Telebiometric model: an international standard based on a theory of every aspect of security, safety, authentication and telemedicine

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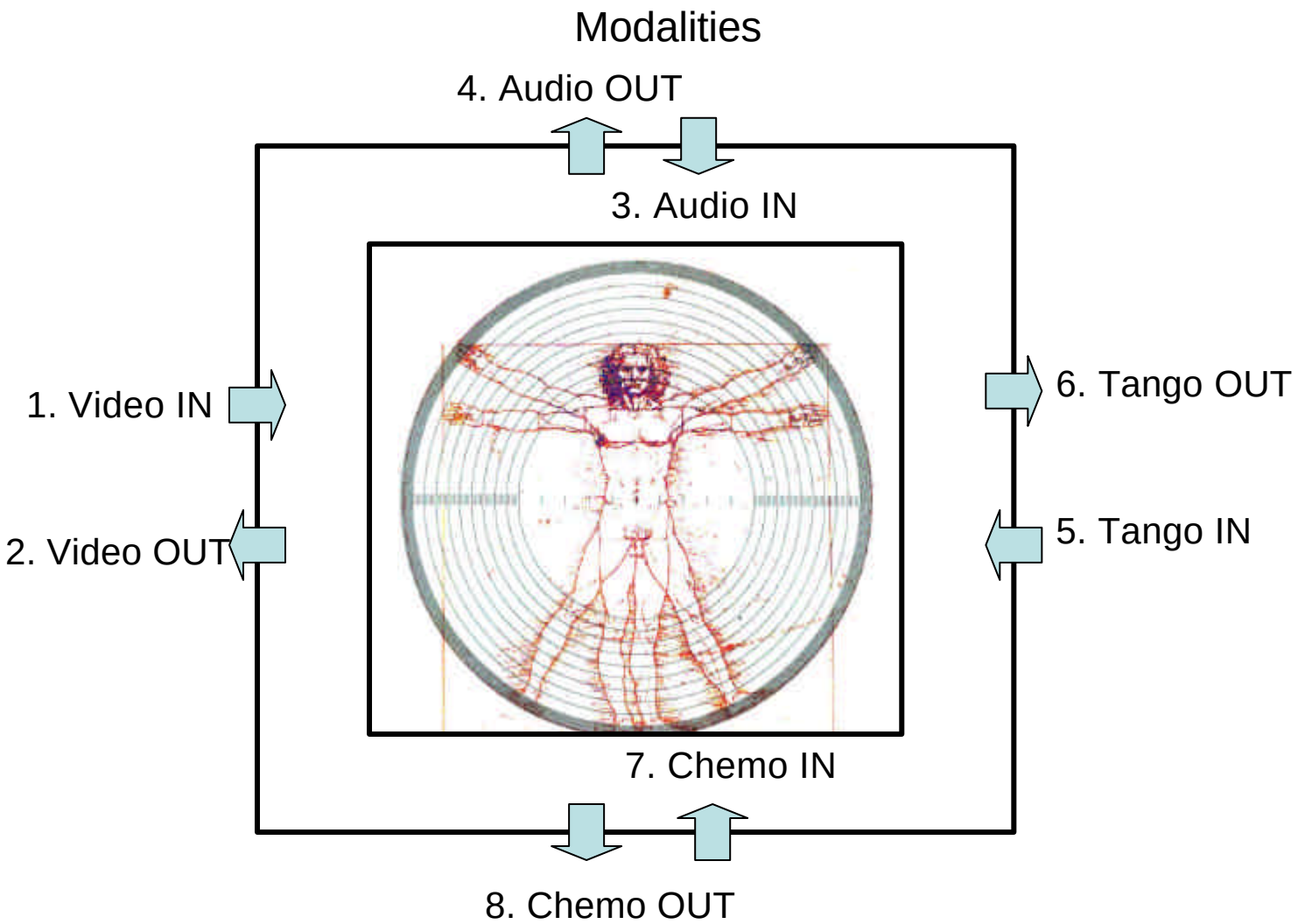
Abstract:
"A general telebiometric model for the establishment of recommended limits to ensure security and public safety for telecommunications systems and biometric devices (A model for security and public safety in telebiometrics)" was submitted to the Lead Study Group on Security within the Standardization Sector of the International Telecommunication Union, in the fall of 2002, in Geneva. This paper describes the vast Safety and Security Framework which is envisioned with a first call for comments from outside the Lead Study Group on Security. The Framework encompasses Scalar Hierarchy (Hsc), Specification Hierarchy (Hsp) and Multimodality.
Key words: International Standard, Telecommunication Terminals and Theoretical Biology, Hsc, Hsp.



Latin: * Video = I see, * Audio = I hear, * Tango = I touch, * Chemo = I smell & I taste.
* IN = em signals entering sphere. * OUT = em signals manifesting from sphere

Greek – English Glossary
Tele : far
Bio : alive
Metron : measurement
Nomos : law
Logos : discourse, science

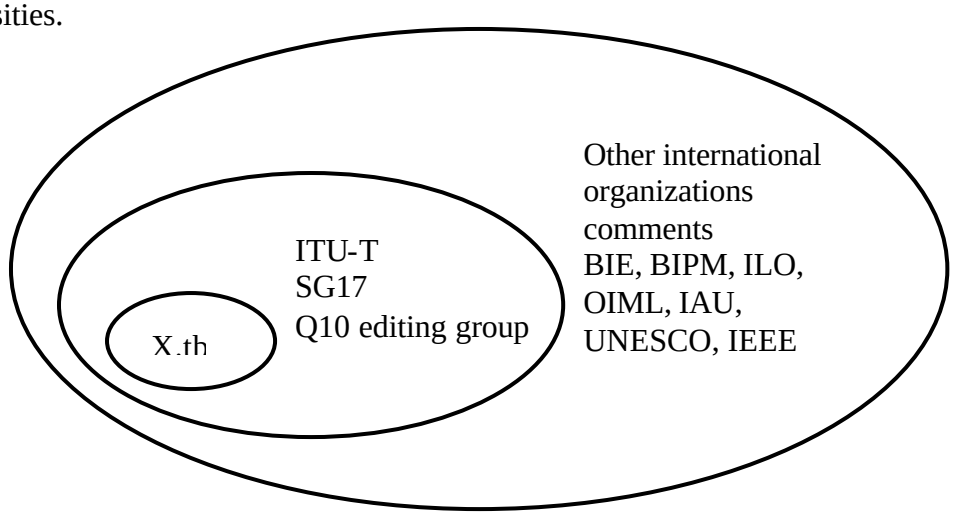
Telebiometronomy

The Science and Technology of the automatic measurement and transmission of data from remote sources to receiving stations for recording and analysis related to life-science measurements.

Telebiometrology

The Science of Metrology, applied to the biological sector of the furniture of the world, where data are recorded or sent from a distance: biometric information may be received or sent. Encoding and decoding, cryptography, safety and security play a major role.

Telebiometrology is a division of Metrology, dealing with biological entities and signs systems in the measurement domain.
Biometric information is recorded and then used in identifying/authenticating a user while involved in a telecommunication process.
Links have been established with International Metrology Organizations, including the International Organization for Legal Metrology for a common approach in the modelling process.
The taxonomy of possible telebiometric devices would prevent extra costs in making new recommendations all the time, as more novel products will hit the market in the years to come.
The new International Standard is currently named: "X.tb".
"ITU is the acronym for the International Telecommunications Union. "T" stands for Standardization Sector of ITU. "SG" stands for Study Group. "Q10" is Question 10 (Security). "BIE" is the International Bureau of Education. "BIPM" is Bureau International des Poids et Mesures (the International Bureau of Weights and Measures). "ILO" is the International Labour Organisation. "OIML" is the Organisation Mondiale de Métrologie Légale (The Global Organisation of Legal Metrology). "IAU" is the International Association of Universities.



Now, the theoretical stage for this contribution is set. Within the various Theories of Everything (T.O.E.s), one has been selected, based upon Scalar Hierarchy (Hsc) and Specification Hierarchy (Hsp).

The Human Body, encased within an all-inclusive 1-meter radius, centered in the navel area – named the Personal Privacy Sphere (PPS) – is considered to be metrologically definable with the descriptors provided by International Standardisation Organisation ISO31 (Quantities and their Units) and by the International Electrotechnic Commission IEC 60027 (Quantities, their Units and their Letter Symbols) at all relevant levels of the Hsc, within the world of Prefixes [see list, next page] provided by them.

The aim of the exercise is to define limits, upper and lower thresholds, to enable such a PPS to stay alive and well within an environment composed of telecommunication machine terminals. Instead of being trapped into defining the interactions and interfaces between terminals irradiating electro-magnetic energies and their biochemical human counterparts, we propose to describe safe and secure interactions in opening the model to make it exhaustive.

Example: Let's take "their hierarchically developed choate component parts, beginning with a cell, the minimal semiotic unit, estimated to correspond to about 50 genes, or about a thousand billions (10^{12}) intricately organized atoms… Our bodies are assemblages of cells, about a hundred thousand billion (10^{14}) of them, harmoniously attuned to one another by an incessant flux of vital messages". The electromagnetic body exists and may be looked at from many hierarchical levels, within the scientific corpus of the Specification Hierarchy (Hsp) whichmay be described, using set theory formalism, as:

{physical level{chemical level{biological level{socio-cultural level{psychological level}}}}}

Each of the above-mentioned levels involves many sciences and their discourse and engineers should not be embarrassed or ashamed to offer their contribution to safety concerns and issues by designing life-friendly terminals with which human beings will interact when telecommunicating. Technophobia will then be eradicated, since algorithms representing proof of a respect for life may be produced at any time within the Telebiometric Framework currently in preparation.
Human psychological conscious activity is informed by sensors of four broad types (Video, Audio, Tango and Chemo) and our behavioural presence to the outside world is conveyed by effectors (or actuators) of four broad types (Postural, Gestural, Facial and Vocal/Verbal).

Semiotic and Rhetoric activities – interpreting and generating messages to and from the outside world are well known. The only work remaining to be done is to ensure that, within the interfaces and interactions between Man and machine, all the relevant levels of application of already known values and measurements are put to use for complete and coherent safety and security of both artifacts and of the human operators of these devices.

Emergent technologies bring with them authentication capabilities (against Identity fraud, for example) and diagnostic capabilities (against health troubles), when a human body reveals its rhythms and other electric signals to be used in telemedicine. Electromagnetic treatments are also a new issue we need to prepare for. Safety and Security will be important within such a completely new Framework.

Human Anatomies and Physiologies evolve at giant pace. Info-graphists are now able to draw physiological sub-processes and anatomical sub-sets of the human body in exactly the same way as the visual encoding they applied for engineering processes and structures, enabling a very vast indeed set of possible focal levels on "what is a human body?" and, consequently a contemporary multimodal taxonomy is the model presented here. Biometric authentication is

one field of application of Telebiometry – which is the science studying measurements carried out on the human body with the purpose of using the biometric data so acquired in a complete security and safety set and setting, before and with the purpose of tele-transmission of the selected and encrypted transformation of such data. The telebiometric traits of natural systems, i.e., human beings, ought to be described within a coherent model, if harnessing them for Telecommunication Security issues is contemplated. The required descriptors are listed in the International System of Units (SI), as it appears in ISO/31 and in IEC60027, in revision to re-appear as Harmonised Standard ISO/IEC80000.

Let's use these tools to model the Personal Privacy Sphere (PPS) on a scalar level. Signals enter and exit from the human body: the guiding principle is 0% toxicity or nocivity in the set of signals going inward from Telecommunication devices and 100% accessibility and authenticability in the set of signals going outward of PPS. Multimodality is envisioned within a scale hierarchy framework construed with the relevant units and prefixes of ISO/IEC80000. A graduated spectrally-ordered focal-level is assigned to observer 1, then transferred to observer 2 in the higher-level, or to observer –1, in the lower-level. To be re-iterated gradually at all relevant morphological observables, at each and every relevant scalar level. Three Security issues, apparently very different, are offered as a coherent model, spanning – to save any further doubt: privacy, authentication and ecological liability in both fields of antennas and toxic electromagnetic leakage at terminals.

Privacy: each and every human user of Telecommunication Services (TS) is entitled to exert a right to be fully safe and secure while using Telecommunications Terminals within the context of "the application of security services in an Open Systems environment, where the term *Open Systems* is taken to include areas such as Database, Distributed Applications, ODP and OSI" [X.810], at the very aware level where meaningful information is interpreted and may transform into a new - informed – behaviour. Meaningful information, delivered in the ideal moment, within the appropriate context, to a mean level of attention of a human user, "makes a difference that makes a difference" [G. Bateson] and this is the reference added value of Telecommunication Services (TS).

The privacy of a human user may be – in a minimalist approach – based on a 1 meter radius from navel in all spherical directions. This Personal Privacy Sphere (PPS) has a natural mean duration as a biological phenomenon of 3'000'000'000 seconds (~ 95 years). If a maximal part of these seconds were to be used in a multi-second telecommunication process offered by the operator as a TS, the information content of each and every meaningful string of signs should be preserved from Insecurity. Wetware Multimodality refers to processes occurring when TS are hired, within the PPS, the user having been linked with devices. Perceptual, cognitive and motor components of the intelligence of a specifically located agent are brought into an exchange and a relationship with similar wetware through telecommunication technologies. Security level of reference is full privacy shared by both Authors when in presence, when sharing a common location where their respective PPS are overlapping. Privacy vs Sovereign State Permanent eavesdropping may be traded by introducing Happy Biometric Authentication Schema, so releasing the full liability to the users.

Biometric Authentication: Within the range of Telecommunication Services (TS), rather than simply providing a conduit for the transmission of voice or data, Authentication Services (AS) ought to make a positive assertion about the identity or attributes of communicators.

Ecological Liability: It is only ascertainable within SI Framework [Applicable Units and Prefixes].in order to facilitate model conversion into other presentation styles [mile, guinea, angstrom] of the same. Human beings deserve – and well – to be safe at all possible scalar

levels, and security starts within PPS, at the First Meter where TS – and A.S.- usage is initiated and paid for. Telecommunication Services Providers may guaranty safety and security to their customers at all theses levels and, AS providers may require a convention with their customers, in which they identify themselves biometrically with a technology-neutral approach, based on two scales: the required degree of security and the appropriate grade of cultural convenience, based on historical previous choices.

REFERENCE 1: <Here a general theory is presented, encompassing the principles by which ecological entities are maintained. Identification of ecological entities, analysis of their fundamental properties and determination of the relations between entities is collated in a precise and well defined conceptual framework. "Addressing the problem of ecological units requires a theory of self-maintaining units, or a theory of organisation." [Kolasa p.1]

Definition 1: Entity is a primitive term. Its meaning is intuitively understood.

Axiom 1. Each ecological entity has structure consisting of other entities.

Definition 2: Structure of an entity is an internal complex of other entities and their static connections to each other.

Axiom 2. Every structure results from the properties and interactions of low-level entities within a higher-level entity.

Axiom 3. The structure of an entity changes.

Definition 3: Organisation is the mode of dynamic perpetuation of structure. Organisation includes the interactions and connections among structural elements that allow the static structure to persist.

Derived Statements.

Theorem 1. Structure is hierarchical.

Definition 4: Hierarchy is a condition of being composed of subunits.

Theorem 2: Lower-level entities change with higher frequencies than higher-level entities. Change requires deletion, addition and replacement of lower-order entities.

MIS: Minimum Interactive Structure. The entities are allowed to have a hierarchical structure open downward and to aggregate upward without apparent limit.

Recognising MIS requires that at one level we see the structure as an entity, while on the next lower level we see the first-order structure of this unit – i.e., a complex of subunits. At an even lower level, the structure of subunits appears. Isomorphism of a MIS of an entity between successive times is thus a sufficient criterion of its identity.

Definition 5: Function is that part of interactions of a component of MIS that contributes to the persistence of the higher-level entities.

Axiom 4. Components of minimum interactive structure are complementary.

Definition 6: Complementarity is the capacity of entities to remain components of the minimum interactive structure of an entity by acting as functional supplements to one another, or being functionally dependent upon each another.

Theorem 3: For entities that persist, changes of structure are constrained in such a way that minimum interactive structure is preserved.

Definition 7: Coordination is an action of one element of minimum interactive structure in response to behaviour of another (others) such that they remain complementary.

Definition 8: Only a specific form of communication resulting in coordination is defined as information.

Definition 9: Integration is an aggregate index of both coordination and rate of configurational change within the minimum interactive structure.

Theorem 4: An entity is always less integrated than its component entities.>

Kolasa, Jerzy and Pickett, S. T. A., Ecological systems and the concept of biological organization, Proc. Natl. Acad. Sci. USA, Vol. 86, pp. 8837-8841. November 1989.

REFERENCE 2: <Theory of Integrative Levels (James K. Feibleman, British Journal for the Philosophy of Science, 5, 1954, p. 59-66)

1. Some Laws Concerning Levels

1. Each level organizes the level or levels below it plus one emergent quality.
2. Complexity of the levels increases upward.
3. In any organization the higher level depends upon the lower.
4. In any organization, the lower level is directed by the higher.
5. For an organization at any given level, its mechanism lies at the level below and its purpose at the level above.
6. A disturbance introduced into an organization at any one level reverberates at all levels it covers.
7. The time required for a change in organization shortens as we ascend the levels.
8. The higher the level, the smaller its population of instances.
9. It is impossible to reduce the higher level to the lower.
10. An organization at any level is a distortion of the level below.
11. Events at any given level affect organizations at other levels.
12. Whatever is affected as an organization has some effect as an organization.

2. Rules of Explanation

1. The reference of any organization must be at the lowest level which will provide sufficient explanation.
2. The reference of any organization must be to the highest level which its explanation requires.
3. An organization belongs to its highest level.
4. Every organization must be explained finally on its own level.
5. No organization must be explained entirely in terms of a lower or higher level.

3. An Extended Theory of Levels

> We have been talking about the interactive levels of the scientific fields as if only some five [physics, chemistry, biology, psychology and anthropology] were involved. This was necessary to see clearly some of the relations. But the situation is more complex than that. For each level is the name for a very considerable group of sub-levels.>

Economic Semio-Anthropology considers that Telecommunication Services will be very useful, as well as being creators of wealth worldwide, when they would go the “First Meter”, the very ultimate meter: the Human Privacy Sphere, a very common [6 billion wetware units, 6 billion spherical natural systems for which all the descriptors are already standardized by ISO31 and IEC27] and in each instance totally unique [un-standardisable, by definition] as well as respectable through ethical magnifiers PIECE of FURNITURE of the WORLD. Generally, we prefer to name this natural complex in Einsteinian coordinates as the human body – in the modern business language of today, it is usually referred to as “the customer” or “the consumer”. To make clear the aim of this new recommendation: uttering clearly and biometrically the wetware multimodal upper and lower thresholds of security and public safety acceptable by experts in the scientific community today and consequently following a

robust trend of prevention of Corporate and Sovereign States liabilities in respect of the user-community for Telecommunication Services.

Authentication of a PPS and the ecological preservation of his/her perpetuation of structure [see Axiomatic System Section] are Janus-like figures: I identify myself happily, entering in a very secure environment, through Telebiometrically standardized processes and structures as well as entrusting it with my safety, at all relevant scalar levels, OSI having been made a natural system friend, by all means and in whatever lawful way. At the multimodal layer where this recommendation edicts normative considerations, the consideration for the Personal Privacy Sphere is made explicit and engineerable, as the human body anatomy and physiology are nowadays drawn by the very same info-graphists.

The newly proposed recommendation consists in securising, enhancing and soothing customers' feelings in respect to safety issues. Security and Public Safety Telebiometric Recommendation X.tb is importing Upper- and Lower- Threshold values in all relevant Units, at all relevant scalar levels. Telebiometrology is the science studying measurable biometric items and parameters, guiding Telecommunication engineering processes to stay in tune with and to conform to this International Standard. Telebiometrology merely derives from International System of Units (SI) a very precise description of the "material" Personal Privacy Sphere, going across levels of magnitude through the help of "Prefixes". [see ISO31&IEC60027]

Factor	Prefix	
	Name	Symbol
10^{24}	yotta	Y
10^{21}	zetta	Z
10^{18}	exa	E
10^{15}	peta	P
10^{12}	téra	T
10^{9}	giga	G
10^{6}	méga	M
10^{3}	kilo	k
10^{2}	hecto	h
10	déca	da
10^{-1}	déci	d
10^{-2}	centi	c
10^{-3}	mili	m
10^{-6}	micro	µ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a
10^{-21}	zepto	z
10^{-24}	yocto	y

Telebiometry: Scalar Hierarchy and Security Modular Elements in Telecommunications.

TELEBIOMETRY frames the set of all methods of remote authentication using unique digital biometric records

- Biometric Information is recorded from many biological sources by sensors.
- Biometric Elements may be categorized as unique processed complex signals emanating from video, audio, tango and chemo - multimodal manifestations of human presence, enabling identification .

Telebiometric Authentication Modeling and Categorizing

- So many different biometric data types have already emerged and more are coming...
- Modeling requires highest sort of design: “Architecture of Security Complexity”
- “By a Hierarchic System, or Hierarchy, I mean a system that is composed of interrelated subsystems, each of the latter being, in turn, hierarchic in structure until we reach some lowest level of elementary subsystem”. H. Simon

SCALAR HIERARCHY is a robust model in Coherence

- ISO-80000 encompasses tools to use for Most Security Issues Solutions Design.
- Prefixes help to span Time-Space domain and sectorize When and Where Security Issues have to be addressed.

In the midscale-range, where human perception occurs, relevant scalar parameters are to be asserted and upper and lower non-biotoxic thresholds to be ascertained.

Cross-Recognition between SIX Billion Interconnected Citizens of the World

Cross-recognition is the minimal multicultural requirement for personal identification to be a certitude

- All sorts of signs may be used from four effective communication types:
  - POSTURAL
  - GESTURAL
  - FACIAL
  - VOCAL / VERBAL / WRITTEN

The Basic Triadic Structure

- Facing a potentially overwhelming complexity of transactions between entities at different levels, what is the basic minimal set of relationships that would satisfactorily frame the most important ones?
- Literature on systems reveals the structure:

The smallest cluster of levels required to represent fundamental interactive relationships is a triad of contiguous levels, so that we can simultaneously examine some process and the events produced, the context of such events and their causes.

- WITHIN; FOCAL; WITHOUT.

The Basic Triad

- ENGLOBING LEVEL is wrapping
- FOCAL LEVEL is wrapping
- ENGLOBED LEVEL
- CONTIGUITY by Scalar Adjacency (“relatively near and having nothing of the same kind intervening”)

SCALAR HIERARCHICAL METHODOLOGY then operates routinely, enabling us to transform any upper level into the focal level, so the previous focal level becomes the lower level; any lower level transforms into a focal level, while a previous focal level plays an upper level role in the interpretation.

Representing a Dynamic System Hierarchically:
The Basic Triadic System

- What are lower-level constraints in the triadic system?
- => Realized potentialities. They make possible, they cause the phenomena that do occur.
- What are upper-level constraints in the triadic system?
- => Strongly relevant features of the environment of a focal process. They inform and influence focal level processes.

In Telecommunications, Skin Propinquity to Device giving Access to Open Networks may be treated with Scalar Hierarchical Methods to ascertain Security Levels

- HEALTHWISE: no external interference is allowed because of the exactness and precision given with Upper and Lower Safety Thresholds
- BIOMETRYWISE: no fraud or impersonation are allowed, securing Telebiometric Service

Fully-Secured Open Networks used by Fully-Authenticated Telebiometrically-Safeguarded Telecommunicators

- Telebiometric ScalarLeonardo refers to Personal Privacy Sphere, a Scalable CHRONOTOPIC NATURAL SYSTEM representable in Einsteinian Coordinates
- SI units and Quantifiers Prefixes span the whole time/space domain (ISO/IEC 80000)

FACILITATION of AUTHENTICATION and
Architectural underpinnings for SECURITY

- Dynamic and Static Biometric Solutions
- Unimodal, Bimodal, Multimodal Approaches
- As well as all the other Subdivisions of a Complete Categorization of Authentication Methods, Techniques and Services are to be constructs based on Natural Systems Science and Scalar Hierarchy, enabling Scalable Security Modular Elements to be picked at will and added for Adequate Security Level.

ITU-T SG17 is liaising with and contributing to the current Harmonized Standard ISO/IEC 80000 for COHERENCE and Optimal Benefits in Safety and Security in all Tele-communicator's acts, at all possible Scalar Levels, as required.

- WETWARE = the Human Body = 99% H2 O

E-Health and Telemedicine standardization process is already proactive and progressing in ITU-T/SG17/Q10 "Security". See Rec. Xtb for a more complete description.