

Installation and Configuration Quick Guide

DRONTECHLAB DCU CONTROL SYSTEM PLATFORM



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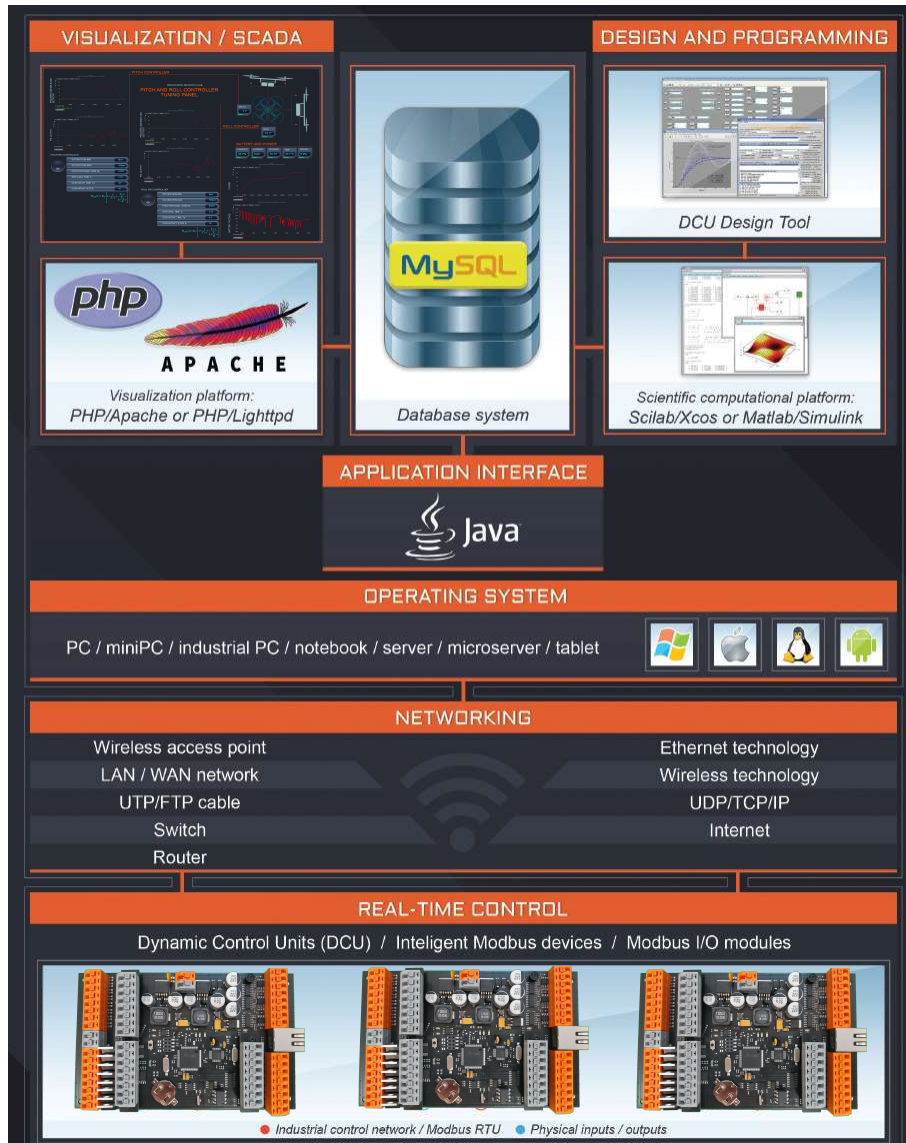
01/09/2025

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1 DCU Control System Platform installation

DronTechLab control system is built with DCU Control System Platform (DCU Platform). The platform consists of Dynamic Control Units (DCUs) connected to sensors and actuators and a software package installed on a computer that allows to program, monitor and manage control system that is built using this platform.



The DCU Platform software package can be installed on any computer with any of the following operating system:

- Windows XP or higher
- Mac OS X
- Linux

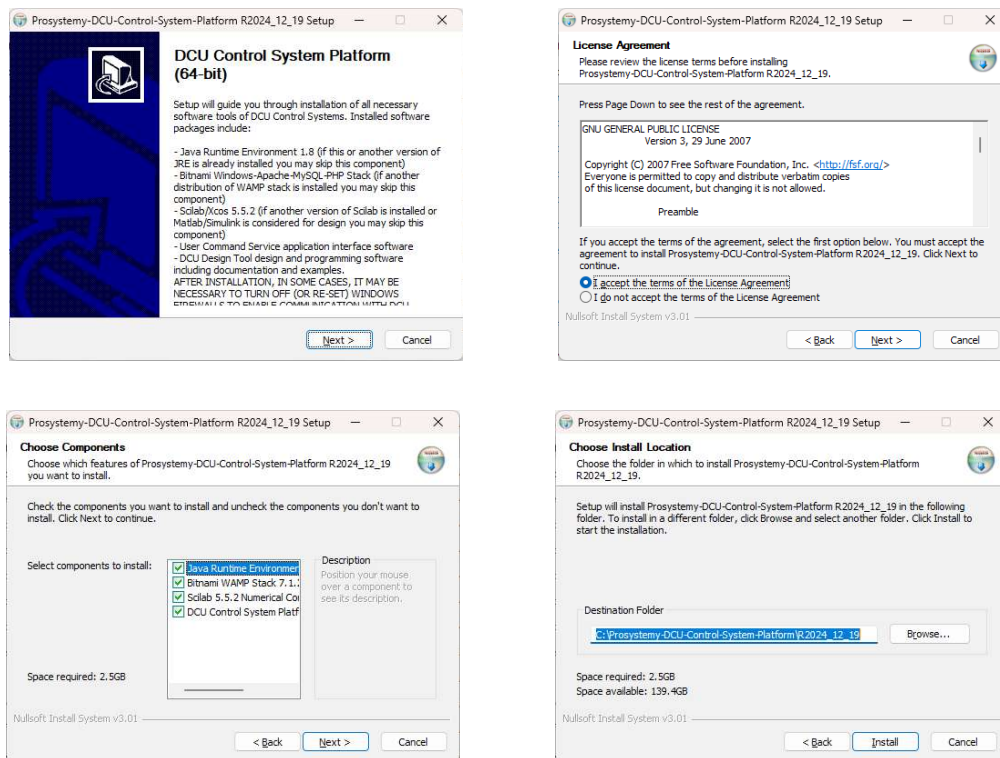
DCU platform contains the following software packages:

- JAVA Runtime Environment for running User Command Center communication software
- MySQL database server
- Apache web server with PHP (programming language for programming web pages)
- PHPMyAdmin tool for MySQL database management
- Scilab/Xcos computational platform
- User Command Center (UCC) – Java-based DCU platform communication service
- DCU Design Tool – user interface application programmed in Scilab (Matlab version in development). It is a user application for management of control system projects of DCU platform

For Windows and Linux Ubuntu operating systems installers are available that will install automatically required packages. Linux installer requires connection to internet.

1.1 Installing on Windows

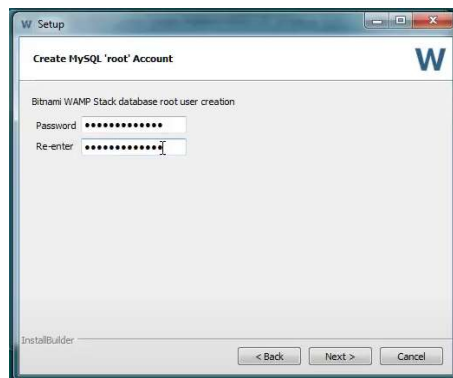
On Windows, run installer by double-click and follow instructions. If you have any of the above packages already installed, you may skip this package installation. Video help *DCU Control System Platform - Installation on windows* for the installation process is in the download section : <https://www.prosystemy.sk/index.php?vh=4>



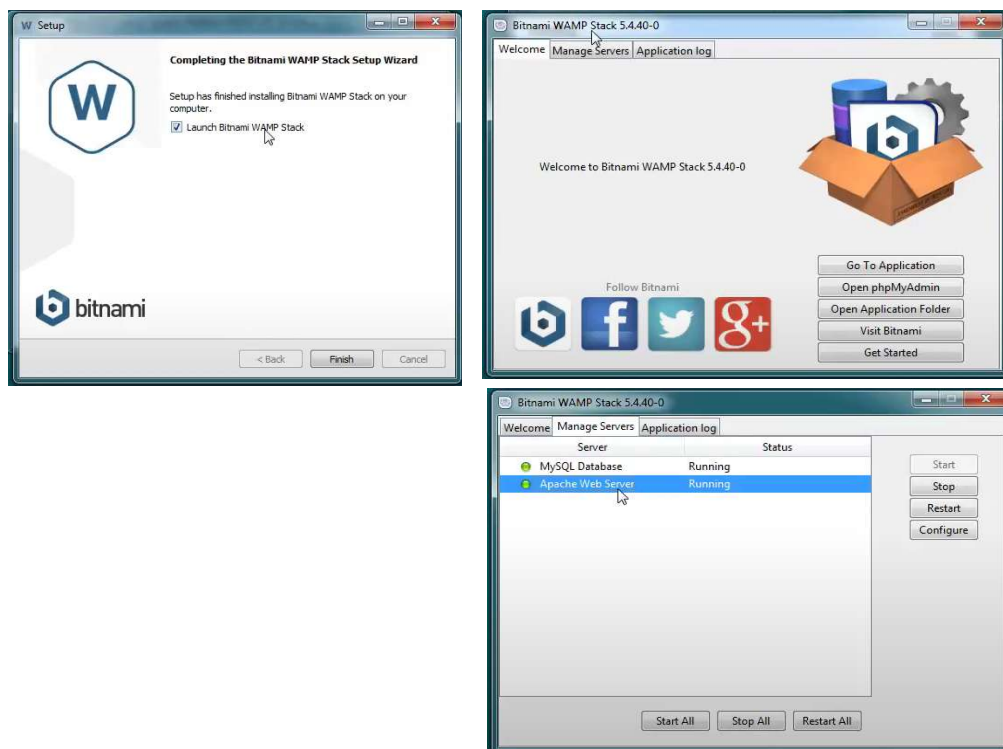
For JAVA installation, version 1.8 is necessary. If other version of JAVA is already installed, let install version 1.8 too.



User is asked to set MySQL *root* user password during installation. Note well selected password, later it will be used often.



When Apache web server, PHP, and MySQL database server are installed, its management tool (Bitnami WAMP Stack tool) may be launched. It may be also started later, but it will be used for resetting Apache server.

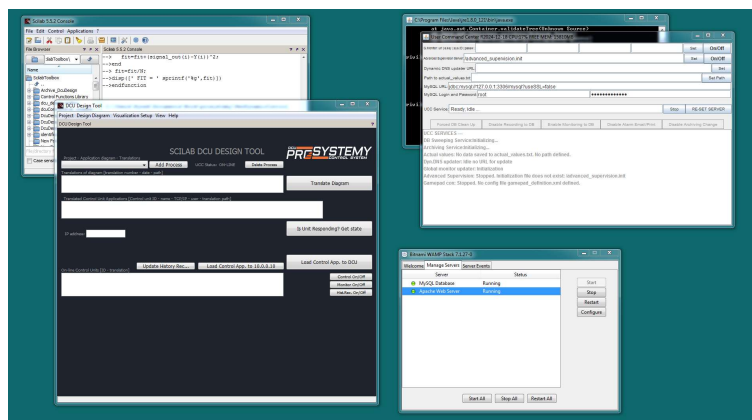
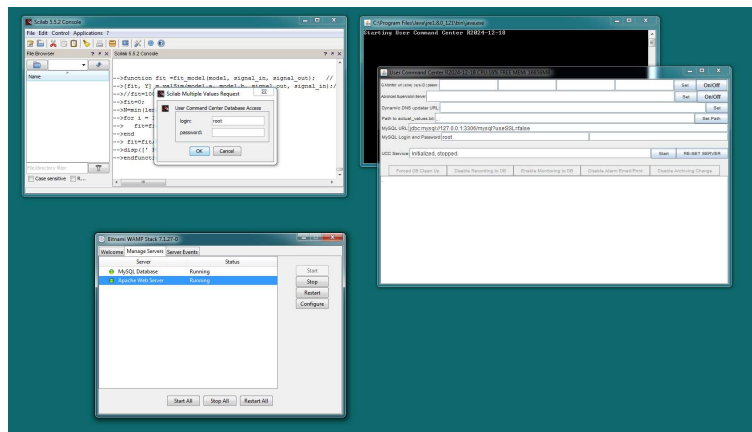
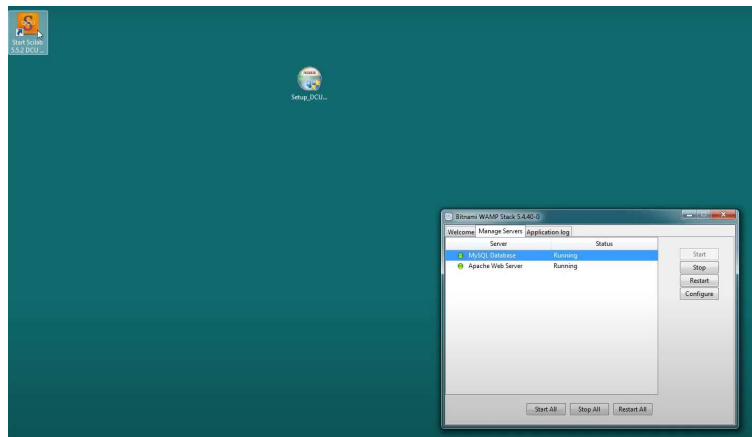


When the installation is finished, user may start the DCU platform by clicking the

Start Scilab DCU icon. This will start:

- Scilab computational platform and inside it DCU Design Tool application
- User Command Center (UCC) JAVA application that serves as communication service.

Both DCU Design Tool and UCC needs root password to MySQL database. Enter password to UCC first click *Start* button and wait until it starts. Then, enter the password to DCU Design Tool as well and click *OK*. The user interface of DCU design tool appears.



1.2 Installing on Linux Ubuntu

Installation video help is at

<https://www.youtube.com/watch?v=rCPx9LR5uZE>

On Linux Ubuntu you proceed as follows:

1. Unpack .tar.gz installer to your home directory
2. open terminal
3. go into installer directory (*cd directory*)
4. run installer (type: *./dcu_install.sh*)

User is asked to set MySQL root password during installation as well as PHPyAdmin tool password. Use one password for all tools for simplicity and note well selected password, later it will be used often.

Linux Ubuntu installer is used for server installations. That is why unlike in Windows installation User Command Center (UCC) JAVA application that serves as communication service is added to applications that start automatically after boot. The Start DCU icon that is added to the desktop starts only Scilab computational platform and inside it DCU Design Tool application.

1.3 Platform installation without installer

For more detailed information on installation and manual installation see document *DCU Control System Platform - Quick Start Guide* in the download section of PROSYSTEMY web page

prosystemy.sk/index.php?vh=4

For Mac OS and other Linux distributions, the software packages may be installed manually without installer. A general installation procedure for is as follows:

1. Install Java Runtime Environment (JRE) version 1.8
2. Install Apache with PHP web server, MySQL database server and a tool for database management such as PHPMyAdmin. This often comes in one Apache+MySQL+PHP (AMP) package (WAMP is Windows AMP, LAMP is Linux AMP, MAMP is Mac OS AMP). Different AMP packages are distributed, for example Bitnami Stack, AMPPS, XAMPP etc.
3. Download and unzip User Command Center (communication service)
4. and DCU Design Tool (design package) from prosystemy.sk.

To start DCU Control System Platform

1. Start AMP package if not running automatically (according to installation).
2. Start ucc.jar, enter password to MySQL database and click “Start” button to start UCC service. Running UCC for the first time will create configuration database for defining standard visualization.
3. Start Scilab or Matlab computational platform.
4. Change directory in Scilab/Matlab console to DCU design tool and type *exec dcudesign.sci* (in case of Scilab) or *dcu* (in case of Matlab) to start DCU

Design tool.

1.4 Configuring DCU platform

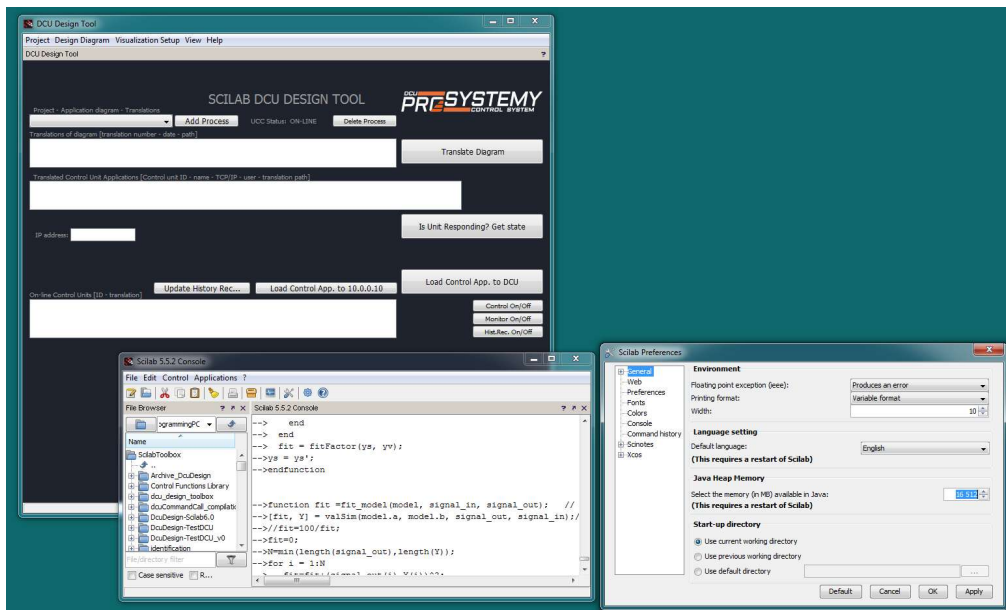
Some configuration parameters are advised to be set to obtain optimal performance of DCU platform. Most of them are set automatically by installers, but it is good practice to check, if they are set properly. Video help (DCU Control System Platform - Setting parameters for windows) is in download section

<https://www.prosystemy.sk/index.php?vh=4>

Detailed description of all parameters to be set/checked is at

<https://www.prosystemy.sk/visualization/installation.html>

Set memory limit of Scilab to approximately 70% of available RAM: Start Scilab, go to menu *Edit-> Preferences* and set Java Heap Memory to about 70% of RAM size (for example with 8GB RAM available set value to 6GB).



Set/check parameters of PHP init file `php.ini`. To access the file on windows go for example to `C:\Bitnami\wampstack-7.1.27-0\php\php.ini`. In Linux Ubuntu the path generally looks something like this: `/etc/php/8.1/apache2/php.ini` Other Apache-PHP installation directories may have different paths. Set/check the following parameters:

`max_input_vars = 10000`

`memory_limit = 512M`

`max_execution_time = 180`

`display_errors = On`

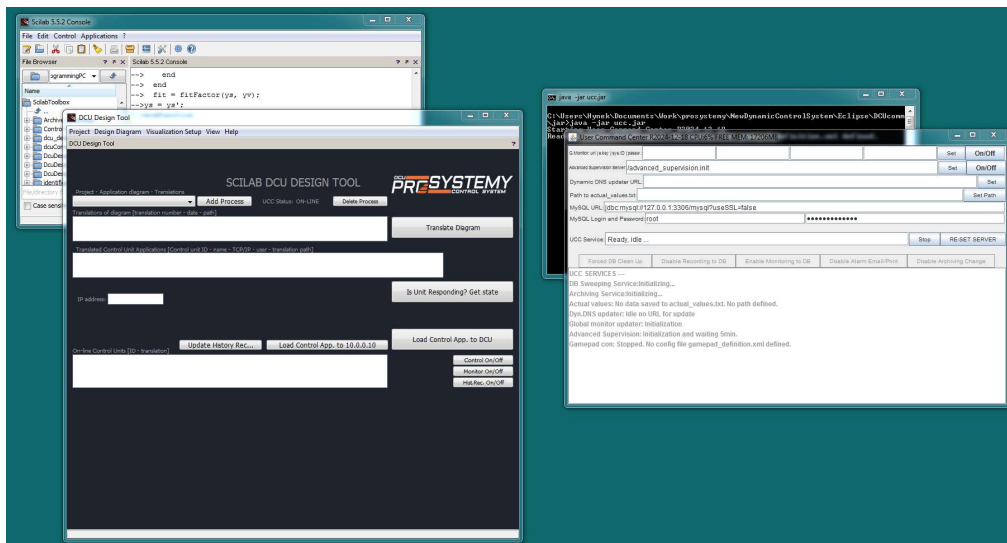
`opcache.enable=0`

This will allow large number of parameters to be transferred from/to web page and to use more memory (needed for display of graphs with large number of samples).

Optionally inside *my.ini* (MySQL initialization file) check/increase *key_buffer_size*, *table_cache* parameters to improve database performance.

2 Opening existing DronTechLab project and setting DCU platform to this project

To start to work in DCU platform UCC JAVA application must be running as well as Scilab and inside it DCU Design Tool application. In Windows it is sufficient to double-click the Start Scilab DCU icon and enter MySQL database *root* password to UCC interface press *Start* button and then to DCU Design Tool interface (see installation section).

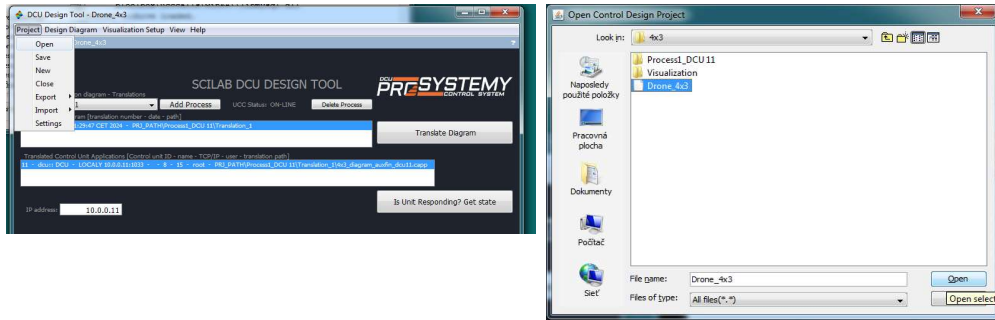


See video help *Opening DroneTechLab project in DCU Control System Platform and Server Setting* at <https://www.prosystemy.sk/drontechlab/support/> for detailed example.

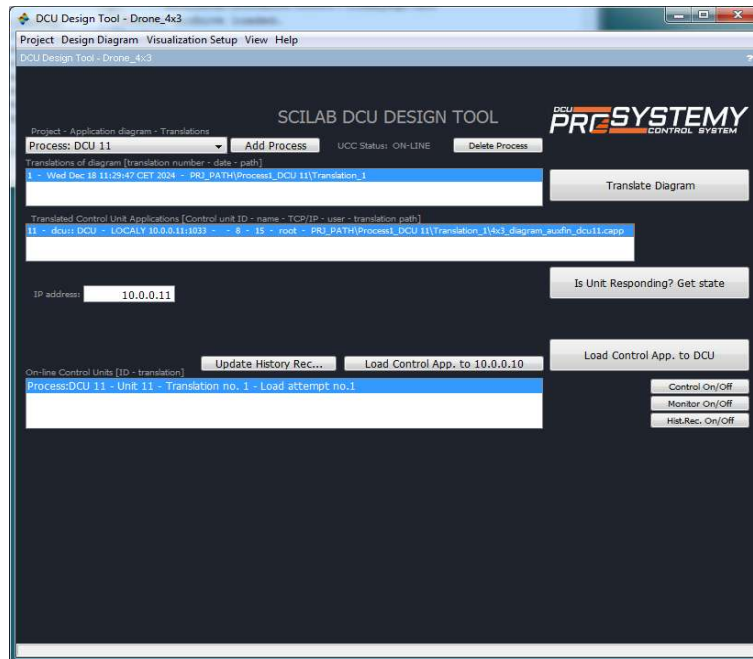
2.1 Opening an existing control system project

To open an existing project and set server to this project:

1. Download an existing control system project for example from the DronTechLab web page <https://www.prosystemy.sk/drontechlab/support/> or request an example from PROSYSTEMY.
2. Unzip the project folder.
3. In DCU Design Tool interface go to menu *File* → *Open* and browse to project folder and select the project file inside the project folder.

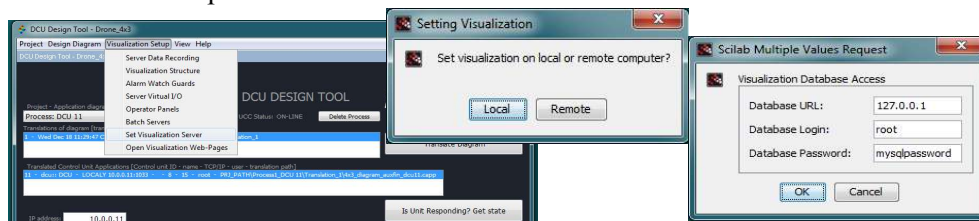


The project is loaded into DCU Design Tool and it appears in its interface

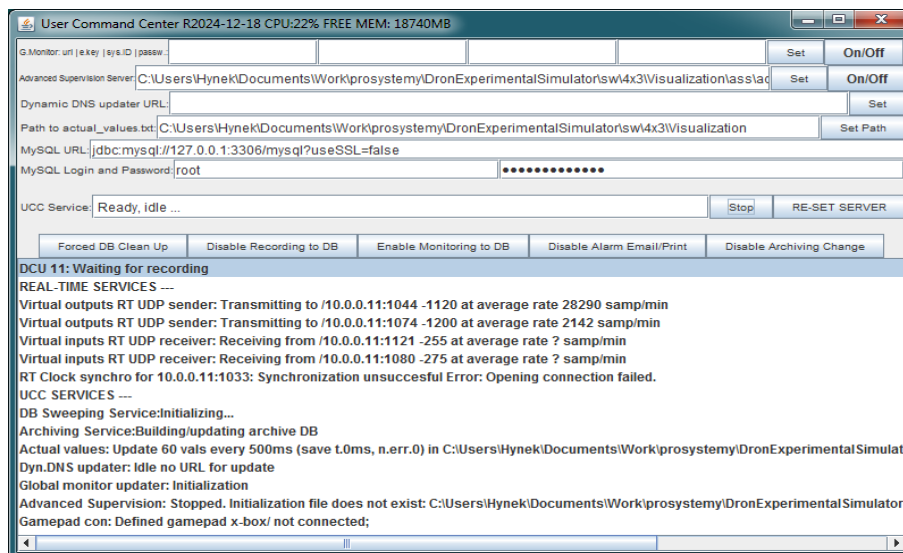
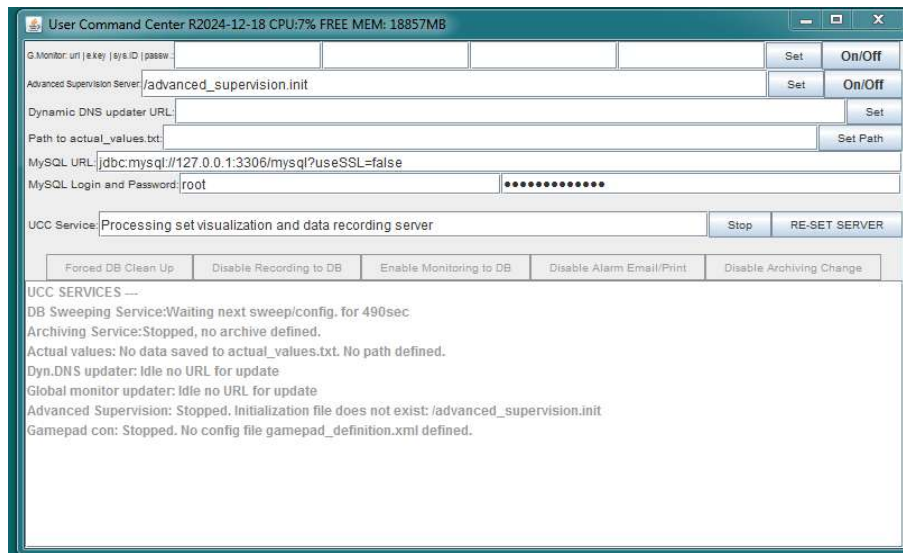


2.2 Setting DCU platform server to an existing project

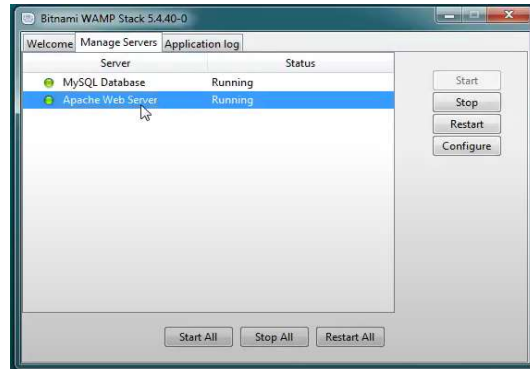
Next step is to set DCU platform server to this opened project. Server means UCC service, MySQL database and Apache web servers. To set these services to the actual project go to menu *Visualization Setup* → *Set Visualization Server*. When asked choose *Local* computer and confirm database access.



The UCC service will then start re-setting services to the actual project. When done, you will see on UCC interface, that the server is set to the selected project.



It is useful to restart Apache server so it takes into account new settings immediately and you may use visualization web pages. If not, the settings will be taken into account after computer reboot. To restart Apache server in windows, start Bitnami WAMP Stack management tool. Then click on *Manage Servers*, select *Apache Web Server* and click the button *Restart*.



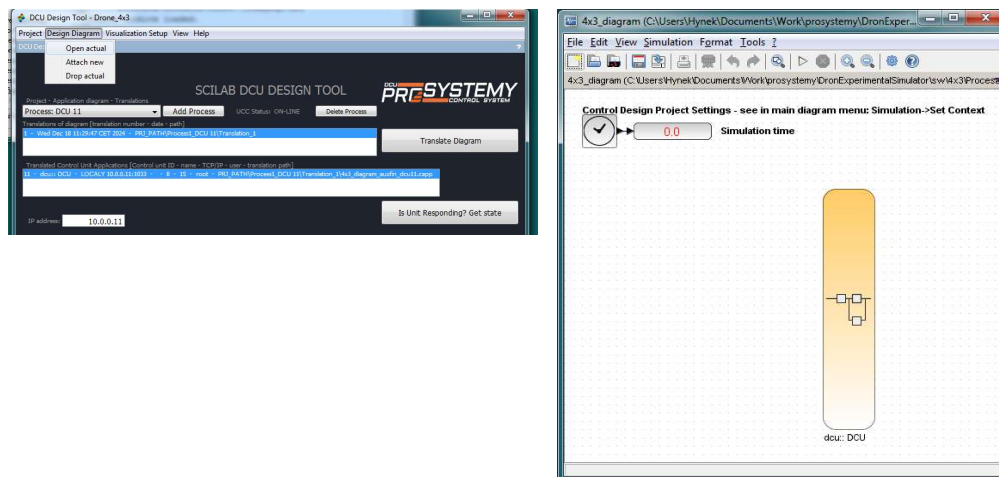
In Linux Ubuntu you may restart the Apache server from terminal command line by typing: `sudo service apache2 restart`

3 Editing control application

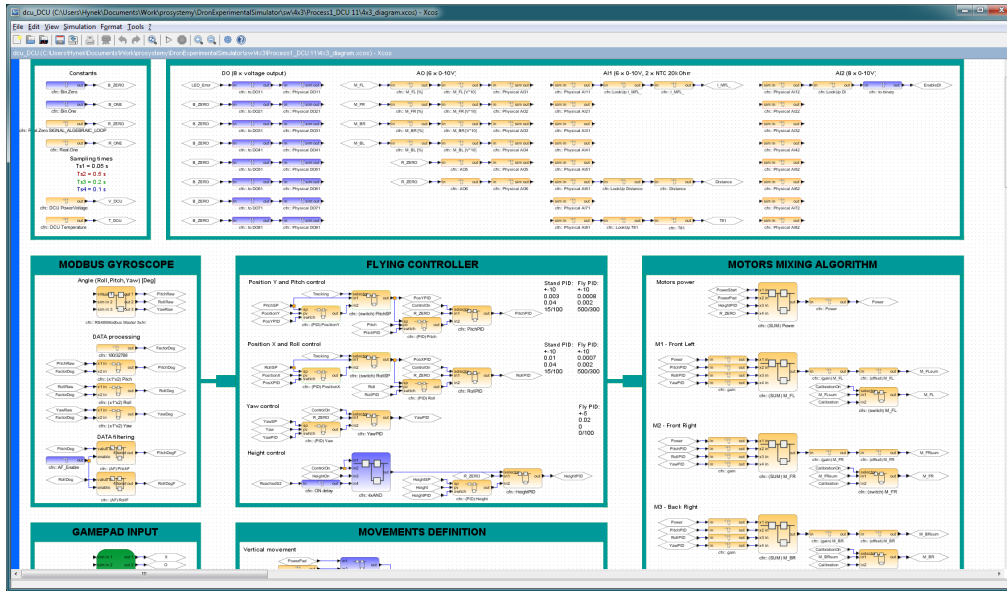
Now you may edit the existing control system project, for example, by editing the control function diagram. For detailed example, see video help *Control Application Modification Example – Adding PID Yaw Controller* at the support web page <https://www.prosystemy.sk/drontechlab/support/>

3.1 Modifying control function diagram

To modify control function diagram, go to menu *Design Diagram* → *Open actual*.



The main diagram opens and it contains DCU super-block (super-block or sub-system is a block containing another diagram). By double-clicking on the super-block of DCU the control diagram with drone control loops is opened. User may now add/remove control function blocks, connect/reconnect them and change their parameters.



Large number of different types of control functions may be found in control function libraries. To open a library go to control diagram menu *File* → *Open*, browse to control function library folder, and select a library. Libraries folder is in DCU Design Tool folder. For example for Windows, the typical path is

C:\Prosystemy-DCU-Control-System-Platform\R2024_12_19\Scilab\Control Functions Library

In Linux Ubuntu the path corresponds to unzipped installer, for example:

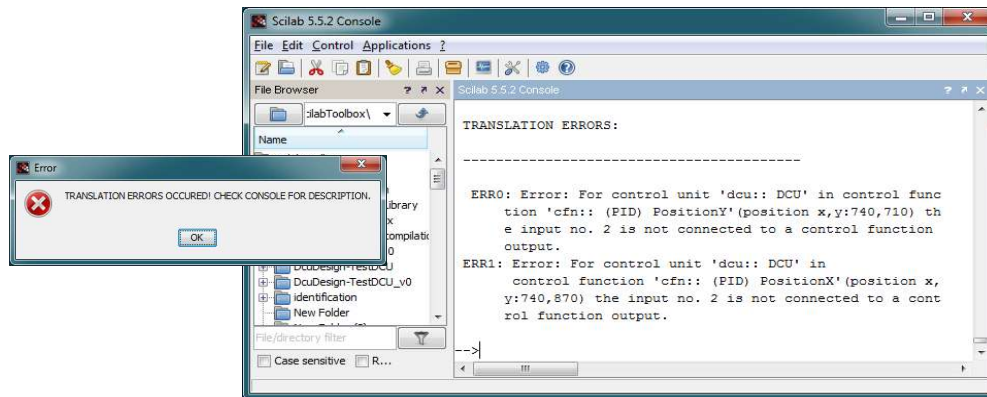
/home/admin/dcu-linux-64bit/Scilab/Control Functions Library

3.2 Translating diagram and exporting diagram image

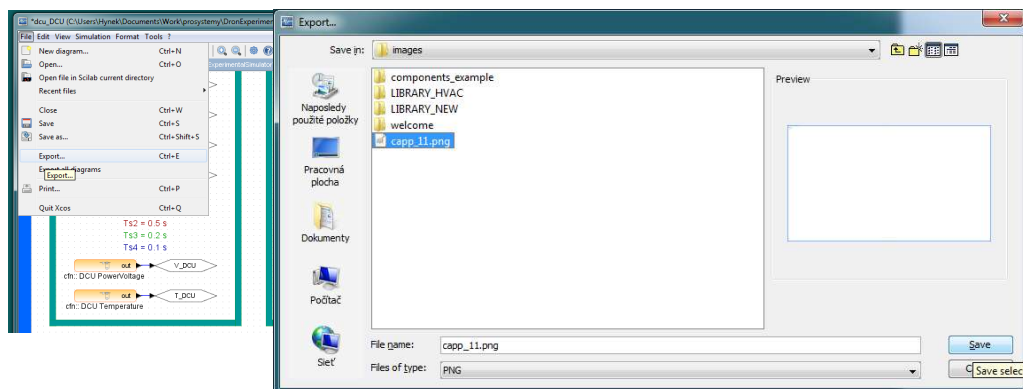
When satisfied with modifications, user saves the diagram modification by going to menu *File* → *Save* in DCU controller main diagram. Next, he may click *Translate Diagram* button in DCU design tool. The translate, if successful, will indicate only unconnected outputs warning.



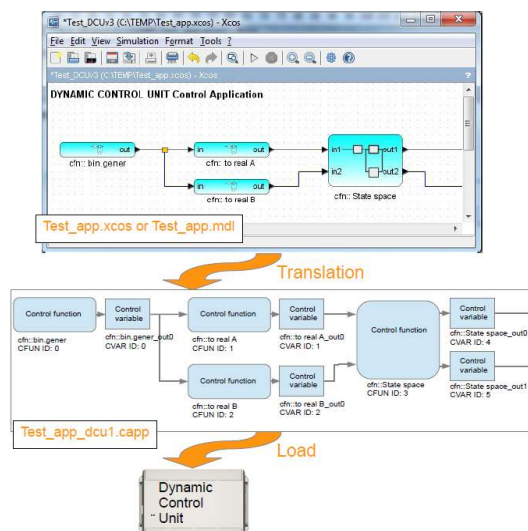
If the translate is unsuccessful, error message is displayed and detailed translation problems message is shown in Scilab console. In that case user must carefully read this detailed message and correct diagram accordingly.



After a successful translation user may export image of the control diagram into visualization folder for on-line visualization of the diagram. This is done by going to menu *File* → *Export* in the control function diagram that is inside DCU block. The image must have .png format and the name must be *capp_XX.png*, where XX is the ID number of the control unit (11 by default). The path of the image must be *project_folder/Visualization/process/images/*



Translated control diagram is a control application. It is a file in .xml format and it contains description of the entire control diagram. The control application can be uploaded into DCU that directly control drone or other technology.

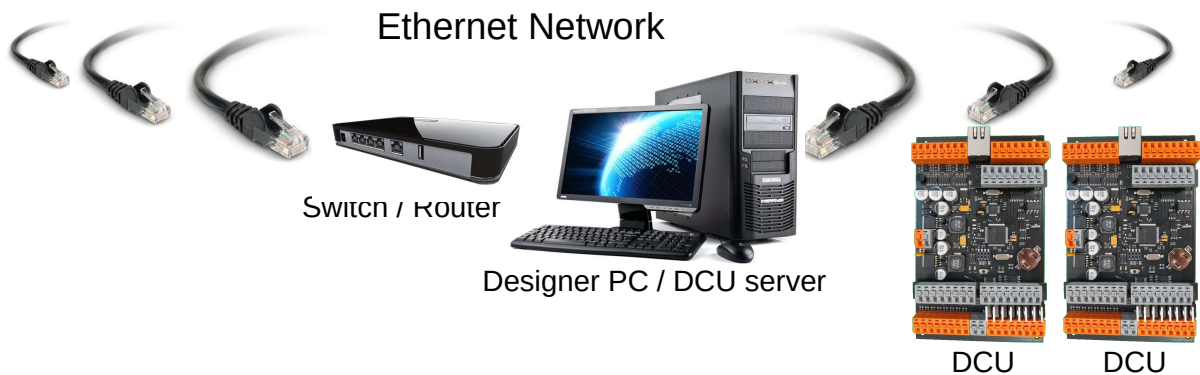


3.3 Connecting to control unit and loading control application

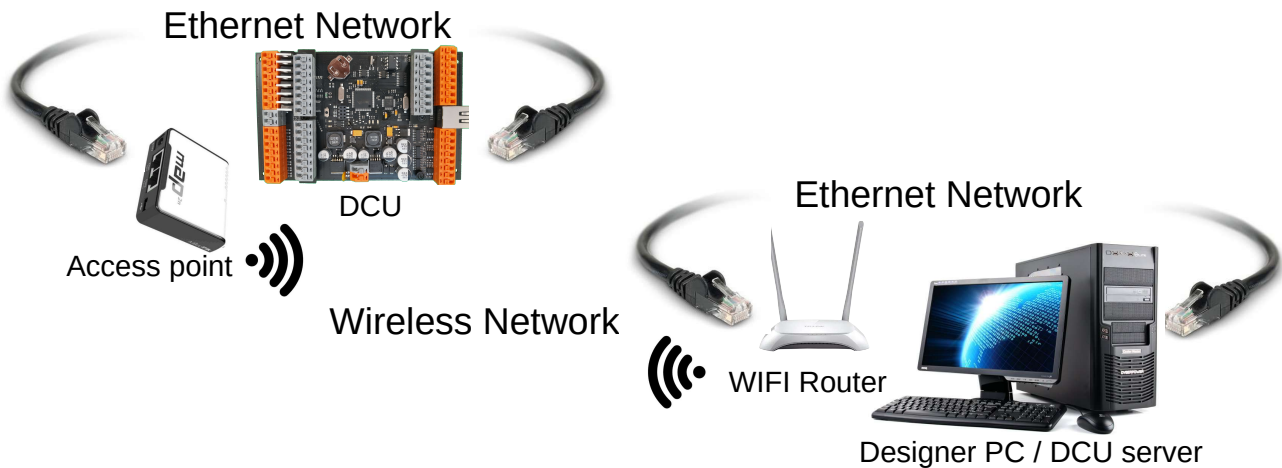
To load control application a connection with DCU must be established first. There are different possibilities for connection of designer computer or server with DCU. In case of connecting directly to one DCU, it is recommended to use Ethernet crossover cable.



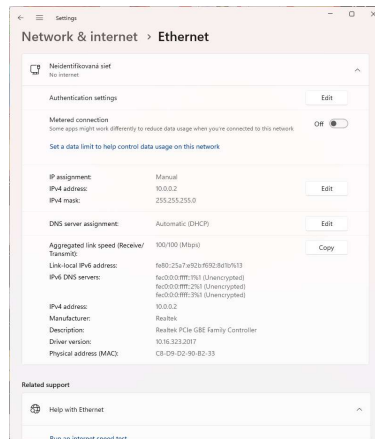
In case of using an Ethernet switch, computer is connected to the network of DCUs using standard Ethernet cables.



Access point and WIFI router may be used as well for remote connection, for example in case of drone control system.



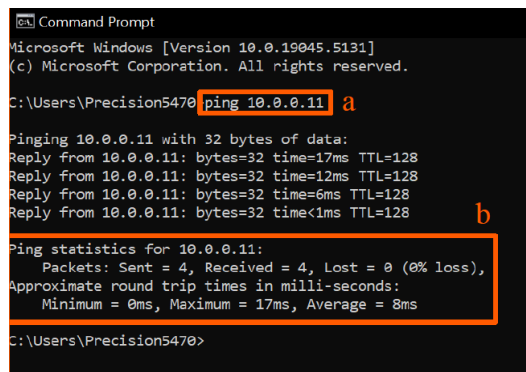
Next, set IP address of the computer manually to 10.0.0.2 with sub-net mask 255.255.255.0. This is default setting in most of DCU control system project that can be anytime changed in control function diagram context.



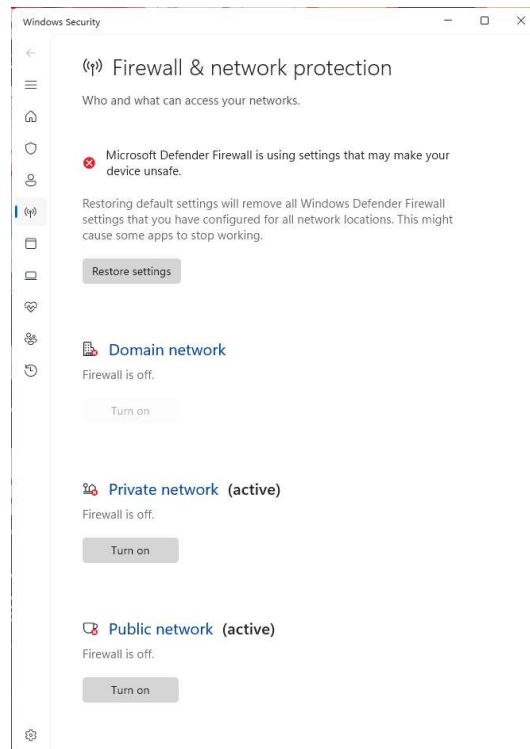
Connect power to DCU.

Control unit has by default IP address 10.0.0.11 (or in case of a brand new DCU 10.0.0.10). To check connection with DCU use ping command in command line:

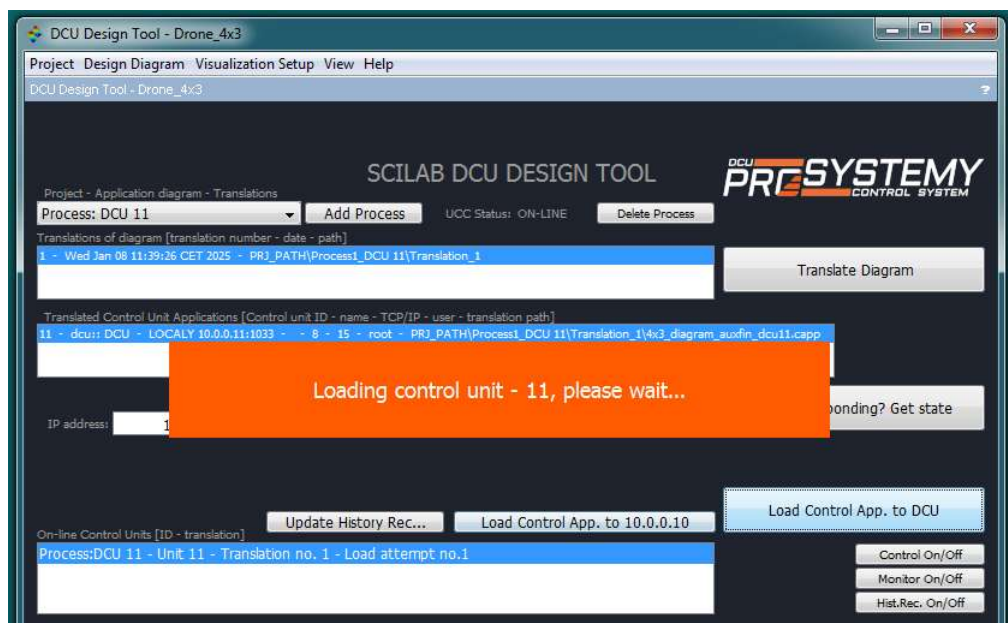
ping 10.0.0.11

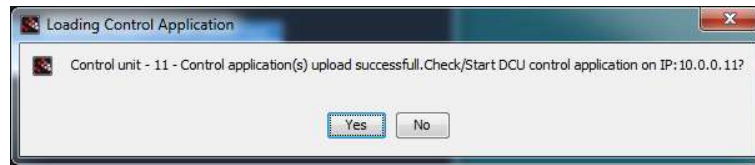


If the DCU is responding properly, connection is OK. If there is any problem with connection try turn off some of windows firewalls.



Finally user may load translated control diagram into DCU control unit. This is done by clicking on button *Load Control App. To DCU* in DCU Design Tool.





Next, click *Yes* to Check/Start DCU control application. A window appears indicating if the application inside DCU is started. If it is not started click *Start control application* button, otherwise click *OK*.



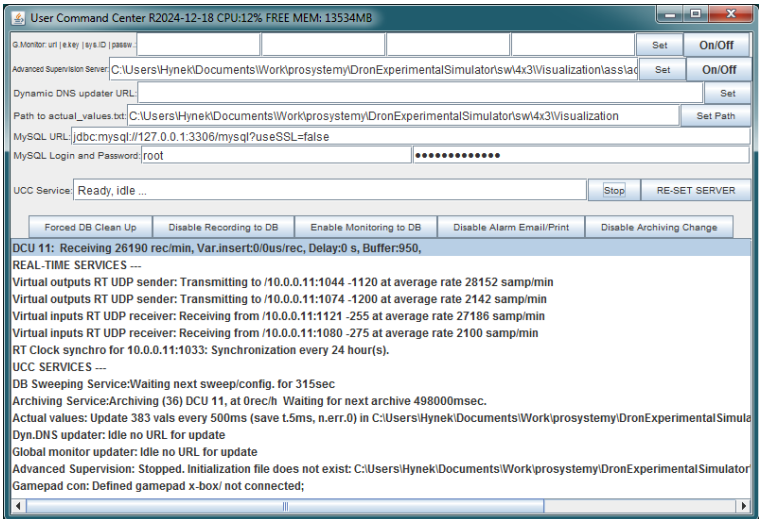
Then click *Yes* to the question Update history recording database. This will update MySQL database according to the actual control diagram. This operation may be done at any time by pressing button *Update History Recording*.



Now user may start streaming data from DCU to the computer by clicking on *Monitor On/Off* and *Hist.Rec. On/Off* buttons. Monitor service is intended to send actual inputs from all functions, but it keeps in computer only last value. History recording service is streaming only selected inputs, but every sample is recorded into database for selected period from hours, days up to months.



Streaming of the data is visible on UCC service interface by the first status lines indicating which control unit is receiving and what amount of data.



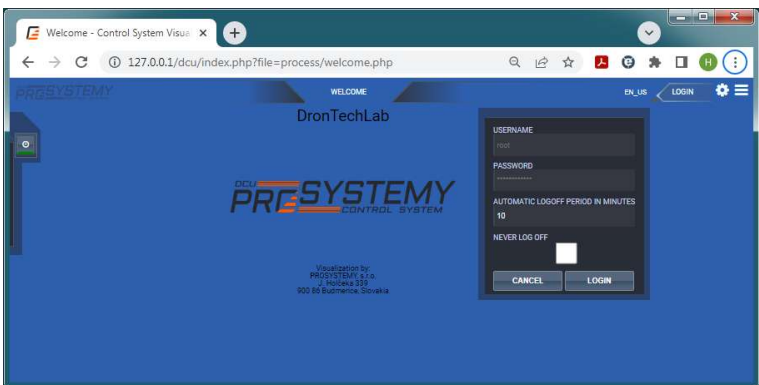
An online web-based visualization may be now opened. Any web browser may be used to open on-line visualization. In Windows, the link to the actual DCU control system project visualization is

127.0.0.1/dcu

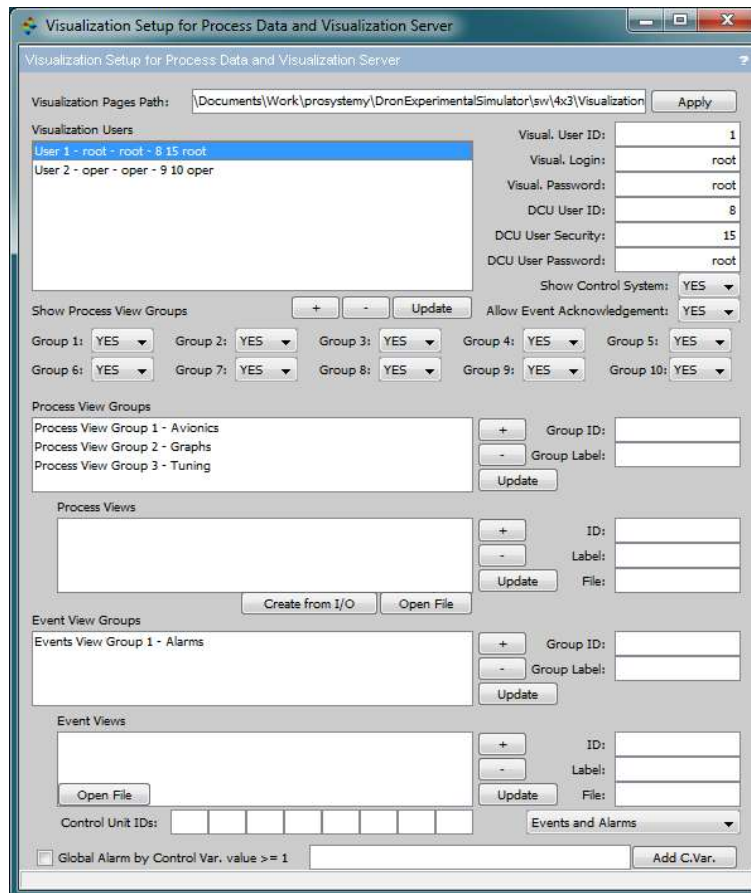
in case of Linux ubuntu the link is

127.0.0.1

Visualization user must login into the visualization by entering correct user login and password.



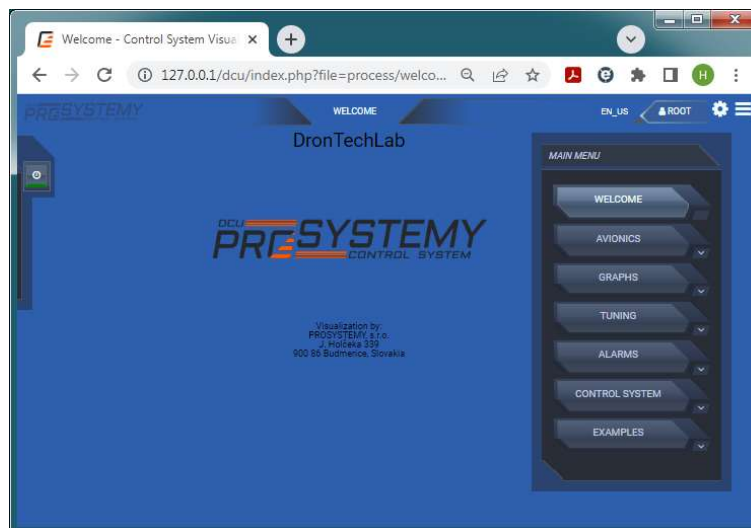
Visualization users are defined in DCU Design Tool application. To add or modify visualization user go to menu *Visualization Seup* → *Visualization Structure*. An interface window opens. Top of the window contains information on users. Lower part defines view panels and event panels. Default users are login:root, password: root and login oper, password: oper



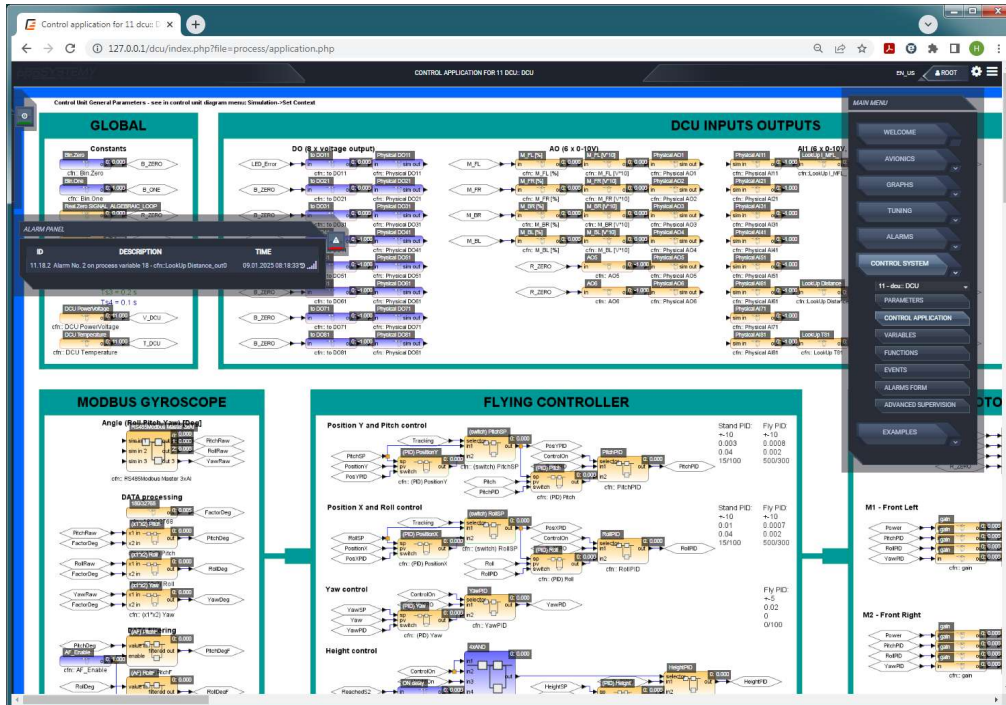
For more details on settings see the document *DCU Control System Platform - Control Design and Programming* that can be downloaded from

<https://www.prosystemy.sk/index.php?vh=4>

Once logged into on-line visualization, user may access web pages created by himself or generated automatically for on-line monitoring and debugging.



Most useful page for on-line debugging is *Control Application* page which is in the group of *Control System* web pages. It displays DCU control function diagram on-line (monitor streaming must be turned on). User see actual output of each function block. He can also change parameters of the functions as well as control variables (output values of functions), or display graphs for those outputs that have enabled recording.



4 References

More detailed information in form of documents, pictures and video helps on DCU Control System Platform and DronTechLab laboratory platform may be found in download section of PROSYSTEMY web page:

<https://www.prosystemy.sk/index.php?vh=4>

in support section of the DronTechLab web page:

<https://www.prosystemy.sk/drontechlab/support/>

and in YouTube channel

<https://www.youtube.com/@dcucontrolsystemhelp9163>

You may also contact info@prosystemy.sk for any technical questions.