


www.omilab.org

Explain 

OMiLAB Training Module 1

The OMiLAB Ecosystem: Characteristics and
Application Cases

Agenda

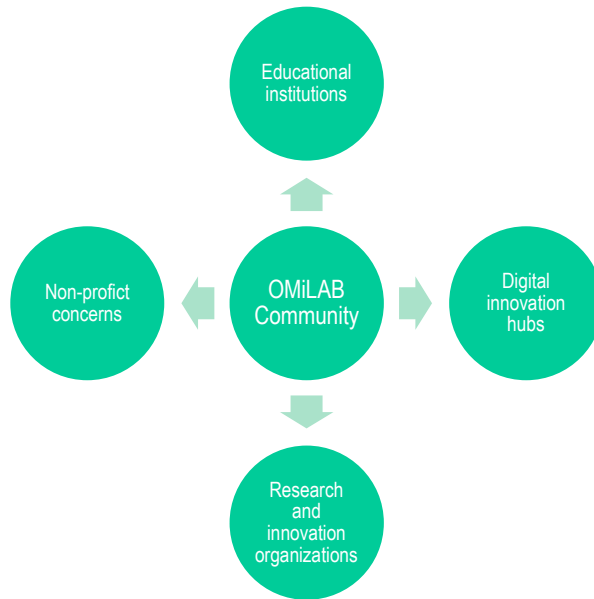
- Philosophy & Principles
- The OMiLAB Network
- Introduction to OMiLAB
 - OMiLAB Example Instance
 - Experimental Environment Infrastructure
 - The Virtual Lab
 - The Physical Lab
 - OMiLAB Delivery Package (?)
- Requirements of an OMiLAB
 - The Physical Lab: Space Requirements / Recommendations
 - The Virtual Lab: IT-Infrastructure
- The Smart Supermarket Case

PHILOSOPHY & PRINCIPLES

Philosophy

- Support of an active global community for conceptual modelling who benefit from open artefacts
- OMiLAB as a facilitator to the development of scientific methods and technology
- OMiLAB as a platform where
 - participants can bring ideas related to modelling
 - Engage in the exploration process
- Contribution to the community through a worldwide network of OMiLAB Nodes
- Resources are
 - Knowledge and procedures
 - Technology
 - Community building activities

Primary Beneficiaries



Principles

- **Open**
 - to all individuals and organisations for membership and contribution
 - To all domains and functional areas or organisations
 - To the use of content and technology through free or open copyright licenses
- **Model driven value creation**
 - Through the interplay of science, technology, and application ins specific domains
 - through the impact and adaption of models in communities of practice
- **Self-goverend**
 - The community members are self-goverend
 - Steer the organisation's activities through a Scientific Advisory Borad
 - Actively contribute to the network

OMILAB NETWORK

OMiLAB worldwide network of Nodes



Collaborate

with peers, academics and experts from all over the world on topics related to conceptual modelling and modelling tool engineering.



Innovate

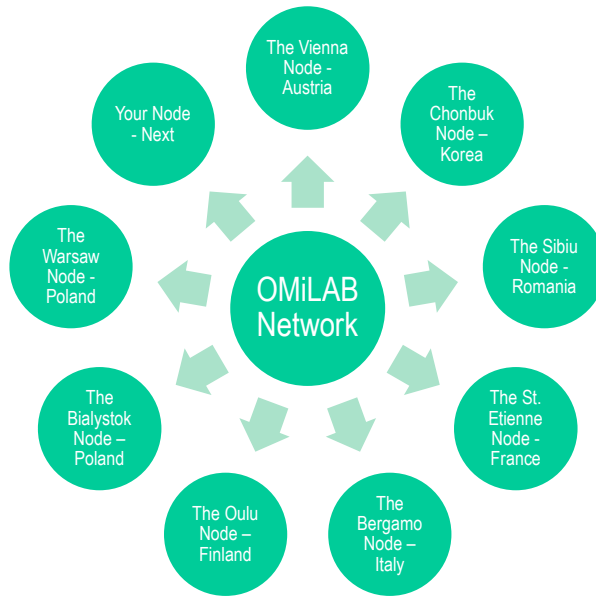
ideas, extend existing concepts, methods and tools, apply modelling knowledge to new domains and innovative designs or technologies.



Prototype

+ modelling methods;
+ tools;
+ design models
using the OMiLAB
technological environment.

OMiLAB Nodes worldwide



INTRODUCTION TO OMILAB

OMiLAB Installation



Experimental Environment Structure

FoF Design Competence Network
OMiLAB Community



OMiLAB 4FOF

Virtual lab

Services

Tools

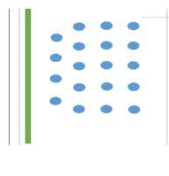
Projects

Scheduling

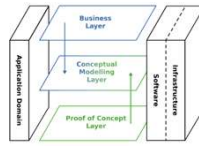
...

Physical lab

Creative Space



CPS-Evaluation Space



Engineering Space



OMiLAB
www.omilab.org

The Virtual Lab

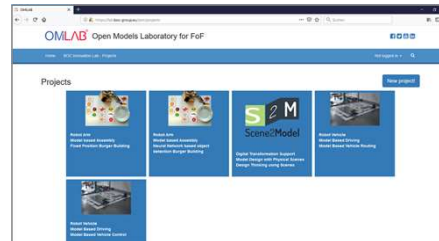
The virtual lab replicates the functionalities offered in the physical laboratory and adds services to them.

As such it enables:

- A virtual space to set-up, execute, document and share experiments (suited for individual use or for group work)
- Each experiment can be set-up as a project with its own administration space, access and user rights, content etc.
- Access to tools and development services
- Remote access to the CPS-equipment in the lab (individual scheduling for remote access to equipment; software and web-services for run-time execution directly on the CPS-infrastructure)
- Access to learning materials, instructions, tutorials etc.

OMLAB
www.omilab.org

Micro
Service
Framework
based on



13

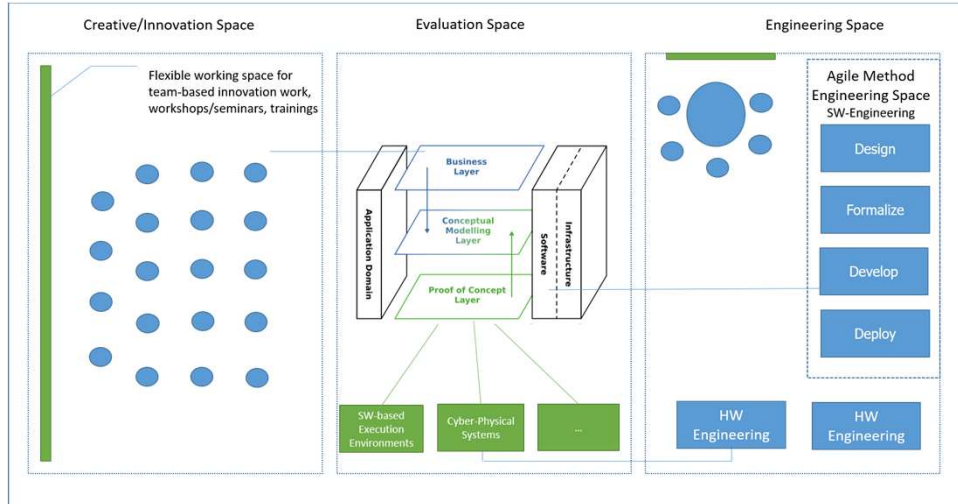
The Physical Lab

The physical lab is a dedicated teaching, research and experimentation space for the conceptualization, development and deployment of modelling methods, tools and models designed with them.

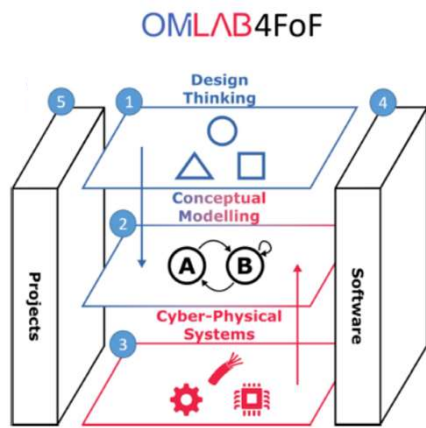
As such it enables in relation to conceptual modelling and modelling tool engineering:

- Trainings and education through teaching materials, instructions, tutorials
- Prototyping of
 - Modelling methods
 - Modelling tools
 - CPS-based experiments
 - Design models
- Access to tools and development services
- Innovation through new ideas, extension of existing concepts, methods and tools, application of modelling knowledge to new domains and technologies

The Physical Lab



The Physical Lab: Evaluation Space



❖ Strategy

- Topics like business models, product-service-systems, crowdsourcing
- Methods like design thinking, open innovation

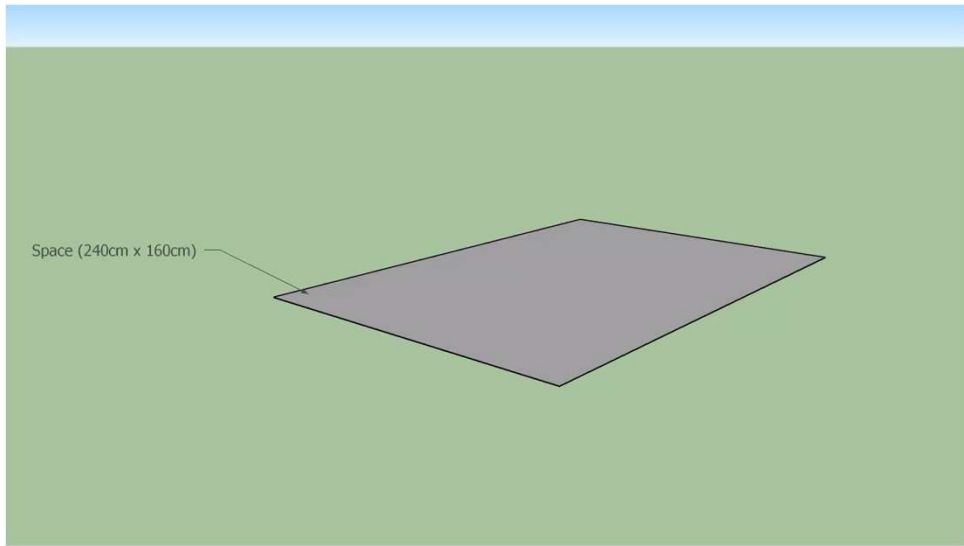
❖ Processes

- Topics like business process management, IT architecture and service management, data management, cybersecurity, product/service-lifecycle-management
- Methods like domain specific languages, formal languages

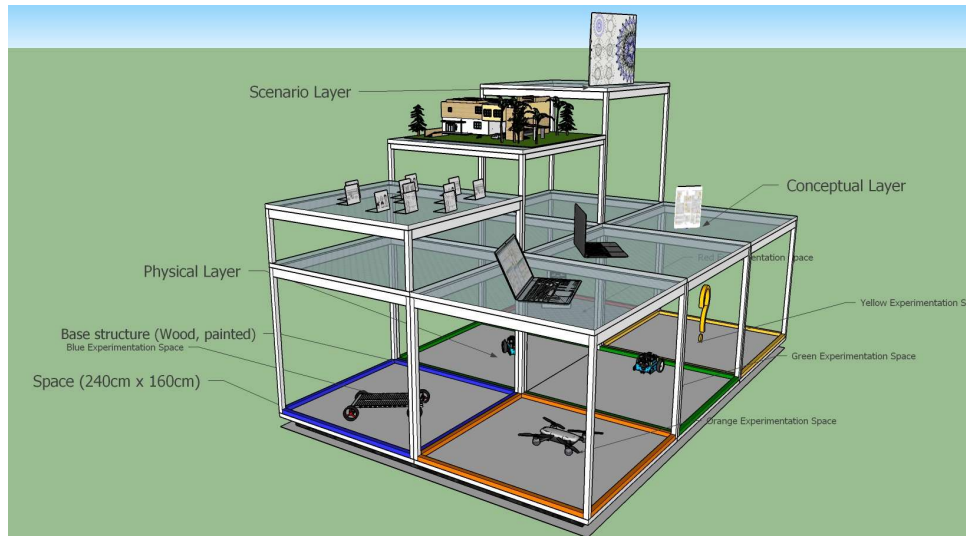
❖ Systems

- Topics like cyber-physical systems, digital factory reference architecture, semantics, production automation, product-service-data-transmission, network security
- Methods like computer-aided-design, model-driven software engineering

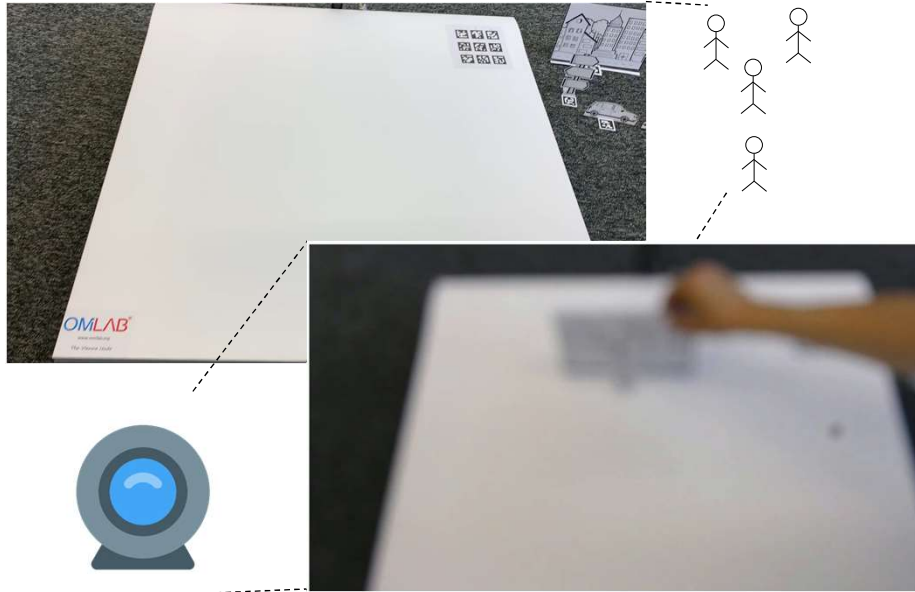
The Physical Lab: Evaluation Space



The Physical Lab: Evaluation Space



Design the Case



Digitalisation: Business Model View

The image displays three overlapping windows of the Scene2Model software interface. Each window shows a different scene in a business model canvas format. The top window shows a laptop and a city skyline. The middle window shows a hand holding a smartphone and a city skyline. The bottom window, labeled 'Scene 3: Commute', shows a storefront with a person, a car, and a city skyline, with arrows indicating relationships between these elements. A text box at the bottom of the bottom window reads: 'Information of the picture licenses can be found in the objects' notebooks.'

Scene 1: Bro

Scene 2

Scene 3: Commute

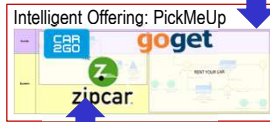
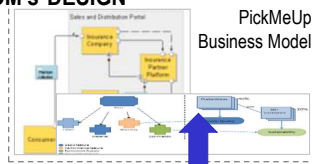
OMLAB
www.omilab.org

Scene2Model

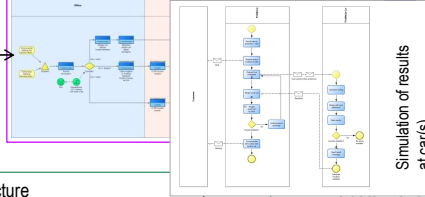
Model the Case

FROM s*DESIGN

PickMeUp Business Model

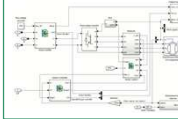


Intelligent Process: (AI) Car Suggestion Algorithm

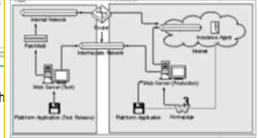


Simulation of results at car(s)

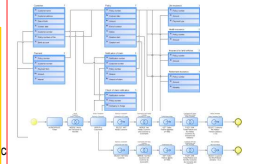
Car Infrastructure



ICT infrastructure (mobile, cloud)

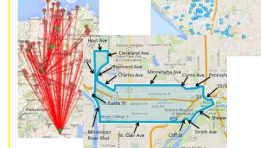


Product/usage/billing client



Business district

Car positions and status



OMLAB
www.omilab.org

Source: h

Make the Case

Reaction: B provides car ride

Option B

Option A

OMiLAB Delivery Package

Interaction/portal software [download OLIVE Micro Frontends]	Broadcasting [download OMi-TV]	Documentation [download] On-site installation of starter package (Physical objects and software) On-site training for OMiLAB (Software, Samples)
Digital/physical lab		
Design Thinking Software [download Scene2Model]	Physical Design Thinking objects [download setup]	
Conceptual Modelling Software [download Bee-Up]	Introductory Samples [download setup]	
Meta-Modelling Platform Software [download ADOxx]	Physical Objects Starting Package: <ul style="list-style-type: none"> • Logitech Camera, • Dobot Magician, • Makeblock mbot [delivery of items]	
Microservice Framework Software [download OLIVE Microservices]		
IoT Adapter Software [download setup]		



Based on OMiLAB Infrastructure

OMiLAB Delivery Package

The following Documents are delivered as a package

1. **OMiLAB – INFRASTRUCTURE**

- Pre-Conditions (Space, Network, Rack, Air Condition,)
- Layout (Bill of Material, Construction Plan)
- Hardware (Server, Router, Camera, Flat Screen)
- Corporate Identity

2. **OMiLAB – SOFTWARE (Open Source/Use)**

- ADOxx: Download and Installation Instruction
- Bee-Up: Download and Installation Instruction
- OLIVE: Download and Installation Instruction
- IoT Connectivity Layer: currently Java Applications

3. **OMiLAB – Cyber Physical System (Physical Devices)**

- mBot: mobile vehicle
- Dobot Magician: Robot Arm
- Camera for QR Code

4. **OMiLAB – Introductory Training Cases/Experiments**

- Dobot Magician: Bee-Up, Setup and Demonstration Instructions, set of objects
- Scene to Model: Scene to Model Tool, Setup and Demonstration Instructions, Scene Figures
- Smart City Scenario: Smart City Modelling Tool, Setup and Demonstration Instructions, print-out

1. OMiLAB Infrastructure

Deliverable describing the OMiLAB Infrastructure

1. Pre-Condition

1. Recommended room size
2. Possible settings: Presentation and Teaching Area, Model & Robot farm (tables), Creative and Working Area
3. Network: Bandwidth, Configurations (open for easy connectivity),
4. Recommended Rack (to be accessible from room)
5. Power supply, air-condition

2. Layout

1. 3D Model from LAB
2. Bill of Material
3. Construction Plan and picture guide how to construct the Model & Robot farm (tables)

3. Hardware

1. Server Requirements
2. Server Software
3. Router (if necessary)
4. Camera for LAB (not for experiments)
5. Flat Screen and corresponding instruction to run OMiLAB TV

4. Corporate Identity

1. Materials (Logos, Images, Skinning)
2. Templates (Word, PowerPoint, Flyer)

2. OMiLAB Software

Deliverable describing and providing access to Software Components

1. **ADOxx**
 1. Laboratory Licence Delivery Package (Non-Disclosure Agreement, Laboratory Licence, Confirmation of Receipt)
 2. Introduction into ADOxx.org Open Source Community
 3. Introduction and Link to Cyber Physical System relevant ADOxx code (Snippets, Scripts, How to, ...)
2. **Bee-Up**
 1. Standalone Installation Package
 2. Training Cases/Experiments
3. **OLIVE**
 1. Download instruction of Olive
 2. Installation, Deployment and Setup Instructions for Laboratory Web portal
 3. (Installation, Deployment and Setup Instruction for connecting ADOxx and IoT Connectivity Layer)
 4. Introduction into Open Source Community of Olive
4. **IoT Platform Layer**
 1. Download instruction of "IoT Platform"
 2. Installation, Deployment and Setup Instructions
 3. Introduction into Open Source Community

3. OMiLAB Cyber Physical System

Deliverable describing Cyber Physical System

1. Starter Package

1. mBot

1. Introduction of mBot
2. Bill of Material
3. Construction, Installation and Setup Instructions

2. Dobot Magician

1. Introduction of Dobot Magician
2. Bill of Material
3. Construction, Installation and Setup Instructions

3. Camera for QR Code

1. Introduction to QR Code Reading, Installation and Setup Instructions
2. Reference to Camera and stand

2. Extended Package

Application Specific Extension

3. Physical Devices (only in case of commissioning)

Depends on agreement

4. OMiLAB Introductory Training

Deliverable describing and providing the Introductory Training Samples

1. Form Conceptual to Physical Layer

1. Reference to Dobot Magician installation for the training sample
2. Reference to download and installation instruction for Bee-Up
3. Reference to training model download
4. Reference to objects for the training sample
5. Demonstration Material

2. From Application Domain to Conceptual Layer

1. Reference to QR reading camera
2. Reference to download and installations instruction for the Scene to Model toolkit
3. Reference to training model download
4. Scene Figures to cut and use during training sample
5. Demonstration Material

3. From Application Domain to Conceptual Layer to Physical Layer

1. Reference to mBot
2. Reference to download and installations instructions for Smart City Model toolkit
3. Reference to training model download
4. Reference to street and object print outs
5. Demonstration Material

REQUIREMENTS

The Physical Lab: Space Requirements / Recommendation

- The **lab layout** presented on slide 10 is an example of a recommended space.
- Room form: Rectangular
- Sections: All (creative, evaluation, engineering)
- Size: 60 sqm
- Per section:
 - Creative: 23 sqm
 - Evaluation: 25 sqm
 - Engineering: 12 sqm
- **Configuration options:** the different spaces could also be separated in different rooms if necessary.
- Specific layout **requirements** may apply depending on **national laws or institutional regulations** also with regards to space affordances.

The Physical Lab: Layout of the Evaluation Space

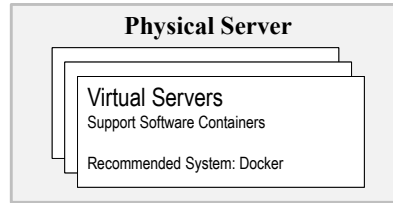
Space

1. Space Requirements
2. Foundation: Base Structure
3. First Layer: Physical Devices
4. Second Layer: Conceptualization Space
5. Third Layer: Abstraction / Scenario Space

The Virtual Lab: IT-Infrastructure – Hardware Requirements

Physical Server Requirements

- Server must be capable to support Hardware Virtualization.
- We recommend to deploy SW in form of Docker containers.
- Our recommendation is VMWare ESXI 6.7



• Minimum Requirements for VMWare ESXI 6.7

(Source: <https://docs.vmware.com/en/VMware-vSphere/6.7/com.vmware.esxi.install.doc/GUID-DEB8086A-306B-4239-BF76-E354679202FC.html>)

- At least **four** CPU cores
- Supports **64-bit x86 processors**
- Requires the NX/XD bit to be enabled for the CPU in the BIOS
- Requires a minimum of 4 GB physical RAM. Recommended to provide at least **16 GB RAM**
- Hardware virtualization (Intel VT-x or AMD RVI) must be enabled on x64 CPUs
- One or more Gigabit or faster Ethernet controllers (depends on network configuration)
- SCSI disk or a local, non-network, RAID LUN with unpartitioned space for the virtual machines (min 500GB, excluding system partition)

The Virtual Lab: IT-Infrastructure – Hardware Requirements

Server Infrastructure: OMiLAB Recommendation

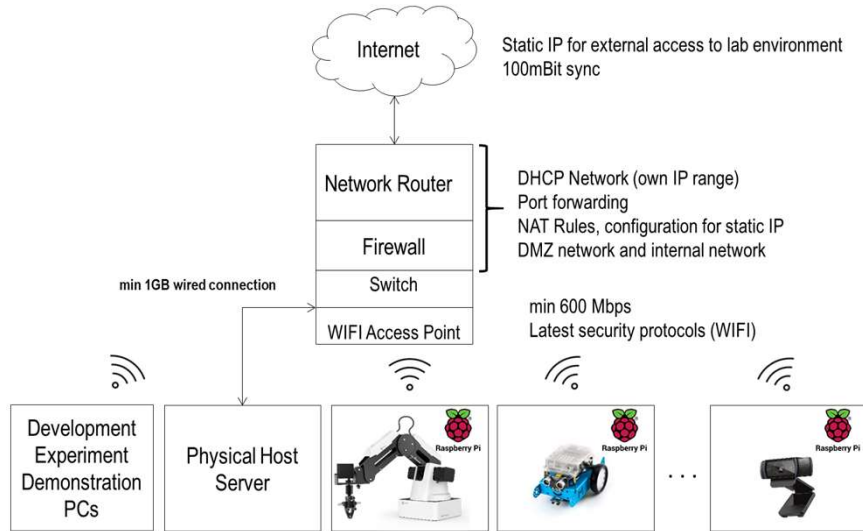
Recommendation for Physical Server:

- CPU: 20 CPUs x Intel Xeon CPU 35-26430 v4 @ 2.20GHz
- RAM: 64 GB
- HDD 1: 100 GB (System)
- HDD 2: 2,8 TB (Data, Virtual Machines)
- Monitor: VGA
- Keyboard/Mouse: USB



The Virtual Lab: IT-Infrastructure – Hardware Requirements

Recommended Network Infrastructure



The Virtual Lab: IT-Infrastructure – Hardware Requirements

Development-, Experiment-, Demonstration PCs
(for each layer/space)

Recommended Hardware/Software Requirements for Development-, Experiment-, Demonstration PCs:

- 16GB RAM
- 512GB SSD Harddrive
- min 14" screen
- at least 1 USB 2.0 A interface (to connect via USB to Arduino)
- LAN/WIFI Interface
- HDMI and VGA (for presentation settings, depends on monitor/screen/projector)
- Software: Microsoft Windows 10
- Peripherals: mouse, keyboard, additional monitor (optional)

The Virtual Lab: IT-Infrastructure – Hardware Requirements

Smart TV

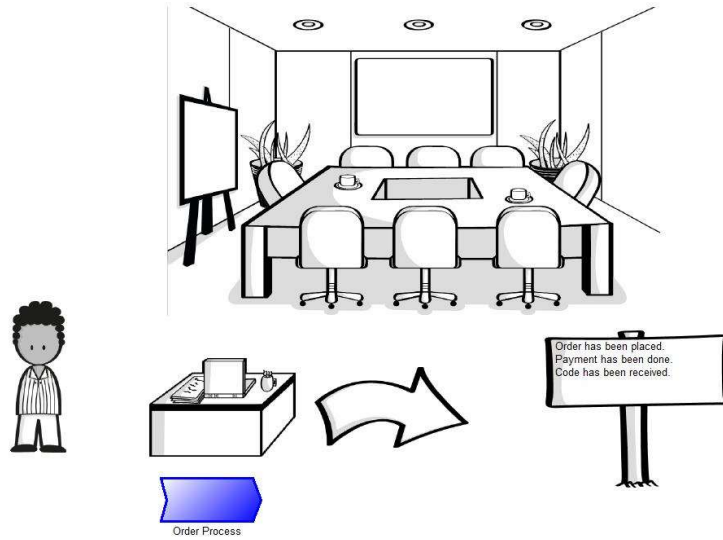
- HTML5 and JavaScript capable
- Network WIFI

THE SMART SUPERMARKET CASE

Hybrid Supermarket World

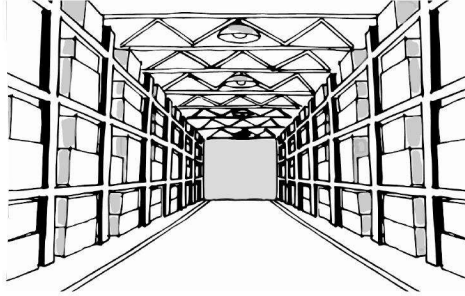
- Digital Transformation enables the vast rise of online shops
→ traditional supermarkets need to find ways how to combine the physical and the digital world
- Examples
 - Click and collect
 - Reserve and collect
 - Deliver Service

Example Shop Ordering



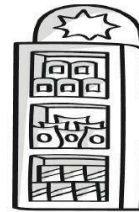
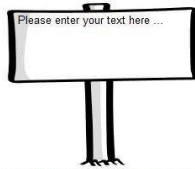
Information of the picture licenses can be found in the objects' notebooks.

Example Shop Order Assembly



Information of the picture licenses can be found in the objects' notebooks.

Example Shop Order Pickup



Information of the picture licenses can be found in the objects' notebooks.