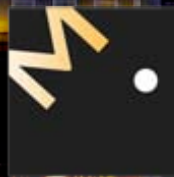
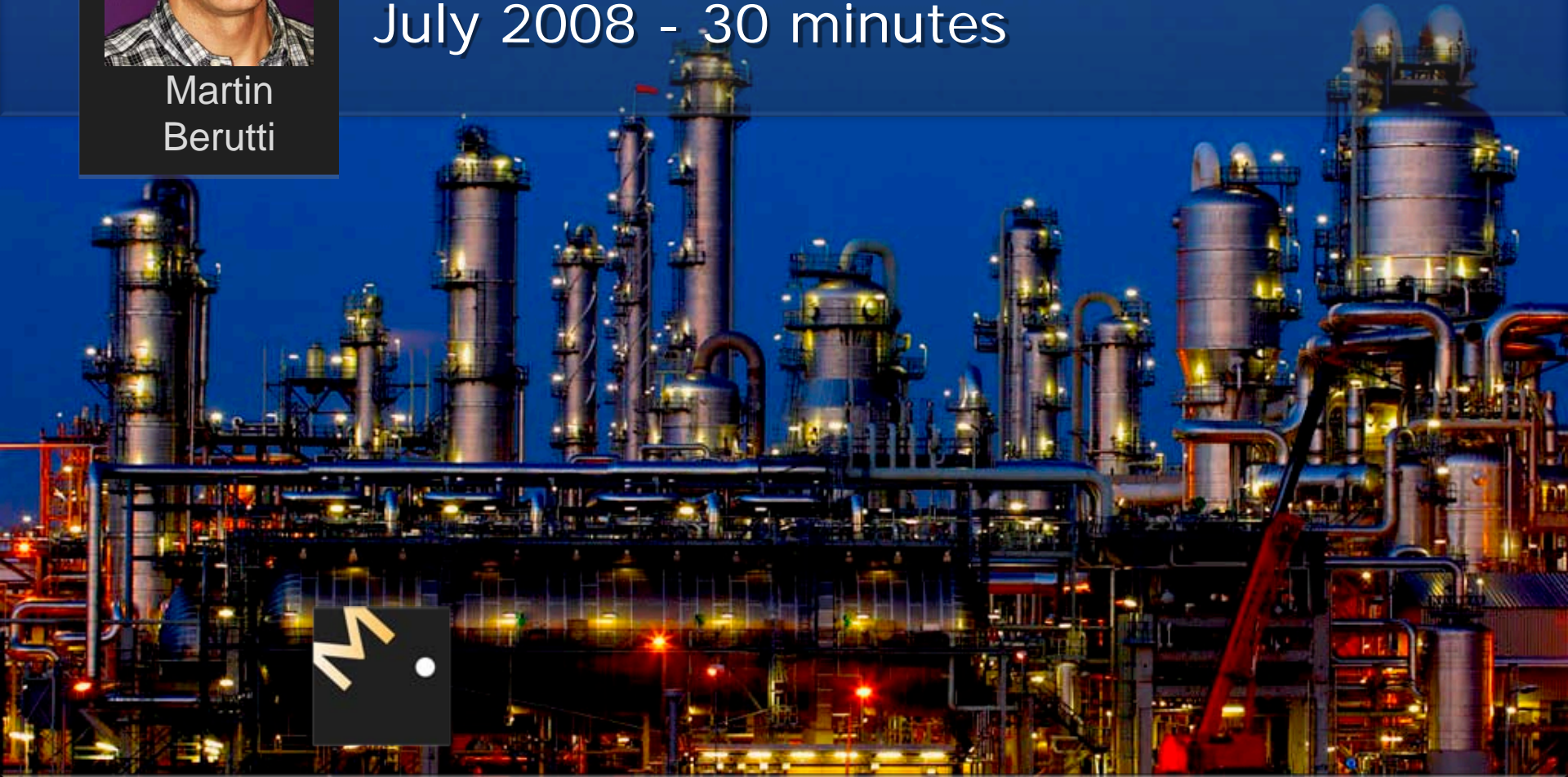




Martin
Berutti

Architecting Simulation Systems for DeltaV

July 2008 - 30 minutes



M Y N A H



Simulation for DeltaV

- Using off-line simulation systems for [DeltaV](#) project software acceptance testing and operator training
- Planning for the goals of the CapEx or OpEx project
- Architectures and components of systems
- Protecting control system integrity
- Choosing model fidelity or complexity
- Getting the most return from the investment

■ **Simulation Systems for Software Acceptance Testing - SAT**

- How many users (test engineers or users)
- Span of testing – process unit or train, unit operation
- Level of testing – control modules, equipment modules, batch, advanced control, MES, EBR, ERP
- IO systems, 3rd-party devices (ESD, PLC)

■ **Simulation Systems for Operator Training - OTS**

- How many operators, availability
- Span of training – process unit or train, unit operation
- Team or individual training
- Training tasks or goals – scenario top level design
- Record keeping requirements

- **DeltaV Simulate** - DeltaV licensing scheme for “off-line” simulation systems
- Standalone – no DeltaV Networking
- MultiNode – DeltaV networking, Station function licensing, DeltaV controllers
- SimulatePro option for Standalone or MultiNode
 - Increase module execution memory from 16 MB to 96 MB
 - Supports freeze/snapshot/restore, speedup/slowdown
- Simulate Convert – FF, Digital Bus IO configuration to run in DeltaV Simulate Workstation

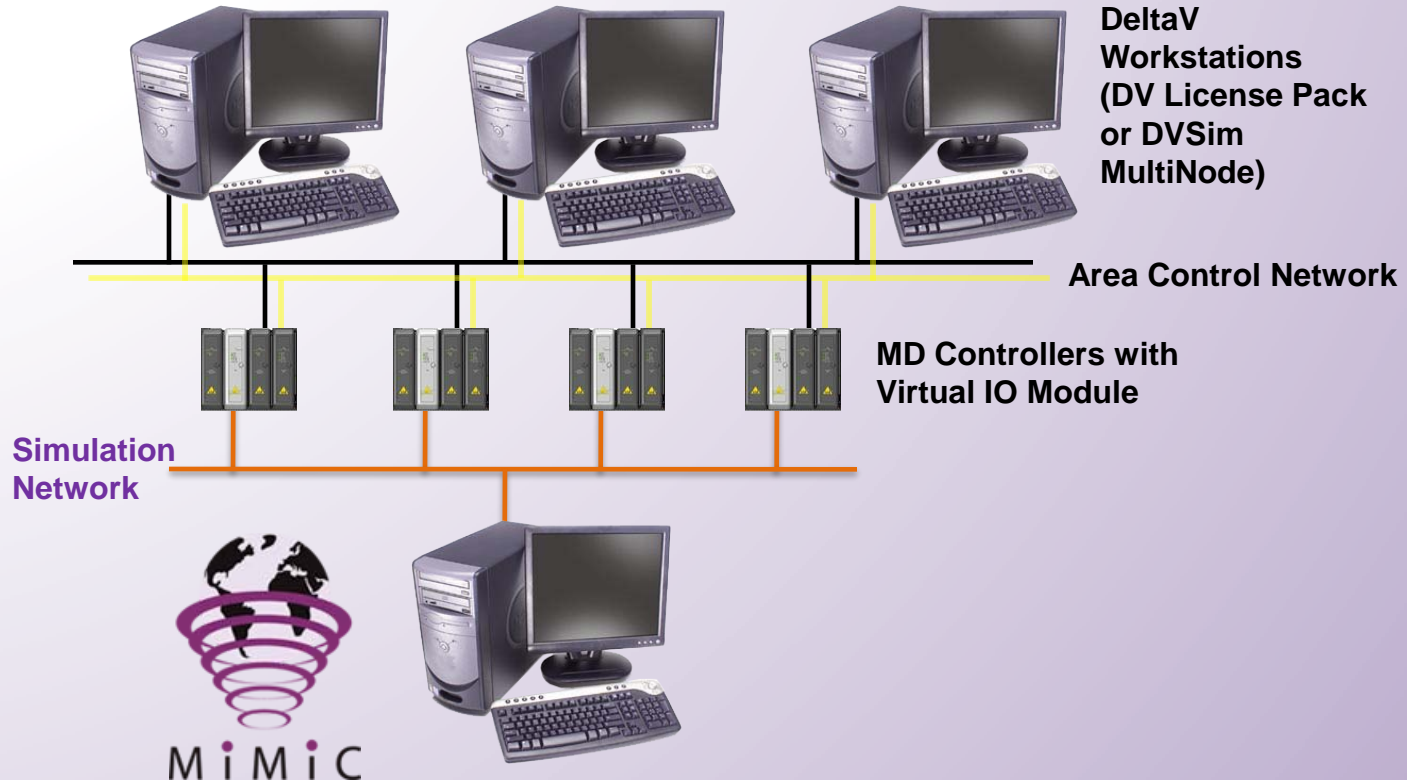


- **MiMiC Simulation Software** – dynamic process and IO simulation for SAT and OTS
- Simulation Engine License – 1000 to 30,000 Simulated IO (SIO) Tags
- SIO Drivers for DeltaV Simulate, SIS, DeltaV IO Bus
- Operator Training Manager – structured training scenarios with integral session scoring, reporting
- MiMiC Server – allows 10 Remote Terminal Services session to one MiMiC Simulation Engine (MS Server 2003 OS)



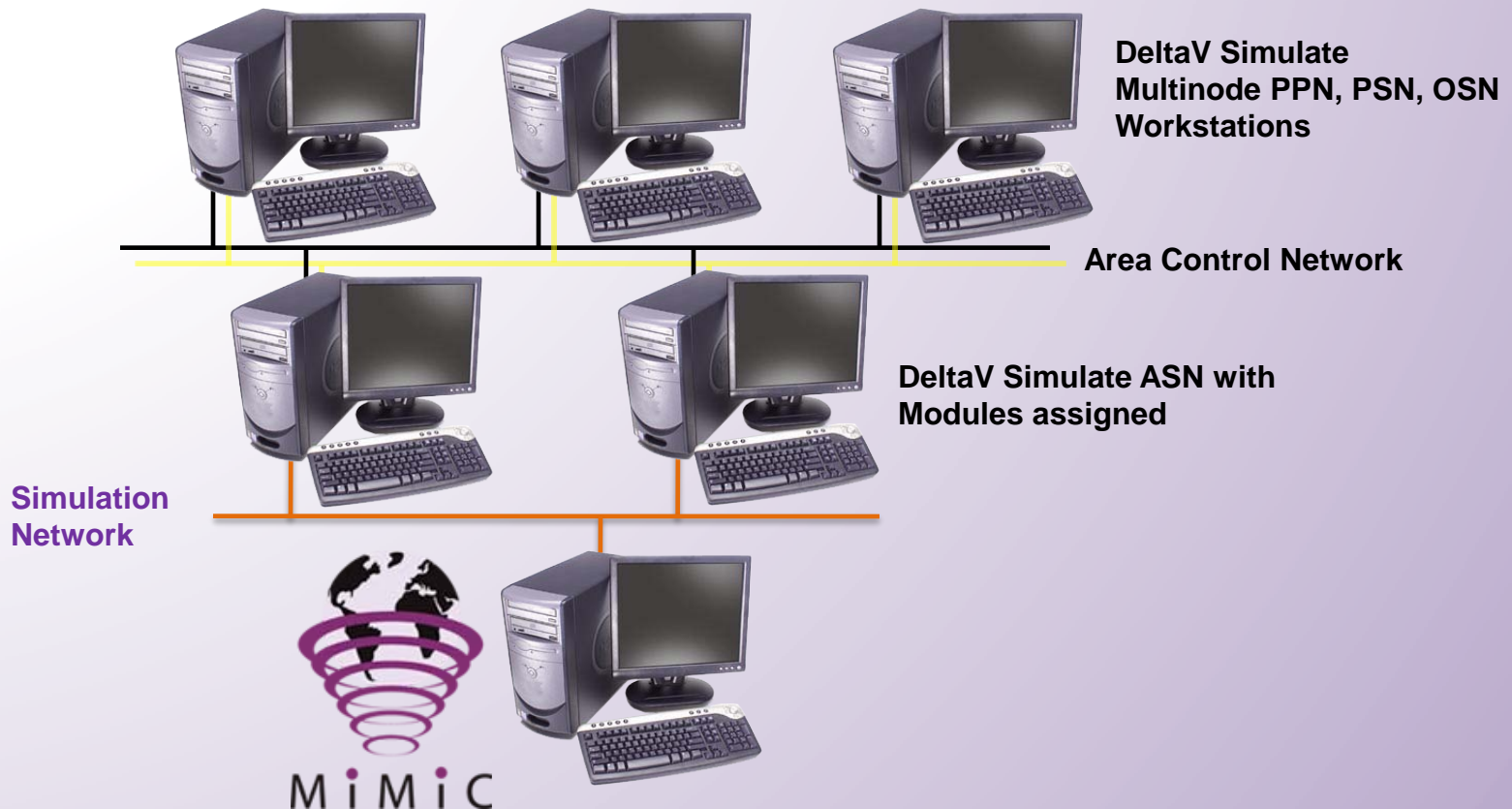
■ Software Acceptance Testing Systems

- Non-intrusive IO simulation (FF, Digital Bus IO, Serial IO)
- Validated systems (GAMP4 guidelines)



■ Operator Training Systems – Team Environment

- Module level simulation, IO signal for SIS

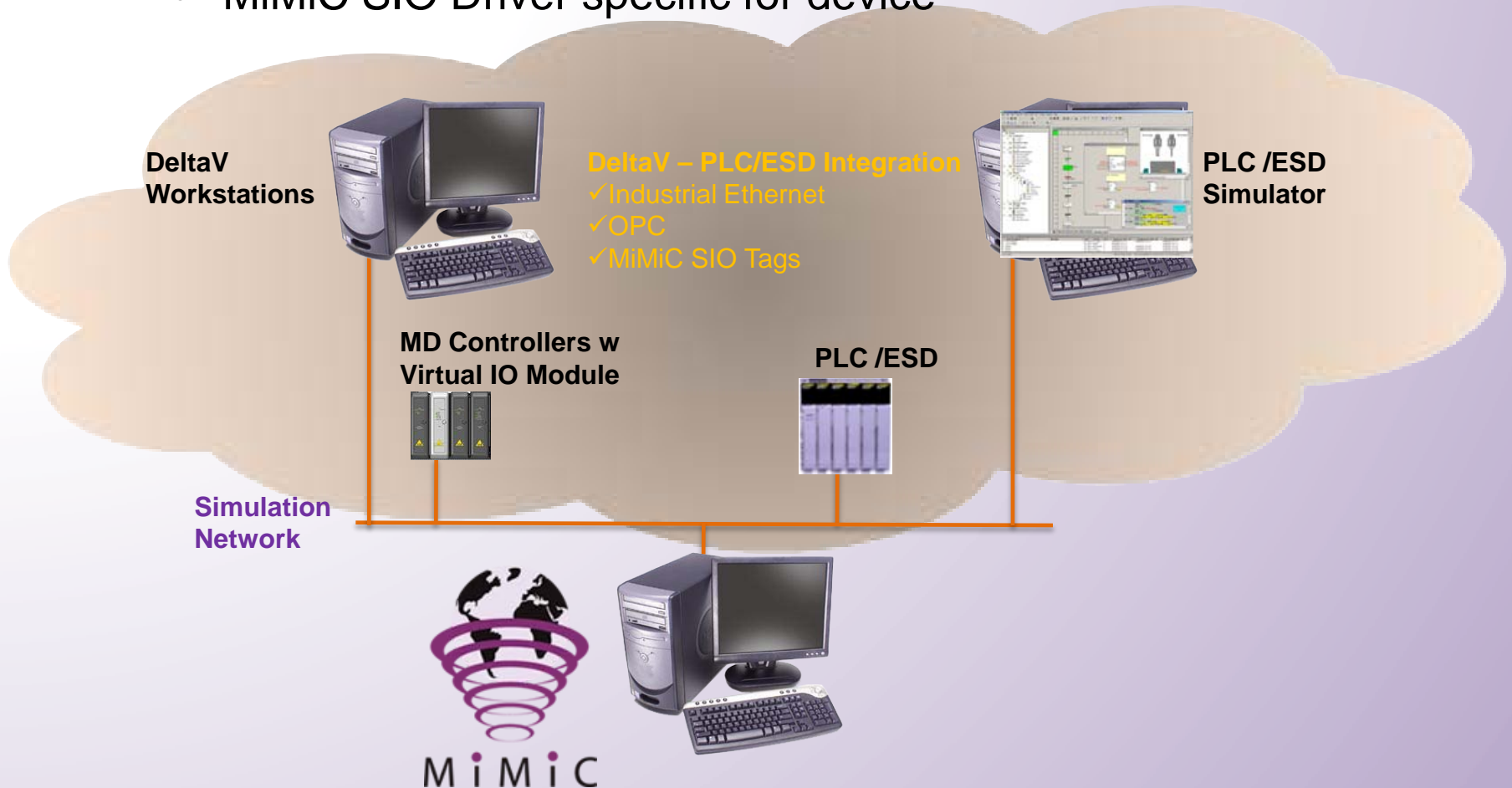


- **Operator Training Systems – Individual Environment**
 - Module level simulation, IO signal for SIS



Architectures and Components

- **SAT and OTS – Integrated System Environment**
 - MiMiC SIO Driver specific for device



- **Minimize or eliminate additions, deletions to the off-line simulation system**
- **Simulate all modules and IO signals**
- **Use MiMiC OTM to drive scenario linkages, session scoring**
- **Use MiMiC for 3rd-party device integration and emulation**
- **Avoid Emulated Simulation Solutions!**
- **Avoid simulation in DeltaV modules!**

- **High Integrity Off-line Systems**
- Exact representation of -
 - Operator graphics, faceplates, detail display, help screens
 - Alarm strategies, priorities, timing, and operator acknowledgement and action response
 - Control strategies including control module, equipment module, sequence and batch, and advanced control loops response
- Support use and emulation of –
 - Physical system management tools - DeltaV Explorer and diagnostics, 3rd party configuration tools
 - Digital bus IO based systems - Foundation Fieldbus

■ Modeling Techniques

- **First Principles** Modeling – based upon laws of conservation of mass, energy using properties
- **Empirical** Modeling - realistic limits to the model using actual or assumed process correlations or data

■ Types of Process Models

- **Steady State** models - plant and process design. No transitions between process states, time delays or lags
- **Dynamic** models – SAT and OTS. Time delays, lags, transport effects are modeled.

■ Model design and math required for Steady State and Dynamic are much different

■ SAT and OTS – we assume the process is designed, models reflect the design dynamically!

- **Fidelity** – **Rigorousness or Complexity of the Model**
 - **Low Fidelity** – simple IO signal modeling, device tiebacks, value initialization. Model requires user intervention to respond to automation system actions.
 - **Medium Fidelity** – mass balance model, heat balance model. Model runs automatically and responds to automation system actions and process changes.
 - **High Fidelity** – complete mass balance, rigorous heat balance, reaction kinetics. Model runs automatically and responds to automation system actions and process changes in a very similar manner to the designed process.

- **Select Model Complexity for the Task**
 - Control Modules – Tieback Simulation, Automated Test Scripts
 - Equipment Modules – Tieback Simulation, Limited Dynamics
 - Sequence, Batch – Mass Balance, Temperature & Pressure Dynamics
 - MES, Advanced Control Applications – Mass Balance, Heat Balance
- **Select Model Complexity for the Process**
 - Tank farm, material movements – lower complexity
 - Distillation, complex reactions, integrated, continuous processes – higher complexity
- **Cost of Model development and maintenance increases with Complexity**

- Plan Simulation for SAT and OTS into the Automation Project Cycle up front
- Begin Testing and Training Early
- Test, test, test... Train, train, train...
 - Database, graphics, interlocks ...
 - Batch, advanced control, reports, MES
 - Device failure, shutdown scenarios
 - Anything that you can't test or train on the live system
- Use simulator for documentation and test records
- Keep the simulation system current with the on-line process automation system

- **Proven CapEx, Opex Benefits to using Simulation for SAT and OTS**
- Time to Market - reduce startup time – \$100-500K / day
- Product Quality - reduce off-spec product – \$50K-\$1MM / run
- Operating Cost - reduce unscheduled downtime – \$5-50K / hour
- Reduce Risk – reduce unknown failures and incidents - \$50K - \$1MM / incident

■ MiMiC Simulation Software

- Over 900 Systems Installed Worldwide
- Control Magazine Reader's Choice Simulation Software 2006, 2007, 2008
- Exceptional Customer Service

■ **Getting More Information – www.mynah.com**

- White Papers, Podcasts
 - ✓ Understanding Simulation Fidelity
 - ✓ Simulation System Integrity
 - ✓ Simulation Objections Answered
 - ✓ Delivering the Promise of the Virtual Plant
 - ✓ Testing with Simulation in Life Sciences Industries
 - ✓ Proven Refinery Operator Training Solutions
- MiMiC Users Forum – www.mynah.com/forum/
- MYNAH E-News
- MYNAH Forum RSS – Updates, Releases, KBAs, FAQs
 - ✓ MiMiC v3 Modeling Examples

■ **Contact for Questions**

- Martin Berutti, +1.636.681.1567, Skype mberutti
martin.berutti@mynah.com

