Multi-Agent Testbed for Emerging Power Systems

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Appropriate testbeds for studying multi-agent systems are needed.

Existing power system simulation does not include facilities needed for studying multi-agent systems.

- Cyber-physical
- Computational facilities
- Data communications

Requirements
- Real-time
- Ability to run a variety of software
- Multiple OSs (e.g., Windows, Linux)
- Languages and tools
  - C/C++, Java, Python
  - Matlab, JADE
- Sufficient computational power
- Communications
  - Inter-agent
  - Power system
- Portability
- Cost effective

Features
Computational Resources
- 6 Versalogic “Mamba” boards
- 6 TS-7800 embedded ARM boards
- 2 Rockwell PLCs
- 1 Xilinx ML507 board (FPGA)
Communications
- 2 Ethernet communication networks
- OPNET real-time simulator
Power System Simulation
- 14 RTDS “racks”

Lessons Learned
Need for automation
- Artifacts from one experiment to the next
- Less error prone
- Time consuming to manually setup testbed for various configurations
- “Wiring” for electrical connections (interface to power systems simulator)

Benefits of real-time simulation
Multiple computational facilities
- General purpose
- High and low performance
- FPGA
- PLC
Data communications simulation
- Topologies
- Communication technologies (e.g., wireless, fiber-optic)