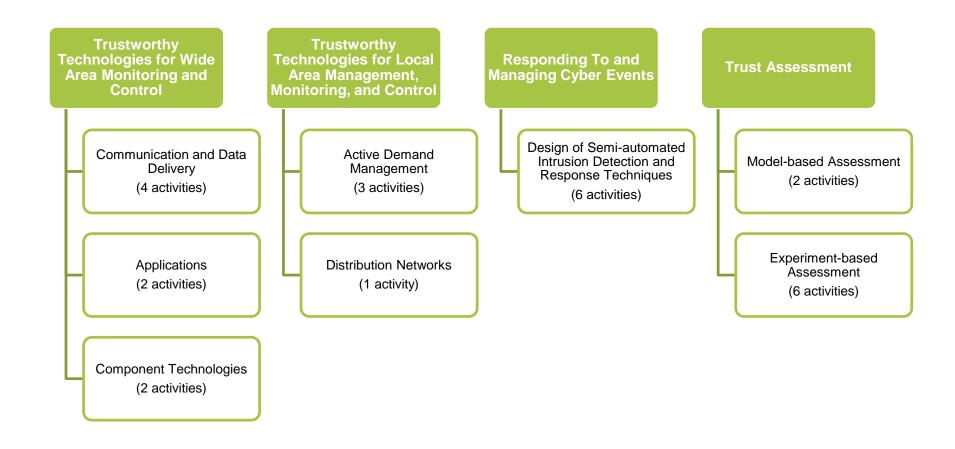
#### TCIPG TECHNICAL CLUSTERS AND THREADS



# CLUSTER: TRUSTWORTHY TECHNOLOGIES FOR WIDE-AREA MONITORING AND CONTROL

## **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

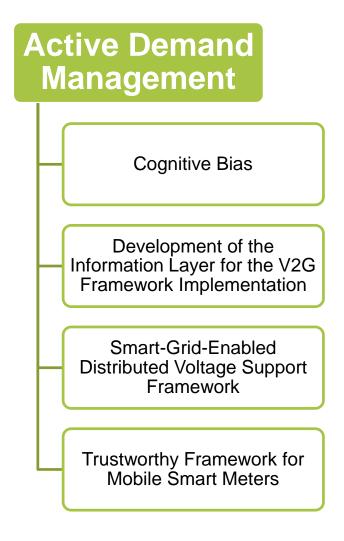
PMU Enhanced Power System Operations

## **Component Technologies**

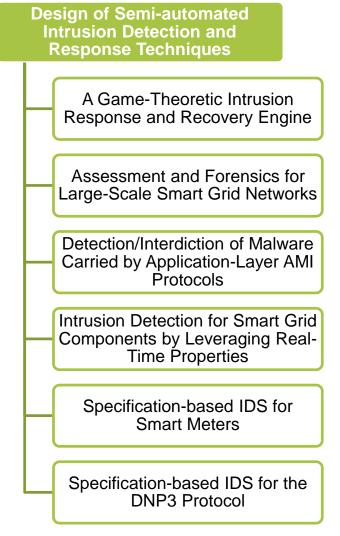
Cryptographic Scalability in the Smart Grid

In-Field RAS Testing

# CLUSTER: TRUSTWORTHY TECHNOLOGIES FOR LOCAL AREA MANAGEMENT, MONITORING, AND CONTROL



CLUSTER: RESPONDING TO AND MANAGING CYBER EVENTS



#### **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



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**



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