

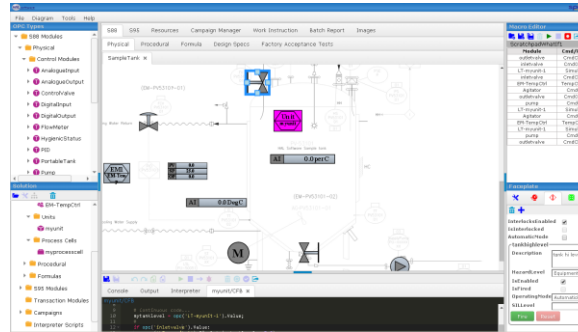


What exactly is Spike prototype?

Spike is a RAD (Rapid Application Development) prototyping tool for Industrial Automation & Control. The Architecture is centered around S88/95 types exposed through an OPCUA information model. The prototyping menu allows rapid generation of 'animated' P&ID drawings. The configuration can be exported to functional requirements loosely based on functional requirements standard ISA5.06.

In short, prototype how you want the control or MES system to work, and how you plan to test it (via OPCUA server) all in one.

Spike Prototype encapsulates standard design patterns in the latest collaboration-friendly webserver technology. It helps the engineers gather requirements in an interactive and intuitive fashion. It's a scratch pad for what-if scenarios, failure mode testing, unit testing, and training and may be used to wire frame out an entire manufacturing and control factory ecosystem.



Spike prototype is a single web-page application

Use Spike Prototype to...

- aid the mapping out of an entire factory's data flow;
- act as a catalyst for front end engineering design;
- enable the building of, and training in, company-wide standards & best known methods for Automation & MES;
- catalyse improved collaboration, tech transfer and training; and
- generate design and test specs in fewer hours.

Spike Prototype equipment and control module faceplate

Module properties

Name: LT-myunit-1
 Description: level transmitter
 Diagram: SampleTank
 Version: prelim design
 AuditTrailEnabled:
 Mode: Automatic
 OwnerId:
 TargetCtrlSystem: S7-Prod1
 Unit: myunit
 EquipmentModule:
 EngineeringUnits: perC
 EURangeStart: 0
 EURangeEnd: 100
 IsInSimulate:
 TransmitterType: Level
 Value:
 Update

Module properties

Alarms

AlarmsEnabled:
 IsInAlarm:
 High:
 InAlarm:
 Ack:
 Enabled:
 Severity: Info
 Value: 0
 HighHigh:
 InAlarm:
 Ack:
 Enabled:
 Severity: Critical
 Value: 90
 Inst:
 InAlarm:
 Ack:
 Update

Alarms

Interlocks

InterlocksEnabled:
 IsInterlocked:
 AutomaticMode:
 TankHLevel:
 Description: Tank High Level
 HazardLevel: EquipmentSafety
 IsEnabled:
 IsFired:
 OperatingMode: ManualReset
 SILLevel:
 Fire:
 Update

Interlocks

Commands

CmdOn:
 CmdOff:
 CmdOutput:
 Update

Commands



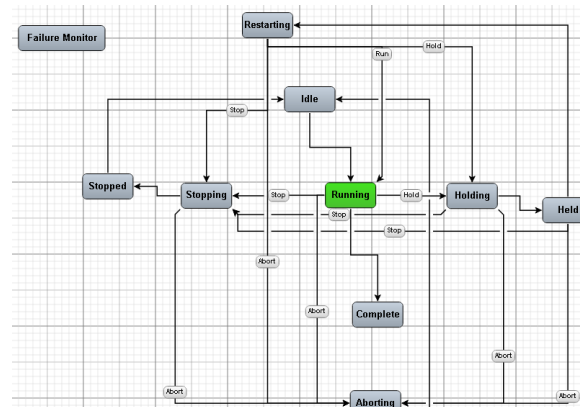
S88 physical model types

- ▼ **Control Modules**
 - ▶ **T** AnalogueInput
 - ▶ **T** AnalogueOutput
 - ▶ **T** ControlValve
 - ▶ **T** DigitalInput
 - ▶ **T** DigitalOutput
 - ▶ **T** FlowMeter
 - ▶ **T** HygienicStatus
 - ▶ **T** PID
 - ▶ **T** PortableTank
 - ▶ **T** Pump
 - ▶ **T** SingleSpeedMotor
 - ▶ **T** ThreeWayValve
 - ▶ **T** Valve
 - ▶ **T** VariableSpeedMotor
 - ▶ **T** WeighCell
- ▼ **Equipment Modules**
 - ▶ **T** EM1
 - ▶ **T** EM2
 - ▶ **T** S88ProcessCell
 - ▶ **T** S88Unit

Spike Prototype implements a generic S88 control module, equipment module and procedural module type library.

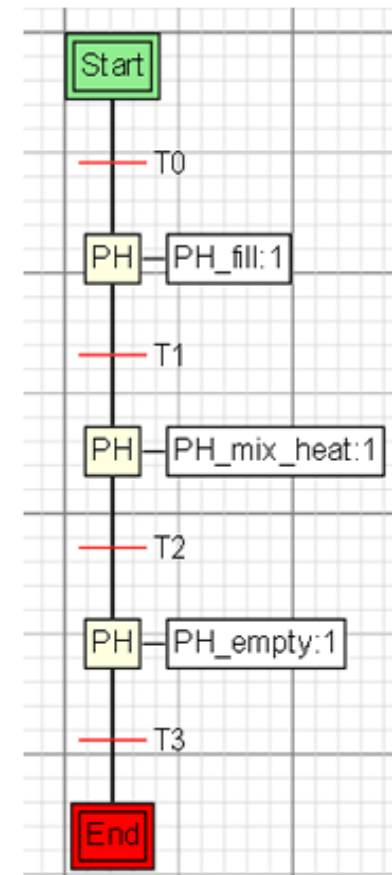
All types are dynamically instanced by simply dragging and dropping onto the canvas which can be an imported pdf of a P&ID.

Spike implements its own workflow engine for S88 state machine emulation at the phase class level. A batch report is available for each campaign.



S88 procedural model types

- ▼ **Procedural**
 - ▶ **T** Procedure
 - ▶ **T** UnitProcedure
 - ▶ **T** UnitOperation
 - ▶ **T** Phase





S95 Physical & Procedural model types

- ▼ S95 Modules
 - ▼ Physical
 - ▼ Control Modules
 - ▶ MESStation
 - ▶ BarCodeScanner
 - ▶ GenericEquipment
 - ▶ WeighScale
 - ▶ S95Room
 - ▶ S95WorkCentre
 - ▼ Procedural
 - ▶ Procedure
 - ▶ UnitProcedure
 - ▶ UnitOperation
 - ▶ Phase

User interaction can be easily modelled with simple messages or more complex work instructions.

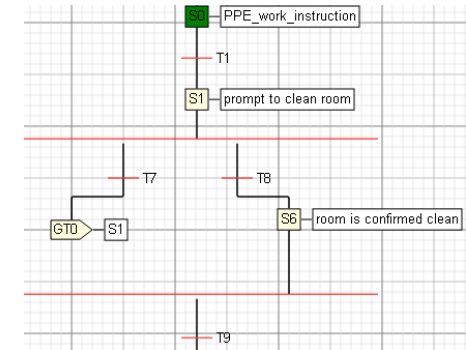
The screenshot shows the S95 Work Instruction interface. At the top, there are tabs for Resources, Campaign Manager, Work Instruction, Batch Report, and Images. Below the tabs are buttons for Create Form, Print Form, Delete Form, Add Section, Delete Section, Edit Section, and Move Sections. A list of instructions is shown, with 'WeighScaleCalibration' selected. Below the list is a console window with tabs for Console, Output, and Interpreter. The Output tab shows a message: 'Add API' with details: Sender: myunit, Timestamp: 06/22/15 5:52:02, Content: API addition instructions, ResponseType: Double.

Spike implements a common S88 procedural model for both S88 & S95 Procedures.

Batch reports can be viewed to help aid reporting requirements capture.

The screenshot shows the S95 Batch Report interface. It includes a 'Select Report' section with fields for Procedure (Weigh_DispansePren:1), StartTime (16/06/15 - 15:27:39), EndTime (16/06/15 - 15:56:07), and State (Abstract). Below this is a 'Selected Report' section with a table of Batch Records and Tracking Records. The table has columns for Type, Name, Description, Units, and Value.

Type	Name	Description	Units	Value
Report	UserCompletedTask	store response from user	Null	true
Report	User_Initials_for_E...	record user init to batch ...	Null	



S95 SFC sample logic

S95 Resource model implementation

A subset of the S95 resource model is implemented for material, equipment, and personnel classes. In addition, material bills may be created.

The screenshot shows a table for the S95 Resource model implementation. The table has columns for Name, Description, Type, Units, and Hazards. The data row is: API_Class, general api powders, Raw, Kg, poisonous, flammable.

Name	Description	Type	Units	Hazards
API_Class	general api powders	Raw	Kg	poisonous, flammable

A transaction module type provides the ability to model B2MML style communications between the S88 & S95 procedures.

- ▼ S95Transaction
 - ▶ AckSync
 - ▶ AckSyncStatus
 - ▶ Description
 - ▶ Diagram
 - ▶ Parameters
 - ▶ PullParameters
 - ▶ PushParameter
 - ▶ PushParameters
 - ▶ ReqSyncStatus
 - ▶ RequestSync
 - ▶ Version
 - ▶ WaitForSync

AT THE HEART OF SPIKE

Campaign manager

This is where the procedural tasks are bound to the physical units or workcentres, together with the associated recipe formulae, material bills and resources.

Task	Formula	MaterialBill	UnitWorkCe
1	PR_Batch:1	myRecipeFormul	
2	UP_myBatch:1		myunit
3	UO_myOperation:1		myunit
4	PH_fill:1		myunit
5	PH_mix_heat:1		myunit
6	PH_empty:1		myunit

Python

Spike maintains its incredible flexibility through the extensive use of the python dynamic programming language. Simply type it, and see its effect, immediately.

```
#Interlocks based off high tank level alarm
if opc('LT-unit-01').Alarms.High == True:
    myinterlockstatus = opc('InletValve').GetInterlock('HighLevel');
    myinterlockstatus.Fire();
    opc('InletValve').CmdClose();
#
#Interlocks based off tank low level
if opc('LT-unit-01').Alarms.Low == True:
    myinterlockstatus = opc('Agitator').GetInterlock('TankLoLevel');
    myinterlockstatus.Fire();
    opc('Agitator').CmdOff();
```

All type instances from the physical, procedural, and resource model are exposed to Python in the Spike integrated development environment (IDE). The IDE utilises 'intellisense' to expose any pre-created instances, helper functions and code snippets that all serve to make prototyping significantly faster, and programming much easier than other packages.

Macro Editor

Programming does not have to be difficult; modern languages are much easier to program than control languages such as IEC61131-3, and are thus faster for prototyping. To get you started, the Spike macro recorder will capture events and export them as python for you, ready to form the basis of your procedural model and requirements specification.

Module	Cmd/Prop
outletvalve	CmdClose
inletvalve	CmdOpen
LT-myunit-1	Simulate
inletvalve	CmdClose
EM-TempCtrl	TempCtrlOn
Agitator	CmdOn
outletvalve	CmdOpen
pump	CmdOn
LT-myunit-1	Simulate
Agitator	CmdOff
EM-TempCtrl	TempCtrlOf
LT-myunit-1	Simulate
pump	CmdOff
outletvalve	CmdClose

Design Specification export

With over 20 design specification reports to choose from, all captured model data can be exported in Microsoft Word® or Excel® format.

Design Specs	Factory Acceptance Tests
Campaigns Please Choose: [Dropdown] View Download	Phases Please Choose: [Dropdown] View Download
Procedures Please Choose: [Dropdown] View Download	Control Modules View Download
Unit Procedures Please Choose: [Dropdown] View Download	Equipment Modules Please Choose: [Dropdown] View Download
Unit Operations Please Choose: [Dropdown] View Download	Solution Summary Report View Download
Procedural Definitions Please Choose: [Dropdown] View Download	P&ID Comments Please Choose: [Dropdown] View Download

Designed from the ground up to be collaborative (it's a web server), easy to use (just import the PDF file and drag & drop the types) and at the same time powerful, (OPCUA is the data modelling standard of choice for Industrie4.0, while Python is a very powerful but practical language). No other software comes close in terms of raw speed for requirements capture, ease of use, and flexibility. Contact us today for a Windows Azure based trial.



About Us

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For videos of Spike in action please visit:

www.spikeprototype.com