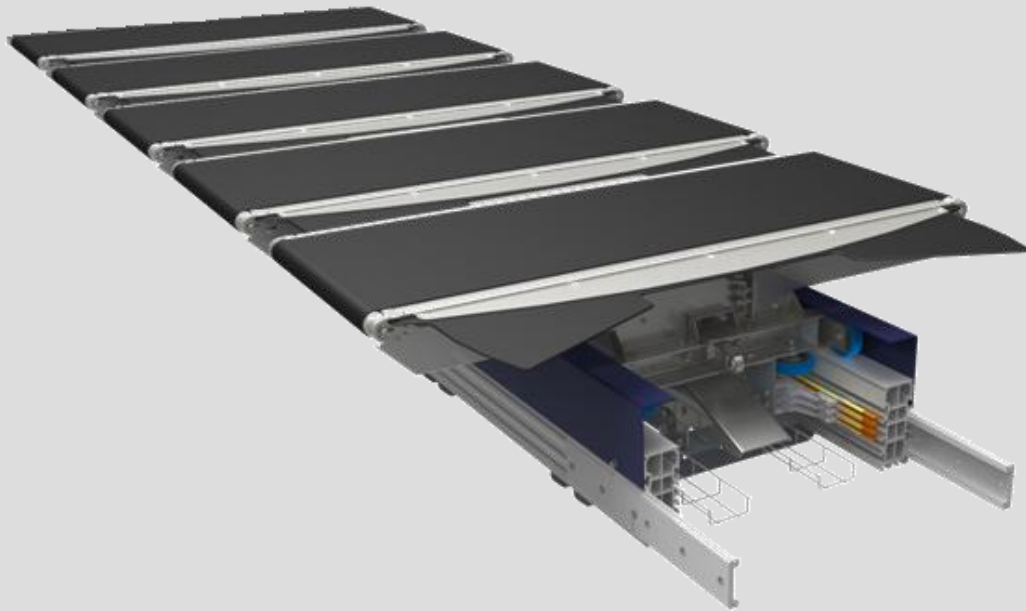
A red Vanderlande LoopSorter unit is shown on a wooden pallet in a warehouse setting. The unit is a large, cylindrical, red container with a grey handle and a small window. The background is a blurred warehouse interior with overhead lights and structural elements.

Configuration, Field Deployment and Commissioning of Vanderlande Loopsorters

03-02-2015 | Tim van Hassel | SASG Meeting | Veghel



Agenda

- > Introduction Loopsorter & FSC
- > Loopsorter Engineering & Commissioning
- > FSC Config Generation
- > FSC Deployment with Web Portal

Introduction

- > Tim van Hassel (MSc)
- > TU/e Electrical Engineering
- > 11+ year Vanderlande
- > Research & Development
- > System Architect / Team Leader
- > Project: Flow System Controller (FSC)
- > FSC: Configurable controls solution for Vanderlande sorter systems

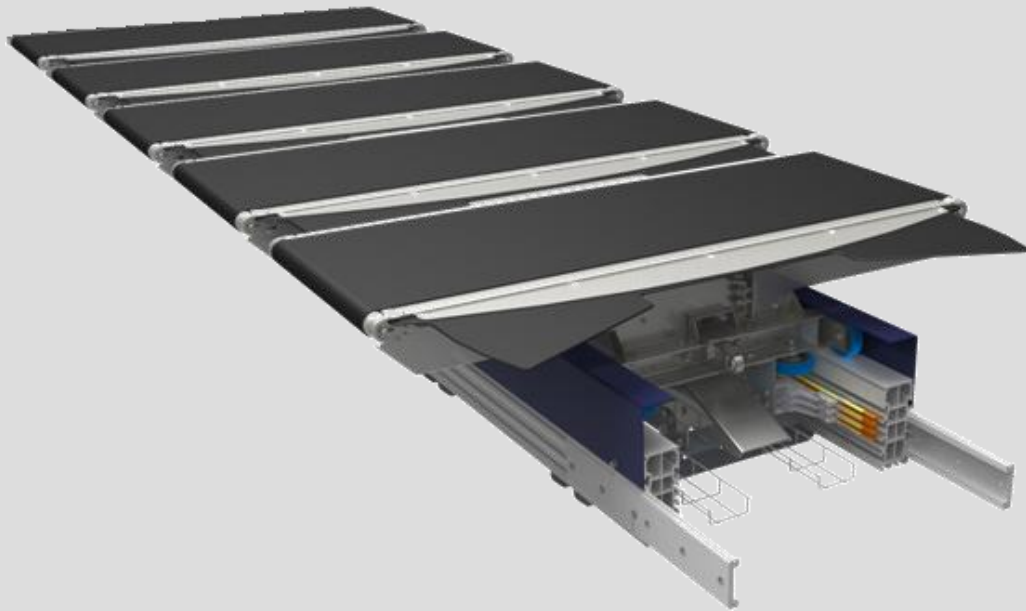


Tim van Hassel
System Architect at Vanderlande Industries
Breda Area, Netherlands | Industrial Automation

Previous Vanderlande Industries, ABB
Education Eindhoven University of Technology

[View profile as](#) ▼

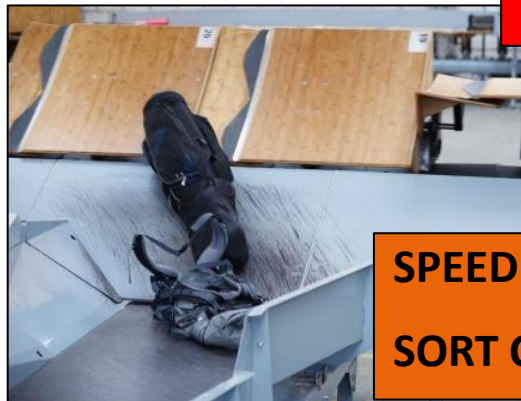
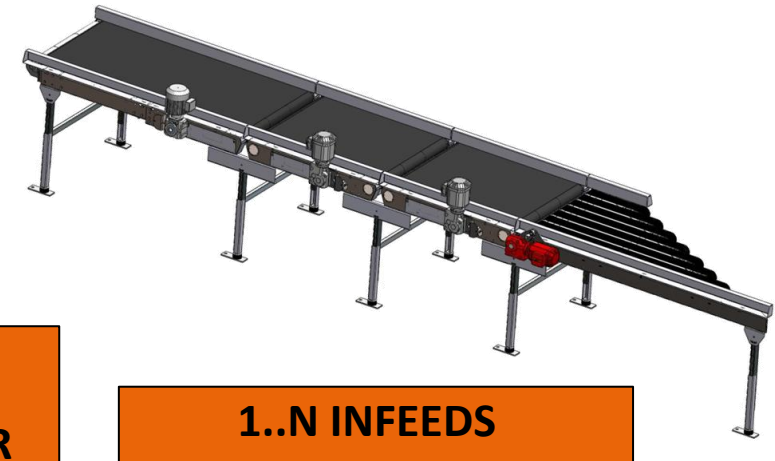
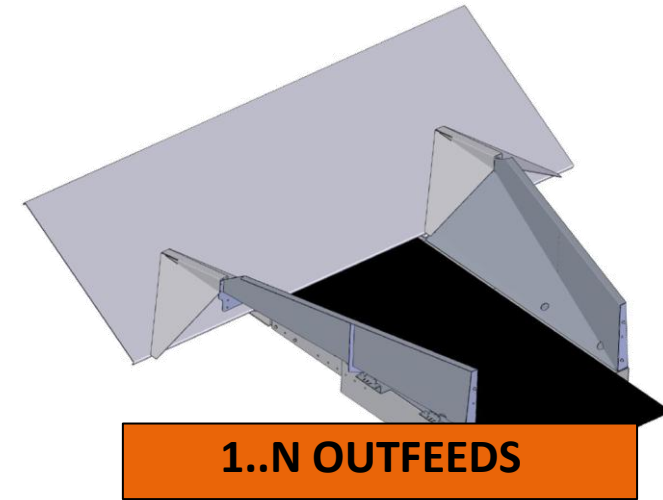
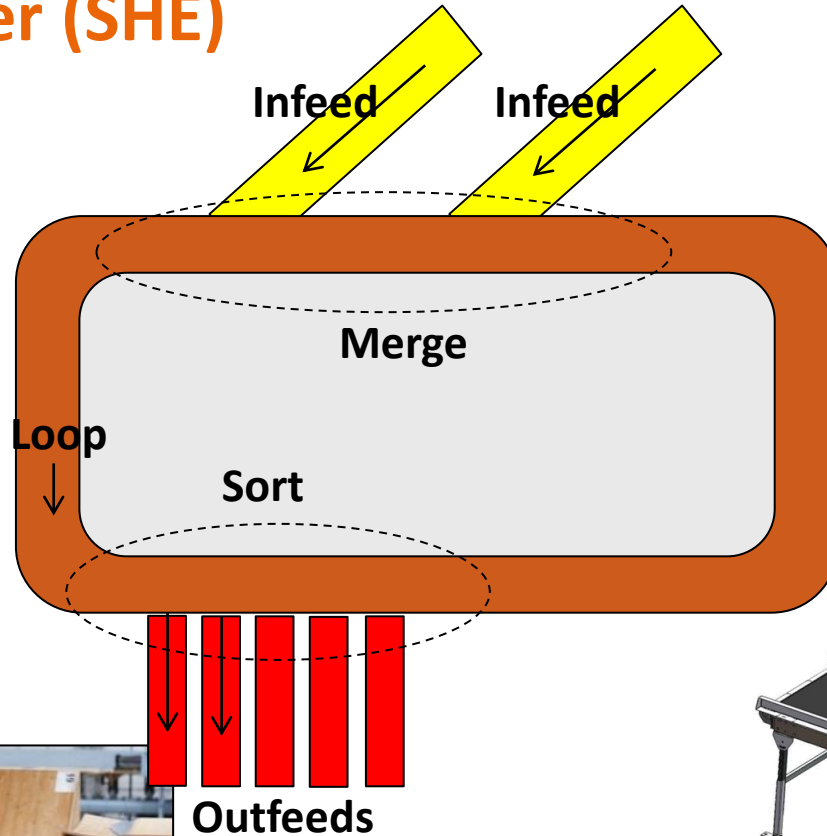
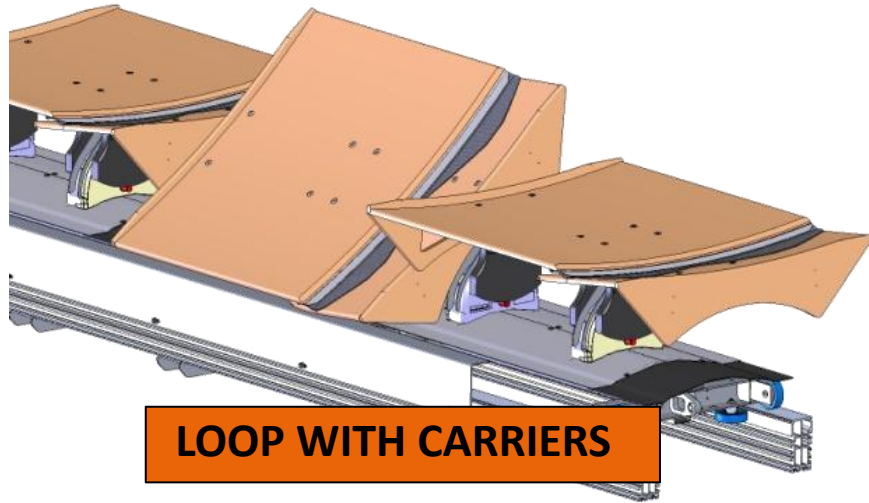




Agenda

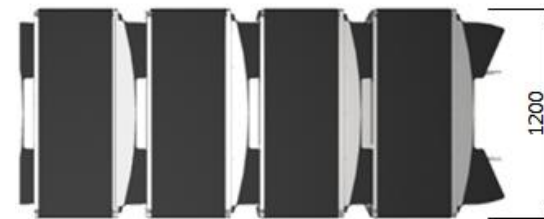
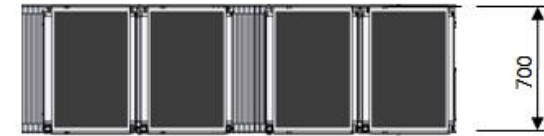
- > **Introduction Loopsorter & FSC**
- > **Loopsorter Engineering & Commissioning**
- > **FSC Config Generation**
- > **FSC Deployment with Web Portal**

Loopserter Family: Helixorter (SHE)



SPEED	2.0 M/S
SORT CAPACITY	6,000 TRAYS/HR

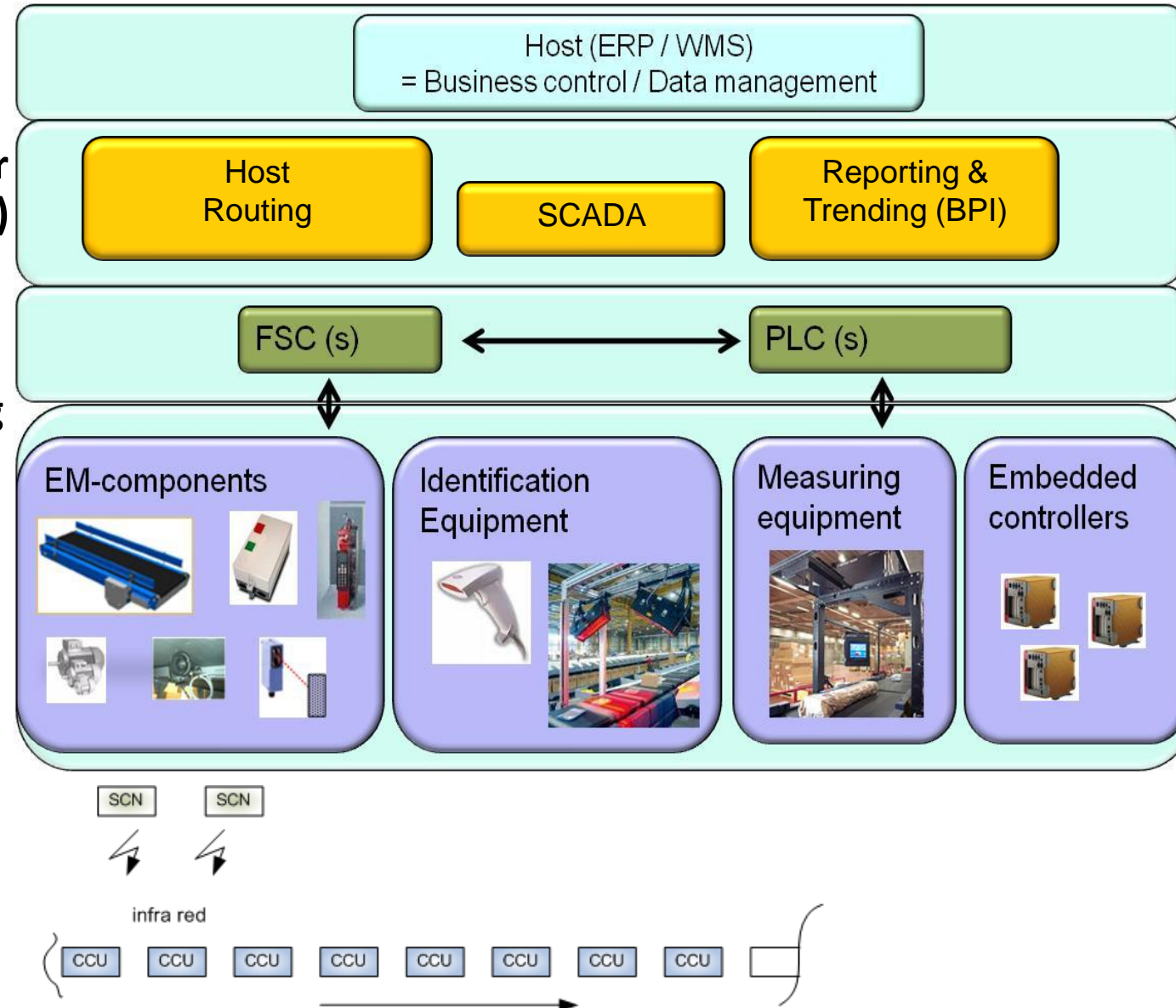
Loopserter Family: Crossorter (SCS)



SPEED	UP TO 3.0 M/S
SORT CAPACITY (@2.5 M/S)	
- SCS700:	15,000 CARRIERS / HR
- SCS1200:	12,850 CARRIERS / HR
- SCS1500:	11,250 CARRIERS / HR

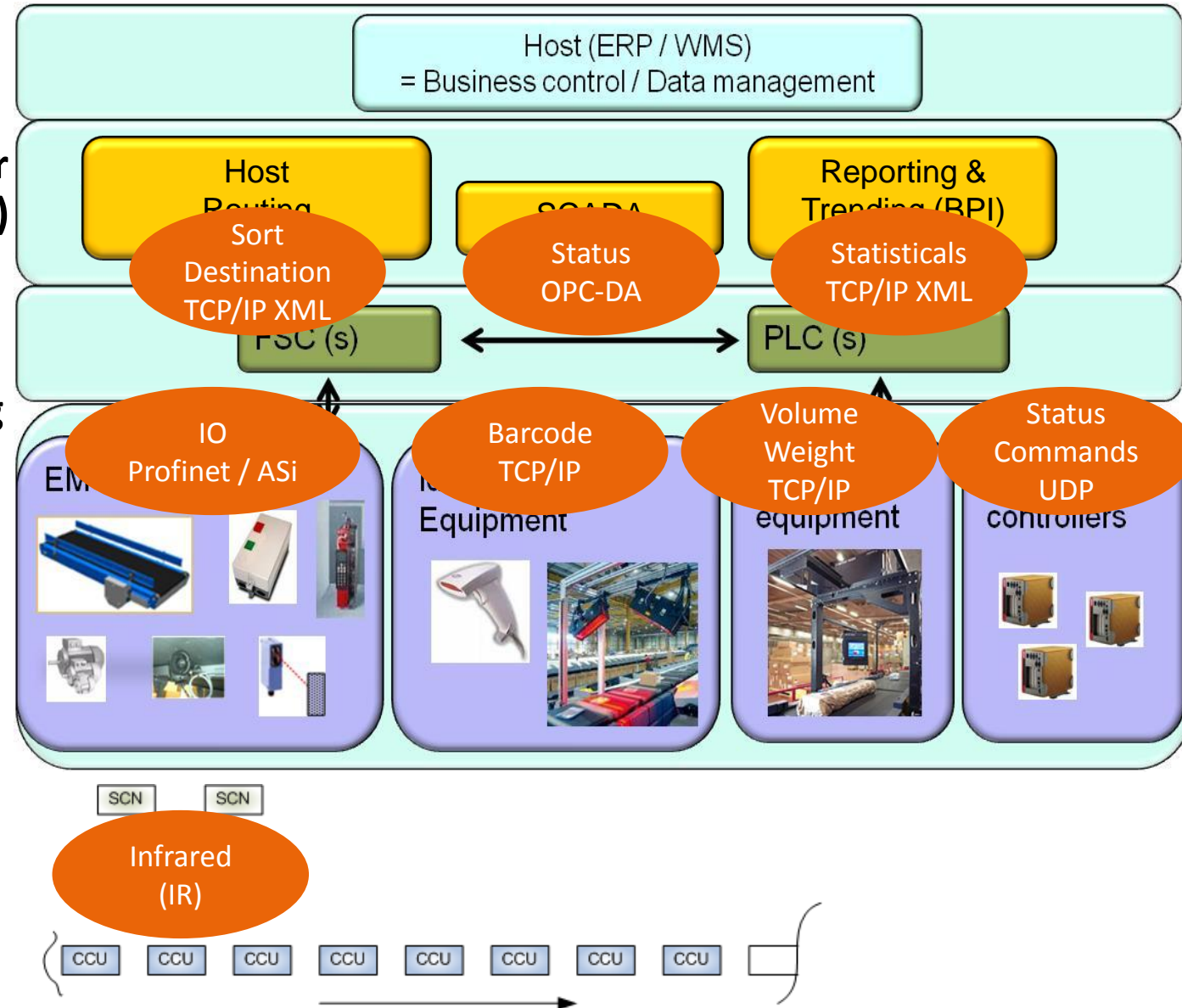
Flow System Controller

- > **Configurable equipment controls solution for Vanderlande sorter systems (1 x FSC / Sorter)**
 - FSC v7: Loopsorters
- > **Controls and monitors the core processes Transporting, Infeeding/Merging and Sorting**
- > **Short response times (<4 ms), required for accurate induction and sortation**
- > **Full Tracking & Tracing**
- > **Extensive realtime diagnostics**
- > **Industrial PC, QNX realtime OS**
- > **References**
 - FSC v7: Crossorter: 50, Helixorter: 30
 - FSC (general): >500



Flow System Controller

- > **Configurable equipment controls solution for Vanderlande sorter systems (1 x FSC / Sorter)**
 - FSC v7: Loopsorters
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- > **References**
 - FSC v7: Crossorter: 50, Helixorter: 30
 - FSC (general): >500



Operator GUI (@Main Cabinet / Control Room)

> **Hardware: Industrial PC / Touchpanel**

> **Software: Windows, C#/.Net**

> **Functions**

- Start-Stop-Reset
- General system status
- Events logging (live and historical)
- Problem and solution description



The screenshot displays the Operator GUI interface. At the top, it shows the date and time '10-1-2012 1:59:23' and the IP address '172.22.0.76 @ Transport Area'. Below this is a 'Live list' table with columns for Time, Location, Section, Element, and ID. The table contains several rows of system events, with the last row highlighted in blue.

Time	Location	Section	Element	ID
06:28:30 24/12	Connections	Hosts	[BSC01-BARCODE] *BSC01*	BSC01-BARCODE
06:28:30 24/12	Connections	Hosts	[BSC01-TRIGGER] *BSC01*	BSC01-TRIGGER
06:28:30 24/12	Connections	Hosts	DestinationReplySCS	DestinationReplySCS
06:28:30 24/12	Connections	Hosts	DestinationRequestSCS	DestinationRequestSCS
06:28:30 24/12	Connections	Network	ManualCoding	ManualCoding
06:28:30 24/12	Connections	Network	[R-BSC01_SCS1500] *R*	R-BSC01_SCS1500
06:28:30 24/12	Connections	Network	[S-BSC01_SCS1500] *S*	S-BSC01_SCS1500
06:28:30 24/12	Connections	Network	SincatoFSC	SincatoFSC
06:28:30 24/12	Connections	Network	SorterPC	SorterPC
06:28:33 24/12	[TRZ-41] Transport Zone	[BF-30.42.1]	[CS-CS1] *CS*	CS1
06:28:32 24/12	[TRZ-99] Transport Zone	[SCS-99.99.1]	[BS-BS] *BS*	BS
06:28:30 24/12	[TRZ-99] Transport Zone	[SCS-99.99.1]	[CMCO-CMCO] *CMCO*	CMCO

Below the table, there are tabs for 'Details' (F6) and 'History' (F7). The 'Details' tab is active, showing a 'Situation' section with the text: 'The maximum number of successive parcels which didn't receive any data is exceeded and the HSC has raised an error.' Below this is a 'Solution' section with the text: 'Check if the hardware functionality works as supposed. Check if all network connections are operational and if the HSC receives data from the hardware. Try to reset and start and monitor behaviour.'

At the bottom of the GUI, there is a status bar that reads 'STOPPED' and a zoom control set to '100 %'.

Maintenance GUI (@Maintenance Console)

- > **Hardware: Industrial PC / Touchpanel**
- > **Software: Windows, C#/.Net**
- > **Functions**
 - Send unhealthy carriers to maintenance zone
 - Check and change status of carriers
 - Test tilt drives / divert nodes
 - SCN/CCU software download functions



Diagnostic GUI (@Service IPC / Laptop)

- > Software: Windows, C#/.Net
- > Optimized for use on laptop
- > Real-time diagnostics
- > For customer technician and commissioning/service engineers



The screenshot displays the 'Photocell diagnostics' section of the software. It includes a tree view on the left for selecting elements to diagnose, a 'Position deviation' chart, a 'Photocell details' table, a 'Photocell specific details' table, and a 'Details of photocell' settings panel.

Photocell details Table:

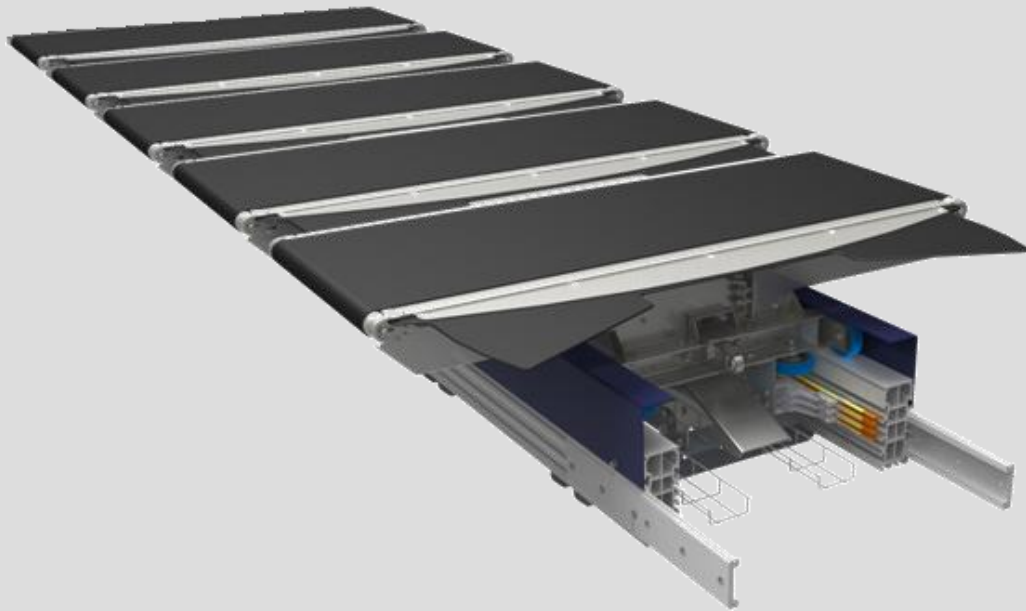
Name	[Common]		[Block]	[Update]		In window		Unspec...	Lost	J...	Leading fl...	Trailing ...	Overlap	Length changes
	Funct...	Parcels	Is blo...	Blocks	New par...	[#]	[#]	[#]	[#]	[#]	[#]	[#]	[#]	[#]
PEC-2001.001.001.PE...	Both	239	No	0	0	195	39	16	5	2	0	12	0	0
PEC-2001.001.001.PE...	Both	229	No	0	0	197	3	1	29	12	0	0	0	0
PEC-2001.001.001.PE...	Both	49	No	0	0	39	8	16	2	4	0	0	0	0
PEC-9.001.001.PEC1	Block	0	No	0	0	0	0	0	0	0	0	0	0	0

Photocell specific details Table:

Name	Dev...	Hea...	Slip ...	Tail ...	Len...	Deviation		OK [#]	Fron...	Fron...	Multi...	Multi...	Rea...	Rear ...
						Boun...	SBA							
PEC-2001.001.001.PEC001	50	0	41	0	0	0	0	0	0	0	0	0	0	0
PEC-2001.001.001.PEC002	-17	0	9	0	0	0	0	0	0	0	0	0	0	0
PEC-2001.001.001.PEC004	117	0	15	0	0	0	0	0	0	0	0	0	0	0
PEC-9.001.001.PEC1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Details of photocell: Settings Table:

Name	Original value	New value
[DETO-2001.001.001.DETO001] Max displacement	4000	4000
[UPDO-2001.001.001.LPDO001] Average slip weighin...	10	10
[UPDO-2001.001.001.LPDO001] Close window size	350	350

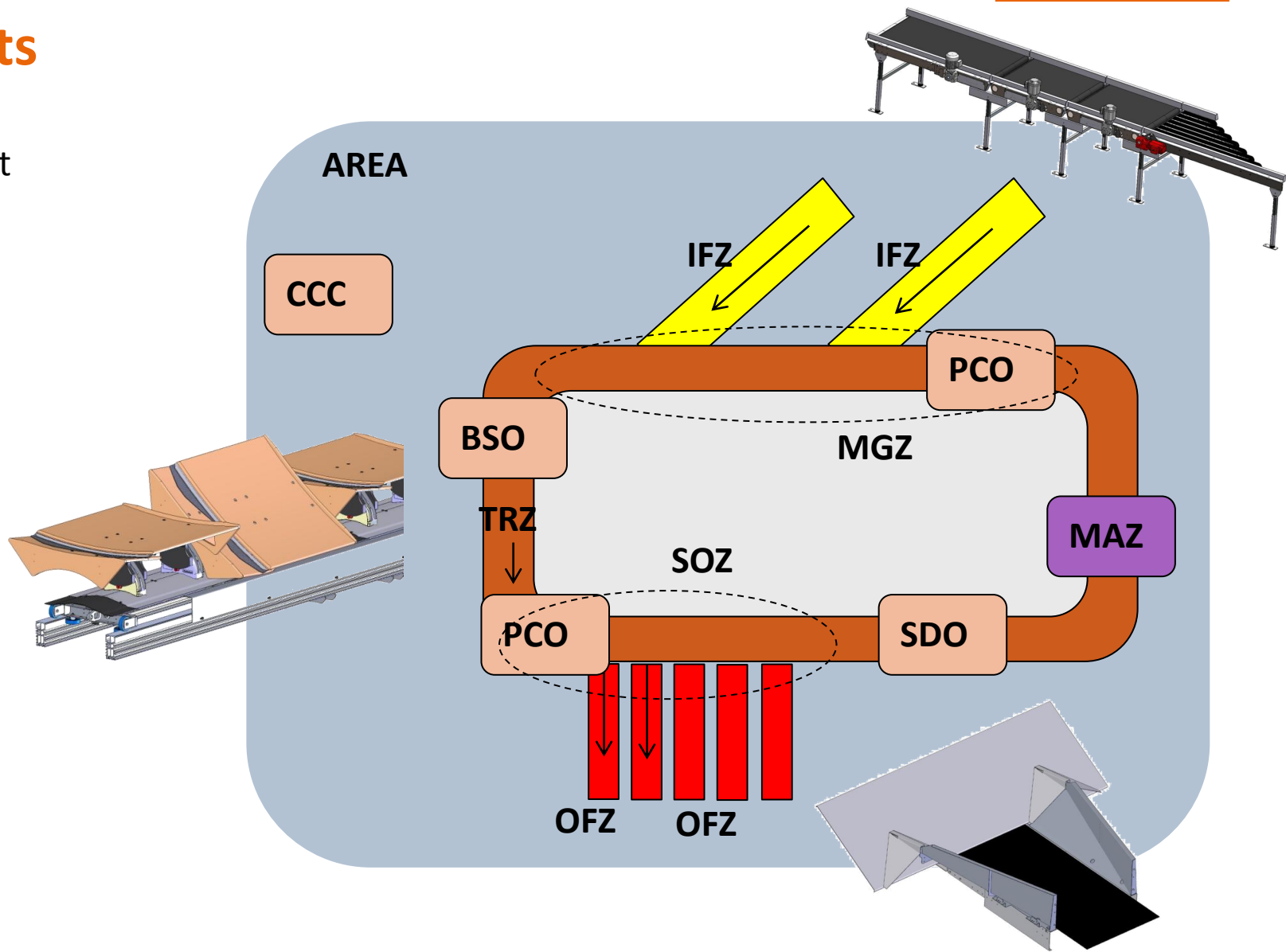


Agenda

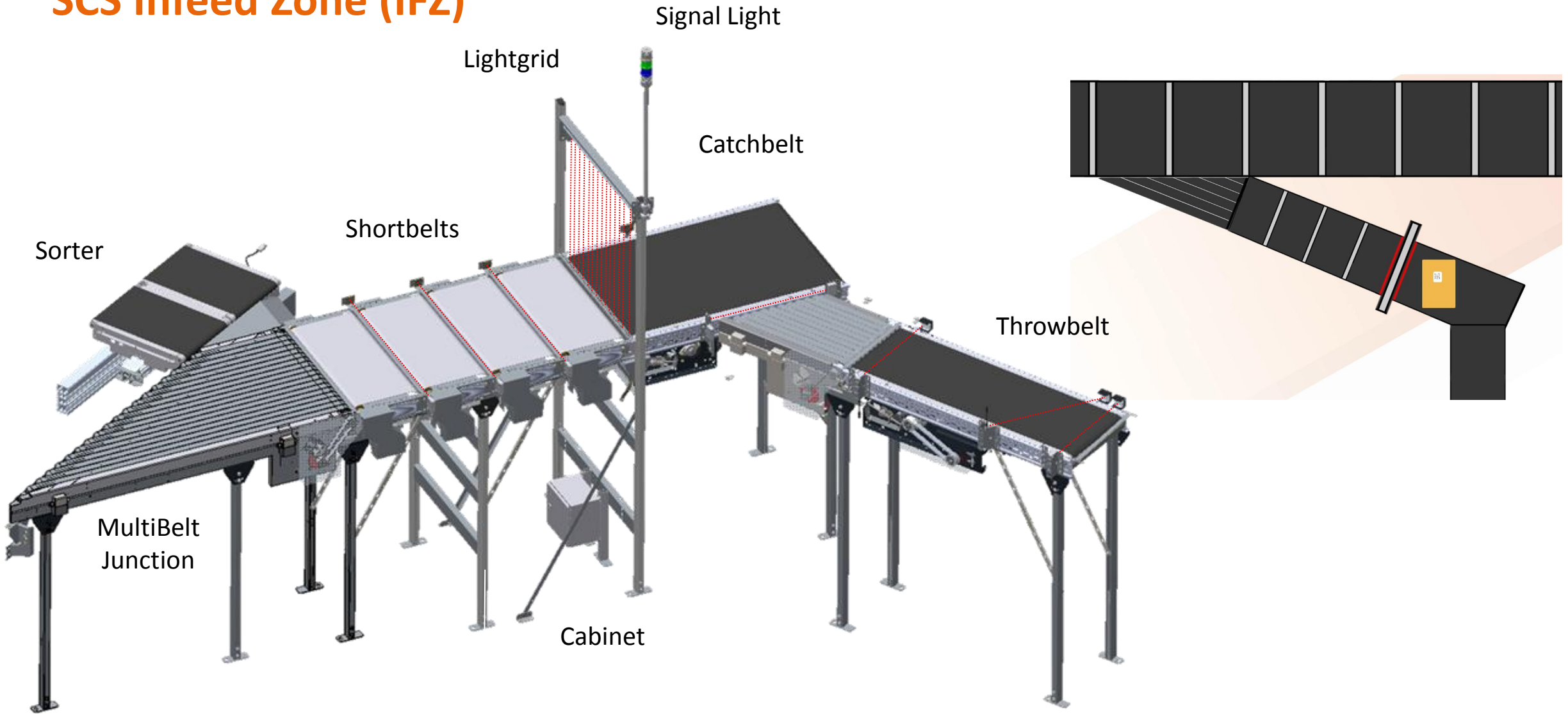
- > Introduction Loopsorter & FSC
- > **Loopsorter Engineering & Commissioning**
- > FSC Config Generation
- > FSC Deployment with Web Portal

Standard Zones & Objects

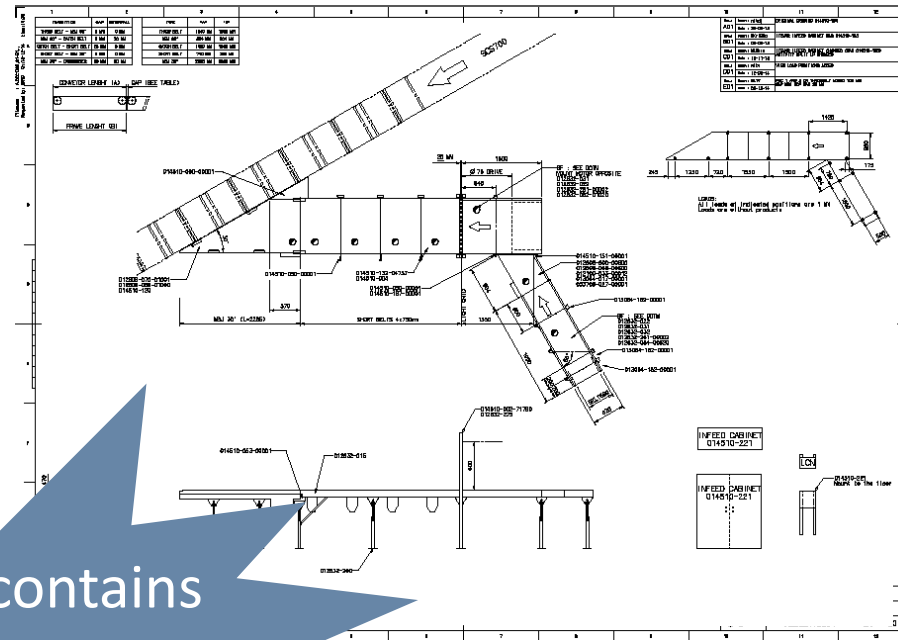
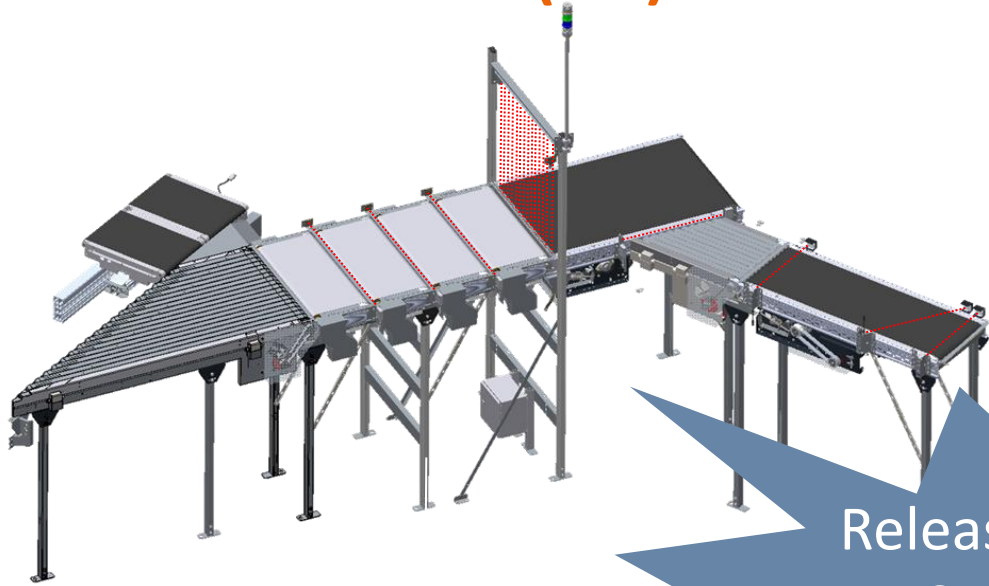
- Area:** CCC, Central Controls Cabinet
- TRZ:** Transport Zone (Loop)
SDO drive
BSO, VSO barcode/ volume
- IFZ:** Infeed Zone
- MGZ:** Merge zone (multiple IFZ)
PCO, product update
- OFZ:** Outfeed Zone
- SOZ:** Sort Zone (multiple OFZ)
PCO, product update
- MAZ:** Maintenance Zone, M-GUI



SCS Infeed Zone (IFZ)

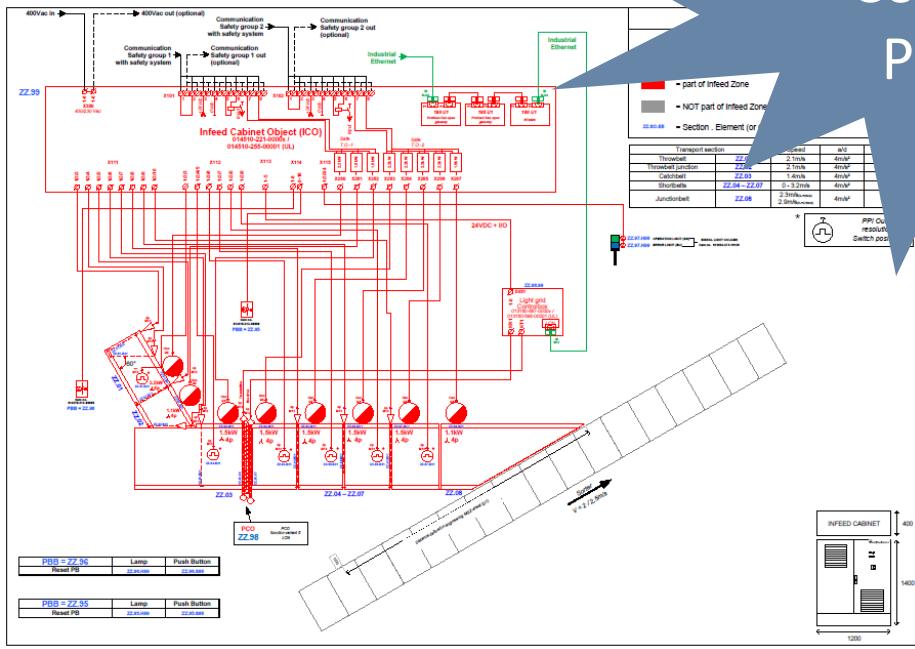


SCS Infeed Zone (IFZ)



Mechanical Typical

Release contains Consistent Package



EM Typical

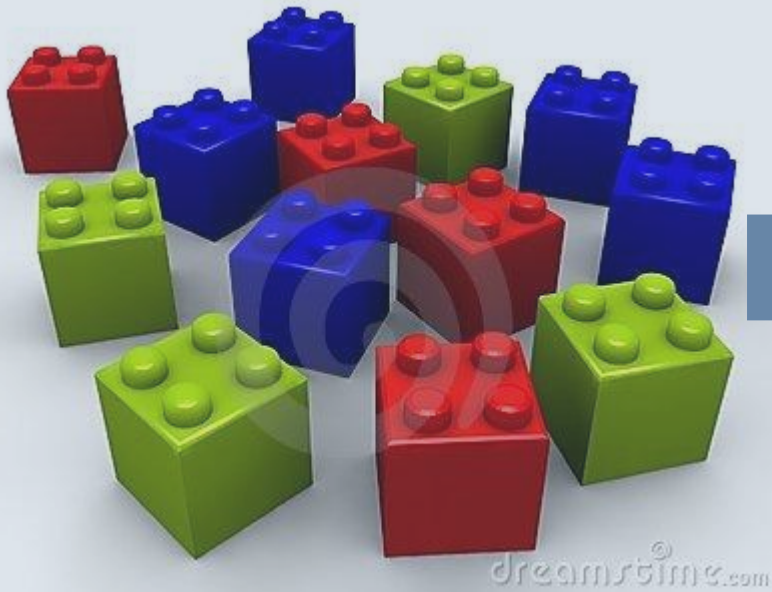
```

<param id="@Zone" value="" comment="Infeed Zone number [ZZ] (eg. '07')" type="int" multiplicity="0..n" >
<param id="@MrgZone" value="" comment="Merge Zone number [ZZ] to which the infeed zone" type="int" multiplicity="0..n" >
<param id="@CCOSection" value="" comment="Section of the related CCO (eg. '97')" type="int" multiplicity="0..n" >
<param id="@FifPositionInMergeZone" value="" comment="Position of the FIF relative to the Merge Zone" type="int" multiplicity="0..n" >
<param id="@FifPositionInTransportZone" value="" comment="Position of the FIF relative to the Transport Zone" type="int" multiplicity="0..n" >
<param id="@AutomaticInfeedClearance" value="" comment="Activate automatic infeed clearance" type="boolean" >
<param id="@PartialReverse" value="" comment="Activate partial reverse (eg. 'true' for activate, 'false' for deactivate)" type="boolean" >
<param id="@TumblingParcelDetection" value="" comment="Activate tumbling parcel detection" type="boolean" >
<param id="@HilscherSlave1" value="" comment="Profinet/Profibus station number of Hilscher slave 1" type="int" multiplicity="0..n" >
<param id="@HilscherSlave2" value="" comment="Profinet/Profibus station number of Hilscher slave 2" type="int" multiplicity="0..n" >
<param id="@ProfinetSlave" value="" comment="Profinet/Profibus station number of Siemens slave" type="int" multiplicity="0..n" >
<param id="@InfeedSide" value="" comment="Side of the sorter to which the infeed is connected" type="int" multiplicity="0..n" >
<param id="@InfeedAngle" value="" comment="Angle of the infeed in degrees (eg. '30')" type="int" multiplicity="0..n" >
<param id="@ThrowCatchAngle" value="" comment="Angle of the ThrowCatchAngle in degrees" type="int" multiplicity="0..n" >
<param id="@UseGravityCorrection" value="" comment="Correct the position of the infeed" type="boolean" >
<param id="@SpeedChangeResponseTime" value="" comment="StartResponse time setting, in milliseconds" type="int" multiplicity="0..n" >
<param id="@StartResponseTime" value="" comment="SpeedChangeResponse time setting, in milliseconds" type="int" multiplicity="0..n" >
<param id="@LightGridControlNodeHost" value="" comment="The IP address of the lightgrid control node" type="string" >
<param id="@LightGridControlNodePort" value="" comment="The IP address of the lightgrid control node" type="int" multiplicity="0..n" >
    
```

FSC Software Typical (Predefined Settings) User Parameters (Config Template)

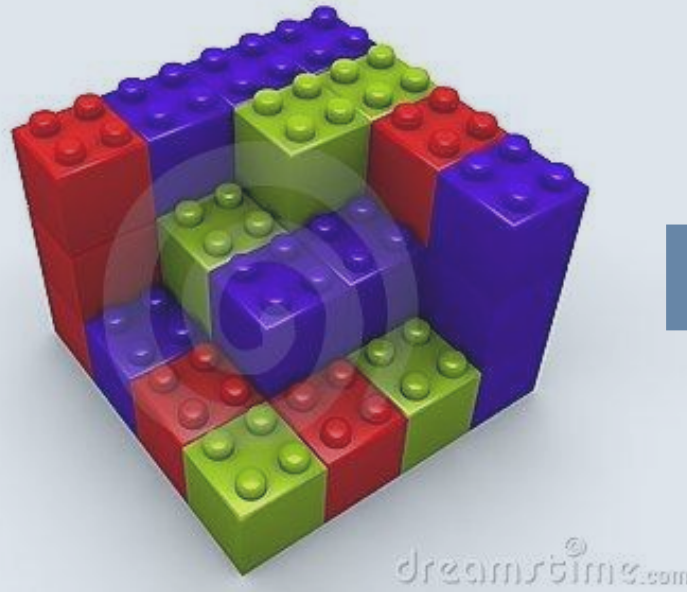
Loopserter Engineering

**R&D
Product Development**



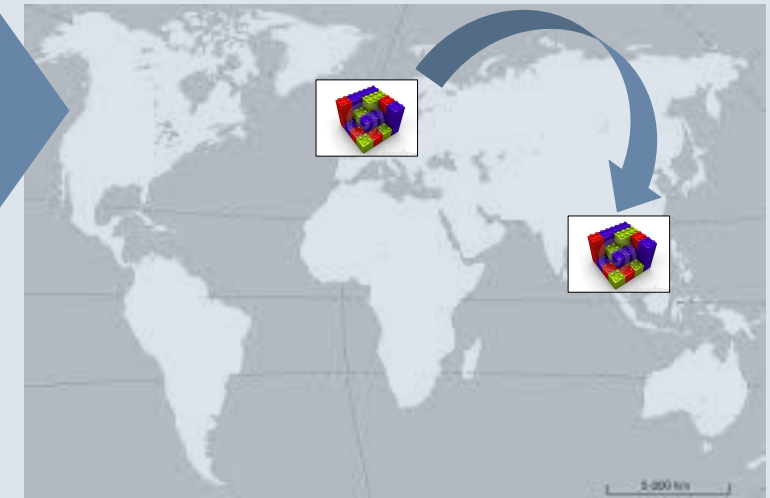
**Mechanical / EM building blocks
FSC Software Release
(incl. Config Templates)**

**Project
Engineering**

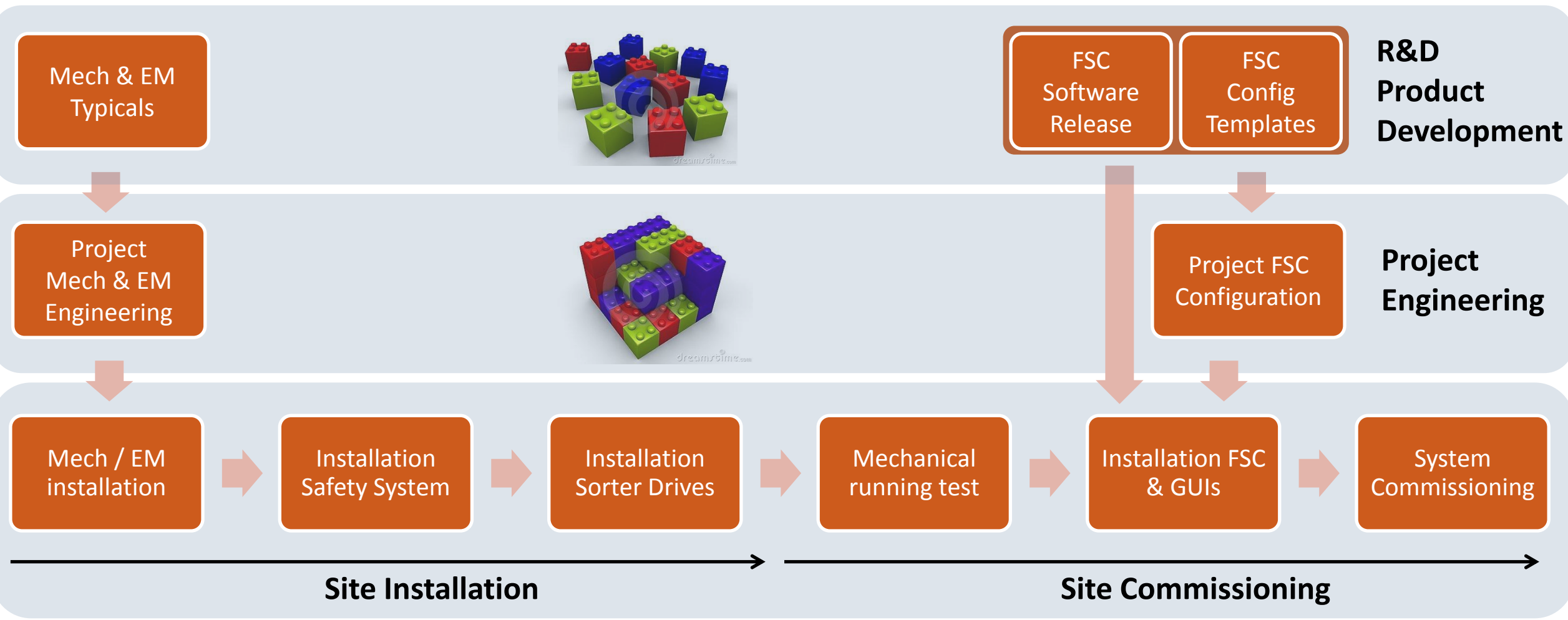


**Project Specific Mech. Layout, EM
Drawings and FSC Configuration**

**Customer Site
Installation &
Commissioning**



Loopserter Site Installation & Commissioning



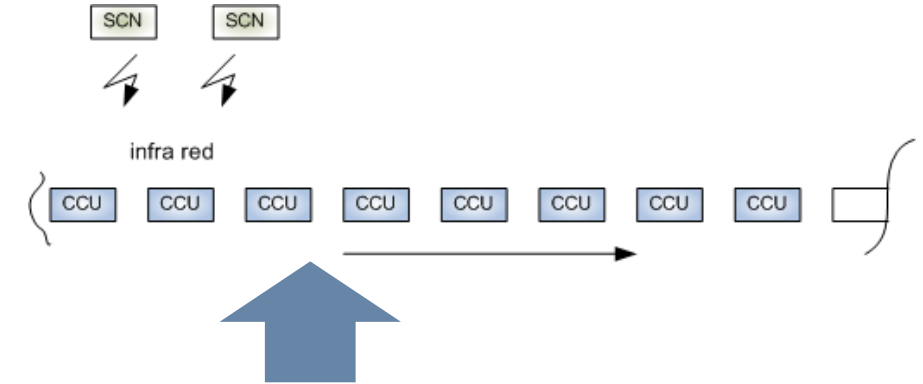
System Commissioning

IO diagnostics

Controller time: 15-12-2014 12:49:28

Select the IO's to diagnose:

PhysicalAddress	Alias	Data type	Type	Value
Slaves: PM1/002				
ByteAddress: PM1/002-10				
PM1/002-20.3	2.00.99.FLOHTR_MTR_Error	BOOL	Input	0
PM1/002-20.5	2.00.99.FLOHTR_MTR_SafetyStopError	BOOL	Input	0
ByteAddress: PM1/002-11				
PM1/002-21.2	2.00.99.FLOHTR_MTR_EncoderCompareError	BOOL	Input	0
PM1/002-21.3	2.00.99.FLOHTR_MTR_TorqueError	BOOL	Input	0
PM1/002-21.4	2.00.99.FLOHTR_MTR_CommunicatorError	BOOL	Input	0
PM1/002-21.6	2.00.99.FLOHTR_MTR_LifeSignPLC	BOOL	Input	1
PM1/002-21.7	2.00.99.FLOHTR_MTR_LifeSignError	BOOL	Input	1
ByteAddress: PM1/002-14				
PM1/002-24	2.00.99.FLOHTR_MTR_ActualTorque	INT16	Input	0
ByteAddress: PM1/002-Q0				
PM1/002-Q0.0	2.00.99.FLOHTR_MTR_Start	BOOL	Output	1
PM1/002-Q0.1	2.00.99.FLOHTR_MTR_Reset1	BOOL	Output	0
ByteAddress: PM1/002-Q6				
PM1/002-Q6	2.00.99.FLOHTR_MTR_SpeedOutput	INT16	Output	9



IO Check

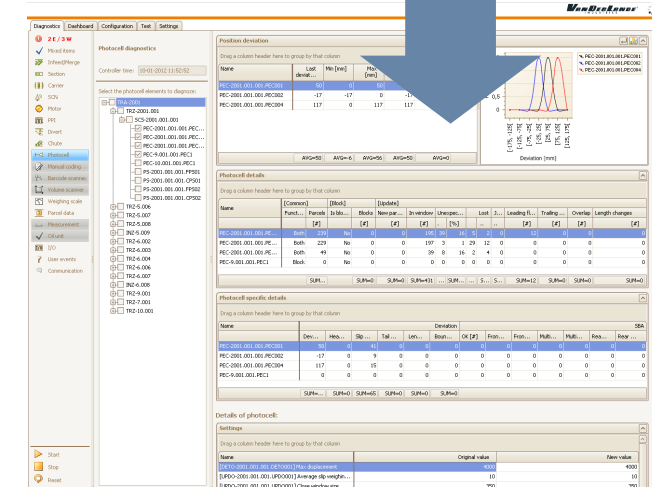
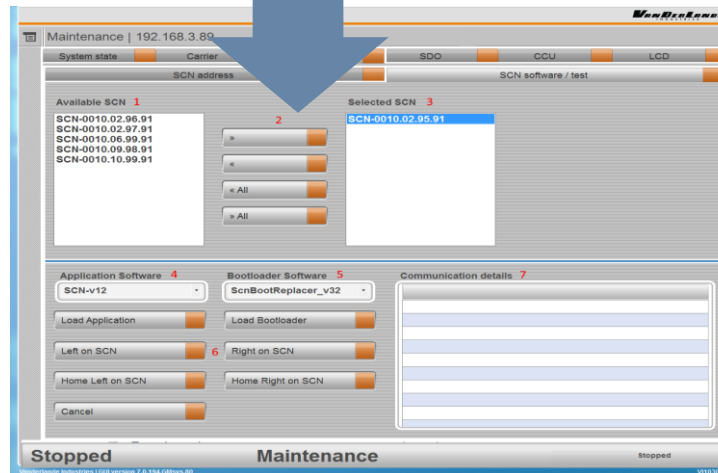
Measure Sensor Positions (Photocell, Prox.Switch, ...)

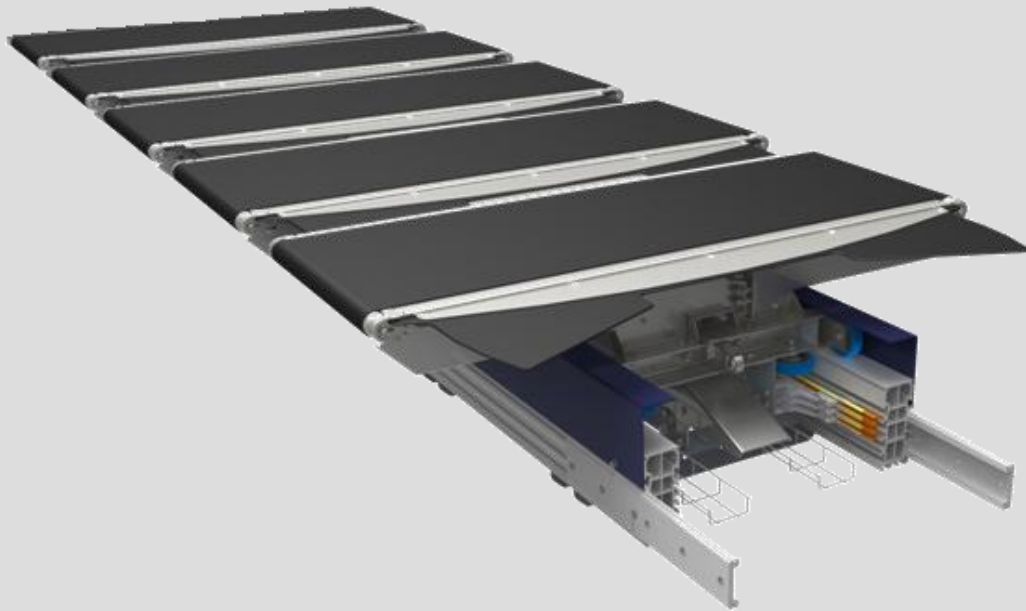
Download SCN/CCU Software

Measure SCN Communication Positions

Fine-tune commissioning parameters

Commissioning Engineer

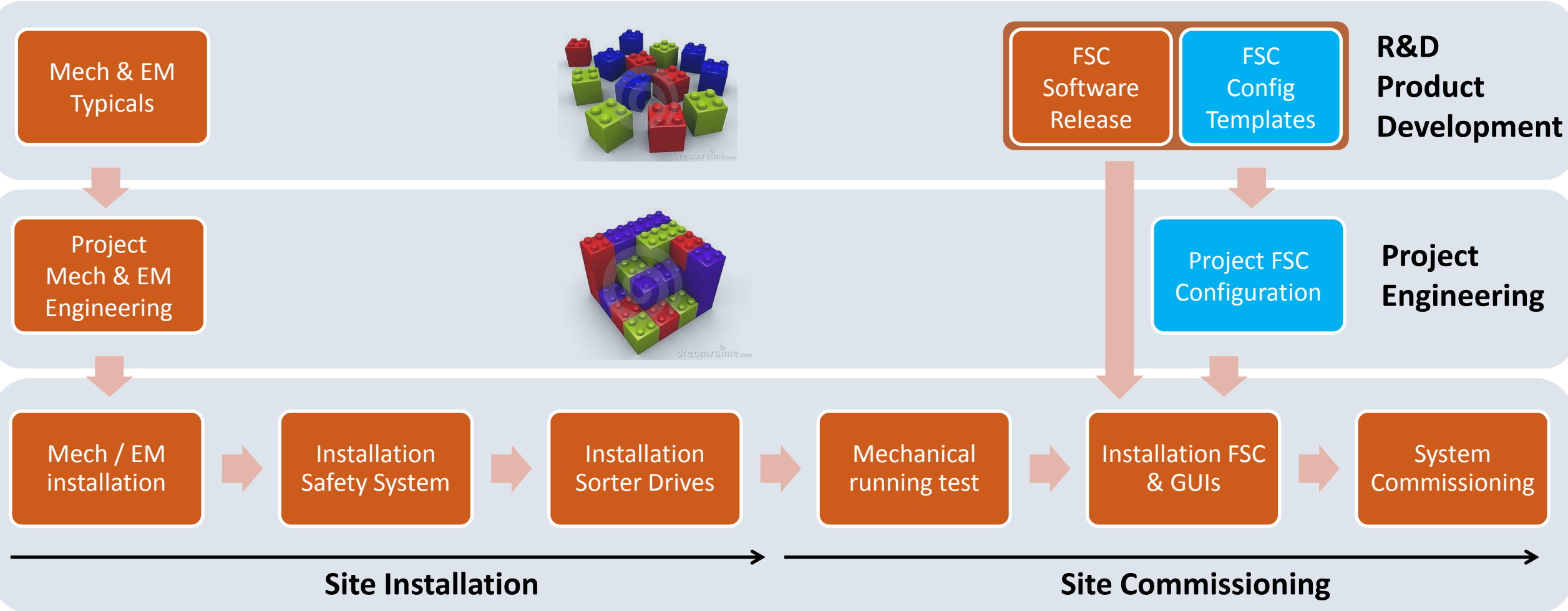




Agenda

- > Introduction Loopsorter & FSC
- > Loopsorter Engineering & Commissioning
- > **FSC Config Generation**
- > FSC Deployment with Web Portal

Loopserter Engineering & Commissioning Process

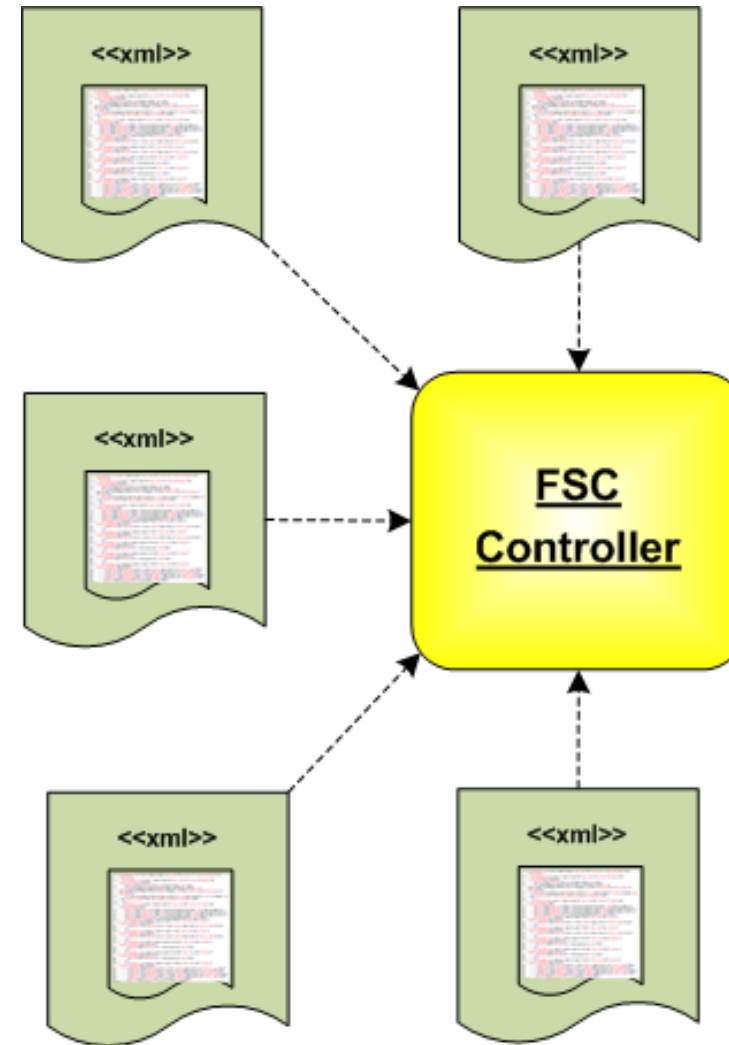


FSC v7: Configurable Platform

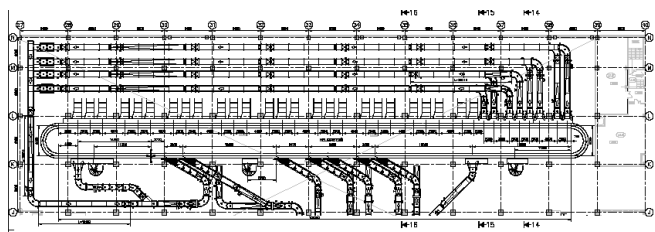
- > Config file related to System Layout
- > Config file related to Network Layout
- > Config file related to EM Layout

- > Product type related settings (SCS/SHE)
- > Domain related settings (Baggage/WPP)
- > Feature related settings
- > Project/Site related settings
- > Commissioning settings (fine tuning)

- > Result is a lot a variability / settings!



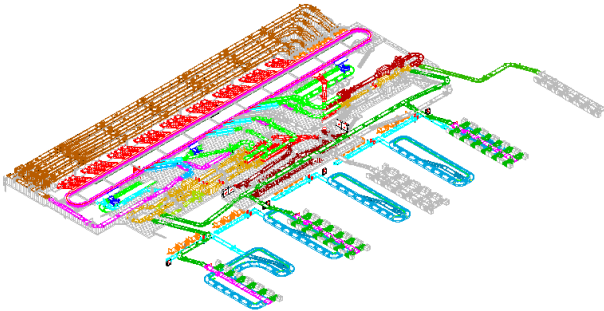
Goal: Generate FSC Configuration



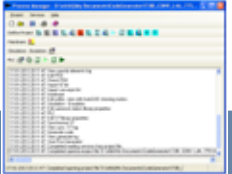
Mechanical Layout



System Layout



Material Flow Diagram



Generator Suite (Vanderlande Tooling)

Commissioning Engineer



Contains all FSC software / user parameters



Project Definition

Gen Tool

Gen Tool

Gen Tool

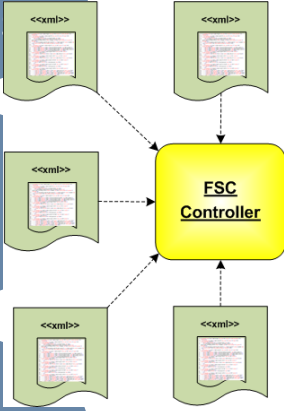
Gen Tool

E-Plan Drawing

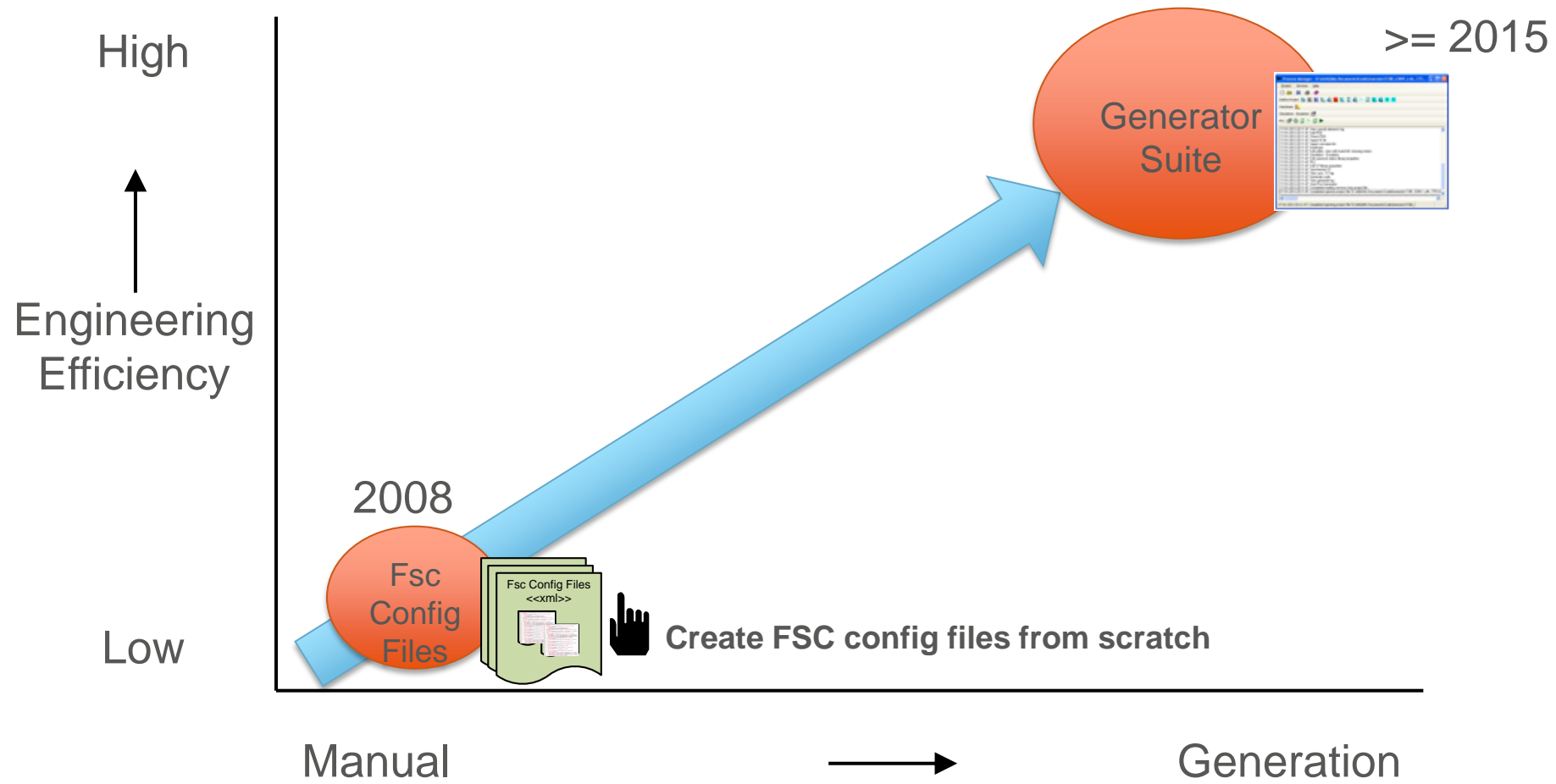
FSC Config

SCADA Config

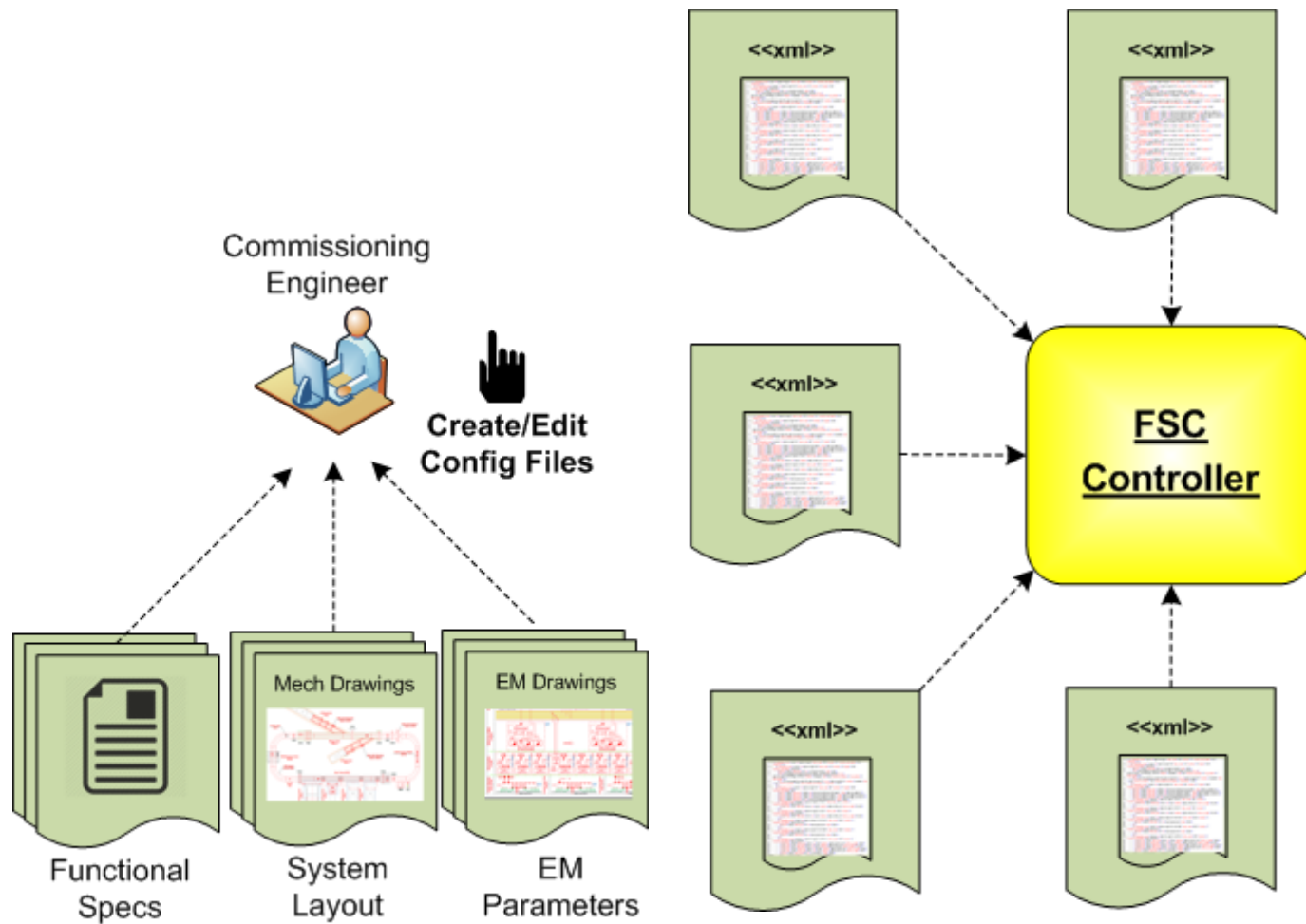
Emulation Config



FSC Configuration Evolution

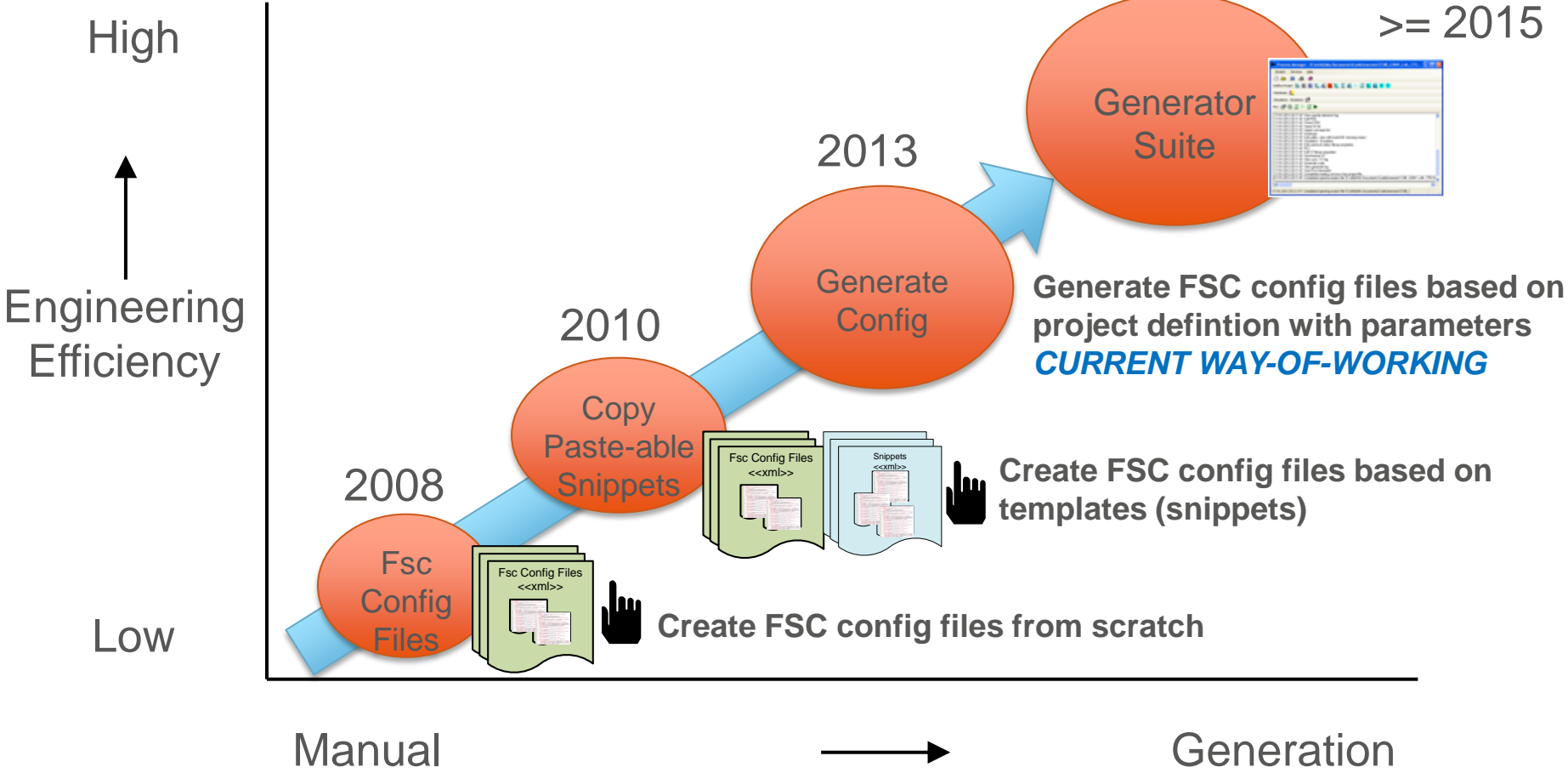


FSC Configuration files from scratch

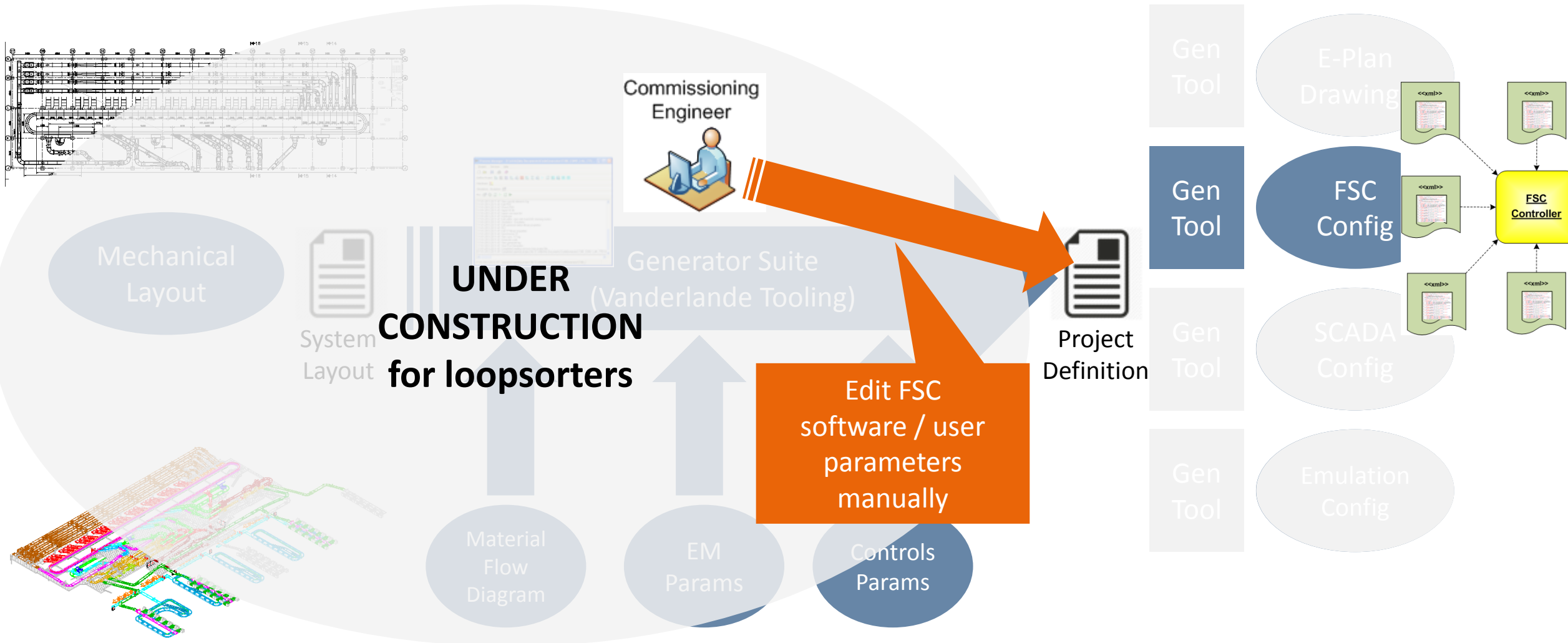


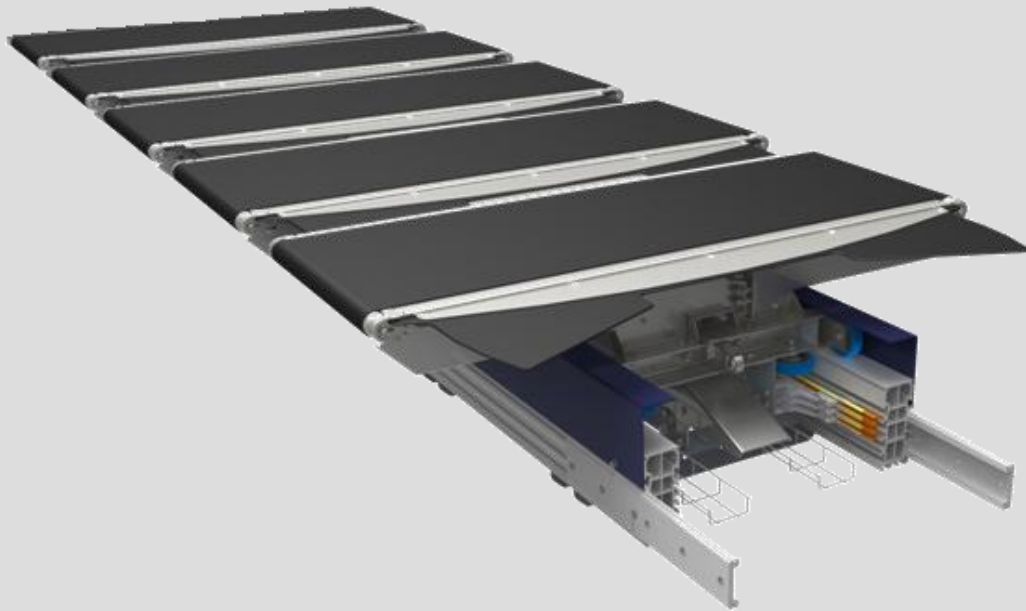
- > Fault-sensitive (all manual)
- > Time-consuming (lot of files)
- > Complex (lot of expert/domain knowledge)
- > Steep learning curve (due to complexity)

FSC Configuration Evolution



Generate FSC config files based on project definition

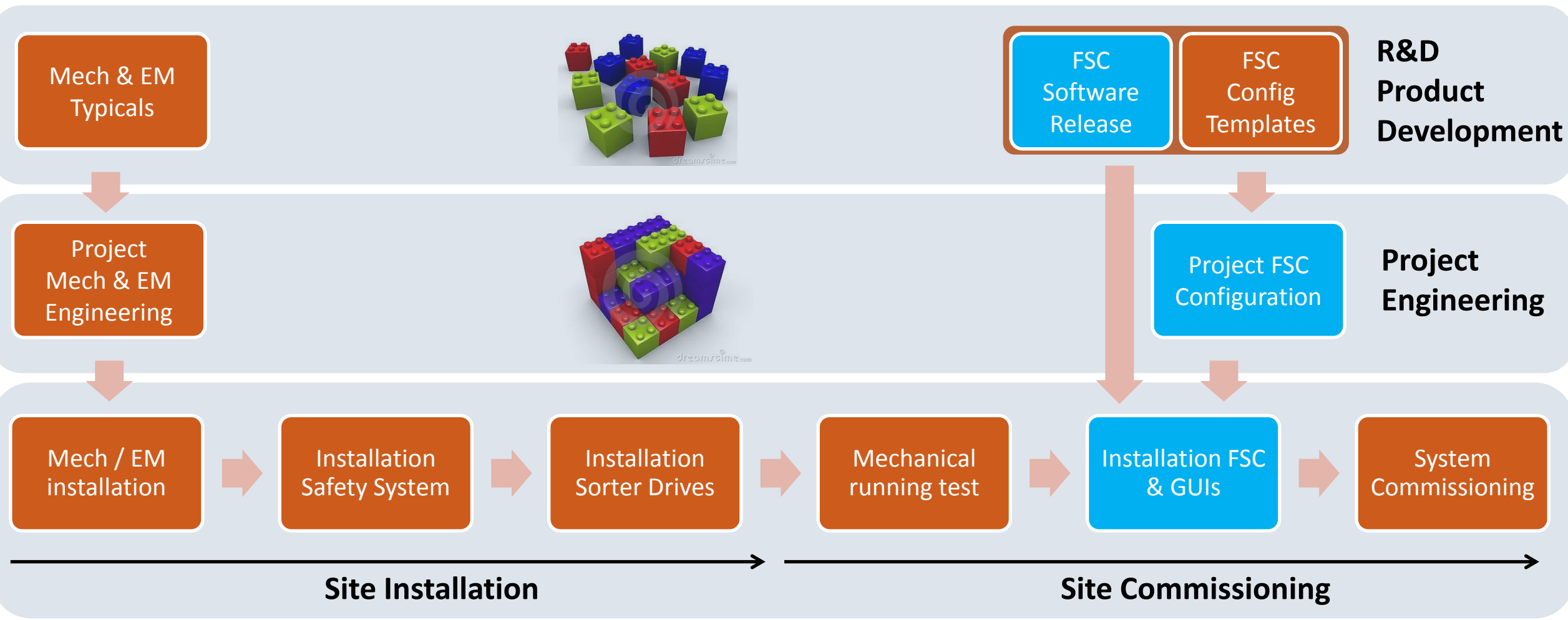




Agenda

- > Introduction Loopsorter & FSC
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- > **FSC Deployment with Web Portal**

Loopserter Engineering & Commissioning Process



FSC Deployment

> Centralized controls solution

- Loopsorter software deployed on the central controller IPC
- GUIs deployed on separate IPCs



> FSC release is 'total package'

- FSC controller binaries
- GUI installers (Operator GUI, Maintenance GUI, Diagnostic GUI)

> After deployment the complete package is available at the Sorter Controller

- Service/commissioning engineer can always retrieve matching Diagnostic GUI

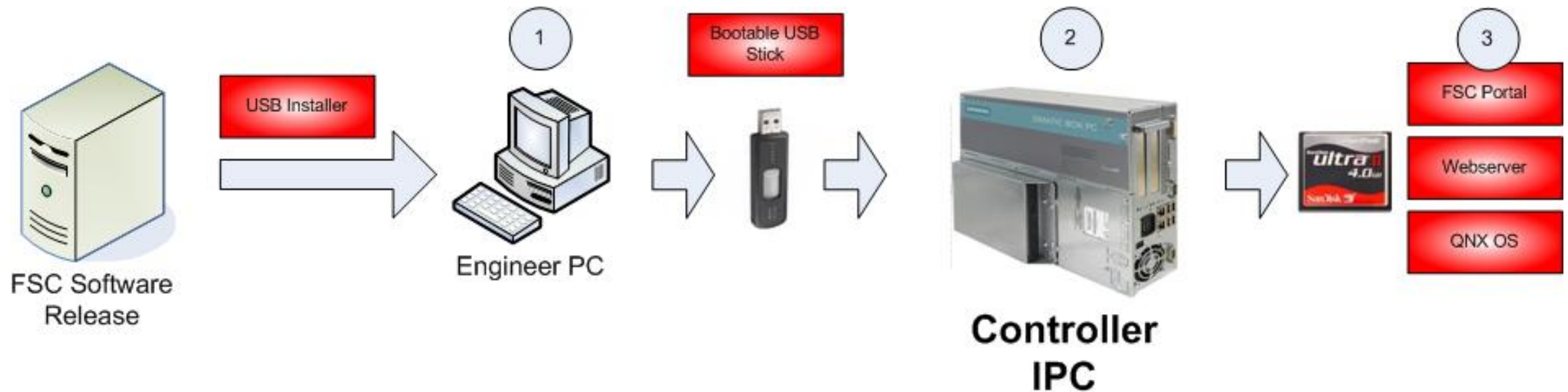
The screenshot displays the 'Photodiode diagnostics' window. It includes a tree view on the left for selecting photodiode elements, a main data table for 'Position deviation', a 'Photocell details' table, and a 'Details of photocell' section. A graph on the right shows the distribution of position deviation for three different photodiodes.

Name	Last deviat. [mm]	Min [mm]	Max [mm]	Avg [mm]	Std. [mm]	Chart
PEC-2001.001.001.PEC001	50	0	50	50	0	<input checked="" type="checkbox"/>
PEC-2001.001.001.PEC002	-17	-17	0	-17	0	<input checked="" type="checkbox"/>
PEC-2001.001.001.PEC004	117	0	117	117	0	<input checked="" type="checkbox"/>

Name	Func...	Parals	Is blo...	Bloch	Items per...	In window	Unrespec...	Lost	J...	Leading fl...	Trailing...	Overlap	Length changes
	[#]	[#]	[#]	[#]	[#]	[#]	[#]	[#]	[#]	[#]	[#]	[#]	[#]
PEC-2001.001.001.PE...	Both	239	No	0	0	195	39	16	5	2	0	0	0
PEC-2001.001.001.PE...	Both	229	No	0	0	197	3	1	29	12	0	0	0
PEC-2001.001.001.PE...	Both	49	No	0	0	39	8	16	2	4	0	0	0
PEC-9.001.001.PEC1	Block	0	No	0	0	0	0	0	0	0	0	0	0

Name	Dev...	Hea...	Slp...	Tal...	Len...	Boun...	OK [#]	From...	From...	Multi...	Multi...	Res...	Rier...
PEC-2001.001.001.PE001	50	0	0	0	0	0	0	0	0	0	0	0	0
PEC-2001.001.001.PE002	-17	0	9	0	0	0	0	0	0	0	0	0	0
PEC-2001.001.001.PE004	117	0	15	0	0	0	0	0	0	0	0	0	0
PEC-9.001.001.PEC1	0	0	0	0	0	0	0	0	0	0	0	0	0

Deployment Controller IPC

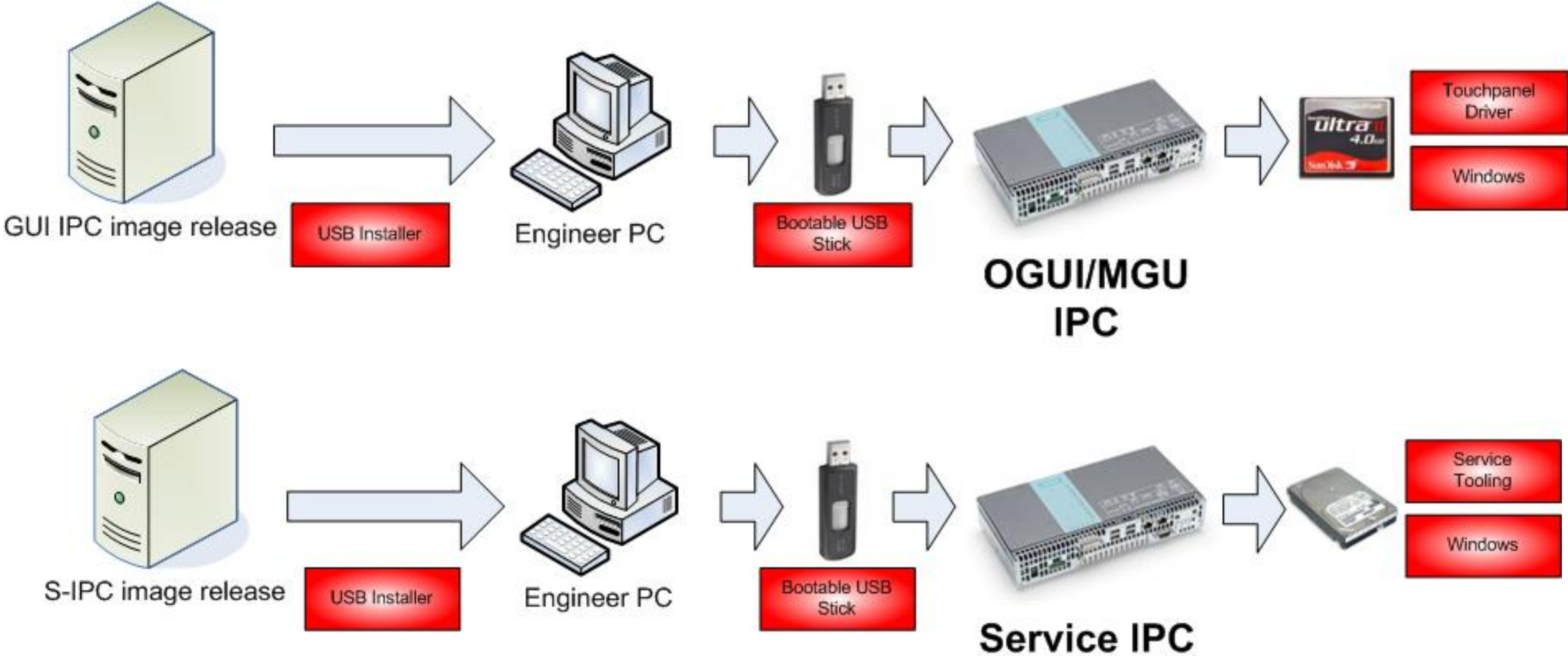


1) Create bootable USB Stick with the USB Installer setup

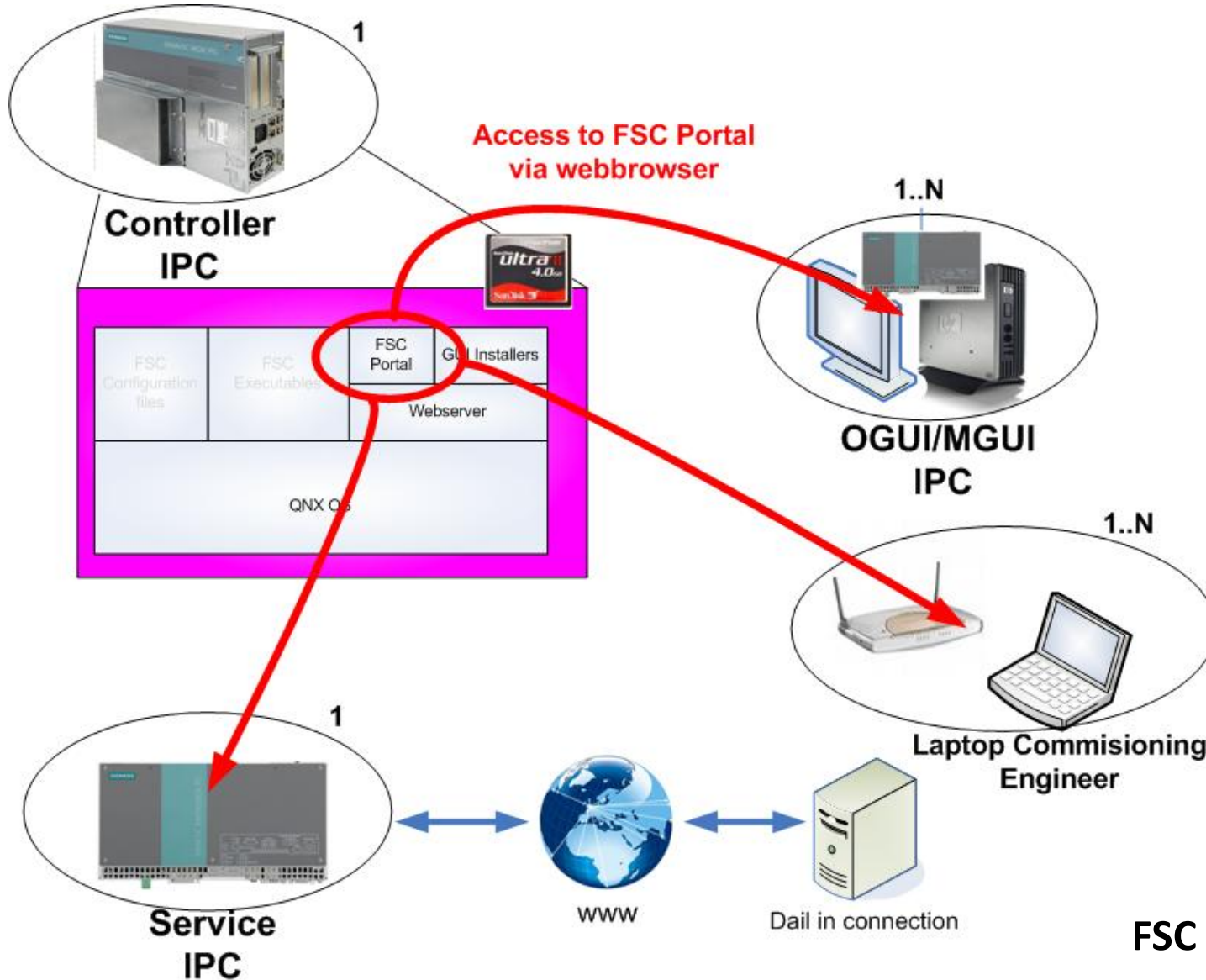
2) Put USB Stick in IPC and boot. QNX OS and Portal will be installed on CF card.

3) After reboot FSC Portal is available

Deployment OGUI/MGUI and Service IPC



FSCv7 Portal Access



FSC7 Portal Version ILLEGAL_BUILD

Home NetworkSettings Logbook

Dashboard

OS

OS version: QNX 6.5.0 SP1

Date of installation: Mon Jun 25 15:53:51 2012

Slots

Current FSC version: 7.0.138.Cdev.i1263

Current Config version: Config0.1

Select software version

<input checked="" type="radio"/>	1	7.0.138.Cdev.i1263	Retrieve
<input type="radio"/>	2	7.0.138.Cdev.i1272	Update Retrieve
<input type="radio"/>	3	7.0.138.Cdev.i1272	Update Retrieve
<input type="radio"/>	4	7.0.138.Cdev.i1263	Update Retrieve
<input type="radio"/>	5		Update Retrieve

Select configuration version

<input type="radio"/>	1	Config1.0_almost_fina	Update Retrieve
<input checked="" type="radio"/>	2	Config0.1	Retrieve
<input type="radio"/>	3	Config1.0_almost_fina	Update Retrieve
<input type="radio"/>	4	Config0.1	Update Retrieve
<input type="radio"/>	5		Update Retrieve

Activate & Start FSC Application

Shutdown FSC Application

Current Downloads

- Dagnostic GUI installer
- Maintenance GUI installer
- Operator Dashboard GUI installer
- Component type definitions

Console

```

#####
## LoggingServer:RunServer
OPCServer: Connected to logserver LoggingServer
## Opening new LoggingChannel for App:OPCServer
## OpenLoggingChannel
spawn: on -C 1 -p 10 ./Sprint5 Sprint5 FscStartup.ini
spawn: OK 784474160
on: Invalid argument ./Sprint5
spawn: on -C 0 -p 10 ./UserEventServer UserEventServer FscStartup.ini
spawn: OK 784506929
    
```

FSC Portal = Web-interface to FSC v7 (like router)

OS version and installation date

FSC7 Portal Version ILLEGAL_BUILD

Home NetworkSettings Logbook

Dashboard

OS

OS version	QNX 6.5.0 SP1
Date of installation	Mon Jun 25 15:53:51 2012

FSC Software version slots (1 – 5) Update & Retrieve

Slots

Current FSC version	7.0.138.Cdev.i1263
Current Config version	Configv0.1

Select software version

<input checked="" type="radio"/> 1	7.0.138.Cdev.i1263	Retrieve
<input type="radio"/> 2	7.0.138.Cdev.i1272	Update Retrieve
<input type="radio"/> 3	7.0.138.Cdev.i1272	Update Retrieve
<input type="radio"/> 4	7.0.138.Cdev.i1263	Update Retrieve
<input type="radio"/> 5		Update Retrieve

Select configuration version

<input type="radio"/> 1	Configv1.0_almost_fina	Update Retrieve
<input checked="" type="radio"/> 2	Configv0.1	Retrieve
<input type="radio"/> 3	Configv1.0_almost_fina	Update Retrieve
<input type="radio"/> 4	Configv0.1	Update Retrieve
<input type="radio"/> 5		Update Retrieve

FSC Configuration version slots (1 – 5) Update & Retrieve

FSC Start/Shutdown buttons

Activate & Start FSC Application

Shutdown FSC Application

GUI installer downloads (of selected software version) OGUI / MGUI / DGUI

Current Downloads

- Diagnostic GUI installer
- Maintenance GUI installer
- Operator Dashboard GUI installer
- Component type definitions

Console

```
## LoggingServer::RunServer
OPCServer: Connected to logserver LoggingServer
## Opening new LoggingChannel for App:OPCServer
## OpenLoggingChannel
spawn: on -C 1 -p 10 ./Sprint5 Sprint5 FscStartup.ini
spawn: OK 784474160
on: Invalid argument ./Sprint5
spawn: on -C 0 -p 10 ./UserEventServer UserEventServer FscStartup.ini
spawn: OK 784506929
```

VANDERLANDE
