



PCS Research at UMR

6 March 2007

Dr. Ann Miller

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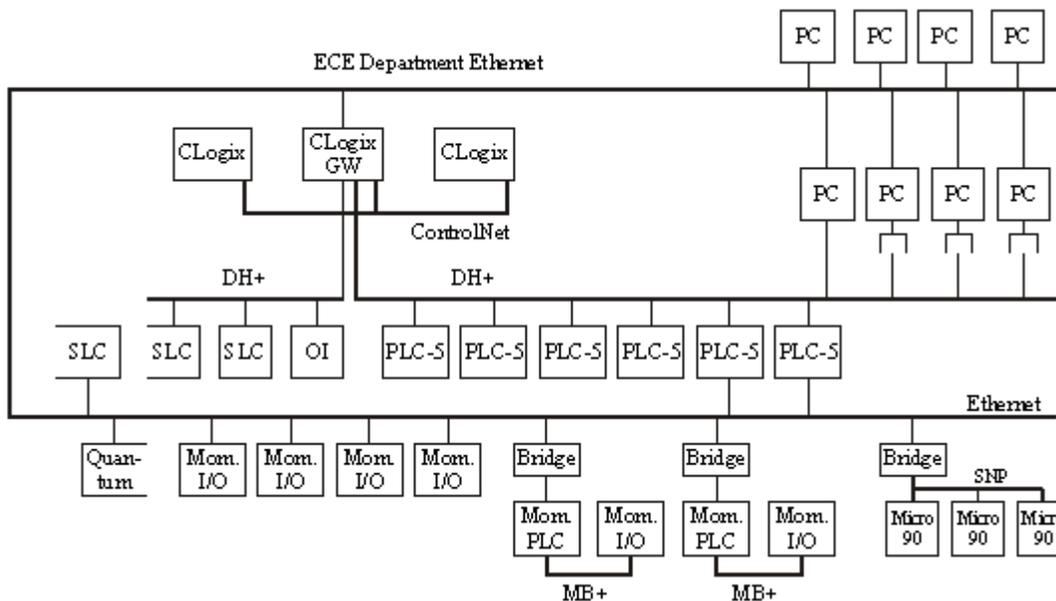
The University of Missouri – Rolla

- **Predominantly engineering and technology**
- **Departments include:**
 - **Electrical and Computer Engineering**
 - **Civil Engineering**
 - **Petroleum Engineering**
 - **Nuclear Engineering**
 - **Computer Science**

The University of Missouri – Rolla

- **We are a small university; our strength is in our inter-disciplinary research**
 - **Center for Critical Infrastructure Protection**
 - **Intelligent Systems Center**
 - **Center for Infrastructure Engineering System**
 - **Transportation Institute**
- **Sample studies follow**

Factory Automation Lab



- **3-tiered factory automation laboratory for Supervisory, Control, And Data Acquisition (SCADA)**

- Workstations
- Programmable Logic Controllers (PLCs)
- Sensors

UMR Power Engineering Research

- **"Incorporation of Energy Storage into FACTS Devices," (Sandia National Laboratories)**
- **"Fault Tolerance and Security for Power Grid Configuration with FACTS Devices, " (National Science Foundation)**
- **"Hybrid Interconnected Systems Laboratory Project," (Missouri Research Board)**
- **"Verification of Protective Device Coordination on Distribution Feeders," (Illinois Power)**

Electric Power Related

- **“Symbolic Reduction for High Speed Power Control”, W. Siever, D. Tauritz, A. Miller, M. Crow, B. McMillin, submitted 2007.**
- **“Blueprint for Iteratively Hardening Power Grids Employing Unified Power Flow Controllers”, W. Siever, A. Miller, D. Tauritz, accepted for IEEE Service of Energy and Security, April, 2007.**
- **“Modeling the Impact of UPFCs”, W. Siever, A. Miller, D. Tauritz, Submitted 2007.**
- **“Improving Fault Tolerance by Gradient-based Control of FACTS Devices”, William Siever, Ann Miller, and Daniel Tauritz, Artificial Intelligence in Energy Systems and Power, Funchal, Madeira, Portugal, February, 2006.**

Oil and Gas Pipeline Related

- **“Reliability of SCADA Systems in Offshore Oil and Gas Platforms”, K. T. Erickson, E. K. Stanek, E. Cetinkaya, S. Dunn-Norman, and A. Miller, Chapter 20 of *Stability and Control of Dynamical Systems with Applications*, Liu and Antsaklis, Editors, Birkhauser Press, 2003.**
- **“Reliability of Pressure Safety Alarms (PSLs) in Offshore Gas Transmission Pipelines,” S. Dunn-Norman, K. T. Erickson, A. Miller and E. K. Stanek, Gas Technology Institute Conference and Exhibition, 29 September - 2 October, 2002.**
- **Miller, A., S. Dunn-Norman, K. T. Erickson, and E. K. Stanek, “Pipelines as Networked Communication Links,” Poster session, DOE/NETL Natural Gas Infrastructure and Reliability Program Conference, Morgantown, WV, 16-17 September, 2002.**
- **Dunn-Norman, S., Erickson, K. T., Stanek, E. K. and A. Miller, “SCADA Trends in Deepwater Developments,” Rio Oil & Gas Expo and Conference, Rio de Janeiro, Brazil, 16-19 October, 2000.**

General: Vulnerability Analysis

- **“Four Phase Approach to Network Vulnerability Analysis”, Ann Miller, Invited Address, Centre for Software Reliability, City University of London, March, 2006.**
- **“SCADA System Vulnerability Analysis”, A. Ramalingam, A. Miller, K. T. Erickson, Proceedings of the Working Together: R&D Partnerships in Homeland Security Conference, Boston, MA, April 27-28, 2005.**
- **“Multi-Layer Vulnerability Assessment of a SCADA Network”, A. Miller and K. T. Erickson, International Workshop on Research and Education in Control and Signal Processing, REDISCOVER 2004, Cavtat, Croatia, June 2004.**
- **“Network Vulnerability Assessment: A Multi-Layer Approach to Adaptivity”, A. Miller and K. T. Erickson, NATO Symposium on Adaptive Defence in Unclassified Networks, pp. 13-1 – 13.8, April 2004.**

Vulnerability Analysis: PCS and SCADA System Specific

- **“Process Control Systems Security Analysis Using Reverse Engineering”, J. Trent, UMR MS Thesis, 2006.**
- **“SCADA System Vulnerability Analysis Using Command Data Packet Manipulation Attacks”, A. Ramalingam, UMR MS Thesis, 2004.**

General: Assurance Cases for Security

- **“International Working Group on Assurance Cases (for Security)”**, Robin E. Bloomfield, Sofia Guerra, Marcelo Masera, Ann Miller, and Charles B. Weinstock, *IEEE Security and Privacy*, Vol. 4, Number 3, pp. 66 – 68.
- **“Assurance Cases for Dependability and Security”**, Robin Bloomfield and Ann Miller, Joint EU-US Workshop on Large ICT-Based Infrastructures and Interdependencies: Control, Safety, Security, and Dependability, Washington, DC, March 2006.

Assurance Cases for SCADA Security

- **“Formalizing Attack Trees for a SCADA System”, K. M. Moleyar and A. Miller, to be presented IFIP, March 2007.**
- **“Developing an Assurance Case for Security of a SCADA system”, K. M. Moleyar and A. Miller, to be submitted.**
- **“Assurance Case for Process Control System Security”, Ann Miller, Assurance Cases for Security: Communicating Risks in Infrastructures Workshop, Ispra, Italy, March 2006.**