Norsk Regnesentral
NORWEGIAN COMPUTING CENTER

IoTSec - Security in IoT for Smart Grids

AFSecurity Seminar, Secure October - Security R&D @ UiO and Partners

Habtamu Abie, Norwegian Computing Center - NR

IFI/Oslo

09/10/2015

IoTSec - Challenges

- Physical access security
- Communication network security
- Big data security
- Value added IoT services security
  - addressing both business and end-user needs

- IoT from three related viewpoints
  - the *things* that are connected
  - the *environments* in which they are situated, and
  - the *interactions* that occur between things, their environments, and their human users

IoTSec - vision

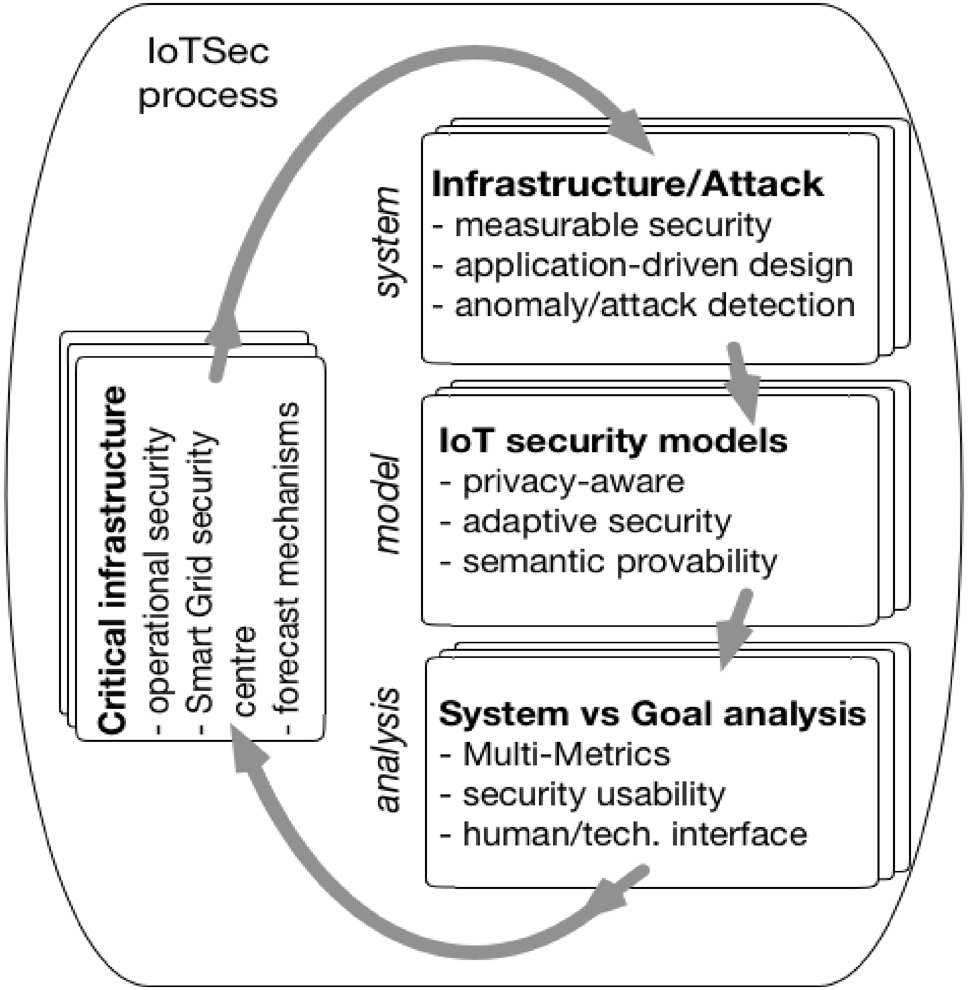
- Develop
  - secure IoT-enabled smart power grid infrastructure
- Achieve
  - reliable and efficient power distribution network
  - distributed, connected smart and value-added services
- Become
  - start-up of a research cluster in security for IoT, industrially applied by members of the NCE Smart Energy Markets

IoTSec - Objectives

- Extend the IoTSec project to a research cluster to include
  - 14 Professors/Senior Researchers
  - 15 PhDs/PostDocs
  - 30 Master students
  - international visibility with 5 projects and memberships in 5 networks/clusters
- Tailor the research towards an operational Smart Grid Security Centre at the NCE Smart
  - supported by at least 15 companies
  - identified as an International Centre of Excellence

IoTSec – research and approach

- Research focuses
  - Semantic provability
  - Adaptive security
  - Privacy negotiations
  - Measurable security and privacy
  - Risk analysis for IoT ecosystem
- Application areas
  - Smart Grid
  - Smart Home
  - Health
- Smart Grid Security Centre



IoTSec process

Critical infrastructure
- operational security
- Smart Grid security centre
- forecast mechanisms

system

Infrastructure/Attack
- measurable security
- application-driven design
- anomaly/attack detection

model

IoT security models
- privacy-aware
- adaptive security
- semantic provability

analysis

System vs Goal analysis
- Multi-Metrics
- security usability
- human/tech. interface

Semantic description and provability

- Objectives
  - create the semantic descriptions for the infrastructure components and the attack surface
  - establish the semantic model for the IoT system
  - establish formal technologies for semantic provability

- Expected results
  - completion of a PhD
  - nontrivial case studies
  - tool for semantic provability
  - minimum of 6 papers, including two journal papers

Adaptive security

- Objectives: review, extend and establish models for
  - adaptive security through predication and advanced behavioral analysis of big-data
  - real-time security monitoring of the entire grid operations
  - prevention, detection and recovery from the failures of security and privacy protections
- Sub-objectives
  - develop and implement anticipatory adaptive security using evolutionary game theory and behavioral analysis
  - develop adaptive user interface with contextual intelligence
  - optimize adaptive security models using optimized machine learning

Adaptive security …

- Expected results
  - functional architecture of adaptive security models
  - working prototype of adaptive security models
  - working prototype of adaptive user interface
  - optimized adaptive security models
  - 8 conference papers and 5 journal papers

Privacy-aware models and measures

- Objectives
  - establish privacy-aware models and related privacy measures
  - introduce privacy design patterns for industrial devices and programs
  - harmonize security models for business interactions between stakeholders
- Expected results
  - construction of privacy by Design patterns and the deployment of user-centric privacy technology
  - cooperation and competition framework among different players in the smart grid
  - processes integrating technology, business model, security model and privacy requirements

Measurable security and privacy

- Objectives
  - establish the multi-metrics model for the Smart Grid
  - adapt to the real world infrastructure
  - analyze the most relevant sub-systems
  - apply specific goals for security, privacy and dependability
- Expected results
  - system analysis for main subsystems on current infrastructure
  - identification of 3-5 use cases
  - feedback from industry on applicability of system analysis
  - extension of the Smart Grid system to include at least 2 new functionalities
  - identification of challenges for industrial applicability

Security usability in IoT ecosystem

- Objectives
  - analyze conflicting incentives for IoT, based on the IoTSec ecosystem
  - establish a platform for multi-shareholder risk analysis
  - create impact assessment for stakeholder in the IoTSec ecosystem
- Expected results
  - functional description of risk platform for IoT multi-operators
  - a platform for cost effective risk analysis platform based on CIRA/ PETweb II results
  - risk analysis of the system to be used by the infrastructure operators in their decision making
  - completion of a PhD

Smart Grid Security Centre

- Objectives
  - establish the industrial requirements, analyze the IoTSec ecosystem and ensure industrial applicability
  - perform the detailed assessment of modules applicable for the Centre and the pre-industrial pilots
  - perform the gap analysis of security methods for critical infrastructures
- Expected results
  - clearly defined scope of the project in terms of stakeholders, their interests, technological components and their functionality and interconnection
  - clarification of what is considered to be outside of the research and industrial applicability

Smart Grid Security Centre …

- Expected results …
  - industrial network enhanced by at least 4 members
  - industrial workshops and defined industrial shareholders
  - Smart Grid Security Center with visualization platform
  - models or modules into the visualization platform
  - operational Smart Grid Security Centre
  - analysis of IoT ecosystems similar to Smart Grids,
  - contacts for applicability in IoT-based critical infrastructures
  - roadmap of the operational applicability of IoTSec results

IoTSec - Facts

- 25 MNOK budget – RCN-IKTPLUSS
- 1 Oct 2015 – 30 Sep 2020
- 10 founding partners
- 18 partners (Aug2015)
- Project owner UiO/IFI/UNIK
- Project manager Prof Josef Noll
- Semantic web site: http://iotsec.no/
- Seeking for partnership, collaboration, and liaison

Partners

UNIK
NR Norsk Regnesentral NORWEGIAN COMPUTING CENTER
NCE NORWEGIAN CENTRES OF EXPERTISE Smart Energy Markets
UNIVERSITAS OSLOENSIS MDCCCXI
[simula . research laboratory]
- by thinking constantly about it
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eSmart SYSTEMS
MOVATION
eB
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COINS
NR

- Founding partners
  - University of Oslo (UiO) through the Institute for Informatics (Ifi) and the University Graduate Centre (UNIK),
  - Norwegian Computing Centre (NR)
  - Simula Research Laboratory (SRL)
  - Gjøvik University College
  - NCE Smart Energy Markets (NCE Smart)
  - eSmart Systems (eSmart)
  - Frederikstad Energi (FEN)
  - EB Nett (EB)
  - Movation (MOV)
- Associated Academic Members
  - Mondragon Unibersitatea, Spain
  - University of Victoria, Canada
  - Universidad Carlos III de Madrid, Spain
  - University of Roma La Sapienza, Italy
- Associated Industrial Members
  - Mondragon Unibersitatea, Spain
  - Fredrikstad kommune
  - EyeSaaS
  - Nimbeo
- H2020 and ECSEL projects
- COINS Academic Research School