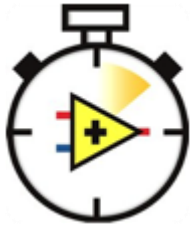
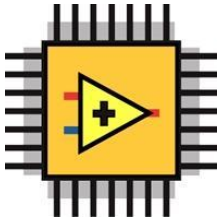
高效運用NI嵌入式系統升級自動化





楊岳庭(Ting)
ting.yang@tinnotek.com
0928-710-968

TINNOTEK 晴軒科技

About me

- 楊岳庭 Ting Yang
- 經歷
  - 晴軒科技有限公司負責人
  - 國家儀器資深應用工程師
- 學歷
  - Drexel University機械所碩士
  - 清華大學動力機械工程系學士
- 專業領域
  - 運動控制/機械視覺
  - 自動化工控設備研發
  - 嵌入式系統解決方案

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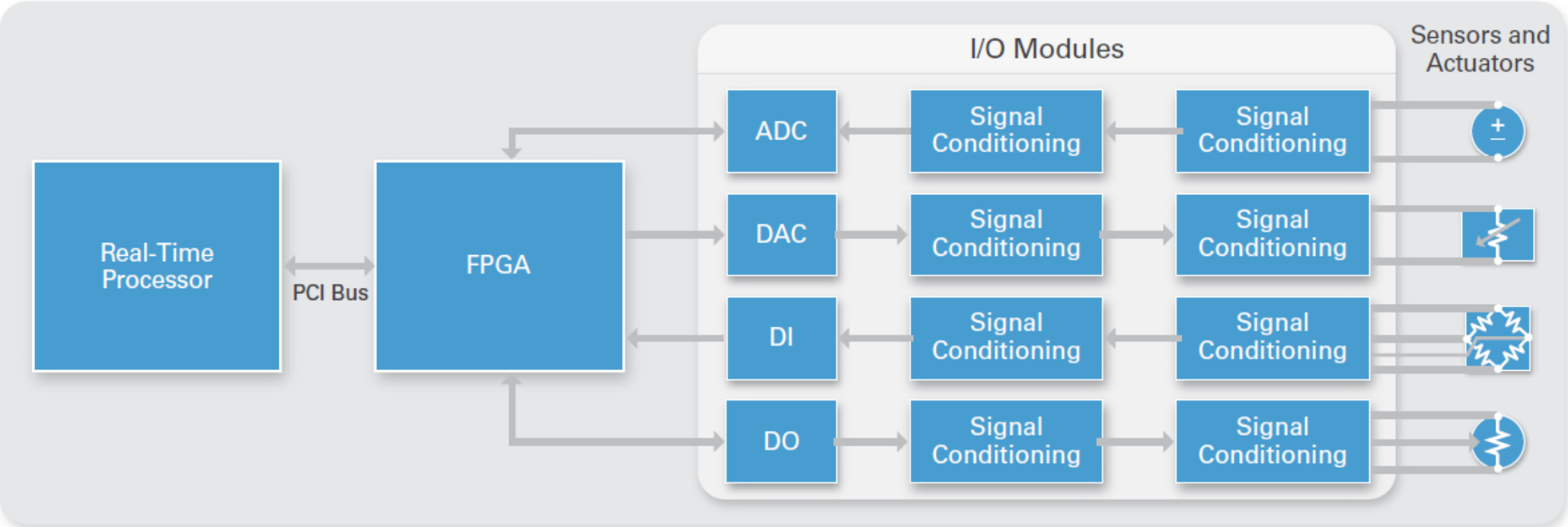
Agenda

- RIO Architecture Introduction
- 常見的Automation Controller
- GECO介紹
- Available GECO Solutions

RIO Architecture Introduction (Hardware)



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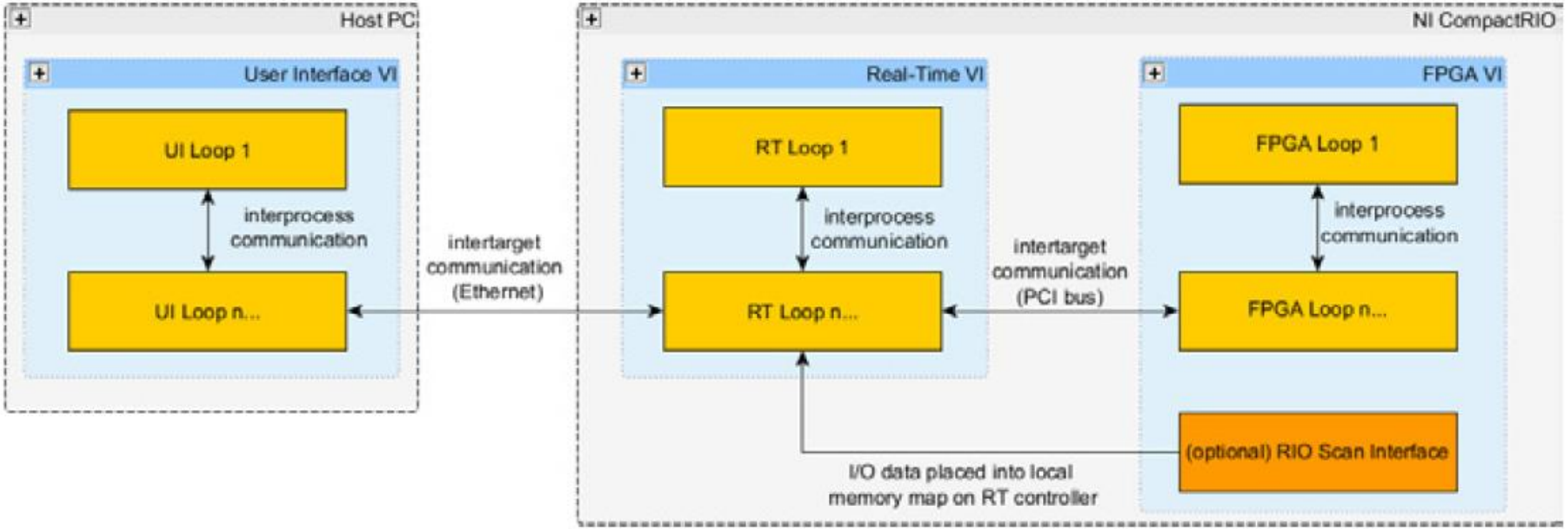
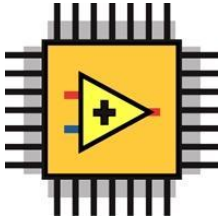
RIO Architecture Introduction (Software)





Automation Controllers

PC Based

- PXI

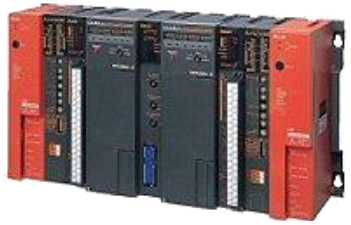
- Industrial Controller

- IPC

Embedded Based

- PAC

- PLC



- Robot

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Software IDE for Automation

PC Based

- LabVIEW

NATIONAL INSTRUMENTS LabVIEW

- Visual C#, VB.NET, Visual C++

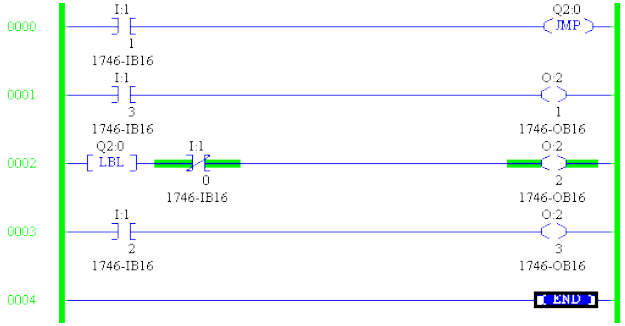
Visual Studio

Embedded Based

- LabVIEW RT / LabVIEW FPGA

LabVIEW Real-Time
Graphical Development, Real-Time Results

- Ladder Logic Diagram



- C/C++
- Assembly
- VHDL/Verilog

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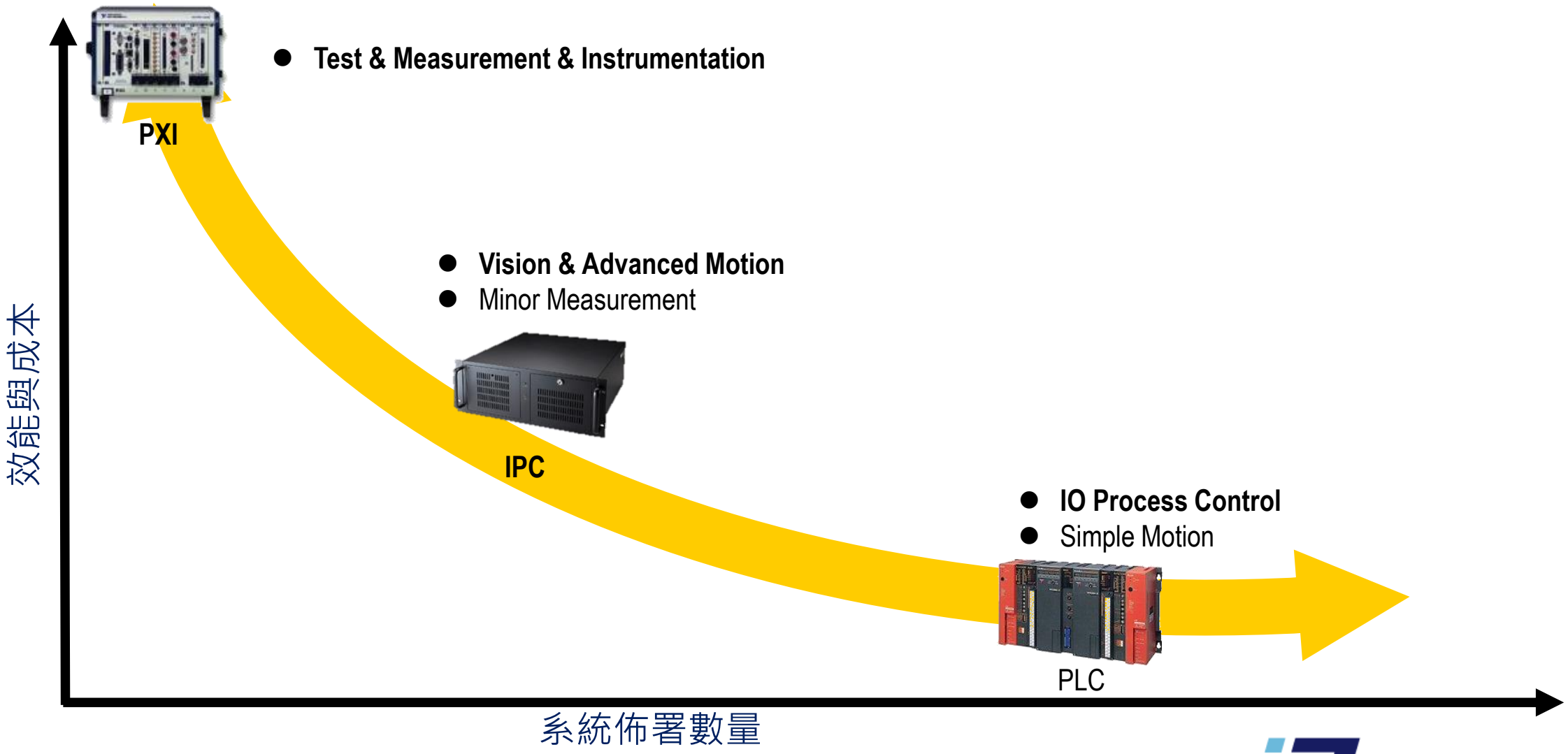
Performance / Deployment Adoption

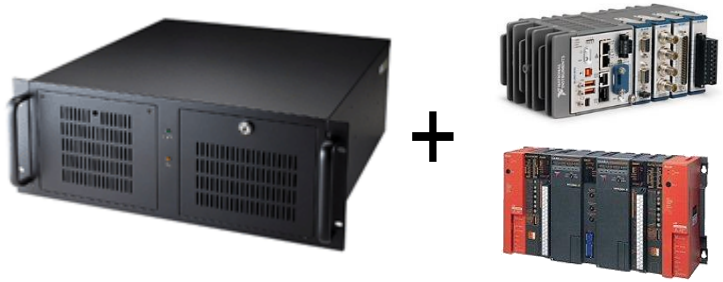


Automated Equipment's Evolution

- 自動化生產設備

PLC + HMI

IPC + PAC/PLC



- 自動化測試設備

ATE

PXI

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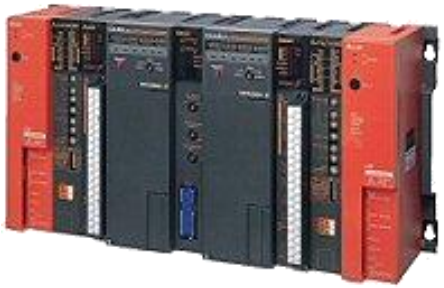
Challenges we are facing

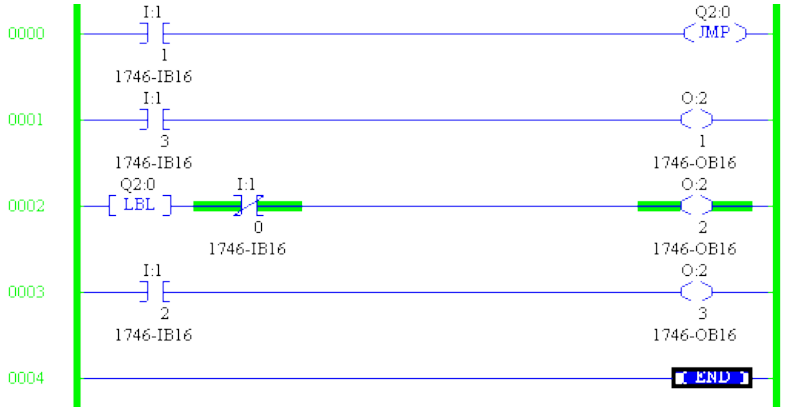
OPC SERVER

Modbus



NATIONAL INSTRUMENTS LabVIEW

CC-Link IE



Visual Studio

EtherNet/IP™

PROFIBUS®

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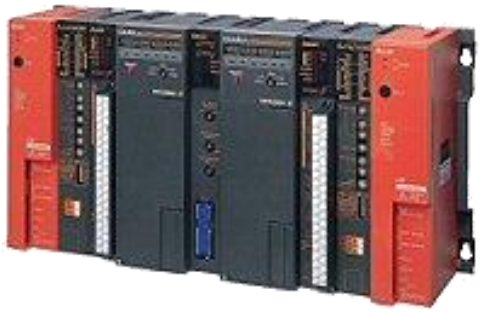
Challenges nowadays

- Big Data
- Integrated Measurements
  - Vision / Motion
  - Sensors
- Connectivity
- Customization
- Faster precision control
- Lower Cost

Any other options?



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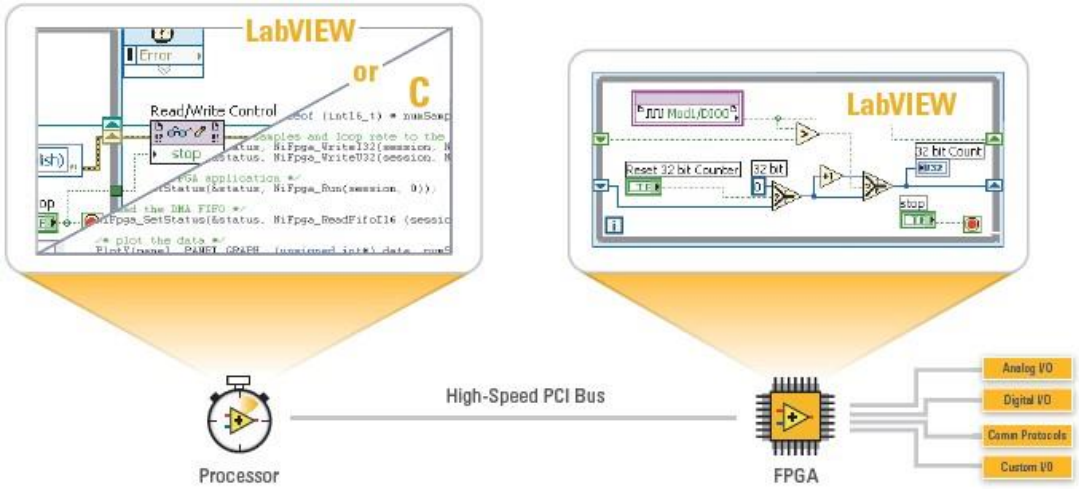
晴 軒 科 技

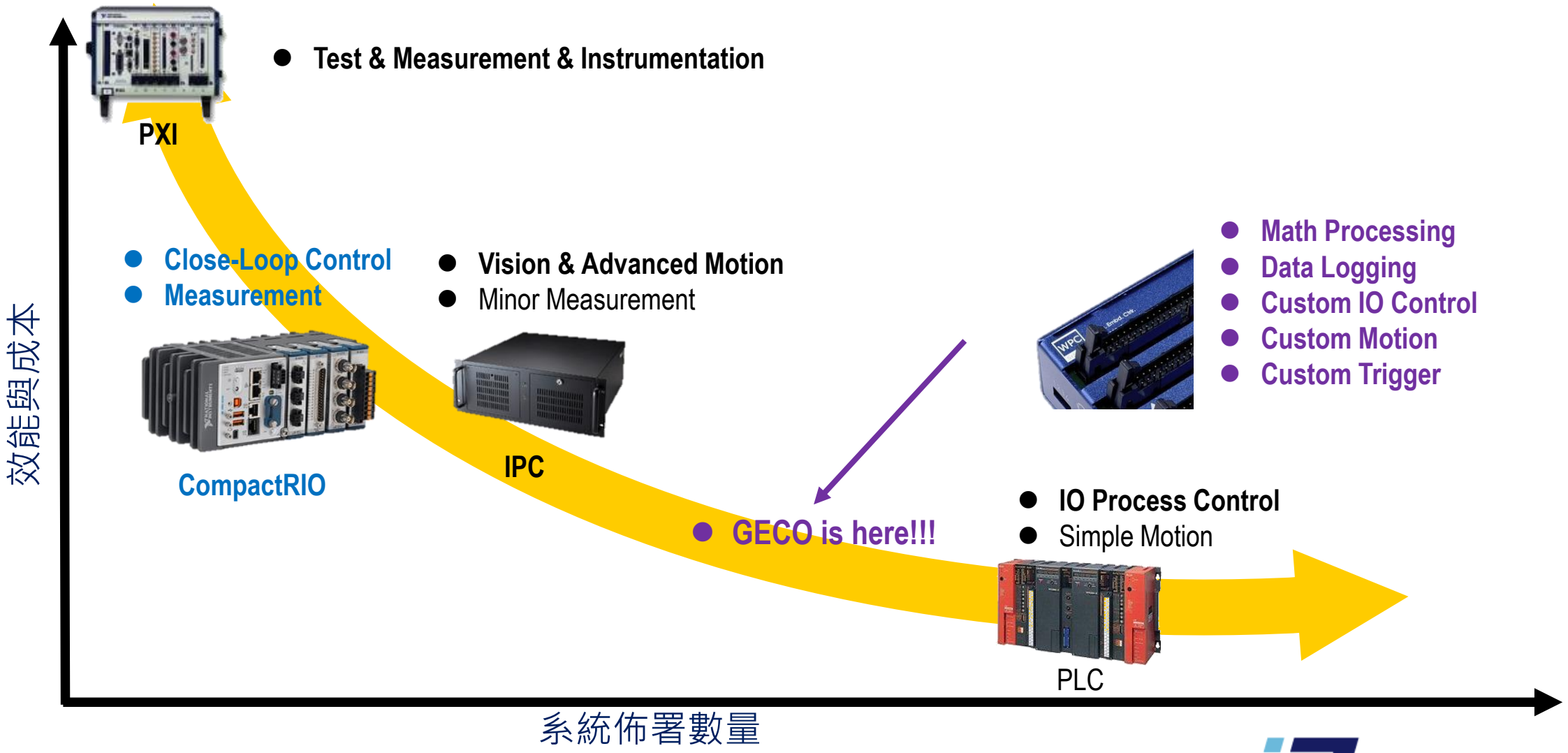
What's GECO?

- GECO = Graphical Embedded Controller
- GECO = NI sbRIO + External IO modules
- Cost effective solution
- Easy to use
- Ethernet based



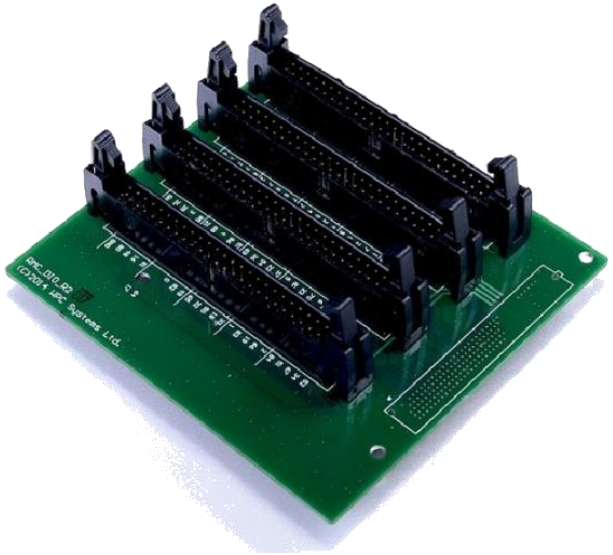
Intrinsic LabVIEW Based

Performance / Deployment Adoption



GECO under the hood

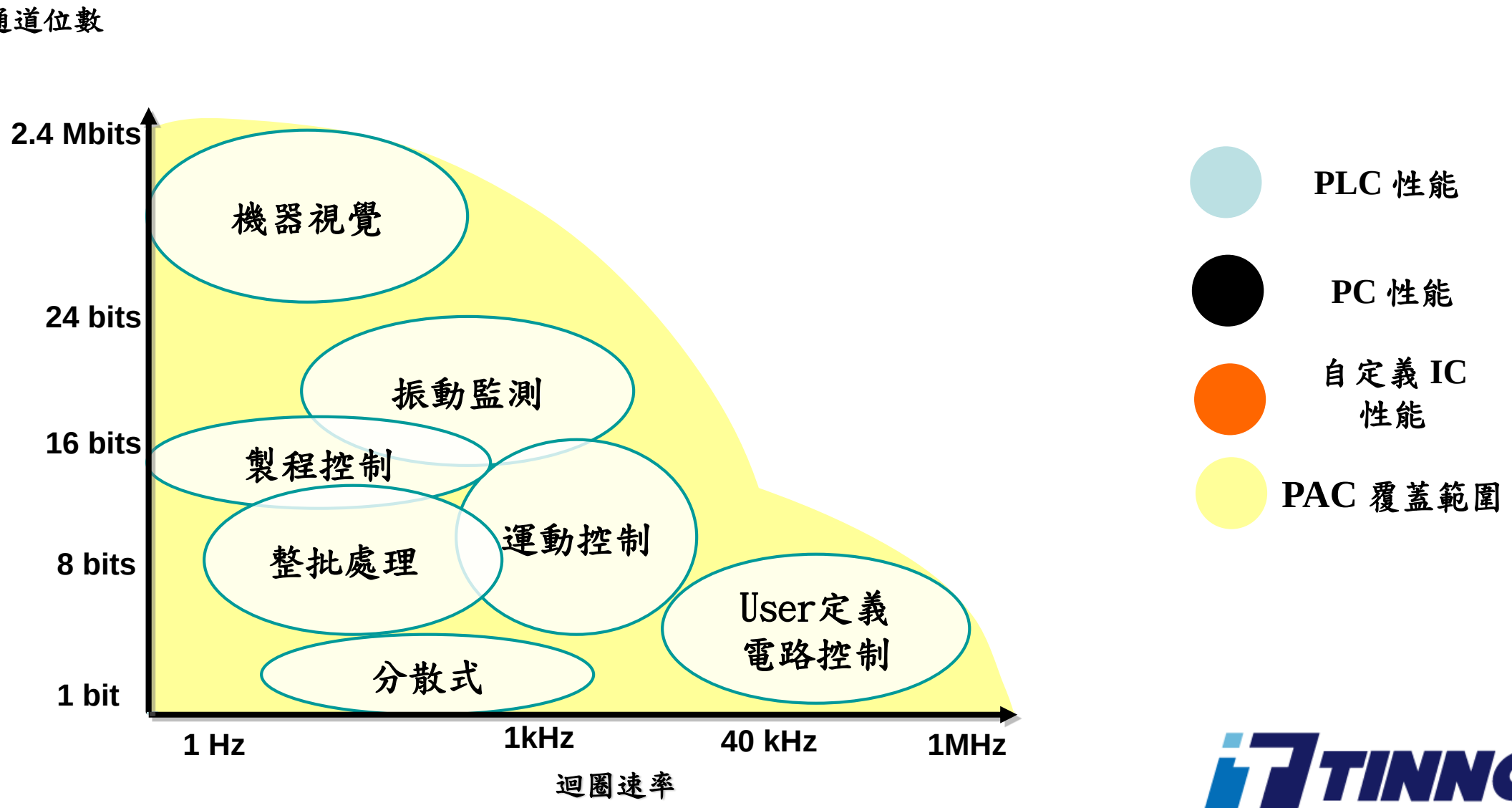
NI sbRIO-9605/6/7



RMC Breakout board

Aluminum Enclosure

Programmable Automation Controller



Automation Controller Utilization

Performance

Controller Types	Desktop Tester	Small Machine	Medium Machine	Future Machine	Auto Tester	Future Tester
MCU	√					
PLC		√	√ (Target)		√ (Target)	
PAC				√ (Host/ Target)		√ (Host/ Target)
IPC			√ (Host)	√ (Host)	√ (Target)	
PXI					√ (Host)	√ (Host)

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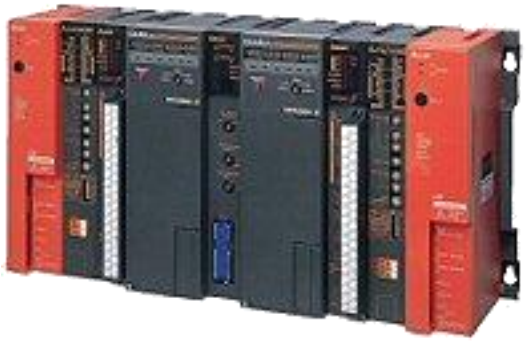
Upgrade your machine



+

- Machine Vision?
- Database Connectivity? (ex. FTP)
- Machine Config File (ex. *.ini)?
- Operation Log? (ex. *.txt)
- Measurement?
- Algorithm?

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GECO Automation Box 模組化配電盤

- 適用自動化設備快速開發與佈署
- GECO Automation Box：
  - LabVIEW Based可程式化嵌入式控制器
  - 四軸運動控制(單/雙脈波指令)
  - 可客製化進階觸發功能
  - 24V工業用DIO, 36-Ch Input, 24-Ch Output
  - 便於使用的G-Auto API
  - 配電盤可直接在機台側測試，便於移動使用

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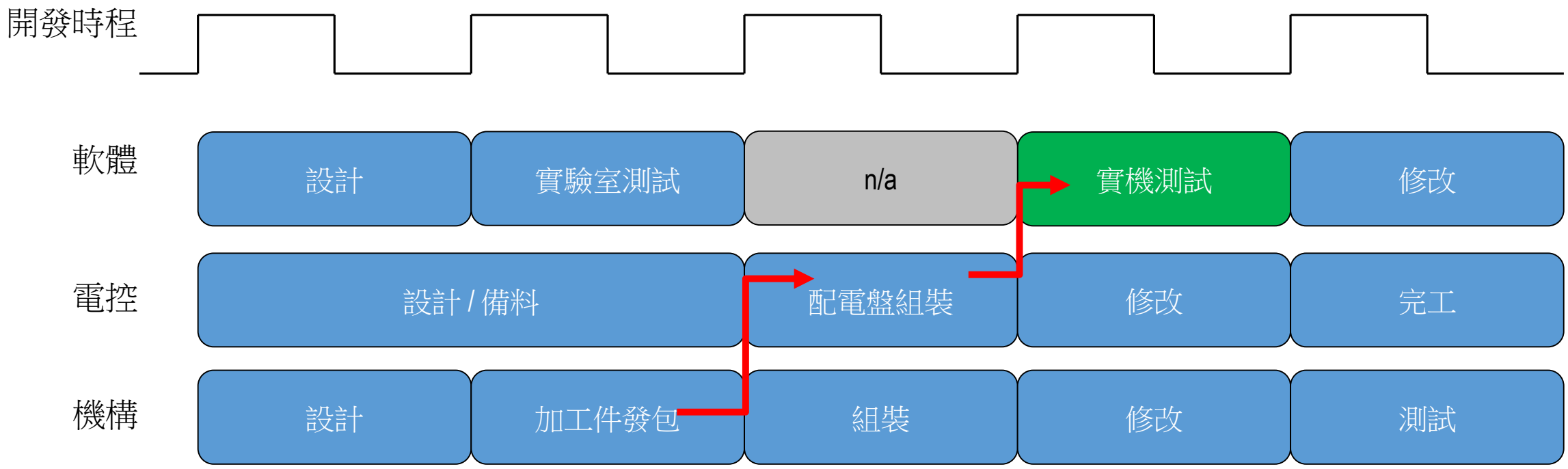
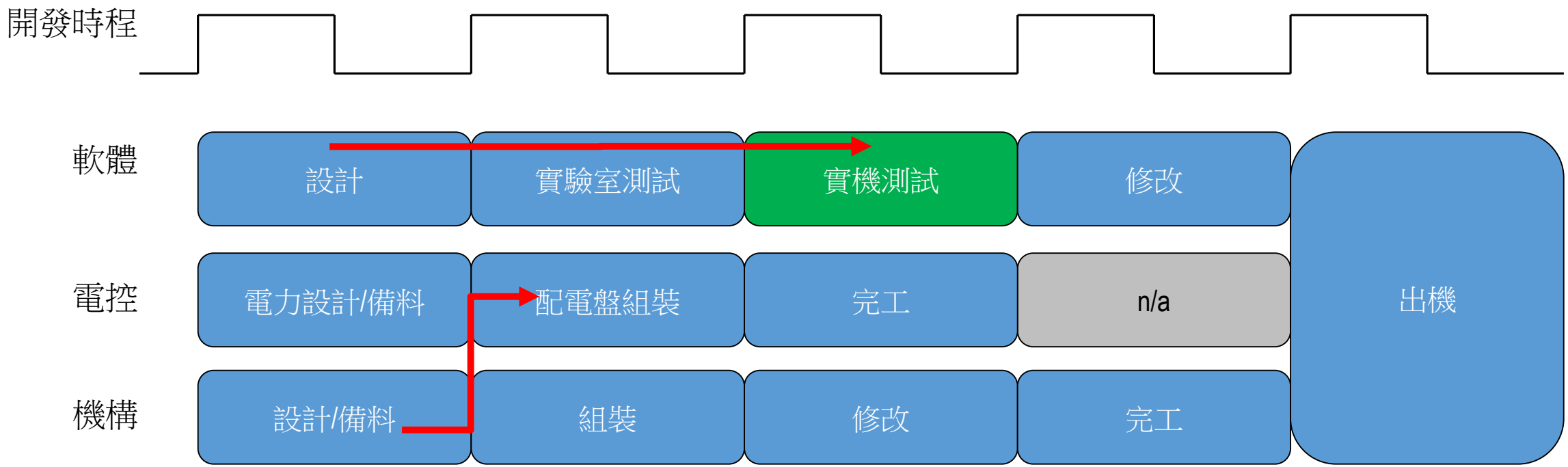
傳統自動化開發時程



傳統設備開發流程

模組化配電盤開發時程



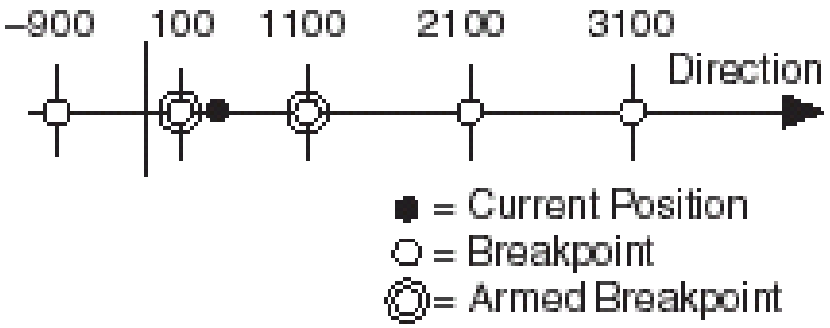
模組化配電盤設備開發流程

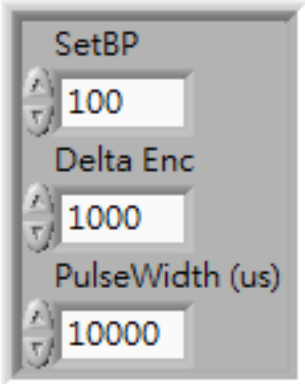
Target Application

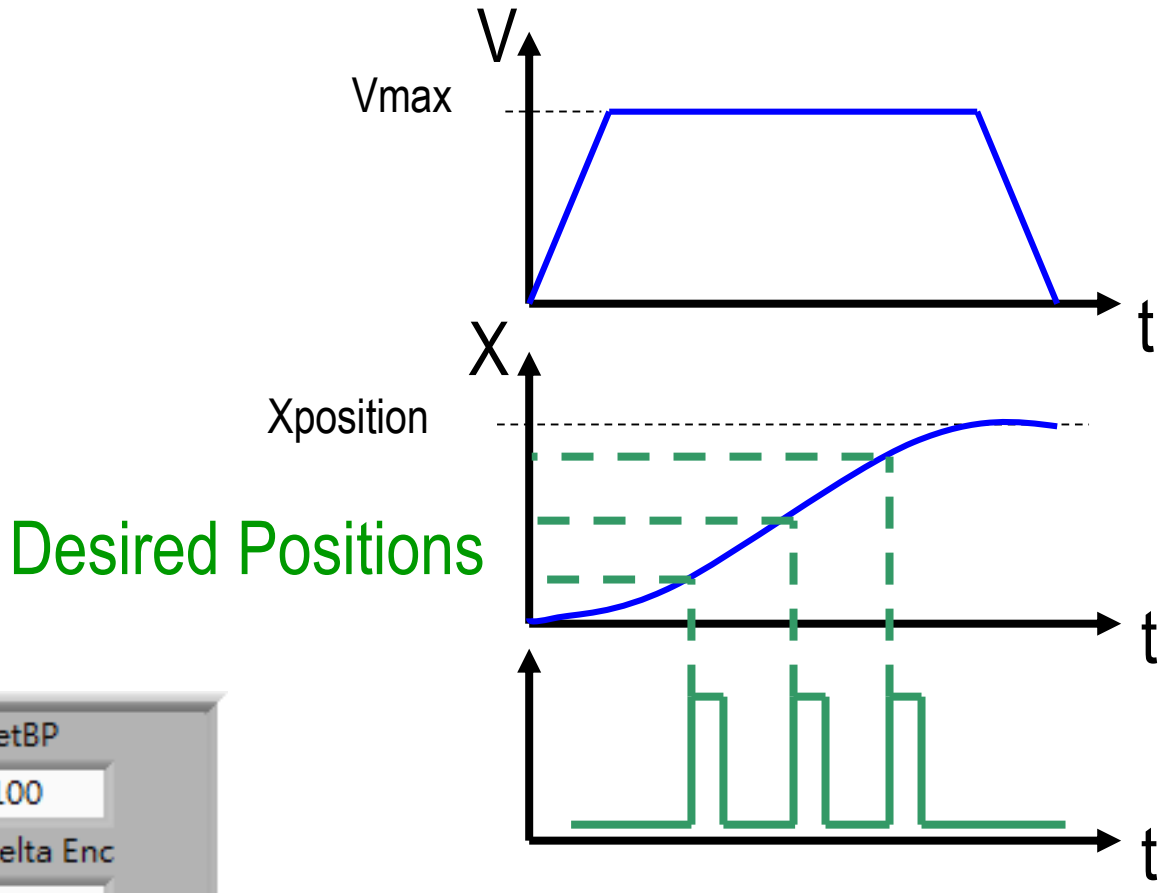
- Probe Tester/探針、按鈕測試機
- 車用電子零件測試機
- 自動化視覺檢測觸發控制
- 真空幫浦控制器
- 自動導引車輛(AGV)
- 各類監控設備客製化
- 生產設備機台升級

Advance Trigger: Periodic Breakpoints

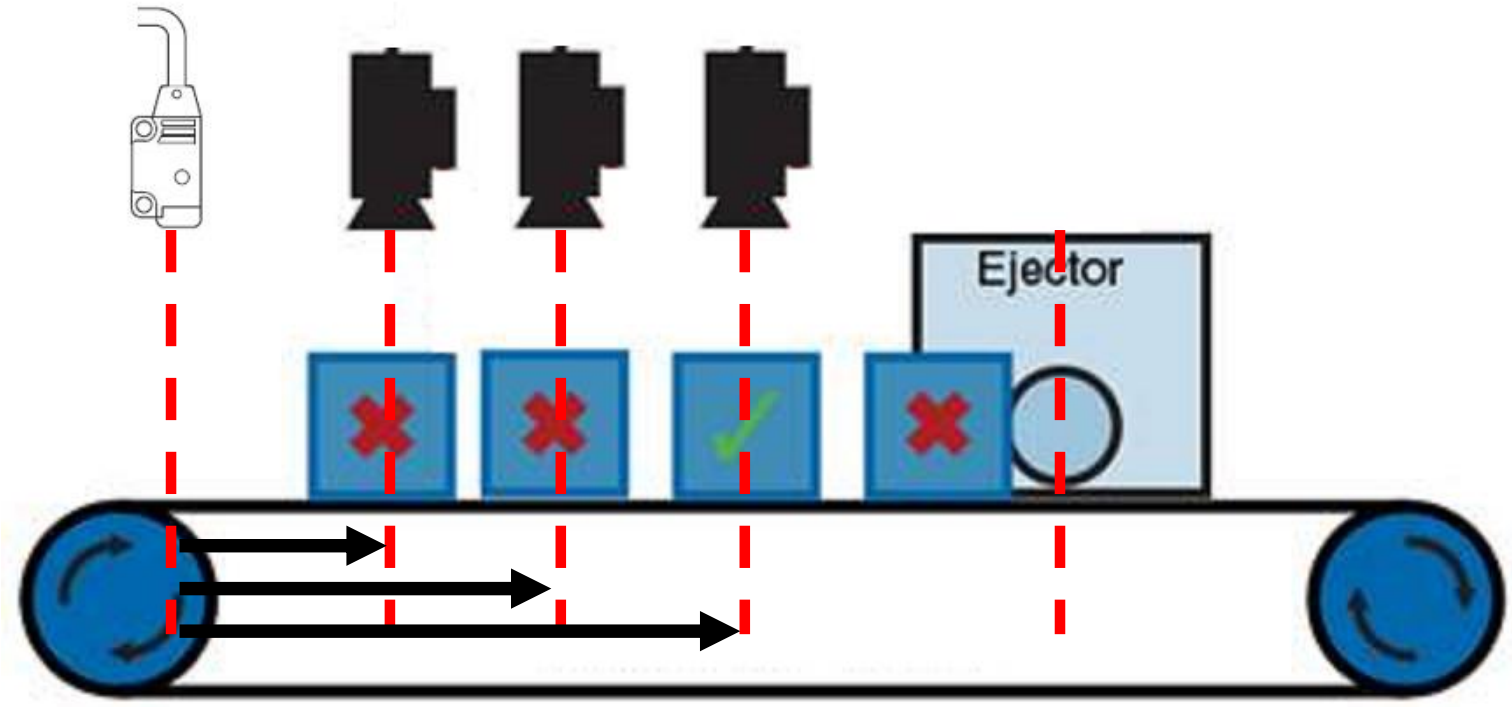
- 用於週期性等距輸出觸發
- 可應用於控制線掃描工業用相機
- 可應用於輸出Sample Clock，搭配DAQ進行同步量測。

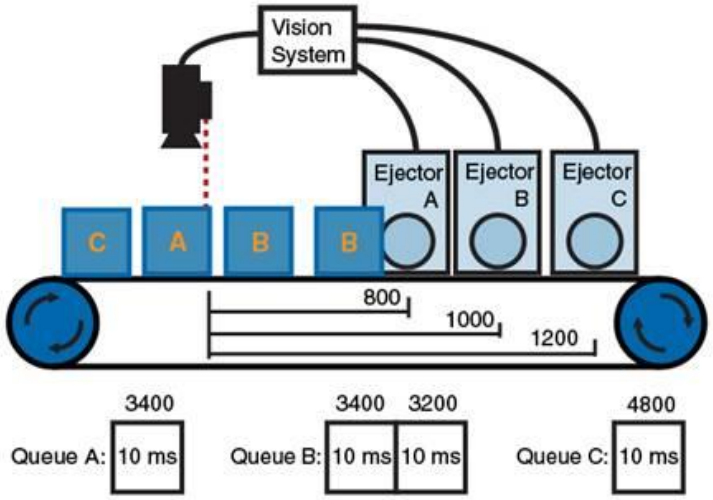






Advanced Trigger (Queue Pulses)





- A pulse queue allows a series of different outputs to be added to a queue as a result of visual inspections, driving the outputs sequentially in response to a trigger.

Available GECO Solutions

- Panel PC / HMI
- Motion Control (G-Auto)

GECO Panel PC / HMI Solution

+

or

+

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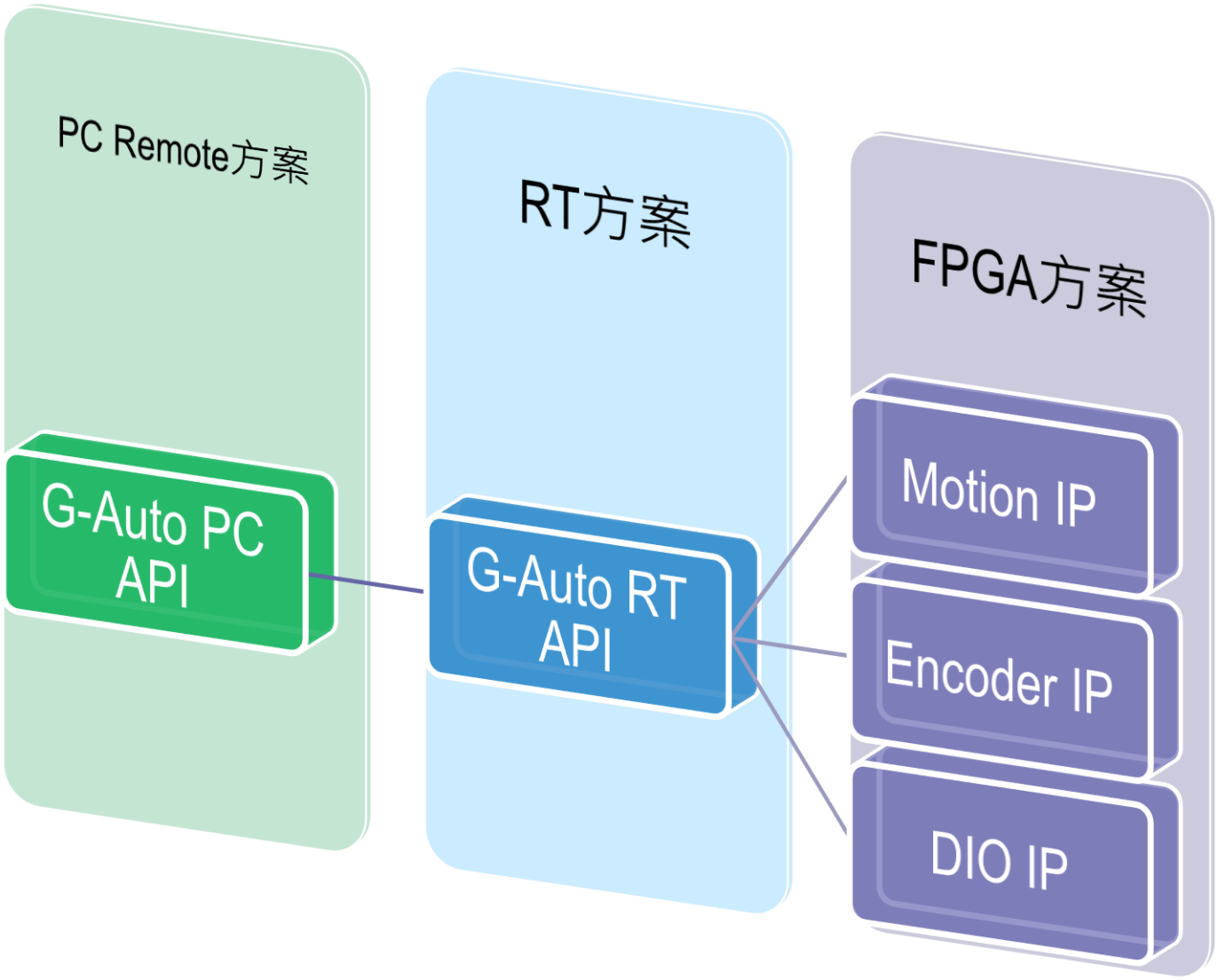
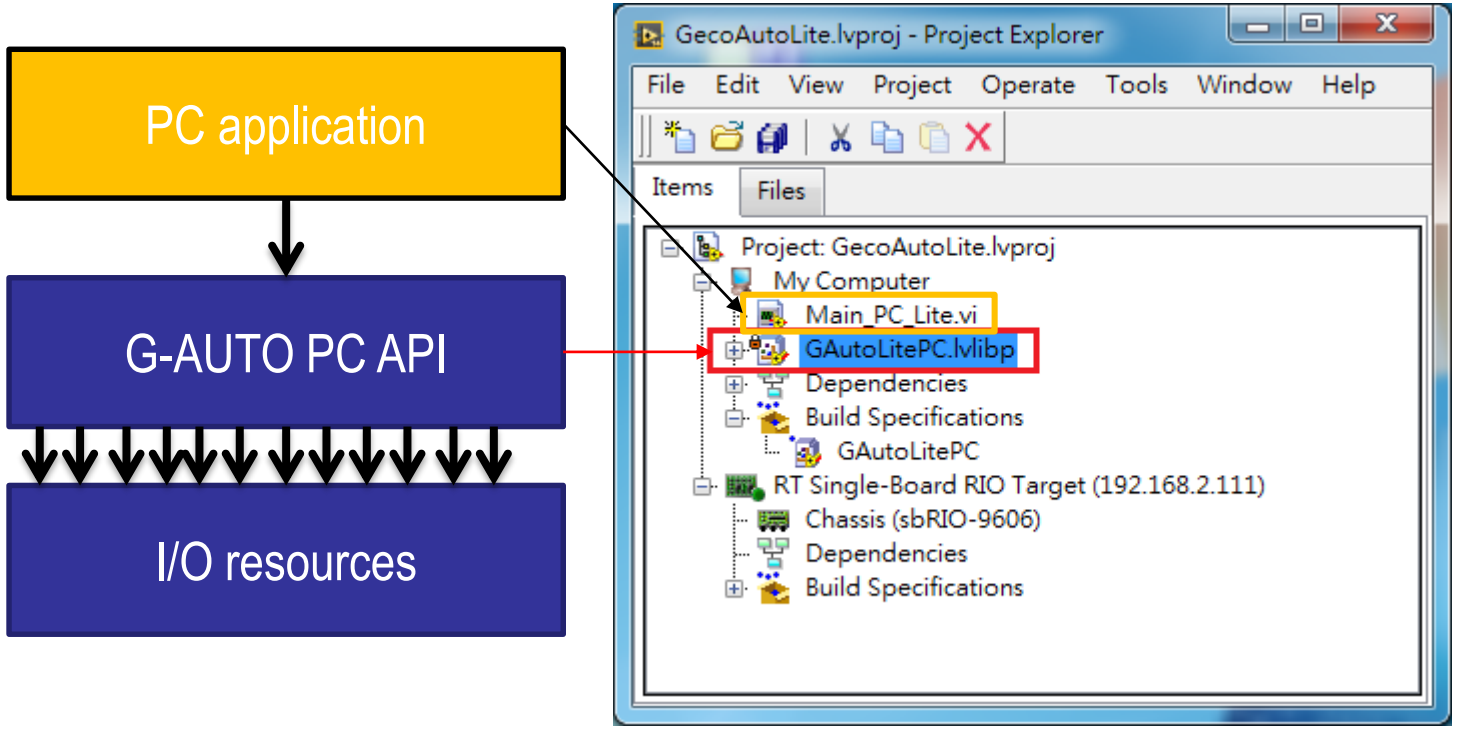
G-Auto Motion Solution



PC Remote方案
(適合習慣用軸卡的使用者)

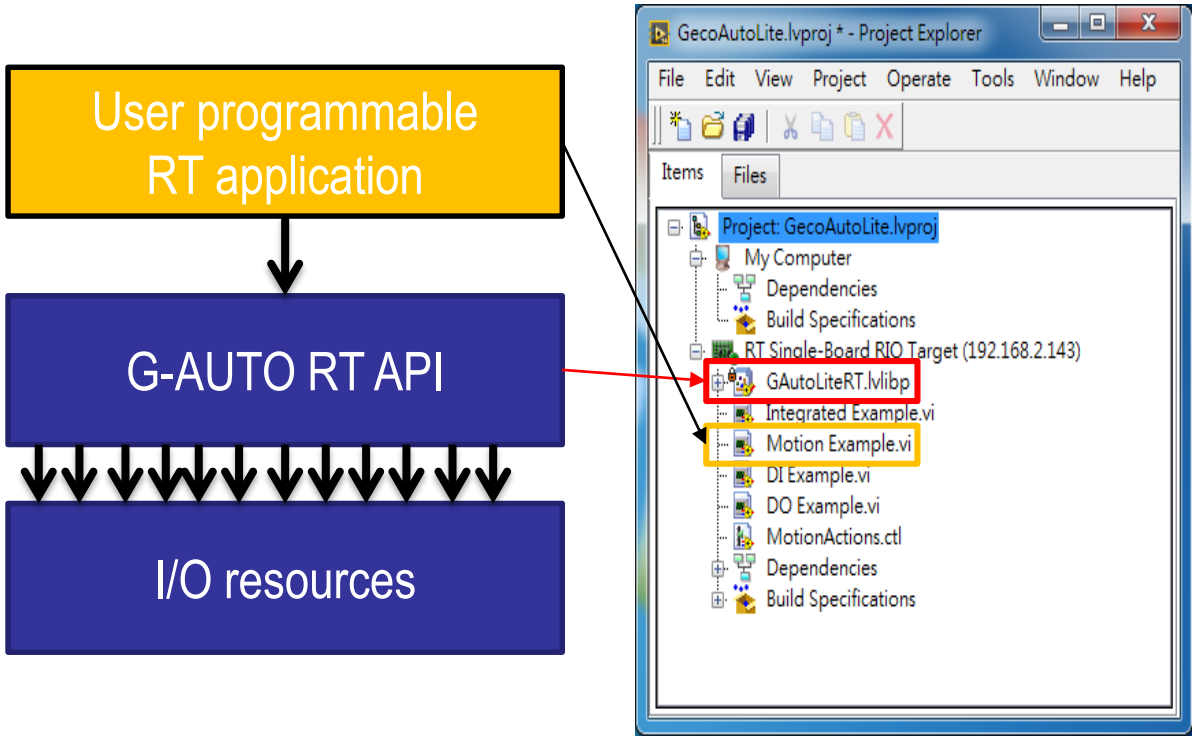


- 原生LabVIEW開發介面
- PC端直控，類似軸卡的開發方法
- 無須開發RT端程式
- 無須開發FPGA程式

Remote control GECO as an external device

Real-Time Standalone 方案

（可獨立運行，類似PLC控制器的使用法）



RT standalone execution

- 原生LabVIEW開發介面
- 無須開發FPGA程式
- 完善的軟體專案框架
- 開發完成後，可離線獨立運行，不須PC主機。

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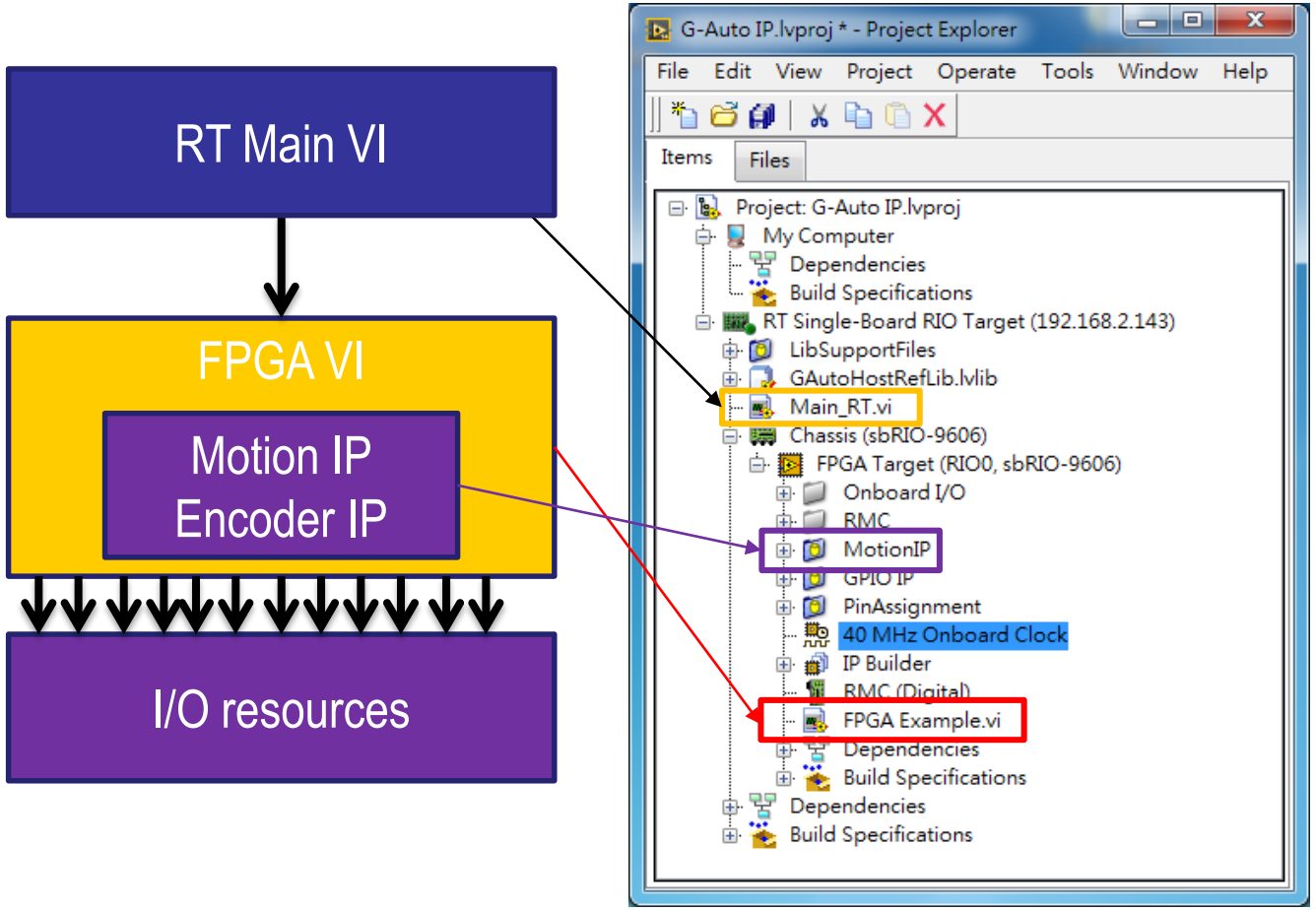
Customize FPGA方案

(適合需要極高度客製化FPGA的進階使用者)



- 可客製化FPGA行為
- 提供底層Motion IP範例

Fully customized FPGA (For advance user)

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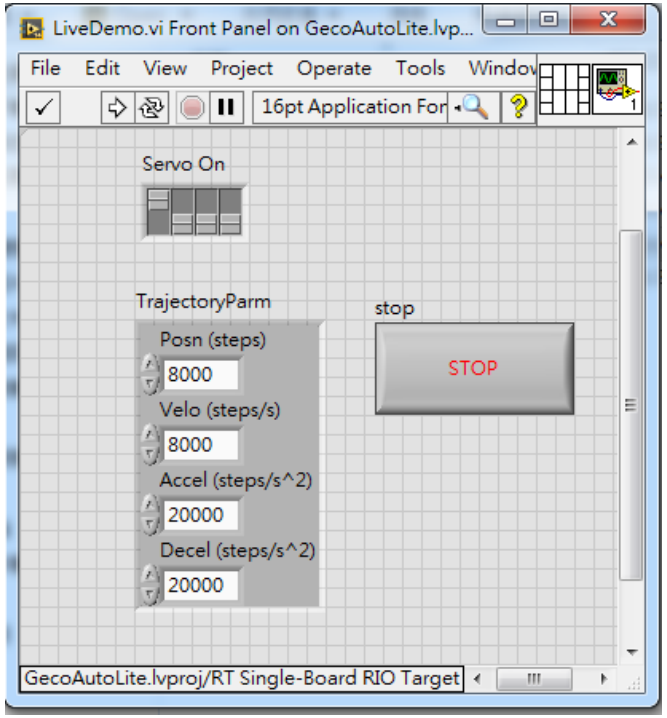
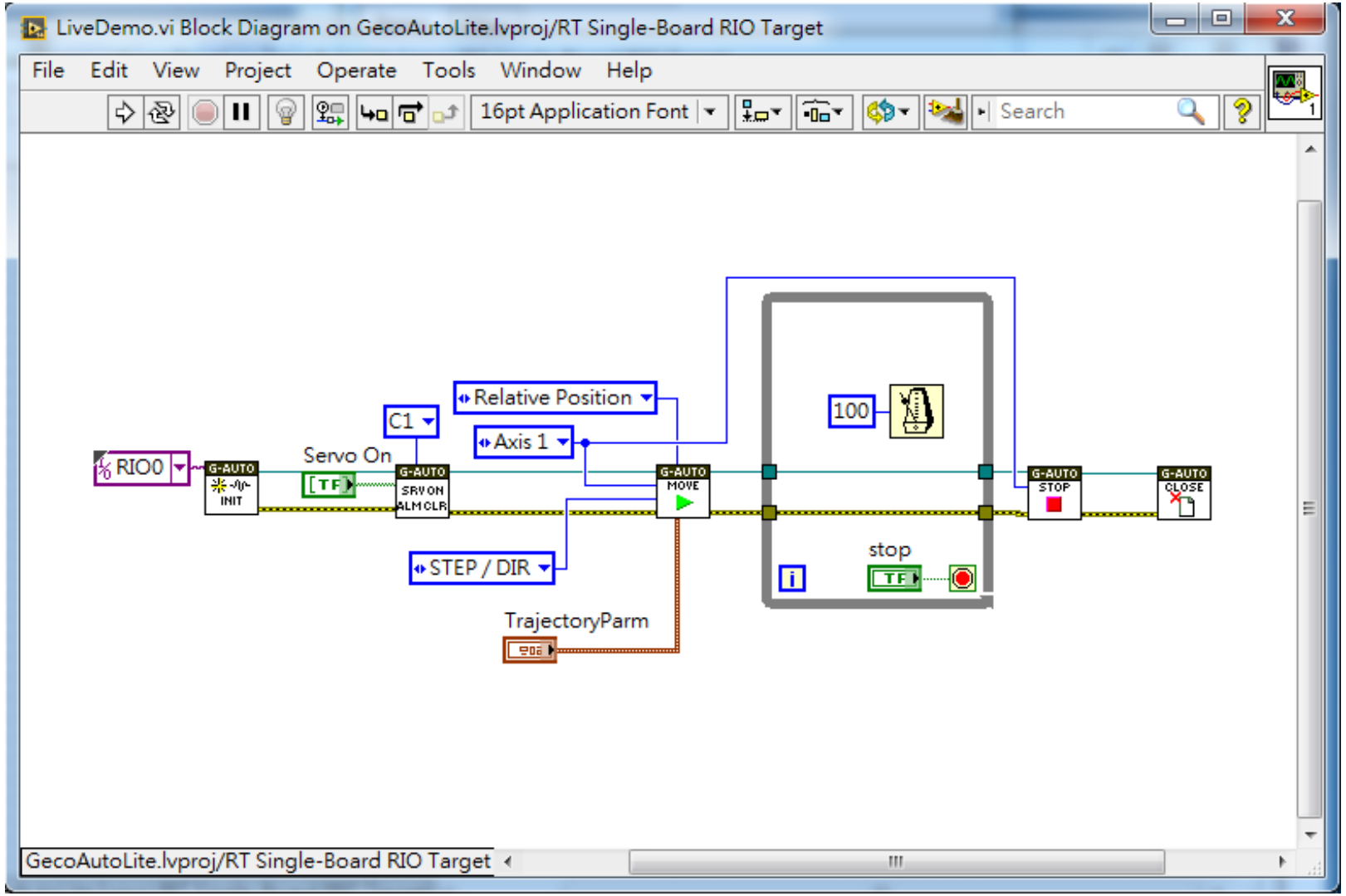
Example Code Demo





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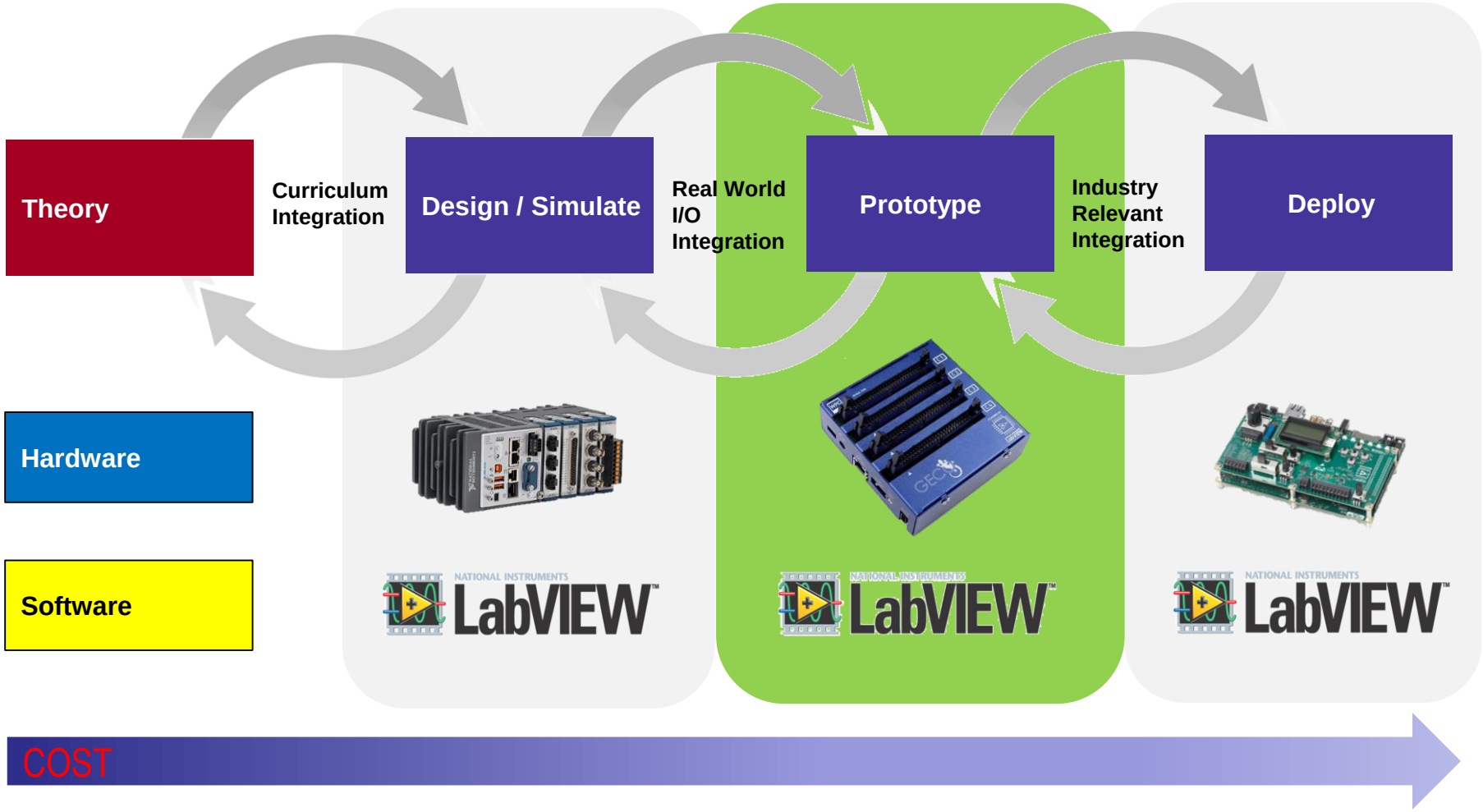
Graphical System Design (Road to OEM)

Graphical System Design



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Benefits to customer

- **Fast time to market**
- LabVIEW-based, ready for use API
- Plug and play
- Standalone, high reliability
- Cost effective

問題 / 建議 ?

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