Last lessons....

- AI
  - Market, technology, what is "IA"
- Open source models, trabalhos derivados
- Marcas, IPR
- Standards

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Aspetos Profissionais e Sociais da Engenharia Informática

This is not a philosophy lesson...
but will take some time for you to understand the title

Rui L Aguiar, UA/IT

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Objective of this class

- Notions on several concepts
  - Close standards lesson
  - Ethics
  - Identity
  - Impact in Informatics

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Introduction

The standardization **landscape is rich and complex**, because of the variety in standard development organizations (SDOs) and the documents they produce…

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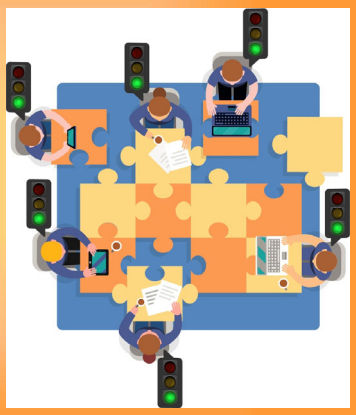
Formal standardization, SDO standards, and regulation

- **Formal standardization** is a well-defined process, open to any individual or organization, and its results are produced in consensus with all interested parties.
- Formal standardization is inspired by international directives on standardization, the most important being the principles produced by the Technical Barriers to Trade (TBT) Committee of the **Word Trade Organization (WTO)**.
  - Old example problem: DIN standards
- Formal standardization is the process adopted by SDOs to produce standards. Hence, we refer to these standards as **SDO standards**
- SDOs put in place formal standardization procedures to guarantee a **fair standard development process**, which is aimed at **building consensus among involved stakeholders** (e.g., manufacturers, providers, consumers, and regulators) and guaranteeing the **quality** of the final deliverables.



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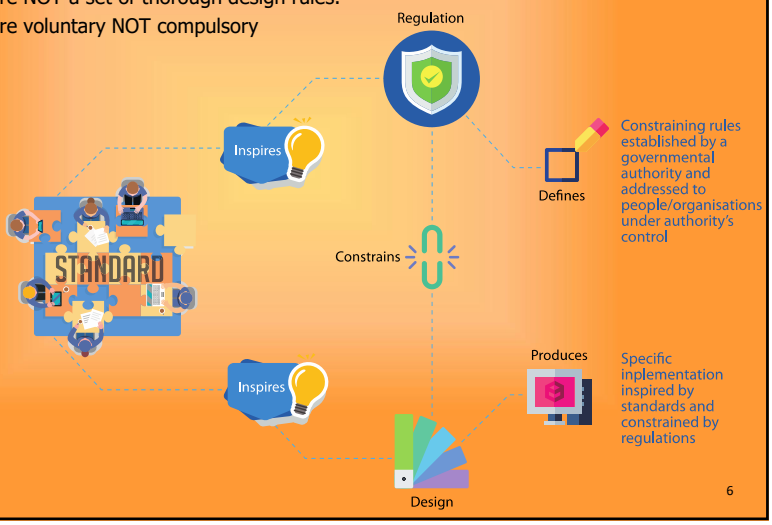
Formal standardization, SDO standards, and regulation

- Standards are NOT regulations.
- Standards are NOT a set of thorough design rules.
- Standards are voluntary NOT compulsory



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Formal standardization, SDO standards, and regulation

- Standards are NOT regulations
  - While conformity with standards is voluntary, **regulations are compulsory**;
    - An item (product, service, process, etc.) that doesn't fit regulations is not allowed in the territory/market where those regulations apply;
    - On the contrary, non-compliance to standards doesn't limit 'by law' the diffusion of an item
  - Standards are often (fully or partially) captured into regulations, as this simplifies and accelerates regulatory work thanks to the directions of established best practices defined in standards
- Standards are NOT a set of thorough design rules
  - Standards are aimed at defining a minimum set of requirements for an item (product, service, process, etc.) in order to make it meet certain well-defined objectives (e.g., to guarantee a certain degree of interoperability or to define a minimum level of performance)
  - Many 'standard-compliant' implementations of the item are possible

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Benefits of standards

Standards benefit:

- The economy
  - Economics of scale, facilitates trade
- Innovation
  - Setting quality levels, reducing risk
- The environment
  - Environmental sustainability, enhancing safety
- Industries
- Communities and individuals

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Examples of benefits from Standards

Benefits of standards for industries (especially for newly established ones and SMEs)

+ Innovation

Ease new developments (- risk, - investment, + opportunities)

+ Trade and competition

Enlarge potential market

+ Safety and sustainability

Fairer competition and less risks of non-compliance (widespread and shared basic requirements)

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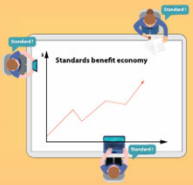
Examples of benefits from Standards

Benefits of standards for communities and individuals

+ Innovation

Satisfaction of tangible and intangible needs

+ Trade and competition



Best value for money

+ Safety and sustainability

Safer environment

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Possible risks of Standards

- Standards may jeopardize innovation, as:
  - When established, standards may limit or delay the introduction of innovative (disruptive) solutions in the market
  - Introducing innovation into standards may take a long time
- Measures SDOs put in place to minimize risks:
  - Effectively managing the standardization processes by being open and responsive to the market innovation trends and to research impulses from the experts involved in the standardization activities
  - Establish open expert groups to explore innovation

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Possible risks of Standards

- Standards may jeopardize fair competition among industries and Countries, as:
  - SDOs may be politicized, or unduly influenced by special interests
- Measures SDOs put in place to minimize risks:
  - Enlarge contributor base
  - Right balance between effectiveness and fairness

All standards get bloated

- Varied standardization landscape may carry to inconsistencies, as:
  - Standards produced by different SDOs may be in competition or partially overlap; consequent production of inconsistent or, at least, redundant requirements may strongly jeopardize standardization benefits
  - Risk of unfairness as some SDO may be misused for local or specific interests
- Measures to put in place to minimize risks
  - Users and contributors to standards must select the most appropriate SDO
  - SDOs promote liaisons and collaboration among themselves

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Classification of SDOs

- Standardization landscape includes multiple SDOs that may differ in
  - Geographical coverage

International SDOs

These have members worldwide, which sometimes also include national or regional standard bodies, and their deliverables have worldwide coverage.

Regional SDOs

These have members (industries, academia and national SDOs) from countries that usually share, or are interested in promoting common practices and regulations.

  - Technical scope of activities (as per each SDO's statute)
  - Level of recognition from regulatory or political organizations

- SDOs often establish liaisons or set up common working groups to generically coordinate their activities or to join efforts on specific items

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Classification of SDOs – International SDOs (examples)

- ITU
  - Since 1947 it's a specialized agency of UN, with study group made up by state members, sector members, associates from industry, international and regional standard organizations, and academia.
  - ITU sectors: ITU-T (electronic design and test specifications), ITU-R (global radio spectrum, satellite orbits), ITU-D (promotion of fair and affordable access to telecommunications)
- ISO
  - Independent, international non-governmental organization founded in 1946, with members from 160 country divided into hundreds of technical committees and subcommittees
  - ISO standards covers ICT, healthcare, energy and automotive.
- IETF
  - Governing body of the Internet as part of the Internet society (ISOC)
  - It is controlled by the Internet Architecture Board (IAB), which is both a committee of the IETF and an advisory body of the Internet Society
- ETSI
  - ETSI is a European Standards Organization (ESO), recognized regional standards body dealing with telecommunications, broadcasting and other electronic communications networks and services.
  - ETSI supports European regulations and legislation through the creation of Harmonised European Standards. Only standards developed by the three ESOs (CEN, CENELEC and ETSI) are recognized as European Standards.
- ARSO
  - Main goals: harmonize national and/or sub-regional standards as African Standards, to initiate and coordinate the development of African Standards (ARS) with reference to products that are of particular interest to Africa, such as agriculture and food, civil engineering, chemistry, and chemical engineering, and to encourage and facilitate the adoption of international standards by member bodies.
- PASC
  - main objectives: to strengthen ISO and IEC international standardization programmes, to improve the ability of Pacific Rim SDOs to participate in these programmes effectively, to improve the quality and capacity of standardization and to promote standardization

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Classification of SDOs - Geographical coverage

- National Standard Development Organizations (NSDO)
  - National SDOs (NSDOs or NSB) operate at the single country level and issue country-specific standards; they often collaborate with International and Regional SDOs.
  - Some relevant NSDOs outside Europe are:

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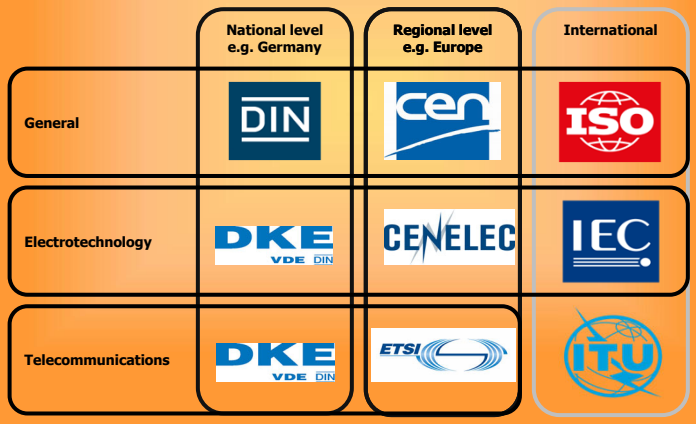
Geographical scope of organizations and standards

Standardization Structures:



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Classification of SDOs - Examples of scope of activities

- A non exhaustive overview of the ICT ecosystem, where International, Regional and National SDOs, Professional Organizations and Industrial Consortia operate

Organization	Typical technical scope of activity
ITU	Interoperable telecom specifications incl. architecture, services, protocols, addressing / numbering plans
ISO	ICT architecture (OSI model) services, protocols incl. application protocols
IEC	Electrotechnical standards, incl. connectors, electrical safety and tests
ETSI	Standards for ICT-enabled systems, applications and services
CEN	Household appliances, Intelligent Transportation and Mobility, Smart Grids and Smart Metering, Cybersecurity, Blockchains
CENELEC	Electrotechnical standards, incl. connectors, electrical safety and tests, ECM
IEEE	All LAN specifications: IEEE 802.xx, including cabled LANs, Token Ring and Bus, Wireless LANs WLAN, e.g. WiFi)
IETF	All internet related specifications including protocols, generic applications, addressing rules (IP, url)

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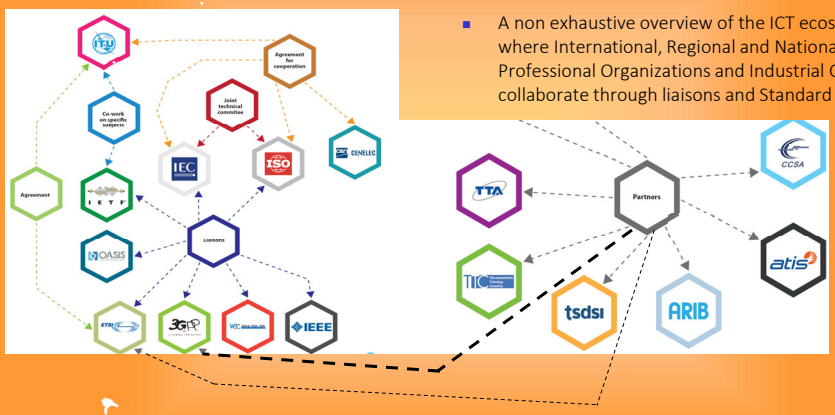
Classification of SDOs – Examples of liaisions among SDOs



- A non exhaustive overview of the ICT ecosystem, where International, Regional and National SDOs, Professional Organizations and Industrial Consortia collaborate through liaisons and Standard Initiatives

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Classification of SDOs

- SDOs can create groups/projects, possibly also involving industries, for cooperating in the definition of specific standards
  - 3GPP
    - It consists of SDOs operating in the telecommunication field in countries and regions across the globe
    - Shared environment in which to produce the reports and specifications that define mobile radio technologies (radio access, core transport network, service capabilities and hooks for non-radio access to the core network, and for interworking with Wi-Fi networks)
  - OneM2M
    - Purpose is to develop technical specifications, which address the need for a reference Machine-to-Machine Service Layer that can be embedded within various hardware and software.
    - One of the main goal is to involve organizations from M2M-related business domains, such as telematics and intelligent transportation, healthcare, utilities, industrial automation, smart homes, etc.

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Classification of SDOs - Affiliation

- In addition to SDOs, there are other organizations that do not strictly or entirely use the formal standardization procedures but aim at defining standard in a specific area
  - Example Industrial Fora/ Consortia: they are composed of groups of companies that temporarily join their efforts on specific subjects to realize, accelerate, complement, or promote the development of standards on them

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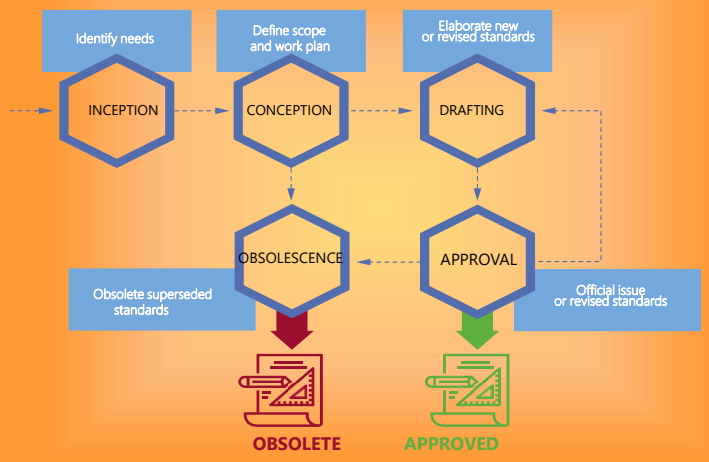
Standard-development process



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How to find a standard

The procedures described here in order to identify standards related to a specific product/service are a simple example of how a beginner may proceed (depending on seniority, knowledge or specific goals the steps can change)

- Select relevant SDOs
  - by technical scope (which corresponds to the typology that the product/service is targeted for)
  - by geographical scope (which corresponds to the geographical market that the product/service is targeted for)

Note: Evolution of standards needs to be monitored to be informed about SDOs' scope and possible liaisons

- Identify selected SDOs' relevant specification documents and their relevance
  - SDOs may produce different kinds of documents such as technology roadmaps, product/service requirements, product/service technical specifications, regulations produced on behalf of regulatory bodies and product/service test specifications

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Select relevant SDOs

First step: to identify relevant SDOs according to geographical scope and technical domain
Example

Organization	Headquarters	Geographical scope	Domain of activity	Affiliate organizations / members
ITU	Geneva (CH)	International	Telecom	National SDO / Industries
ISO	Geneva (CH)	International	ICT	National SDO
IEC	Geneva (CH)	International	Electrotechnical	National SDO
ETSI	Sophia Ant (FR)	Regional (Europe)	Telecom	National SDO / Industries / Research Institutes / Government bodies
CEN	Brussels (BE)	Regional (Europe)	ICT	National SDO
CENELEC	Brussels (BE)	Regional (Europe)	Electrotechnical	National SDO
IEEE	New York (US)	International	ICT Electrotechnical	Professionals
IETF	Fremont (US)	International	ICT	Professionals

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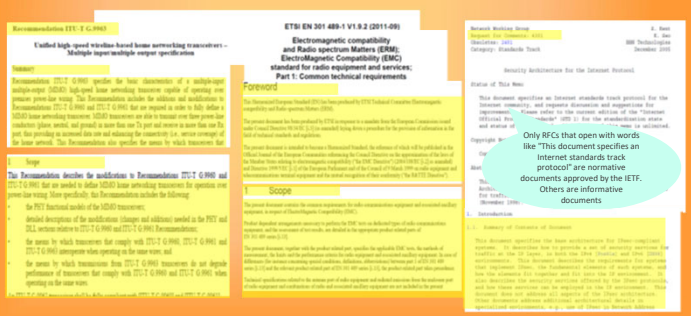
Understanding structure and formalism of the standards

- Clearly identify standard document's objectives and area of application

Standard documents explicitly claim scope and applicability, usually in introductory sections of the document

Examples

ITU ETSI IETF



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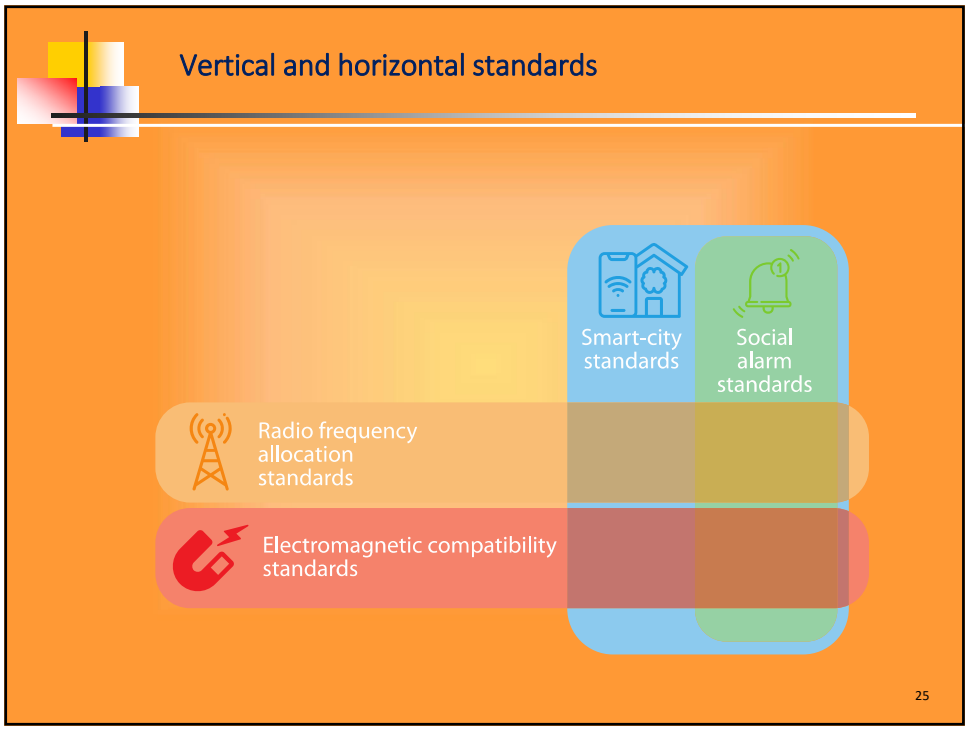
Vertical and horizontal standards
Smart-city standards
Social alarm standards
Radio frequency allocation standards
Electromagnetic compatibility standards
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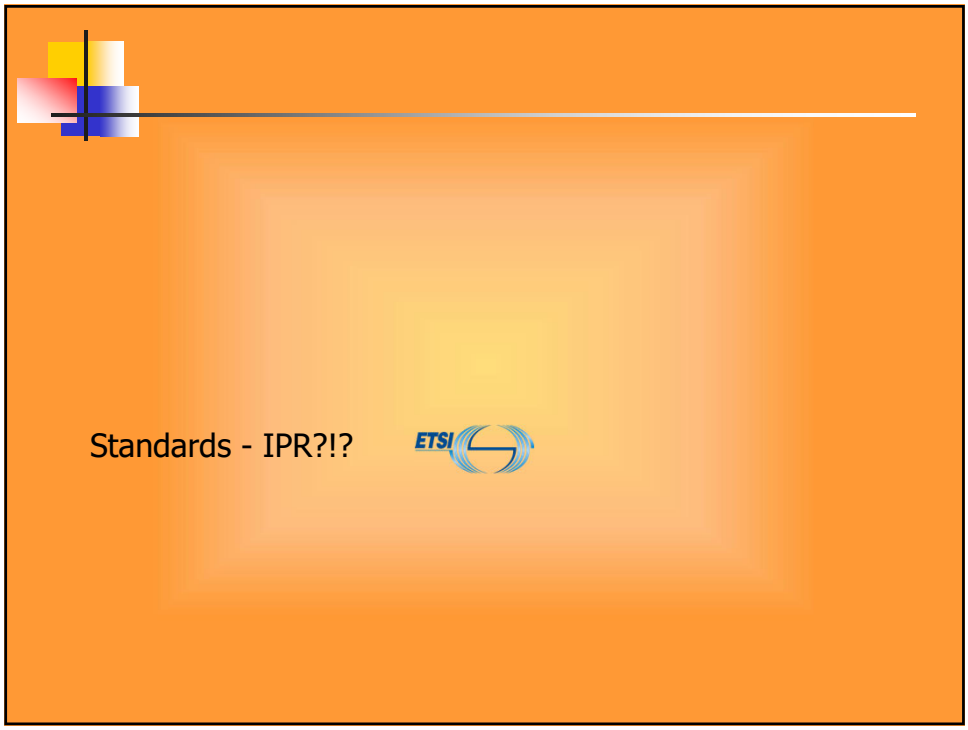
Standards - IPR?!?
ETSI

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IPRs can be relevant to standards and standardization

IPRs can be relevant to standards and standardisation in different ways:

1. Standards are text documents, and the question of copyright arises
2. Standards are often known by a name and associated with certain logos (or symbols or emblems, think of GSM, Wi-Fi, Bluetooth and CD)
   - Often, the SDO will be copyright owner of the name
   - But not always: the well-known 'GSM' logo is owned by the GSM Association (GSMA), and the trademark 'Wi-Fi', is owned by the Wi-Fi Alliance
   - Often these trademarks are associated with specific licencing conditions (with certification processes).
3. The implementation of a standard into a product or service may require the use of certain intellectual property rights
   - May require mandatory software code

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The tension between patents and standards

- The patent system and the standardisation system are both institutionalized to serve the **public benefit**
  - Uneasy relationship, which creates tension and calls out for thoughtful considerations and policy

Underlying reason:

- patents aim to promote innovation by granting temporary rights to exclude others from using technological innovations,
- whereas standards aim to promote innovation by an endeavour to make technical solutions available to all interested parties without any undue barriers

This tension specifically pronounced for so-called **Standard Essential Patents (SEPs):** without the use of the technology protected by that patent, it is impossible to make a product that satisfies the standard

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The tension between patents and standards

While patented technology can bring innovative and valuable solutions into a standard, the inclusions of a specific technology can also raise a number of concerns

NON-AVAILABILITY OF LICENCES	SDOs and their participants, after having finalized and published a standard, find out that one or more owners of essential patents are not willing to license these
EX POST PATENT HOLD-UP	SEP owners, aware of the fact that implementers have no choice other than obtaining a license from them, use the resulting bargaining power to demand a significantly higher licensing fee than they could have obtained in a licensing negotiation where implementers were not yet 'locked into' the standard
ROYALTY STACKING	The total amount of royalties for a single product that implements that standard mounts up to such a level that the product is no longer commercially viable
UNDUE DISCRIMINATION	This refers to the situation where a SEP owner treats implementers differently

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The tension between patents and standards

- Q: How many SEPs are there? A: Nobody knows
  - Many SDO policies require participants to disclose information on patents that are potentially essential. A recent study for the European Commission showed that per February 2019, parties declared around 260,000 patents as potentially essential for ETSI standards, which can be grouped into slightly over 25,000 patent families
    - Patent families group patents on the same invention but applied for in different countries
  - Yet, a *potential* SEP is not a factual SEP
    - At the time of such a declaration, the precise content of the final standard is not yet known, and the technology in the declared patent may eventually not be included in the standard at all. Furthermore, by the time of such declaration, the ultimate scope of the patent may not be yet known either – this only becomes known at the moment when that patent is actually granted (or granted at all)

In 2017, the European Commission announced it wants to increase transparency in this field, and noted that it is desirable that information on factual essentiality would be available to market players

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IPR policies at SDOs

SDO IPR policies can be categorized into two main categories:

Policy type	Description	Examples
COMMITMENT-BASED POLICIES	(A)Members have the obligation to inform ('disclose', 'declare') the SDO when they believe they own patents that may be or may become essential to a standard. (B)(B) Owner of disclosed patents are requested to commit to making licenses for these patents available specified conditions, if the patent indeed becomes essential	ISO, IEC, ITU, ETSI and IEEE
PARTICIPATION-BASED POLICIES	As is a condition of membership, all members of the SDO must be willing to license all their essential patents at specified conditions, if the patent indeed becomes essential. Opt-out possibilities may exist	W3C, HDMI Forum

- If a commitment is missing, the SDO will seek to develop a standard not requiring the patent
- Examples of specified conditions:
  - Fair, Reasonable and Non-Discriminatory (FRAND, sometimes referred to just as RAND)
  - "Royalty Free"

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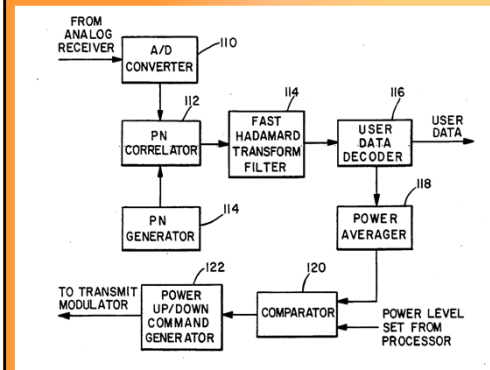
The tension between patents and standards

Patent that may well be a SEP:



Patent that is not a SEP:

(but may nevertheless be valuable!)

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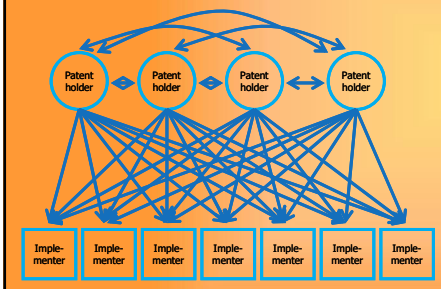
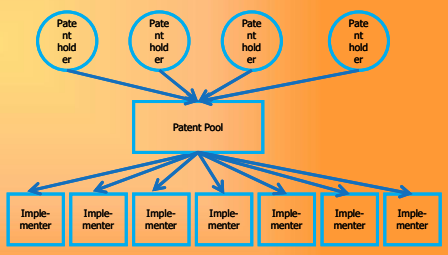
Patent pools

No pool
(34 licensing agreements needed)



Patent pool
(11 licensing agreements needed)



There is a whole business ecossystem associated to the "pool" concept.
Litigation is the only way of imposing patent rights, and patent pools may be used as deterrant.

recall: patent trolls.

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IPR, standards, and the legal system

When parties to turn to the legal system (courts), three bodies of law are relevant here:

- Patent law
  - is relevant here because it is this body of law that allows a patent holder to prevent others from making, using, selling, or importing the patented invention without permission
- Private law
  - is relevant because it governs contracts and other relationships between companies and other parties
- Competition/antitrust law
  - is important because it places restrictions on the conduct of parties (or groups of parties) that have a dominant market position

There have been quite some court cases on SEPs.
Famous cases include Microsoft vs. Motorola (2013), In re Innovatio (2013), TCL v Ericsson (2017), and Huawei/ZTE (2015)

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Other resources

- Robert W. Gomulkiewicz, *How Copyleft Uses License Rights to Succeed in the Open Source Software Revolution and the Implications for Article 2B*, 36 Hous. L. Rev. 179 (1999)
- Robert W. Gomulkiewicz, *De-bugging Open Source Software Licensing*, 64 U. Pitt. L. Rev. 75 (2002)
- *Yo Sop Choi, Andreas Heinemann,* Standard essential patents – a comparison of approaches between East and West, 2018
- Jorge L. Contreras, *A Research Agenda for Standards-Essential Patents*, SJ Quinney College of Law, University of Utah, 2023

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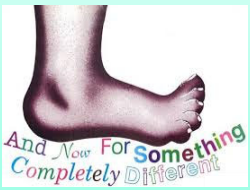

Lets have fun - I

FLOW OF REALITY

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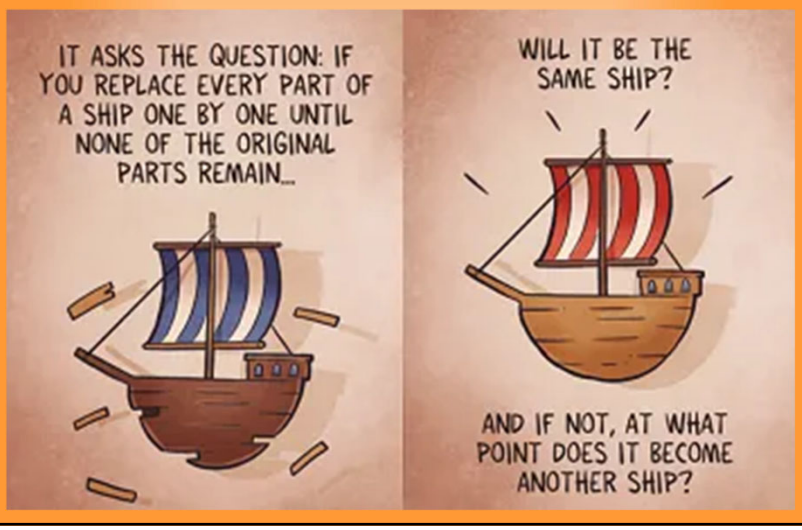
The ship of Theseus

- Classic philosophy problem



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Lets have fun - I

VOTE

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Reasons – class built!

- It is the same
  - O barco nunca deixou de existir, foi sendo renovado gradualmente
  - O modelo estrutural mantem-se igual ao aoriginal (faz parte da "identidade do barco")
- It is not the same
  - Atualizações tornam o produto inicial diferente

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Reasons – class built 2023!

- It is not the same
  - All human cells are renewed: we still remain the same person.
- It is the same
  - An object is not a person
  - An object is associated to the legal registry

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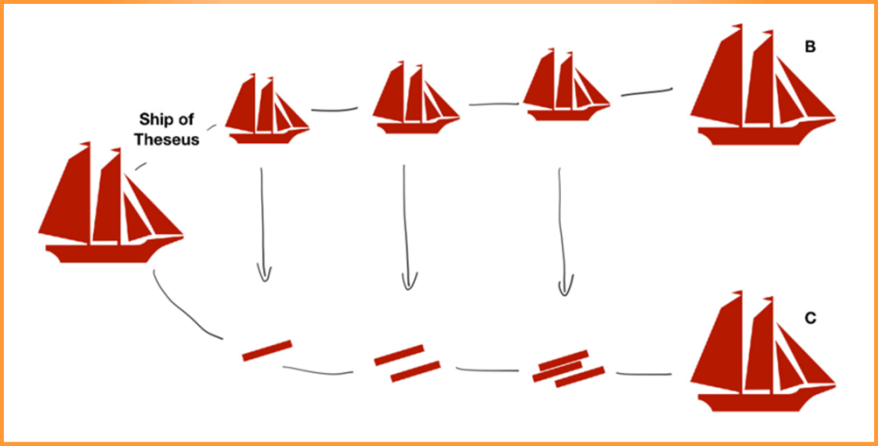
The ship of Theseus – Hobbes view

- Modification to the classic problem



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Reasons – class built in 2023!

- It is B
  - Choice will depend on the process
    - It could be the other way around (develop the copies of the board as new, retain the old boat, and then build a new one with the new boards)
- It is C
  - The choice will depend on the process, indeed

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Theories of Identity and Time

- What is an object? Does it change?

Presentism:

- Only those things that exist at the present time – *now* – really exist at all. The only qualities that these things really possess are the qualities that they possess now.

Eternalism:

- All things exist. Or, rather: past and future objects and times are just as real as currently existing ones. Reality is a four-dimensional spatiotemporal manifold of objects and events.
  - Reducionism: language can be reduced to scope the instant of the existence of the thing
  - Perdurantism: Objects persist through time by having different temporal parts, or "stages," at different times

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But do you remember LAWs exist?

- What defines a boat *a boat*?
  - What are the properties that make the object part of a class?
  - In this case… a registration license, with a license plaque.
    - Remember the car registration?
    - But then is the registration license the *"boat"*?
    - This approach is implicitly following a concept known as *spacetime worms* associated to objects (eternalism).

How do you handle this discussion in the context of software objects?

- Remember **"copy as is" concepts? "derivative works"?**
- Can you comment on **NFTs?**

Side Note:there are different philosophy theories on the subject (*eternalism/presentism;*

Reductionism vs holism: complex systems can be explained based on simpler phenomena vs complex systems need to be analysed globally)

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Law

- Laws are brought about by tension, agitation and conflict by dramatic situations.
  - Governments create and enforce laws
- Laws are societal rules or regulations that are obligatory to observe.
- Laws protect the welfare and safety of society, resolve conflicts, and are constantly evolving.

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Ethics and Morality

- **Ethics** is a set of moral principles and a code for behavior that govern an individual's actions with other individuals and within society.
- **Morality** is what people believe to be right and good, while ethics is a critical reflection about morality.
  - Different cultures have different moral codes.
  - There are no universal truths in ethics because it is difficult to say that customs are either correct or incorrect.
    - Human declaration of human rights, etc… are voluntary processes.

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Law vs Ethics

- Law, and ethics are different but related concepts.
- Laws are mandatory to which all citizens must adhere or risk civil or criminal liability.
  - Legal bodies will impose the law
- Ethics relate to morals and help us organize complex information and competing values and interests to formulate consistent and coherent decisions.
  - Professional bodies may impose ethics (e.g. Ordem dos Engenheiros, Comités de ética ou deontologia)

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Law, Regulations, Ethics

- You cannot avoid following the law.
  - There are consequences
- Regulations are professional aspects that must/should/may be followed in a specific context
  - Enforced by diferent (professional) bodies
- You can avoid following ethics, but may be community consequences
  - Anyone remembers "cancelling"? "untrustable partner"?

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