Designed to manage simple automation systems, **Zelio** Logic smart relays, with their unique combination of value for money and ease of use, provide a real alternative to solutions based on cabled logic or specific cards.

Zelio Logic offers you the choice of two ranges: Compact versions with fixed configurations and Modular versions with extension modules. The smart relays propose a PID function for HVAC applications and a 2G/3G modem communication ability.

Zelio Logic configuration software, **Zelio** Soft, provides simplified tool-free Ladder or FBD and SFC language programming for small applications and is available for free download from our website.

Download Zelio Soft

Benefits of **Zelio** Logic SR2/SR3

Flexible

Zelio Logic offers you the choice of 2 ranges- Compact and Modular with expandable units and two programming languages (FBD or LADDER).

Open

Zelio Logic enables you to control and monitor installations in any situation, either on-site or remotely.

Simple

Simple to select, install and program, Zelio Logic is suitable for all your applications.

Below are screenshots from a Zelio Soft operating manual. Which is easier—a Shelly implementation or the one below? For Shelly, you can go on YouTube to learn how to do the implementation and then go on GitHub to get the code.

Greenhouse Ventilation Panes

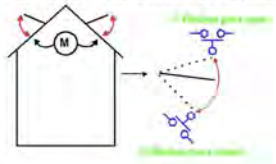
Description

This example describes how greenhouse ventilation panes can be managed automatically.

Specifications

The owner of a greenhouse would like to acquire an installation to manage the opening and closing of the ventilation window panes located on the greenhouse roof.

The greenhouse has two window panes to provide ventilation. The opening of these window panes is controlled by a motor and 2 sensors that indicate whether the window panes are open or closed:



During the day, the window panes open to ventilate the structure from 12:00 to 15:00, at the time of day when, in principle, the temperature is the highest. However, if the temperature is less than 10 °C, the window panes do not open, or when they are already open, they close.

In addition, the window panes open during the day when the temperature reaches 25 °C. If the temperature falls below 25 °C, the window panes must close again.

Finally, at night, the window panes remain closed regardless of the temperature.

Program description, 3 time ranges are used:

- Range 1: Night, from 21:00 to 07:00
- Range 2: Day, from 07:00 to 12:00 and from 15:00 to 21:00
- Range 3: Noon, from 12:00 to 15:00

Summary:

Input/Output Table

Description of the inputs:

Input	Description
I1	Window panes open (Discrete)
I2	Window panes closed (Discrete)
IB	Temperature (analog)

Description of the outputs:

Output	Description
Q1	Opening of the window panes (Discrete)
Q2	Closing of the window panes (Discrete)

The temperature is supplied by a sensor with output voltage of 0 to 10 V.

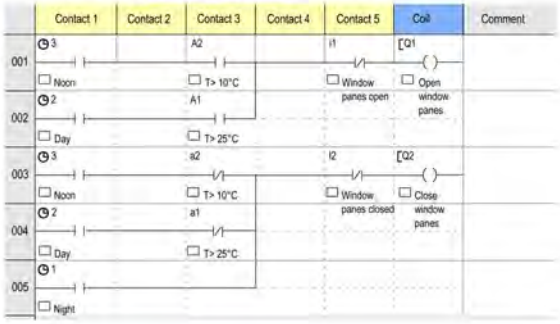
Required Reference

For this application, a smart relay with a clock and analog inputs is required:

- **SR2B121BD** (24 Vdc),
- **SR2B122BD** (24 Vdc),
- **SR2B121JD** (12 Vdc).

The LD Wiring Sheet

This figure shows the example with Ladder symbols display:



Description of the Parameters

Daily programmer H1:

Channel C:

The other channels (A, B, D) are not configured.

Daily programmer H2:

Channel C:

- ON: 07:00 OFF 12:00,
- The other parameters are the same as for programmer H1.

Channel D:

- ON: 15:00 OFF 21:00,
- The other parameters are the same as for programmer H1.

The other channels (A, B) are not configured.

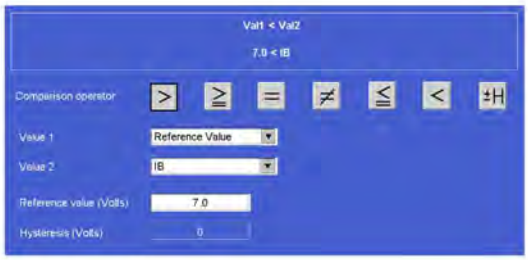
Daily programmer H3:

Channel C:

- ON: 12:00 OFF 15:00,
- The other parameters are the same as for programmer H1.

The other channels (A, B, D) are not configured.

Analog comparator a1

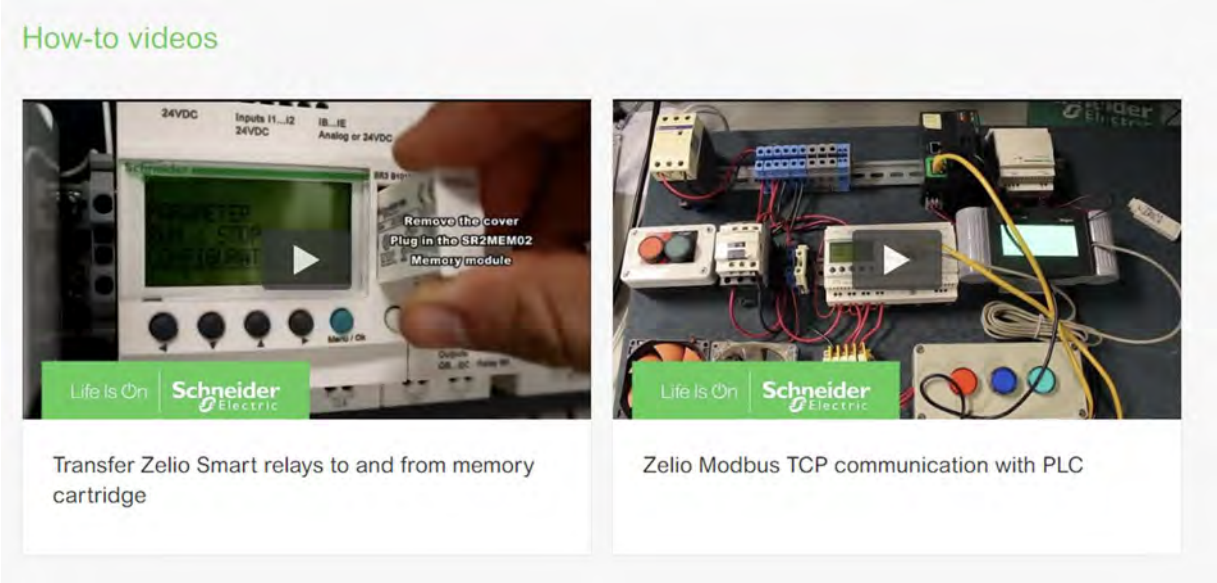


Analog comparator A2

- Reference value: 3 Volts.

The other parameters are the same as for programmer A1.

And what does Schneider have for a knowledge base? Compare these vidoes to the videos one will find on YouTube regarding Shelly.



https://download.schneider-electric.com/files?p_enDocType=Instruction+sheet&p_File_Name=1602234_01_11_A05.pdf&p_Doc_Ref=1602234_01A55

https://www.se.com/us/en/product-range/531-zelio-logic/

https://download.schneider-electric.com/files?p_Doc_Ref=DIA3ED2111202EN&p_enDocType=Catalog&p_File_Name=Catalog+Zelio+Logic+Smart+relays+for+simple+automation+systems+from+10+to+40+IOs_English_January+2022.pdf

https://www.se.com/us/en/product-range/542-zelio-soft/#overview

https://download.schneider-electric.com/files?p_Doc_Ref=EIO0000002600

https://download.schneider-electric.com/files?p_Doc_Ref=EIO0000002612

For more advanced projects Schneider has the ExoSctruxure software platform. But this suffers from the inherent weakness evident in the Zelio platform. It just adds more prebuilt functionality in a closed system built on aged technologies.

What is EcoStruxure?

EcoStruxure is Schneider Electric's IoT-enabled, plug-and-play, open, interoperable architecture and platform, in Homes, Buildings, Data Centers, Infrastructure and Industries. Innovation at Every Level from Connected Products to Edge Control, and Apps, Analytics and Services.

EcoStruxure explained in 3 minutes

EcoStruxure enables enhanced safety, reliability, efficiency, sustainability, and connectivity in your business. How? By using advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level.

Search products, documents & more

Products Solutions Services Support About Us

For Your Business > EcoStruxure™ : IoT-enabled architecture and platform >

What is EcoStruxure Platform?

At the heart of our IoT system architecture is the EcoStruxure Platform. Connecting everything in your enterprise from the shop floor to the top floor. Collecting critical data, from sensors to the cloud. Analyzing data to discover meaningful insights. Enabling you to act based on real-time information and business logic. The EcoStruxure Platform is the foundational technology backbone on which Schneider Electric solutions are built and delivered.

EcoStruxure Platform enables:

Core capabilities for connectivity and intelligence

The platform enables embedded connectivity and intelligence, using standards-based communication protocols and the ability for smart devices to perform native analytics for control decisions.

An interoperable foundation for smart operations

It assists developers, system integrators, and your engineering staff in building applications such as monitoring, visualization, and control systems for implementing smart operations across your enterprise.

Infrastructure for cloud-connected digital services

Leveraging scalable Microsoft Azure IoT technology, the EcoStruxure Platform allows us to deliver value-added digital services to help optimize your operations.

Discover Network Management Card

Securely monitor and control business in a connected world

The Schneider Electric Network Management Card enables secure remote monitoring and control of power and cooling infrastructure by connecting it directly to the network.

Our Network Management Card support contract licenses offer always up-to-date features and security to ensure you have the most resilient, secure and sustainable IT infrastructure.

View the Network Management Card options ›

Schneider Electric Device IP Configuration Wizard

The Device IP Configuration Wizard is a Windows application designed specifically to remotely configure the basic TCP/IP settings of Network Management Cards. The Wizard runs on Windows® Server 2012, Windows Server 2016, Windows Server 2019, Windows 8.1, and Windows 10. This utility is for IPv4 only.

NOTES:

- In firmware version v1.4.x and higher, it is not supported to assign IP addresses to Network Management Cards using the Wizard.
- You cannot search for assigned devices already on the network using an IP range unless you enable SNMPv1 and set the Community Name to "public". For more information on SNMPv1, see the User Guide.
- When the NMC IP address settings are configured, to access the NMC Web UI in a browser, you must update the URL from http to https.

The Wizard is available as a free download from the APC website at www.apc.com:

1. Go to https://www.apc.com/shop/us/en/tools/software-firmware and click **Show More** from the list of checkboxes in **Filter by > Software / Firmware**.
2. Select **Wizards and Configurators** to view the list of utilities available for download.
3. Click the Download button to download the **Device IP Configuration Wizard**.

Who doesn't love something that runs on Windows 10 and a Windows Server 2019 and only works on IPv4 (IPv6 is faster than IPv4)?

Network Management Card Features

Improving resiliency and security in IT infrastructure management with remote power device management

EcoStruxure™ IT integration: Monitor and manage your equipment more efficiently. The vendor-neutral architecture delivers a new standard for proactive insights on critical assets of an IT environment.

Network Management System (NMS) compatible: Make device information available to your preferred NMS by forwarding SNMP traps (events) or polling across SNMP (v1/v3) using the PowerNet MIB.

Modbus TCP/IP support: Benefit from Modbus TCP/IP support with operational flexibility wired for the industry and energy business, to efficiently control or take remote readings from automated equipment.

Reboot equipment remotely: Quickly re-establish availability over your network and save dispatching technicians to remote locations.

Battery management for UPS: Manage and maintain the battery system with detailed battery information, providing early fault warning.

Flash upgradeable NMC firmware: Convenient remote installation of NMC device firmware updates.

PowerChute Network Shutdown software*: Graceful server shutdown with support for virtualized and hyperconverged environments. (VMware® ESX/ESXi, Microsoft® Hyper-V and SCVMM, Nutanix AHV)

* A separate license purchase is needed to benefit from all features

Notification
Receive alerts to quickly deal with issues

Scheduling
Customize shutdown and reboot of connected equipment to UPS

Data logging
Identify problematic trends before they escalate or export logs for analysis

Event logging
Pinpoint timing and sequence of events leading up to an incident with event log

https://www.se.com/us/en/work/campaign/innovation/platform.jsp

https://industrie-elektronik.at/dl/Datenbl%C3%A4tter/Steuerungen/SPS/SPS%20f%C3%BCr%20Anlagen%20und%20Maschinen/EcoStruxure%20Control%20Expert/EcoStruxure%20Manual.pdf

https://www.se.com/us/en/work/campaign/innovation/platform.jsp

http://cdn.cnetcontent.com/44/9d/449de622-a1ec-4570-aa59-0e6e4fac3265.pdf

https://www.se.com/us/en/product-range/61936-ups-network-management-cards/#overview

https://download.schneider-electric.com/files?p_enDocType=Brochure&p_File_Name=AP9544+Network+Management+Card_end_user_brochure+FINAL.pdf&p_Doc_Ref=NMC_for_EasyUPS_Brochure_EN

Siemens

Siemens is very similar to Schneiders but uses KNX communications protocols. It also uses FBD and Ladder.

LOGO! logic modules

Overview

LOGO! logic modules

- The compact, easy-to-use and low-cost solution for simple control tasks
- Compact, easy to operate, universally applicable without accessories
- "All in one": Integrated display and operator panel
- 36 different functions can be connected at the press of a button or by means of PC software; up to 130 times
- LOGO! 8: 38/43 different functions can be linked at the press of a button or using PC software; up to 200/400 times
- Functions are easy to change at the press of a button. No more time-consuming rewiring

SIPLUS LOGO!

- The controller for use in the toughest environmental conditions
- With extended temperature range from -40/-25 °C to +70 °C
- Suitable for exposure to media (harmful gas atmosphere)
- Condensation permissible
- With the proven PLC technology of LOGO!
- Easy to handle, program, maintain, and service
- Ideal for use in automotive engineering, environmental engineering, mining, chemical plants, material handling, food industry, etc.

Accessories:

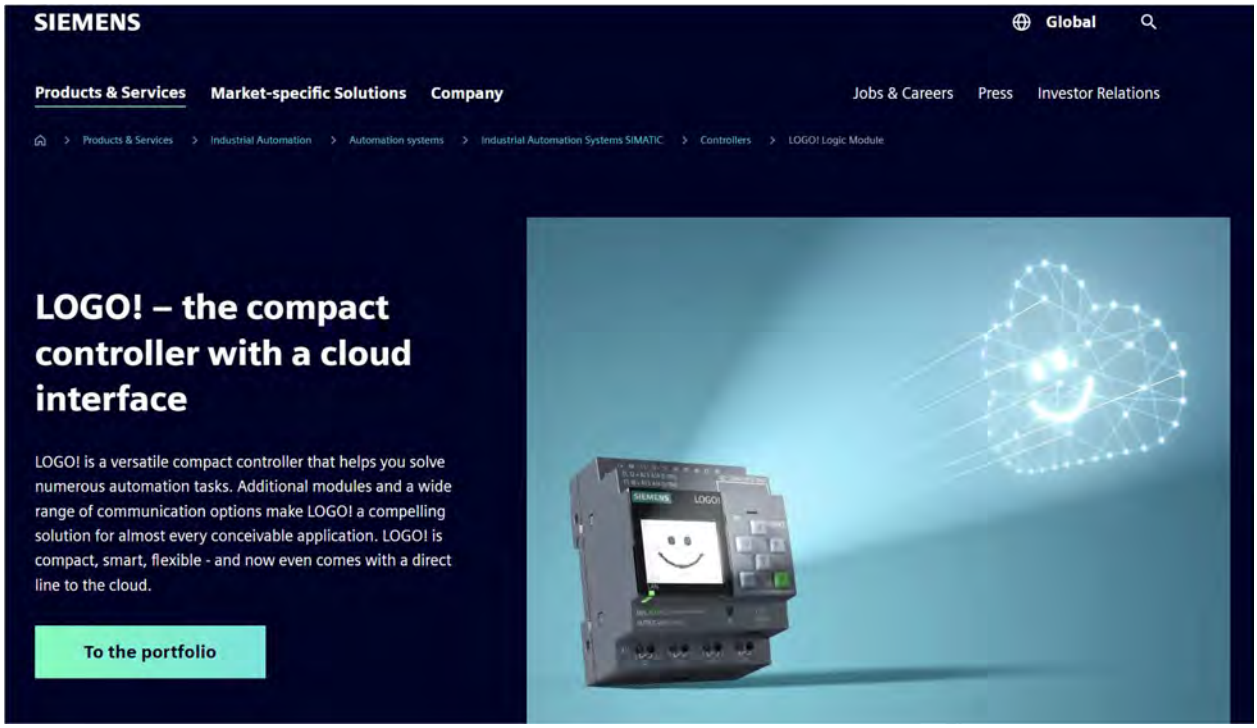
- The front panel mounting set also allows simple and reliable installation of the logic modules in front panels; IP65 protection is thus possible.
- In order to ensure dependable operation of SIPLUS devices supplied by the battery in conjunction with combustion engines, it is necessary to put in a SIPLUS upmiter upstream device between the battery and the SIPLUS LOGO!.

For more information, please go to:

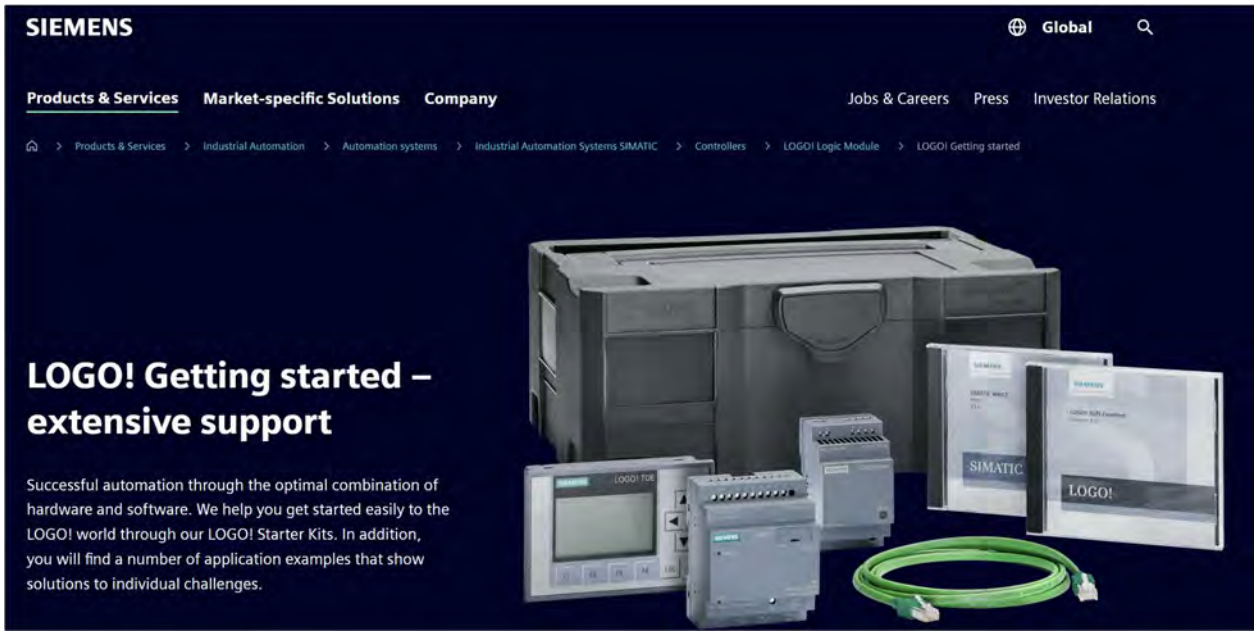
http://www.siemens.com/siplus-extreme

General technical specifications SIPLUS LOGO!

Ambient temperature range	-40/-25 ... +70 °C
Conformal coating	Coating of the printed circuit boards and the electronic components
Technical data	The technical data of the standard product applies except for the ambient conditions.
Ambient conditions	
Extended range of environmental conditions	
• with reference to ambient temperature, air pressure and altitude	Tmin ... Tmax at 1080 hPa ... 795 hPa (-1000 m ... +2000 m) // Tmin ... (Tmax - 10K) at 795 hPa ... 658 hPa (+2000 m ... +3500 m) // Tmin ... (Tmax - 20K) at 658 hPa ... 540 hPa (+3500 m ... +5000 m)
• At cold restart, min.	0° C
Relative humidity	
• with condensation, max.	100 %; RH incl. bedewing/frost (no commissioning in bedewed state)
Resistance	
• to biologically active substances/ compliance with EN 60721-3-3	Yes; Class 3B2 mold and fungal spores (except fauna); the supplied plug covers must remain in place on the unused interfaces during operation.
• to chemically active substances/ compliance with EN 60721-3-3	Yes; Class 3C4 (RH < 75%) incl. salt spray in accordance with EN 60068-2-52 (severity 3); the supplied plug covers must remain in place on the unused interfaces during operation.
• to mechanically active substances, compliance with EN 60721-3-3	Yes; Class 3S4 incl. sand, dust; the supplied plug covers must remain in place on unused interfaces during operation.



I guess someone still uses CDs! Putting a picture of a cloud on a website does not make a product truly cloud native.



LOGO! Communication Modules

The LOGO! family offers many communication options. In LOGO! 8, the connection to the communication modules is done via Ethernet. This means the entire address range of the inputs/outputs remains available for digital and analog signals.

> LOGO! Communication Modules

CMR Mobile Communication →

CSM Compact Switch →

CMK 2000 KNX Commnunication →

CIM Communication Interface Module →

LOGO! logic modules

LOGO! Starter Kits

LOGO! Starter Kits

Overview

There are now six LOGO! 8 Starter Kits for price-conscious beginners – each individually configured for the specific requirements.

- LOGO! Starter Kit 12/24RCE;
  With LOGO! 12/24RCE, power supply, screwdriver, in Systainer
- LOGO! Starter Kit 130 RCE;
  With LOGO! 230RCE, power supply, screwdriver, in Systainer
- LOGO! Starter Kit 12/24 V;
  With LOGO! 12/24RCEO, LOGO! TD, power supply, screwdriver, in Systainer
- LOGO! 8 KP300 Basic Starter Kit;
  With LOGO! 12/24RCE, LOGO! Power 24 V 1.3 A, KP300 Basic mono PN
- LOGO! 8 KTP400 Basic Starter Kit;
  With LOGO! 12/24RCE, LOGO! Power 24 V 1.3 A, KTP400 Basic
- LOGO! 8 KTP700 Basic Starter Kit;
  With LOGO! 12/24RCE, LOGO! Power 24 V 1.3 A, KTP700 Basic

With these low-cost complete packages, users can familiarize themselves quickly and easily with the advantages and possibilities of the logic module. LOGO! has been used successfully for many years in industry and trade throughout the world. It solves switching and control tasks conveniently and cost-effectively.

Ordering data	Article No.
LOGO! Starter Kits In TANOS Box, with LOGO! Soft Comfort V8, WinCC Basic, Ethernet cable	
LOGO! Starter Kit 12/24RCE With LOGO! 12/24RCE, power supply, screwdriver, in Systainer	**6ED1057-3BA01-0AA8**
LOGO! Starter Kit 130 RCE With LOGO! 230RCE, power supply, screwdriver, in Systainer	**6ED1057-3BA03-0AA8**
LOGO! Starter Kit 12/24 V With LOGO! 12/24RCEO, LOGO! TD, power supply, screwdriver, in Systainer	**6ED1057-3BA11-0AA8**
LOGO! 8 KP300 Basic Starter Kit With LOGO! 12/24RCE, LOGO! Power 24 V 1.3 A, KP300 Basic mono PN	**6AV2132-0HA00-0AA1**
LOGO! 8 KTP400 Basic Starter Kit With LOGO! 12/24RCE, LOGO! Power 24 V 1.3 A, KTP400 Basic	**6AV2132-0KA00-0AA1**
LOGO! 8 KTP700 Basic Starter Kit With LOGO! 12/24RCE, LOGO! Power 24 V 1.3 A, KTP700 Basic	**6AV2132-3GB00-0AA1**

LOGO! software

Overview

- The user-friendly software for generating switching programs on the PC for single-user mode and network mode
- Generation of switching programs in a function block diagram (FBD) or ladder logic (LAD)
- Furthermore, testing, simulation, online testing and archiving of the switching programs
- Professional documentation with the help of various comment and print functions

Minimum system requirements

Windows XP (32-bit), 7 (32/64-bit) or 8 (32/64-bit)

- PC Pentium IV.
- 150 MB free disk capacity.
- 256 MB RAM.
- SVGA graphics card with minimum resolution 800 x 600 (256 colors).
- DVD-ROM

Mac OS X

- Mac OS X 10.4

Linux

- Tested with SUSE Linux 11.3 SP2, kernel 3.0.76
- Runs on all Linux distributions on which Java 2 runs.
- Please refer to your relevant Linux distribution for the necessary hardware requirements.

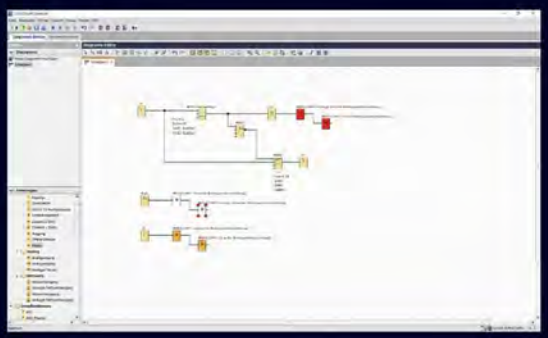
Ordering data

	Article No.
LOGO!Soft Comfort V8 for programming on the PC in LAD/FBD; executes on Windows 8, 7, XP, Linux and Mac OSX; on DVD	**6ED1058-0BA08-0YA1**

LOGO! Soft Comfort | LOGO! Access Tool | LOGO! Web Editor | Demo software

LOGO! Soft Comfort

- Circuit program creation in the languages Function Block Diagram (FBD) or Ladder Diagram (LAD)
- Automatic configuration of communication and display in the network view
- Fully program simulation of all functional states, parameters and current values
- Comprehensive protection concept for programs and access to the controller
- Simple commissioning and connection of the LOGO!
- Free upgrades to the latest software version



LOGO! Soft Comfort | LOGO! Access Tool | LOGO! Web Editor | Demo software

LOGO! Web Editor

With the free LOGO! Web Editor (LWE) can be created custom websites without HTML knowledge. This allows automation projects to be controlled and visualized in a flexible and user-friendly manner from a PC, smartphone or tablet.

In LWE, graphics can be drawn and texts, images and links can be integrated. The components are simply dragged and dropped into the editor area. In addition, digital values, switching and display surfaces can be displayed.

Analog values can either be displayed as a value, an analog bar (bar graph) or an analog slider. The LWE runs on all common operating systems.

› Download LOGO! Web Editor

LOGO! Soft Comfort | LOGO! Access Tool | LOGO! Web Editor | Demo software

LOGO! Access Tool

The free LOGO! Access Tool is used to transfer process values directly to an Excel spreadsheet – while the application is running.
Only as an add-in for Excel on a Windows operating system.

› Download LOGO! Access Tool

Introduction

This application example offers you the "Gate circuit" logic function for LOGO! 8 according to the definition in chapter 1.1.

An expanded application of the application example (see chapter 4) contains suggestions for using the function for the gate circuit for a wind sensor (or a weather station). Use these applications as a basis for your own implementation of a gate circuit by modifying, replacing or adding functions in LOGO! Soft Comfort.

The integrated functions of a LOGO! 8 offer many options for quick and easy solutions for automation tasks. Pre-programmed function blocks support you when creating a project, e.g. week timer, pulse generator, astro timer, yearly timer, stopwatch and simple logic gates.

The LOGO! text display unit (TDE) and the integrated LOGO! 8 web server offer additional options for control and monitoring with function keys and message texts.

The communication module CMK2000 from Siemens provides a solution for communication in building automation with LOGO! 8. The communication module enables communication between a LOGO! 8 and any KNX device via the KNX building system bus.

Figure 1-1: Hardware setup for the application example

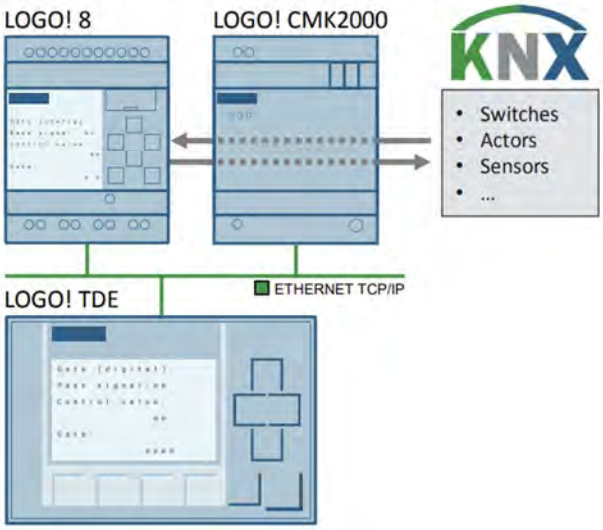
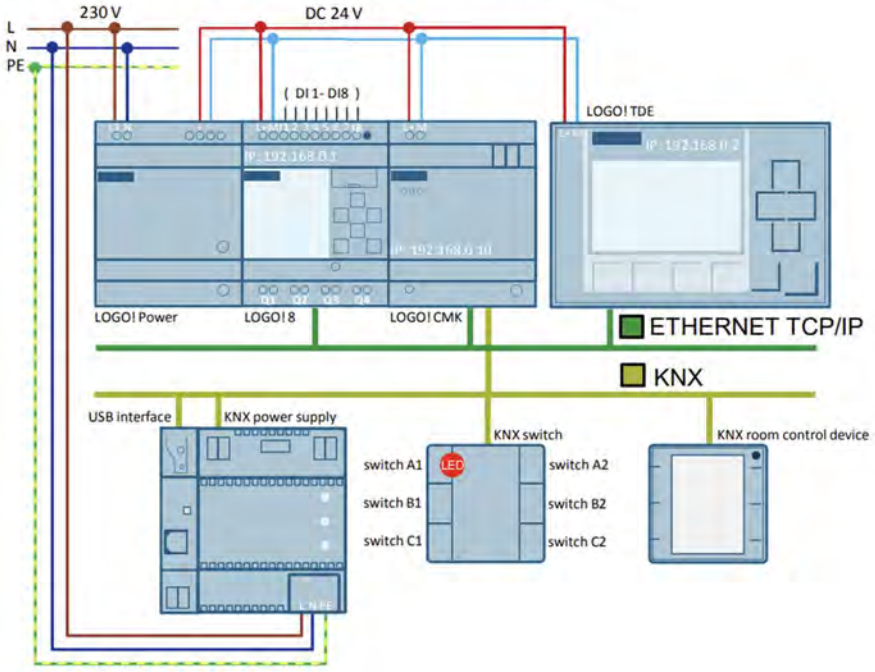


Figure 2-1: Hardware configuration for the application example



LOGO! TDE is an optional component.
You can also use its functions (message texts and function buttons) via the integrated LOGO! web server.

LOGO! CMK2000 communications module

Ordering data | Product Information | Configurators

More Actions

Product No. / Product Description	Listprice / Your price
> 6BK1700-0BA20-0AA0 LOGO! CMK2000 Communication module for integrating the LOGO! 8 "in the building system bus KNX;" connection 24 V DC 0.04A 1 RJ45 port for Ethernet 50 communication objects time-of-day synchronization Configuration/diagnostics via web interface	> Show prices

Page 1 of 1 | |< | < | 1 | > | >|

LOGO! TDE — Text Display | SIMATIC HMI Basic Panels

LOGO! TDE — Text Display

- 2 Ethernet interfaces to connect LOGO! and PC/PG at the same time
- Display of up to 50 messages and integrated acknowledgement function
- Display with six lines and 20 characters per line for messages in plain text
- Password protection for operator/admin mode switching
- Backlight in white, orange and red
- 10 menu languages (DE, EN, FR, IT, ES, NL, RU, TR, ZH, JA) and 6 built-in character sets

› Configure and order LOGO! operating devices in the TIA Selection Tool

› Discover the LOGO! product overview

KNX is an open standard (see EN 50090, ISO/IEC 14543) for commercial and residential building automation. KNX devices can manage lighting, blinds and shutters, HVAC, security systems, energy management, audio video, white goods, displays, remote control, etc. KNX evolved from three earlier standards; the European Home Systems Protocol (EHS), BatiBUS, and the European Installation Bus (EIB or Instabus).

It can use twisted pair (in a tree, line or star topology), powerline, RF, or IP links. On this network, the devices form distributed applications and tight interaction is possible. This is implemented via interworking models with standardised datapoint types and objects, modelling logical device channels.

KNX

International standard	EN 50090, ISO/IEC 14543
Industry	Building automation
Website	knx.org

Standard [edit]

The KNX standard has been built on the OSI-based EIB communication stack extended with the physical layers, configuration modes and application experience of BatiBUS and EHS.

KNX installations can use several physical communication media:

- Twisted pair wiring (TP1 Cable) (inherited from the EIB standard). (The previously inherited BatiBUS communication medium (TP0) is no longer part of the KNX Specifications.)
- Power-line networking (inherited from EIB standard). (The previously inherited EHS communication medium (PL132) is no longer part of the KNX Specifications.)
- Radio (KNX-RF)
- IP (also referred to as EIBnet/IP or KNXnet/IP)

KNX universal light dimming actuator with two channels

KNX is not based on a specific hardware platform and a network can be controlled by anything from an 8-bit microcontroller to a PC, according to the demands of a particular building. The most common form of installation is over twisted pair medium.

KNX is an approved standard by the following organisations, (inter alia):[1]

- International standard (ISO/IEC 14543-3)
- European standard (CENELEC EN 50090 and CEN EN 13321–1)
- US standard (ANSI/ASHRAE 135)
- China Guobiao (GB/T 20965)

KNX-Transceiver-Board by Elmos

It is administered by the KNX Association cvba, a non-profit organisation governed by Belgian law which was formed in 1999. The KNX Association had 500 registered hardware and software vendor members from 45 nations as at 1 July 2021. It had partnership agreements with 100,000 installer companies in 172 countries and more than 500 registered training centres.[2] This is a royalty-free open standard and thus access to the KNX specifications is unrestricted.[3]

Architecture [edit]

KNX devices are commonly connected by a twisted pair bus and can be modified from a controller. The bus is routed in parallel to the electrical power supply to all devices and systems on the network linking:[4]

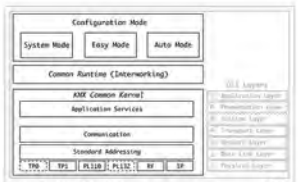
- Sensors (e.g. push buttons, thermostats, anemometers, movement) gather information and send it on the bus as a data telegram;
- Actuators (dimming units, heating valves, displays) receive data telegrams which are then converted into actions; and
- Controllers and other logic functions (room temperature controllers, shutter controllers and other)
- System devices and components (e.g. line couplers, backbone couplers).

Classifying devices as either "sensor" or "actuator" is outdated and simplistic. Many actuators include controller functionality, but also sensor functionality (for instance measuring operating hours, number of switch cycles, current, electrical power consumption, and more).

Application software, together with system topology and commissioning software, is loaded onto the devices via a system interface component. Installed systems can be accessed via LAN, point to point links, or phone networks for central or distributed control of the system via computers, tablets and touch screens, and smartphones.

The key features of the KNX architecture are:

- Interworking and distributed application models for the building automation various tasks;
- Schemes for configuration and management of resources on the network, and to permit the binding of parts of a distributed application in different nodes;
- A communication system with a message protocol and models for the communication stack in each node (capable of hosting distributed applications (KNX Common Kernel); and
- Models for the realization of these elements when developing actual devices to be mounted and linked in an installation.



The KNX Model

https://en.wikipedia.org/wiki/KNX

https://www.siemens.com/global/en/products/automation/systems/industrial/plc/logo/logo-basic-modules.html#LOGObasicmodulesataglance

https://www.siemens.com/global/en/products/automation/systems/industrial/plc/logo.html

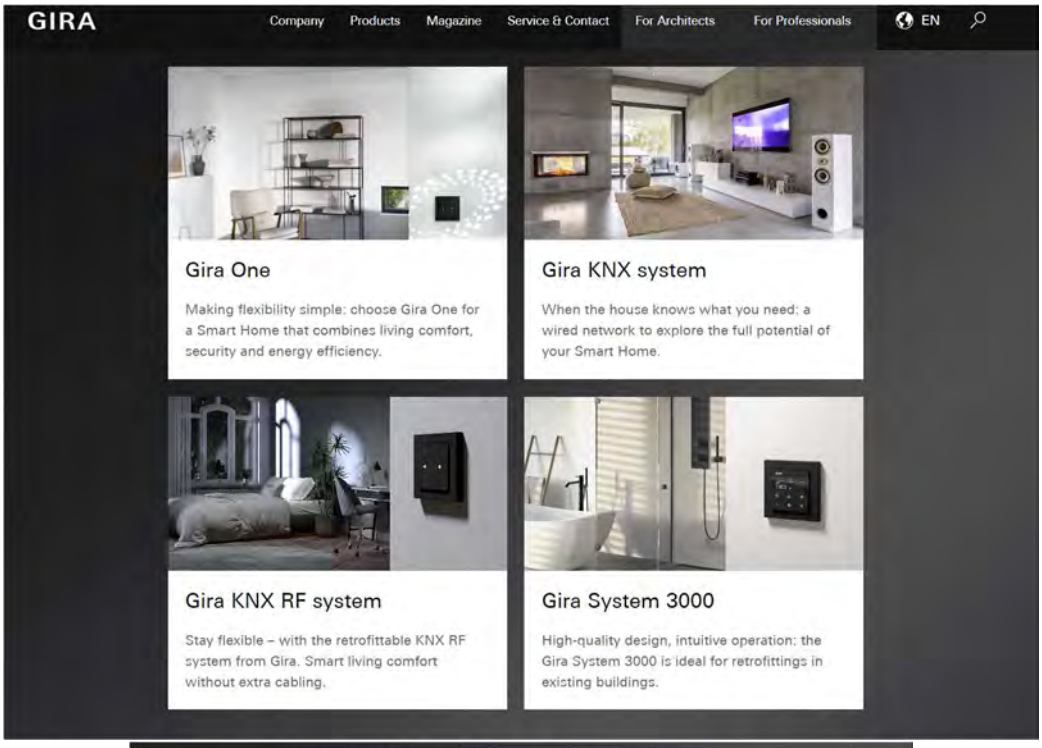
https://assets.new.siemens.com/siemens/assets/api/uuid:6f404a6d-6a64-4658-a171-873f838d614b/difa-b10075-01-brlogo-deengb-144.pdf

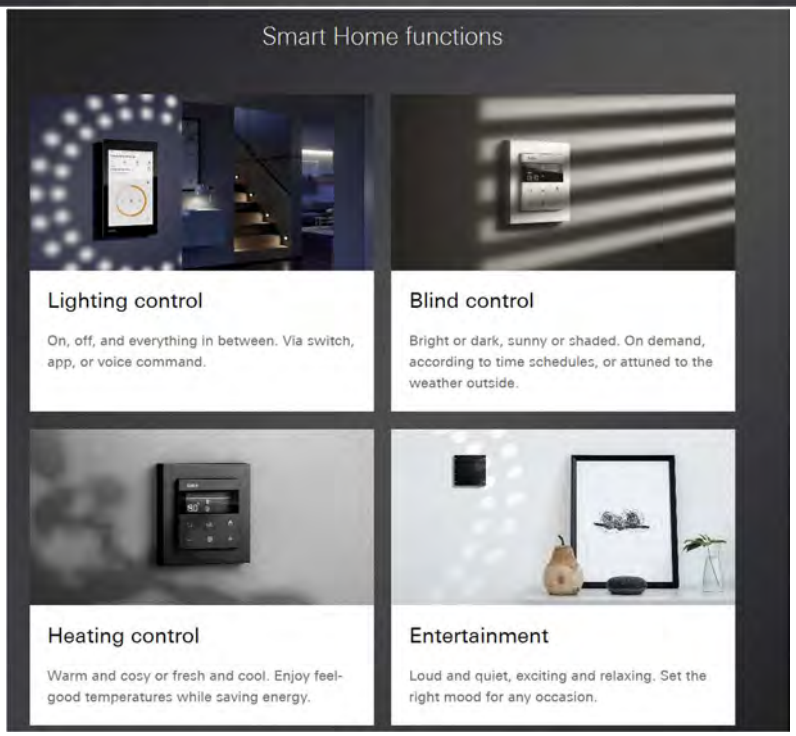
https://assets.new.siemens.com/siemens/assets/api/uuid:68c9ddc4-a869-4b45-86d9-4c89e8d644d0/dffa-b10114-01-broschuere-logo-knx144dpi.pdf

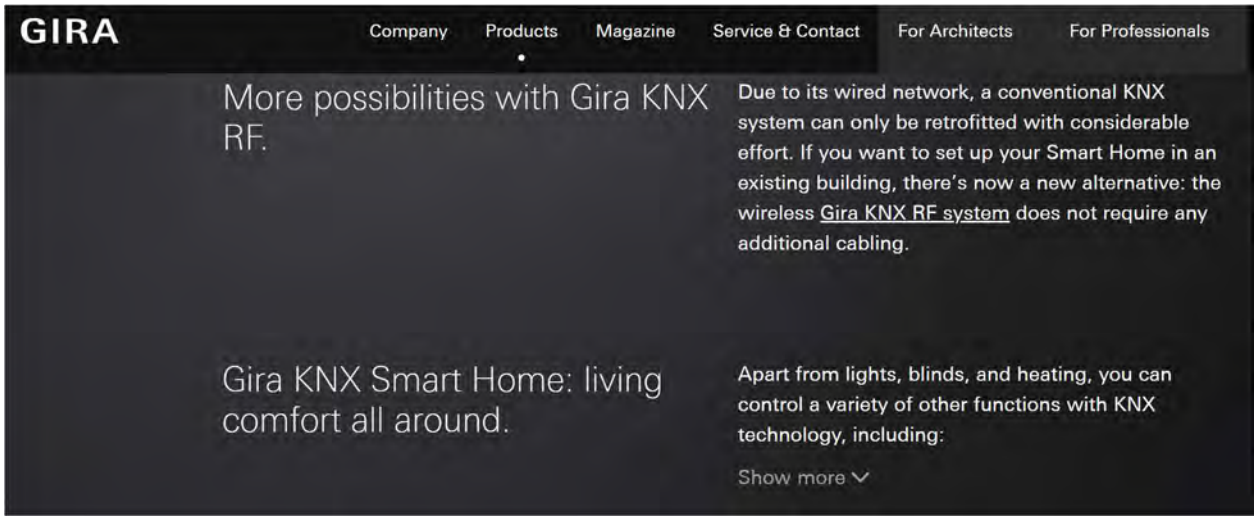
https://assets.new.siemens.com/siemens/assets/api/uuid:47a85a5f-b968-41f2-9d7b-e57d0d7df18a/simatic-st70-complete-english-2021.pdf

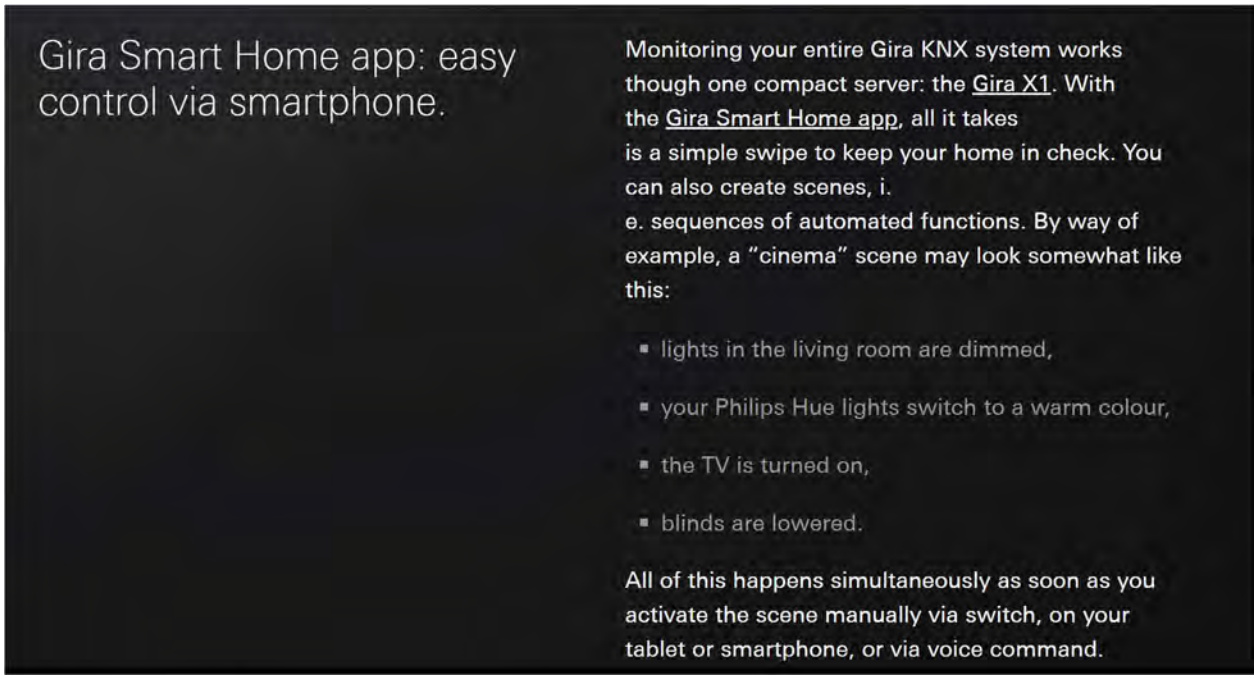
Gira

Whereas Schneiders and Siemens have historically been strong in the industrial markets and have used that strength to enter the buildings automation market, GIRA is focused on the residential market. Gira uses the KNX communication protocol and is a closed system. They have very good standard functionality but cannot compete with Shelly on customization and speed of implementation.



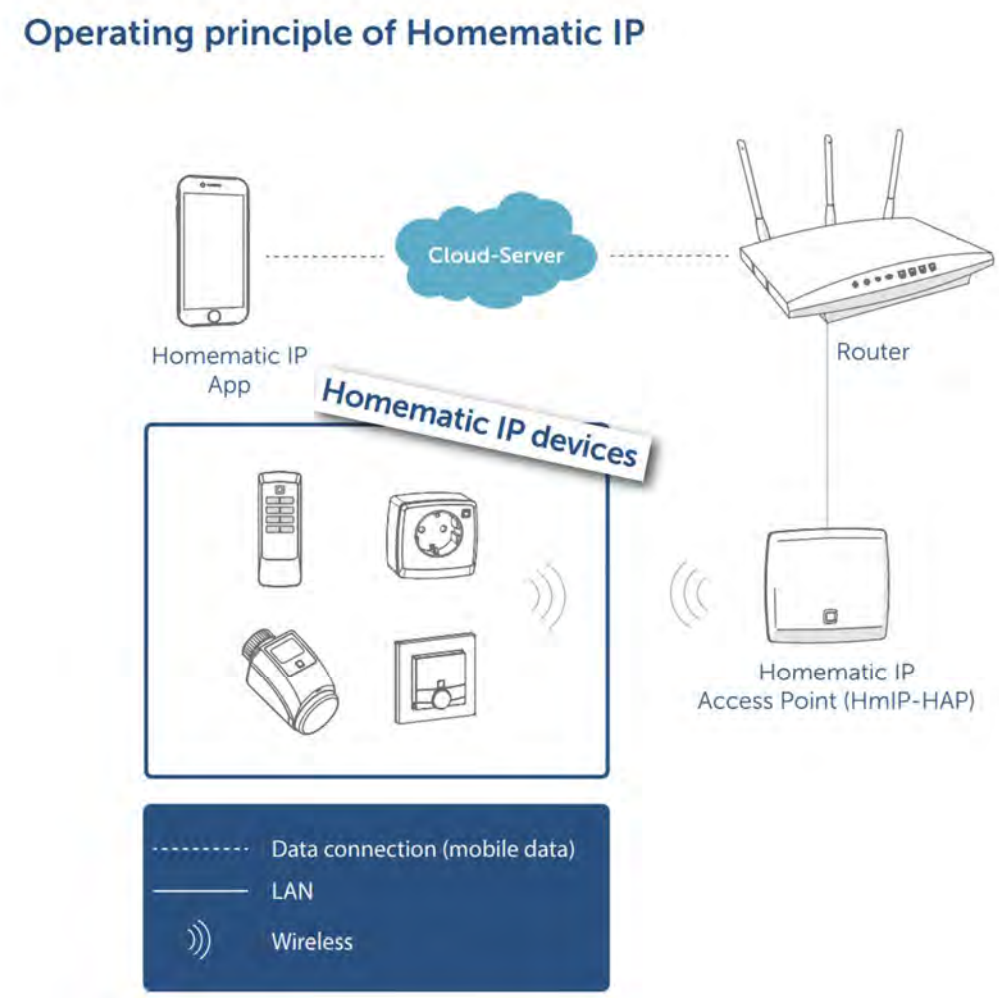



GIRA
Company
Products
Magazine
Service & Contact
For Architects
For Professionals
More possibilities with Gira KNX RF.
Due to its wired network, a conventional KNX system can only be retrofitted with considerable effort. If you want to set up your Smart Home in an existing building, there's now a new alternative: the wireless Gira KNX RF system does not require any additional cabling.
Gira KNX Smart Home: living comfort all around.
Apart from lights, blinds, and heating, you can control a variety of other functions with KNX technology, including:
Show more


Gira Smart Home app: easy control via smartphone.
Monitoring your entire Gira KNX system works though one compact server: the Gira X1. With the Gira Smart Home app, all it takes is a simple swipe to keep your home in check. You can also create scenes, i.e. sequences of automated functions. By way of example, a "cinema" scene may look somewhat like this:
lights in the living room are dimmed,
your Philips Hue lights switch to a warm colour,
the TV is turned on,
blinds are lowered.
All of this happens simultaneously as soon as you activate the scene manually via switch, on your tablet or smartphone, or via voice command.

Homematic and Fibaro

Homematic and Fibaro are focused on the home markets and are Shelly's closest competitors today as they focus on the home market.



Homematic IP Wired Access Point

In a wired smart home system, the Homematic IP Wired Access Point links the CCU3 central control unit to the connected devices. You then control the Homematic IP Wired Access Point via the cloud and smartphone app.

To simultaneously operate wired and wireless components, add the Homematic IP Access Point

› go directly to product

Homematic IP WLAN Access Point

The Homematic IP WLAN Access Point connects to your WLAN from anywhere in your home without a router connection. Now you can set up your entire smart home system with ease – and control it intuitively with the smartphone app. You also have the convenience of being able to control many devices and functions of your Homematic IP system via Amazon Alexa or Google Assistant.

› go directly to product

Homematic IP smart home CCU3 central unit

As the local heart of your smart home system, the CCU3 takes care of all communication between Homematic IP and/or Homematic devices.

In terms of configuration and control, you can choose: Via the well-established WebUI user interface with local data storage – without cloud and without an active internet connection. Or via the AIO CREATOR NEO extension from Mediola – with app and customisable interface as well as connection to numerous devices from different brands.

› go directly to product

Starting the WebUI user interface

- The WebUI user interface offers a large number of configuration and control options for your Homematic and Homematic IP devices. To enable local configuration of your devices and to control devices and connect them with each other or for using Central Control Unit programs, you must start and set-up the WebUI.
- You can access the user interface via a web browser (see „5 System requirements“ on page 36).
- To call the WebUI in your web browser you will need the IP address or the DNS name of your CCU3. You can also use your router or the “NetFinder“ add-on software to find out the IP address.

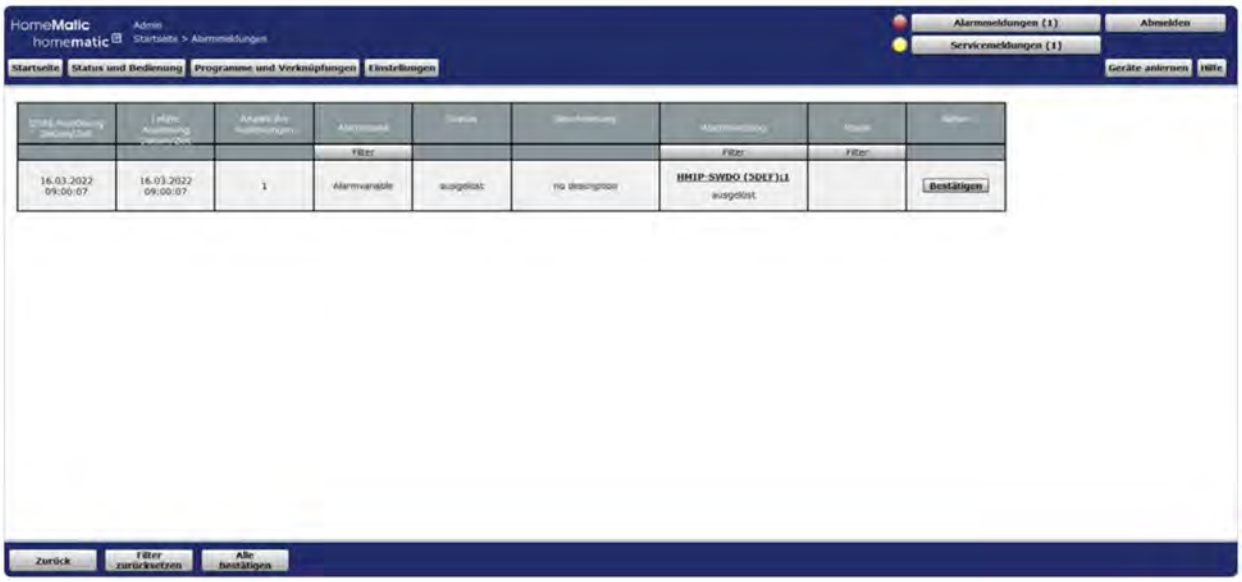
After a short time and successful teach-in, the newly taught-in device appears in the inbox of your software interface. Click on the button "**Inbox**" to get to the inbox.

Figure 126: Pop-up window "Inbox" WebUI

Newly taught-in Homematic IP devices and the corresponding channels are ready for operation and configuration in the Homematic system only after they have been configured in the inbox. Configuration instructions for newly taught-in Homematic IP devices can be found in the current version of the Homematic WebUI Manual, available for down by clicking *here*.

After connecting your Homematic IP devices to the Homematic WebUI, your devices can be conveniently

- controlled and configured as well as
- used in central control unit programs.



Climate control	With Internet connection	Without Internet connection
Change settings via the Homematic IP app	✓	x
Heating profile is active	✓	✓
Reduction of the room temperature by window contacts when opening windows	✓	✓
Transmission of room temperature settings from radiator thermostats or wall thermostats to devices in the room	✓	✓
Activation of eco mode via wall-mount remote control	✓	x
Activation of manual mode	✓	✓
Activation of boost function	✓	✓
Activation of party mode for one room	✓	x
Deactivation of child protection lock that was activated via app	✓	x
Security and alarms		
Change settings via the Homematic IP app	✓	x
Transmission of smoke alarm messages to all connected smoke alarms in the system	✓	✓
Changing the alarm status (absence mode, presence mode, not activated)	✓	✓
Switching coming home light via key-ring remote control	✓	✓
Alarm notification via app	✓	x
Alarm notification via alarm siren	✓	✓
Switching panic light	✓	✓
Switching alarm light	✓	x
Shutter control		
Change settings via the Homematic IP app	✓	x
Switching of shutter groups via a remote control or push-button	✓	✓
Executing time profiles for shutters and blinds	✓	✓
Shutter and blind functions lockout protection, storm protection, heat protection, escape function	✓	x
Light		
Change settings via the Homematic IP app	✓	x
Switching switching groups on and off via a remote control or push-button	✓	✓
Switching of switching groups via motion detectors	✓	✓
Dimming of dimming actuators via a button pair of a switching group	✓	✓
Executing time profiles for switching actuators	✓	✓

cloud triggers

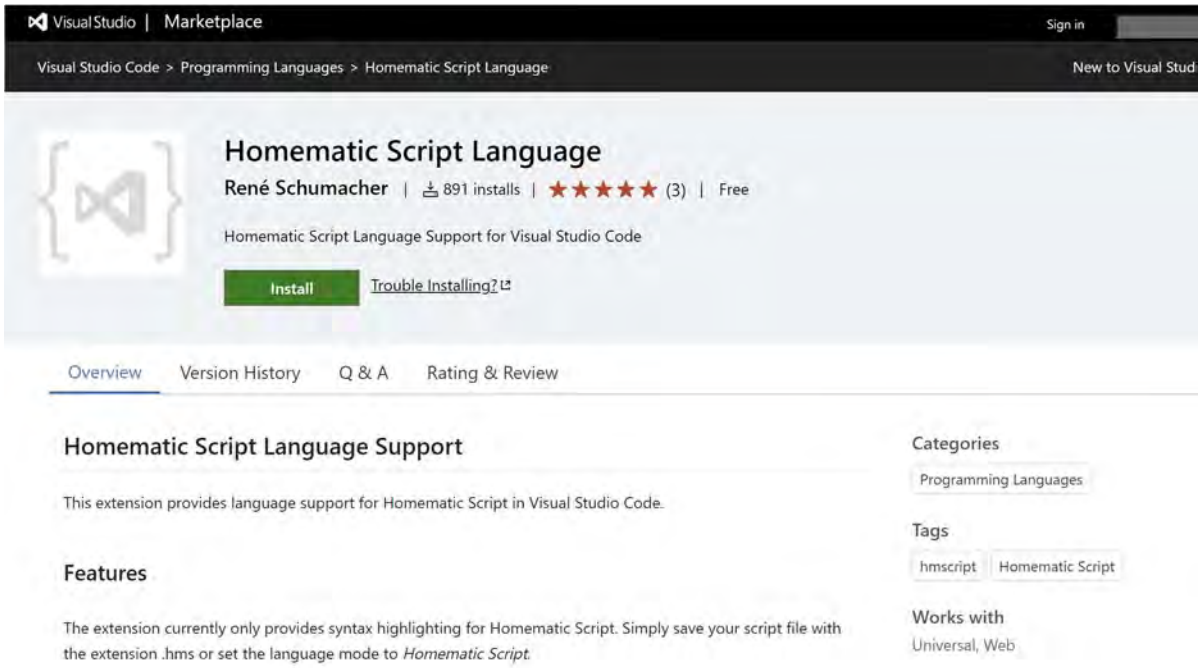
This function makes it possible to address channels on another center from one center. To do this, each smart home center must have its own CloudMatic account with the CloudMatic Connect package. In addition, the free addon CUxD must be installed on each control panel that is to trigger an action on another control panel via Cloud Trigger.

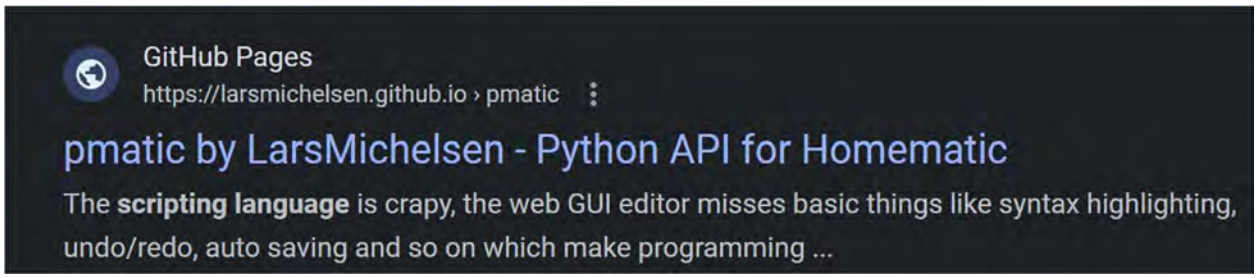
Important

The cloud triggers are currently only supported in connection with a HomeMatic central unit.

Preparation

First the free addon CUx-Daemon has to be installed. `Einstellungen > Systemsteuerung > CUx-Daemon > Geräte` A new CUx daemon device of type must then `(91) CloudMatic ..,` be created. `Cloud` Must be selected as a function . The serial number and the name are optional information and are set automatically. A preferred device can be selected as the device icon.





https://marketplace.visualstudio.com/items?itemName=HeadCrash.hmscript-language-vscode

https://na.niceforyou.com/solutions/residential/

https://homematicip-rest-api.readthedocs.io/en/latest/hmipoverview.html

https://www.galaxus.de/en/page/enter-the-smarthome-part-1-homematic-ip-18054

https://www.cloudmatic.de/

https://homematic-ip.com/sites/default/files/downloads/webui-handbuch-eq-3.pdf

https://homematic-ip.com/sites/default/files/downloads/homematic-ip-user-guide.pdf

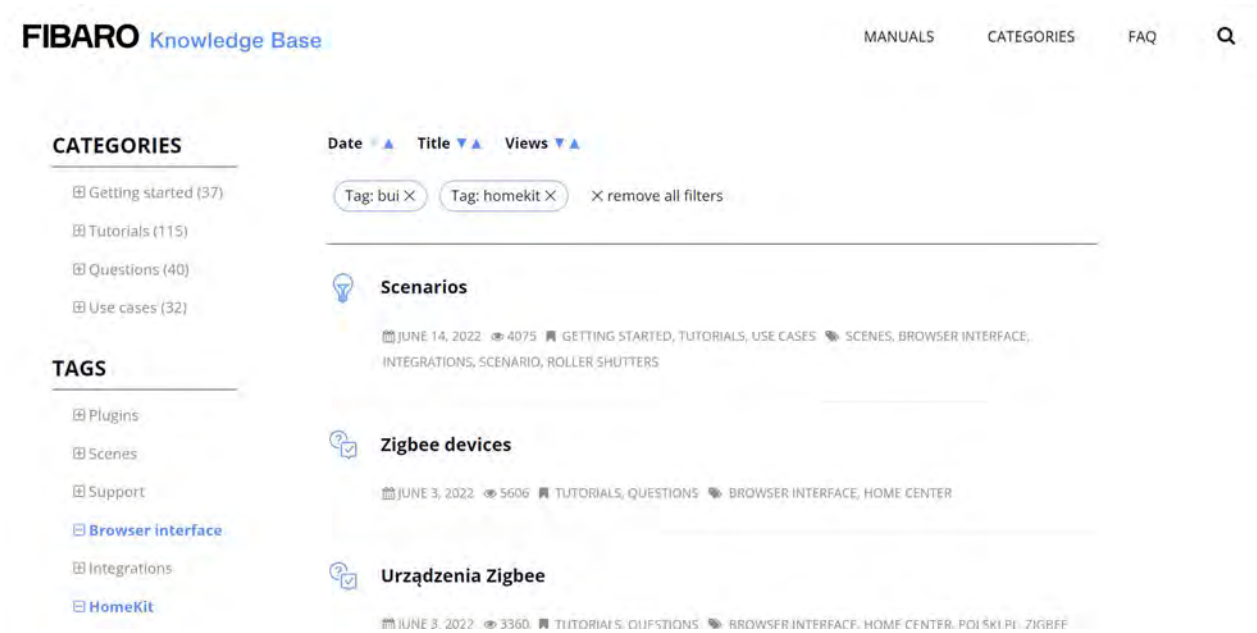
https://device.report/manual/7104426

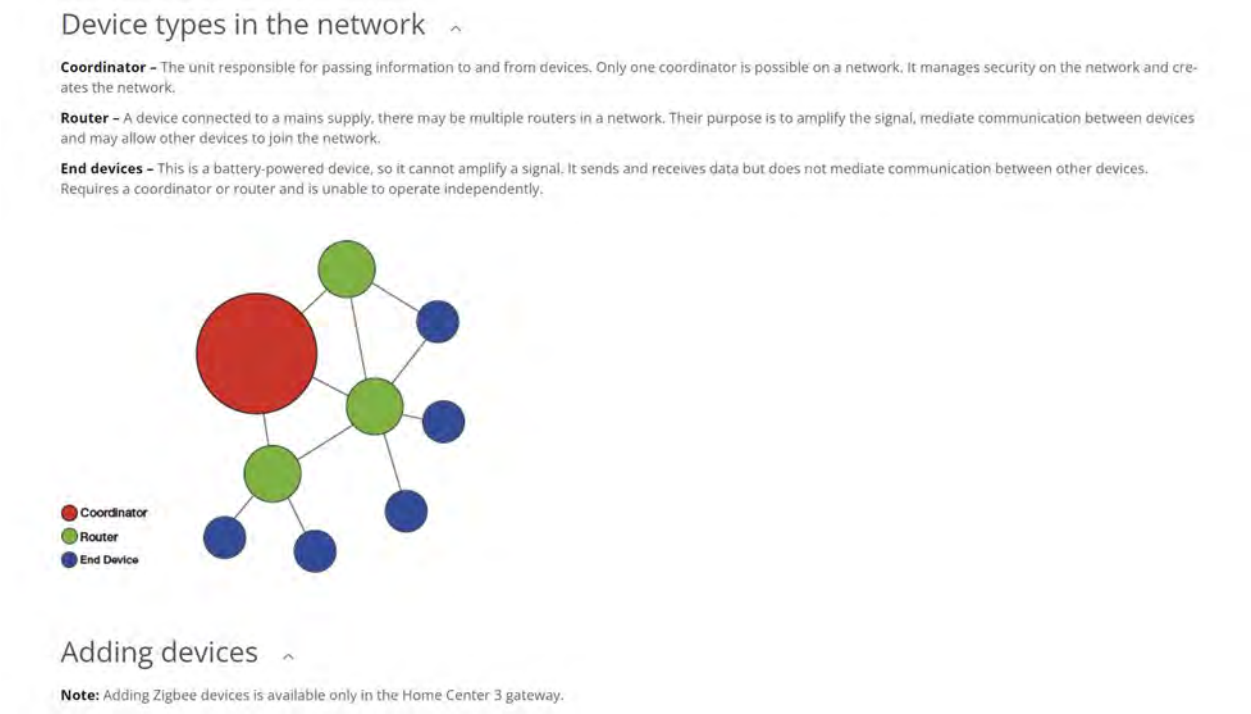
https://wiki.instar.com/en/Software/Other_Platforms/Homematic_IP/

Fibaro uses the Zigbee and Z-wave protocols. Fibaro is a Polish company that was acquired by a larger Italian home automation company.

https://manuals.fibaro.com/knowledge-base-browse/?kb_tag=bui%2Chomekit

https://www.fibaro.com/files/presentation_dimmer2.pdf





Fibaro uses the LUA scripting programming language to make customizations to its scenes. JavaScript runs on both a browser (client) and server (remember shelly has a webserver in its products). A user needs to install a LUA interpreter to run the code whereas JavaScript already runs on all major browsers. JavaScript is also more widely used due to the growth in demand for dynamic, interactive web applications. This means there are more libraries of code available for JavaScript than LUA. JavaScript has built-in HTTP libraries which provides basic APIs through which HTTP requests can be created and executed.

```
// This function read rain value in last 24h
function ReadRainHistory() {
    print("Check and Decide");
    Shelly.call(
        "http.get",
        {url: getWeatherURLForLocation(here)},
        function (response, error_code, error_message) {
            if (error_code !== 0) {
                // HTTP call to error service failed
                // TODO: retry logic
                return;
            }
            let weatherData = JSON.parse(response.body);
            let RainValue = weatherData[0].PrecipitationSummary.Past24Hours.Metric.Value;
            print("RainValue", RainValue);
            decideIfToIrrigate(RainValue);
```

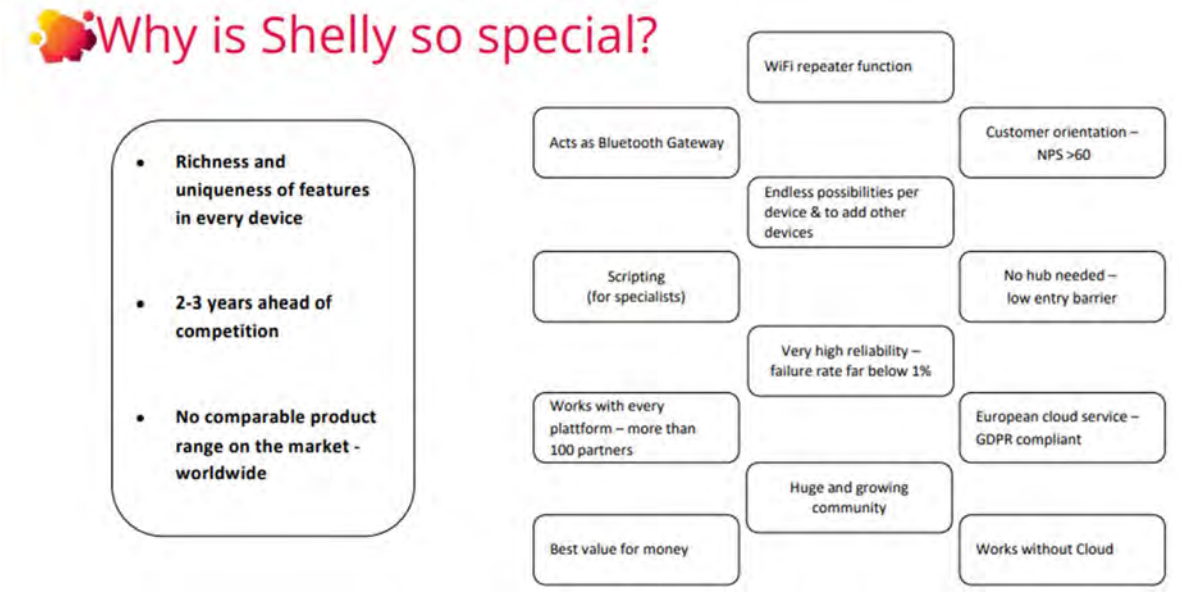
https://smarterhome.sk/sk/blog/fibaro-hc2-lua-riadenie-zavlahy_118.html

https://www.educba.com/lua-vs-javascript/

Shelly vs the Competition

What this all means is Shelly devices are more easily installed, can be more easily programmed from a web browser located anywhere in the world, can be programmed more quickly due a larger set of available developers and libraries, and Shelly can be programmed with many more functions that get information from the internet. Homematic CCU3 can be programmed using webhooks but it is much more difficult to do than using a Shelly device. Any Shelly device can be programmed using a web browser without the need for special control with an outdated UI like Homematic.

Also do a quick YouTube search for Homeatic and Fibaro and compare these to YouTube searches for Shelly devices. Shelly searches return thousands of videos created by users and influencers, whereas Homeatic and Fibaro return few videos—most of which are created by the companies themselves. A Facebook search returns similar results. Also, compare the Shelly scripts that are available on GitHub versus the Homeatic and Fibaro scripts available on GitHub. Shelly has a much larger, and growing, community when compared to other home IoT companies.

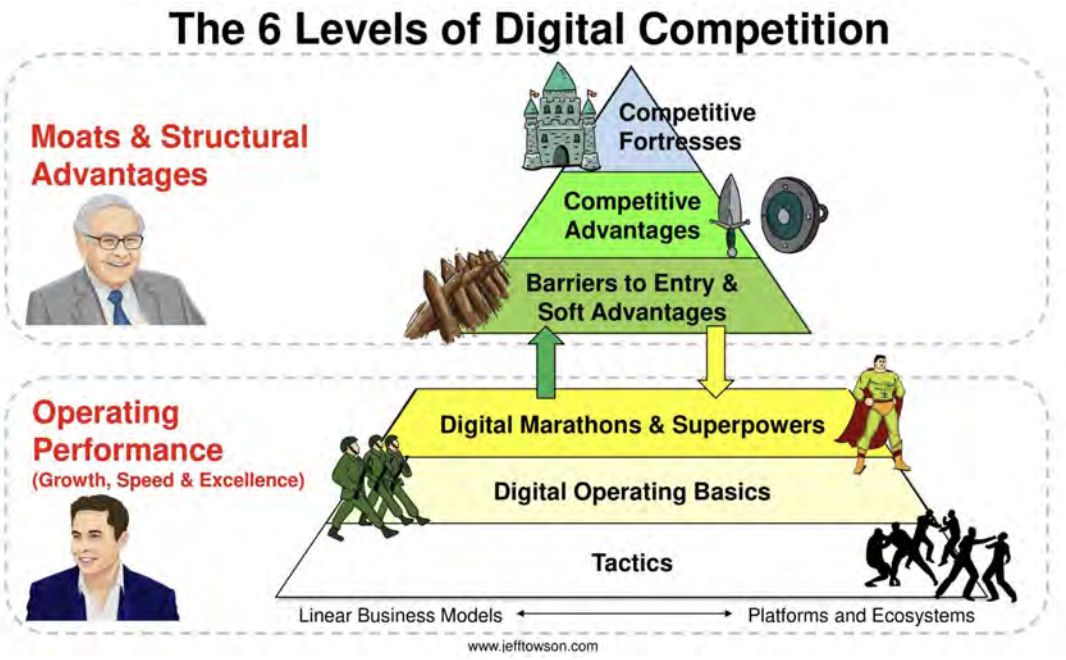


Homeatic and Fibaro face a dilemma when deciding how to compete with Shelly:

1) They can continue to create patches such as the CCU3 that allows for web functionality, or;

2) They could redesign their products/platform using an operating system like Mongoose OS that allows for Wi-Fi communications, webservers, and JavaScript. This would give Homeatic and Fibaro more functionality and easier access to scripting and customization for customers. But how would they support the millions of customers on the old technologies / platforms? Would their current customers just leave them for Shelly when Shelly is so much further ahead in functionality and community support? Do they have internal capabilities to support such projects or are their managers and programmers incentivized to support systems they created and have expert knowledge in already? How do Homematic and Fibaro compete against the Shelly brand and online community?

Shelly's Competitive Advantage



https://jefftowson.com/moats-and-marathons-books/

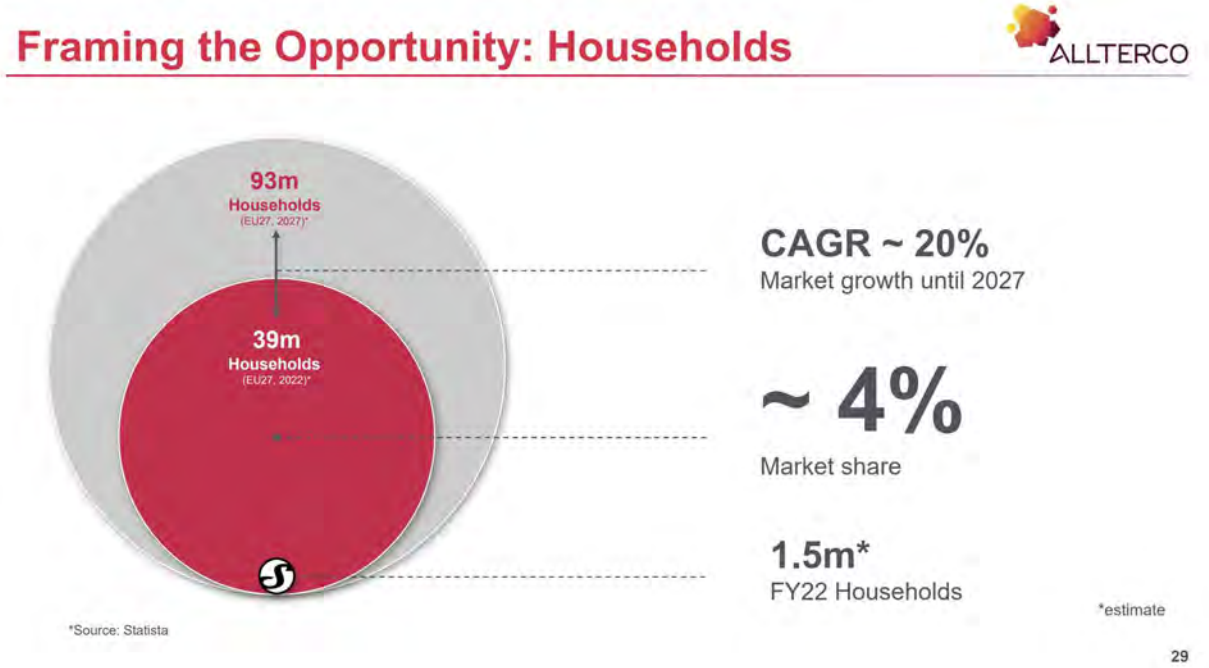
Tactics

To analyze Shelly's competitive position, I am going to use the Moats and Marathons framework created by Jeffrey Towson. I have already covered a large part of Shelly's tactics of counter positioning itself versus the competition by combining technologies to make implementing IoT projects easier and using social media to grow its brand and community.

There are two important things to note about Shelly's products and community building. First, the products are easy enough to install by anyone, but customization is difficult enough that YouTube, Facebook, and GitHub are very important in the knowledge building process. Shelly products are like a good video game—easy to learn but take time to master and offer hours of "fun." Second, users *feel* a need to post code, comments, tips, and videos to give back to the community and show off projects.

Digital Operating Basics

The digital operating basics is where a company builds the foundation for digital operations. It is important at this point to mention again, if it hasn't already been obvious, Shelly is a software company disguised as a hardware company. Like Apple, they do not produce the phone but design the product, build the brand and community, write many core software functions that tie the platform together, and now are developing their own operating system. A software company (Shelly) is inherently different than a hardware company (Schneider or Siemens). Yes, the big incumbents sell software products but as we will see Shelly's operations are different on many vectors because they are software first and open.

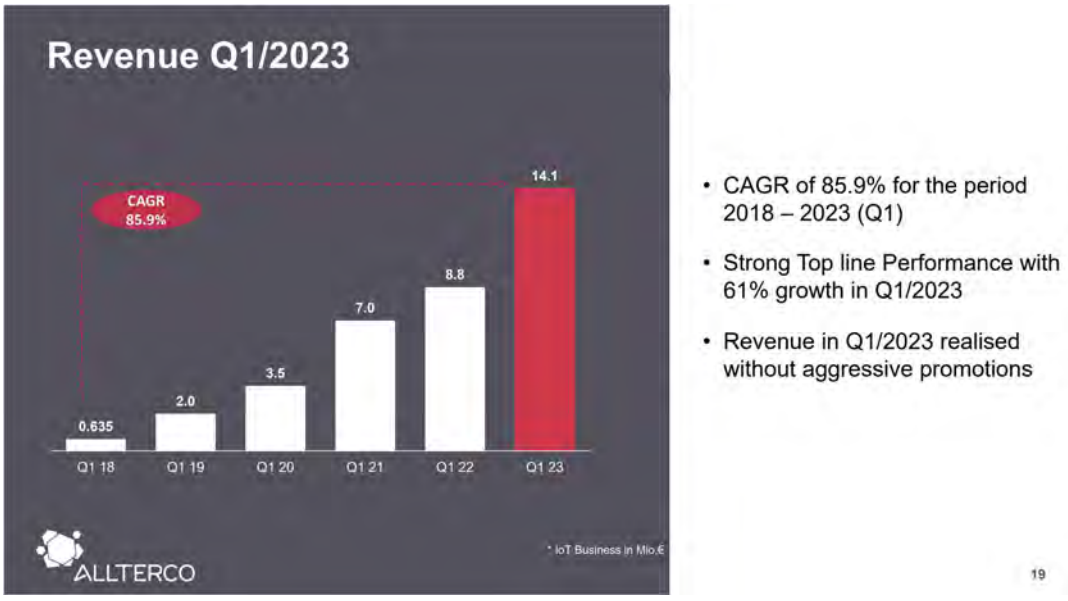


Rapid Growth at Small Incremental Costs without Constraints

Most software companies have rapid growth at small incremental costs without constraints. This is another way of saying they have high (sometimes infinite) returns on invested capital with large growth runways. Many software companies start in one market and move over time into other markets. Shelly started in the DIY home installation market, is moving into the professional home installer market, and has even started moving into the industrial IoT market. Shelly does have inventory and accounts receivable so at this time capital is very important but overtime this will be less so as software revenues become a larger percentage of total revenues. Even with the need to invest in inventory and A/R, Shelly's return on operating equity (minus cash and intangibles) is around 50%. And this is ignoring the fact that they are investing in growth through the income statement and carried excess inventory in 2022. Revenues and gross profits grew 57% and 43% in 2022. In Q1 2023, revenues and gross profit grew 61% and 62%.

> **Despite impressive sales growth, EBIT grew at a disproportionately low rate, and the EBIT margin fell from 31 to 22 percent year-on-year. What are the reasons here?**
>
> **Wolfgang Kirsch** : This effect was planned and has also been announced. In the past year, we have invested heavily in our structures in order to be able to steadily increase our rate of growth. We have invested in particular in hiring staff in research and development as well as in sales. We have doubled the number of full-time employees in 2022 compared to the previous year. It is all the more gratifying that this is a one-off effect on the cost side and that we are again assuming an increasing EBIT margin for the current year. We will continue to invest in the right structures, new talent and technology, but the cost increases will be less than sales. We promised our shareholders an increasing EBIT margin and want to keep this promise.

https://www.boersengefluester.de/allterco-wir-werden-viel-positives-zu-berichten-haben/



Never-ending Improvements and Rate of Innovation

One of the biggest differences between Shelly and its competitors, whether large industrial suppliers or smaller home automation companies, is the rate of innovation. Since Shelly's products are installed using the internet, Shelly knows which products are selling well and how they are being used. This granular knowledge allows Shelly to react quickly by allocating resources (inventory, marketing, further feature enhancements) to the most popular devices, along with helping to coordinate activities by helping to spread popular ideas. This allows for fast prototyping and quick launches at minimal costs. Shelly recently launched a new R&D hub in Dublin, Ireland to tap into the deep talent pool of IT specialists.

> *The success of our Black Friday sales across all our geographic markets confirms that we are on the right track with our expansion strategy. With the new development hub in Ireland, we are attracting high-caliber IT specialists to continuously improve the research and development process, thus consistently pursuing our expansion strategy," Dimitar Dimitrov, Allterco joint CEO and R&D director, said in a company statement.*

Looking through the previous section, we can see that the competition is using legacy technologies and old products that were developed years (decades) ago. The software systems have not been updated. Because they have built their business around these resources, processes, and values, they have a difficult time adopting new, better ways of doing things (resource dependency theory).

- Award winning products
- Innovations in 2022:
  - WiFi-Repeater + Bluetooth
  - Shelly & Carplay
  - 15 new products
  - Pro Series
  - Upgrade of Shelly App

Shelly products are personalized and customized by the customers themselves. The customers buy a few new Shelly devices, install them, write some code using Shelly calls, and now the product has been customized to perform a very specific automation task. Moreover, the code has been written and the customer is unlikely to switch to another product. Shelly will also constantly improve its cloud applications by adding new features.

Now Shelly Group's focus is on developed markets, developing smart devices for smart homes, and currently there are 35 of them. By the end of the year, at least 30 more will be put on sale, Dimitrov said. "These are complex solutions. Over 35 types of smart home automation services from automated garage doors, through lighting, heating management, access control management, irrigation systems devices, devices tracking the energy consumption of a home (in the last one year there is great interest in them)".

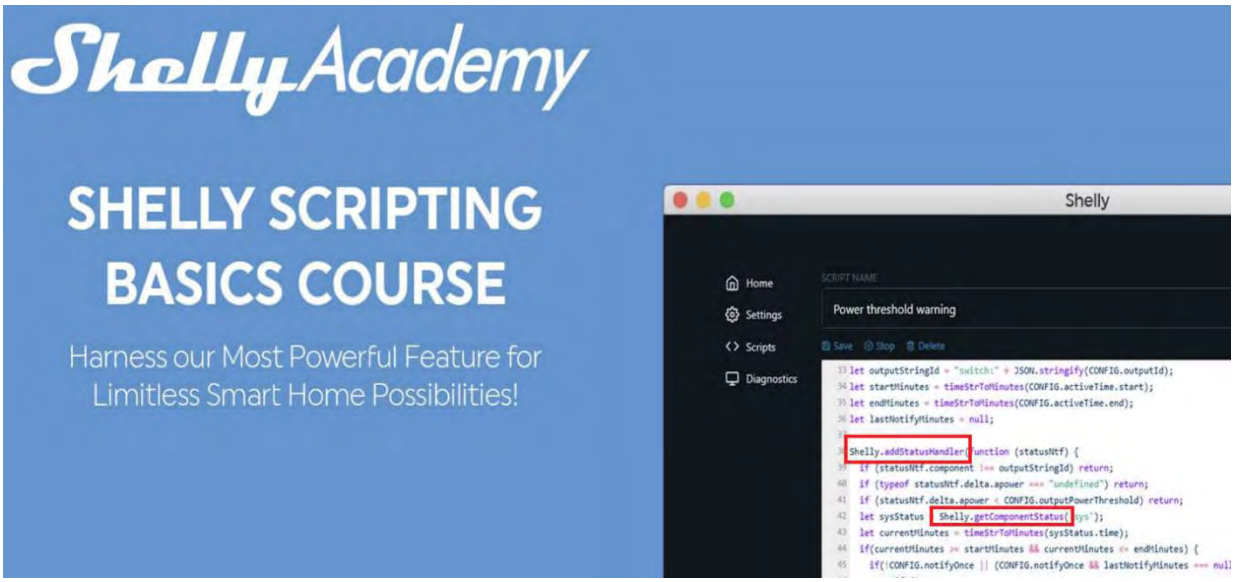
--Dimitar Dimitrov

July 2023

https://www.bloombergtv.bg/a/19-svetat-e-biznes/120316-nezavisimostta-ot-kitay-v-proizvodstvoto-na-elektronika-zasega-e-himera

Connectedness, Interoperability, Coordination of Platforms and Ecosystems

Finally, the biggest difference between Shelly and the competition is that it is increasingly becoming an ecosystem coordinator. Shelly does not make most of the YouTube videos, write most of the Facebook posts, or even write most installation scripts. This is all done by the community. Shelly is responsible for providing the infrastructure (physical products, web applications, RPCs, operating systems, knowledge base) and coordination (bringing the different technologies together, doing some posts, training software developers, training installers in technical schools, and coordinating distribution).



- +10 social channels / +150k followers
- +1.5m social post reach
- Independent Shelly support groups with +100k members
- + 2000 user generated videos

8


Open Platform & Partner Network
ALLTERCO
Industry Partners
CRESTRON
CVS pharmacy
Google
SAMSUNG
amazon
vodafone
Albertsons
+30 others...
Compatible with...
amazon alexa
Home Assistant
SmartThings
iBroker
Google Home
openHAB
Homey
Apple HomeKit
+100 others...
HOOBS

Leadership and Management

Shelly is currently lead by co-CEOs, Dimitar Dimitrov and Wolfgang Kirsh. Dimitar is a founder responsible for reasearch and development. He owns 33% of the shares.

Dimitar Dimitrov is an IT entrepreneur. He started his first company shortly before graduating from high school. It specialized in software development for 8 and 16 bit computers. His next project was REAL TV – a cable television, which provides services in Studentski grad, Kazichene and Busmantsi, as well as in Plovdiv and Krumovo. He is the founder of the newspapers PC Review, Computers and Peripherals and GSM Review.

Dimitar Dimitrov started his business relations with mobile operators in 2002, creating the company DVR OOD, which subsequently became part of Terra Communications AD – a leading company in the development of mobile solutions, platforms and applications. Today he is the CEO of the holding Allterco JSCo, which unites under its umbrella 7 companies.

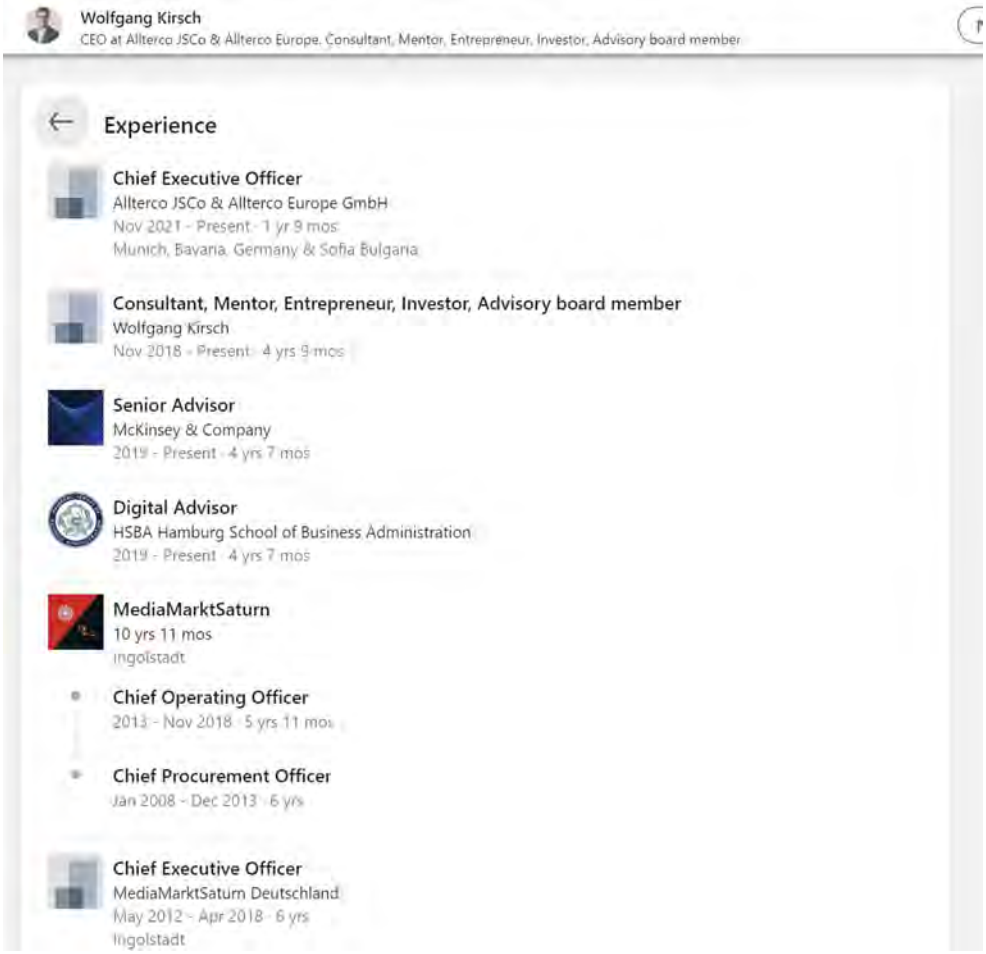
Dimitar Dimitrov is the founder of the IoT business of the Group in his role of a manager first and a director of "Research and Development" later. His main activity is the development of new IoT products and projects.

https://info.shelly.cloud/ddimitrov-bios/

https://www.youtube.com/watch?v=dhyRck7j_rU

https://www.youtube.com/watch?v=b0KzFOfevwo

The other co-CEO is Wolfgang Kirsch. Wolfgang is a German who previously was the COO of one of Europe's leading consumer electronics retailers, MediaMarktSaturn. Wolfgang is responsible for growing Shelly's distribution with retailers, large wholesale distributors, and professional installers. Wolfgang is also responsible for capital markets.



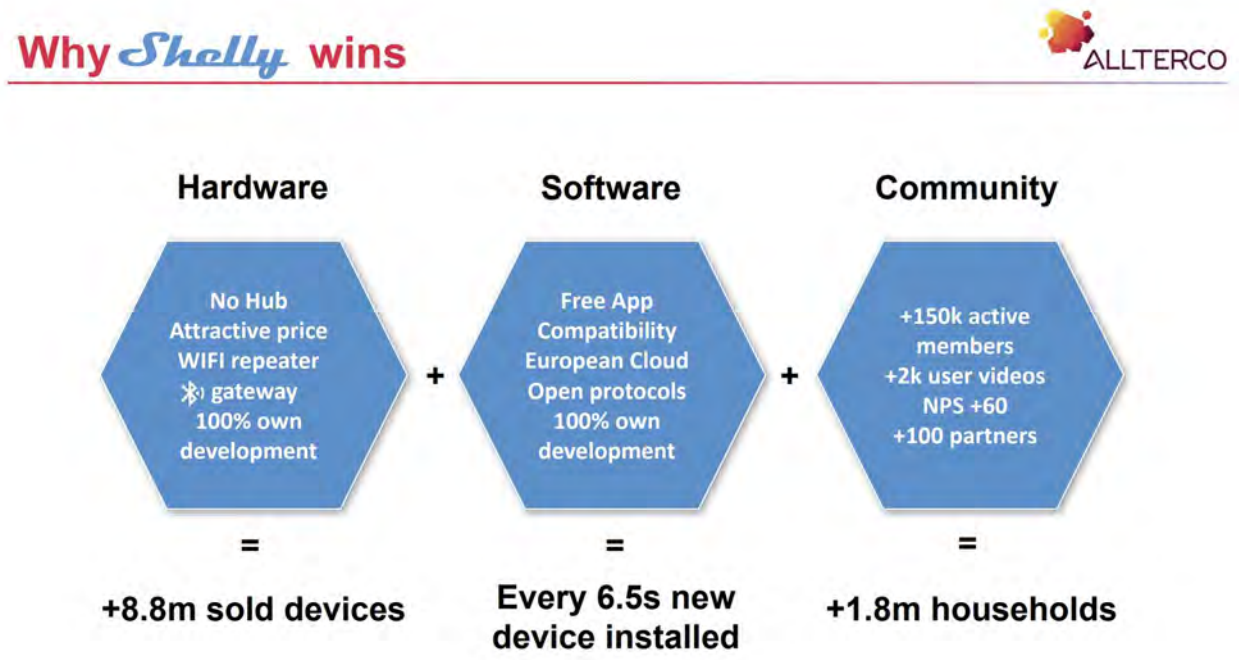
https://www.linkedin.com/in/wolfgang-kirsch/details/experience/

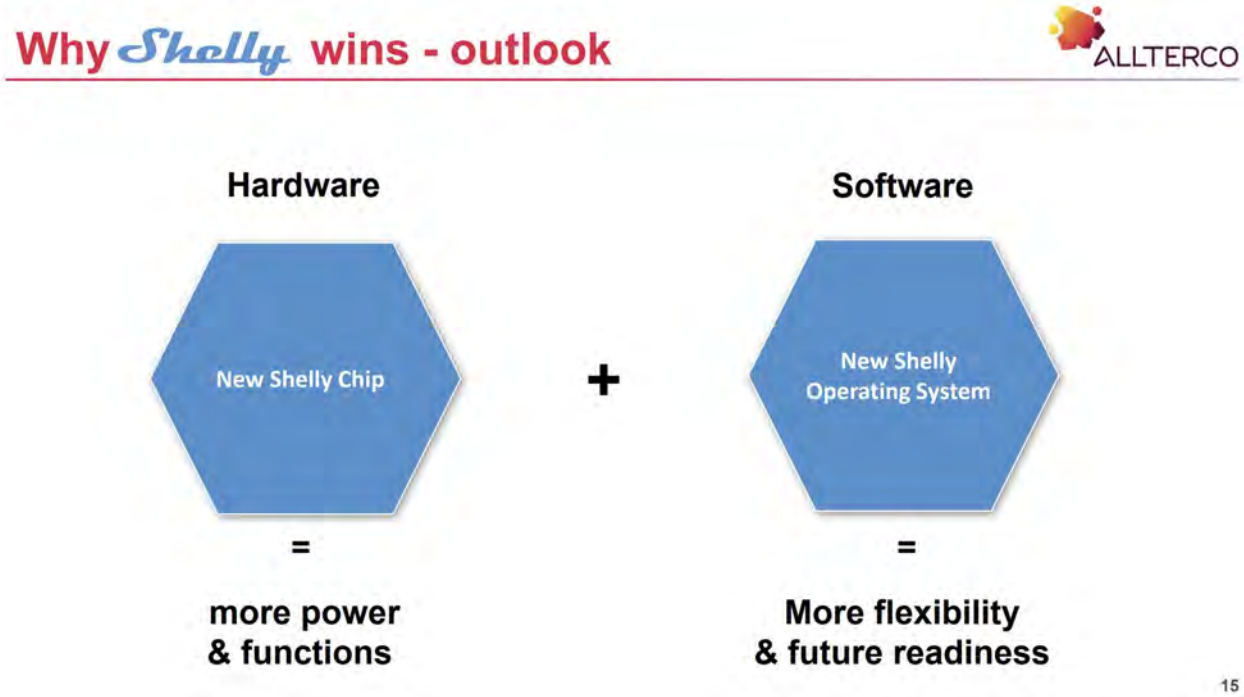
Dimitar is the engineer founder and Wolfgang is the operator brought on to build structure and lead growth.

Sound familiar to Facebook and Google?

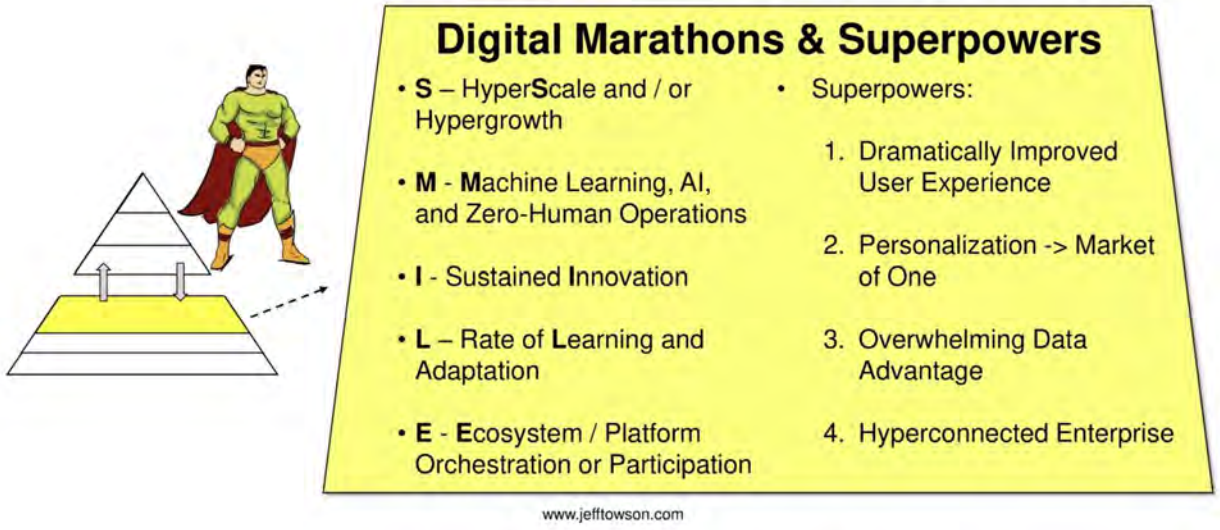
Sustainable Cash Engine that Scales

Finally, Shelly generates cash flows to provide funds for the development of new products and better software. Shelly's gross margin is 50-55% versus ~37% for Siemens. Further, Shelly's gross margins are expected to increase as it releases software products and an operating system.



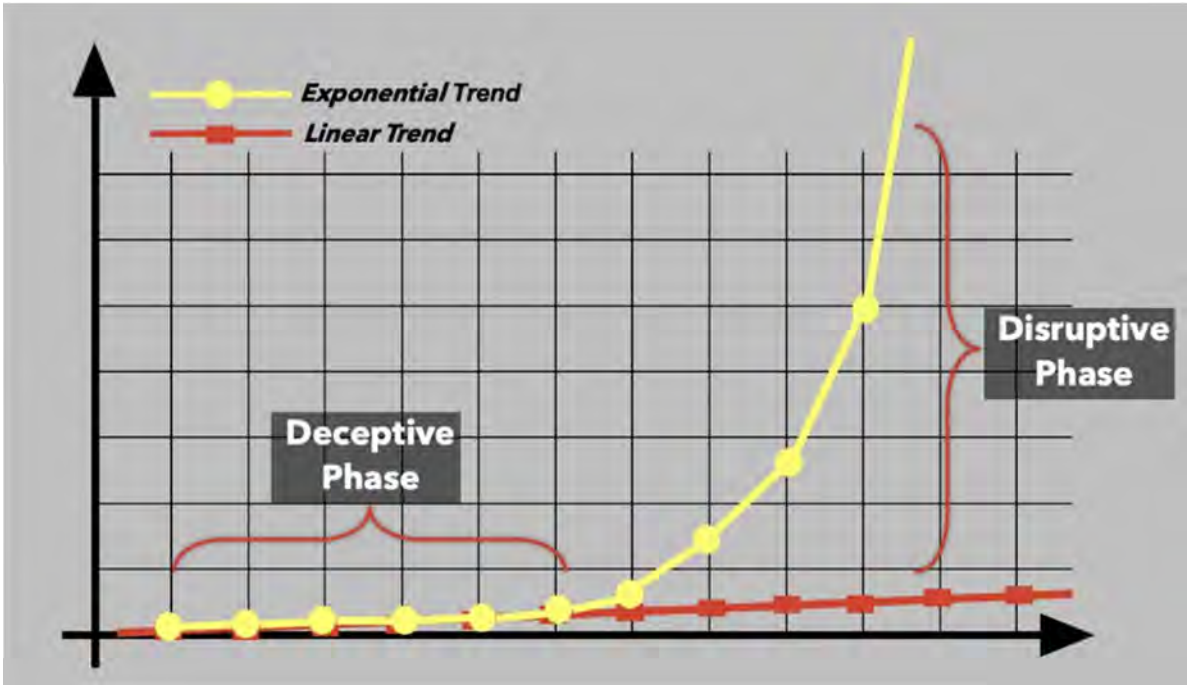


Digital Marathons and Superpowers

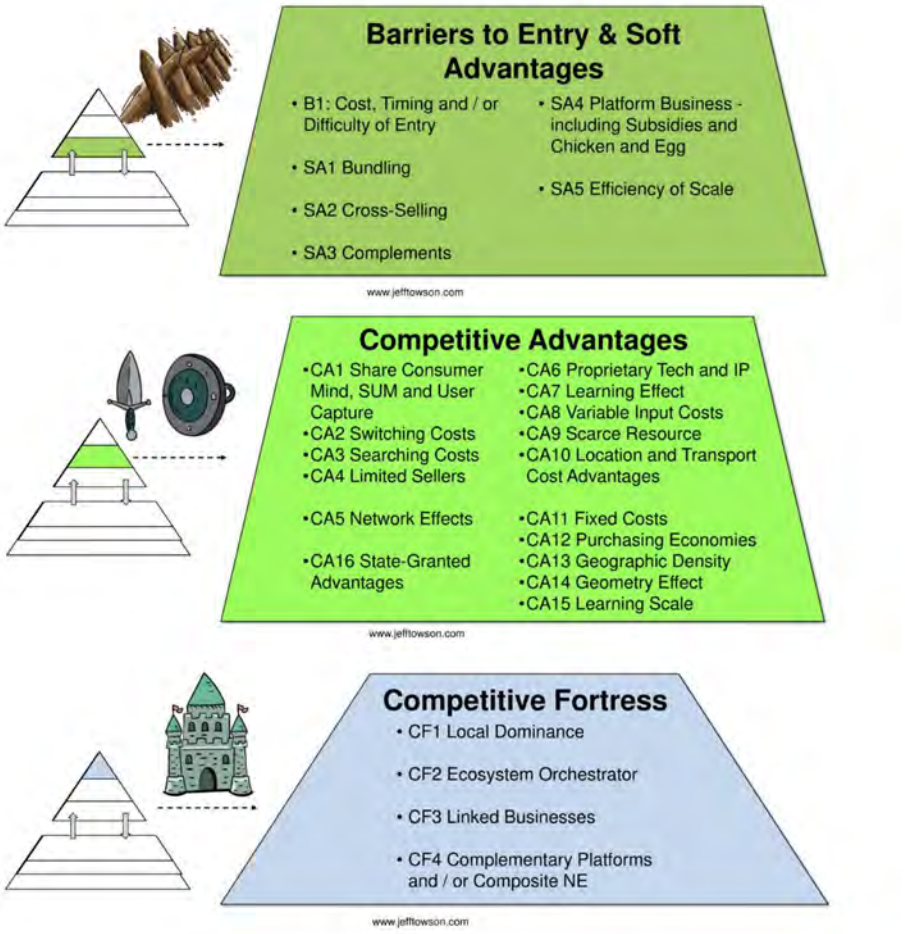


Shelly is quickly pulling away from the competition. They are building a community/ecosystem that is hard to compete against; and as they continually innovate by creating new products, operating systems, and cloud applications, it will become even more difficult for competitors to catch Shelly. At first, Shelly's digital operating basics seem to be insignificant but over time, the difference becomes a moat. Afterall, what difference is there when just a few Europeans have one or two Shelly plugs connected through Wi-Fi? However, how different is the world when just about any electrical device can be connected via Wi-Fi and programmed in JavaScript and controlled remotely?

Currently, in 2023, we are at the point where the yellow line is just starting to pull away from the red line.



Competitive Advantages & Fortress



Currently, Shelly is still in the phase where it is starting to pull away from the competition and only beginning to build out a wide moat, but we are starting to get an idea of what this moat will look like in five to seven years.

Perhaps, Shelly's biggest advantage today is its ecosystem/community. This will only grow bigger overtime. Like how YouTube and Google search have advantages due to long-tail searches (relatively low search volumes), Shelly's advantage will be the code base and social media posts by its community. Want to find some obscure knowledge? Your best bet is on YouTube. Want to know how to adjust the amount of water applied to your garden based on rainfall for the day in your area? I would make a bet that you are more likely to find that using Shelly's ecosystem than any other competitor's ecosystem.

As more and more customers install Shelly products, Shelly's share of mind will grow and search costs to find Shelly products and automation solutions will be much lower than the competition. Shelly will also benefit from switching costs. Once you have a house, office building or manufacturing plant built with Shelly products and use Shelly's cloud applications and or scripting functions, how likely will you be to switch to a new product? Shelly faces this problem today when trying to win market share against its competitors but slowly (and more quickly as time goes by) it is winning market share. As we have seen, Shelly's products and ecosystem are much better than other solutions.

Another important consideration is how Shelly is winning over the professional installer market. Shelly is now training installers in technical schools in Germany and the Nordic countries. Think about your position as a professional installer:

> There are now new installers entering the market who can now do implementations quicker (which means cheaper than you) and often with more functionality. What do you do? Continue doing home installations based on dated technology or learn a new better way to serve the market?

Big data will be another advantage. The company with the biggest data set will make the best predictions about your air quality and appliance status.

If Shelly is very successful with the new chip and OS, it will build a truly great competitive position. In addition to being installed in Shelly products, Shelly CEO Dimitar Dimitrov wants to sell the chips and the necessary technology to manufacturers of household appliances. According to him, the target group is equipment manufacturers who want to make smart electrical appliances without needing "any software engineers". If other equipment manufacturers use the Shelly OS, Shelly will become more like Windows or iOS and its position will be very strong. The new chip could also lead to an economies of scale advantage if Shelly can sell a much higher volume of chips than its competitors. It is way too early to tell if Shelly will have any success offering its OS to manufacturers, but the outcome adds huge optionality to the value of the company.

> **They have also partnered with semiconductor specialist Espressif to develop a custom microcontroller for Shelly products. What does this step bring and to what extent does it change the cost basis per end device?**
>
> **Wolfgang Kirsch** : Our collaboration with **Espressif** has been developing very successfully for a long time. Now we will bring this new chip to the market together, which will enable us to integrate new standards and additional features into our **Shellys without having to forego existing functions.** In this way, we can uncompromisingly maintain and expand the unsurpassed flexibility of our Shelly products, which our customers value so much. This chip will have a rather positive effect on the costs per device, if at all. After all, we now produce quantities that bring us considerable price advantages.

https://www.boersengefluester.de/allterco-wir-werden-viel-positives-zu-berichten-haben/

About the plans and current projects of the Shelly Group (the company is changing its name from Allterco), the guest said that at the moment the work on the production of its own chip occupies a central place. "It's not so much about a shortage of chips as it is that we haven't been able to find a ready-made chip on the market right now that can meet the needs of the devices we plan to produce in the future."

> *"Aiming for artificial intelligence and other functions that we plan to build into devices, we therefore need to have a new chip that is powerful enough to operate and support all of these functionalities, while at the same time having low power consumption ".*

The company has invested in the creation of the chip, as it is manufactured in Taiwan, added Dimitar Dimitrov. "Only we will use it in our products, but we plan to offer it as a "solution" as well - through this chip, the service for connecting and controlling other smart electrical appliances and other manufacturers who do not have our experience in the field of automation, smarthome will be offered , smartenergy".

--Dimitar Dimitrov

July 2023

https://www.bloombergtv.bg/a/19-svetat-e-biznes/120316-nezavisimostta-ot-kitay-v-proizvodstvoto-na-elektronika-zasega-e-himera

Currently, equity markets are valuing Shelly (A4L) likes it's a hardware company with modest growth and a weak moat. This could not be further from the truth. Shelly is a software company that is orchestrating a vast ecosystem that is building a connected and automated future. In 2012, Apple was trading for 12-14x earnings and Mr. Market was valuing the company as a seller of single purchase hardware. Over the next decade, however, Mr. Market came to realize Apple was an orchestrator of a unique cloud-based software ecosystem. Today, Apple's strengths are now obvious to everyone, but the big rewards went to the early investors who understood Apple's ecosystem, brand, and growth potential before the rest of the crowd.