

# The Intuitive ROS UI: FlexGui 4.0

## introduction and industrial applications

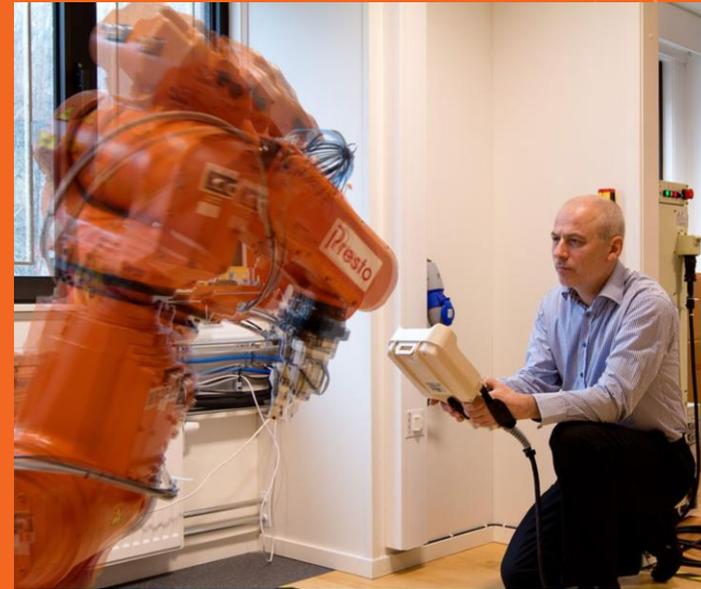
Laszlo Nagy

PPM AS

08 October, 2016

# PPM AS

- International high-tech robot-system integrator and software house
- Making robotization user friendly, highly flexible and cost efficient
- Developing cutting edge industrial robot installations and software for industrial robots
- Full member of ROS Industrial Europe



....turning innovation into flexible automation....

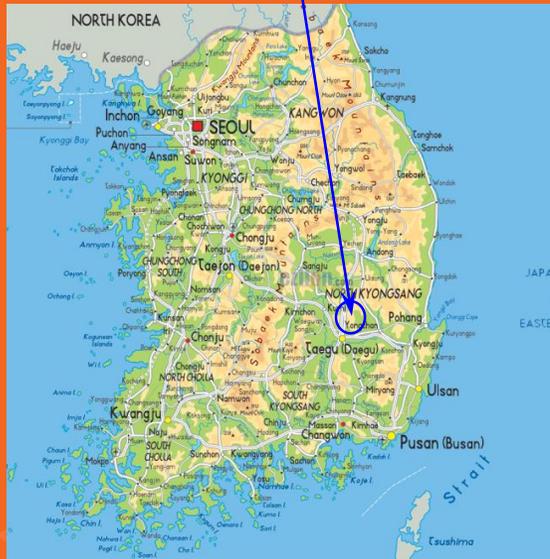


# PPM AS – R&D network

**South Korea**



**Japan**



**Norway**



**Germany**



**Bosnia**



**Hungary**



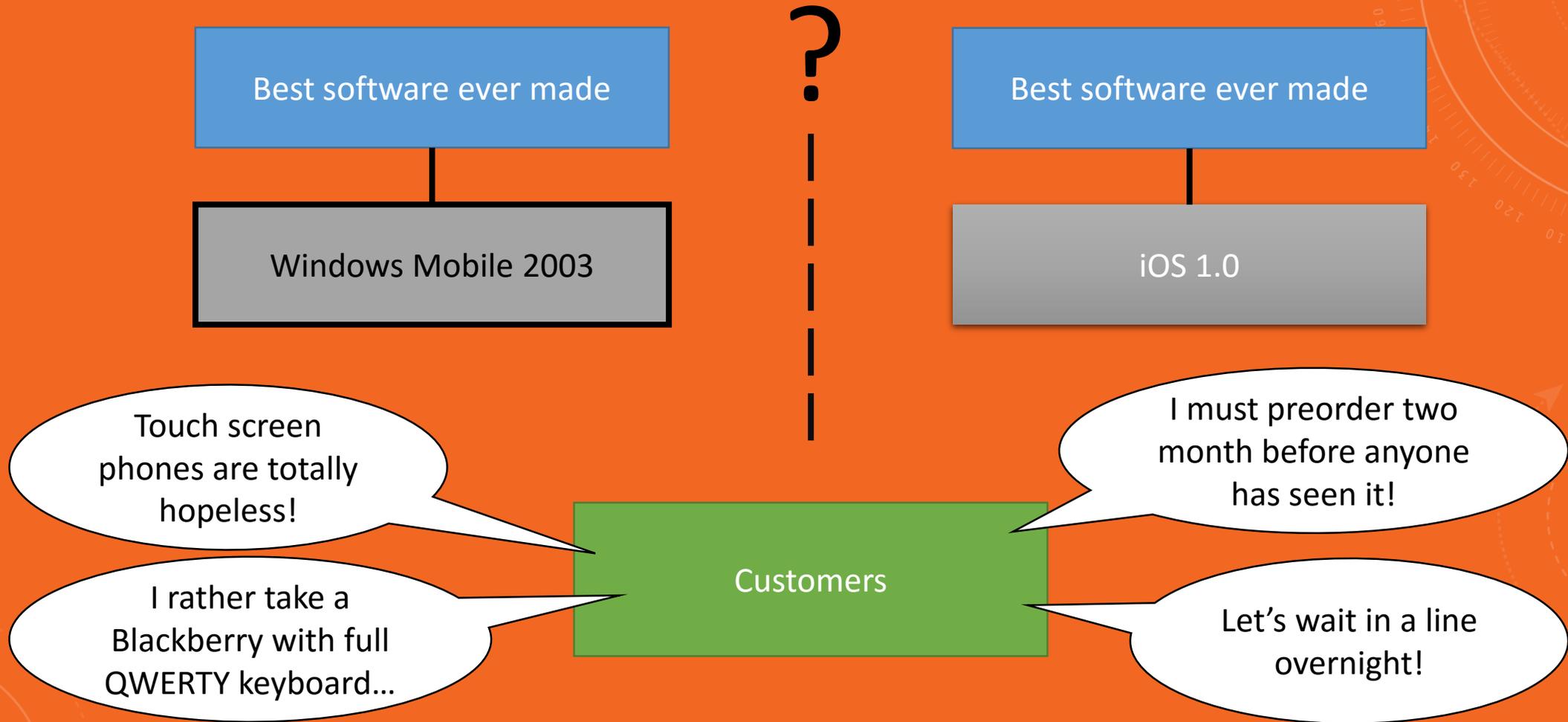
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# PPM AS – Industrial experience



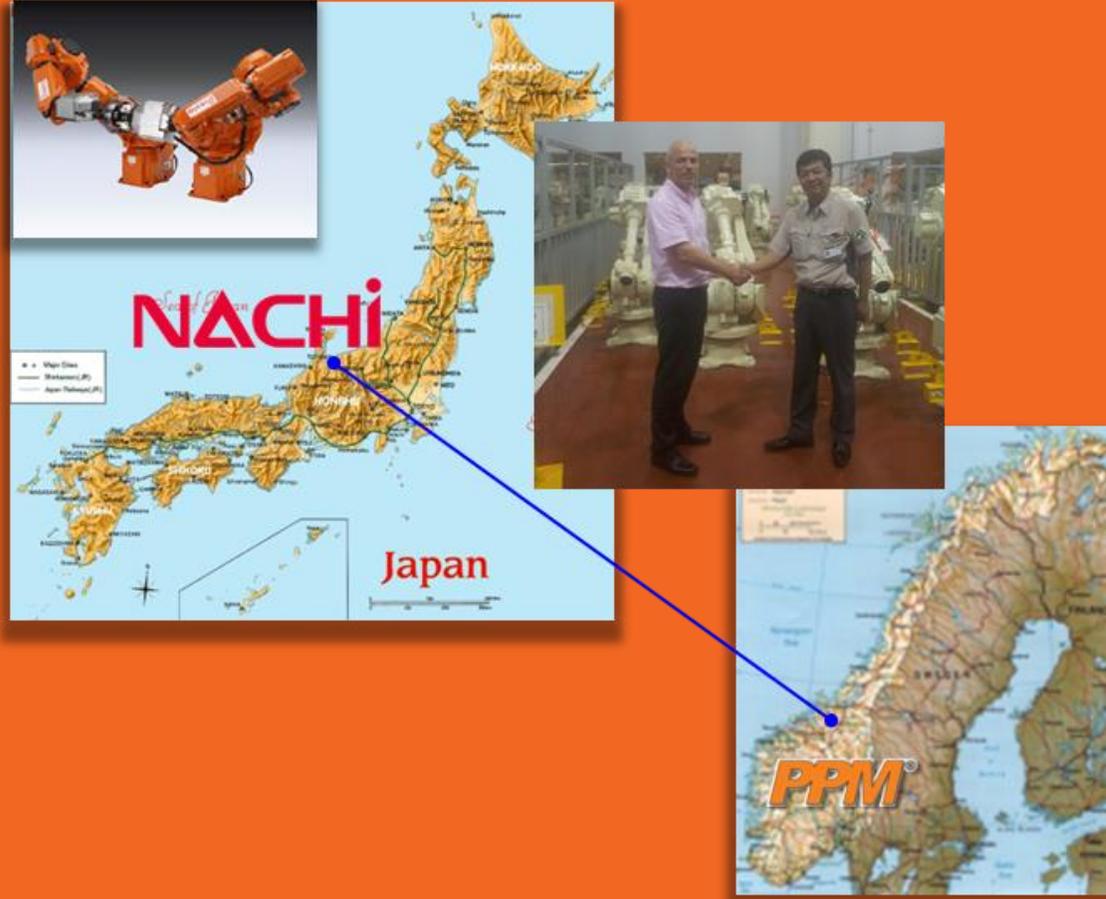
# Users know your software through the UI



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# R&D + Industry → FlexGui



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# FlexGui Applications

## Graphical Program Editor

**Editing MC70-01-A.100** Change program

Copy Cut Delete Edit FN Paste REC

156 Calculates, how much should we rotate before reaching th >>

157 Variable: V121! = Value: ((V116!-V114!)\*(V116!-V >>

158 SQR LetObject: V121! LetValue: V121! th from >>

159 Variable: V122! = Value: ((V110!-V116!)\*(V110!-V >>

**Editing Step 162 of MC70-01-A.100** Save Cancel CB

Accuracy: 8 Continue Acceleration: 0 Smoothness: 0 >>

Acceleration: 0

Complex expression...

Previous Next

W-02099

## Welding Monitor

**Welding monitor** Advanced number > 1000 OR (voltage > 20 AND voltage <= 30)

List view **Detail view** Graph view

Date: 2014.05.30. 18:21 Weld history: 1001

Welding result: Normal term

Welder No: 1 Gun No: 1 Trans ratio: 75.0

Program 7777 Step: 4

Weld Cond 1 Sequence: 1

Stepper Step: 1 Count: 1 Up Rate: 100%

Voltage 23 V Freq: 50 Hz

Com. current W1: 4.0 kA W2: 0.0 kA W3: 0.0 kA Avg: 4.0 kA

Weld current W1: 0.0 kA W2: 0.0 kA W3: 0.0 kA Avg: 0.0 kA

## Welding monitor



Show only filtered 1/45 Select fields

## Graphical Palletizing

**Pallet 3D simulation**

Screen1 X 452 Y 367 Z 481 RX 0 RY 0 RZ 0

Welcome Utility Connect

**Layer editor - New layer 2**

Cardboard 520x260x110

**Layer order on New stack**

Up Down Edit Remove

New layer 2 New layer 2 New layer New layer

Previous stack New stack

Pallet list Simulate Stack... Finish Edit layers

# Industry 4.0 → FlexGui 4.0

- Transparent access to all devices on a production line
- “Mobile phone” like interface
- Drag’n drop GUI to any application
- Open source (the source is on the ROS GitHub)
- Platform independent
- Based on ROS



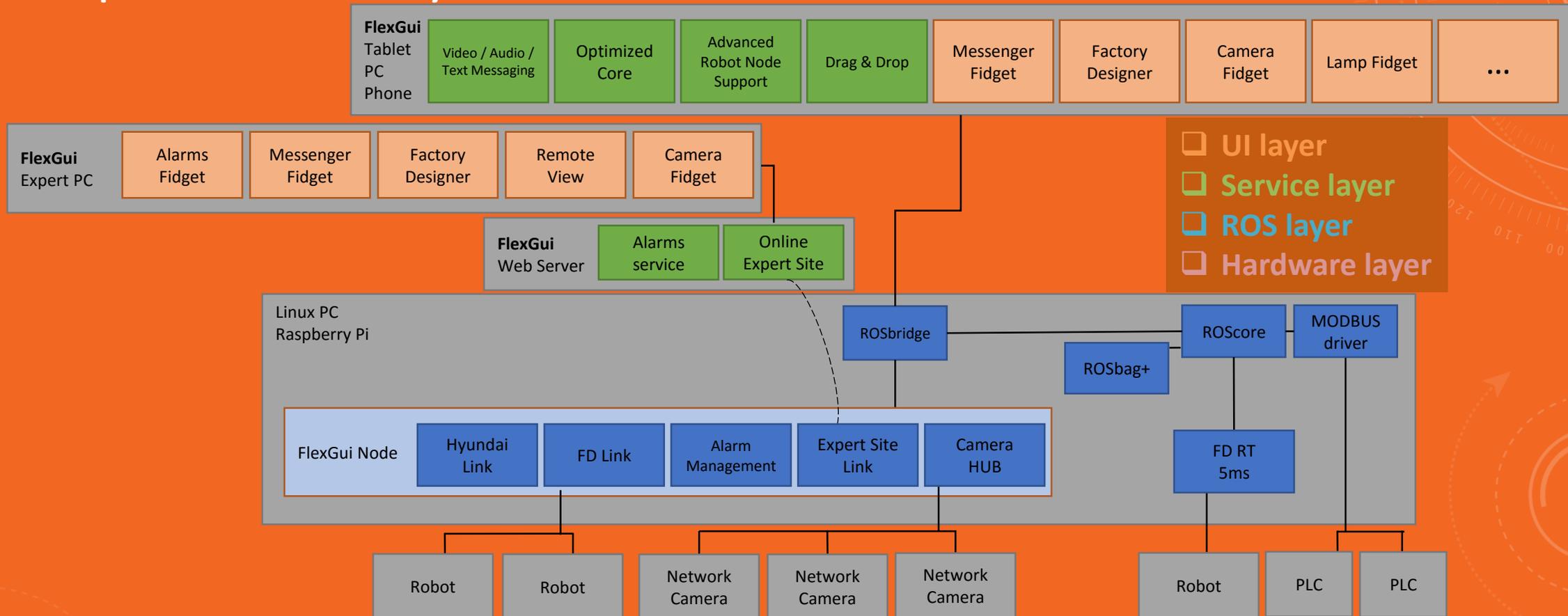
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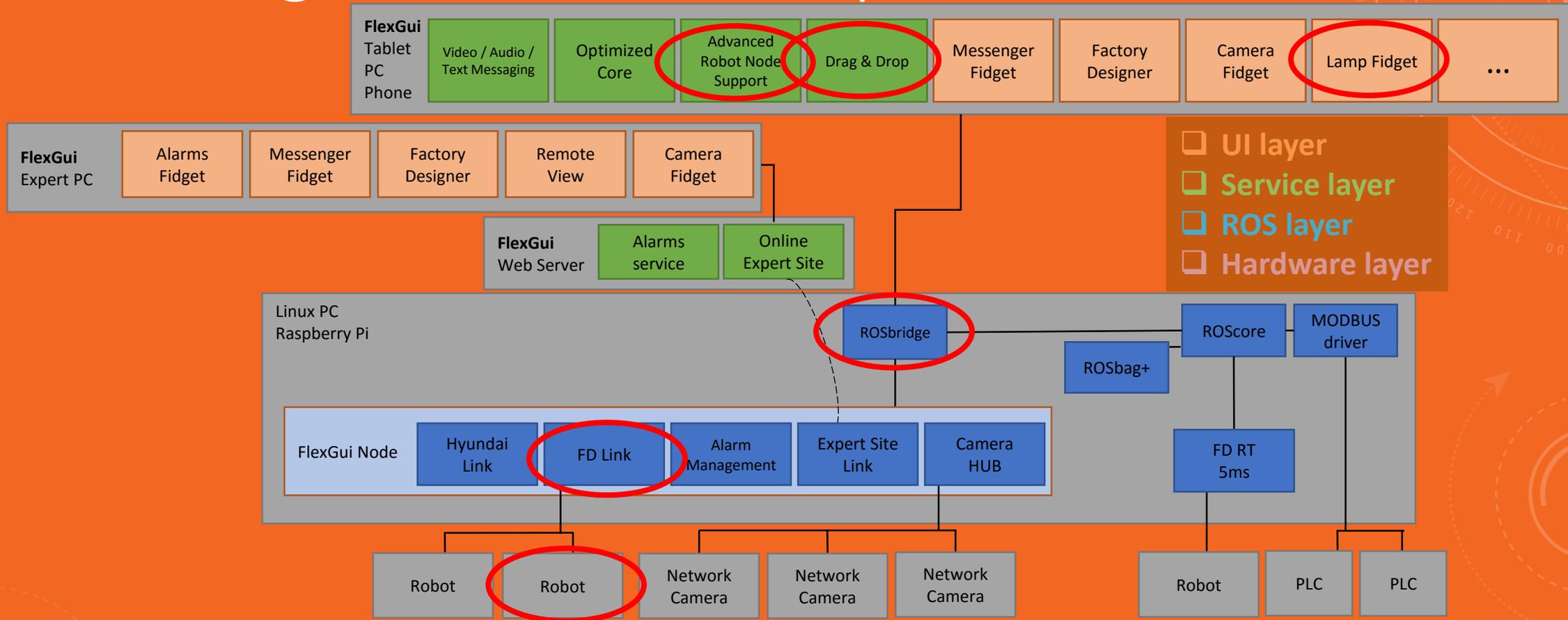
# FlexGui 4.0 Components

FlexGui 4.0	 Industrial Apache License	 Professional Commercial License	 Enterprise Commercial License
Price	FREE!	Contact us	Contact us
Offline work	✓	✓	✓
Debug	✓	✓	✓
Drag & Drop	✓	✓	✓
Plug & Play	✓	✓	✓
Multi Language	✓	✓	✓
Scripting	✓	✓	✓
Camera Image Fidget	✗	✓	✓
Advanced Script Editor	✗	✓	✓
Advanced NACHI Node Support	✗	✓	✓
No-Coding Wizard	✗	✓	✓
Global Scripting	✗	✓	✓
Easy Editing	✗	✓	✓
Custom Background	✗	✓	✓
Multi User Levels	✗	✓	✓
<48 Hours Support	✗	✓	✓
Online Expert Support	✗	✗	?
Optimized Core	✗	✗	✓
Messenger	✗	✗	✓
Remote Mode	✗	✗	✓
Themes	✗	✗	✓
Factory Designer	✗	✗	✓
Alarm Management	✗	✗	✓
Palletizing Editor	✗	?	?
Reporting	✗	?	?
Spot Welding Monitor	✗	?	?
Pick & Place	✗	?	?
Graphical Program Editor	✗	?	?
FDLink	?	?	?

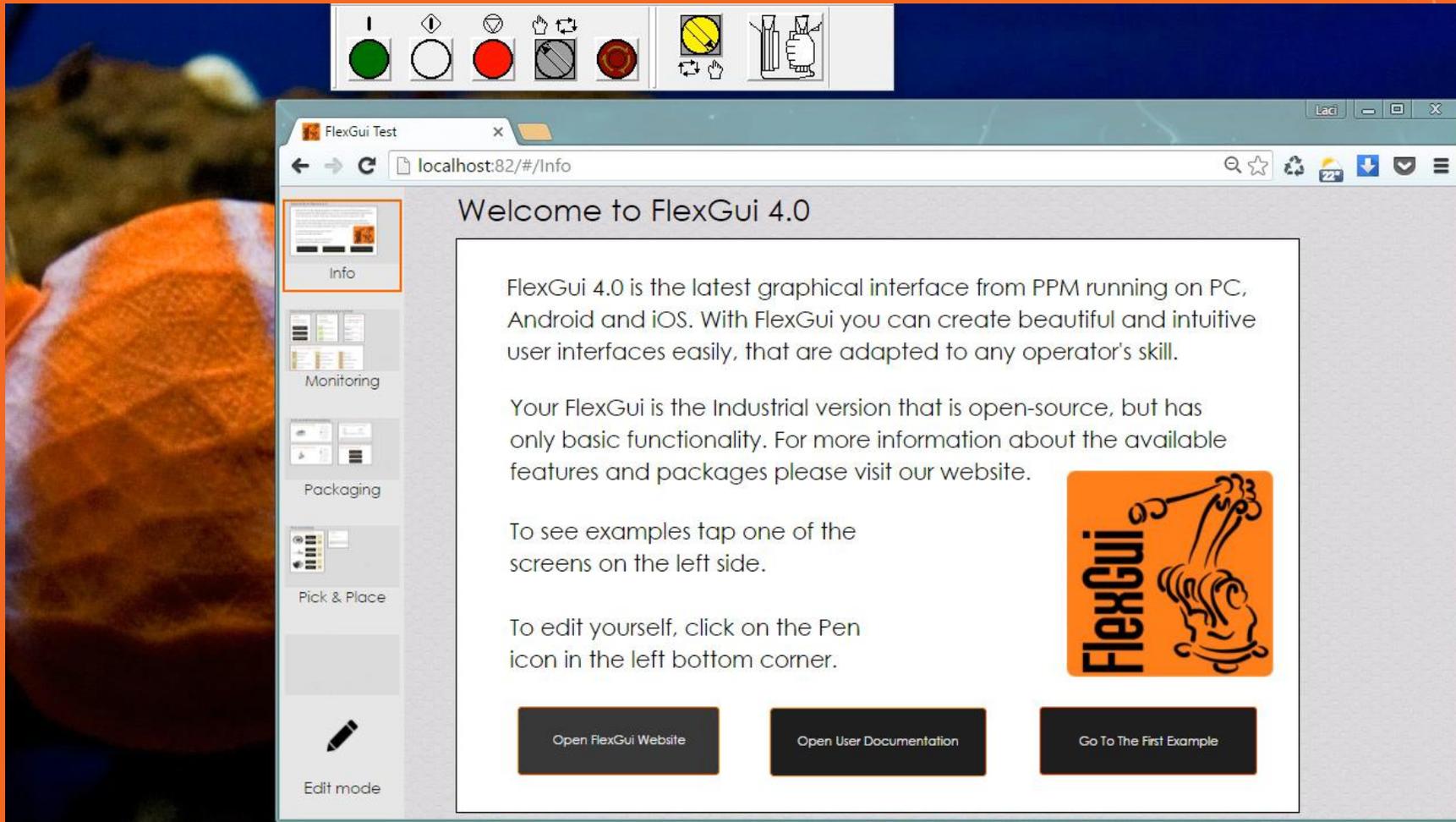
# Components by Connections



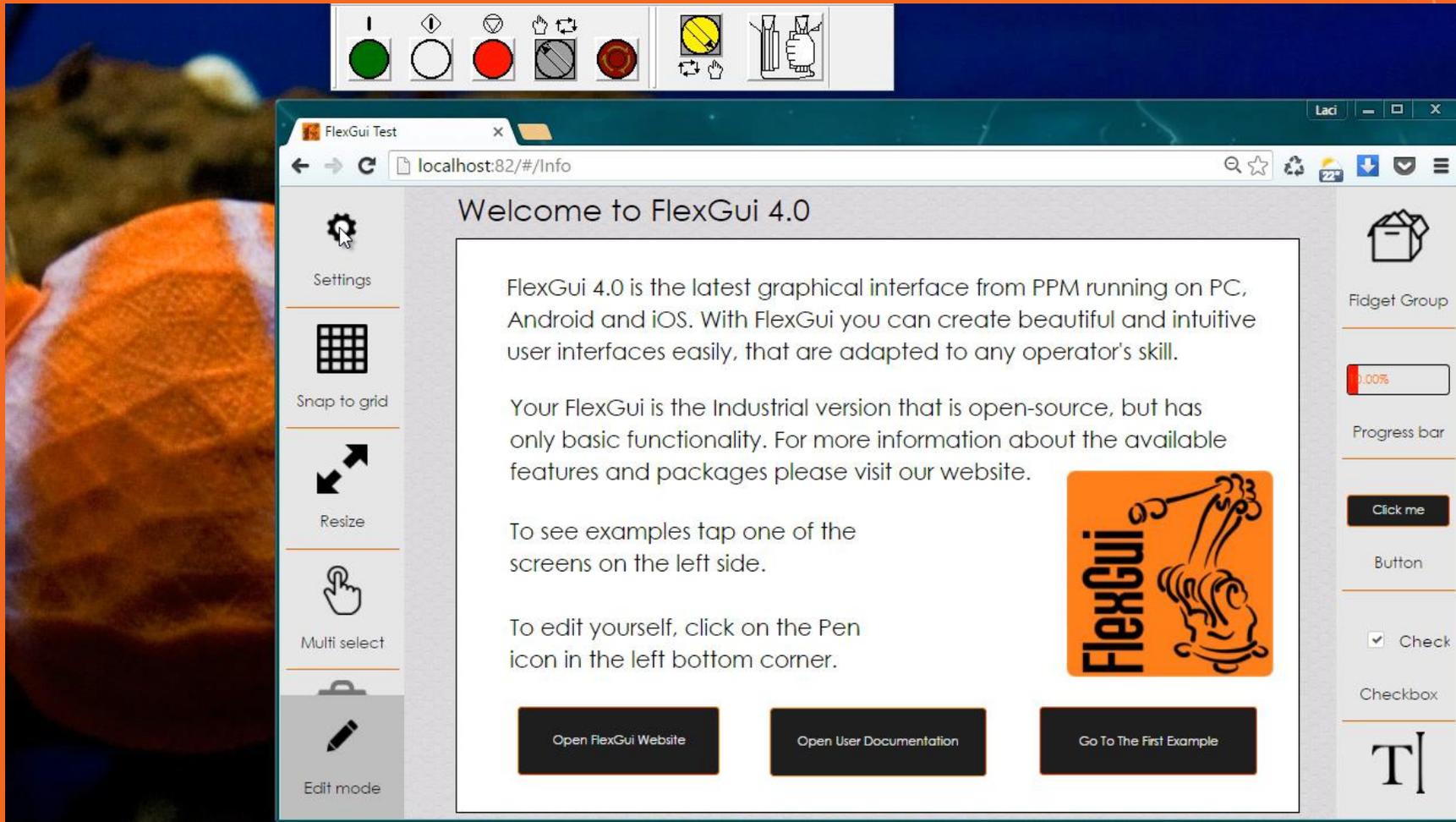
# Connecting a robot to a lamp



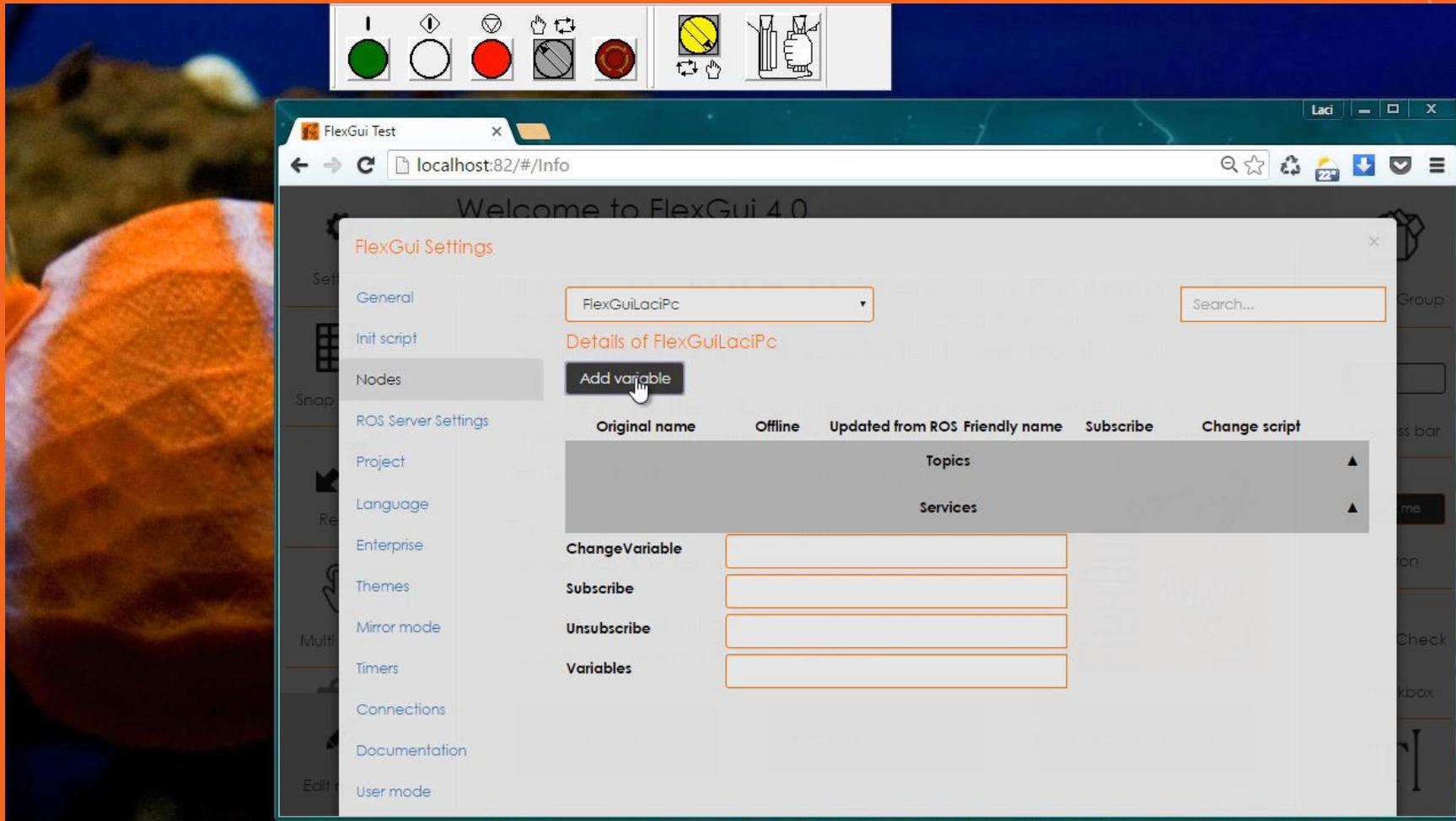
# Demo 1: Binding lamps to a robot



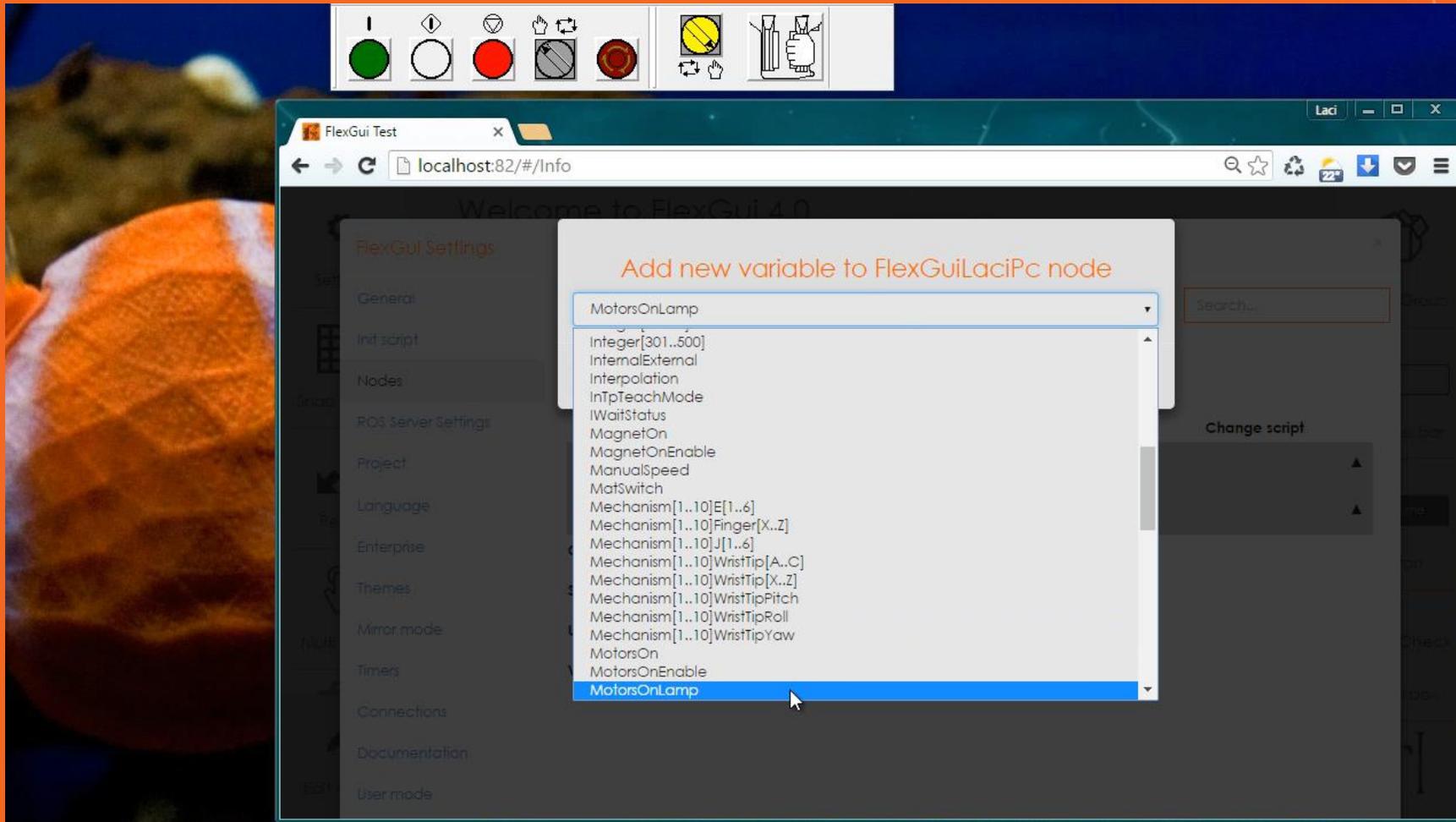
# Demo 1: Switch to edit mode



# Demo 1: Select the robot's node



# Demo 1: Pick the variables from the list



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# Demo 1: See the topics created

FlexGui Test

localhost:82/#/Info

Welcome to FlexGui 4.0

FlexGui Settings

General FlexGuiLaciPc Search...

Init script

Nodes Add variable

ROS Server Settings

Project Topics

Original name	Offline	Updated from ROS	Friendly name	Subscribe	Change script
InTeachMode	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Set
MotorsOnLamp	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Set

Services

ChangeVariable

Subscribe

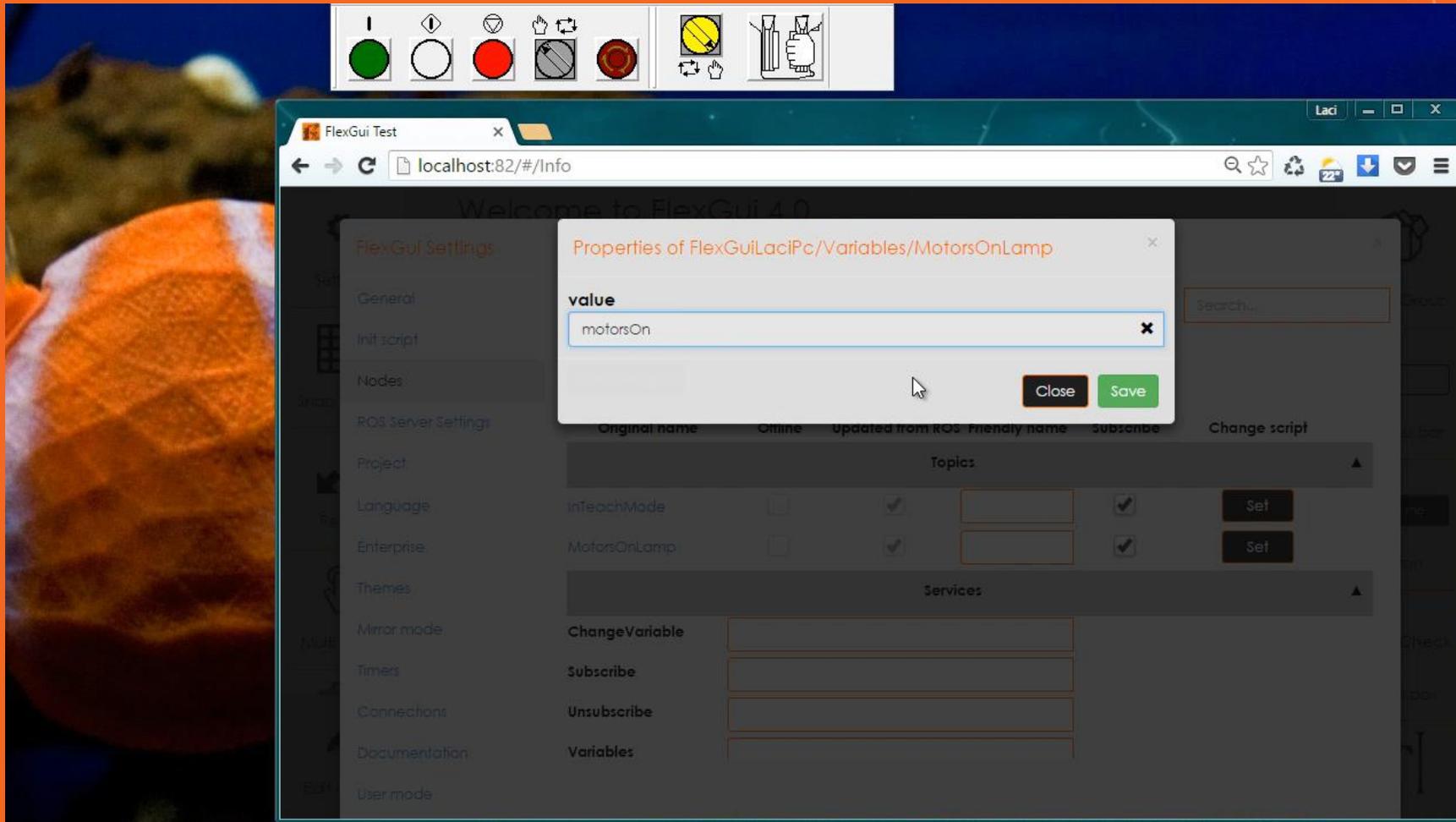
Unsubscribe

Variables

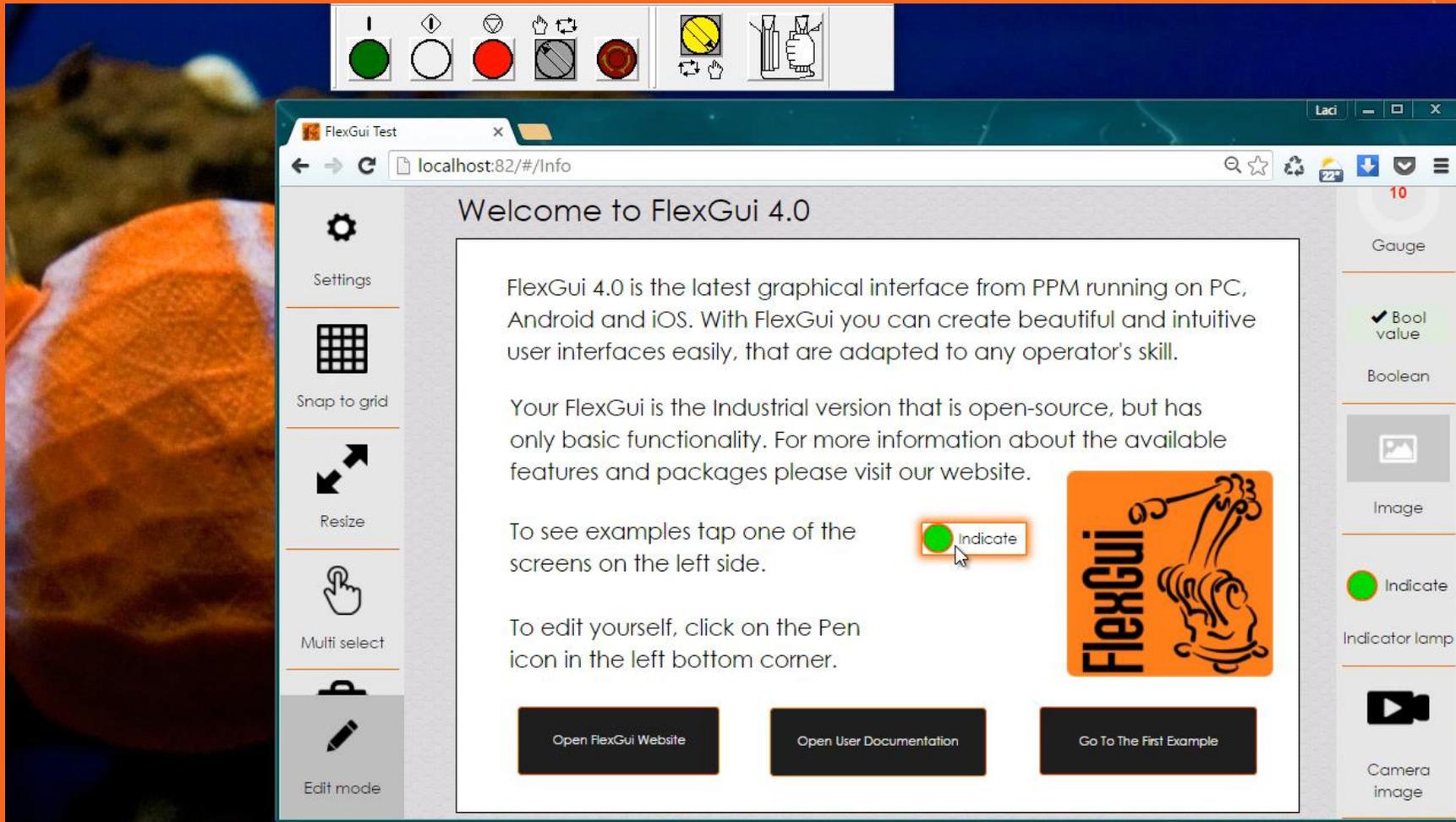
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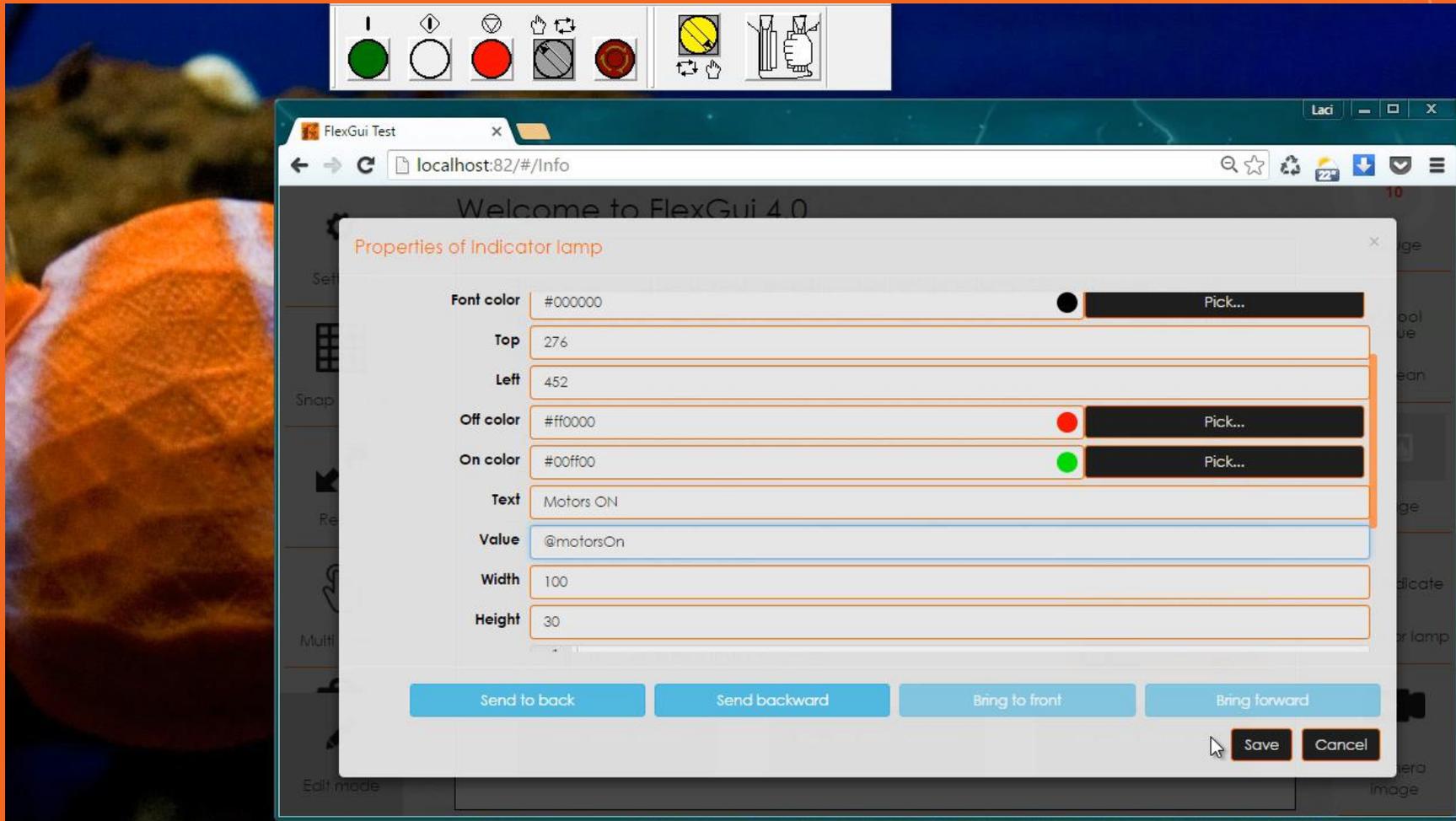
# Demo 1: Give them a short „friendly name”



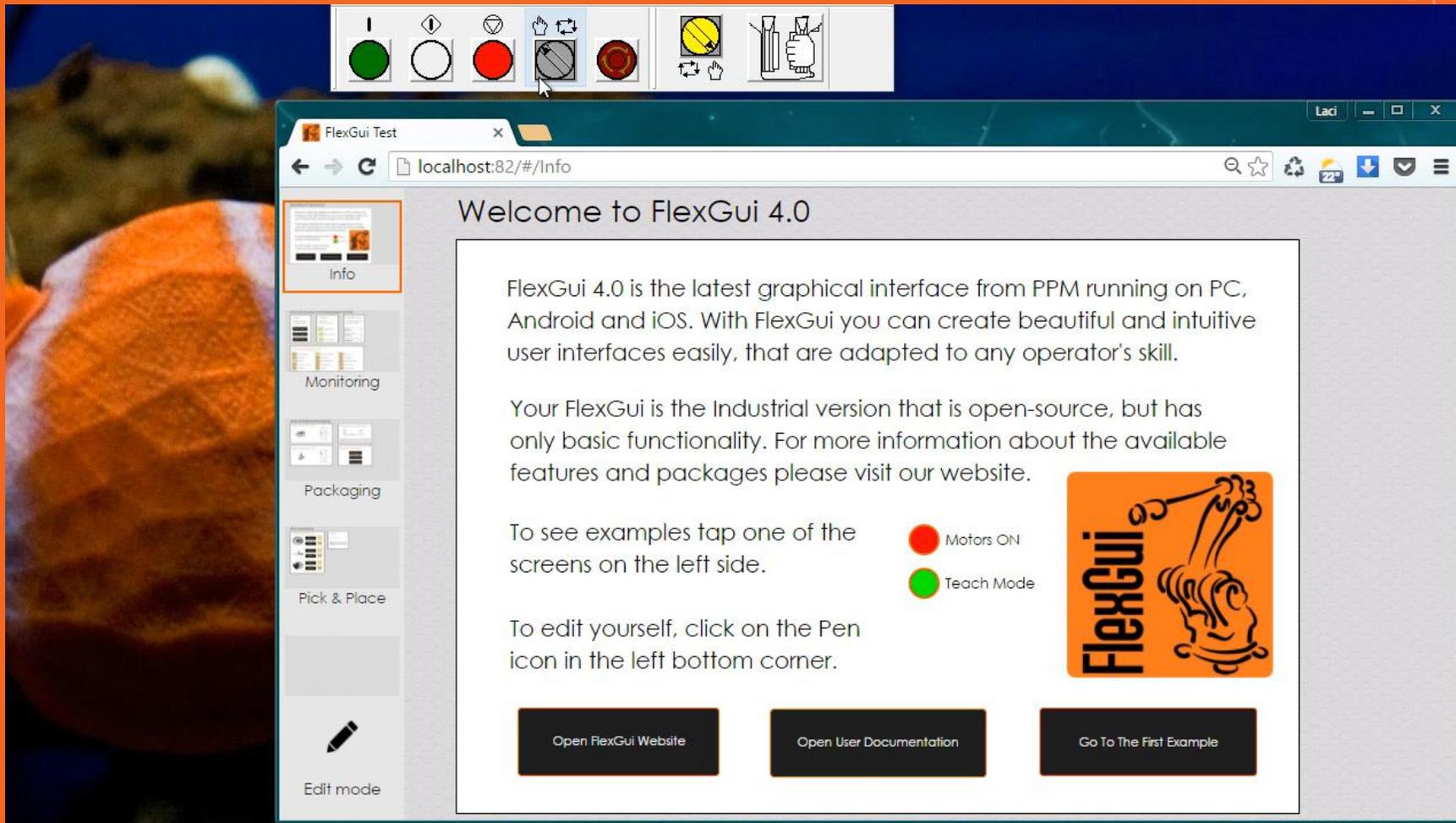
# Demo 1: Place a lamp from the right belt



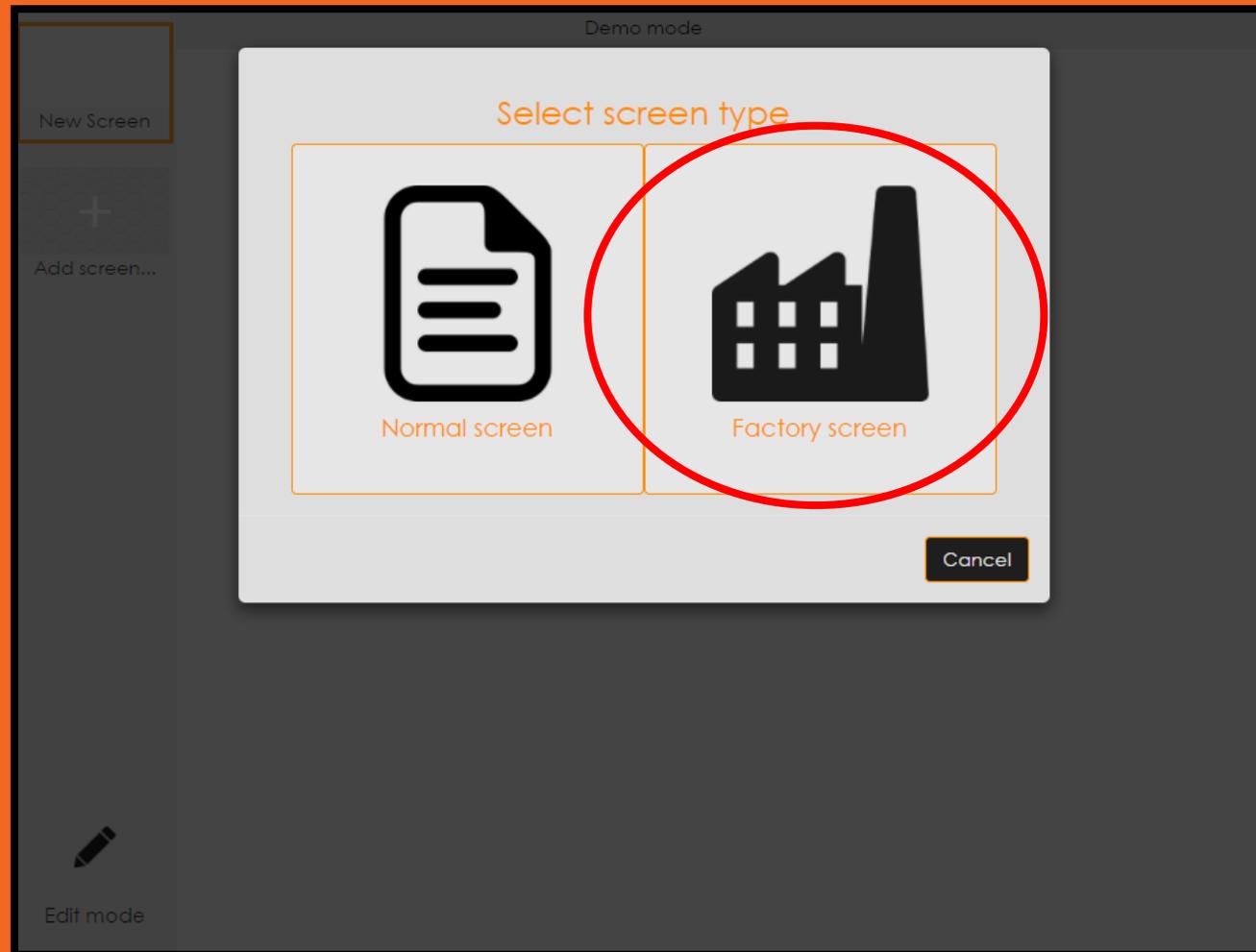
# Demo 1: Edit the lamp: text and value



# Demo 1: Copy and paste to have teach mode



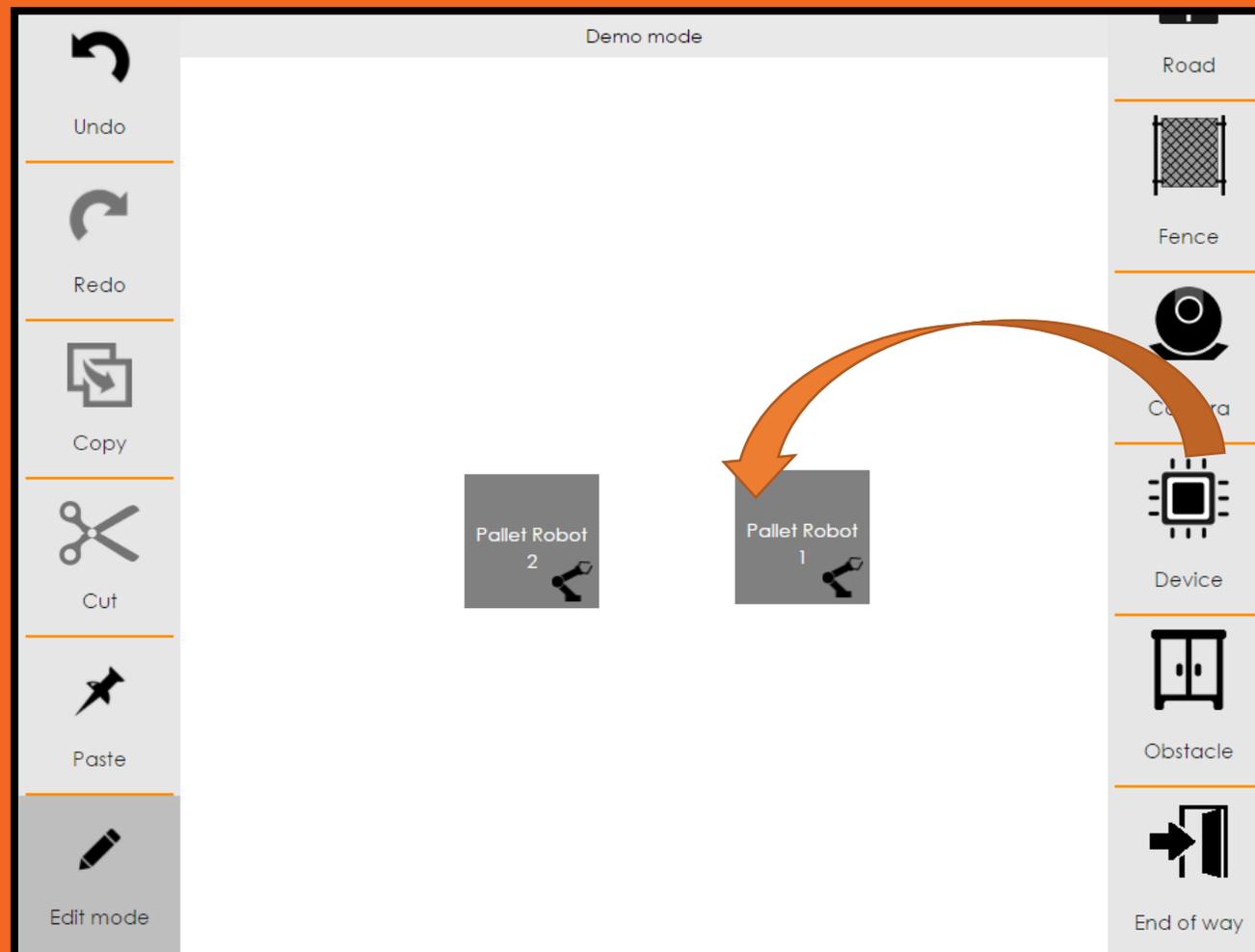
# Demo 2 – Building a Factory Screen



## Factory Designer

- Simplified Overview
  - Devices, Cameras
  - Fences, Obstacles, etc.
- Shortcuts to screens
- Customizable
- Adding a new device takes a second

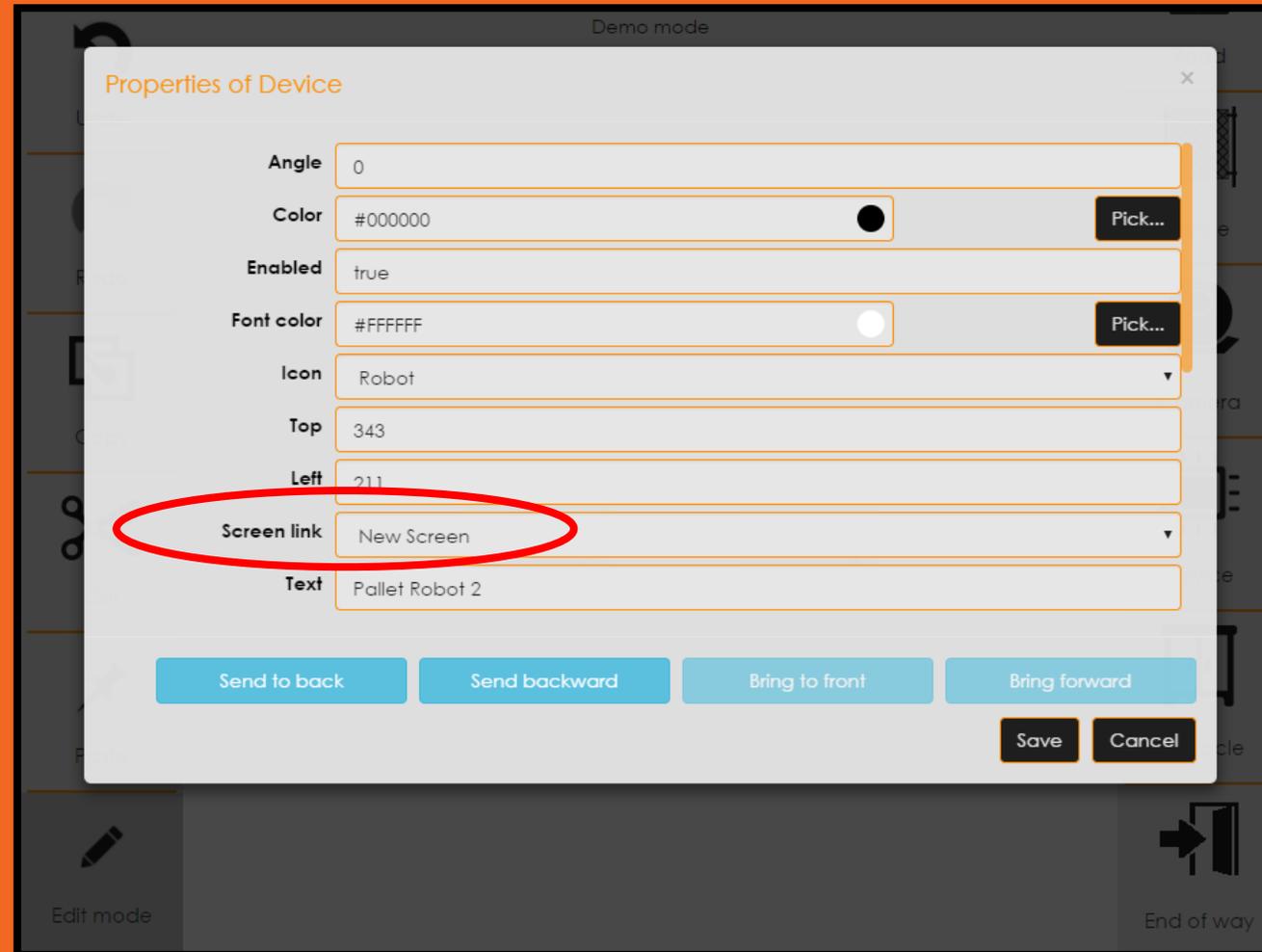
# Demo 2 – Place robots or other devices



## Factory Designer

- Simplified Overview
  - Devices, Cameras
  - Fences, Obstacles, etc.
- Shortcuts to screens
- Customizable
- Adding a new device takes a second

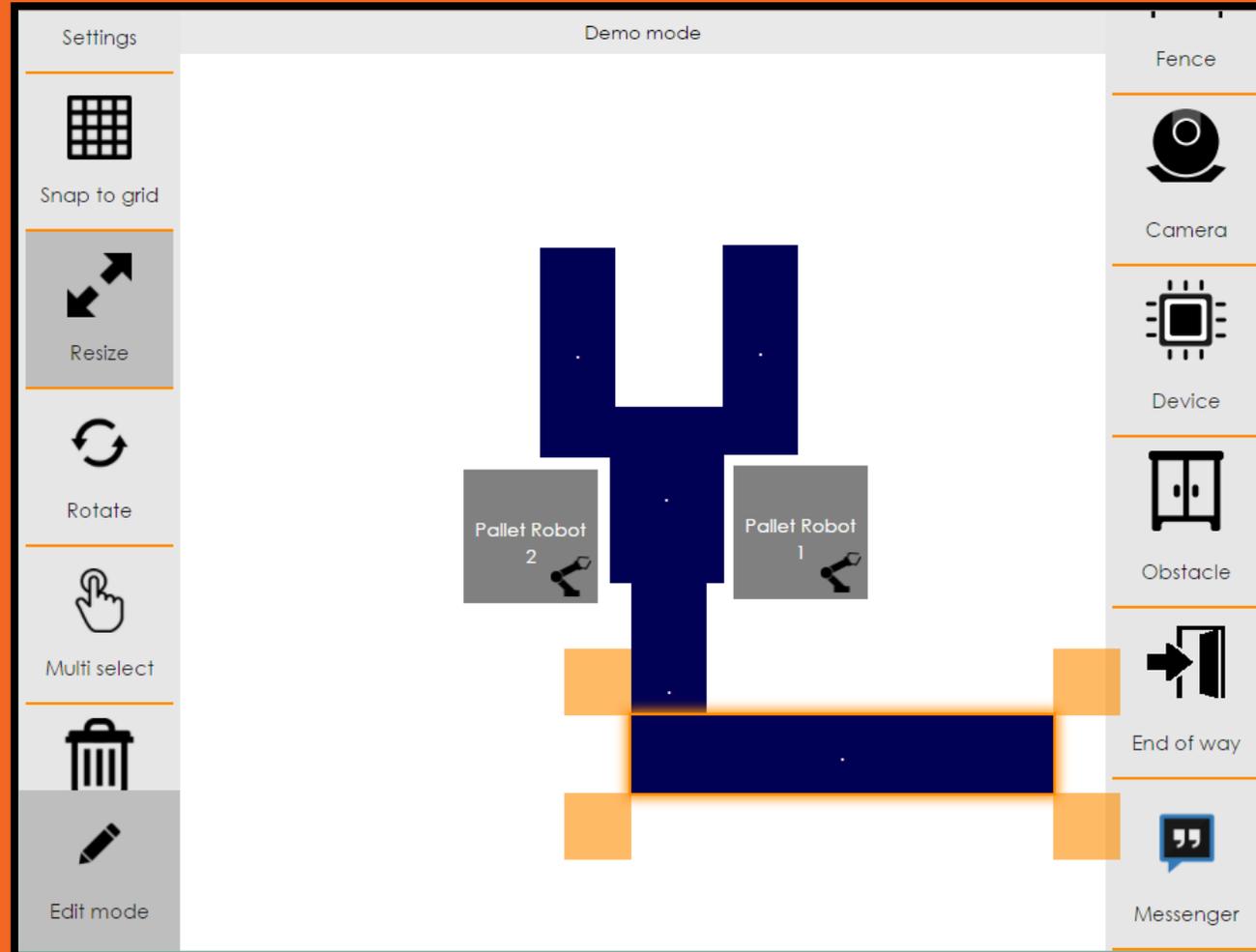
# Demo 2 – Set up the screen links



## Factory Designer

- Simplified Overview
  - Devices, Cameras
  - Fences, Obstacles, etc.
- Shortcuts to screens
- Customizable
- Adding a new device takes a second

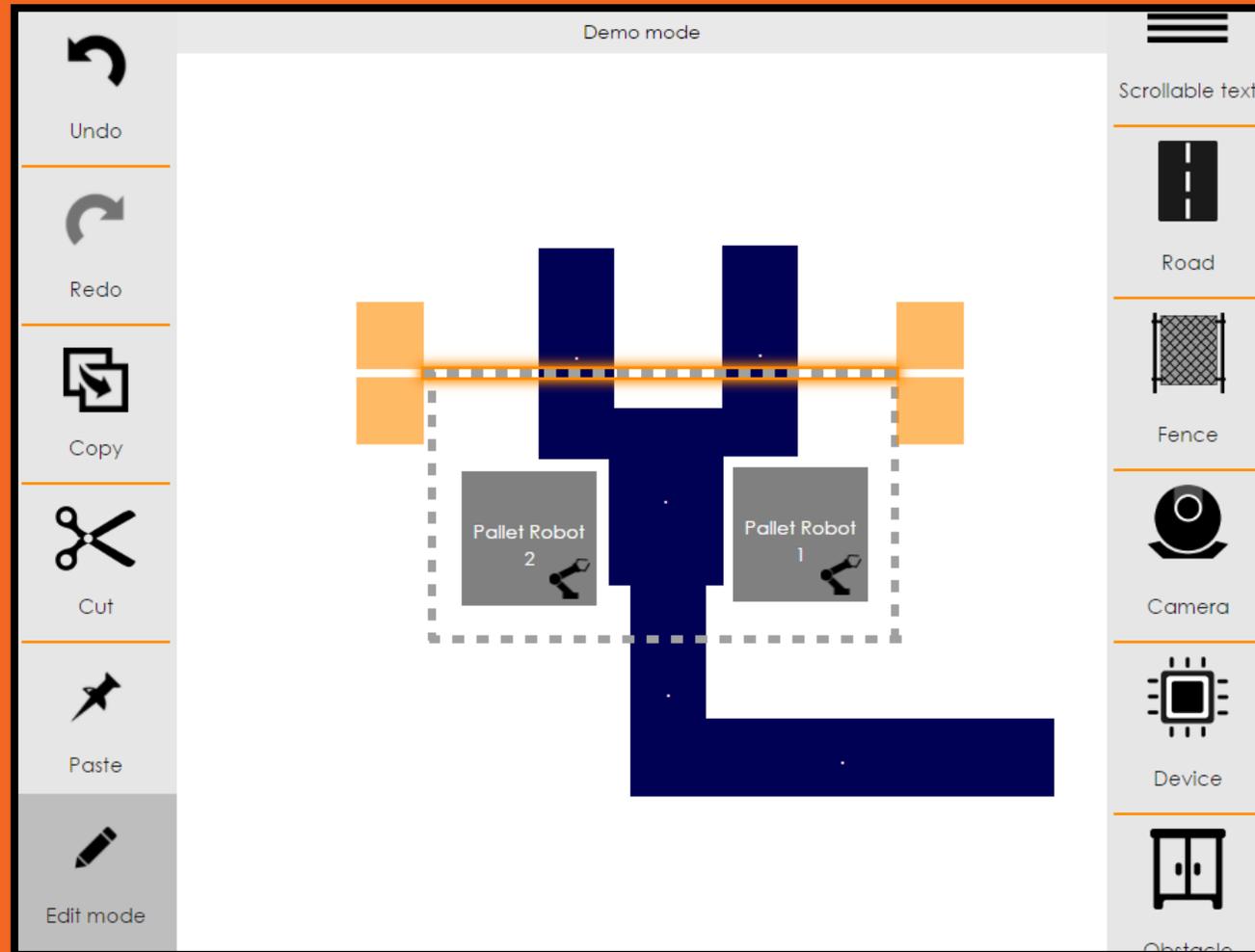
# Demo 2 – Place obstacles



## Factory Designer

- Simplified Overview
  - Devices, Cameras
  - Fences, Obstacles, etc.
- Shortcuts to screens
- Customizable
- Adding a new device takes a second

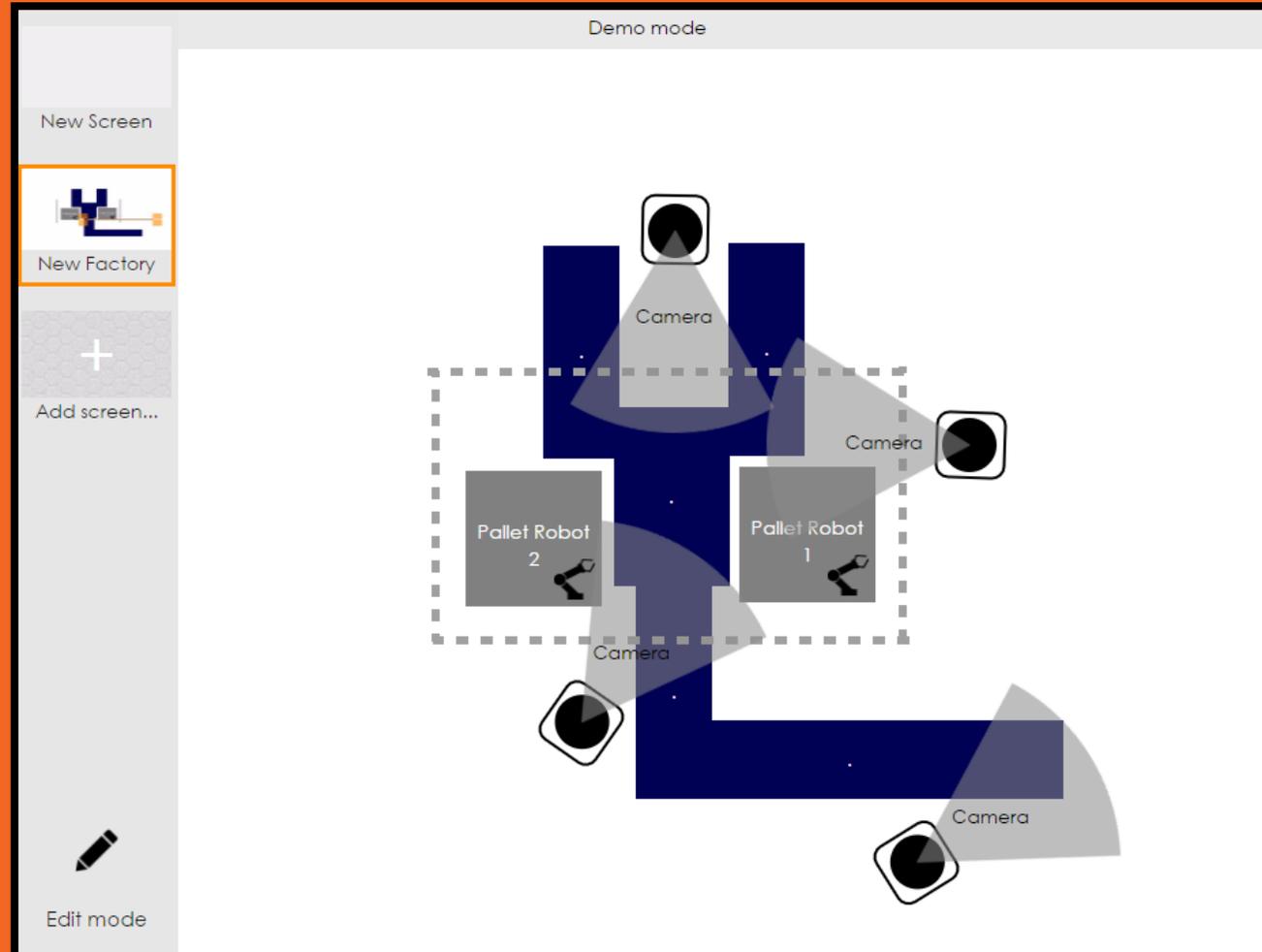
# Demo 2 – Draw the fences



## Factory Designer

- Simplified Overview
  - Devices, Cameras
  - Fences, Obstacles, etc.
- Shortcuts to screens
- Customizable
- Adding a new device takes a second

# Demo 2 – Adding cameras



## Factory Designer

- Simplified Overview
  - Devices, Cameras
  - Fences, Obstacles, etc.
- Shortcuts to screens
- Customizable
- Adding a new device takes a second

# Demo 3 – Scriptable Alarm Definition

```
*c:\FlexGui\FlexGui_3\src\FlexGuiNode\build-FlexGuiNode-Desktop_Qt_5_5_1_MSVC2013_32bit-Release\release\alarms.js - Notepad++
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
cameras.ini flexGuiNode.ini alarms.ini config.ini fghtlatex.cfg ISS01.test ISS02.test config.ini alarms.js
1 //Provided variables are:
2 // string topic: the name of the topic
3 // Object data: the object sent as topic message
4 //Return format is {severity: 1, message: "default"}
5 //If the returned value is null, it will be ignored.
6
7 if (topic == "/FlexGui/Variables/SafetyPlug") {
8     if (data.value == 0)
9         return { severity: 3, message: "Someone entered the cell." };
10    else
11        return null;
12}
13 else if (topic == "/FlexGui/Variables/MotorsOnLamp") {
14     return { severity: 2, message: "Motors were turned " + (data.value == "1" ? "on" : "off") + "." };
15}
16 else if (topic == "/FlexGui/Variables/InPlaybackMode") {
17     return { severity: 2, message: "Playback mode was turned " + (data.value == "1" ? "on" : "off") + "." };
18}
19 else if (topic == "/FlexGui/Variables/EStop") {
20     if (data.value == 0)
21         return { severity: 3, message: "The emergency stop was pressed." };
22     else
23         return null;
24}
25 else
26     return { severity: 3, message: "Not specified: " + topic };
27
JavaScript file length: 933 lines: 27 Ln: 3 Col: 50 Sel: 0|0 UNIX UTF-8 INS
```

## Custom Scripts

- Full JavaScript logic
- Kept simple
- Combine parameters

# Demo 3 – FG ExpertSite Multiple Factory Management

The screenshot displays the FlexGui Expert Site web interface. The browser address bar shows 'localhost/ExpertSite.Auth/#/'. The interface is divided into several sections:

- Left Sidebar:** Lists 'ONLINE FACTORIES (0)' and 'OFFLINE FACTORIES (6)'. Offline factories include XY Factory, IVAR 2, IVAR 3, IVAR 4, IvarBaby, and testAlarmNode, each with status icons.
- Top Center:** 'XY Factory alerts' section with a table of recent alarms:

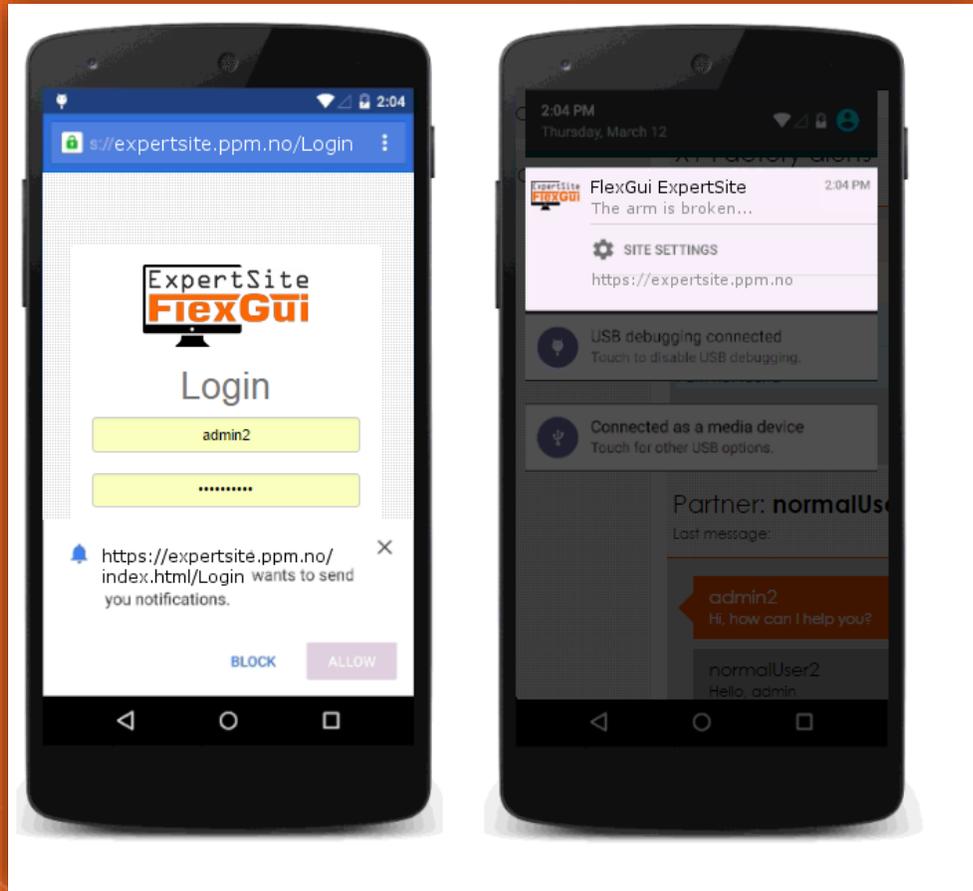
Time	Alert	Factory
2016.03.03. 00:00:00	Broken arm	XY Factory
2016.04.02. 00:00:00	Battery low	XY Factory
2016.05.02. 00:00:00	Path not found	XY Factory
2016.05.05. 00:00:00	Path not found	XY Factory
- Bottom Center:** Two chat windows for 'Partner: normalUser2' and 'Partner: normalUser1'. The normalUser2 chat shows a message from admin2: 'Hi, how can I help you?' (33 minutes ago) and a response from normalUser2: 'Hello, admin' (29 minutes ago). The normalUser1 chat shows a message from admin2: 'Hi!' (29 minutes ago).
- Right Panel:** 'LOGGED IN AS: ADMIN2' with links for 'Contacts', 'HISTORY', and 'MESSAGES'. The HISTORY section shows messages from normalUser1 ('Hi!') and normalUser2 ('Hello, admin'). The MESSAGES section shows a message from admin2: 'Hi!' (29 minutes ago).

## Widget System

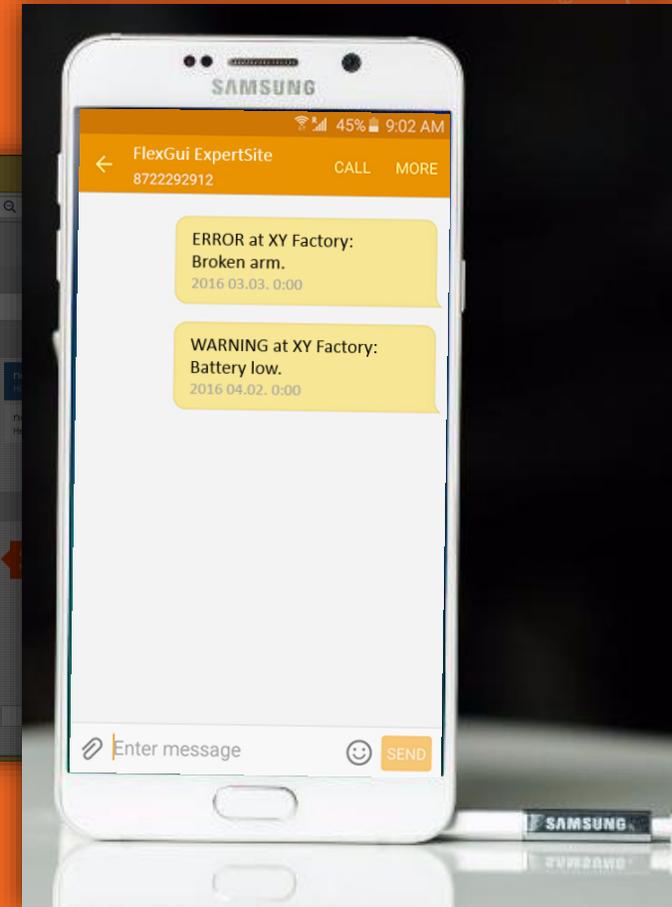
- Factories
- Alarms
- Multimedia Messages

# Demo 3 – Diverse Alarm Possibilities

Push Messages



SMS messages



# Demo 3 – Inspect the problem

## Remote Access

- Over VPN
- All device variables
- Camera images
- History Mode
- Real Time Synchronization

The screenshot displays the FlexGui Expert Site interface. The main window shows a list of online and offline factories on the left. The central area displays 'XY Factory alerts' with a table of recent incidents:

Time	Alert	Factory
2016.03.03. 00:00:00	Broken arm	XY Factory
2016.04.02. 00:00:00	Battery low	XY Factory
2016.05.02. 00:00:00	Path not found	XY Factory
2016.05.05. 00:00:00	Path not found	XY Factory

Below the alerts, there are chat windows for 'normalUser2' and 'normalUser1'. The 'normalUser2' chat shows a message from 'admin2' at 33 minutes ago: 'Hi, how can I help you?'. The 'normalUser1' chat shows a message from 'admin2' at 29 minutes ago: 'Hi!'. To the right, a 'LOGGED IN' section shows 'normalUser1' with 'Hi!' and 'normalUser2' with 'Hello, admin'. A 'MESS' section shows a message from 'admin2' at 29 minutes ago: 'Hi!'. The bottom right window shows a 'FlexGui Test - Google Chrome' browser window displaying a camera feed titled 'Camera 1' showing a factory floor with several mobile robots. Below it are thumbnails for 'Camera 2', 'Camera 3', and 'Camera 4'. A sidebar on the right contains navigation options: Info, Monitoring, Packaging, Pick & Place, and Edit mode.

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# Demo 3 – Prepare a solution

## Remote Access

- Over VPN
- All device variables
- Camera images
- History Mode
- Real Time Synchronization

The screenshot displays the FlexGui Expert Site interface. The main window shows a list of factories (ONLINE and OFFLINE) and a detailed view of 'XY Factory alerts' with a table of incidents:

Time	Alert	Factory
2016.03.03. 00:00:00	Broken arm	XY Factory
2016.04.02. 00:00:00	Battery low	XY Factory
2016.05.02. 00:00:00	Path not found	XY Factory
2016.05.05. 00:00:00	Path not found	XY Factory

Below the alerts, there are chat windows for 'normalUser2' and 'normalUser1'. A 'Recovery Screen' overlay is visible, featuring a 'Device Controls' section with a progress bar at 43.62% and a 'Process Controls' section with buttons for 'Go to parking position', 'Select Input', and 'Process Data'.

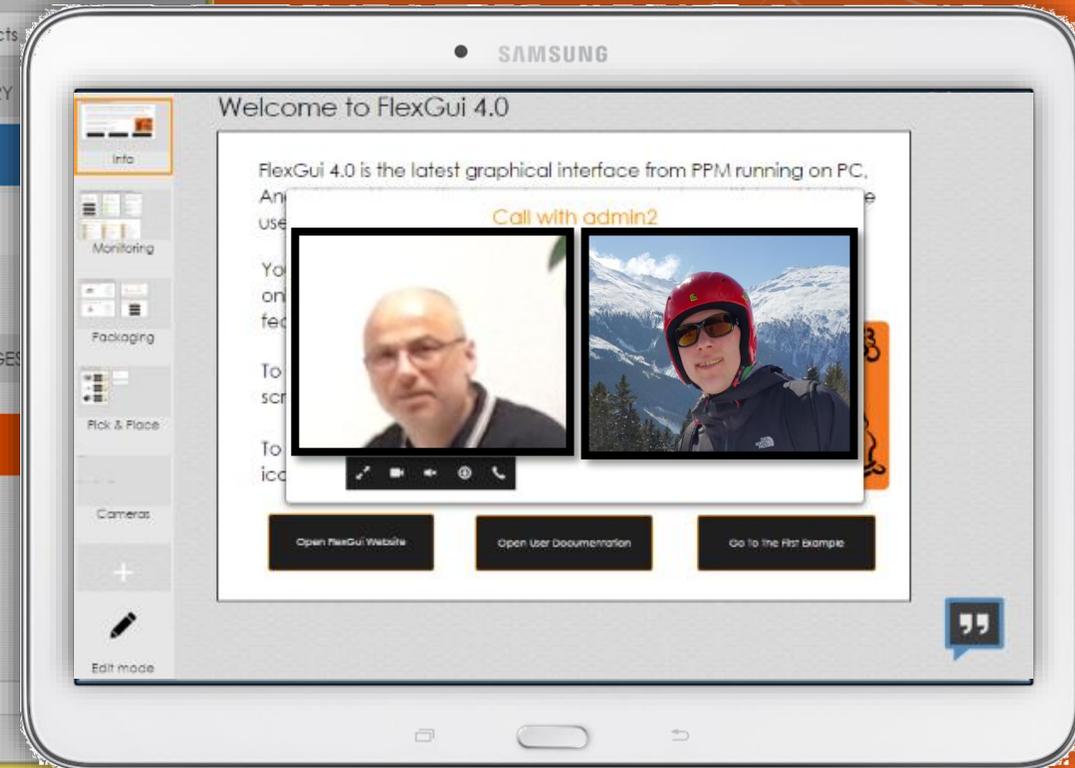
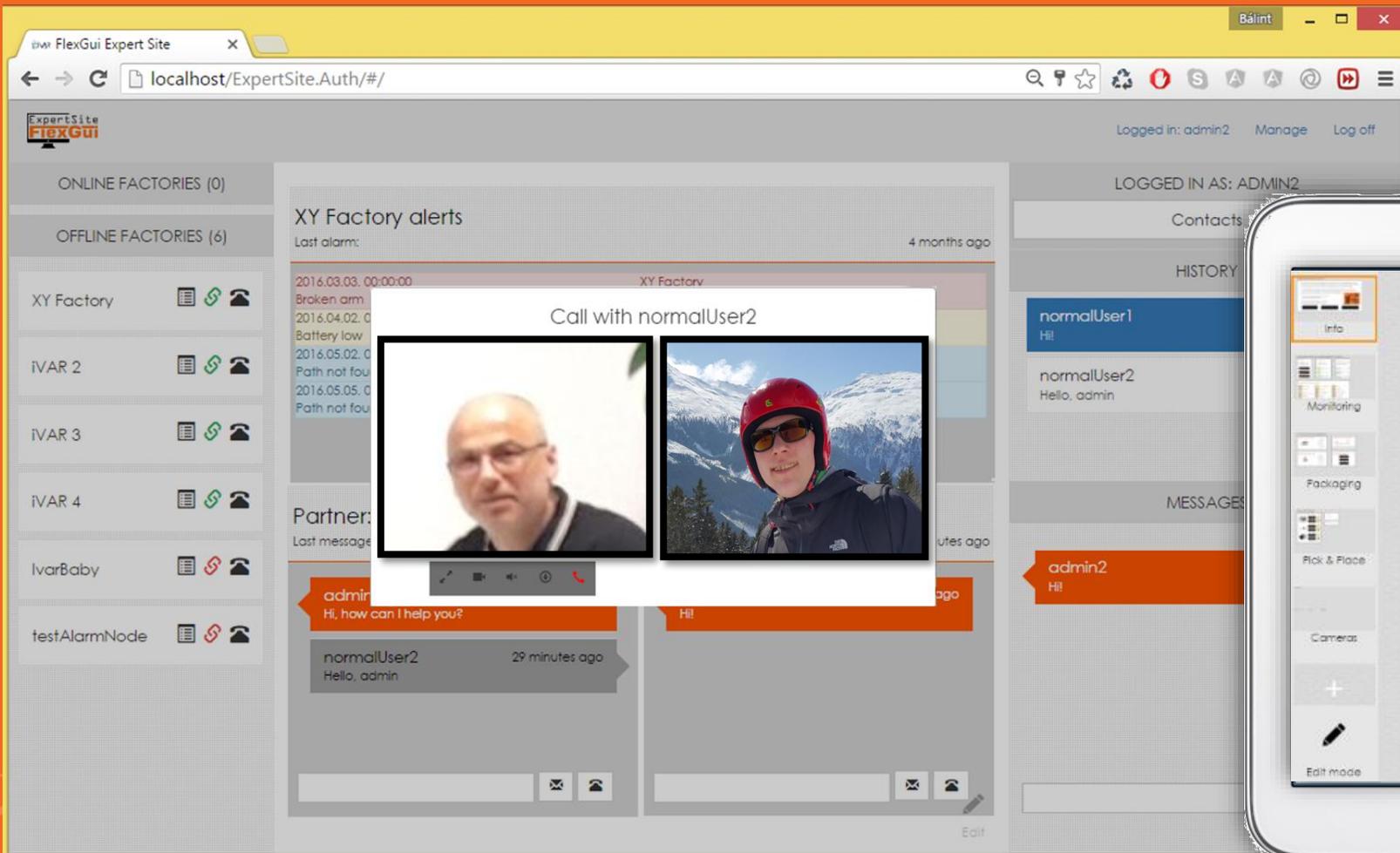
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# Demo 3 – Wait for the call

## Remote Access

- Over VPN
- All device variables
- Camera images
- History Mode
- Real Time Synchronization



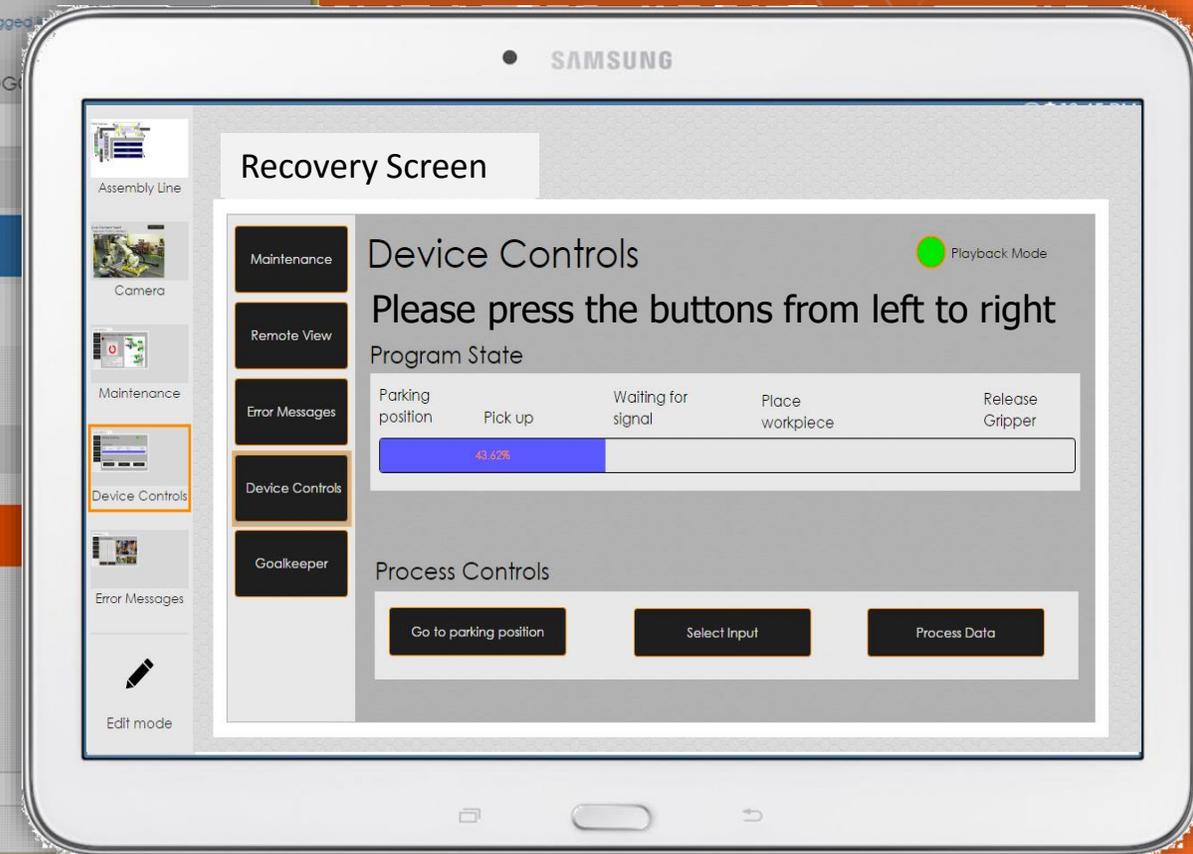
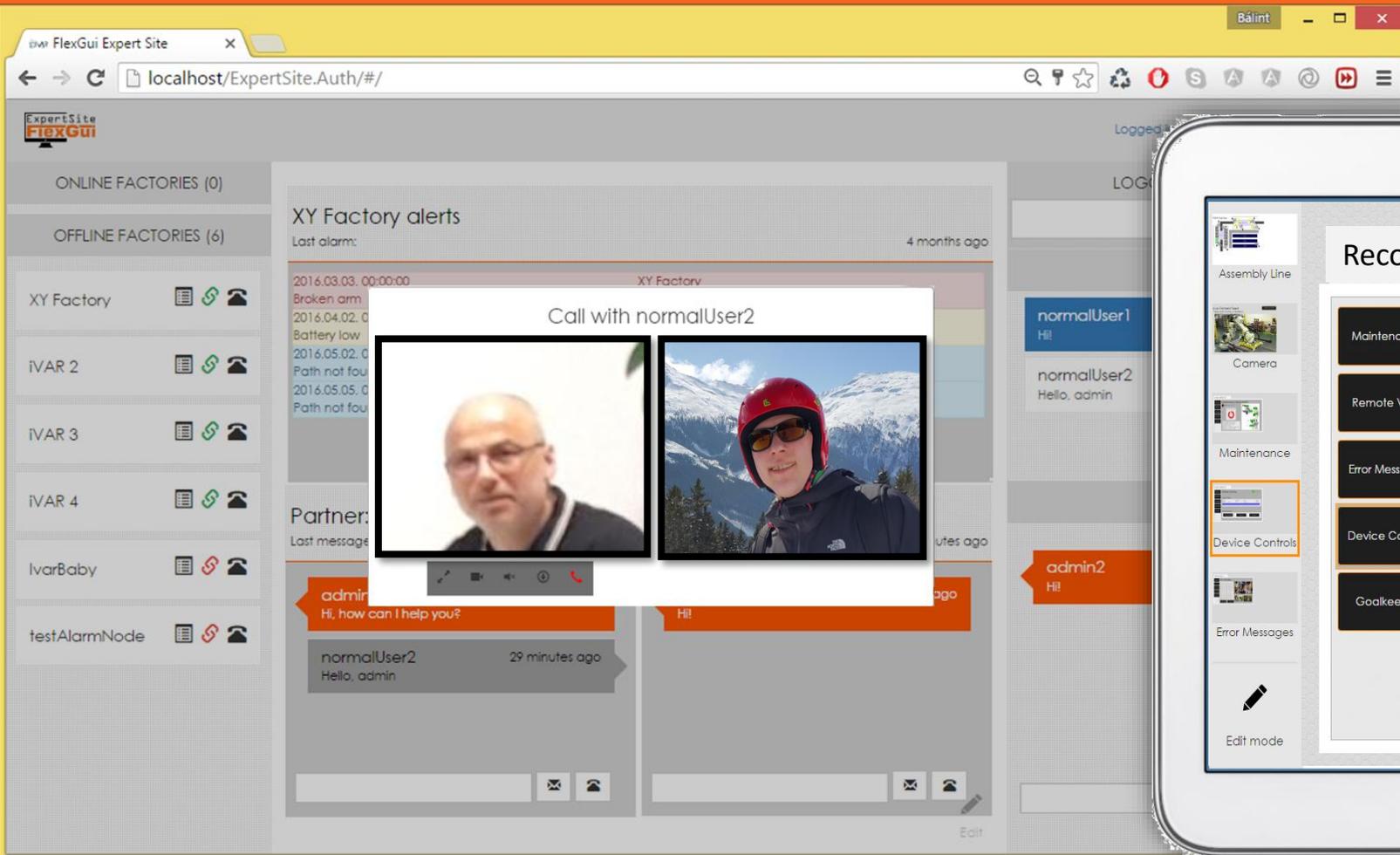
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# Demo 3 – Amaze the customer with 5s response time

Emergency Line

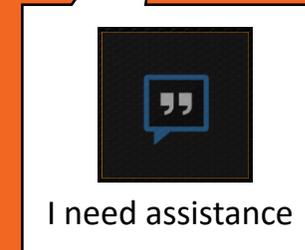
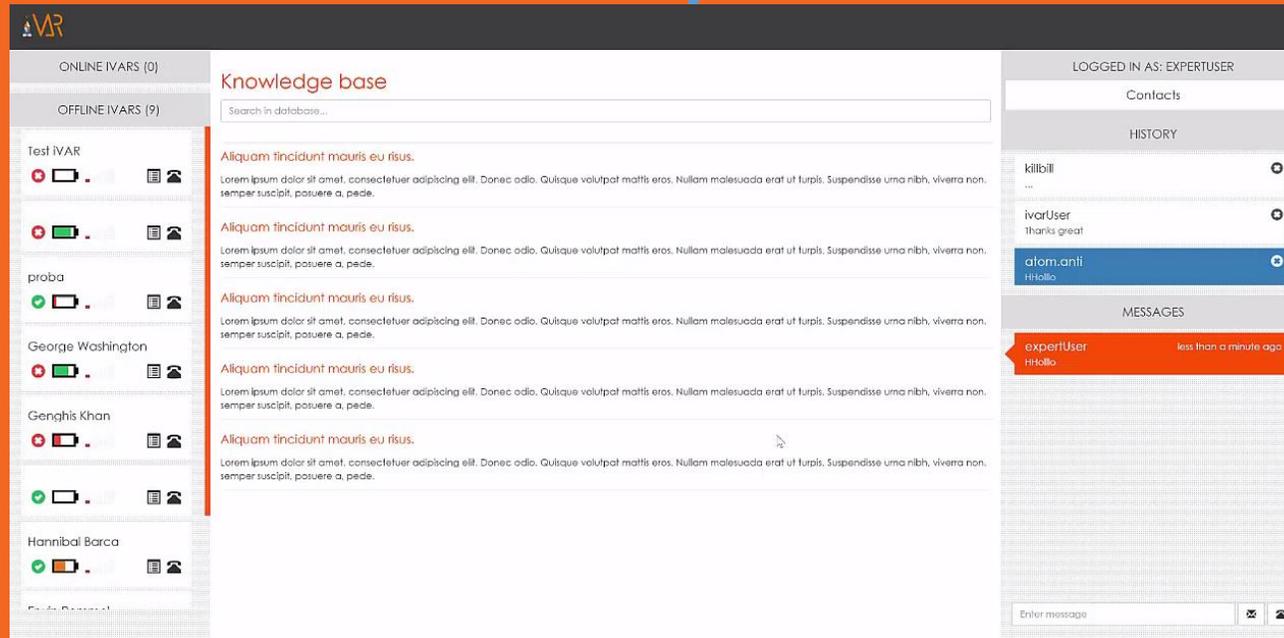
- Not even an expert is required



# FlexGui 4.0 – case setup

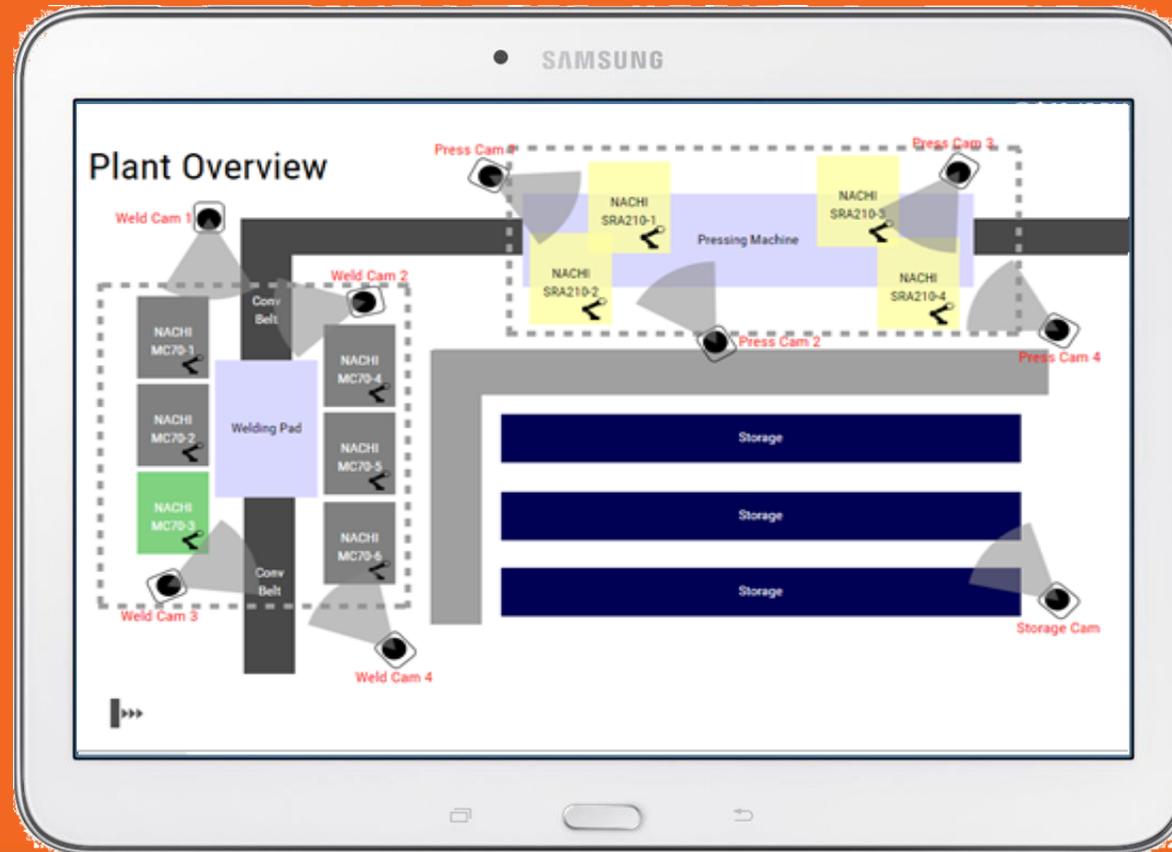
- level 0: Multi-factory monitoring and control  
(example; View status of factories, remote control, contact the local operator (audio, video, text))

Only 1 button press!



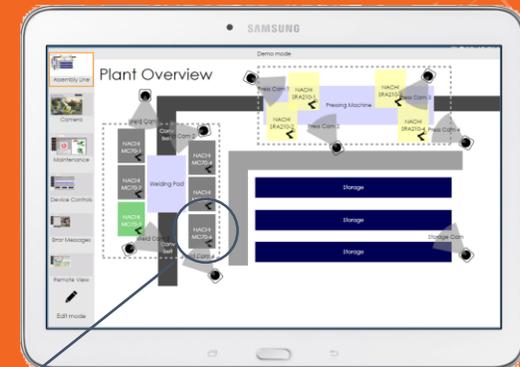
# FlexGui 4.0 – case setup

- level i: Factory monitoring and control  
(example; View status of the factory and get access to any device by double click on the icon)



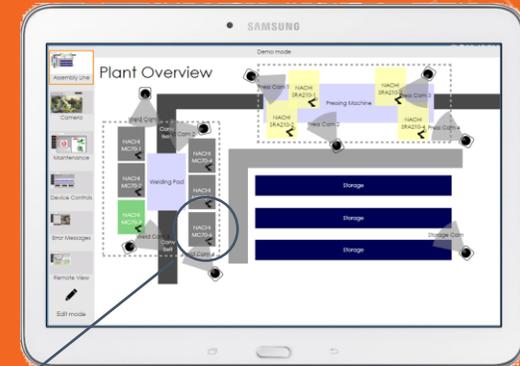
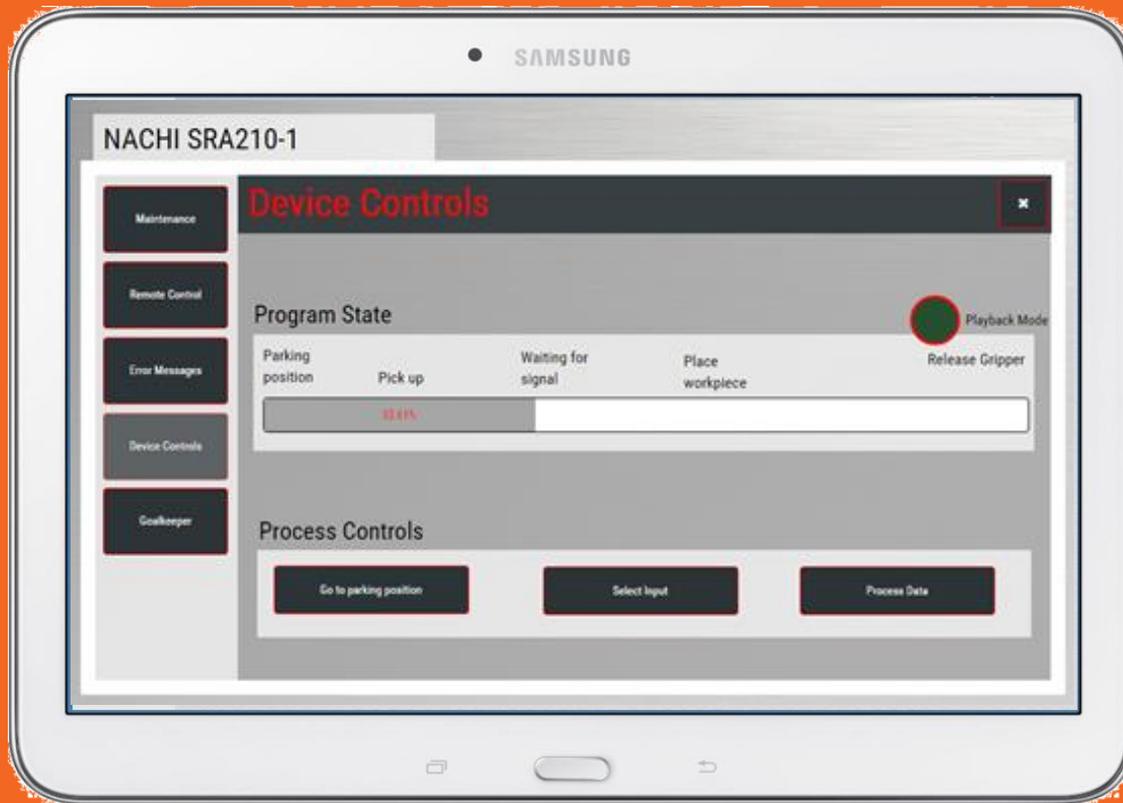
# FlexGui 4.0 – case setup

- level ii: Device monitoring and control  
(example; View status and manufacturing data of one of the robots in the production)



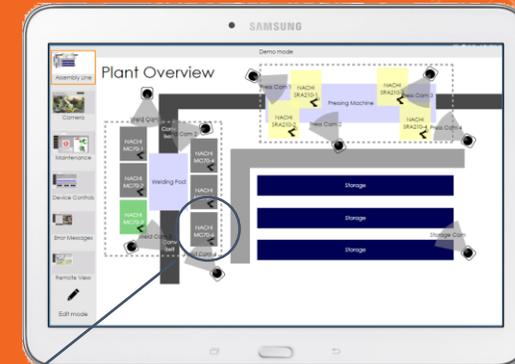
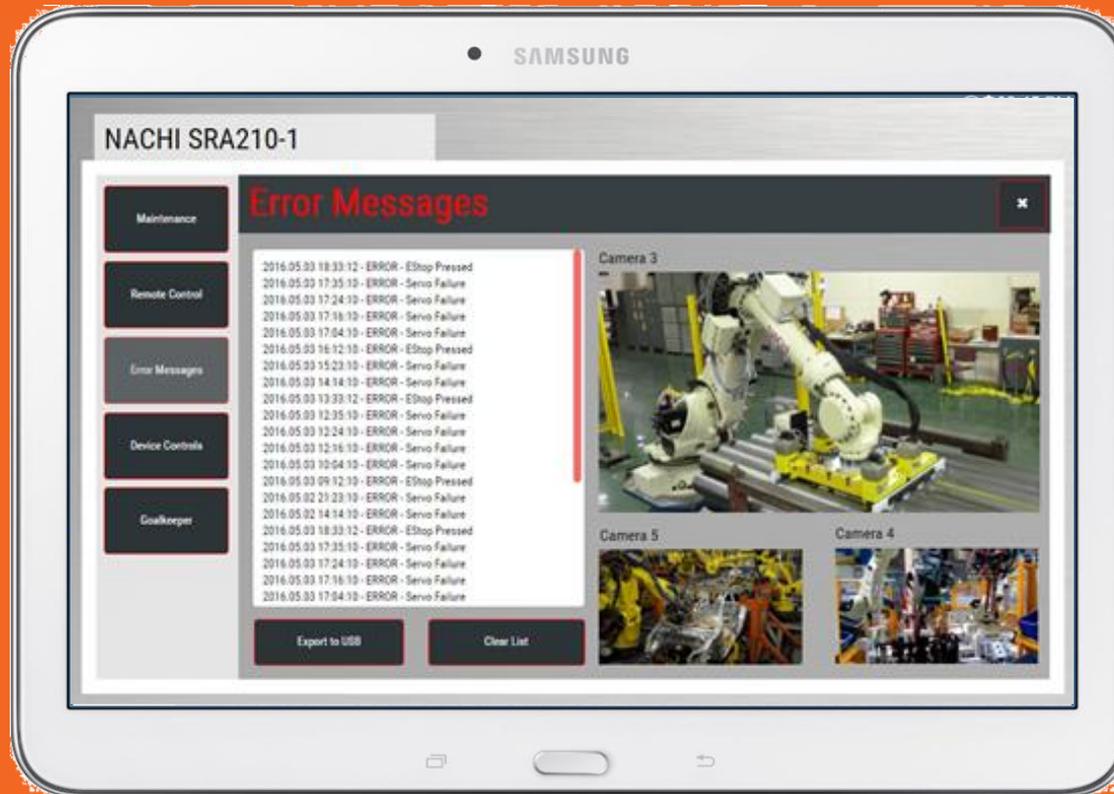
# FlexGui 4.0 – case setup

- level ii: Device monitoring and control  
(example; View the current status of the robot program being executed)



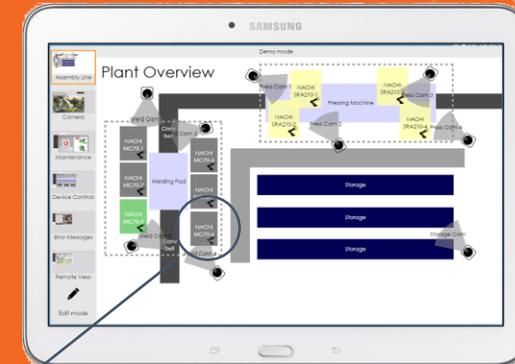
# FlexGui 4.0 – case setup

- level ii: Device monitoring and control  
(example; View / playback error messages and synchronous video from the production)



# FlexGui 4.0 – case setup

- level iii: Device operation – std interface  
(example; Safe remote monitoring / operation of the robot to assist the local operator production)



# FlexGui 4.0 – case setup

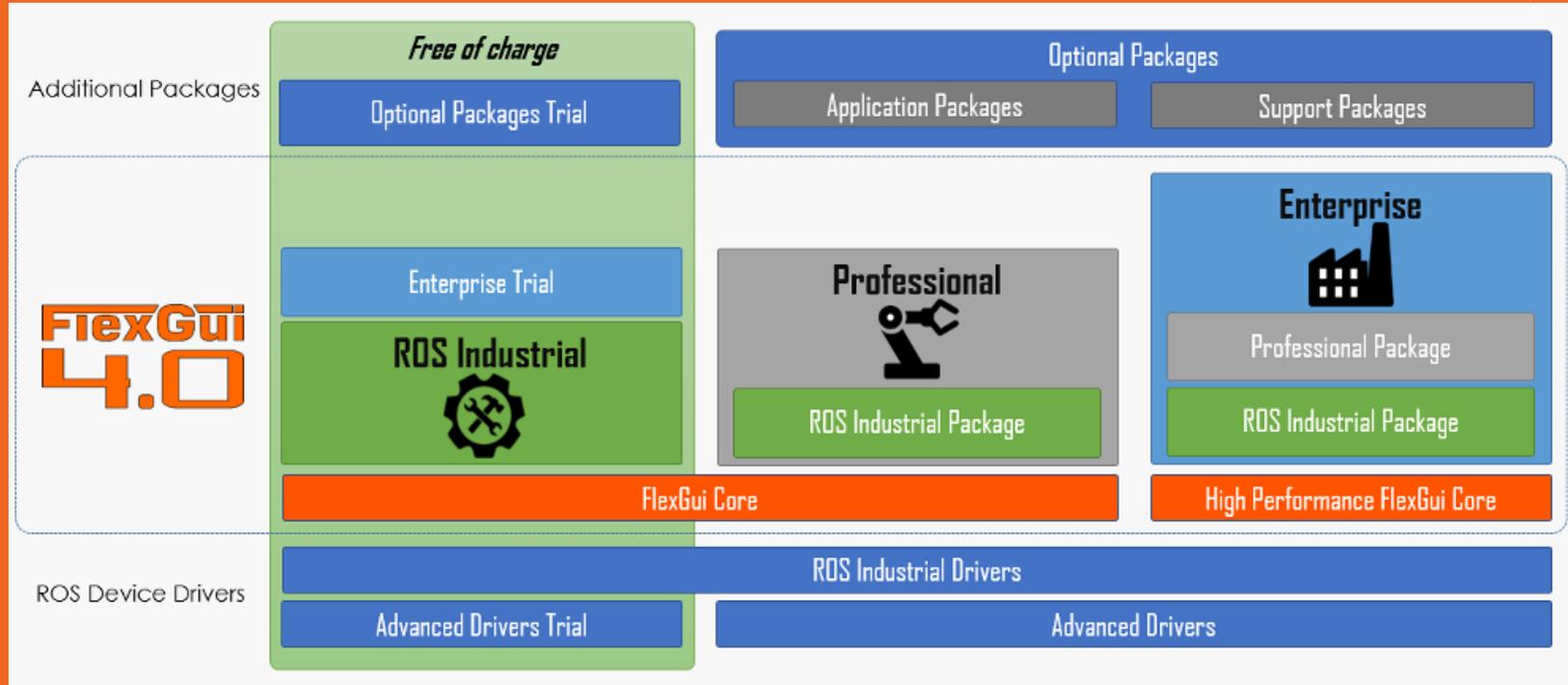
- level iii: Device operation – FlexGui interface (example; Programming and operating the robot by FlexGui)



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# FlexGui 4.0 licenses



# How to get FlexGui 4.0 ?

- Homepage: [www.ppm.no/flexgui4-Home](http://www.ppm.no/flexgui4-Home)
  - Product description, documentation, on-line trial
- ROS: [github.com/ros-industrial/flexgui\\_industrial](https://github.com/ros-industrial/flexgui_industrial)
  - Open source download



# Contact information



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