# Ecava IGX Talks to the Robot Hands

How It Started

Robots have been penetrated the industries ever since industrial automation was brought in. Basically, with the rising of Artificial Intelligence (AI), industrial robots can be designed and programmed to do almost anything. There are varieties of different robots used for industrial automation. Among all, robotic arms are one of the most popular used in different industries, and even robotic arms itself consists of multiple types. Articulated robotic arm is a type of robotic arm with rotary joints, in which these joints may vary in different number of axis. KUKA is well known in the market to produce 6 axis articulated robotic arms, used mostly for industrial purpose.

In order to ensure integration with the latest and popular industrial needs, Malaysia government has funded several technical institutes to provide professional courses in robotics and automation. Other than theories, these courses shall provide the environment / laboratory which equipped with real KUKA robots as well as the complete imitation system of an industrial manufacturing production line.

Three (3) institutes in Malaysia are chosen to introduce and implement this project by government, which are Pahang Skill Development Center (PSDC), Pusat Pembangunan Kemahiran Sarawak (PPKS), and German-Malaysian Institute (GMI). By providing these courses, the attendants are allowed to get a hands on experience with the full system, this shall assist them to familiarize with the industrial real world.

Get the Robots Moving

In order to integrate with the robotic arms, a Computer Integrated Manufacturing (CIM) system is designed and implemented. Once again, Ecava IGX SCADA is chosen as the automation solution as well as training toolkit for this project. The system is established along with PLCs (Programmable Logic Controllers) to talk to the robotic arms. Process conveyor belt is built to transport pallets of raw materials, where they will be sent to stations with robot arms to perform the assembly operation. Besides, there are also RFID scanners and vision checking system devices to register and inspect each pallet's barcode ID and status. The basic system architecture of CIM system is shown as follow diagram.
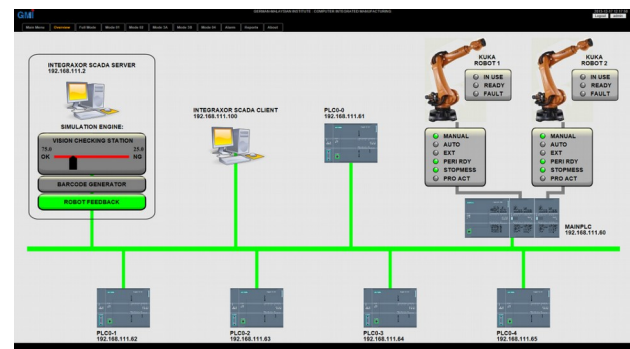
*Basic system architecture of CIM system*

The main concept may seem simple, but the truth is there are multiple times of efforts required to achieve the expected impression. Ecava IGX plays the role of simulator, in which the robots' movement will be automated. User can also monitor and control the operation by interacting with the SCADA screens. The procedures to configure Ecava IGX certainly involves powerful automated scripts to control the robotic arms. PLCs in this project act as the logic commanders to the robots. However, they will require a handshake agent to communicate with

each other, and that is how Ecava IGX step in again. Thus, different communication protocol are involved to establish the complete CIM operation, which includes Modbus TCP/IP, OPC and Profinet.

The CIM system is designed to consists of five (5) operation modes, as listed below.

- Store Raw Material
- Machine Raw Material
- Assembly
- Barcode Printing
- Unloading

These modes are actually sections of a complete CIM operation. User can also select to execute full mode from Ecava IGX, and all PLC kits will be activated to operate based on system designed routine. The manufacturing process can be monitored real-time on the HMI mimic screens, for example as shown below.
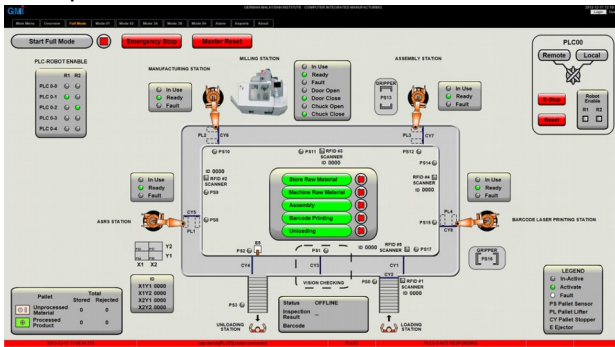
Full mode CIM operation HMI mimic screen on Ecava IGX
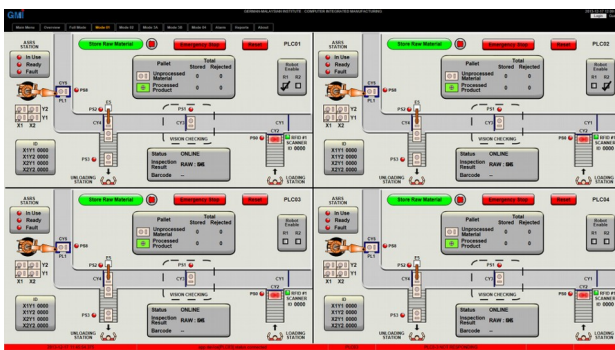
HMI mimic screen for Machine Raw Material operation in CIM system

The Hardware / Software:

Server Machine: Dell Precision T3600 Workstation
OS: Microsoft Windows 7

PLC (Programmable Logic Controllers):
- Siemens S7-200
- Siemens S7-1200

Protocol: Modbus TCP/IP, Profinet

Robotic Arms:
- KUKA KR10
- KUKA KR16
- KUKA KR5_ARC
- KUKA KR5_SIXX

Protocol: OPC

Vision Checking System
Protocol: Modbus TCP/IP

SCADA: Ecava IGX
IO tags: 1500 tags

Download Ecava IGX

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