

# UbiLAB

## The UbiLAB Framework and virtual laboratories introduction

Multiplier Event 1 - Skopje

Host: Ss. Cyril and Methodius University in Skopje

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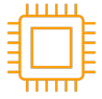
Ss. Cyril and Methodius University in Skopje, N. Macedonia  
Faculty of Electrical Engineering and Information Technologies

# Outline

- UbiLAB Architecture
- Architecture Elements
- Cloud backend modules
- Laboratory Framework Website
- Laboratory Framework Laboratories
- Laboratory Virtual Resources

# UbiLab Architecture

## Hardware/Physical Labs



*Embedded Systems*



*PLC & Industrial Automation*



*Digital Signal Processing*



*Instrument Systems*

## Software/Virtual Labs



*Programming*



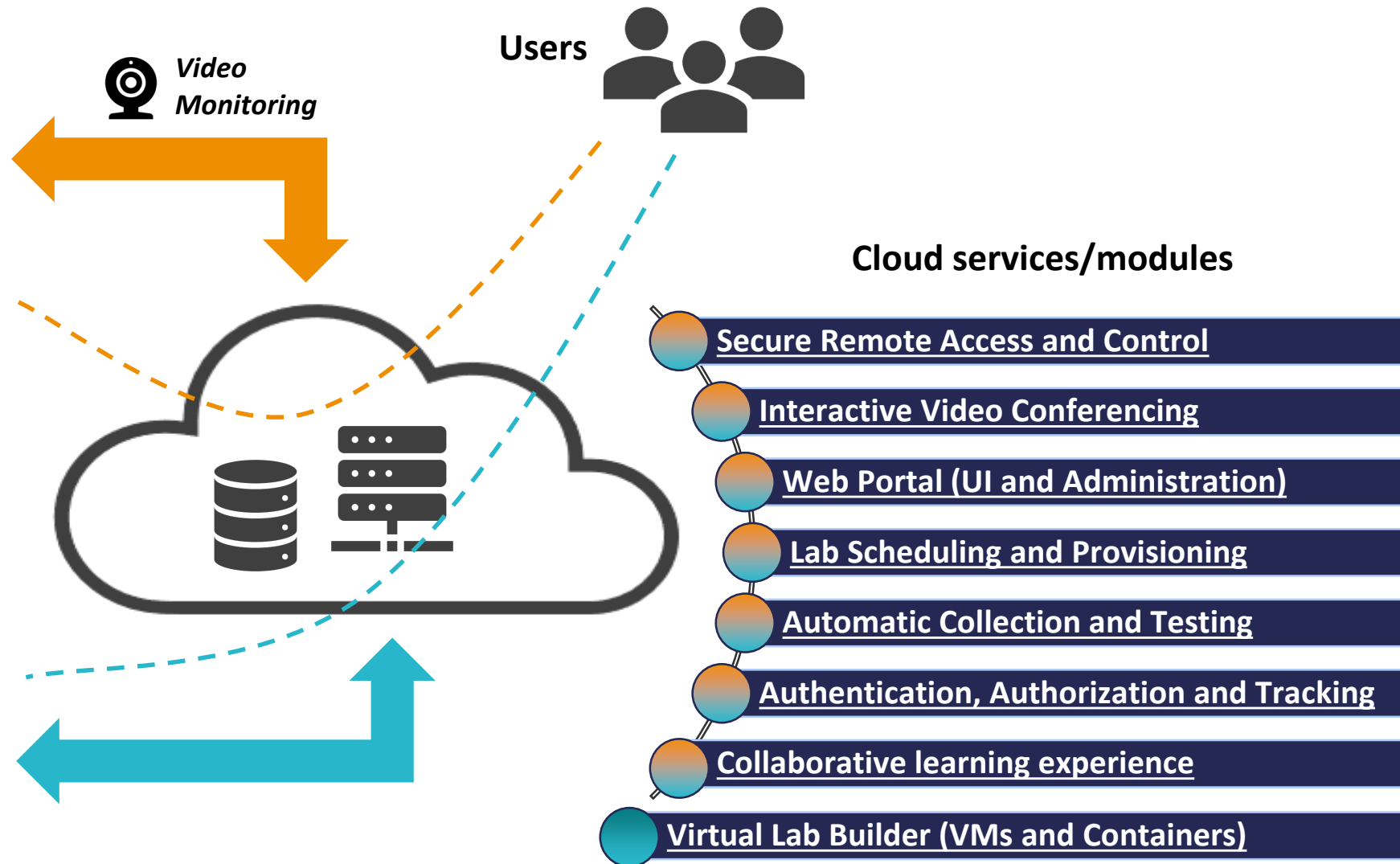
*Application Development*



*Network Security*



*Machine Learning*



# Architectural elements



- The currently identified core elements of the envisioned UbiLAB framework are **hardware laboratories, software laboratories, core cloud backend** and **users**.
- The **hardware-based remote laboratories** will be focused on facilitating the realization of exercises from the courses that require the use of hardware, e.g., lab exercises in the areas of embedded systems, programmable logic controllers (PLCs), microcontrollers, field-programmable gate arrays (FPGAs), electrical measurements and digital signal processing (DSP).
- The **software-based remote laboratories** focus mainly on computer science and telecommunications, i.e., in the particular areas of programming, algorithm design, database systems, data science and machine learning, web and mobile application development, network security, virtualized network hardware environments, virtual instrumentation.
- The **core cloud backend** consists of modules and services that will enable the students' remote access to laboratory resources, virtual presence during the lab exercises and their interaction with colleagues and instructors. The core cloud backend would use actual resources available to the partners in their laboratories: servers, personal computers, equipment used in the laboratories in ordinary circumstances.
- All elements in the UbiLAB architecture, working together, are envisioned to provide a virtual experience to the **users** as close as possible to the physical presence in the actual laboratories.

- **Secure Remote Access and Control** module that provides remote, secure, unobstructed and reliable use of the lab resources;
- **Interactive Video Conferencing** module that provides video conferencing between students and teachers;
- **Web portal** to access, use and control the laboratories resources;
- **Lab Scheduling and Provisioning** module for scheduling of classes, monitoring and provisioning of laboratories and resource utilization;
- **Automatic Collection and Testing** module for automatic collection of student projects after finishing the lab exercises and online exams;
- **Authentication, Authorization and Tracking** module for authentication and authorization of students, teachers and administrators, tracking of their actions;
- **Video Monitoring** module that will use web cameras from physical labs and feed video streams to students, teachers and administrators when necessary.
- **Collaborative learning experience** module that would facilitate the group learning experience: sharing results, comments, communication, jointly reaching solutions and exchanging knowledge.

# Laboratory Framework Website



NATIONAL AGENCY  
FOR EUROPEAN EDUCATIONAL  
PROGRAMMES AND MOBILITY



## UBILAB Virtual Laboratories



Hardware Laboratories



Software Laboratories




Универзитет "Св. Кирил и Методиј" во Скопје  
ФАКУЛТЕТ ЗА ЕЛЕКТРОТЕХНИКА И  
ИНФОРМАЦИСКИ ТЕХНОЛОГИИ



# Laboratory Framework Laboratories



https://lab-ubilab.feit.ukim.edu.mk/login/index.php



[Log in](#)

[Lost password?](#)

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Some courses may allow guest access

[Log in as a guest](#)

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[Cookies notice](#)

# Laboratory Framework Laboratories



The screenshot shows a web browser window displaying the UbiLAB dashboard. The browser's address bar shows the URL <https://lab-ubilab.feit.ukim.edu.mk/?redirect=0>. The page header includes the UbiLAB logo on the left and a user profile for "Marija Kalendar" with the initials "MK" on the right. The main content area is titled "lab-ubilab.feit.ukim.edu.mk" and includes a breadcrumb trail "Dashboard / Site home". On the left, a "Navigation" sidebar lists: Dashboard, Site home (highlighted with a house icon), Site pages, My courses, and V-SciLAB. The main content area is titled "Available courses" and features a card for "Virtual SciLAB Laboratory" with a teacher profile for "Marija Kalendar" and a list of courses including "kurs1".



# Laboratory Framework Laboratories

## - Collaboration elements -



A screenshot of a web browser displaying the UbiLAB course interface. The browser address bar shows the URL: https://lab-ubilab.feit.ukim.edu.mk/course/view.php?id=7#section-0. The page header includes the UbiLAB logo and a notification bell icon. Below the header, a breadcrumb trail reads: Dashboard / My courses / V-SciLAB. The main content area is divided into two columns. The left column is a navigation menu with the following items: Dashboard, Site home, Site pages, My courses, V-SciLAB (expanded), Participants, Badges, Competencies, Grades, Collaboration, Virtual SciLab Laboratory 1, Topic 2, Topic 3, Topic 4, and Topic 5. The right column is titled "Collaboration" and contains three items: a FORUM icon for "Teacher's Announcements", a FORUM icon for "Students Forum - Virtual Lab", and a CHAT icon for "Students Chat - Virtual Lab". Below the chat item, a message states: "Next chat time: Wednesday, 1 February 2023, 11:00 AM".

# Laboratory Framework Laboratories

## - Virtual Laboratories (Resources) -



The screenshot shows a Moodle course page for "Virtual Laboratories". The browser address bar displays the URL: <https://lab-ubilab.feit.ukim.edu.mk/course/view.php?id=7#section-0>. The user is logged in as "Marija Kalendar" (MK). The course page is titled "Virtual SciLab Laboratory 1" and contains four resource blocks:

- Virtual SciLab Laboratory 1** (Section)
  - SciLAB Virtual Machine 1** (PAGE) - Available but not shown on course page
  - SciLAB Virtual Machine 1** (SCHEDULER)
  - SciLAB Virtual Machine 2** (PAGE) - Available but not shown on course page
  - SciLAB Virtual Machine 2** (SCHEDULER)

The left sidebar contains the following navigation options:

- Course completion
  - Users
  - Filters
  - Reports
- Gradebook setup
  - Badges
  - Import
  - Backup
  - Restore
  - Copy course
  - Reset
  - Question bank

Below the sidebar is an "Add a block" section with a dropdown menu currently set to "Add..."

# Laboratory Framework Laboratories - Virtual Laboratories (Scheduling) -



Navigation

- Dashboard
- Site home
- Site pages
- My courses
  - V-SciLAB
    - Participants
    - Badges
    - Competencies
    - Grades
    - Collaboration
    - Virtual SciLab Laboratory 1
      - SciLAB Virtual Machine 1
      - SciLAB Virtual Machine 1**
      - SciLAB Virtual Machine 2
      - SciLAB Virtual Machine 2
      - Topic 2
      - Topic 3
      - Topic 4

Dashboard / My courses / V-SciLAB / Virtual SciLab Laboratory 1 / SciLAB Virtual Machine 1

## SciLAB Virtual Machine 1

My appointments | All appointments | Overview | Statistics | Export

### SciLAB Virtual Machine 1 Slots

You can add additional appointment slots at any time.

Actions: Add slots | Delete slots

Date	Start	End	Location	Students	Activity	Action
<input type="checkbox"/> Tuesday, 31 January 2023	1:15 AM	1:30 AM		<input type="checkbox"/> SF Student1 FEIT	page	
<input type="checkbox"/> Wednesday, 1 February 2023	9:00 AM	9:15 AM			page	
<input type="checkbox"/>	9:15 AM	9:30 AM			page	
<input type="checkbox"/>	9:30 AM	9:45 AM			page	

# Laboratory Framework Laboratories

## - Student View -



The screenshot shows a web browser window with the URL <https://lab-ubilab.feit.ukim.edu.mk/my/>. The page header includes the UbiLAB logo on the left and a user profile "Student1 FEIT SF" on the right. The main content area is titled "Dashboard" and includes a "Customise this page" button. Below the dashboard title, a welcome message reads "Welcome, Student1!" with a hand icon. The page is divided into three main sections: a left-hand navigation menu, a central timeline, and a right-hand "Recently accessed items" section. The navigation menu lists "Dashboard" (selected), "Site home", "Site pages", "My courses", and "V-SciLAB". The timeline section is titled "Timeline" and features filters for "Next 7 days" and "Sort by dates", along with a search box for "Search by activity type or name". A single activity is listed for "Wednesday, 1 February 2023" at "11:00": "Students Chat - Virtual Lab" with a green chat icon and the text "Virtual SciLAB Laboratory · Chat requires action". The "Recently accessed items" section shows a document icon for "SciLAB Virtual Machine 1" from the "Virtual SciLAB Laboratory".

# Laboratory Framework Laboratories

## - Student View -



The screenshot shows a web browser window with the URL <https://lab-ubilab.feit.ukim.edu.mk/course/view.php?id=7#section-1>. The page header includes the UbiLAB logo and a user profile for 'Student1 FEIT SF'. A left-hand navigation menu lists 'Virtual SciLab Laboratory 1' and its sub-topics. The main content area features a 'CHAT' section for 'Students Chat - Virtual Lab' with a 'Next chat time' of Wednesday, 1 February 2023, 11:00 AM. Below this is a section for 'Virtual SciLab Laboratory 1' containing two 'SCHEDULER' items for 'SciLAB Virtual Machine 1' and 'SciLAB Virtual Machine 2', each with a calendar icon showing the date 31.

# Laboratory Framework Laboratories

## - Student View (Booking) -



Browser address bar: <https://lab-ubilab.feit.ukim.edu.mk/mod/scheduler/view.php?id=32>

UbiLAB logo

- ▼ V-SciLAB
  - > Participants
  - ☑ Competencies
  - 📅 Grades
  - > Collaboration
- ▼ Virtual SciLab Laboratory
  - 1
    - 📄 SciLAB Virtual Machine 1
    - 📄 SciLAB Virtual Machine 2
  - > Topic 2
  - > Topic 3
  - > Topic 4
  - > Topic 5

### SciLAB Virtual Machine 1

#### Upcoming slots

Date	Teacher	Location	Comments	Activity
Tuesday, 31 January 2023 1:15 AM – 1:30 AM	Marija Kalendar			Come back at your time slot to see the activity

#### Available slots

The table below shows all available slots for an appointment. Make your choice by clicking on the corresponding "Book slot" button. If you need to make a change later you can revisit this page.

You can book 4 more appointments in this scheduler.

1 2 3 »

Date	Start	End	Location	Comments	Teacher	Group session	Book slot
Wednesday, 1 February 2023	9:00 AM	9:15 AM			Marija Kalendar	No	Book slot
	9:15 AM	9:30 AM			Marija Kalendar	No	Book slot
	9:30 AM	9:45 AM			Marija Kalendar	No	Book slot

# Laboratory Framework Laboratories

## - Student View (Booked Slots) -



Dashboard / My courses / V-SciLAB / Virtual SciLab Laboratory 1 / SciLAB Virtual Machine 1

Student1 FEIT SF

### Navigation

- Dashboard
  - Site home
  - Site pages
- My courses
  - V-SciLAB
    - Participants
    - Competencies
    - Grades
    - Collaboration
  - Virtual SciLab Laboratory 1
    - SciLAB Virtual Machine 1**
    - SciLAB Virtual Machine 2
  - Topic 2

## SciLAB Virtual Machine 1



## SciLAB Virtual Machine 1

### Upcoming slots

Date	Teacher	Location	Comments	Activity
Tuesday, 31 January 2023 1:15 AM – 1:30 AM	Marija Kalendar			Come back at your time slot to see the activity
Tuesday, 31 January 2023 3:43 PM – 3:58 PM	Marija Kalendar			<a href="#">SciLAB Virtual Machine 1</a>

# Laboratory Framework Laboratories

## - Student View (Using Booked Resources) -



The screenshot shows a web browser window with the URL <https://lab-ubilab.feit.ukim.edu.mk/mod/page/view.php?id=31>. The page header includes the UbiLAB logo on the left and a user profile "Student1 FEIT SF" on the right. A navigation sidebar on the left lists the following items:

- Navigation
  - Dashboard
    - Site home
    - Site pages
  - My courses
    - V-SciLAB
      - Participants
      - Competencies
      - Grades
      - Collaboration
    - Virtual SciLab Laboratory
      - 1
        - SciLAB Virtual Machine 1**
        - SciLAB Virtual Machine 1
        - SciLAB Virtual Machine 2
      - Topic 2
      - Topic 3
      - Topic 4
      - Topic 5

The main content area is titled "SciLAB Virtual Machine 1" and features a dark blue background. At the top left of this area is a language selector button labeled "EN". In the center is a large, glowing blue square representing a virtual machine. At the bottom, there are two input fields: "User name" and "Password", with a blue arrow button to the right of the password field.



# SciLAB Laboratory

My courses / V-SciLAB / Virtual SciLab Laboratory 1 / SciLAB Virtual Machine 2

## SciLAB Virtual Machine 2

```
Password: *****
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 5.15.0-58-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

197 updates can be applied immediately.
119 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Last login: Tue Jan 31 23:13:15 2023 from 194.149.144.249
ubilab@ubilab-KVM:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos
ubilab@ubilab-KVM:~$ █
```

- Participants
- Dependencies
- es
- poration
- al SciLab Laboratory
- LAB Virtual Machine
- LAB Virtual Machine 2
- LAB Virtual Machine



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