

## **Graphical Programming Language Support for Service Oriented Architecture in** Automation

Theorin, Alfred; Johnsson, Charlotta

2012

## Link to publication

Citation for published version (APA):

Theorin, A., & Johnsson, C. (2012). *Graphical Programming Language Support for Service Oriented Architecture in Automation*. Paper presented at Reglermöte 2012, Uppsala, Sweden.

Total number of authors:

Unless other specific re-use rights are stated the following general rights apply:
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study

- or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
   You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: https://creativecommons.org/licenses/

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



# Graphical Programming Language Support for Service Oriented Architecture in Automation

Alfred Theorin alfred.theorin@control.lth.se

Charlotta Johnsson charlotta.johnsson@control.lth.se LUND UNIVERSITY

Department of Automatic Control

## Challenges in manufacturing

- Faster set-up
- Faster adaptations
- Customizable products
- Better vertical integration
- Manufacturing equipment is becoming more complex

Service Oriented Architecture (SOA) is a promising technology to tackle these challenges, e.g. SIRENA [2] and SOCRADES [1][3]. One outcome of SIRENA was a web service profile for embedded devices, i.e., Devices Profile for Web Services (DPWS).

## Grafchart Chan:0 S Valve = 0;Valve Level < 60.0S Valve = 1;Real 0.0 Level > 80.0Level

Grafchart is a graphical programming language for sequential control applications. Graphical programming is intuitive as it allows programming that mimics the way people model problems.

**DPWS** 

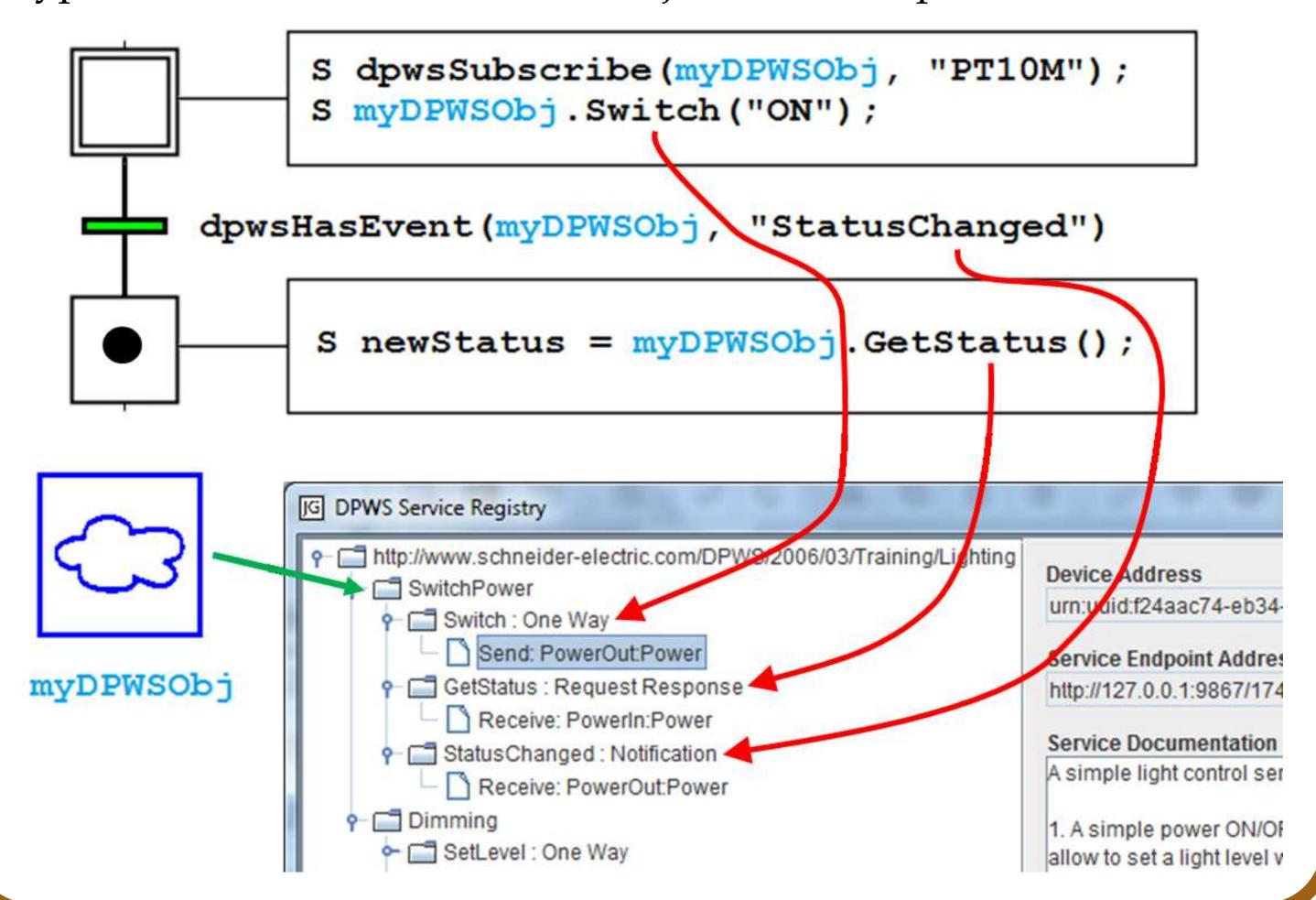
## WS-WS-WS-Device MetadataEx. Discovery Eventing WS-Security, WS-Policy, Service WS-Addressing SOAP, WSDL, XML Schema PortType HTTP UDP TCP Operation IPv4 / IPv6 / IP Multicast

All DPWS devices are discoverable (WS-Discovery) and selfdescribing (WS-MetadataExchange), meaning that all information required to use a DPWS device can be obtained from the device itself, e.g. its IP-address, operations, and operation signatures.

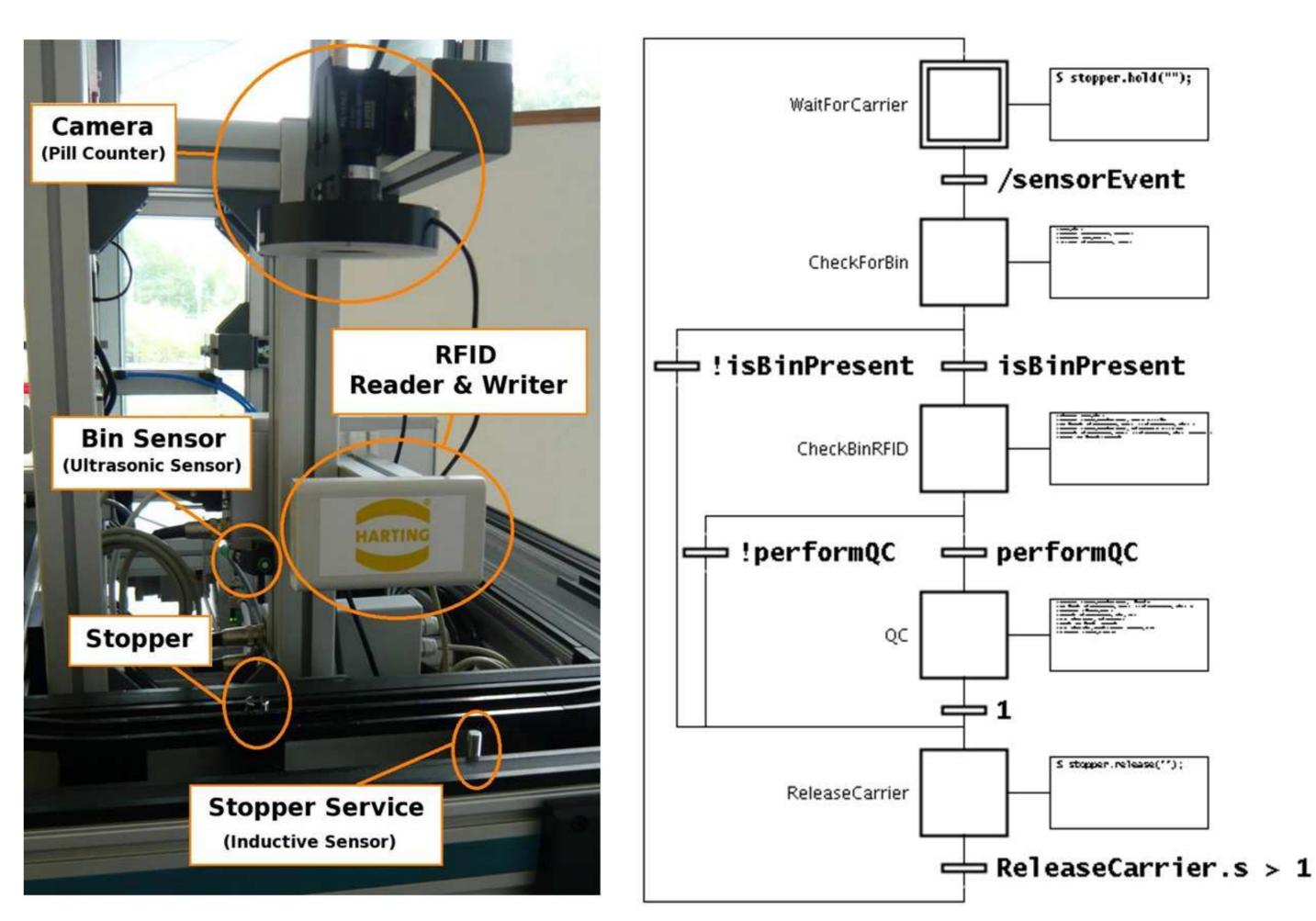
DPWS Stack

## **Grafchart DPWS Integration**

Generic DPWS support that is easy to use has been added to Grafchart [4], enabling anyone to try out SOA for automation with minimal effort. Simply create a DPWS Object, bind it to the Port-Type of a DPWS device, and then just call the operations.



## **SOA** Demonstrator



The DPWS implementation in Grafchart was tried out on a quality control station of SmartFactory $^{KL}$ 's SOA demonstrator, checking if bins have been filled with the correct number of pills.

When a carrier arrives, one should check that there is a bin on it, if so the status of the bin should be read, and if it is ready for quality control then it should be executed. Not only was it possible to implement this using DPWS in Grafchart, but the application actually looks like one would model the process conceptually.

## Acknowledgements

We would like to thank Lisa Ollinger at TU Kaiserslautern, Tobias Gerber at DFKI, and the SmartFactory KL demonstration platform.







[1] De Souza, LMS, Spiess, P., Guinard, D., Köhler, M., Karnouskos, S., and Savio, D. Socrades: A web service based shop floor integration infrastructure In First Int. Conf. on Internet of Things (IOT), Zurich, Switzerland, March, 2008. [2] Jammes, F., Mensch, A., and Smit, H. Service-oriented device communications using the devices profile for web services In MPAC, 2005.

DPWS Structure

[3] Kirkham, T., Savio, D., Smit, H., Harrison, R., Monfared, R.P., and Phaithoonbuathong, P. SOA middleware and automation: Services, applications and architectures In 6th IEEE Int. Conf. on Industrial Informatics (INDIN), July, 2008.

[4] Theorin, A., Ollinger, L., and Johnsson, C. Service-oriented Process Control with Grafchart and the Devices In Proc. of the 14th IFAC Symp. on Information Control Problems in Manufacturing (INCOM), Bucharest, Romania, May, 2012.