Introducing ORTO™

A Novel Approach Real-time Optimisation

Paul Oram

To introduce me…..

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- Process Control & Optimization Engineer, PhD in Adaptive Control
- With BP until Dec. 2020. Last role held - **Chief Engineer for Instrumentation, Control & Electrical**
- **Visiting Professor** at Imperial College London since July 2017:
  - Taught process dynamics, control & optimization to undergraduates and postgraduates
- Since leaving BP:
  - Developed a novel **'ORTO agent'** approach to Real-time Optimization (RTO)
  - Started **Ortomation.IO**
- What's been **my motivation**?
  - Closed loop optimisation has significant benefits, but **few companies** enjoy these due to the cost and expertise needed to install and maintain applications.
  - There must be a better way!

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What is Real-time Optimization (RTO)?

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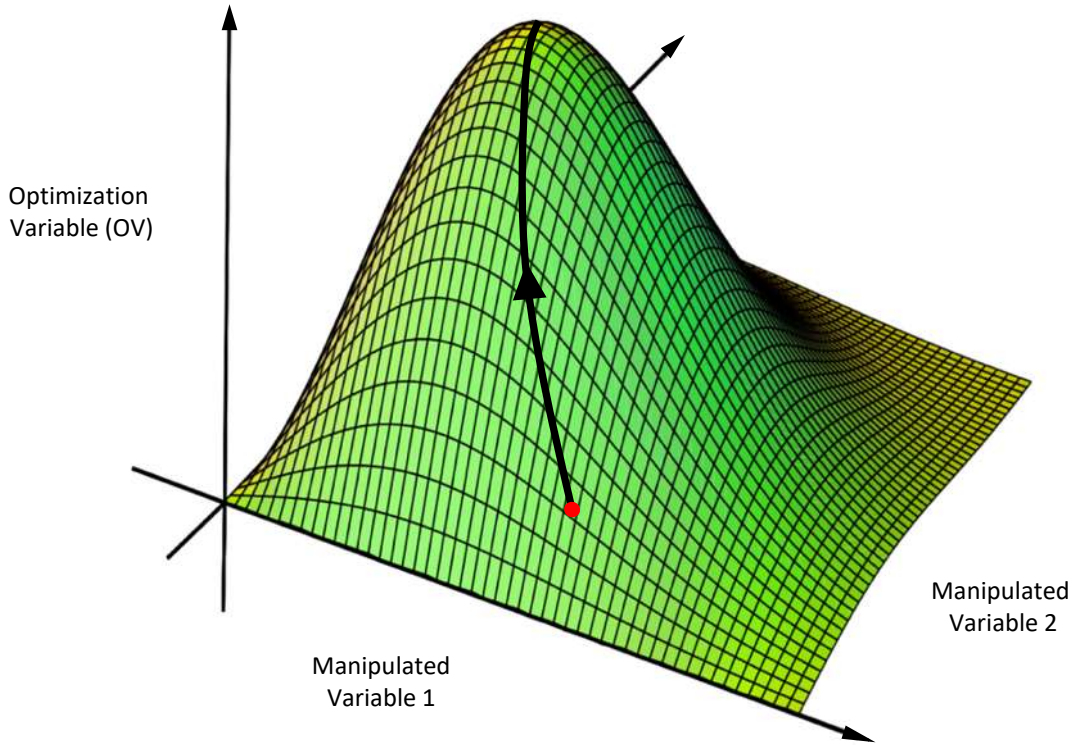
Two MVs (no constraints):



- **RTO** is a **generic technology** and has applicability across many industry sectors
- Works in **closed loop** (no human in the loop)
- Typically, the OV is a **proxy for profitability** e.g., an indicator / calculation of:
  - **Production** (maximize)
  - **Operating costs** (minimize)
  - **Emissions** (minimize)
- **Delivered benefits**: 2-10% in the OV
- **Payback** measured in months, if not days.
- **Existing market** size ~$0.5B - ~$1B / annum.
- **However**, there are an estimated **five million PID controllers** in operation across all plants worldwide, but only a **tiny fraction** of these are being written to by RTO. **Why?**

The current state-of-play…..

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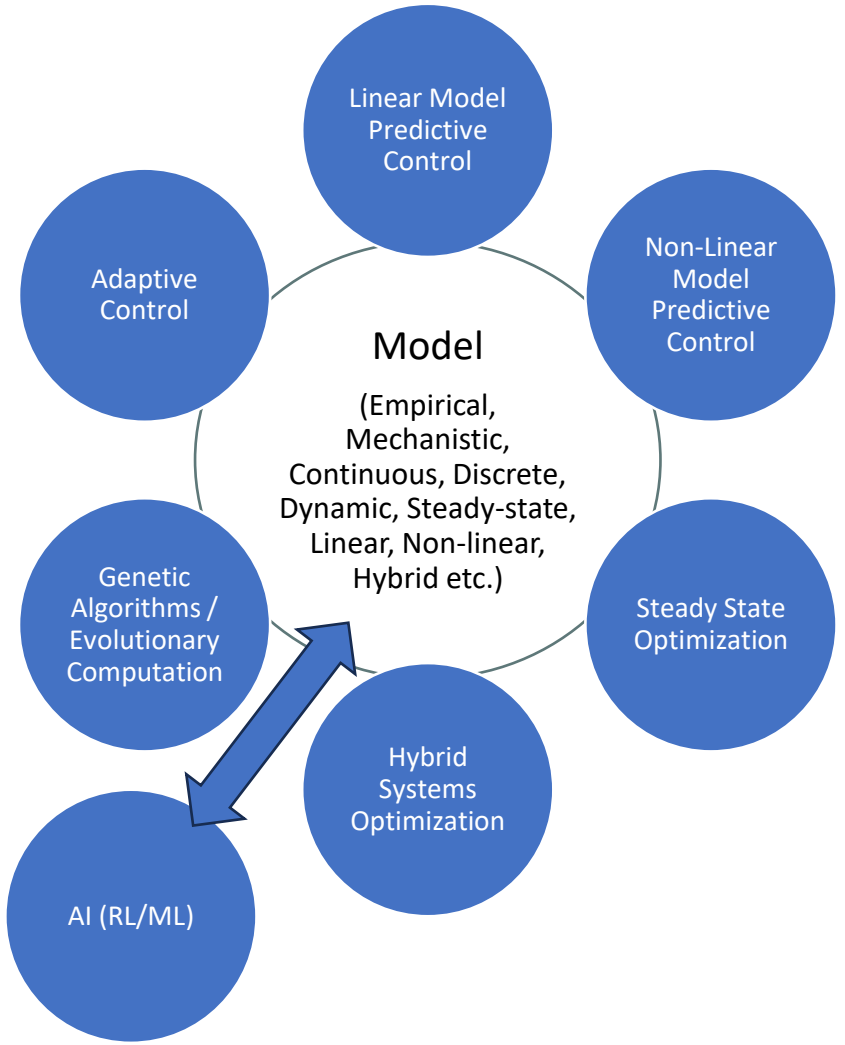
Existing technologies have been very **successful**, where:

- **Expertise** exists
- Companies have the **$ resources**
- Applications justify the **time** and **expense** to **build** and **sustain** them



Dominant **commercial solutions** all have one thing in common: a **deep dependency** on having a **high-fidelity model** of the process.

Making implementing schemes:

- **Difficult** and **laborious** to build & maintain
- Reliant on **specialised** and **scarce** experts
- Prone to **model error**
- **Costly**

- Current RTO market size ~$0.5B-$1B / annum
- BUT, only ~10% of the possible market being served

So, what is ORTO™?

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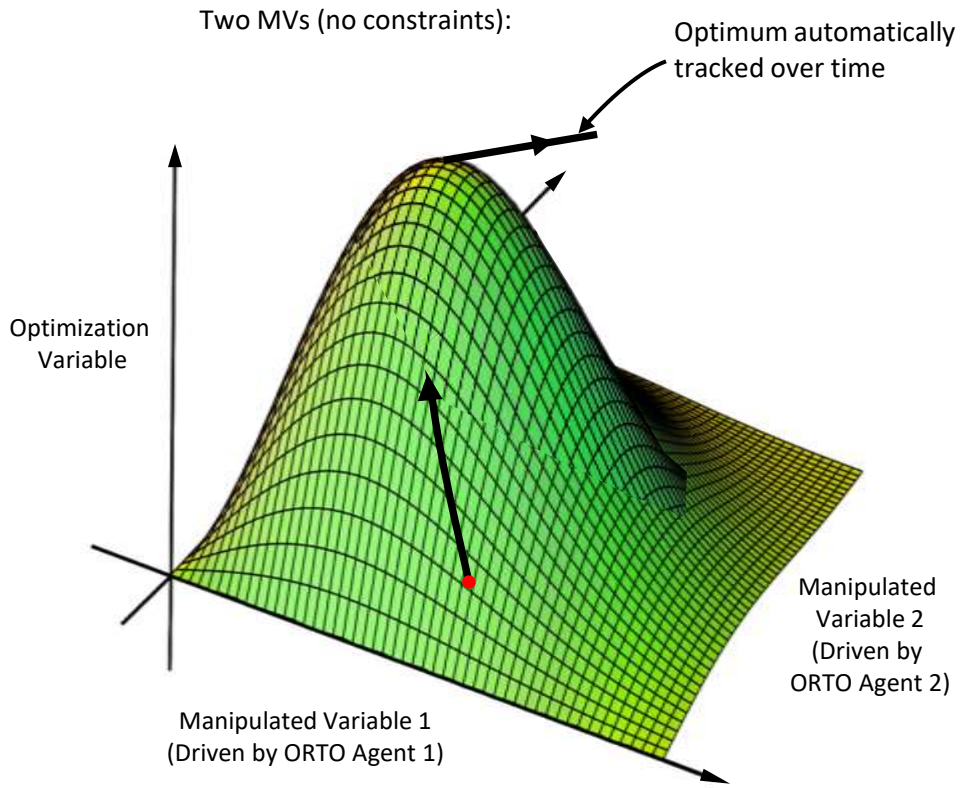
- A completely **novel <u>model-free</u> approach** to **process** and **system RTO**
- ORTO™ optimization schemes comprise of one or more '**ORTO Agents**'
  - Reside in dedicated ORTO™ software
  - Or, in OEM DCS / SCADA control libraries (future)
- Agents are:
  - **Simple** to configure and deploy
  - **Self-learning** and **autonomous**.
  - Work together, in closed loop, to **find** and then **track** the **optimum over time**
- Agents are not:
  - **AI** based



Presently, the ORTO algorithm is being kept as a **trade secret. Patents** are being prepared.

A new disruptive approach to process optimization….

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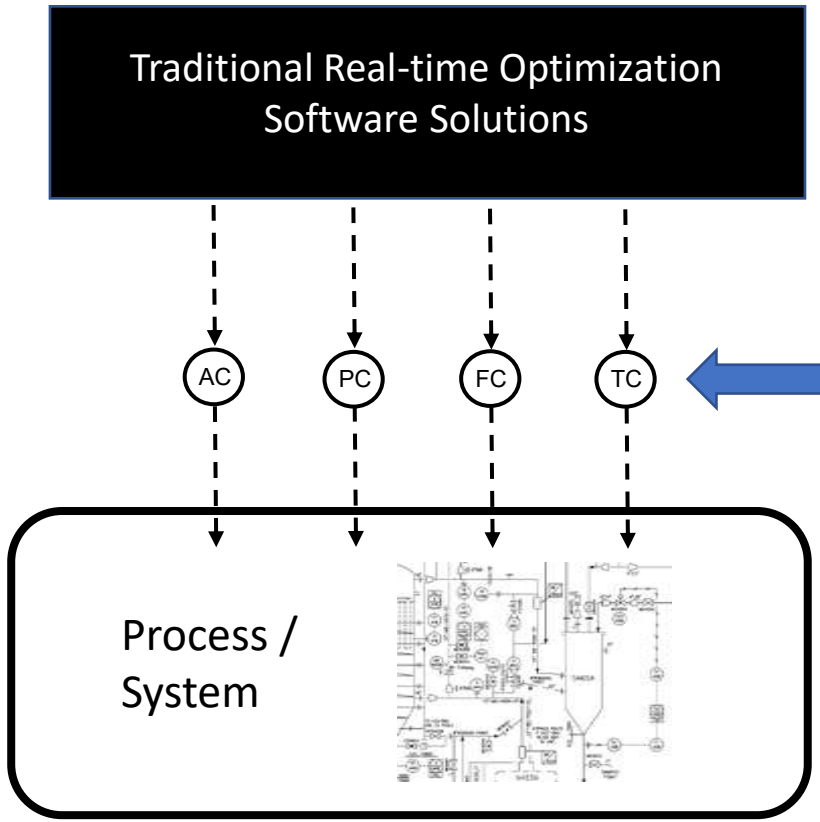
Existing RTO solutions – model dependency makes them:

- Difficult / dependant on scarce expertise
- Deteriorate
- Resource intensive
- Bespoke
- Require lots of maintenance

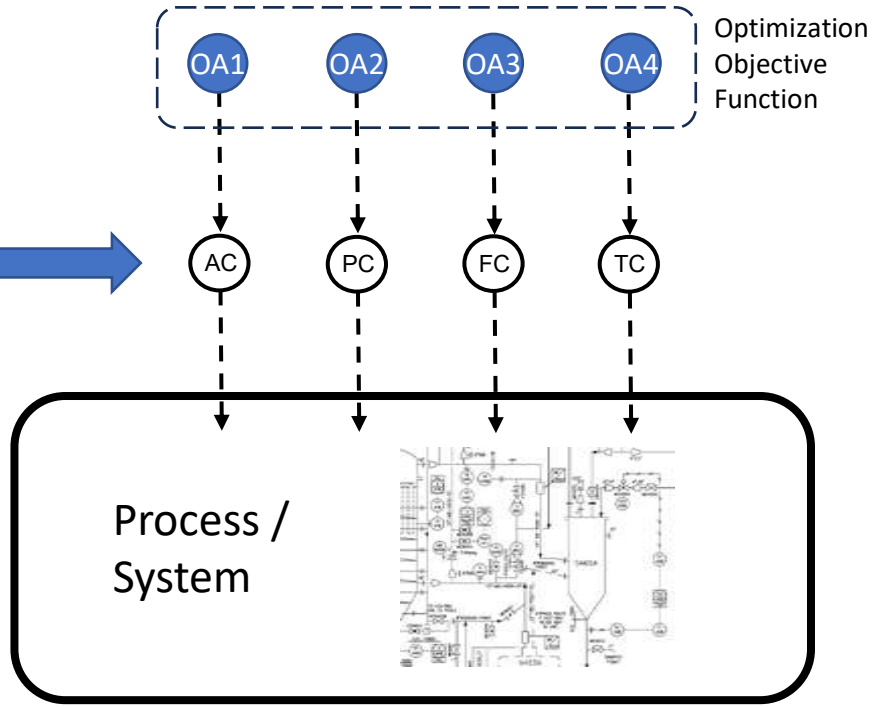


Regulatory PID:

- Simple
- Robust
- Intuitive
- Standardised / Scalable
- Minimal maintenance

'ORTO Autonomous Agent' (model-free) approach:

- Simple
- Robust
- Intuitive
- Standardised / Scalable
- Minimal maintenance



Traditional Model-based Optimizer versus ORTO™ Timeline

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Traditional RTO Timeline

~1 Week | ~1 Week | ~4-12 Weeks | ~2 Weeks

Assess → Prep → Model build and validation → Build → Commission & Monitor → Sustain .....>

< Resource Intensive / disruptive to operations >

< Resource Intensive >

Robust regulatory control foundation

ORTO™ Timeline

~1 Week | ~2 days | ~1 Week

Assess → Prep → Build → Commission & Monitor → No Model = Minimal Maintenance

Swift Implementation

< Evergreen & Process Tolerant >

>70% reduction in project timeline
>90% reduction in maintenance

Key Milestones Achieved

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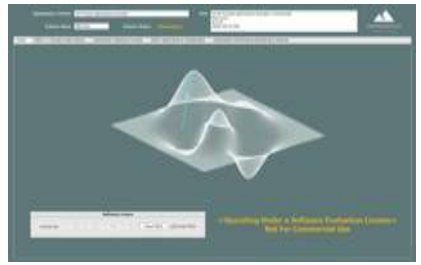
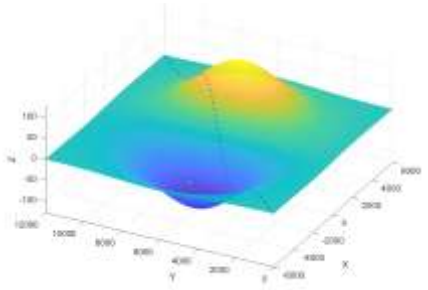
1. Proof of Concept
   - Conducted with a major O&G company
   - ORTO used to maximize catalyst life on a ULSD refinery unit
   - ORTO succeeded where conventional RTO / AdCon techniques had failed

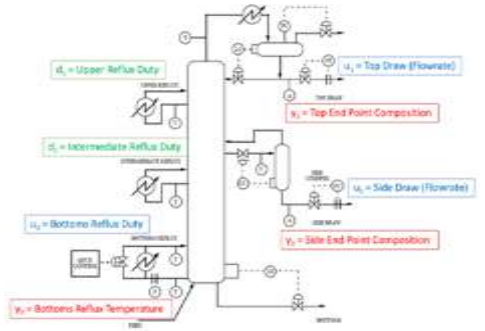
2. Commercial ORTO™ software developed

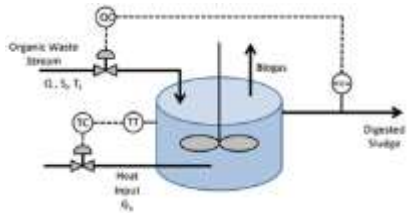


3. Internally tested to optimize systems / processes, for example:
   - Numerous academic benchmark problems
   - Distillation column optimisation
   - Variable speed wind turbine power output maximisation
   - Total power maximization from a wind farm
   - Wider optimization problems, including
     - PID control adaptive tuning
     - Non-linear Model parameter estimation



4. ORTO independently tested and validated by a specialist third party
   - Applied to 'benchmark' optimization problems:
     - Anaerobic Digestion Reactor
     - Shell Heavy Oil Fractionator
   - All success criteria achieved:
     - Minimal training needed
     - Schemes quickly implemented
     - Constraints adhered to
     - True optimum found and then tracked
     - Software intuitive, easy to use





Recent Applications

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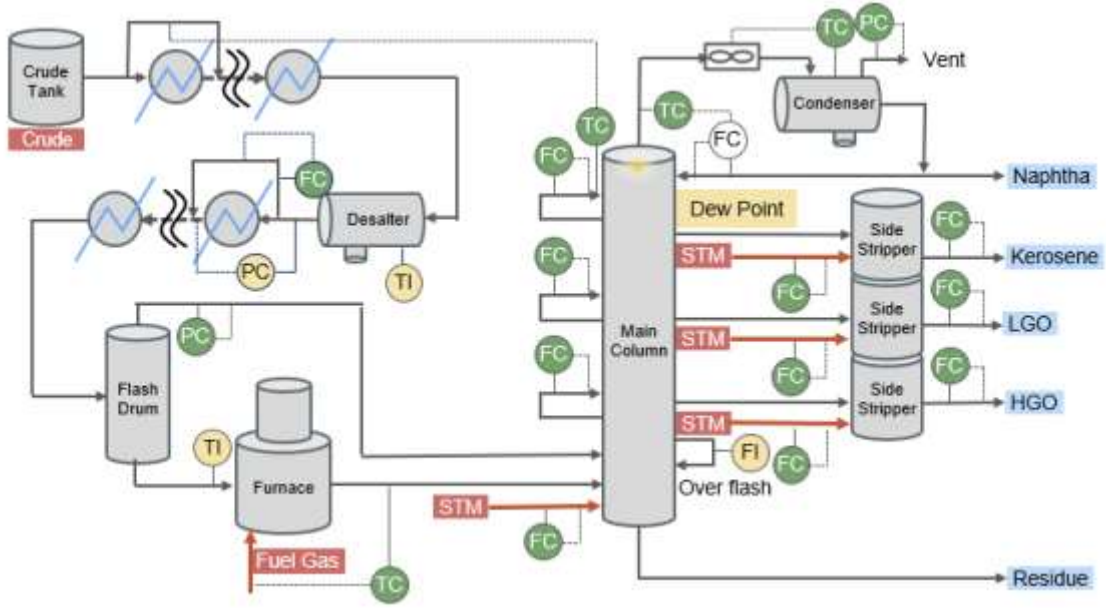
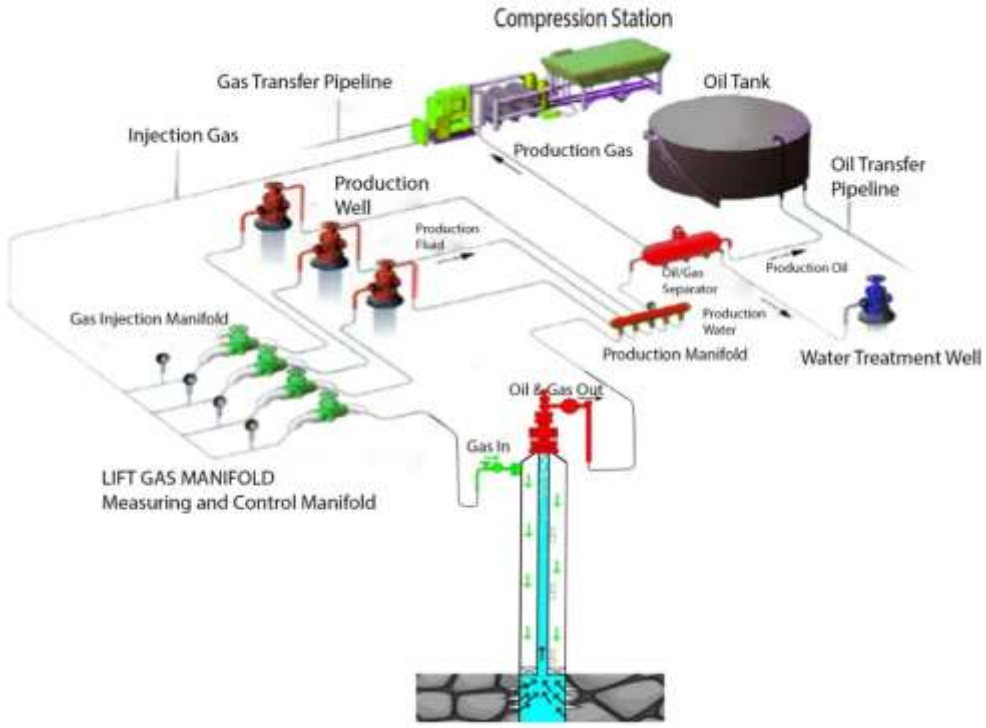
CDU Optimisation

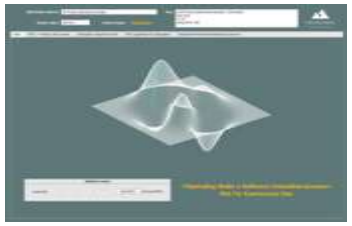


Gas Lift Optimisation



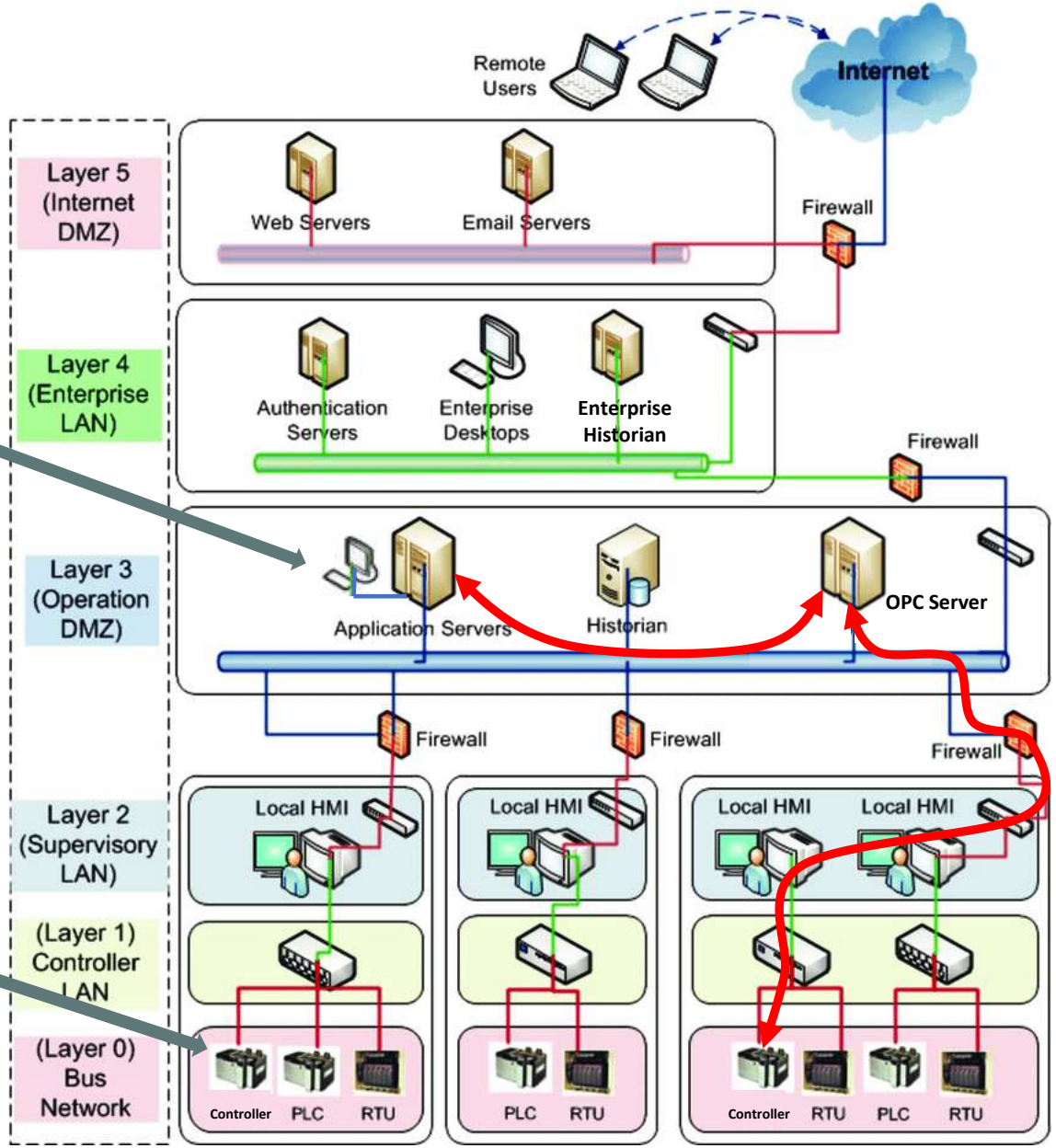
Implementation Pathways….

ORTO™ Software Installation



ORTO™ Agent Algorithm

(future)



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ORTO software…

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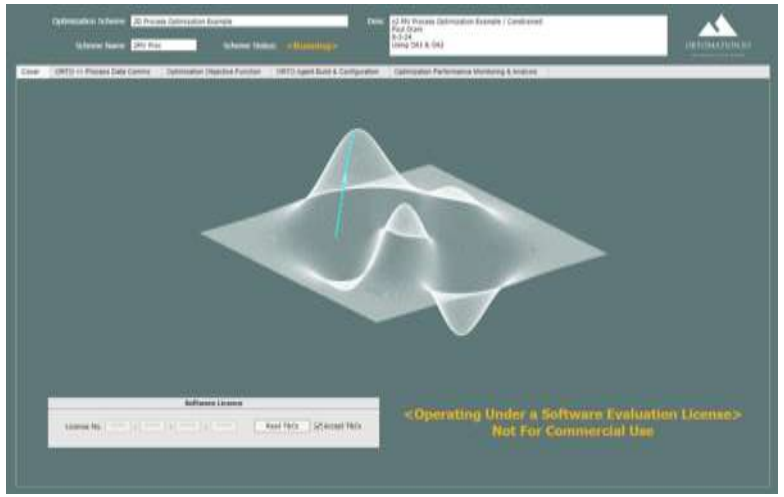

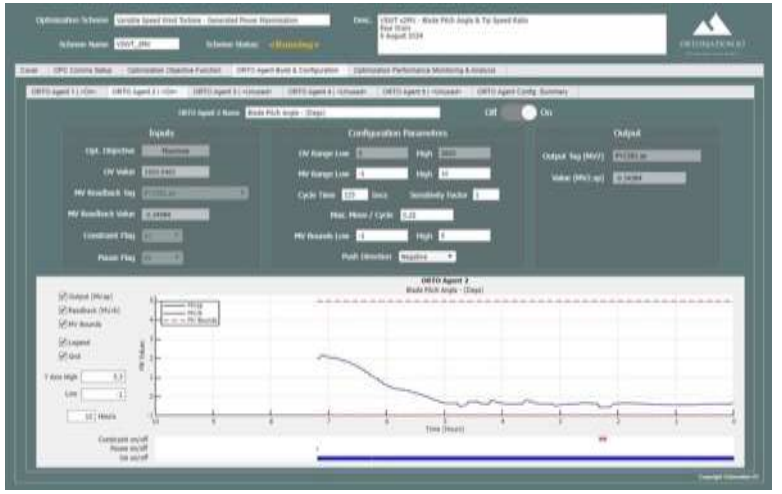

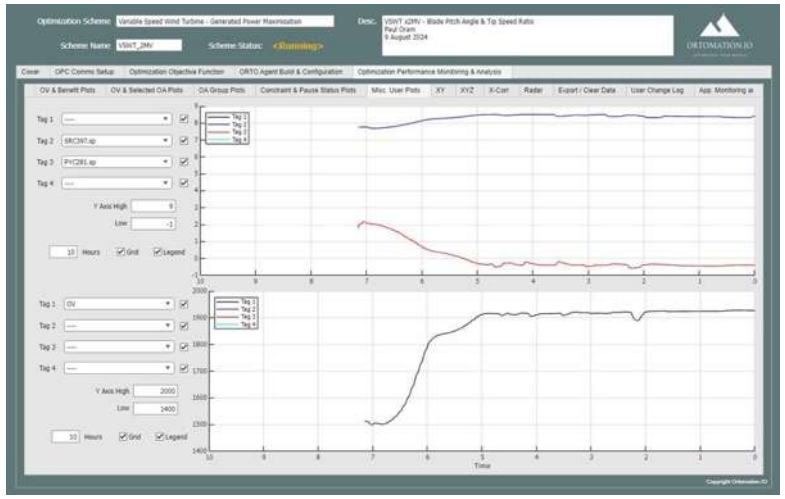

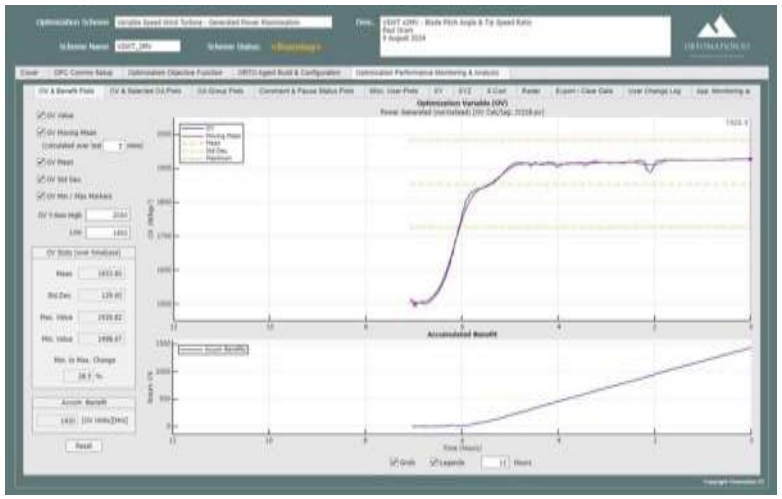

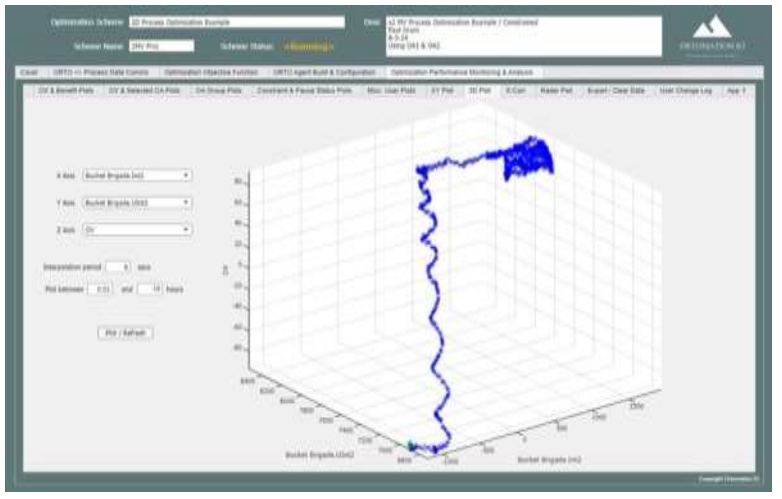

Summary

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- ORTO is:
  - A completely **new approach** to real-time optimisation
  - **Model-free**
  - Dramatically reduces **engineering effort**
  - Highly **scalable**

‘As simple as PID’

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Need more info?

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