



# Highly custom design

## Qt implementation

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# Plan

- ▶ S2Innovation - company introduction
- ▶ Project goal
- ▶ WinCC OA
- ▶ Implementation results
- ▶ How to plan the development

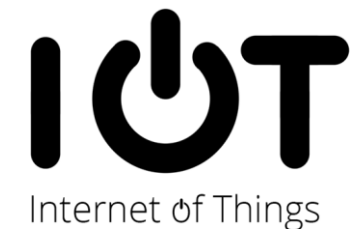
# Who we are?

- ▶ S2Innovation was founded in December 2017 by:
  - ▶ Piotr Goryl, former Head of IT and Controls at SOLARIS,
  - ▶ Wojciech Soroka, former Procurement officer at SOLARIS
- ▶ Since 2019 S2Innovation is a Polish-Slovenian Joint Venture (Investment of Cosylab d.d.).



# What we offer

- ▶ Complete accelerator and beamline's control system delivery,
- ▶ Instruments/experiments integration,
- ▶ Device Servers & IOC's for devices,
- ▶ Data acquisitions systems,
- ▶ Digital User Office software (DUO),
- ▶ Alarms management system,
- ▶ PLC-based control systems
  - ▶ Beckhoff,
  - ▶ Siemens,
  - ▶ Rockwell.



# The aim of project

- ▶ Project implemented for CERN
- ▶ Implement new designs according to ISA 101 while keeping the previous functionality
- ▶ Implement those in WinCC OA/Qt



### Front-End Diagnostic

Configured Front-Ends

System: TEST\_UNICOS1

- TRANEBCU355
- CFC\_272\_DT8\_IP8\_DL8K
- cfc\_ccr\_magintik1
- DCS\_CMSDT\_56
- MEQ59\_IEC104\_GWS
- CFP\_107\_FS
- CFP\_180\_GLO2
- CFP\_864\_PLCSIM15
- HVAC\_ISOLDE
- PLCCOIS20
- COMM\_SR1\_RY03

Checked Front-End Alarms

State	Description
Masked	2022.03.02 17:52:26.804: Communication CFP_375_FSNTOF -> DS driver 7 Ok
Masked	2022.03.02 17:52:26.807: Time synchro CFP_375_FSNTOF -> DS driver 7 Ok
Masked	2022.03.02 17:52:26.809: Modbus state DS driver 7 -> CFP_375_FSNTOF Ok
OK	2022.06.14 16:40:02.295: Communication CFP_864_PLCCV7 -> DS driver 9 Ok
OK	2022.06.14 16:40:01.391: Time synchro CFP_864_PLCCV7 -> DS driver 9 Ok
OK	2022.06.14 16:39:35.051: Modbus state DS driver 9 -> CFP_864_PLCCV7 Ok
Masked	1970.01.01 01:00:00.000: Communication MOD_LAB_GW1 -> DS driver 19 Ok
Masked	1970.01.01 01:00:00.000: Time synchro MOD_LAB_GW1 -> DS driver 19 Ok
Masked	1970.01.01 01:00:00.000: Modbus state DS driver 19 -> MOD_LAB_GW1 Ok

Enable / Disable

Configuration

Sub-applications: 272    Import time: 2022.02.25 11:31:35.636    Analog archive: RDB-99) EVENT    Boolean archive: RDB-99) EVENT    Event archive: RDB-99) EVENT

Status: Enabled    Driver: 15    CMW: Masked

Specific Information

Gateway name: CFC\_272\_DT8\_IP8\_DL8K

GQ: OFF

Last GQ execution: 1970.01.01 01:00:00.000

FE alarms

State	Description	Value
	2022.06.14 15:47:01.339: Communication CFC_272_DT8_IP8_DL8K -> DS driver 15 Bad	
	2022.06.14 15:46:41.321: Time synchro CFC_272_DT8_IP8_DL8K -> DS driver 15 Bad	

Alarm text:

Alarm value:

Communication

FE -> DS    Counter:   Invalid

Timestamp: 1970.01.01 01:00:00.000

### Front-End Diagnostic

Configured Front-End

System: TEST\_UNICOS1

- TRANEBCU355
- CFC\_272\_DT8\_IP8\_DL8Kk
- cfc\_ccr\_magintik1
- TRANEBCU355
- CFC\_272\_DT8\_IP8\_DL8kK
- cfc\_ccr\_magintik1

Checked Front-End Alarms

State	Description
Masked	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok
Masked	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok
OK	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok
OK	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok
OK	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok
Masked	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok
Masked	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok

Enable/Disable

Configuration

Sub-applications:     Import time: 2022.02.25 11:31:35.636    Analog archive: RDB-99) EVENT    Boolean archive: RDB-99) EVENT    Event archive: RDB-99) EVENT

Status: Enabled    Driver: 15    CMW: Masked

Specific Information

Gateway name: CFC\_272\_DT8\_IP8\_DL8K

GQ: OFF

Last GQ execution: 1970.01.01 01:00:00.000

FE alarms

State	Description	Value
	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok	10
	2022.03.02 17:52:26.804: Communication CFP_375_FSNOF_DS driver / Ok	10

Alarm txt:

Alarm value:

Communication

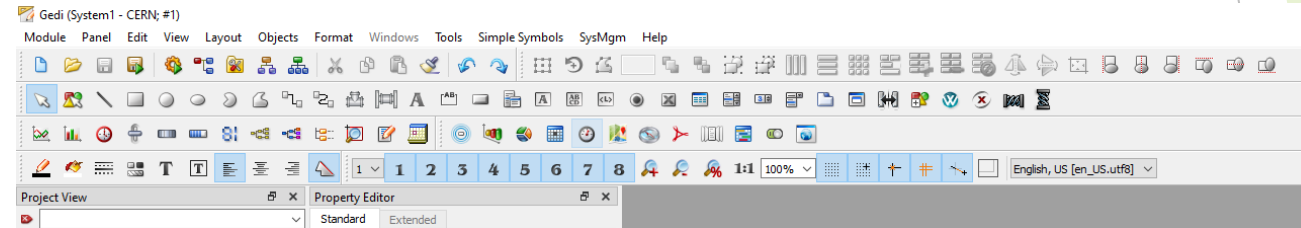
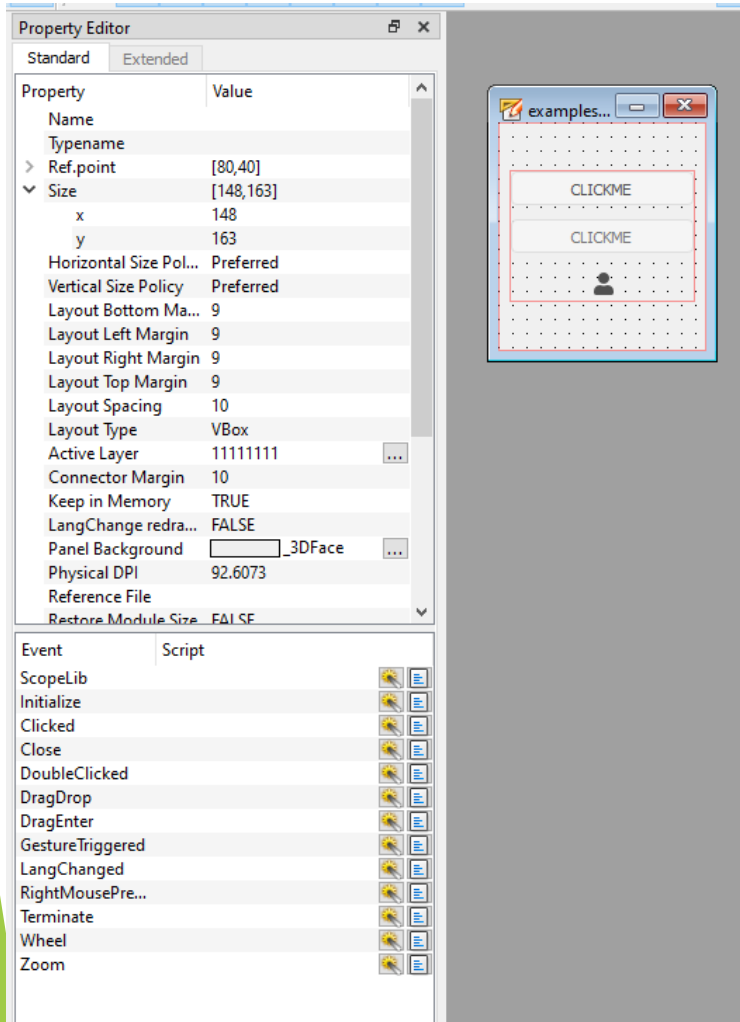
FE -> DS    Counter:   Invalid

Timestamp: 1970.01.01 01:00:00.000

# WinCC OA – an overview

- ▶ Qt based widgets (work done here can be also done in Taurus)
- ▶ Functionality similar to QT designer (in the concept of UI)
- ▶ Allows to directly connect to datapoints defined withing the WinccOA
- ▶ Color palette definition
- ▶ Icon sets definition
- ▶ Can be customized with special widgets (EWO)
- ▶ Major limitation: cannot use directly the Qt library; components can only be styled using CSS

# WinCC OA – an overview





# My background and why Qt bothers me and (should) designer too

- ▶ Is it possible to have a pixel-perfect design in Qt?
- ▶ Does the target of such a design is the same as the one developed for web design?
- ▶ Which tradeoff can we accept here? (some, none?)
- ▶ Do the scientist have a need for better design?

Should designer design  
design?

Yes, but...



# Should a designer design design?

- ▶ UX designers are use to working in different scope
- ▶ Not everything is possible in Qt (easily)
- ▶ New widgets should stick to Qt concept
- ▶ Designer should be aware of limitations and introduced to the technology before starting to work on design

# Implementation results



### Import Devices / Front-Ends

**Settings**

Source file:   

Char encoding:  Archive (Bool):




Driver:  Front-End type:  Archive (Event):


Archive (Analog):   

**Details**

System name:	Front-End version:	Device prefix:	Event type:
<input type="text" value="System best"/>	<input type="text" value="Frontend started"/>	<input type="text" value="TEST_UNICOS_1"/>	<input type="text" value="event32: old and current value"/>

**Log**

    Check OK



Import Devices / Front-Ends

Settings

Source file:

Char encoding:   Archive (Bool):

Driver:  Front-End type:   Archive (Event):

Archive (Analog):

Details

System name:  Front-End version:  Device prefix:  Event type:

Log

Check OK

70%



Import Devices / Front-Ends

Settings

Source file:

Char encoding:   Archive (Bool):  Front-End type:   Archive (Event):

Archive (Analog):

Details

System name:  Front-End version:  Device pr:    Check OK

70%

## Front-End Diagnostic

### Configured Front-End

System: TEST\_UNICOS1

TRANEBCU355  
CFC\_272\_DT8\_IP8\_DL8K  
cfc\_ccr\_magintik1  
DCS\_CMSDT\_56  
MFC50\_IPC104\_GWS

### Checked Front-End Alarms

State	Description
OK	2023.03.14 23:16:09.564 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad
Masked	2023.03.14 23:16:09.564 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad
OK	2023.03.14 23:16:09.564 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad
Masked	2023.03.14 23:16:09.564 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad
Masked	2023.03.14 23:16:09.564 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad
OK	2023.03.14 23:16:09.564 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad
OK	2023.03.14 23:16:09.564 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad

Enable/Disable

Request all data

Delete sub-apps

### Configuration

#### Sub-applications

TRANEBCU335  
CFC\_272\_DT8\_IP8\_DL8kK  
cfc\_ccr\_magintik1  
CFC\_272\_DT8\_IP8\_DL8kK

#### Import time:

TRANEBCU335  
CFC\_272\_DT8\_IP8\_DL8kK  
cfc\_ccr\_magintik1  
CFC\_272\_DT8\_IP8\_DL8kK

#### Analog archive:

TRANEBCU335  
CFC\_272\_DT8\_IP8\_DL8kK  
cfc\_ccr\_magintik1  
CFC\_272\_DT8\_IP8\_DL8kK

#### Boolean archive:

TRANEBCU335  
CFC\_272\_DT8\_IP8\_DL8kK  
cfc\_ccr\_magintik1  
CFC\_272\_DT8\_IP8\_DL8kK

#### Event archive:

TRANEBCU335  
CFC\_272\_DT8\_IP8\_DL8kK  
cfc\_ccr\_magintik1  
CFC\_272\_DT8\_IP8\_DL8kK

Status:

Driver:

CMW:

Enabled

15

Stopped

### FE alarms

State	Description	Value
OK	2023.03.14 23:16:09.617 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad	12
NOK	2023.03.14 23:16:09.617 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad	14
OK	2023.03.14 23:16:09.617 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad	14
OK	2023.03.14 23:16:09.617 Communication CFC 272 DT8 IP8 DL8K -> DS driver 15 Bad	15

Alarm txt:

Alarm value:

### Communication

FE > DS

Header:

Header:

Diag

Close



## Mail / SMS Configuration

System: TEST\_UNICOS1

New E-Mail/SMS Configuration:

DT\_AnalysisChain1Alarms

Existing configurations:

unSystemIntegrity

unProcessAlarm

category1

category2

NO\_SMS\_ON\_WARNING

NO\_SMS\_ON\_ALARM

NO\_SMS\_ON\_ALERT

Use this function for the configuration:

DT\_AnalysisChain1Alarm E-Mail/SMS

On

Apply changes

Use this function for E-mail/SMS:

Max. number per ...

Report off

Interval in seconds:

Use this function for reports

Interval in seconds

E-mail/SMS at start-up

### Configuration

Link to show in E-Mail/SMS

info.php



Custom message:

Lorem ipsum dolor sit amet

Monitored DPs:

Show DP names



TEST\_UNICOS1: CMSDT\_1

TEST\_UNICOS1: CMSDT\_2

TEST\_UNICOS1: CMSDT\_3



Sender address:

Sender 1

Receiver(s):

Lorem ipsum dolor sit amet



A



Domain:

SMTP server:

External SMTP server



## Application Configuration

General

Front-end application

Alarms

Settings

General

Application name:

TEST\_UNICOS\_1 UNICOS 8.6.0

HMI logo:



Pane bar background color

inputBackground



Pane bar foreground color

inputBackground



Default panel:



Navigation panel:

Position of navigation panel:



X:

Y:

Alarm overview panel:



**Beep:**

Type:

Device:

Panel:

Line 1:

Line 2:



Ok

Apply

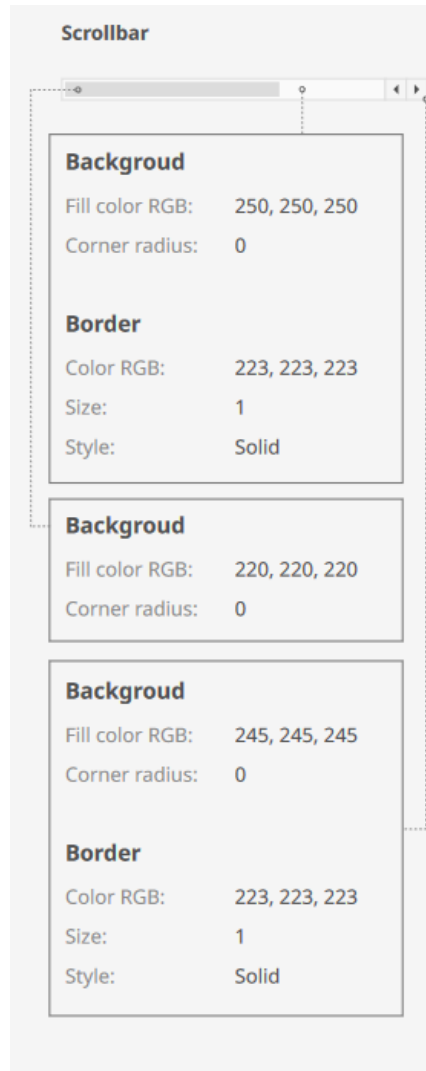
Cancel

# How did we schedule it?

- ▶ schedule was based on project iterations
- ▶ each of them had a deliverable of a new screen implemented
- ▶ styleguide was delivered in the first iteration
- ▶ designer worked without previous experience with Qt

# How should it be scheduled?

- ▶ The project should be reconsidered as a whole application
- ▶ The reoccurring widgets should be extracted and implemented consistently
- ▶ Widgets should be implemented in the first iterations and screens afterwards

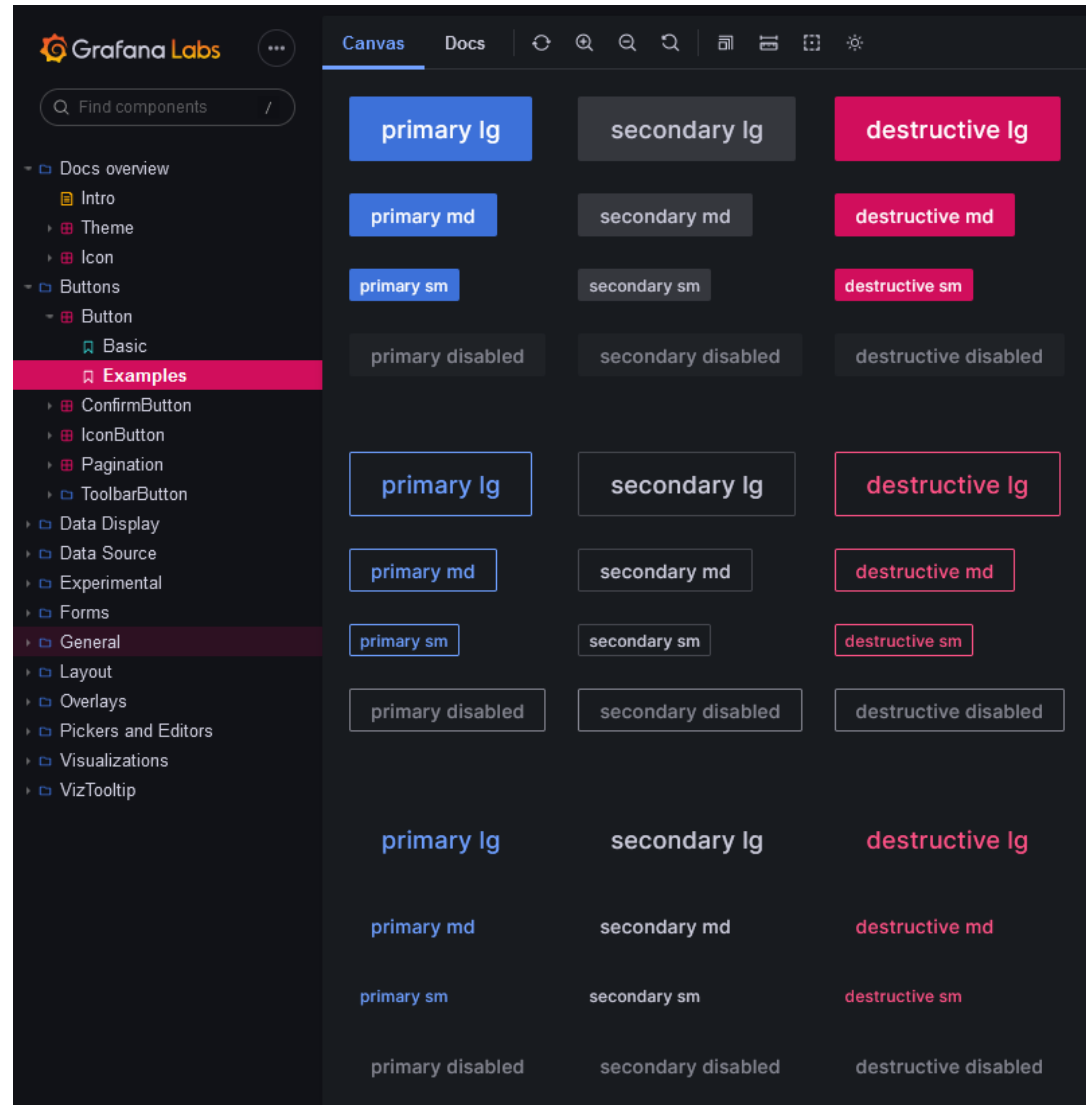


# Reusing styled components

- ▶ Create a styleguide
- ▶ Keep the widgets simple and atomic
- ▶ Create lot of examples
- ▶ Present the concepts to the development team

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# Reusing styled widgets – web based solution



# Reusing styled widgets – web based solution

- ▢ General
  - ▢ Card
    - ▢ As Link
    - ▢ Basic
    - ▢ Full
    - ▢ Not Selected
    - ▢ Selected
    - ▢ With Actions
    - ▢ With Media
    - ▢ With Tags
  - ▢ ContextMenu
  - ▢ ErrorBoundary
  - ▢ FilterPill
  - ▢ LoadingBar
  - ▢ LoadingPlaceholder
  - ▢ Menu
  - ▢ PanelContainer
  - ▢ RenderUserContentAsHTML
  - ▢ Typography
- ▢ Layout
- ▢ Overlays
- ▢ Pickers and Editors
- ▢ Visualizations
- ▢ VizTooltip

```
export const Selected: ComponentStory<typeof Card> = () => {  
  return (  
    <Card isSelected>  
      <Card.Heading>Spaces</Card.Heading>  
      <Card.Description>Spaces are the superior form of indenting code.</Card.Description>  
      <Card.Figure>  
        <img src={logo} alt="Grafana Logo" width="40" height="40" />  
      </Card.Figure>  
    </Card>  
  );  
};
```

# Thank you!

**s<sup>2</sup>:innovation**  
Software solutions

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