TCIPG TECHNICAL CLUSTERS AND THREADS

Trustworthy Technologies for Wide Area Monitoring and Control
- Communication and Data Delivery (4 activities)
  - Applications (2 activities)
  - Component Technologies (2 activities)

Trustworthy Technologies for Local Area Management, Monitoring, and Control
- Active Demand Management (3 activities)
- Distribution Networks (1 activity)

Responding To and Managing Cyber Events
- Design of Semi-automated Intrusion Detection and Response Techniques (6 activities)

Trust Assessment
- Model-based Assessment (2 activities)
- Experiment-based Assessment (6 activities)
Communication and Data Delivery
- Functional Security Enhancements for Existing SCADA Systems
- GridStat Middleware Communication Framework: Management Security and Trust
- State-Aware Decentralized Database Systems for Smart Grid
- Trustworthy Time-Synchronous Measurement Systems

Applications
- GridStat Middleware Communication Framework: Application Requirements
- PMU Enhanced Power System Operations

Component Technologies
- Cryptographic Scalability in the Smart Grid
- In-Field RAS Testing
CLUSTER: TRUSTWORTHY TECHNOLOGIES FOR LOCAL AREA MANAGEMENT, MONITORING, AND CONTROL

Active Demand Management

- Cognitive Bias
- Development of the Information Layer for the V2G Framework Implementation
- Smart-Grid-Enabled Distributed Voltage Support Framework
- Trustworthy Framework for Mobile Smart Meters
CLUSTER: RESPONDING TO AND MANAGING CYBER EVENTS

Design of Semi-automated Intrusion Detection and Response Techniques

- A Game-Theoretic Intrusion Response and Recovery Engine
- Assessment and Forensics for Large-Scale Smart Grid Networks
- Detection/Interdiction of Malware Carried by Application-Layer AMI Protocols
- Intrusion Detection for Smart Grid Components by Leveraging Real-Time Properties
- Specification-based IDS for Smart Meters
- Specification-based IDS for the DNP3 Protocol
CLUSTER: TRUST ASSESSMENT

Model-based Assessment

- Quantifying the Impacts on Reliability of Coupling Between Power System Cyber and Physical Components
- Security and Robustness Evaluation and Enhancement of Power System Applications

Experiment-based Assessment

- 802.15.4/ZigBee Security Tools
- Synchrophasor Data Quality
- Tamper-Event Detection Using Distributed SCADA Hardware
- Testbed-Driven Assessment: Experimental Validation of System Security and Reliability
- Trustworthiness Enhancement Tools for SCADA Software and Platforms
- Understanding and Mitigating the Impacts of GPS/GNSS Vulnerabilities
CROSS-CUTTING EFFORT: EDUCATION AND ENGAGEMENT

K-12 Education
- Interactive lessons, hands-on activities, and curriculum materials
- Partnerships with teachers and schools
- Dissemination activities
- Connections with national curriculum endeavors

Outreach and Workforce Development
- Create interest in STEM related careers
- TCIPG summer schools
- Research opportunities for undergraduates

Consumer Education and Public Information
- Energy information for an informed public
- Consumer acceptance of smart grid technologies and policies
CROSS-CUTTING EFFORT: TESTBED INITIATIVES

**Testbed Development**
- Hardware and software integration to support research
- Coupled system interaction
- Generic visualization of experimental results
- Automated power specific device configuration

**External Involvement**
- DETER Enabled Federated Testbeds (DEFT)
- Utility testbed interactions
- Vendor services
- Hardware and software procurement
CROSS-CUTTING EFFORT: INDUSTRY INTERACTION AND TECHNOLOGY TRANSITION

**Activity Involvement**
- Industry day posters and interest “post-its” follow-up
- PMU data NDAs and processes

**Visits and Collaboration**
- Company visits by students/faculty
- Guest industry lectures and seminars
- Student internships

**Tech Transfer**
- Software testing
- Formal adoption