



This project is co-financed by the
European Union and the Republic of Turkey

Bu proje Avrupa Birliđi ve Türkiye Cumhuriyeti tarafından
finanse edilmektedir



TURKEYⁱⁿ
HORIZON 2020
COOPERATION. INNOVATION. COMPETITIVENESS

Technical Assistance for Turkey in Horizon 2020 Phase-II

EuropeAid/139098/IH/SER/TR

National Advisory Group Meeting on Secure Societies

Sabancı University

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Ankara, 5 March 2020



REPUBLIC OF TURKEY
MINISTRY OF INDUSTRY
AND TECHNOLOGY



Sabancı
Üniversitesi



Sabancı University

- Internationally recognized research university in Istanbul
- Est. 1999
- ~4000 undergraduate, 1200 graduate students
- ~200 research oriented faculty members
- Top ranked Turkish University according to Times Higher Education



REPUBLIC OF TURKEY
MINISTRY OF INDUSTRY
AND TECHNOLOGY



enterprise
europe
network



COMPETITIVE
& CO-OPERATIVE
PROGRAMME

Sabancı
Üniversitesi



TÜBİTAK

Albert Levi

- Ph.D. from Bogaziçi University, 1999
- has been actively working in the general area of information and network security for more than 20 years
 - at Sabancı University since the beginning of 2002.
 - visiting positions at Oregon State University (1999 – 2002) and Dalhousie University (2017 – 2018)
- PI in 6 funded projects and researcher in other 3.
- Consultancy in various industrial projects (some are performed at Sabancı University as a subcontractor)
- current research group includes 8 graduate students



Albert Levi - Research Interests

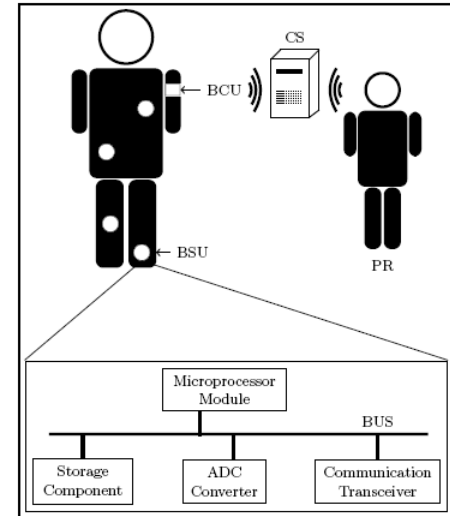
General Overview

- Security in various wireless networking systems
 - wireless mesh networks, sensor networks, body area networks, RFID systems / smartcards, ad hoc networks, Bluetooth, cellular networks
- Privacy preserving computing structures
 - Privacy preserving IDS log sharing
 - Privacy preserving data management
 - Privacy preserving data collection in WSNs (Wireless Sensor Networks)
 - Privacy preserving collaborative traffic monitoring
 - New projects:
 - Privacy Preserving IoT identification, authorization and authentication
 - Privacy Preserving Network Security
- Application layer security issues
 - Web security, E-mail security, E-commerce security, Public Key Infrastructures
 - Authentication and password management



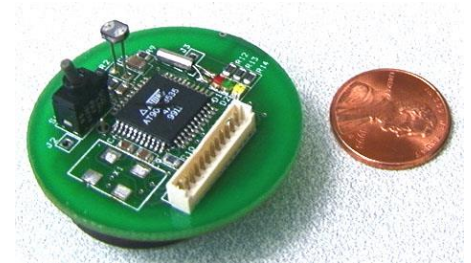
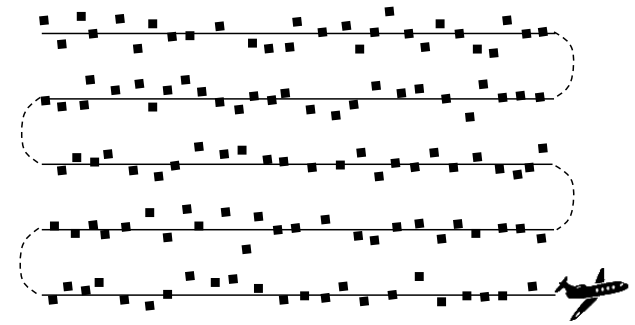
Security in Body Area Networks (BAN)

- TÜBİTAK funded project
 - 2015 – 2017 (2.5 years)
 - 3 MS, 1 PhD graduated
 - 4 journal, 7 conference papers
- BANs are useful in mobile and pervasive healthcare (mostly for elderly)
- Different wearable biosensors for different physiological signals over the human body
- Secure data protection & secure node-to-host association required
 - biosensors collect & communicate sensitive personal medical data
 - crucial power and memory constraints of the biosensors
 - conventional solutions for generic sensor networks are not applicable
- We managed to generate distinct and random cryptographic keys using physiological signals (ECG, PPG, blood pressure) captured at different locations on the human body
- We also applied similar ideas to generate crypto keys from biometrics



Security in Wireless Sensor Networks

- Wireless Sensor Networks (WSN)
- A computing paradigm
 - Vast amount of sensor nodes distributed over a field
 - Both sensing (temperature, pressure, humidity, etc.) and short-range wireless communication capabilities
 - Ultimate aim is to establish a self-configured network and carry the sensed data towards a sink node
- A challenging environment due to limited-resource networking elements
- Security is also an important challenge in WSNs



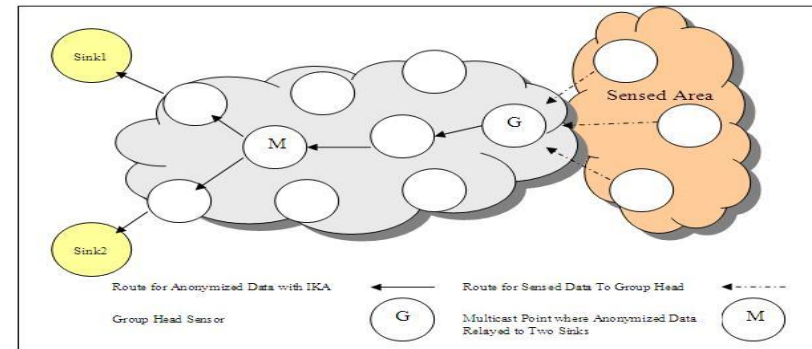
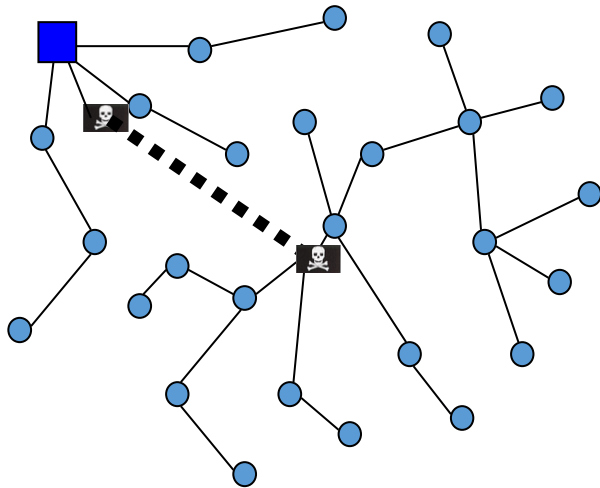
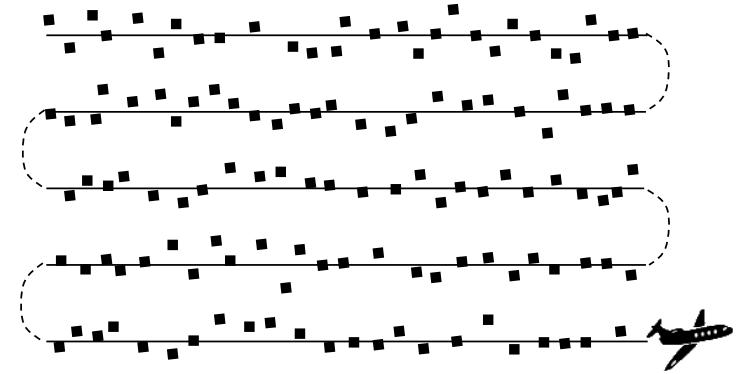
Security in Wireless Sensor Networks

- Main research interest in the years 2005-2013
- 22 papers in esteemed conferences and journals
- 12 graduate students have finished their theses on related topics
- TÜBİTAK Career project has finished in 2010
 - mainly to address key distribution issues
- Another TÜBİTAK project (2011-2013)
 - In the new project the focus in security in "mobile" sensor networks.
 - Utilizing mobility for the sake of security



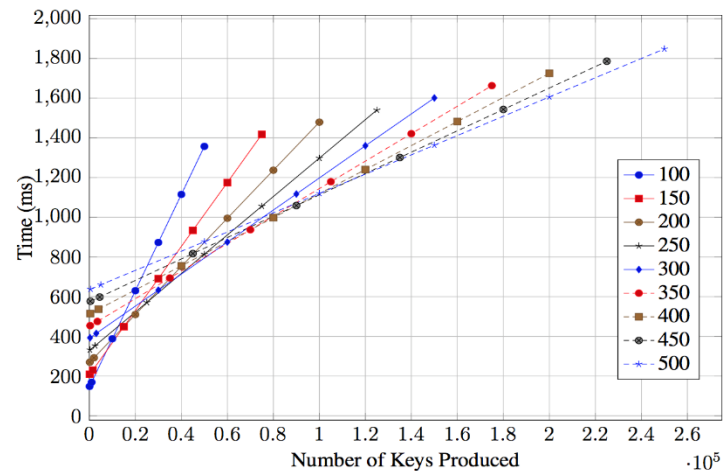
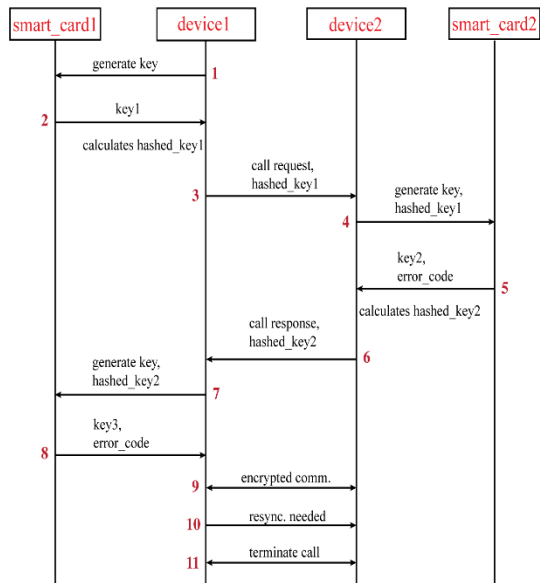
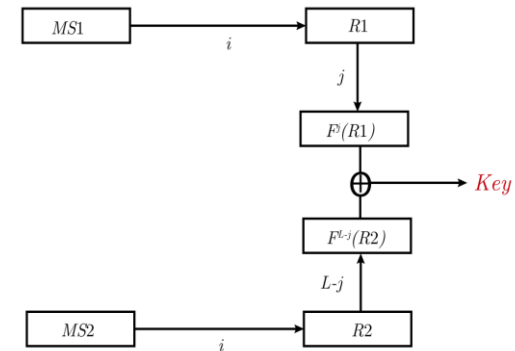
Categories of WSN Security Issues Worked

- Spam Attack Prevention
- Secure Routing
- Privacy Preserving Data Collection
- Key Distribution
- Mobile WSN Security
 - Wormhole detection
 - Key distribution
 - Trajectory privacy



Generating One-time Keys for Secure Multimedia Communication

- SANTEZ Project with Netaş (industrial partner) and Uludağ Uni.
- Effective session-based key generation and rekeying for server-assisted peer-to-peer multimedia communication
- By using hash chains on smart-cards



- ▶ Ö. M. Candan, A. Levi and C. Togay, "Generating one-time keys for secure multimedia communication", in Proceedings of 2018 IEEE International Conference on Communications Workshops (ICC Workshops), Kansas City, MO, 2018, DOI: 10.1109/ICCW.2018.8403554.

IoT Related Research

- FUSE project: Turkish-Polish bilateral research programme
 - 2018 - 2021
 - Fully secured and managed home gateway
 - For the privacy-preserving and secure interconnection of IoT devices
- IoT attack detection using Machine Learning
 - Not yet funded but started to publish
 - Detection and Localization of Network Layer Attacks in IoT
 - Attacks utilizing Wi-Fi related vulnerabilities
- Key Distribution among IoT devices
 - HaG: Hash Graph model: key pools are regenerated at each generation
 - Renewable keys → renewable IoT devices
 - Supports mobility
 - A. Levi and S. Sarımurat, "Utilizing Hash Graphs for Key Distribution for Mobile and Replaceable Interconnected Sensors in the IoT Context", Ad Hoc Networks, vol. 57, pp. 3-18



Specific Topics and Calls Interested

Protecting the infrastructure of Europe and the people in the European smart cities

- SU-INFRA01-2018-2019-2020: Prevention, detection, response and mitigation of combined physical and cyber threats to critical infrastructure in Europe (IA)
 - *In the context of IoT and Sensor Network Security*

Artificial Intelligence and security: providing a balanced assessment of opportunities and challenges for Law Enforcement in Europe

- SU-AI02-2020: Secure and resilient Artificial Intelligence technologies, tools and solutions in support of Law Enforcement and citizen protection, cybersecurity operations and prevention and protection against adversarial Artificial Intelligence (IA)
 - *In the context of AI based techniques for attack mitigation and classification, secure and privacy-preserving data collection*



Specific Topics and Calls Interested

Security - Border and External Security

- SU-BES03-2018-2019-2020: Demonstration of applied solutions to enhance border and external security (IA)
 - *In the context of AI based Anomaly Detection*

Digital Security - Cybersecurity, Digital Privacy and data protection

- SU-DS02-2020: Intelligent security and privacy management (IA / RIA) -
SU-DS03-2019-2020: Digital Security and privacy for citizens and Small and Medium Enterprises and Micro Enterprises (IA)
 - *In the context of cyber threat analytics and privacy-aware data collection/sharing, advanced digital identity solutions, cryptographic key management*

Digital Security - Cybersecurity, Digital Privacy and data protection

- SU-DS04-2018-2020: Cybersecurity in the Electrical Power and Energy System (EPES): an armour against cyber and privacy attacks and data breaches
 - *In the context of IoT and Sensor Network Security*



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