ILNAS Breakfast “Digital Trust for Smart ICT”

November 18th, 2016

ILNAS / ANEC GIE

PROGRAM

- Introduction and welcome words
- Presentation of the National Standards Body
- White Paper “Digital Trust for Smart ICT”
  - Introduction
  - Technical Overview
  - Standardization Landscape
- Conclusion and Outlook
- Discussions

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Introduction & welcome words

Dr. Jean-Philippe HUMBERT - ILNAS

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Presentation of the National Standards Body

Mr. Jérôme HOEROLD - ILNAS

ILNAS, Institut Luxembourgeois de la Normalisation, de l'Accréditation, de la Sécurité et qualité des produits et services

- **Creation:** Law dated July 14, 2014 (repealing the amended Law of May 20, 2008)
- **Status:** Public administration under the authority of the Minister of the Economy
- **Total staff:** 38 civil servants (Nov 2016)

Luxembourg's Standardization Strategy 2014-2020

PILLAR 1	Information and communication technologies (ICT)

- Support and constant **development of the standardization field dedicated to ICT**
- Implementation of the **Luxembourg's Policy on ICT standardization (2015-2020)**
  - Developing the interest and the involvement of the market
  - Promoting and reinforcing the participation of the market
  - Supporting and strengthening the education about standardization and related research activities
- Detection of **niche opportunities for economic developments**

PILLAR 2	National influence and compliance with legal attributions

PILLAR 3	Products and services

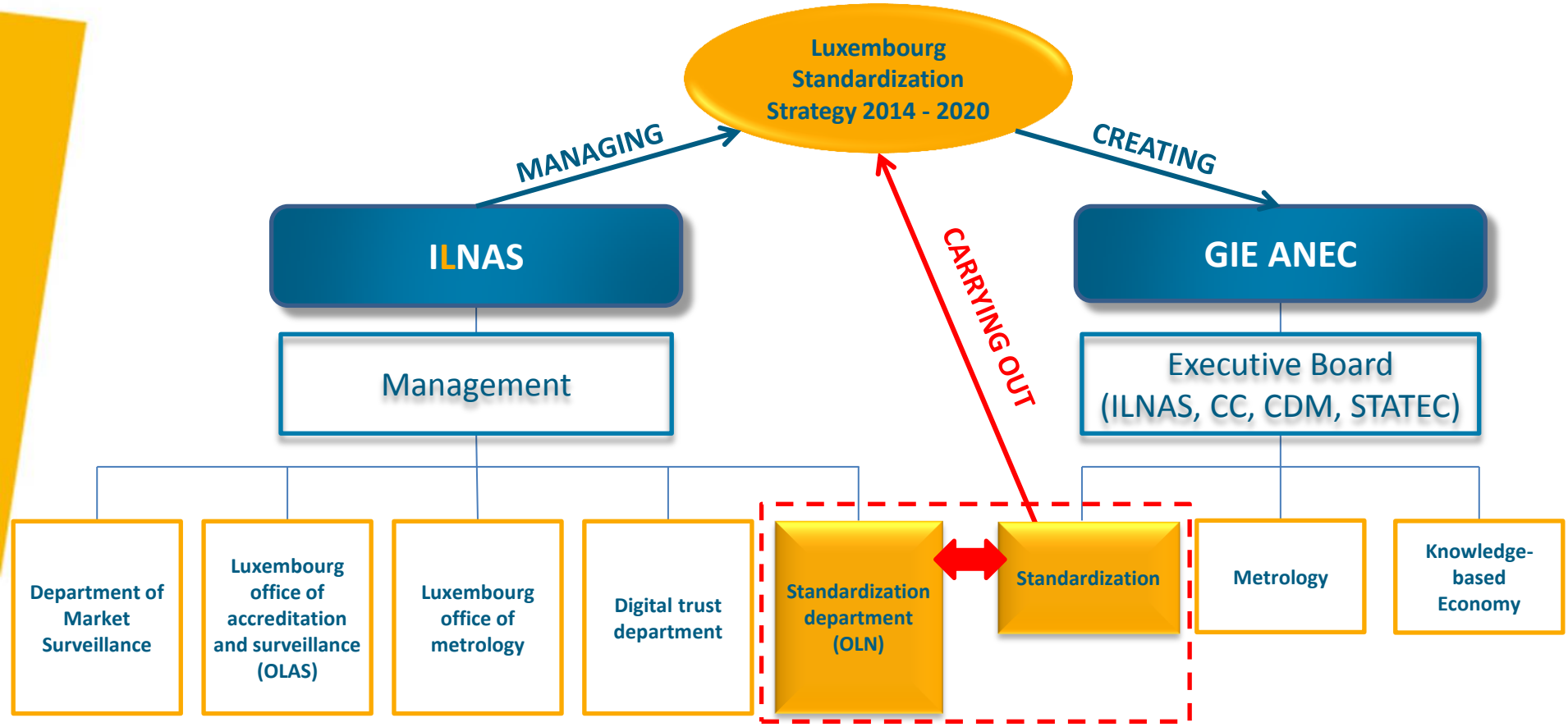
ANEC, Agence pour la Normalisation et l'Économie de la Connaissance

Agency for Standardization and knowledge-based Economy

- **Creation:** October 4, 2010
- **Status:** Economic Interest Grouping (EIG)
- **Object:**
  - Promotion, awareness raising and training, applied research in the field of standardization and metrology in order to support companies' competitiveness in Luxembourg
- **Total staff:** 14 employees (Nov 2016)
- **Partners:**

ILNAS · CHAMBRE DES METIERS Luxembourg · CHAMBRE DE COMMERCE LUXEMBOURG · statec

Position


Luxembourg Standardization Strategy 2014 - 2020
MANAGING
CREATING
CARRYING OUT
ILNAS
GIE ANEC
Management
Executive Board (ILNAS, CC, CDM, STATEC)
Department of Market Surveillance
Luxembourg office of accreditation and surveillance (OLAS)
Luxembourg office of metrology
Digital trust department
Standardization department (OLN)
Standardization
Metrology
Knowledge-based Economy

ILNAS Standardization activities in Luxembourg

- **Create a normative culture in Luxembourg**
  - University Certificate ”Smart ICT for Business Innovation” at the University of Luxembourg
  - Promotion in the field of standardization (Newsletter, portail-qualite.lu, LinkedIn, events, …)
  - Trainings and research in the field of standardization

- **Creation of national standards**
  - National Annexes of the Eurocodes
  - National Annex concerning the Winter Diesel
  - National standard about the living surface
  - Creation of a national standards office in the field of construction

Availability of standards

Standardization catalogue

- 61 national standards

Institut luxembourgeois de la normalisation, de l'accréditation, de la sécurité et qualité des produits et services

- 48.000 European standards from CEN and CENELEC

- 58.000 international standards from ISO and IEC

- 7.100 ETSI standards (free)

World Class Standards

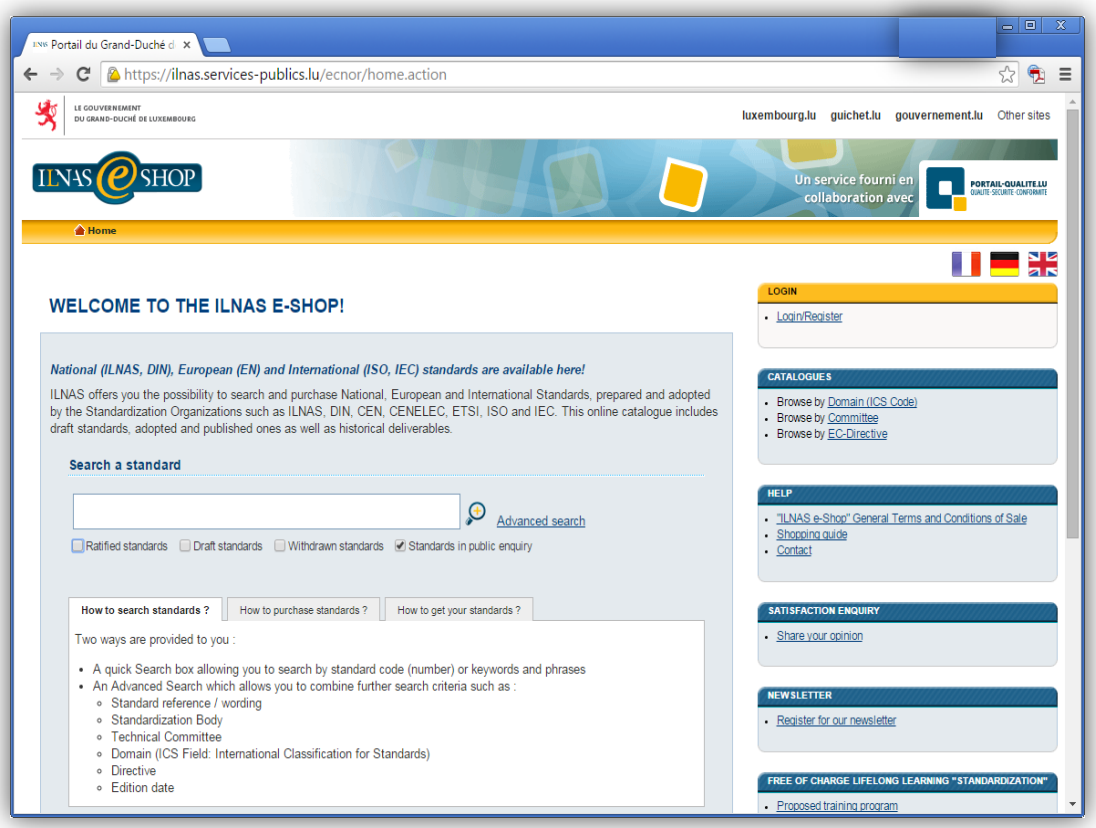
- 45.200 DIN standards

- More than **150.000 normative documents** at your disposal

Availability of standards

ILNAS e-shop

- Format: electronic
- Language: French, German and English
- Competitive prices
- Free access to documents in public enquiry

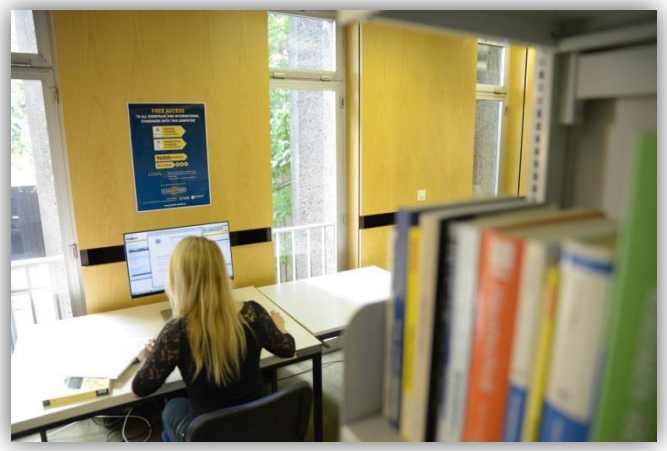


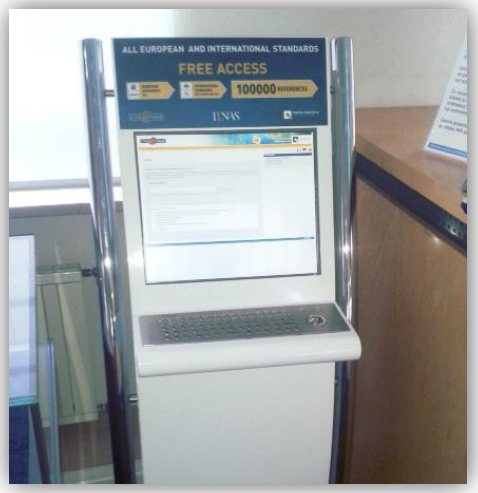
Availability of standards

Free access on lecture stations

- Availability of all EN (CEN,CENELEC et ETSI), ISO, IEC and ILNAS standards (despite DIN)

- Location of the reading stations:
  1. **Université du Luxembourg**
     - Campus Kirchberg
  2. **House of Entrepreneurship**
     - Kirchberg
  3. **Bibliothèque nationale de Luxembourg**
     - Luxembourg centre-ville
  4. **ILNAS**
     - Esch-Belval
  5. **LIST**
     - Esch-Belval (Maison de l'innovation)
     - Belvaux





Participation in standardization

Different possibilities

- **How to participate in the development of national, European and international standards ?**

1. Comment of draft standards in public enquiry

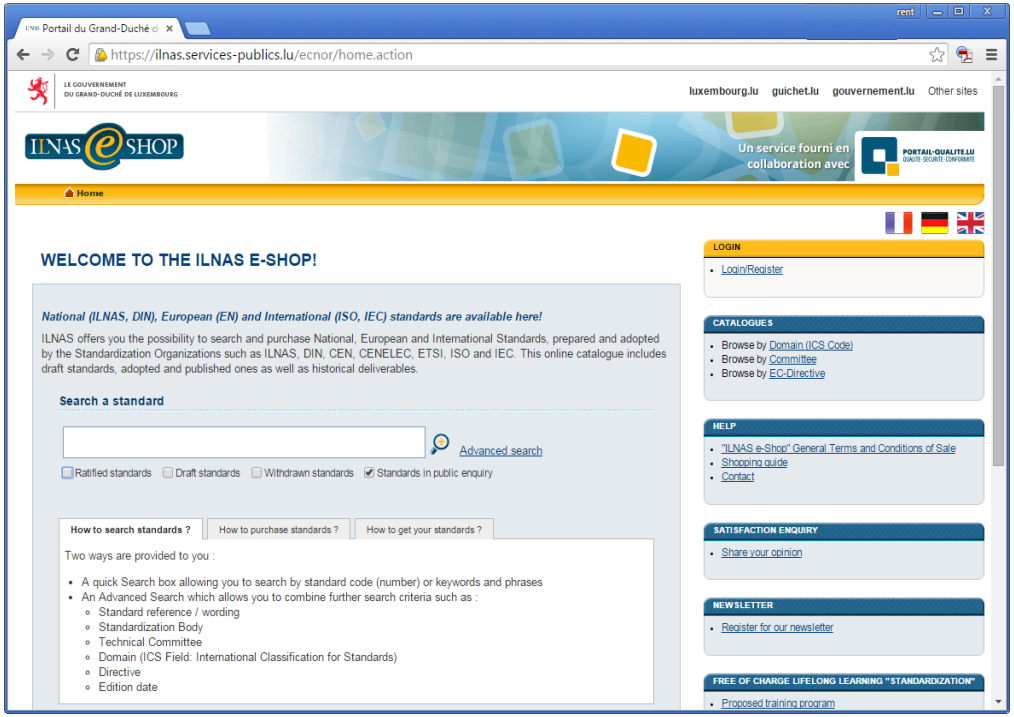
2. Active participation in a technical committee

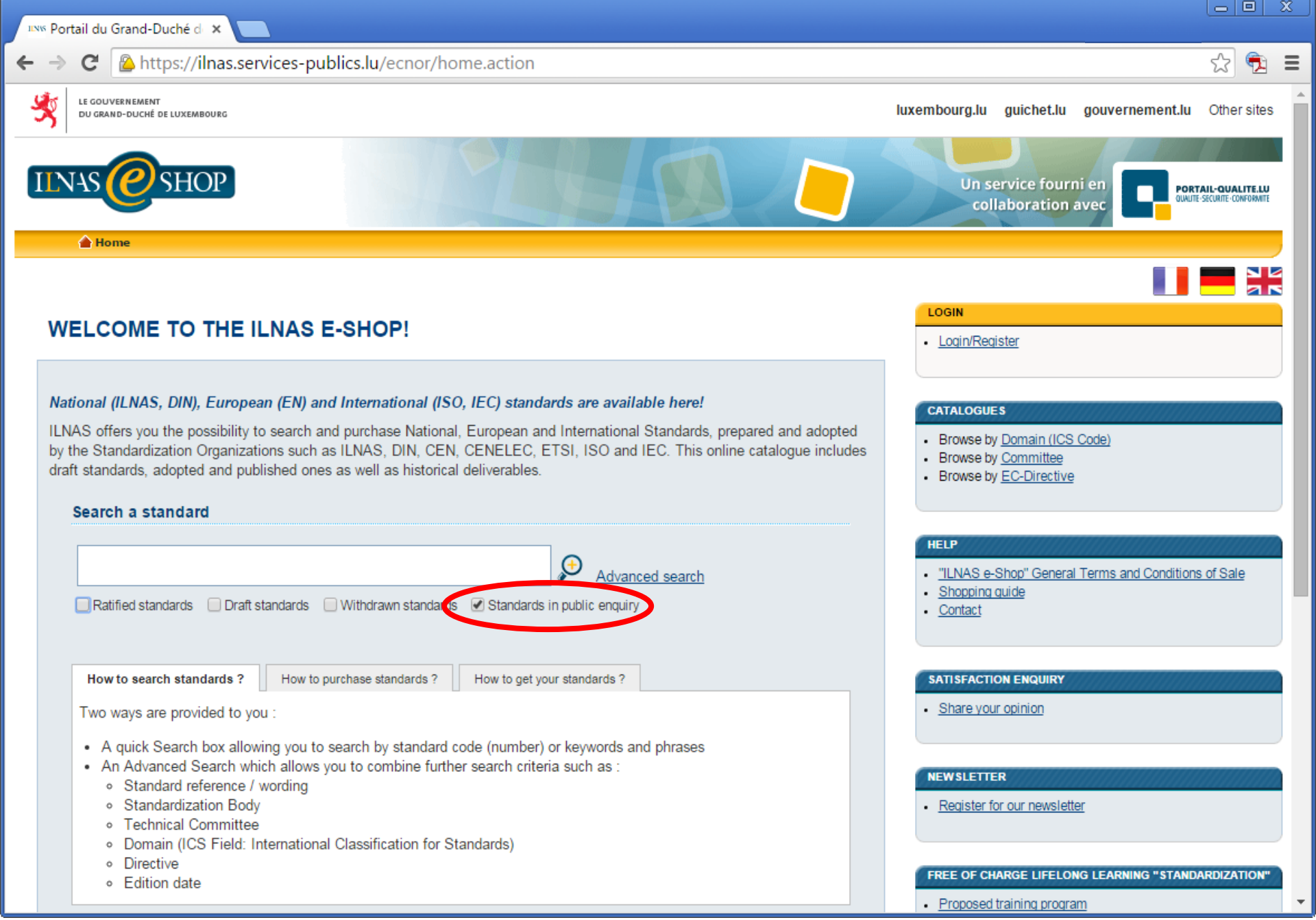
Participation in standardization

1. Public enquiry

- Navigate in the ILNAS e-shop in order to comment a draft standard which is in the stage of public enquiry

- https://ilnas.services-publics.lu

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ILNAS offers you the possibility to search and purchase National, European and International Standards, prepared and adopted by the Standardization Organizations such as ILNAS, DIN, CEN, CENELEC, ETSI, ISO and IEC. This online catalogue includes draft standards, adopted and published ones as well as historical deliverables.
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A quick Search box allowing you to search by standard code (number) or keywords and phrases
An Advanced Search which allows you to combine further search criteria such as :
Standard reference / wording
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Technical Committee
Domain (ICS Field: International Classification for Standards)
Directive
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Browse by Domain (ICS Code)
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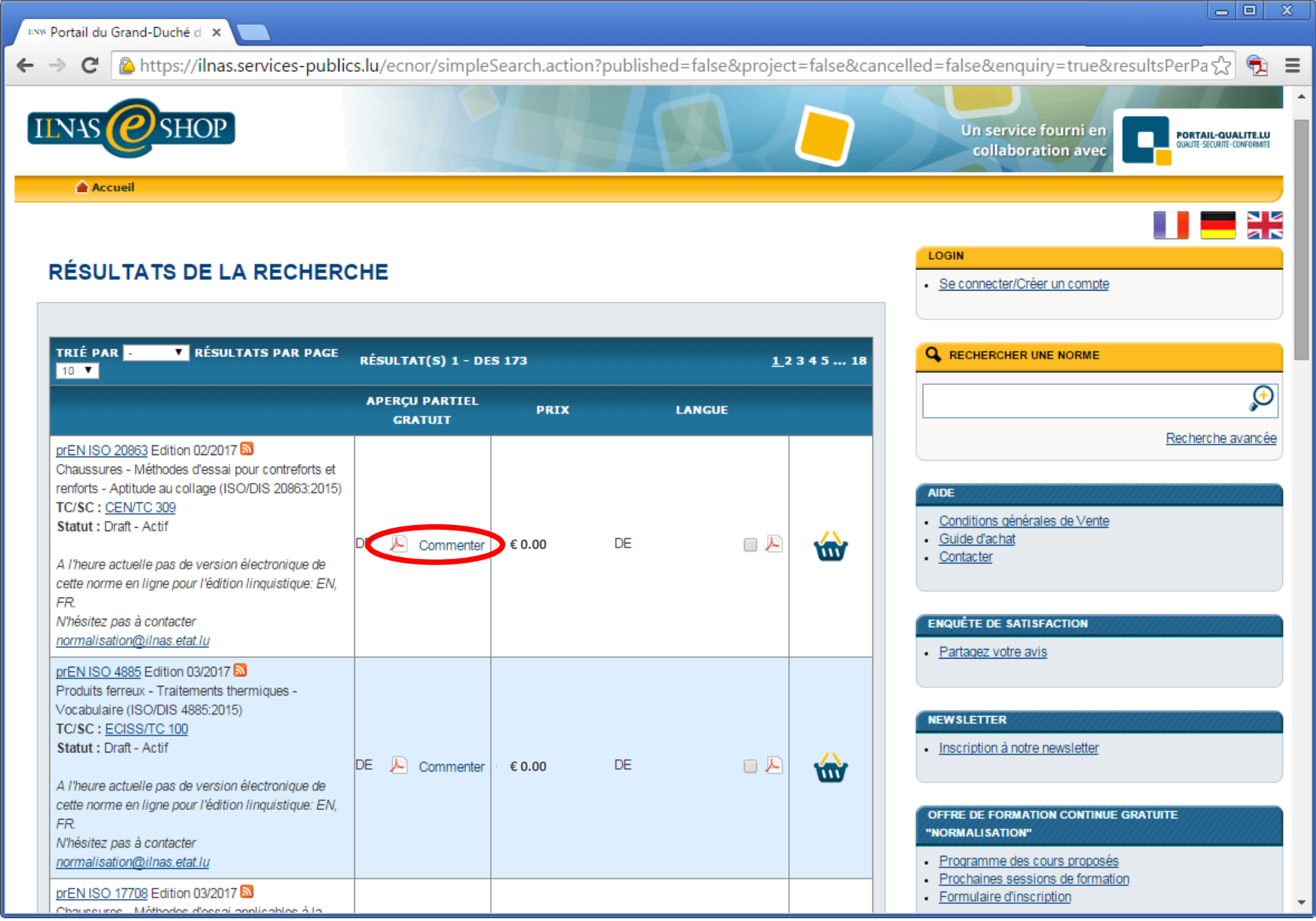
Proposed training program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TRIÉ PAR - RÉSULTATS PAR PAGE 10
RÉSULTAT(S) 1 - DES 173
1 2 3 4 5 ... 18
APERÇU PARTIEL GRATUIT
PRIX
LANGUE
prEN ISO 20863 Edition 02/2017
Chaussures - Méthodes d'essai pour contreforts et renforts - Aptitude au collage (ISO/DIS 20863:2015)
TC/SC : CEN/TC 309
Statut : Draft - Actif
A l'heure actuelle pas de version électronique de cette norme en ligne pour l'édition linguistique: EN, FR.
N'hésitez pas à contacter normalisation@ilnas.etat.lu
DE Commenter € 0.00 DE
prEN ISO 4885 Edition 03/2017
Produits ferreux - Traitements thermiques - Vocabulaire (ISO/DIS 4885:2015)
TC/SC : ECISS/TC 100
Statut : Draft - Actif
A l'heure actuelle pas de version électronique de cette norme en ligne pour l'édition linguistique: EN, FR.
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Programme des cours proposés
Prochaines sessions de formation
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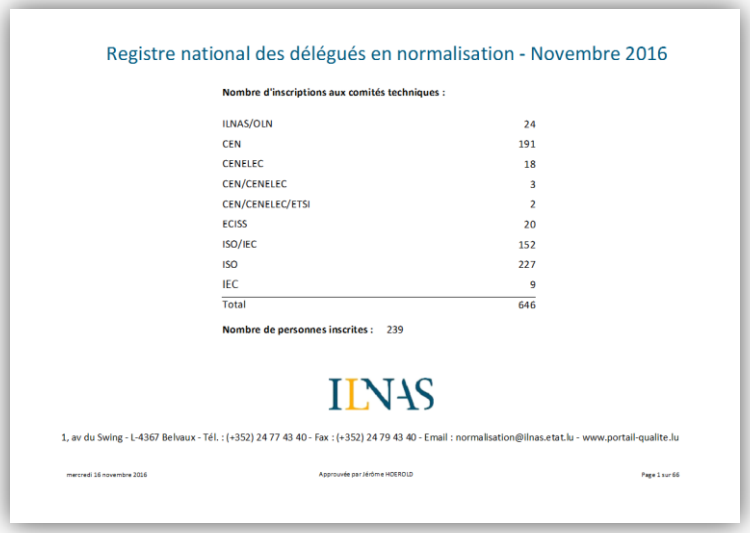
Participation in standardization

2. National delegate in standardization

- **Who can participate ?**
  - Every socio-economic actor with a certain expertise
- **Cost of participation ?**
  - Free participation in Luxembourg
- **National experts register (Nov 2016)**
  - 239 persons registered
  - 646 registrations in technical committees



Registre national des délégués en normalisation - Novembre 2016

Nombre d'inscriptions aux comités techniques :

ILNAS/OLN	24
CEN	191
CENELEC	18
CEN/CENELEC	3
CEN/CENELEC/ETSI	2
ECISS	20
ISO/IEC	152
ISO	227
IEC	9
Total	646

Nombre de personnes inscrites : 239

ILNAS

1, av du Swing - L-4367 Belvaux - Tél. : (+352) 24 77 43 40 - Fax : (+352) 24 79 43 40 - Email : normalisation@ilnas.etat.lu - www.portail-qualite.lu

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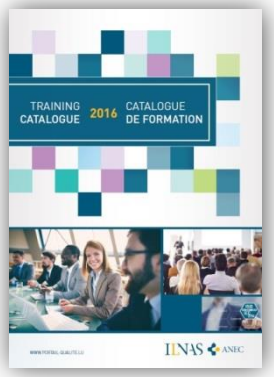
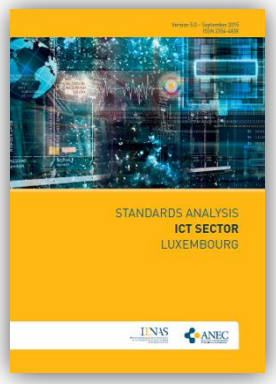
Products and services

- ILNAS, in collaboration with G.I.E. ANEC, offers the following products and services to the national market :
  - Diffusion of normative information
  - Training and awareness sessions
  - Standards watch
  - Standards analysis (ICT)
- These products and services are provided for free on simple demand





Stay informed about ILNAS activities

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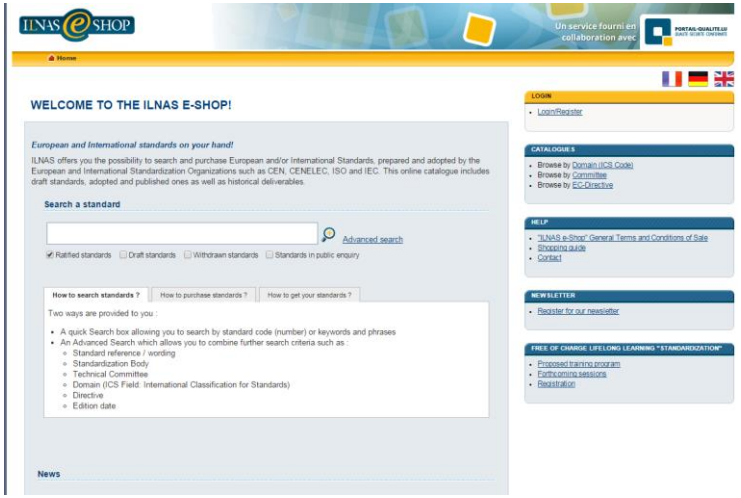
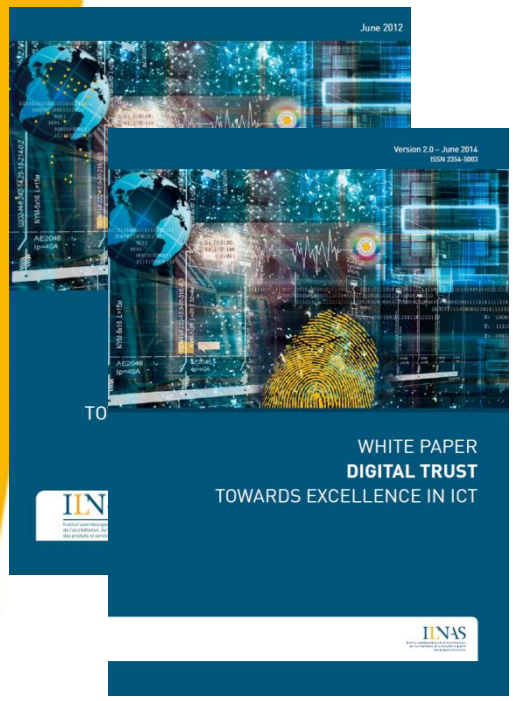


White Paper “Digital Trust for Smart ICT”
Introduction

Dr. Johnatan PECERO – ANEC GIE

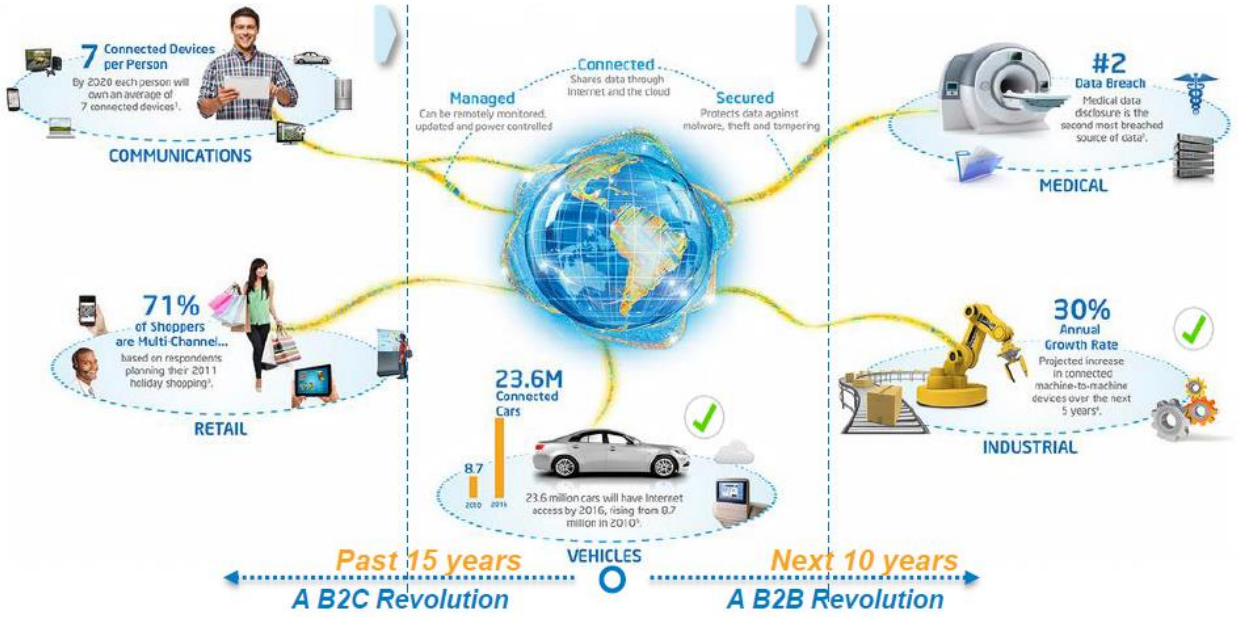
White Paper “Digital Trust” - Background



- First version 1.0 (2012) – Presented the main results of the NormaFi-IT research project
  - Main purpose: To investigate and develop the knowledge areas of digital trust
  - Main topics : Digital trust and the tools allowing to improve digital trust in Luxembourg: Public Key Infrastructures and electronic signatures, Electronic records management, Business continuity management, main standards in the domain

- Second version 2.0 (2014) – Extended first version by presenting the current developments in research for digital trust
  - Main purpose:
    - To present new tools in the field of digital trust : Cryptographic tools, Identity and Access Management (IAM), and Mobile Device Management
    - To present the digital trust trough the knowledge of standardization and certification

Digital Trust for Smart ICT



- ***Cisco*** *projects 40 billion intelligent things connected by 2019*
- ***ABI Research*** *estimates 35 billion networked devices by 2019*
- ***IDC*** *predicts 212 billion devices connectable by 2020*
- ***Gartner*** *anticipates 19 billion IoT devices by 2019 & 25 billion by 2020*
- ***Harbor*** *projects 21.7 billion IoT devices by 2019*
- ***Business Insider Intelligence*** *estimates 23.4 billion IoT devices by 2019*

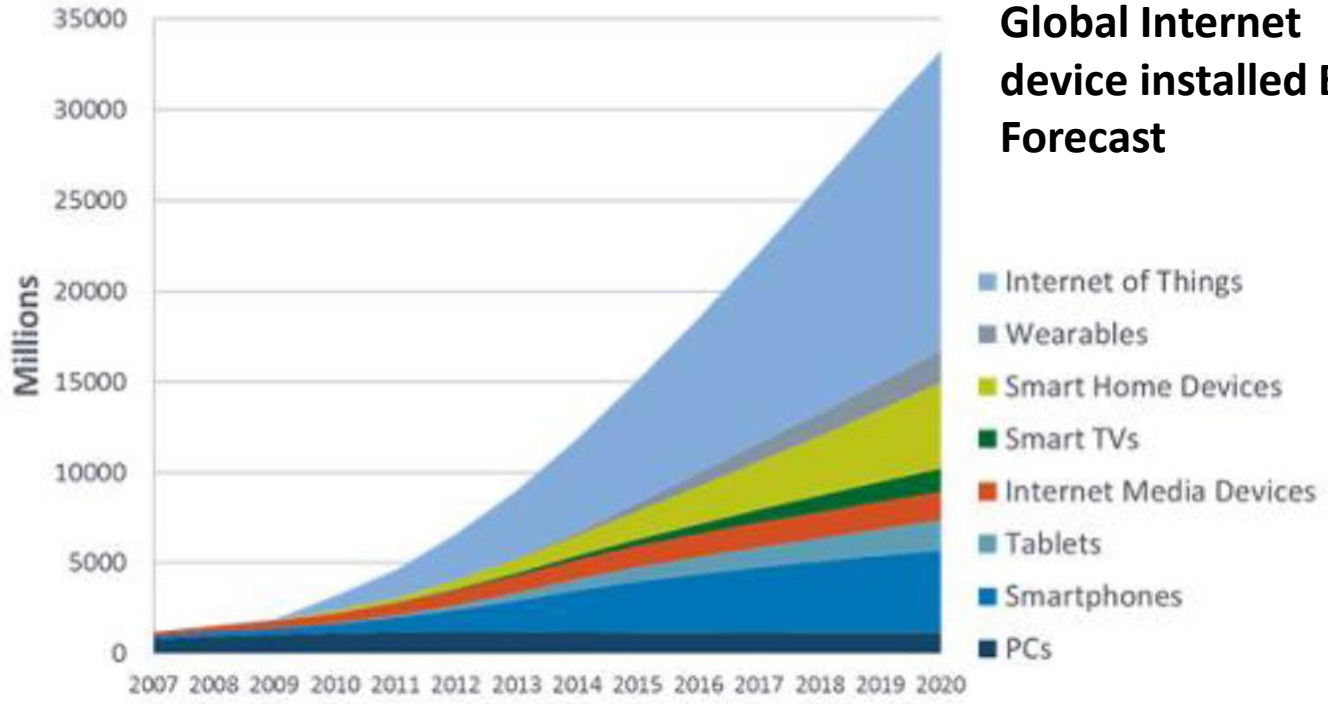
Source: Intel Intelligent Systems

Infosys®

Digital Trust *A positive and verifiable belief about the perceived reliability of a digital information source, product or service, leading to an intention to use*

Digital Trust for Smart ICT

- 33 Billion Internet Devices By 2020: Four Connected Devices For Every Person In World.



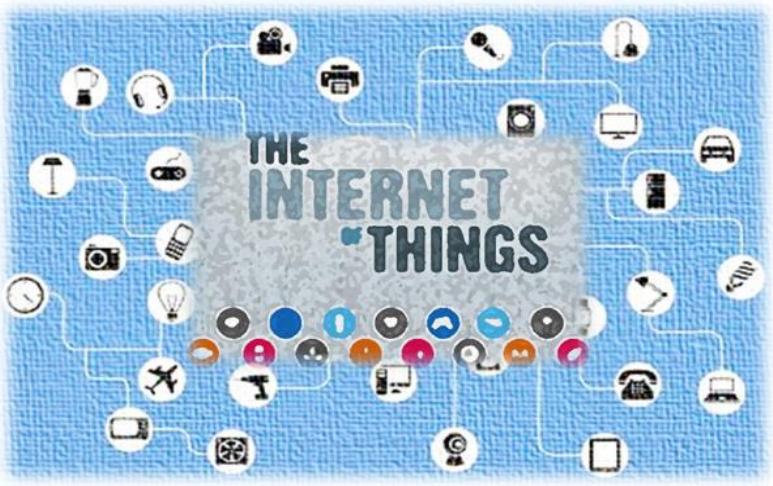
Global Internet device installed Base Forecast

Source: Strategy Analytics, October 2014

Users are increasingly concerned about their **privacy** and **data security** which implies a **lack of trust** regarding the use of data and consequently a negative impact on the take-up of communication services and products

Digital Trust for Smart ICT

The Billions of Devices and Trillions in Impact



Performance Efficiency	↑	20-25% Equipment Efficiency & Effectiveness
Maintenance Efficiency	↑	20-40% Increase in Equipment Lifetime
Information Efficiency	↑	5- 10% Saving in Business Expenditure
Service Efficiency	↑	30 - 40% Service Margin
Energy Efficiency	↓	25% Reduction in Energy Consumption

$3.9 trillion -11.1 trillion per year in 2025- McKinsey

Add about $15 trillion to global GDP by 2030 - GE

To grow at CAGR of 7.9% reach $8.9 trillion by 2020 - IDC

IOE a $19 Trillion opportunity - Cisco

Projected Economic Benefits

Source: McKinsey Global Institute (MGI); Findings from the Infosys – FIR Joint Study on Industry 4.0 'The state of the Nations'

Infosys®

To create services, users (citizens and companies) need feel they are **safeguarded** no matter who is handling their personal or commercial data

Digital Trust for Smart ICT

The Billions of Devices and Trillions in Impact

Consumers need to trust the digital world

20-25%
Equipment Efficiency & Effectiveness

20-40%
Increase in ipment Lifetime

5- 10%
Saving in ness Expenditure

30 - 40%
Service Margin

25%
Reduction in Energy Consumption

Energy Efficiency

$3.9 trillion -11.1 trillion per year in 2025- McKinsey	Add about $15 trillion to global GDP by 2030 - GE	To grow at CAGR of 7.9% reach $8.9 trillion by 2020 - IDC	IOE a $19 Trillion opportunity - Cisco

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Infosys

To create services, users (citizens and companies) need feel they are **safeguarded** no matter who is handling their personal or commercial data

White Paper “Digital Trust for Smart ICT”

- Developed by ILNAS with the support of the Ministry of the Economy
  - Released in October 14th, 2016 (World Standards Day)
- Investigate and develop knowledge in the field of *Digital Trust for Smart ICT*
- State of the art in some key areas of Smart ICT
  - Internet of Things (IoT)
  - Cloud Computing
  - Big Data
- A building block for the development of a research program and for the evolution of the university certificate *Smart ICT for Business Innovation*

White Paper “Digital Trust for Smart ICT”

- It surveys current advances in Digital Trust from three complementary points of view:
  - A technical analysis
  - A business and economic prospective analysis
  - A technical standardization perspective
- **From the technical analysis**
  - It reviews the basic concepts of the technology and the existing work supporting the development of Digital Trust
  - It presents some technical challenges related to Digital Trust
- **From business and economic prospective**
  - It highlights the interest for Digital Trust
  - It stress the need of Digital Trust for each Smart ICT concepts
- **From standards point of view technical standardization**
  - It considers both as an important tool to support Digital Trust for Smart ICT

1 SMART ICT, A DEFINITION AND INTRODUCTION TO THE CONCEPTS

2 DIGITAL TRUST FOR SMART ICT: ECONOMIC CHALLENGES AND PROSPECTS

3 DIGITAL TRUST FOR SMART ICT: TECHNICAL APPROACHES

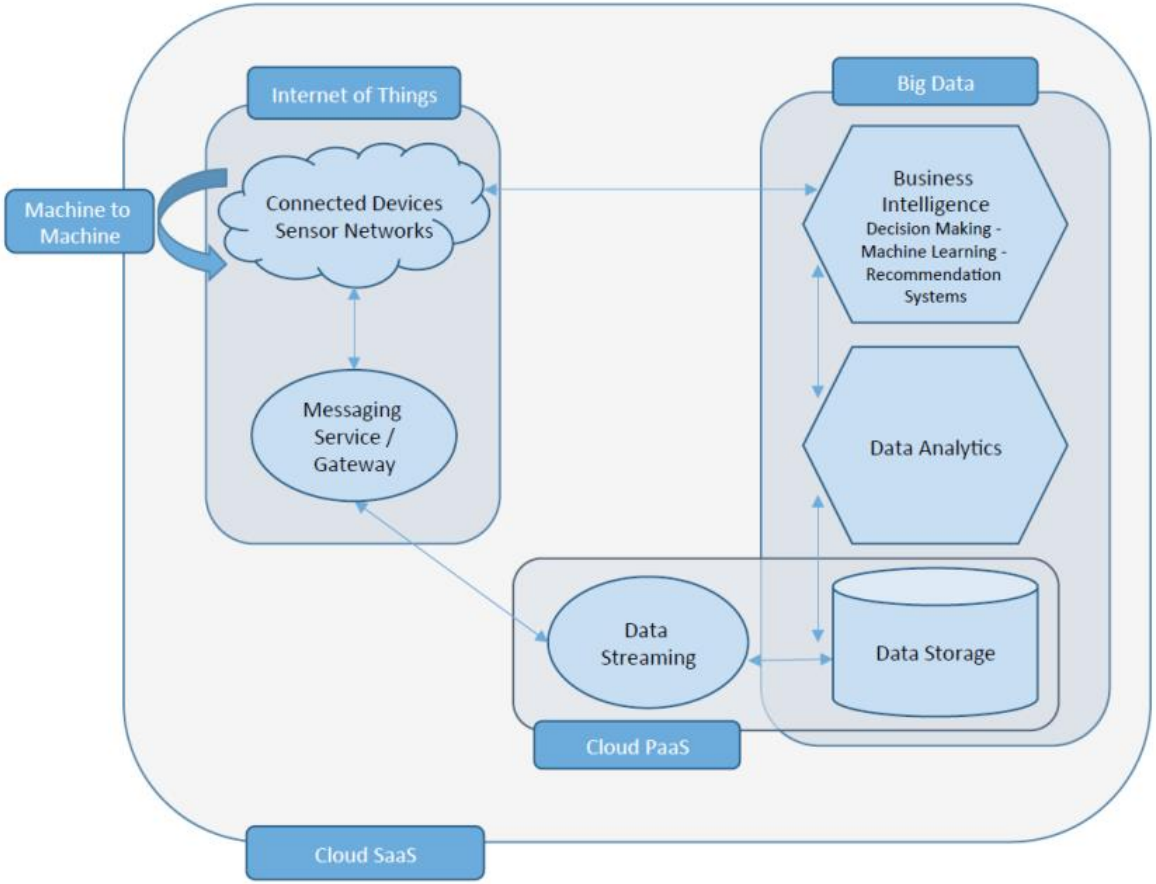
4 STANDARDIZATION TO LEVERAGE DIGITAL TRUST

5 CONCLUSIONS AND OUTLOOK

- **Introduce smart technologies detailed in the White Paper:**
  - **Internet of Things (IoT)**
  - **Cloud Computing**
  - **Big Data & Analytics**
- **Show how smart technologies interact and place them into context**
- **Introduce Digital Trust requirements and give some leads for leveraging digital trust**

Smart ICT: A definition and introduction to the concepts

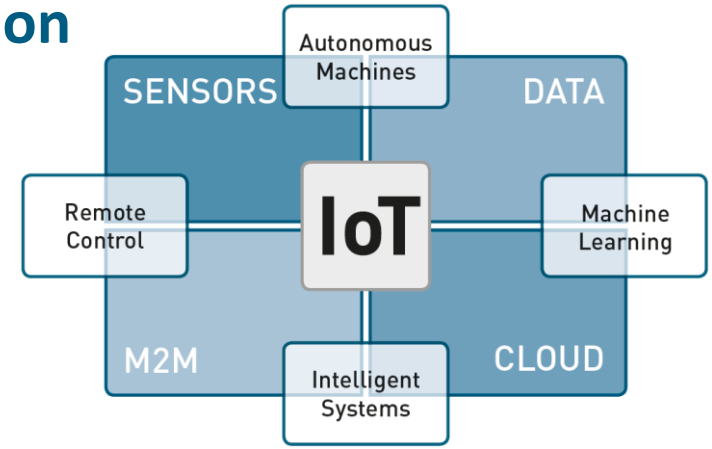
- Introduction and contextualization of technologies, interactions and applications



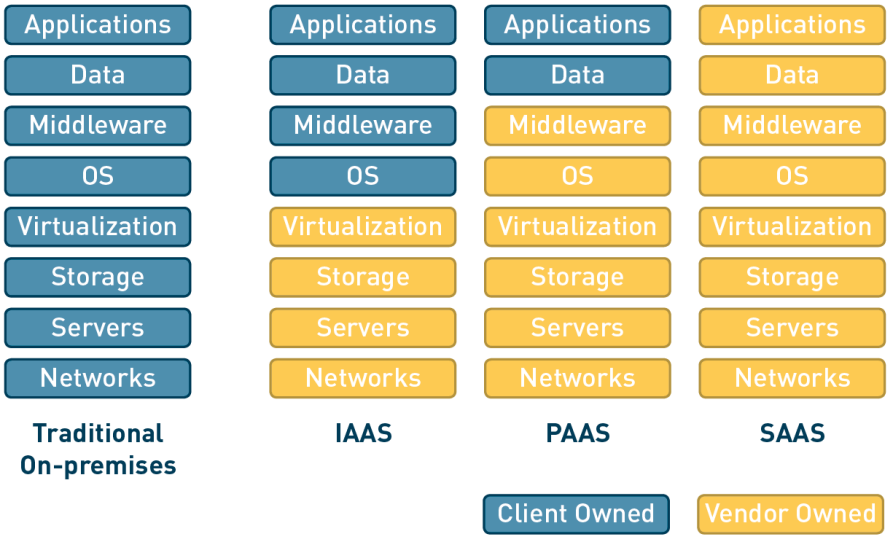
Smart ICT Components and their Interactions

Smart ICT: A definition and introduction to the concepts

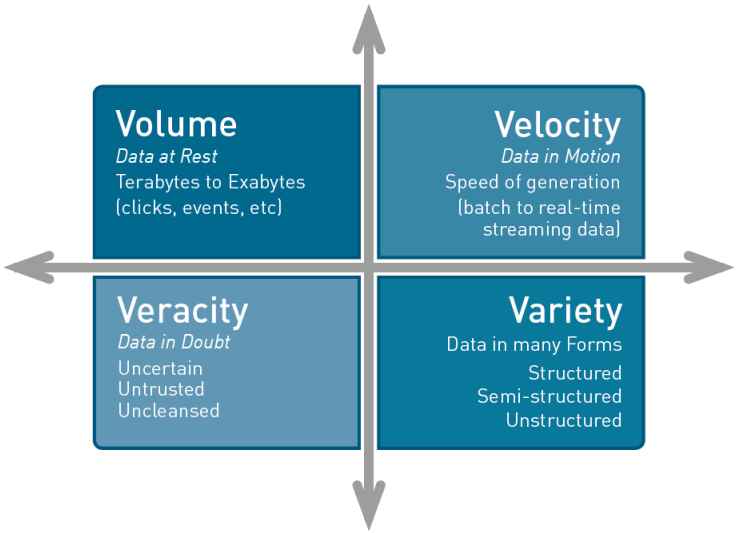
- Focus on IoT, Cloud Computing and Big Data
  - Definition
  - Characteristics
  - Digital Trust challenges (e.g.: accountability, security, privacy, etc.)



Main enablers of the Internet of Things



Allocation of responsibilities in the Cloud Computing service models



The four Vs of Big Data

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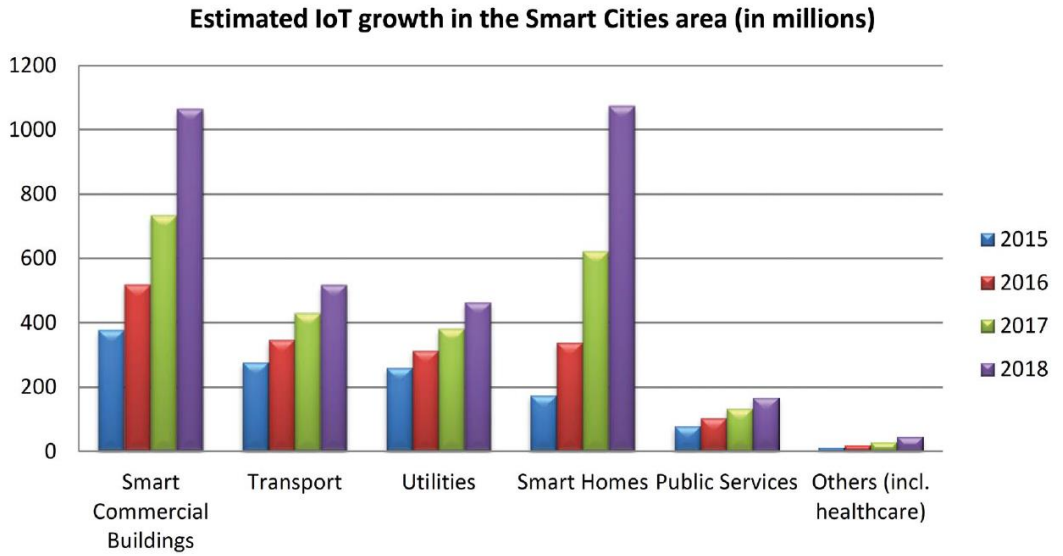
5 CONCLUSIONS AND OUTLOOK

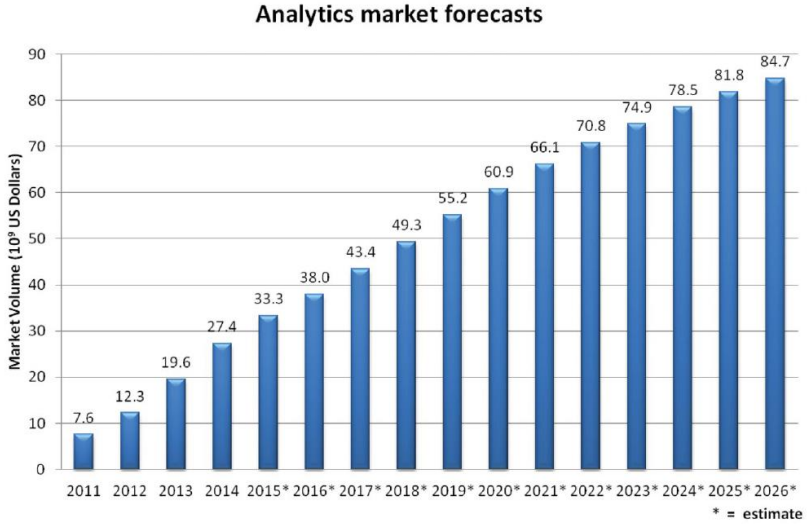
- **Economic Analysis and Prospects / Economic Challenges of Trust**
  - **Internet of Things**
  - **Cloud Computing**
  - **Big Data & Analytics**

Digital trust for Smart ICT: Economic challenges and prospects

- Economic Analysis and Prospects:
  - E.g.: IoT development and applications



Connected Things installed base within the area of Smart Cities

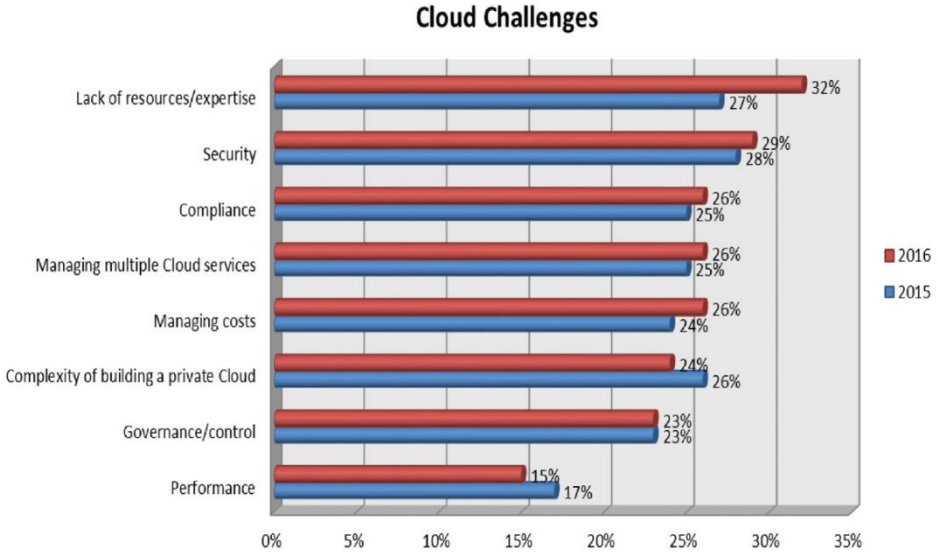


Big Data Analytics market forecasts

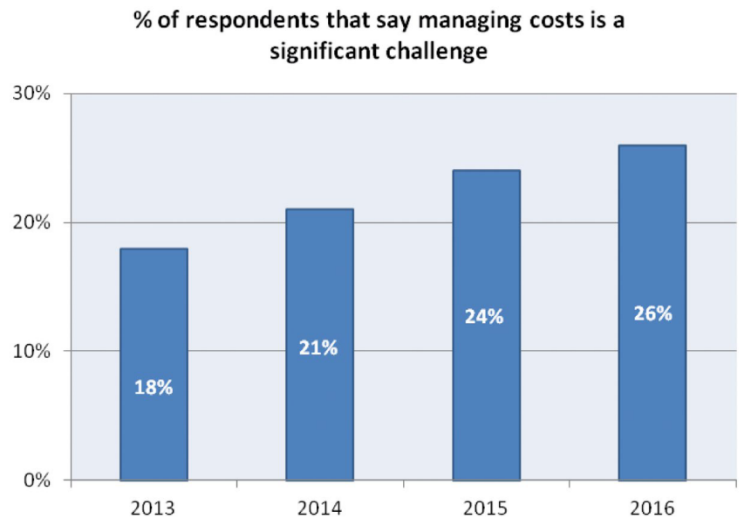
- E.g.: Big Data Analytics market growth forecast

Digital trust for Smart ICT: Economic challenges and prospects

- Economic Challenges of Trust – some examples:
  - IoT: privacy, transparency, responsibility, data collection context
  - Cloud: talents, compliance with regulation, security, costs
  - Big Data: monetization, data evaluation



Cloud challenges 2016 vs. 2015



Cloud cost challenges

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4 STANDARDIZATION TO LEVERAGE DIGITAL TRUST

5 CONCLUSIONS AND OUTLOOK

- **Trust in Smart ICT**
  - Privacy
  - Data and Information Security
  - Interoperability
- **Trust in Cloud Computing**
  - Trust as a Human Concern
  - Trust Models
  - Trust as a Technical Challenge
  - Trust as a Legal Puzzle
- **Trust in Big Data**
  - Data Accessibility
  - Data Provenance and Reproducibility
  - Privacy Concerns in Big Data
  - Information and Data Security
  - Access and Policy Management Techniques
- **Trust in Internet of Things**
  - Privacy, Anonymity and Consent
  - Attack Surfaces and Threats
  - Smart Home Security
  - Security in Embedded Devices and Real-Time Processing
  - Transmission Encryption and Security
  - Security in IoT Friendly Messaging Protocols
  - Authentication / Secure Pairing

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5 CONCLUSIONS AND OUTLOOK

- **Cloud Computing Standardization Technical Committees & Standards**
  - E.g.: ISO/IEC JTC 1/SC 38
  - E.g.: ETSI Cloud Standards Coordination
- **IoT Standardization Technical Committees & Standards**
  - E.g.: ISO/IEC JTC 1/WG 10
  - E.g.: ETSI & oneM2M
  - E.g.: The Alliance for IoT
- **Big Data Standardization Technical Committees & Standards**
  - E.g.: ISO/IEC JTC 1/WG 9
  - E.g.: NIST Public Working Group for Big Data
- **Common Standardization Technical Committees & Standards**
  - E.g.: ISO/IEC JTC 1/SC 27
  - E.g.: ISO/IEC JTC 1/SC 40
  - E.g.: ETSI/TC CYBER

1 SMART ICT, A DEFINITION AND INTRODUCTION TO THE CONCEPTS

2 DIGITAL TRUST FOR SMART ICT: ECONOMIC CHALLENGES AND PROSPECTS

3 DIGITAL TRUST FOR SMART ICT: TECHNICAL APPROACHES

4 STANDARDIZATION TO LEVERAGE DIGITAL TRUST

5 CONCLUSIONS AND OUTLOOK

- **Review of each Smart Technology development prospective**
- **Stress out Digital Trust importance and impact**
- **Highlight standardization value for technological evolution**

ILNAS WHITE PAPER "DIGITAL TRUST FOR SMART ICT"

https://gd.lu/7H5sD3

White Paper “Digital Trust for Smart ICT”
Technical Overview

Dr. Joseph EMERAS - ANEC GIE

Digital Trust

- *Positive and verifiable belief about the perceived reliability of a digital information source, product or service, leading to an intention to use* [5]
- More complex than ''regular'' trust [4]
  - Expectancy
  - Belief
  - Risk willingness

Sociological **and** technological

- Asymmetry of information
  - IT infrastructure
  - Data processing
  - Business model

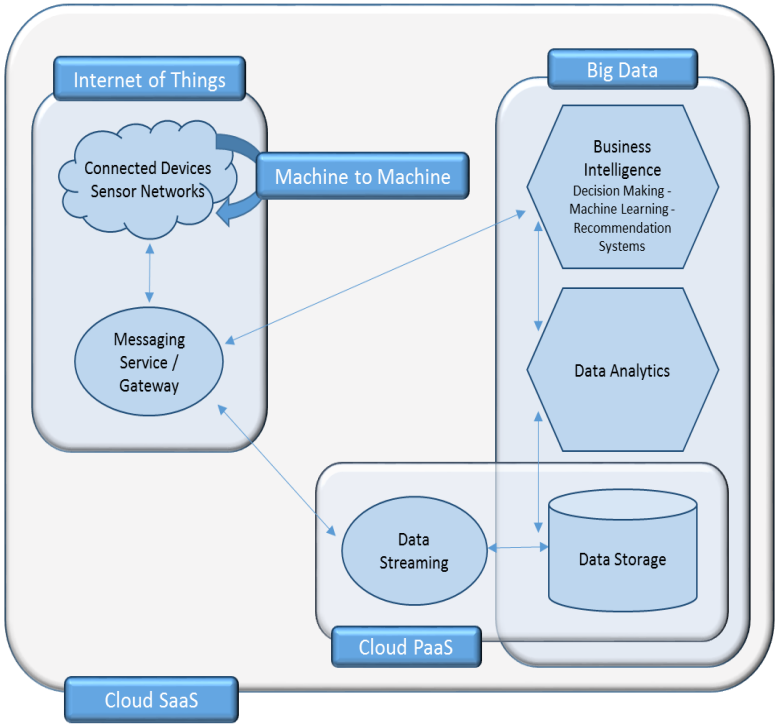
Black Box

- Accenture [8]: *the confidence placed in an organization to **collect**, **store**, and **use** the digital information of others in a manner that **benefits and protects** those to whom the information pertains*

[4] D. M. Huang, J., Nicol, "A Formal-Semantics-Based Calculus of Trust," in *IEEE Internet Computing, 14(5)*, 2010, pp. 38–46.
[5] F. Rowley, J., & Johnson, "Understanding trust formation in digital information sources: The case of Wikipedia," *J. Inf. Sci.*, 2013.
[8] Accenture, "Digital Trust in the IoT Era." Accenture Consulting, 2015.

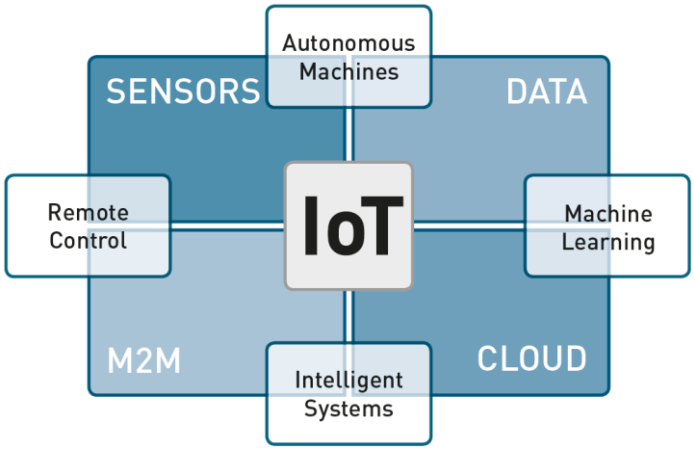
Technology in Progress

- 2007 – 2015: 12-fold mobile penetration
- 2015: mobile world, massive network densification
  - 69% humans covered by 3G
  - 89% in urban areas
- New communication paradigms, access to information & services
- Shortcuts:
  - Emergence of Cloud Computing made big IT infrastructure & computing power accessible to anyone
  - Algorithms, computing power brought Big Data
  - Circuit densification brought smaller devices and IoT, bringing data to exploit



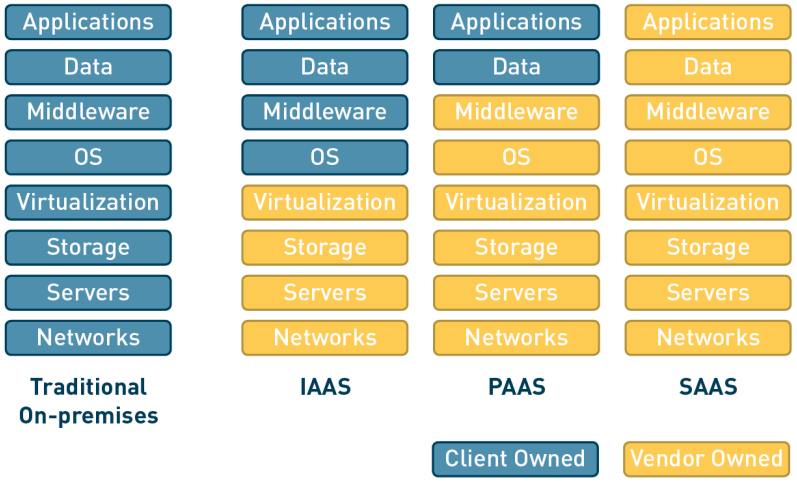
IoT

- Some characteristics
  - Permanently connected
  - Processing data
  - Interacting with humans
  - Communicating with each others
- Some Digital Trust challenges
  - Authentication
  - Authorization
  - Data confidentiality
  - Privacy & security
- Problem
  - Typical measures inadequate due to low processing power of some devices



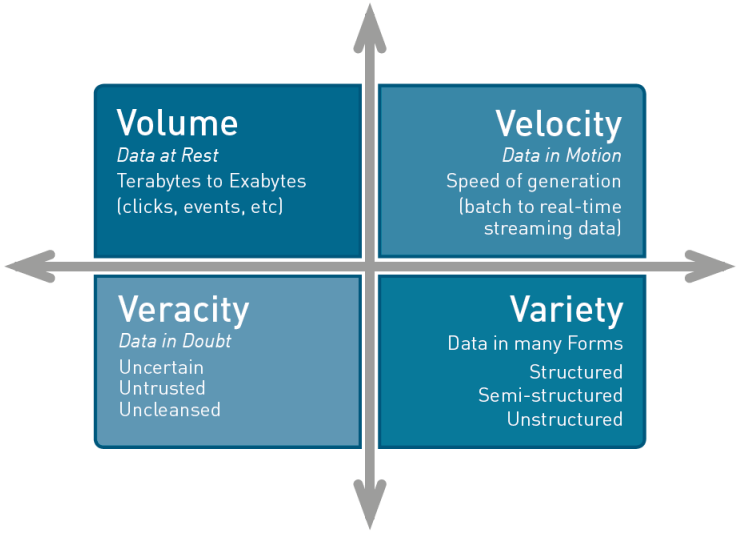
Cloud

- Some characteristics
  - Different models: IaaS, PaaS, SaaS…
  - Different deployment models
- Some Digital Trust challenges
  - ➢ Lack of control
  - ➢ Portability
  - ➢ Interoperability
  - ➢ QoS / SLA comparison
- Problems
  - Diversity of models and providers (public Clouds), difficult comparison
  - Cost uncertainty



Big Data

- Some characteristics
  - Vs
  - Analyze data from multiple sources / formats
  - Correlation, trends analysis
- Some Digital Trust challenges
  - ➢ Privacy, security, ethical
  - ➢ Re-identification
  - ➢ Ownership (IP)
    - Data
    - Correlations
    - Findings



- Problems
  - Business rationale vs the hype: validity, generalization, replicability
  - Big Data vs robust statistics: overfitting and model complexity
  - Integration of technology in people's lives

Digital Trust

- Chapter 1 proposes an extended view of Smart technologies and their Digital Trust requirements
- Now a glimpse into Chapter 3, Digital Trust is not only about **Security**
- Trust is fragile, distrust is robust
- Fundamentals
  - Privacy
    - Uncertain, context-dependent and malleable
  - Data and Information Security
    - Confidentiality, Integrity, and Availability (CIA)
    - Availability, reliability, safety, integrity, maintainability
  - Interoperability
    - Compatibility: 2 systems communicate and work for a common purpose
    - Interchangeability: systems' purpose, functionalities and services are the same

Privacy by design [84]

1. MINIMIZE: restrict amount of personal data collected to the minimum.
2. HIDE: personal data and interrelationships are hidden from plain view from anybody. Beware of correlation and re-identification.
3. SEPARATE: distribute data processing and/or storage to prevent global view from an individual.
4. AGGREGATE: aggregation guarantees anonymity if no information can be attributed to an individual.
5. INFORM: informing subjects whenever personal data is processed, in particular by third parties.
6. CONTROL: is the counterpart to the INFORM strategy that allows users to edit their personal information.
7. ENFORCE: compatibility with legal requirements.
8. DEMONSTRATE: compliance with the privacy policy and legal requirements.

[84] J. Hoepman, "Privacy Design Strategies," *ICT Syst. Secur. Priv. Prot.*, pp. 446–459, 2014.

Cloud Computing Trust Models

Trust level evaluation framework for IaaS platforms [110]

TRUST CRITERION	DESCRIPTION
Integrity	all assets can be accessed or modified only by authorized parties.
Benevolence	willingness and motivation of a service provider to add value, and without expecting any reward.
Security	ability to protect the most valuable assets and control the situation of these assets.
Competence and Ability	level of knowledge and skills. demonstrate the competencies and expertise of the trusted party.
Privacy	prevention of unauthorized parties from gaining important information.
Predictability	consistency of actions and job performance which reduce uncertainty and risk.
Reputation	end user's perception based on observations or past experiences.
Accountability	auditing of the identity of an object which helps users determine with whom it is interacting and determine legal, operational, and technical responsibility with respect to that object.
Assurance	providing a sense of comfort or ensuring that the service has been designed, developed, and maintained based on formalized and rigorous controls and standards.

[110] H. M. Alabool and A. K. Mahmood, "A novel evaluation framework for improving trust level of Infrastructure as a Service," *Cluster Computing*, pp. 1–22, 2015.

Big (or not) Data Protection Techniques

- Storage: encryption – file level, block level
- Processing: searchable encryption, homomorphic encryption, policy-based techniques, multi-authorities
- Hardware: Trusted Platform Module, detect tampering
- Lifecycle management: data coloring, watermarking
- Access and management: XACML workflow – declarative language for attribute-based access control

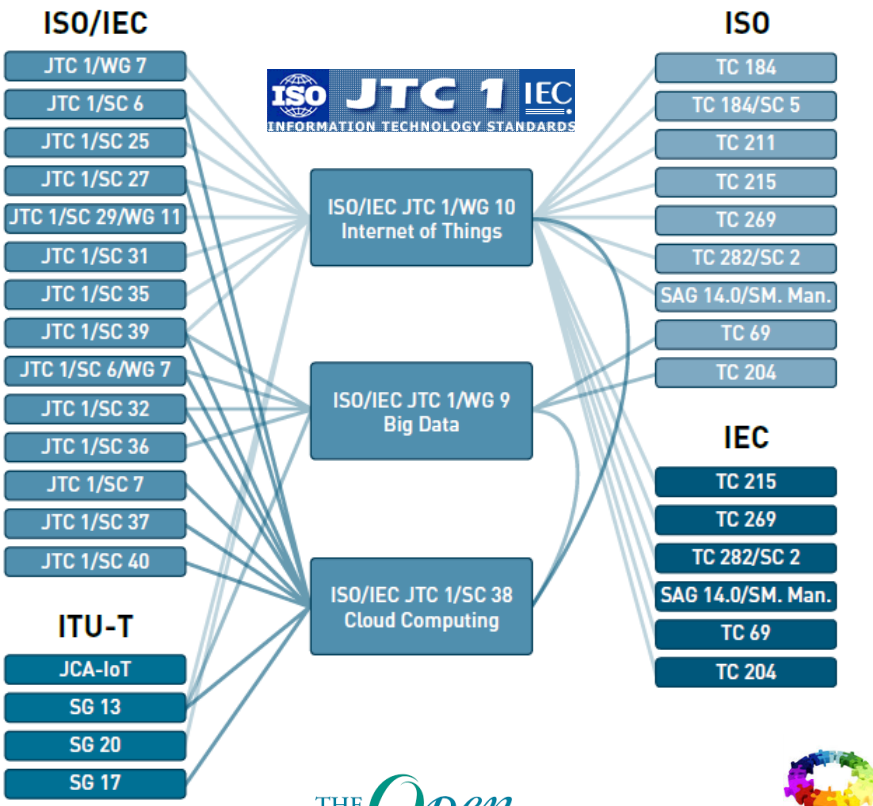
IoT Security

- Communications encryption techniques: WPA2 (link), AES/DES (internet), SSL (application)
- Messaging protocols: MQTT, COAP, DDS…
- Authentication and secure pairing protocols: Bluetooth Secure Simple Pairing (SSP)
  - Numeric Comparison
  - Passkey Entry
  - Just Works
  - Out of Band

White Paper “Digital Trust for Smart ICT”
Standardization Landscape

Dr. Joseph EMERAS - ANEC GIE

A rich and complex standardization ecosystem



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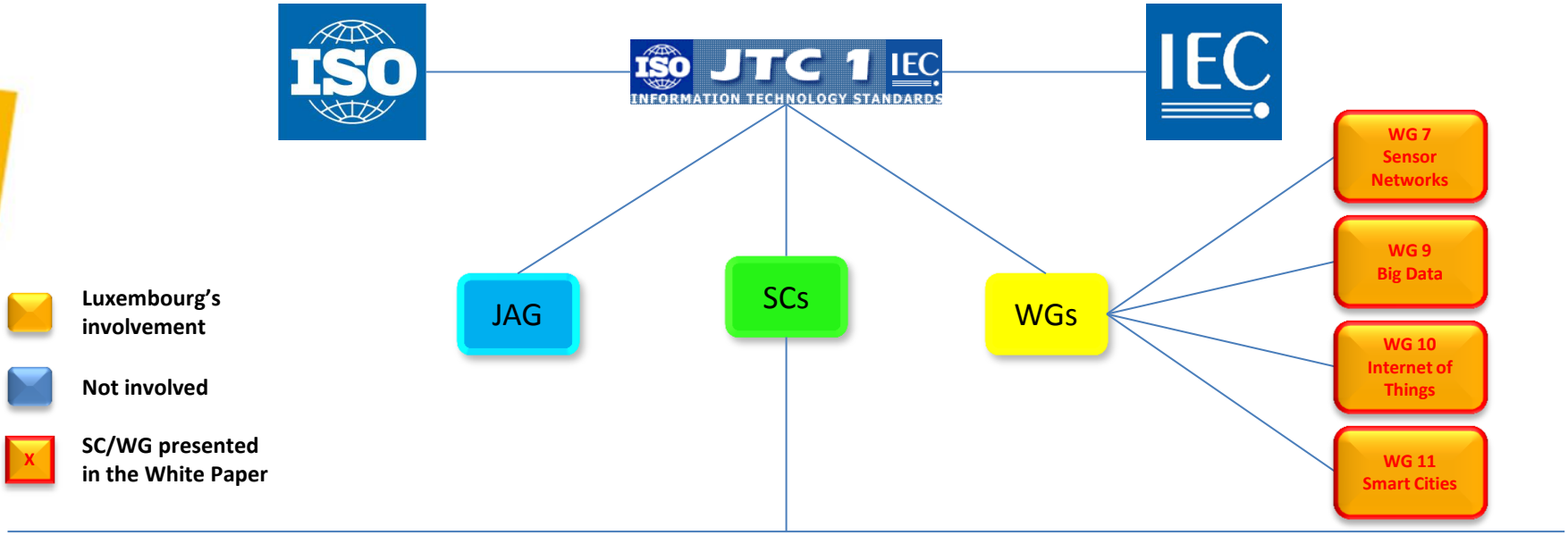
ISO/IEC JTC 1



SC 2 Coded Character Sets	SC 6 Telecommunications and information exchange between systems	**SC 7 Software and Systems Engineering**	**SC17 Cards & Personal Identification**	SC 22 Programming Languages	SC 23 Digitally recorded media for information interchange and storage	SC 24 Computer graphics, image processing, and environmental data representation	SC 25 Interconnection of information technology equipment	**SC 27 IT security techniques**	SC 28 Office equipment
SC 29 Coding of audio, picture, multimedia and hypermedia information	SC 31 Automatic identification and data captures techniques	**SC 32 Data management and interchange**	**SC 34 Document description and processing languages**	SC 35 User interfaces	**SC 36 Information technology for learning, education and training**	SC 37 Biometrics	**SC 38 Cloud Computing and Distributed Platforms**	**SC 39 Sustainability for and by information technology**	**SC 40 IT Service Management and IT Governance**

ISO/IEC JTC 1/WG 10 – Internet of Things

- **Created:** **2014**

- **Main focus areas:**
  - **Develop foundational standards for IoT**
  - Work on **IoT standardization gaps**
  - Establish **liaisons with other entities** undertaking work related to IoT
  - Encourage **exchange of information** between entities working on IoT
  - Monitor the **ongoing IoT regulatory, market, business and technology requirements**
  - Develop **other IoT standards that build on the foundational standards**

- **Projects under development:** 3 International Standards and Technical Reports

- **Chairperson:** Mr. Sangkeun Yoo (Republic of Korea)

- **Members:** **30 countries**: Australia, Austria, Belgium, Canada, China, Czech Republic, Denmark, Finland, France, Germany, Hungary, India, Ireland, Israel, Italy, Japan, Republic of Korea, **Luxembourg**, Mexico, Netherlands, New Zealand, Norway , Russian Federation, Singapore, South Africa, Spain, Sweden, Switzerland, United Kingdom, United States

- **Luxembourg's involvement:**
  - Mr. Joseph EMERAS, Mr. Sune NIELSEN (ANEC GIE)
  - Mr. Hervé COLLIGNON (e-TIC)
  - Mr. Cyril CASSAGNES (KPMG)

ISO/IEC CD 20924, Information technology - Internet of Things (IoT) - Definition and vocabulary

- **Scope:**
  - This International Standard **provides a definition of Internet of Things along with a set of terms and definitions**
  - This International Standard is a **terminology foundation for the Internet of Things**

- **E.g.:** Internet of Things (IoT)
  - An infrastructure of interconnected objects, people, systems and information resources together with intelligent services to allow them to process information of the physical and the virtual world and react

- **Limit date for the publication:** **November 2019**

ISO/IEC CD 30141, Internet of Things - Reference Architecture (IoT RA)

- **Scope:**
  - This document **specifies the general IoT reference architecture** in terms of defining **system characteristics**, a **conceptual model**, a **reference model** and **architecture views** for IoT

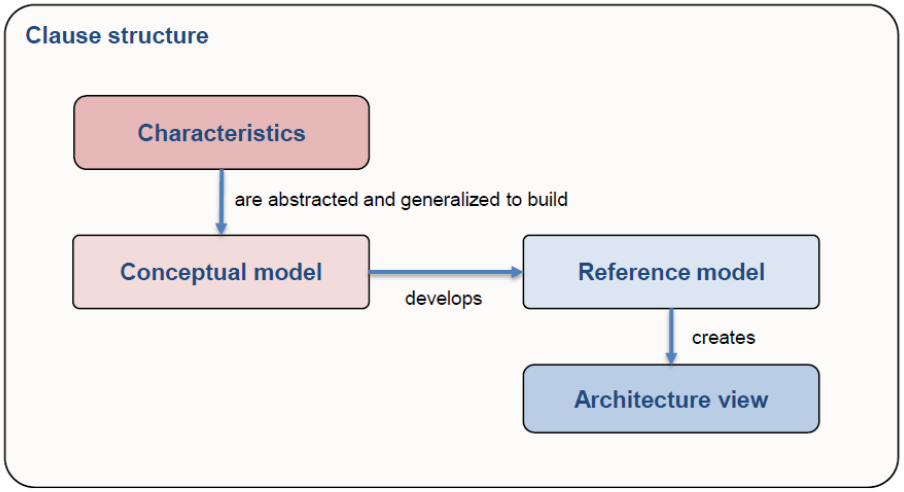
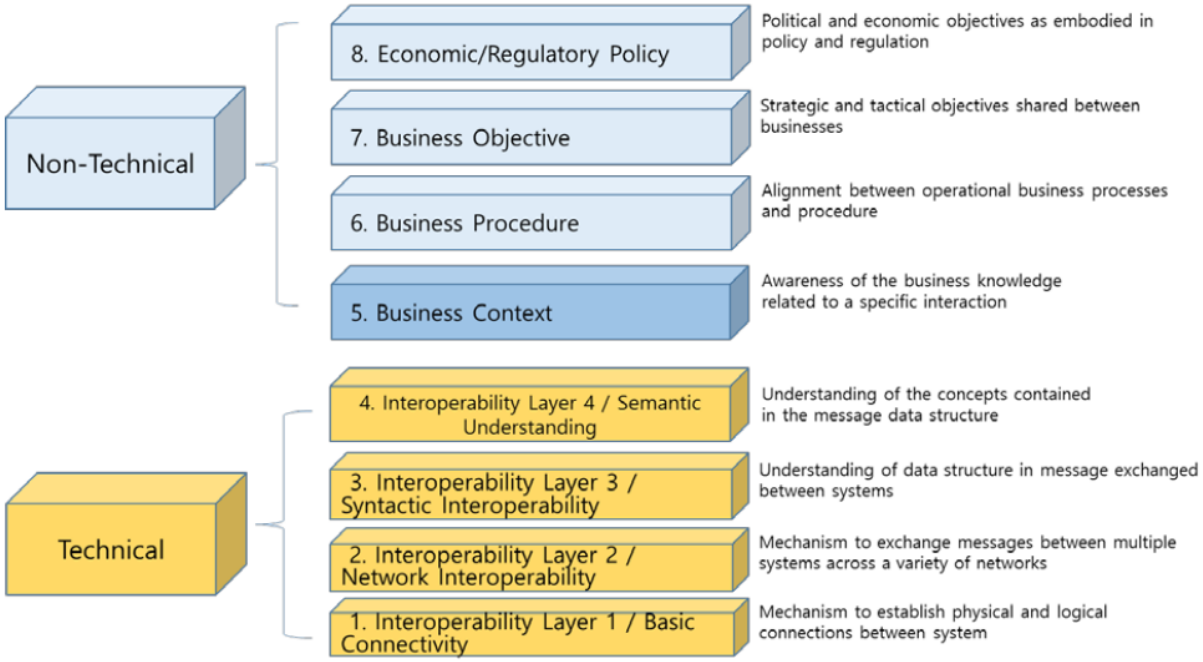


Figure 1 – IoT RA structure

- **Limit date for the publication:** **October 2018**

ISO/IEC AWI 21823-1, Internet of things (IoT) - Interoperability for internet of things systems - Part 1: Framework

- **Scope:**
  - This part of standards **presents an overview of interoperable IoT systems and framework for interoperability** to ensure information exchanges in such that the information is understood and can be efficiently processed to support peer-to-peer interoperability of IoT systems and seamless communication among IoT system entities



- **E.g.:** Example of IoT Interoperability Framework (Source: GridWise Interoperability Framework)
- **Limit date for the publication:** July 2019

ISO/IEC JTC 1/WG 9 – Big Data

- **Created:** **2015**

- **Main focus areas:**
  - Serve as the **focus of and proponent** for JTC 1's Big Data standardization program
  - Develop **foundational standards** for Big Data for guiding Big Data efforts throughout JTC 1
  - Develop **other Big Data standards** that **build on** the foundational standards
  - Identify **gaps** in Big Data standardization
  - Identify, develop and maintain **liaisons** with all relevant entities and investigate **ongoing work**
  - Engage with the **community** outside of JTC 1 to grow the **awareness** of and encourage engagement

- **Projects under development:** 5 International Standards and Technical Reports

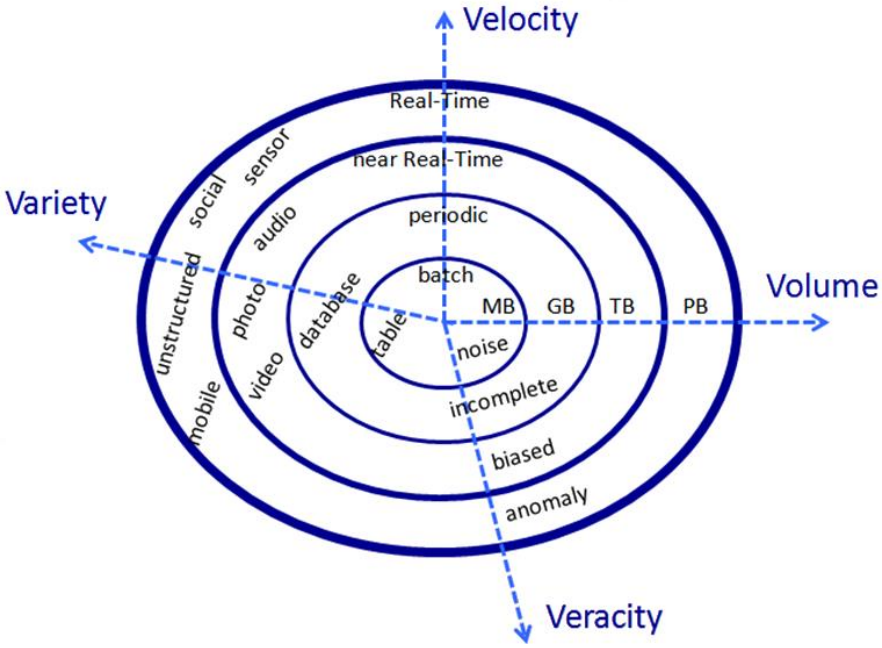
- **Chairperson:** Mr. Wo Chang (United States)

- **Members:** **24 countries**: Australia, Austria, Brazil, Canada, China, Finland, France, Germany, India, Ireland, Italy, Japan, Republic of Korea, **Luxembourg**, Mexico, Netherlands, Norway , Russian Federation, Singapore, South Africa, Spain, Sweden, United Kingdom, United States

- **Luxembourg's involvement:**
  - Mr. Johnatan PECERO, Mr. Joseph EMERAS, Mr. Sune NIELSEN (ANEC GIE)
  - Mrs. Aida HORANIET (Docler Holding)
  - Mr. Emmanuel KIEFFER (University of Luxembourg)
  - Mrs. Natalia CASSAGNES (Travelsify)
  - Mr. Christophe DELOGNE, Mr. Cyril CASSAGNES (KPMG)

ISO/IEC 20546 - Information Technology - Big Data - Definition and Vocabulary

- This International Standard provides an **overview of Big Data** along with a set of **terms and definitions**
- It provides a **terminological foundation** for Big Data-related standards
- **Example:**
  - Definition of Big Data characteristics
  - Horizontal scaling / vertical scaling
  - And more
- **Expected date of publication:**
  - **March 2017**



ISO/IEC 20547 - Information technology - Big Data - Reference Architecture

- **Scope:**
  - The ISO/IEC 20547 series of standards and technical reports will provide a framework and **reference architecture** which organizations can apply to their problem domain to effectively and consistently describe their architecture and its **implementations** with respect to the **roles/actors** and their concerns as well as the **underlying technology**

- **Structure:**
  - Part 1: Framework and Application Process
  - Part 2: Use Cases and Derived Requirements
  - Part 3: Reference Architecture
  - Part 4: Security and Privacy Fabric - *has been assigned to JTC 1/SC 27 "IT security techniques"*
  - Part 5: Standards Roadmap

- **Expected dates for the publication:** **December 2017**

ISO/IEC JTC 1/SC 38 - Cloud Computing and Distributed Platforms

- **Created:** 2009
- **Main focus areas:**
  - **Standardization in the area of Cloud Computing and Distributed Platforms**
- **Structure:**
  - ISO/IEC JTC 1/SC 38/WG 3 - Cloud Computing Service Level Agreements (CCSLA)
  - ISO/IEC JTC 1/SC 38/WG 4 - Cloud Computing Interoperability and Portability (CCIP)
  - ISO/IEC JTC 1/SC 38/WG 5 - Cloud Computing Data and its Flow (CCDF)
- **Published projects:** 9 International Standards and 1 Technical Report
- **Projects under development:** 6 International Standards

- **Chairperson:** Mr. Donald Deutsch (United States)
- **Members:** 40 countries (**Luxembourg**)
- **Luxembourg's involvement:**
  - Mr. Johnatan PECERO, Mr. Joseph EMERAS (ANEC GIE)
  - Mr. Michel AYME (ATOS)
  - Mr. Christophe DELOGNE, Mr. Cyril CASSAGNES (KPMG)
  - Mr. Joost PISTERS (Luxcloud)
  - Mrs. Myriam DJEROUNI (Banque de Luxembourg)
  - Mrs. Shenglan HU, Mr. Jean-Michel REMICHE (POST)
  - Mrs. Ana-Maria SIMIONOVICI, Mr. Qiang TANG, Mr. Shyam WAGLE (University of Luxembourg)
  - Mrs. Digambal NAYAGUM (AS Avocats)
  - Mr. Jean RAPP (Actimage)

ISO/IEC 19086, Information technology - Cloud computing - Service level agreement (SLA) framework

- **Structure:**
  - **Part 1: Overview and concepts** (published in 2016)
    - Provides an overview, foundational concepts, and definitions for the cloud SLA framework
    - Establishes a common framework for helping organizations to understand the purpose of all the parts of ISO/IEC 19086 and the relationships between those parts
  - **Part 2: Metric Model**
    - Provides the metrics model to be used for creating metrics used in SLOs and SQOs
  - **Part 3: Core conformance requirements**
    - Provides the core conformance requirements derived from the SLOs and SQOs defined in this document
  - **Part 4: Security and privacy** - *has been assigned to JTC 1/SC 27 "IT security techniques"*
    - Describes specific components and the conformance requirements for SLOs and SQOs in the area of Security and Privacy

- **Limit dates for the publication:** **September 2018**

ISO/IEC CD 19941, Information technology - Cloud computing - Interoperability and portability

- **Scope:**
  - This document **specifies cloud computing interoperability and portability types**, the **relationship and interactions between these two aspects**, and **common terminology and concepts** used to discuss interoperability and portability and particularly relating to cloud services
  - The goal of this document is to ensure that all parties involved in cloud computing, particularly CSCs, CSPs and CSNs acting as Cloud Service Developers, have a common understanding of interoperability and portability for their specific needs
  - This common understanding helps to achieve interoperability and portability in cloud computing by establishing common terminology and concepts

- **Limit date for the publication:** **August 2018**

ISO/IEC DIS 19944, Information technology - Cloud computing - Cloud services and devices: data flow, data categories and data use

- **Scope:**
  - This document:
    - **Extends the existing cloud computing vocabulary and reference architecture** in ISO/IEC 17788 and ISO/IEC 17789 to describe an ecosystem involving devices consuming cloud services
    - **Describes the various types of data flowing** within the devices and cloud computing ecosystem
    - **Describes the impact of connected devices on the data** that flow within the cloud computing ecosystem
    - **Describes flows of data** between cloud services, cloud service customers and cloud service users
    - Provides **foundational concepts**, including a **data taxonomy**
    - Identifies the **categories of data** that flow across the cloud service customer devices and cloud services

- **Limit date for the publication:** **August 2018**

ISO/IEC NP 22123, Information Technology - Cloud Computing - Concepts and Terminology

- **Scope:**
  - This document **provides a consolidated set of concepts, terms terminology and definitions** extracted from the ISO/IEC cloud computing standards
  - In addition, relevant and stable terminology from non-cloud computing ISO sources (e.g.: Information technology – Security techniques) and external organization are also included
  - This document may also contains cloud computing related terms and definitions that are not necessarily contained in other works
  - This document also addresses discrepancies and inconsistencies that have been identified in the consolidated terms and definitions to further enhance the usability of the ISO cloud computing terminology

- **New project under approval (until 30.01.2017)**

New developments in ISO/IEC JTC 1

- **Last plenary meeting:** 7-10 November 2016 in Lillehammer (Norway)

- **Resolution 12 adopted:** Establishment of JTC 1 **Subcommittee SC 41, Internet of Things and related technologies**
  - Scope: **Standardization in the area of Internet of Things and related technologies**
    - Serve as the focus and proponent for JTC 1's standardization program on the Internet of Things and related technologies, including Sensor Networks and Wearables technologies
    - Provide guidance to JTC 1, IEC, ISO and other entities developing Internet of Things related applications
  - Structure:
    - Working group on **Sensor Networks** (will replace JTC 1/WG 7)
    - Working group on **Internet of Things** (will replace JTC 1/WG 10)
    - Study group on **Wearables technologies**

Conclusion & Outlook

Dr. Johnatan PECERO – ANEC GIE

Internet of Things & Digital Trust

- Further adoption of IoT and the achievement of its full potential will depend on two key factors that need further elaboration
  - Interoperability
  - Security/Privacy (*one of the biggest barrier for IoT adoption*)

- Current technology and related standards are relatively immature and make interoperability of proposed solutions between the various Things an important challenge
  - oneM2M platform (leading by ETSI regarding standardization) seems to be a good option and becoming a standard

- The various connected devices (such as medical equipment, smart meters and smartphones) may not have the required security protections implemented, resulting in the potential misuse of personal data
  - New malware every ½ second
  - Control system, vehicles, homes, etc can be accessed and manipulated causing injury or worse (Cloud security alliance)

Cloud Computing & Digital Trust

- New security challenges for Cloud Computing have emerged and existing vulnerabilities have been amplified
- Reduction in concerns about Cloud security
  - The shortage of trained resources/expertise has overtaken security as the top Cloud challenge
- Cost concerns
  - Few organizations are actively working to reduce costs and to further improve Cloud ROI

Big Data & Digital Trust

- Big Data technologies are still in the initial stages of development and challenges include capture, curation, storage, search, sharing, transfer, analysis, and visualization
- More capital investment should be made to further develop the practice and science of Big Data
- New standards should be set from both a technological and privacy perspective
- Inadequate and outdated data protection regulations need to be modernized
  - The new EU data protection rules for personal data protection recently adopted by the European Parliament (GDPR approved by the EU parliament on April 14th 2016) are good example of steps taken in this direction

Standardization's role in Digital Trust

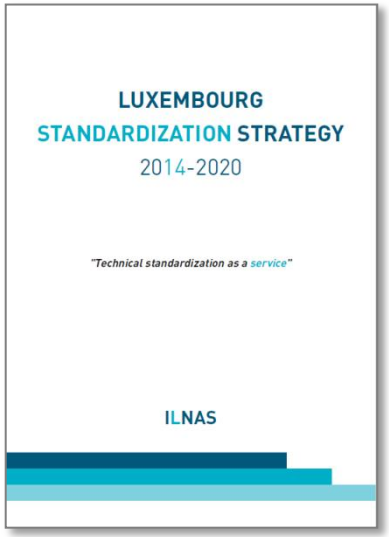
- Standardization is further promoted by the European Commission for the Digital Single Market
  - Ensure the interoperability of digital technologies
  - Provide the necessary foundations for achieving cooperation among EU countries by ensuring the smooth and reliable interaction of technologies
  - Foster research and innovation
  - Enable economies of scale

- Necessity to bring together the different standardization bodies and striking a balance between the manufacturing industry and service sectors

- Adoption of open and international standards will play a crucial role in tackling Smart ICT challenges related to Digital Trust

ILNAS positioning

- Luxembourg Standardization Strategy 2014-2020



- Luxembourg's Policy on ICT technical standardization for 2015-2020
  - To foster and strengthen the national ICT sector involvement in standardization work through three leading projects:
    - Developing market interest and involvement
    - Promoting and reinforcing market participation
    - Supporting and strengthening the Education about Standardization (EaS) and related research activities

ILNAS positioning

- Leads the national mirror committee ISO/IEC JTC 1
- National representative of the “European Multi-stakeholder platform on ICT Standardization” through its Digital Trust department
  - “Rolling Plan on ICT Standardization” defining the most important standardization initiatives and actions supporting EU policies
- Strengthens its relation with academic partners in order to structure standards-related education and research in Luxembourg
  - Pilot project conducted between September 2015 and September 2016: University certificate “Smart ICT for Business Innovation” in partnership with the University of Luxembourg
  - Objective: Master degree related to technical standardization
    - Would address Smart ICT topics in line with national priorities, providing a smart way of linking technology, standards, and business and creating an additional means of innovate at national level

SMART ICT
4business
INNOVATION

ILNAS positioning

- Development of related research activities
  - 4-year research program dedicated to “Digital Trust for Smart ICT”
  - Aims to build a solid base of knowledge and expertise in Smart ICT taking into account aspects related to security, reliability, and standardization and considering Digital Trust as a transversal axis
  - Crucial to the development of the future Master program and consolidation of the university certificate and future activities of education about standardization

Next ILNAS events – Save the date

December 8, 2016

Breakfast "Digital Trust for Big Data"

January 26, 2017

Breakfast "**Digital Trust for Cloud Computing**"

March 9, 2017

Breakfast "**Digital Trust for Internet of Things**"

Discussions

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