The Virtual Process Overview and Applications

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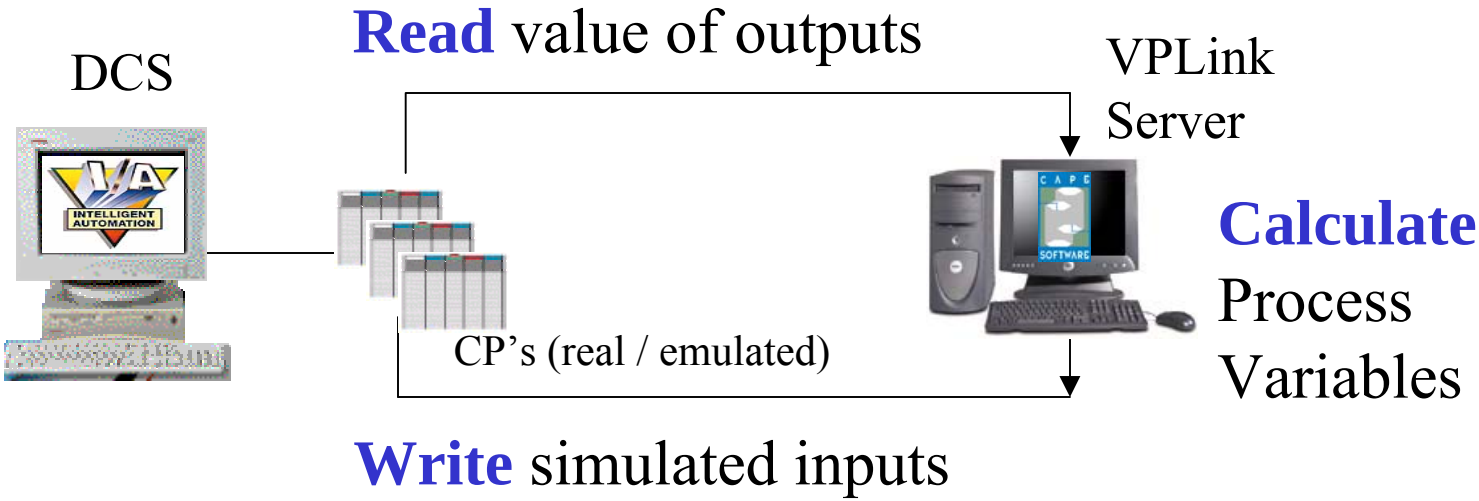
VP Link

The Virtual Process Loop

- I/O Tag-based modelling blocks
- Direct Connect **bypasses hardware I/O boards**
- Interfaces with **real/emulated controllers**



Supported Systems

- **Foxboro I/A series, Archestra, A^2**
- **Triconex:Tricon / Trident / Emulator**
- Honeywell Experion PKS ,TPS , Honeywell FSC, eXPerion Safety Manager
- Honeywell Plantscape / Rockwell ProcessLogix
- GE Fanuc series 90
- A-B PLC5/SLC500,CLX, Modicon,Siemens-Ti 505
- Siemens APACS, PCS7, S7
- ABB Mod300, Advant
- Yokogawa CS3000/R3/ ProSafe
- Etc...

Some of our customers...

BASF – many plants across several sites W/W

TOTAL– Netherlands

Eastman – several systems within Kingsport, TN

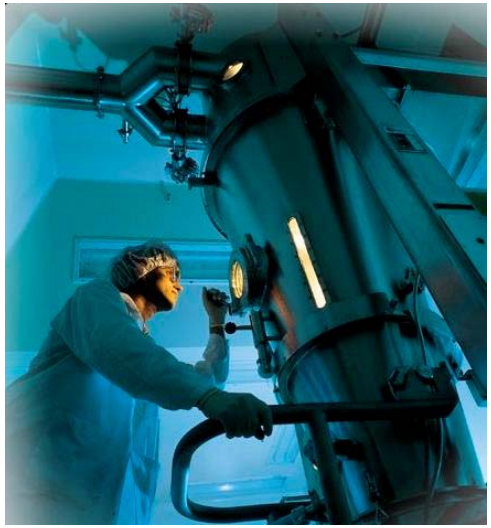
Air Products & Chemicals – several systems W/W

ConocoPhillips –Several Sites Licenses

ChevronTexaco – Several Sites Licenses

Phillips Refining – Several Sites Licenses

Rohm and Haas – PA site license



BP – several licenses at several sites

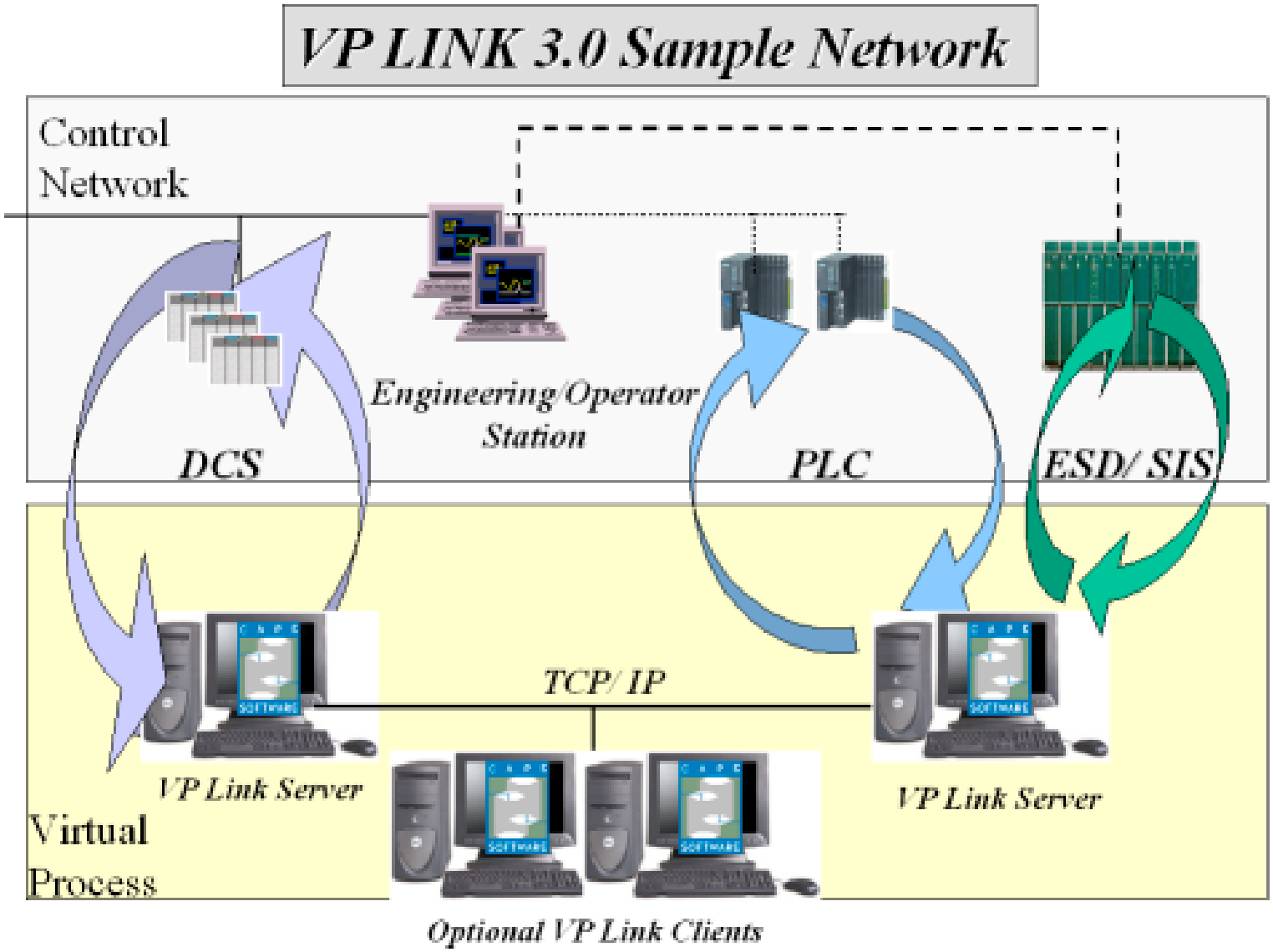
Shell Deepwater / Shell Chemicals,UK

Eli Lilly – Corporate licensing

Genentech – several licenses at different sites

General Mills – W/W licensing

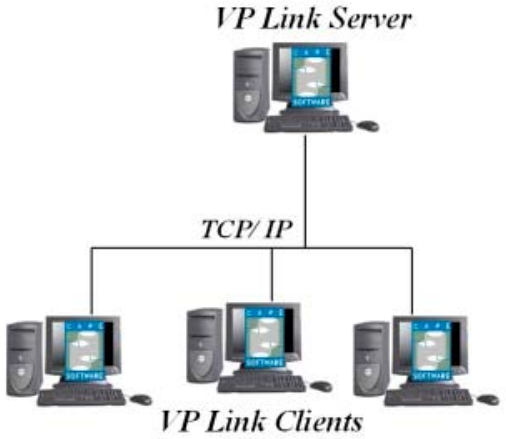
Dow / Dow Corning – Several Sites



Control Network Systems are solving the logic, responding to simulated VP Link inputs

Different Architectures for different Applications

Integrated Training or FAT Setup



Trainees operate different units, interacting with each other

Parallel Training Setup

Trainees operate identical units, in parallel

Virtual Process for IA Series with Triconex Systems

VP Link 3.0

Server(s)

Trainer Station

VP Link/IA Interface

over Ethernet

AW 51/70
with VP3 driver:
•Solves Logic
•Trainee GUI

VP Link/Tristation Interface

optional
VP Bridge
Not required with real chassis

NodeBus

Tristation Emulator Station

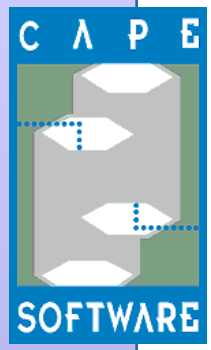
CP
Controllers
(or emulated)

Trainee Station

Does the type of process matter ?

- VP Link is a proven solution for :
  - Batch (recipe / state control)
  - Semi-continuous
  - Continuous

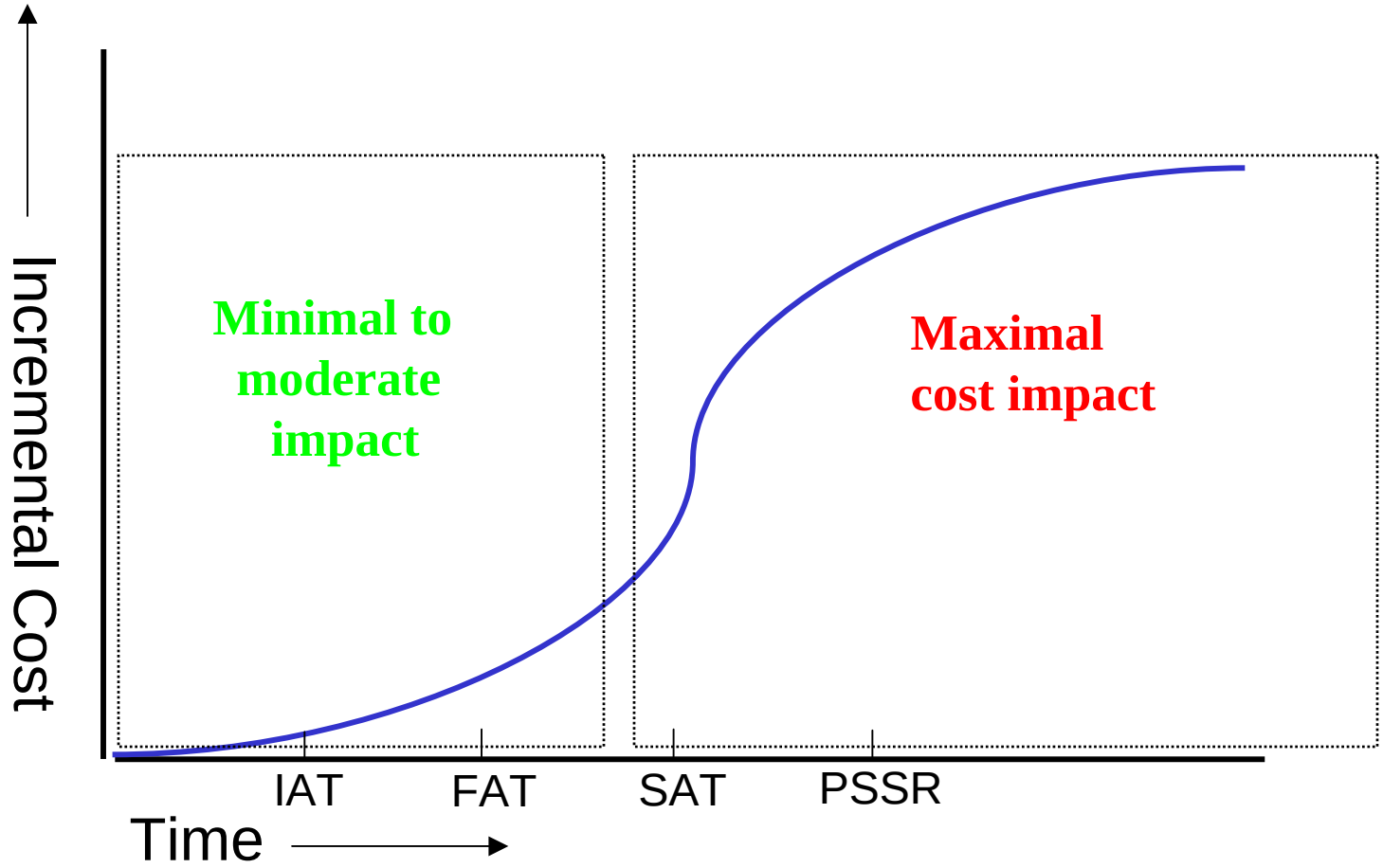
- How ?
  - VP Link model is I/O based
  - Hence, isolated from control strategy



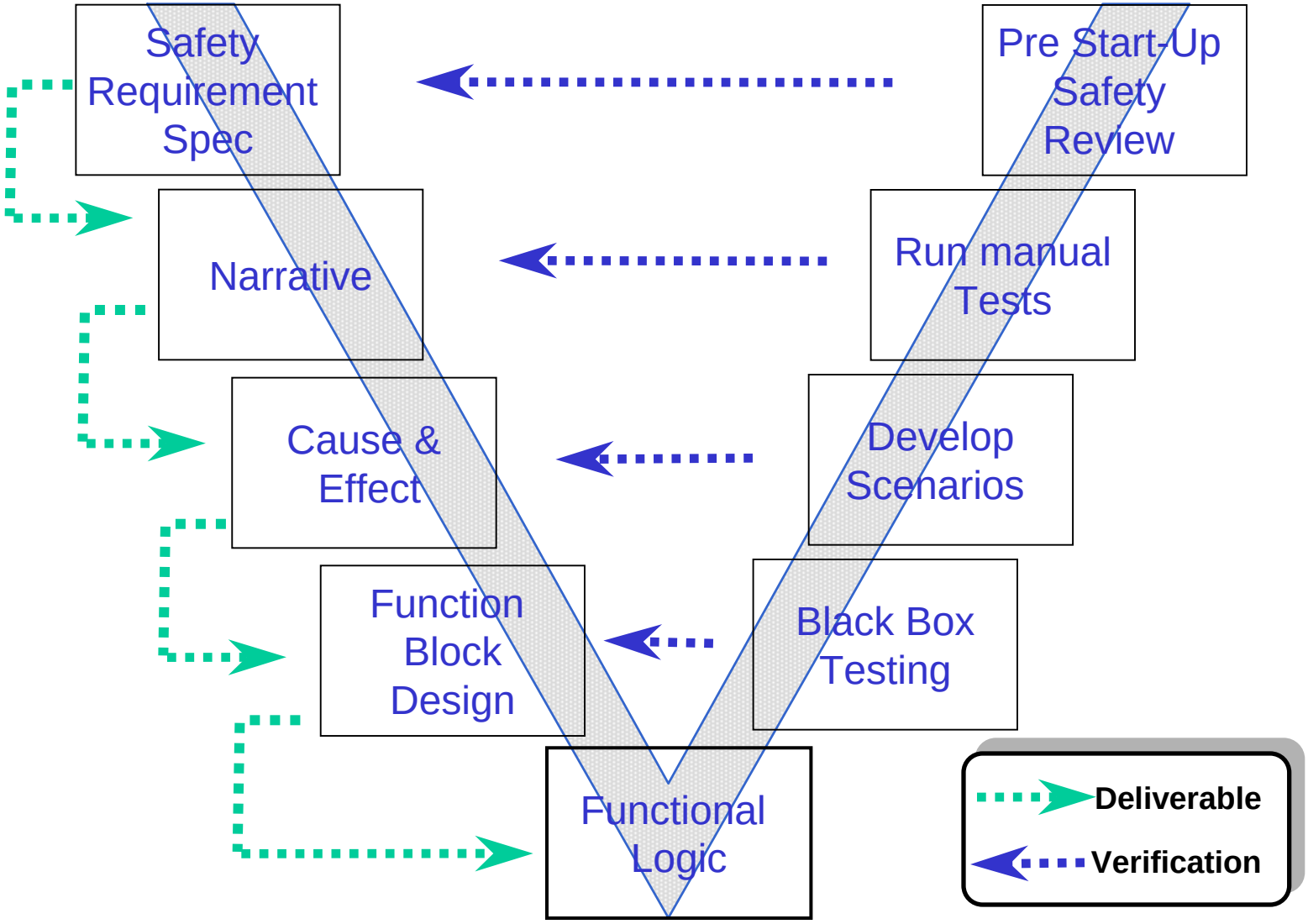
VP Link Applications

I - Logic Validation

Impact of change during a project development cycle



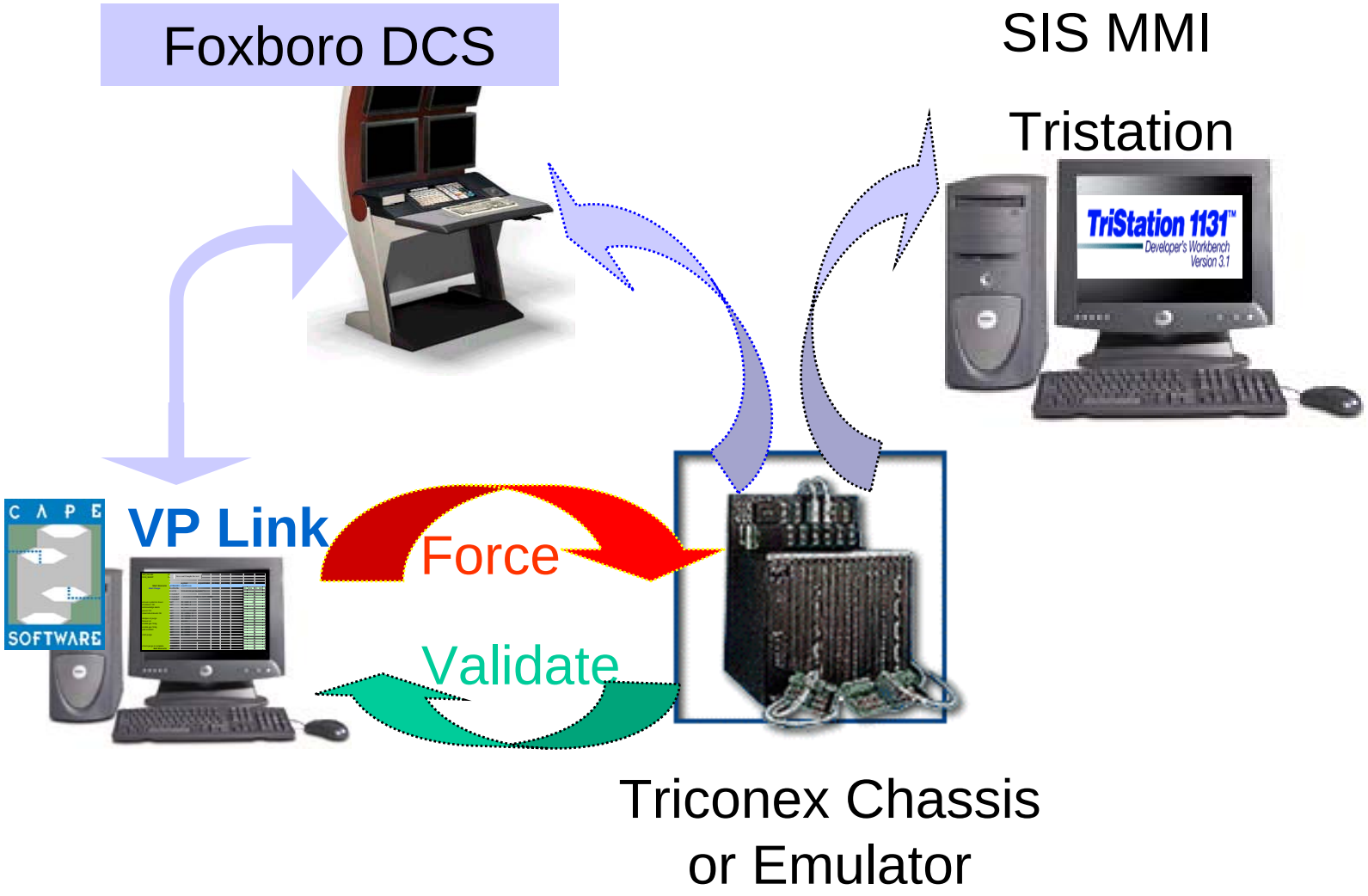
V-Approach methodology: application to validation

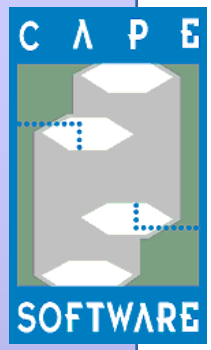


I - Logic Validation

- VP Link Allows:
  - Graphics verification
  - Logic checkout at I/O / block / module / system level
  - Interlock schedule approval
  - Integrated Testing :Mapping to DCS and interaction between DCS/PLC logic (gateway points tests)
- How ?
  - Automates repetitive testing task (ie resets etc…)
  - Facilitates FAT with customized graphics
  - Collaborative testing framework thru distributed architecture
- Thoroughly debug prior to online download, ie, Management of Change and periodical testing
- **Test Compiler complies with IEC61508/61511**

Integrated Testing of Distributed Program





VP Link Applications

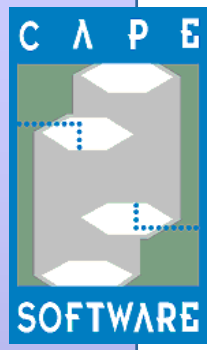
II- Operator Training Simulator (OTS)

II- Goals of Operator Training

- Familiarize staff with HMI, Overlays, Navigation, Alarm Pages, Trend Displays
- Exercise Startup / Shutdown Procedures
- Test Operator's Emergency Response to Faults / Malfunctions / Upsets (Real or Instrumentation)
- Refresher Training or Re-certification
- Track trainee's proficiency (**Scoring Engine**)
- Knowledge Transfer Tool

Operator Training System (OTS) using VP Link

- *Real control program* is used, in same field controllers for realistic control response
- Trainees operate the virtual plant using the real *field consoles, graphics and keyboards*
- *ESD* (Emergency Shutdown Device) is fully integrated in the process model and OTS
- *HMI graphics are imported* in VP Link to offer a intuitive trainer interface
- *High Quality* process modeling tools, simulating the most complex chemical processes (Rx,Dist…)
- *Scoring Engine* for knowledge retension metrics
- *Experienced* simulation staff in the *chemicals industry*

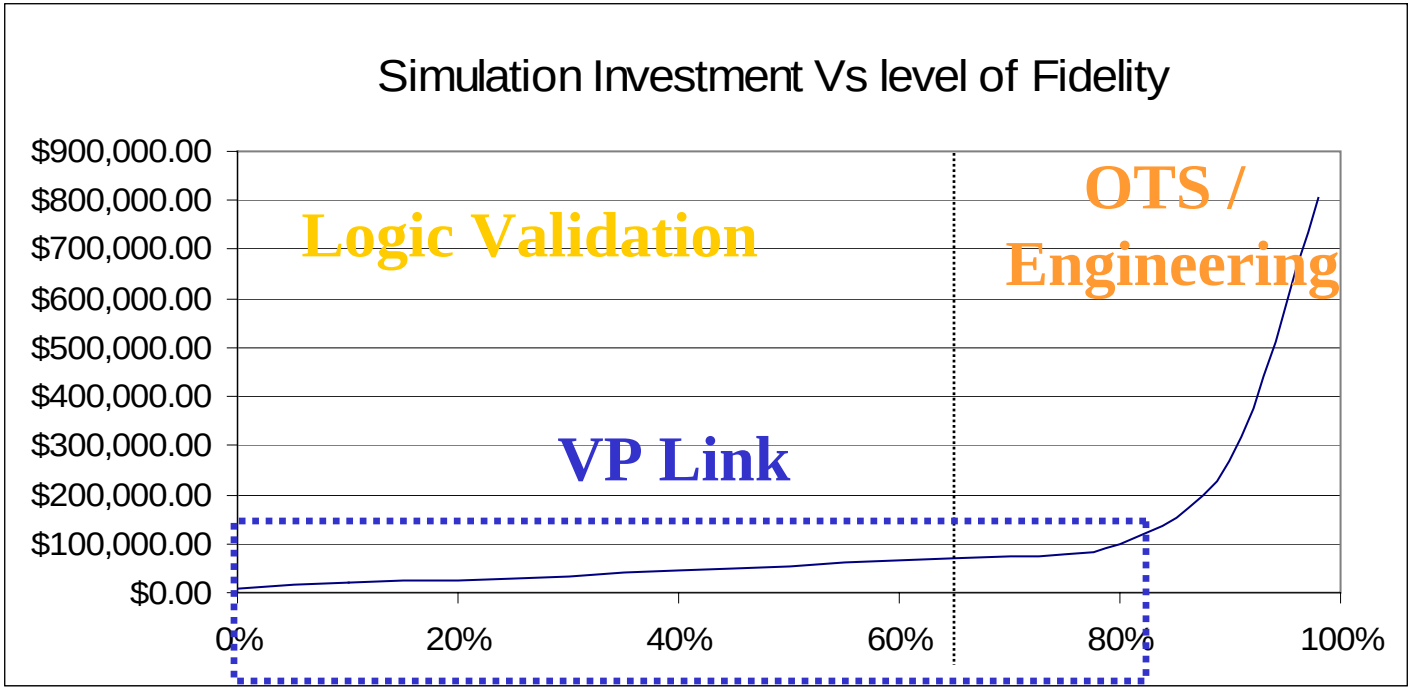


What kind of process simulation do I need ?

Facts about Process simulation Fidelity Level

Cost Analysis of process model fidelity

- ~ 2,000 I/O
- Refining units (treater/separation)



Medium Vs High Fidelity Process model

- Medium Fidelity
  - validation & OTS
  - Heuristic / Hybrid
  - dynamic
  - Connects to DCS
  - Console graphics
  - DCS upgraded during normal maintenance
  - $50k-$150k
- High Fidelity
  - Plant study (sizing)
  - Predictive
  - steady or approx.
  - Invasive or Emulation
  - replicate HMI
  - Heavy maintenance
  - $500k-$1M

Why is Hybrid modelling more cost effective ?

- No compositional (I/O based) = more flexibility
- Control loops compensate for model approximations
  - Ex: Linear Flow across valve Vs ΔP driven flow
- Rigorous modules available:
  - **Distillation** modules(ex: Air separation colums at 3 9 purity,in reduced pressure,cryo temps)
  - **Heat Exchanger**/ condenser blocks
  - **Reactor** modules(catalytic,treating,cracking etc)
  - **Liquid Flow Network** / HxNGen
  - **Sequential** and **Simultaneous** Matrix Solving schemes integrate seamlessly
- Layer Approach minimized model upkeep costs
- VP Link allows exactly for desired model fidelity

Maximize your ROI with VP Link

- Minimize your operating costs & investment:
  - Fixed investment for simulation based on **I/O count**
  - **Low maintenance** cost (non-invasive, I/O based)
  - High **portability** (X Platforms / X Projects)
- Maximize your gain:
  - **Gains** calculated over **process lifecycle**
  - Highly **variable gains** depending on flexible implementation **timing** (if used for **validation** AND **OTS**) in terms of schedule AND software quality

QUICK FACT :

Invensys uses our solution on both Foxboro and Triconex Staging Floors

Conclusion

- VPLink solves simulation needs from *simple to sophisticated* modeling in a continuous framework
- OTS node can used as an engineering Test Bed system for *preventive / periodical logic validation*
- *Unattended Real Time* trainee performance logs
- Modeling environment is *flexible,easy to learn and maintain and platform neutral*
- *Lowest Total Cost of Ownership* thanks to a non-invasive, I/O based simulation
- *Cost Effective* simulation package for *OTS And Validation*,using Off the Shelf components
- *Cross platform* functionalities makes VP Link a *portable, evolutive investment*