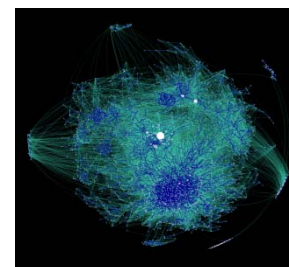


# Interdisciplinary Centre for Security, Reliability and Trust

Leon van der Torre

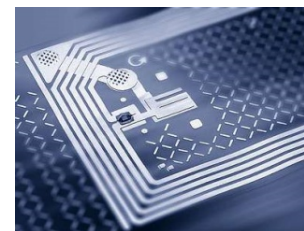
# Security, Reliability and Trust

- *Security and Trust* 1 of 4 priorities at University of Luxembourg
- SnT created in 2009
- Headcount > 150, 17 faculty members
- Interdisciplinary research approach to



- *Secure, Reliable, and Trustworthy  
ICT Systems and Services*

- Platform for collaboration with industrial and governmental partners, EU & ESA projects



# Luxembourg – Environment for ICT industry?

## Security and Trust a Key Element!

- Part of Government's strategy coupled to the *Digital Agenda for Europe*
- Investments in
  - High bandwidth connectivity to major hubs
  - Data centres with competitive offers
  - Commercial internet exchanges
  - Cloud computing and services
- Investment in competence and research
- EU strategic research programs
- Luxembourg an ideal European and vendor neutral “test bed”



# Part of Luxembourg Innovation System

Create impact well beyond the academic community!  
Attract R&D investments to Luxembourg!



Not only tax and VAT legislation!

# Goals & Strategy

Centre of excellence in research and innovations in  
*Security, Reliability and Trust*

Impact well beyond the academic community

Increase R&D investments to Luxembourg

SNT

securityandtrust.lu



Highest quality research in areas with a relevance to  
Luxembourg

Strategic partnerships

International collaboration and attract European  
research funding

Interdisciplinary approach with application area focus

# Strategic Research Areas

- **Enterprise Security**
  - Financial and banking industry (Ministry of Economy, BCEE, CETREL, FEDIL)
- **Services, Content and e-Government**
  - Service and content providers, government agencies (itrust, RedDog, RTL, BCE, LuxTrust)
- **Communication and Network Infrastructure**
  - Network providers and operators (SES, EPT, Telindus, IEE S.A., ...)



# Partnership Program



## Partners

Entreprise P&T

SES

CETREL

IEE S.A

Ville de Luxembourg

Telindus

BCEE

RedDog

itrust

Data Protection Agency

Ministry of Economy and Trade

LuxInnovation

FEDIL

CREOS

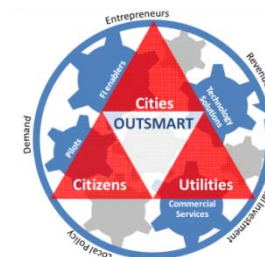


# SnT Participation European Programs



**OUTSMART** – Provisioning of urban/regional smart services and business models

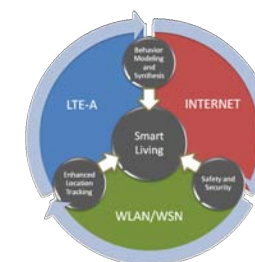
IP FI Program, usage case, start 1 April, 2011



**BUTLER** – uBiquitous, secUre inTernet-of-things with Location and contExt-awaReness

Pervasiveness, context-awareness and security for IoT

ICT-2011-7, IP, start 1 October, 2011



**UIoT6** – Universal Integration of the Internet of Things through an IPv6-based Service Oriented Architecture enabling heterogeneous components interoperability

ICT-2011-7, STREP, 1 October, 2011





# SnT Participation European Programs

## **FREESIC** – Free Secure Interoperable Communications

Highly secure and cost effective interoperability between communication infrastructures

SEC-2011-1, FP, start 1 November, 2011

## **GEN6** – IPv6 for Governments

IPv6 upgrade of eGovernment Network Infrastructures

CIP-ICT-PSP-2011-5, start 1 November, 2011

## **LiveCity** – Video to video over the internet

CIP-ICT-PSP-2011-5, start 1 November 2011

## **Web2LLP** – Improving web strategies and social media presence of LLP projects, EACEA/15/2011, start late 2011

# SnT Participation European Programs

- **CoRaSat – COgnitive RAdio for SATellite Communications**
  - ICT-2012-8, STREP, 2,5 MEUR funding over 3 years
  - Negotiations ongoing with the EC
  - Partners from Italy, France, Belgium, UK incl. Thales-Alenia France and SES ASTRA TECHCOM
- **TREsPASS – Technology-supported Risk Estimation by Predictive Assessment of Socio-Technical Security**
  - ICT-2012-8, IP 561 kEUR funding (SnT) over 4 years
  - Negotiations ongoing with the EC
  - Partners from The Netherlands, Denmark, Estonia, Portugal, Spain, UK, Germany, Switzerland, Luxembourg

# SnT Participation European Space Agency Projects

## MIMO Hardware Demonstrator for DVB-SH

Algorithm development, assessment and implementation in demonstrator.

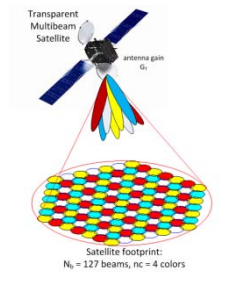
Partners: SES, Electrobit, CWC-Oulo



## Multi-spot Beam Ku-band Satellite Networks

Enhanced spectral efficiency and resource management

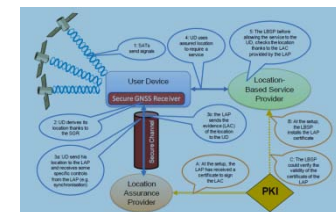
Partners: SES, Astrium



## LASP – Developing a prototype of Localisation Assurance Service Provider

Location assurance through monitoring and certification

Partners:itrust



## Securing Mission Operations Using Multi-level Security

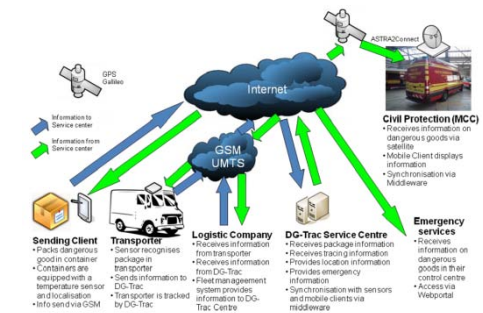
Networking Partnership Agreement at ESOC

# SnT Participation European Space Agency Projects

## DG-Trac – Dangerous Goods Transport Tracking and Tracing in the Medical Sector

Algorithm development, assessment and implementation in demonstrator.

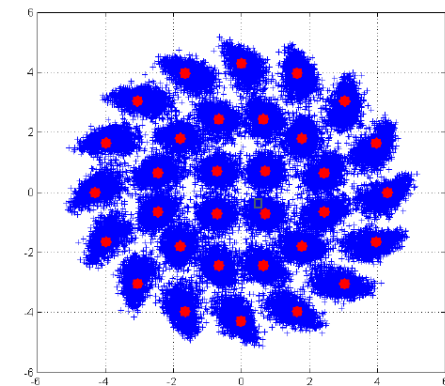
Partners: Hitec, EPT, T&E Gefahrgutlogistic, CRP Tudor



## On-ground Multicarrier Digital Equalization/pre-distortion Techniques for Single or Multi Gateway Applications

Enhanced spectral efficiency by advanced pre-distortion and non-linear equalization techniques

Partners: SES, TRZ, KTH, Astrium



# Participating Professors @uni.lu



Thomas Engel, Vice-director

Yves Le Traon

Lionel Briand

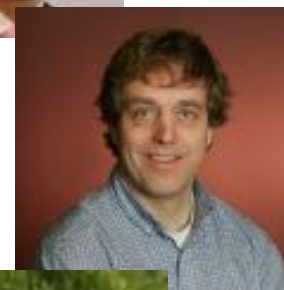
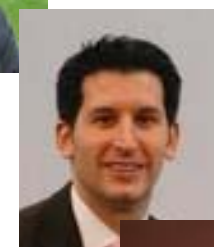
Peter Ryan

Holger Voos

Charles Max

Jürgen Sachau

Leon van der Torre



Pascal Bouvry

Mark Cole

Christoph Schommer

Mahulena Hofmann

Romain Martin

Alex Biryukov

Sjouke Mauw

Pierre Kelsen

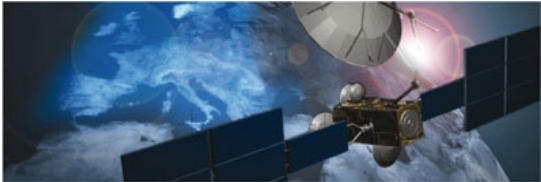
# Security, Reliability and Trust

- > 10 MEUR turnover, 2/3 competitive
  - 18 % Partnerships
  - 10 % EU/ESA
  - 42 % FNR
- Headcount > 150, 17 faculty members
  - 20 permanent researchers
  - 50 senior researchers holding PhD
  - 50 PhD candidates
  - 25 MS students/interns
    - 8 Research fellows and visitors
  - 13 Admin and tech support



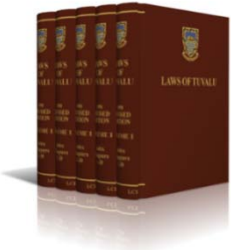
# Research Program in Satellite Systems

## Partnership



### 1. Legal and Regulatory Challenges

SES Chair on Satellite Comm and Media Law!



### 2. Applications and Services

### 3. Satellite Hybrid Networks

### 4. Transmission and Reception Technologies



# Partnership with CETREL

## Resilient Infrastructures for Financial Transactions

### Partnership



### Software Testing and Validation

- From daily test traffic to a minimum subset of dissimilar test cases
- Product differential testing from a product line

### Network and Service Security

- Smart Honeypots for Tracking Fraudulent Malware

### Fraud Detection

- Statistical Manifold Learning for Fraud Detection

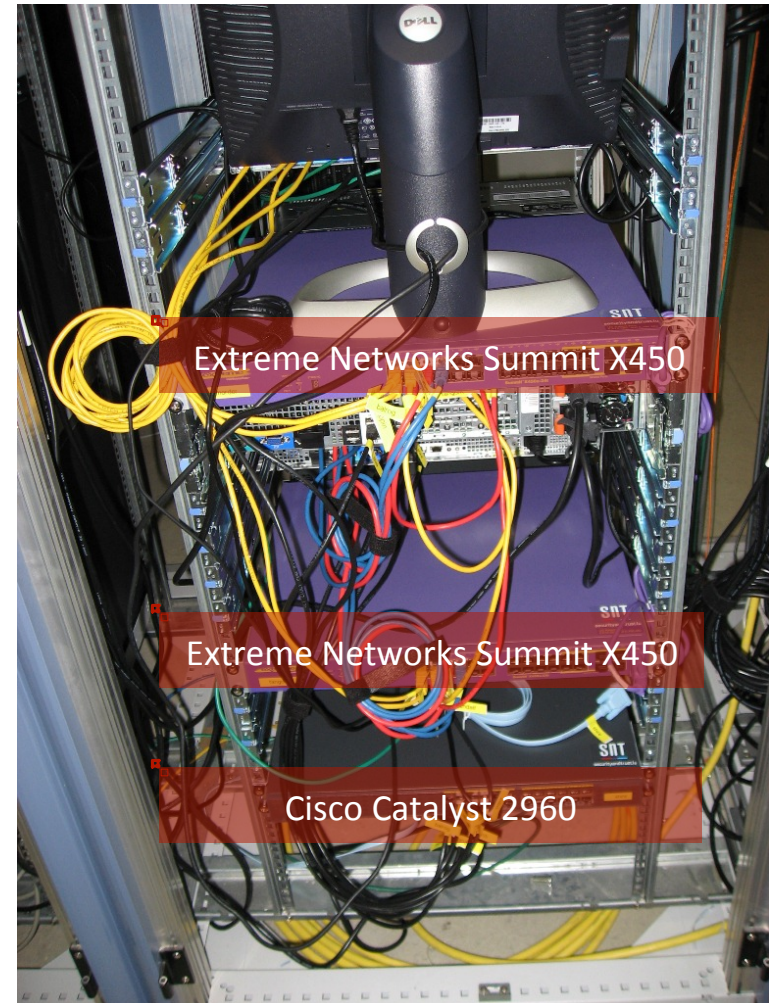


# Network Security Lab

4 switches  
9 servers



- Cisco Catalyst 2960S
- 4 cores, 8GB RAM, 2x250GB HDD
- 4 cores, 8GB RAM, 2x250GB HDD
- 8 cores, 64GB RAM
- 18TB HDD + 160 GB SSD
- 4 cores, 8GB RAM, 2x250GB HDD
- 4 cores, 8GB RAM, 2x250GB HDD
- 4 cores, 8GB RAM, 2x250GB HDD
- 4 cores, 8GB RAM, 2x250GB HDD
- 4 cores, 8GB RAM, 2x250GB HDD
- 4 cores, 8GB RAM, 2x250 GB HDD



- Extreme Networks Summit X450
- Extreme Networks Summit X450
- Cisco Catalyst 2960

# Location Assurance Service Provider (LASP)

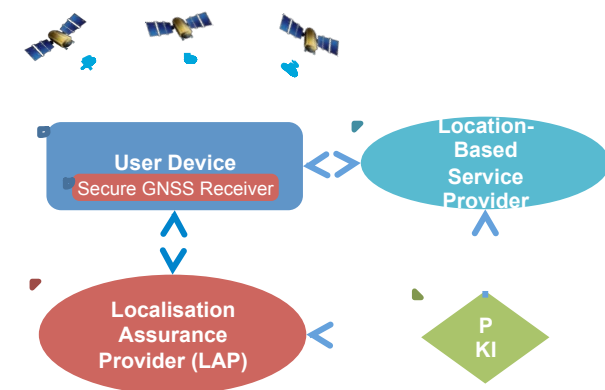
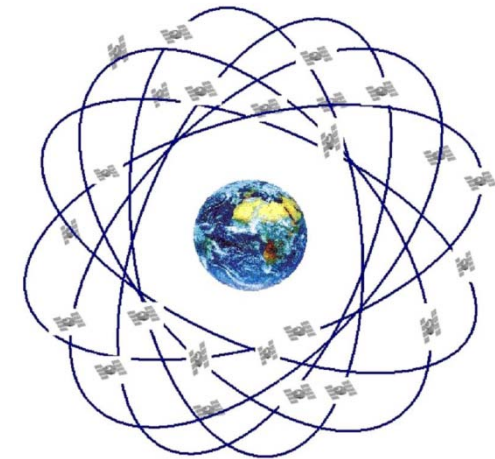
Trusted service that supports *security/safety-critical* Location-Based Services

## Partnership



## Goal:

- assesses GNSS locations be intact from spoofing
- issues assurance certificates for localisation integrity
- Industrial PhD candidate project
- Supported by European Space Agency and FNR



# Research Program in Vehicular Networks

## Partnership



1. Sensor and Mobile Ad Hoc Networks
2. Embedded Systems
3. Applications and Services – Distributed Traffic Management



# Vehicular Networks

## Vehicular networks:

- Vehicle to Vehicle / Vehicle to Infrastructure Communication
- Applications:
  - Road traffic management: real-time, smart navigation
  - Road Safety: accident avoidance and mitigation
  - Road-Side Assistance: automatic emergency call, eDiagnostic, repair service notification
  - Infotainment: VoD, Internet, parking/tourist info



## Concept: From simulator to real world driving studies



4 Person collaborative driving simulator



Simulator connected to Tablet PC with new services



# Multi Sensor Fusion Laboratory

## 2D-3D Sensor Fusion

### Surveillance Applications

#### Partnership



- Sensor fusion at data level
- Feature level fusion
- Decision level fusion
- Behavioural modeling



# Data Protection Agency – CNPD

Legal Issues in Data Protection, Cloud Computing, and Privacy

## Partnership



## Research Topics:

1. The revision of the EU data protection Directive 95/46/EC
2. Cloud computing
3. Privacy by design

# SnT – Contacts

## Visiting address

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L-1359 Luxembourg

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Web: <http://www.securityandtrust.lu>





# Software Testing and Validation

## Mobile Devices – Emerging Threat

- Will be increasingly targeted in attacks
- Direct access to payment system
- Access to telecom infrastructures
- Both application and physical layers being targeted



# Mobile Devices – Vulnerabilities

## Applications vs Baseband Processor

### Vulnerabilities in Baseband implementation

