

NovaGenesis

NOVAGENESIS PROJECT: OVERVIEW, CURRENT ACTIVITIES AND RESEARCH OPPORTUNITIES

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Design Space

Self-* to manage complexity	Simplification of security, privacy and trust	Decoupling HW & SW evolution; Evolution of virtualized	Improved HW evolvability	One-fits-all solution	One-fits-all solution	Accomoda-tion of substrate resources evolution	Simplicity, Sustaina-bility and Evolvability						
Semantic rich objectives; Self-monitor; Desambiguity	Semantic and context for security, privacy, etc.	Substrate resources need semantic rich descriptors	Contextualiza-tion of experimental facility resources	Search needs semantic and context.	Entity naming	Scalability of contextualiza-tion mechanisms	Evolvability through contextualized selective pressures	Semantic, Context, Ontology, Naming					
Self-configuring, self-optimizing, self-healing	Traceability of mobile entities; Secure attachment	Mobility of virtual entities, e.g. VMs; Fast handover	Experimenta-tion on mobility and multi-homing	Discovery of mobile services	Generalized mobility requires ID/ Loc and unique Ids	Increased connectivity; mobility of substrate resources	Simplification of mobility support	Mobile friendly naming and contextual.	Generalized Mobility & Multi-homing				
RWI sensing and acting; NEDs Self-mngt; Self-dissemin.	Security, privacy, and trust of sensors and actuators	Virtualization of real-world; Timeliness of RWI information	RWI experimenta-tion, c.f. FIRE, GENI	Searchable sensors and actuators	ID/Loc of real and virtual entities. Unique IDs.	Scalability and ubiquity of sensors and actuators	Simplication of real-virtual worlds integration	Contextualiza-tion of real world collected information	Mobility of sensors, actuators, RFID	Real-Virtual Worlds Integration			
Self-* & cognition req. *-Awareness to provide adaptability	Application-Aware security, privacy and trust	Service-Awareness; Real-time feedback control loops	Service-Awareness, QoS	Semantic web	Identity-Awareness	Service-Awareness, Self-scaling substrate	Evolution-as-it-could-be	Context-Awareness, Regulation-Awareness	Power-aware handover; Connectivity-aware multi-homing	Situation-awareness, Self-Awareness	Adaptability and *-Awareness		
Autonomic service frameworks	Security, privacy, and trust of service frameworks	Exposure of resources; Support for real-time services	Service frameworks experimentation facilities	Service composable-ability requires search	ID/Loc of services and descriptors	Capacity and scalability for service frameworks	Evolvability of services and applications	Service frameworks require semantic and context	Roaming; service-mobility	Real world information enrich services and applications	Business-Awareness; Network-Awareness	Service-centrism	
Self-certifying, self-organizing content	Self-certifying names and information; authenticated rendezvous	Descriptors of virtualized resources; Real-time information	Experimenta-tion on information-centric networks	Persistent information search and localization	Information ID/Loc; Unique IDs; Support for pub/sub	Scalability of information-centric approaches	Simplification of information-centric designs	Semantics and context of persistent information	Information mobility, caching copies, consistency	Persistent representa-tion of real world information	User-awareness	Persistent descriptors of services	Information-centrism
Self-* and Cognition	Self-protecting, self-organizing, self-healing	Self-mngt of virtualized resources; Real-time control loops	Experimenta-tion on self-*, autonomic HW	Self-organizing hash tables; Semantic web	Self-configuration of locators	Self-organizing, self-scaling architectures							
	Security, Privacy, Trust, Traceability	Security, privacy, and trust of virtualized resources	Security and trust behind experimental facilities	Security, privacy and trust behind rendezvous	ID-based security, privacy and trust	Scalability of security, privacy and trust mechanisms							
		Virtualiza-tion & Real-time Support	Virtualization of reconf. HW; Real-time support for entities	Searchable substrate resources	ID/Loc of virtualized resources	Scalability of virtualized resources; Real-time computing							
			Fast Protot. Experim. & Reconfigu-rable HW	Search for reconfigu-rable HW	ID/Loc of flexible hardware resources	FPGA provides flexible capacity							
				Search and Indirection Resolution	Dynamic resolution of ID/Loc mappings	Scalability of search and indirection resolution mechanisms							
					ID/Loc Splitting, Unique IDs	ID/Loc of substrate resources							
						Capacity, Ubiquity and Scalability							

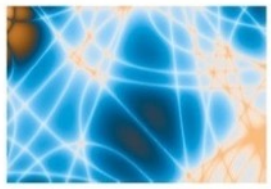
(2011)

<http://link.springer.com/chapter/10.1007%2F9>

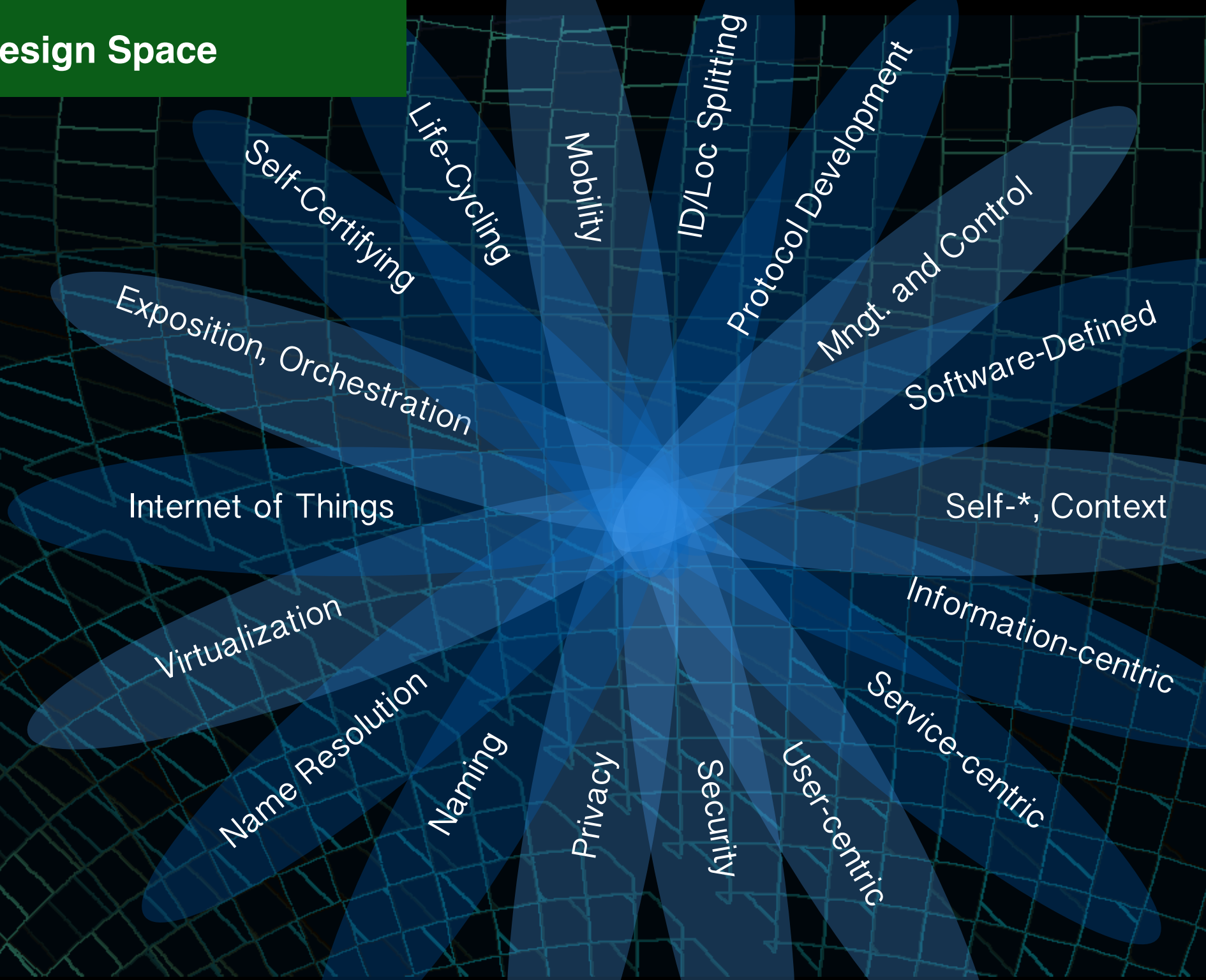
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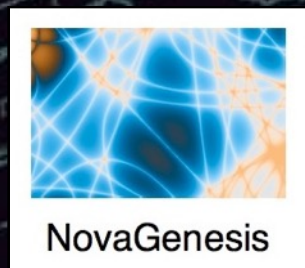
Design Space



NovaGenesis



NOVAGENESIS SCOPE



=

“Things”

+

Networks

+

Clouds

+



**Machine to
machine
& Internet of
Things**

**Telecom
& Internet**

IT & Web

**Identity,
Credentials,
Biometrics**

INITIAL CORNERSTONES

- **NAMING**
- **LIFE-CYCLING**

NAMING

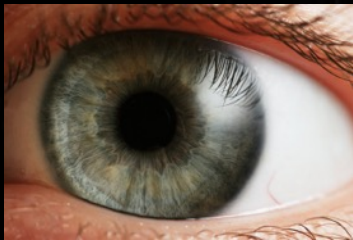
- TO DENOTE **ENTITIES** USING **SYMBOLS**.

LIFE-CYCLING OF ENTITIES

- **THE **PROCESS** OF EXPOSING, SEARCHING FOR PEERS, NEGOTIATING, CONTRACTING, OPERATING, AND RELEASING.**

SELF-CERTIFYING NAMING

Entities are named by a mathematical hash function, e.g. MD5, SHA-1.



Example: Iris pattern

Example: AF35277784564ABEFF

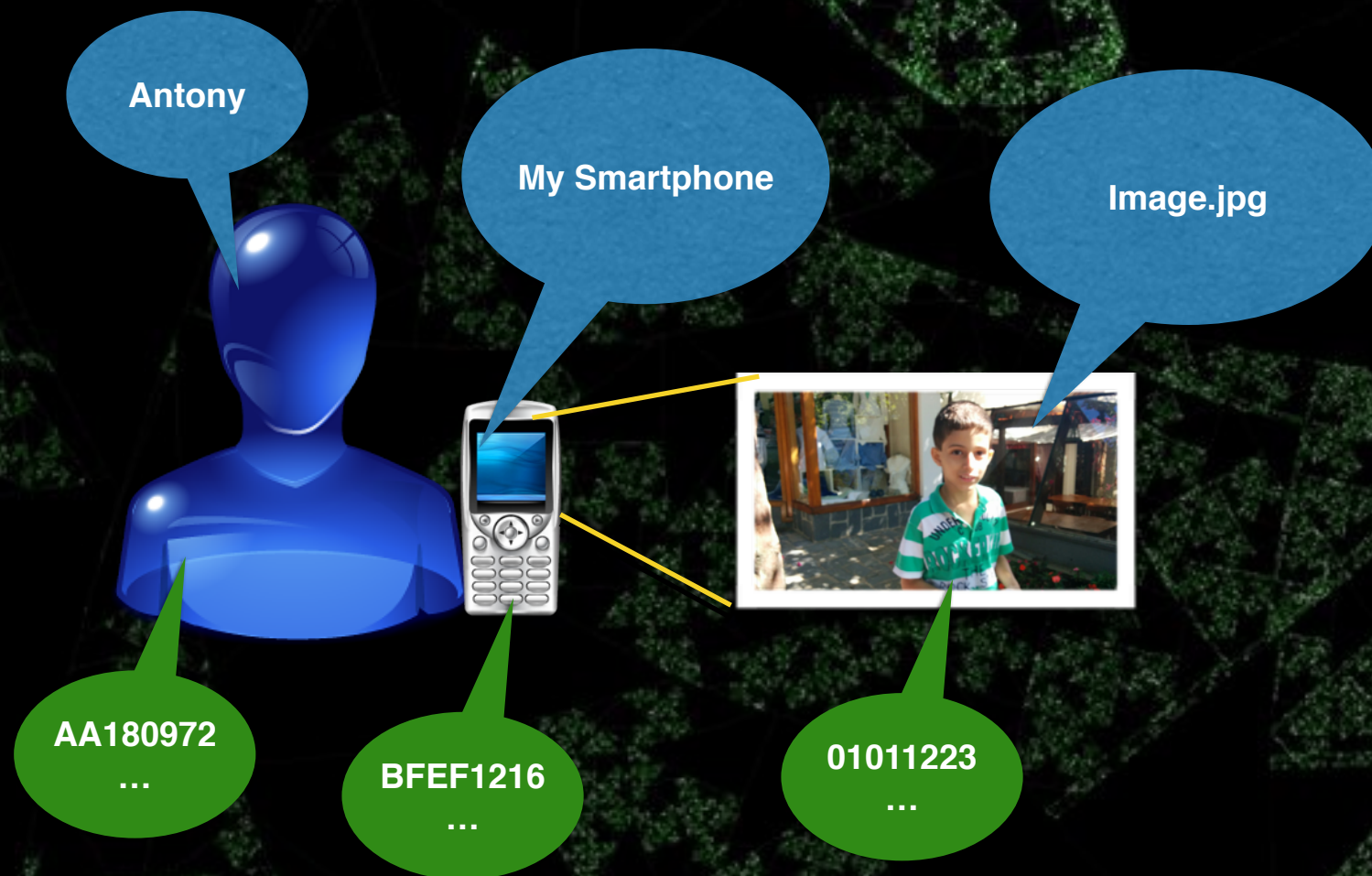
NAMING AND NAME BINDING

Natural language names: Portuguese, English, etc.



Self-certifying names generated from existences' immutable patterns.
Unlimited sets of namespaces and name resolution capabilities!

IDENTIFICATION AND LOCALIZATION

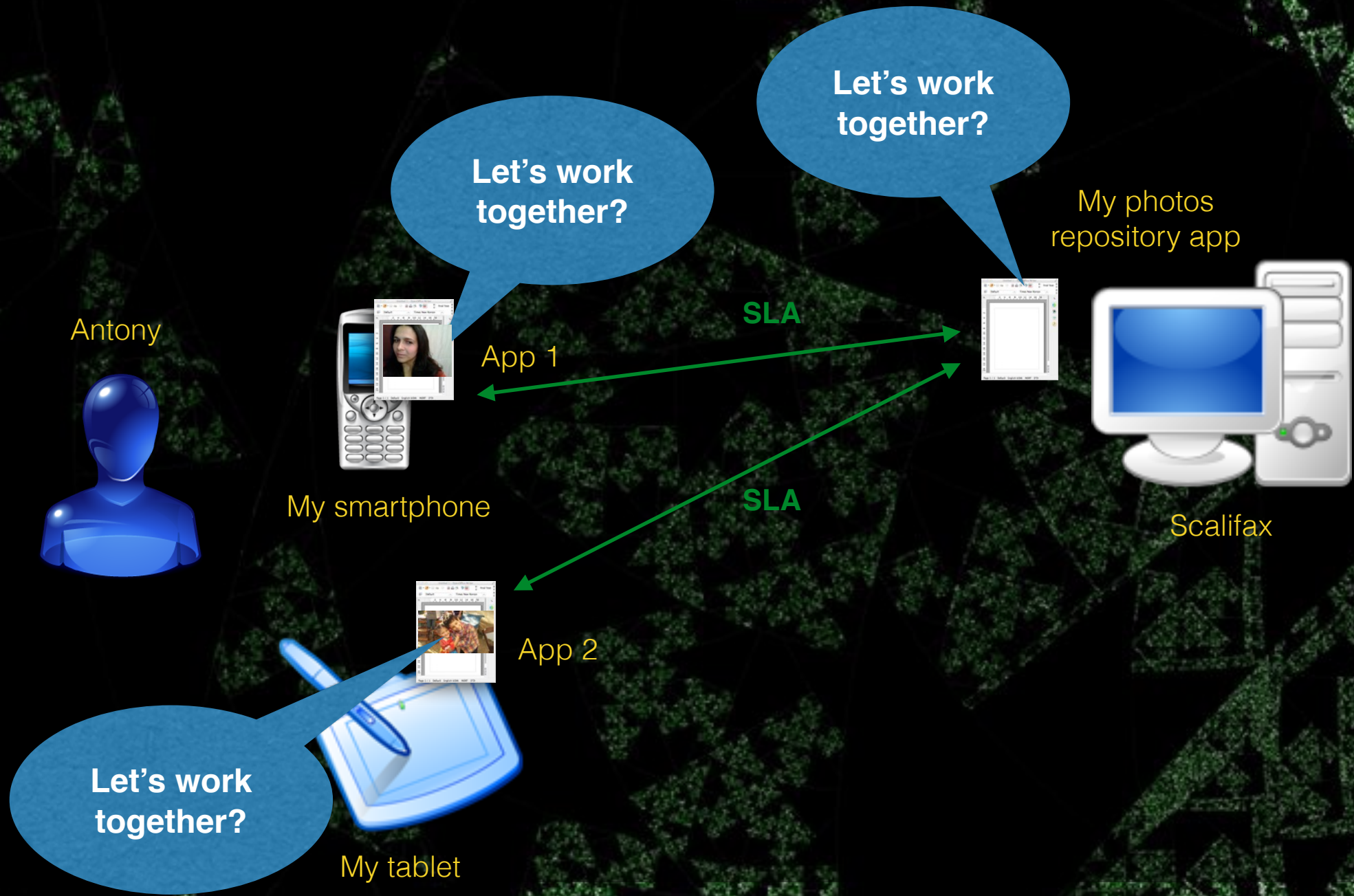


**A name can be an identifier, a locator, define a scope or a space.
Depends on the way systems look to it.**

EXPOSITION AND DISCOVERY



NEGOTIATION

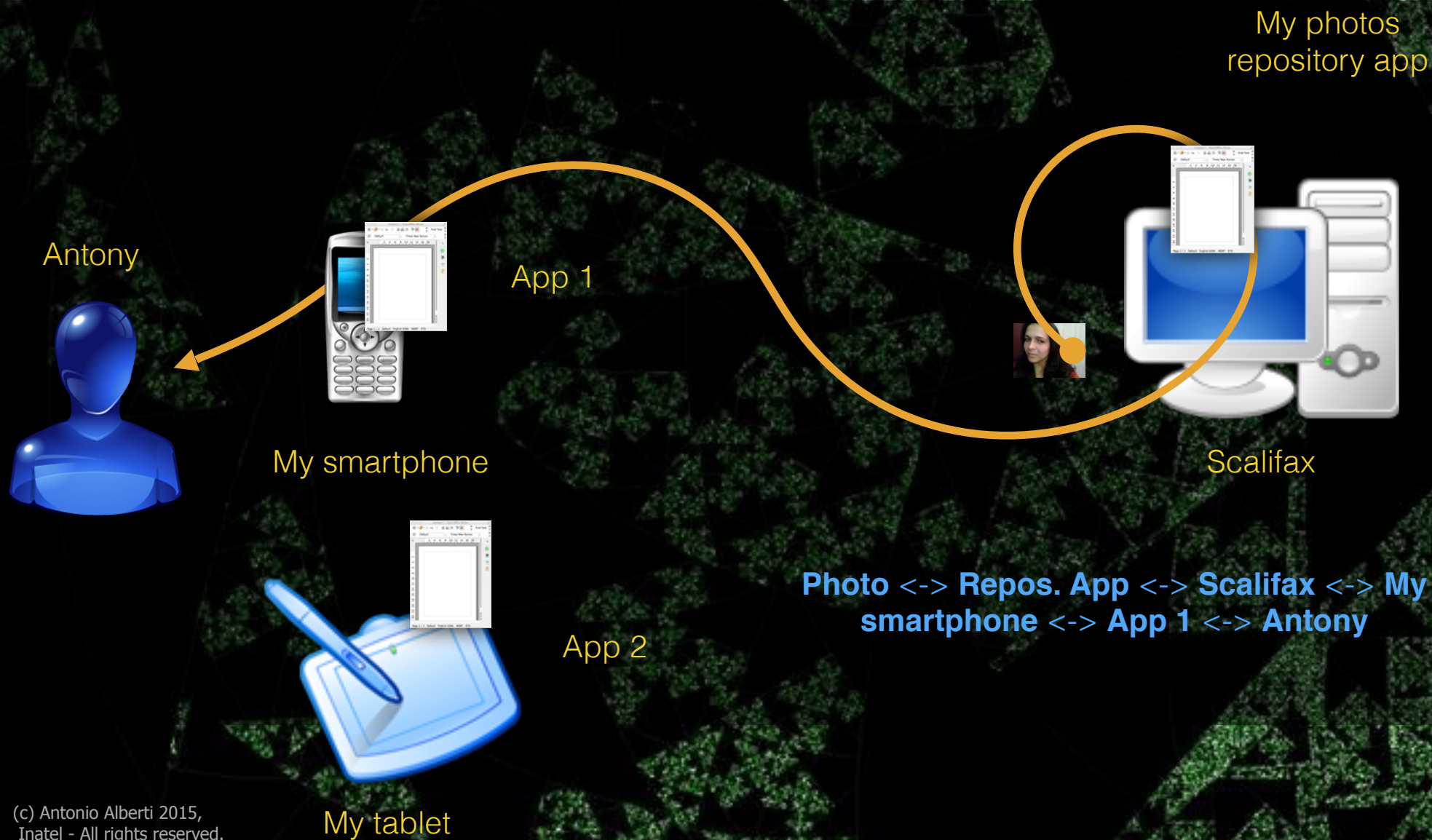


INFORMATION EXCHANGING



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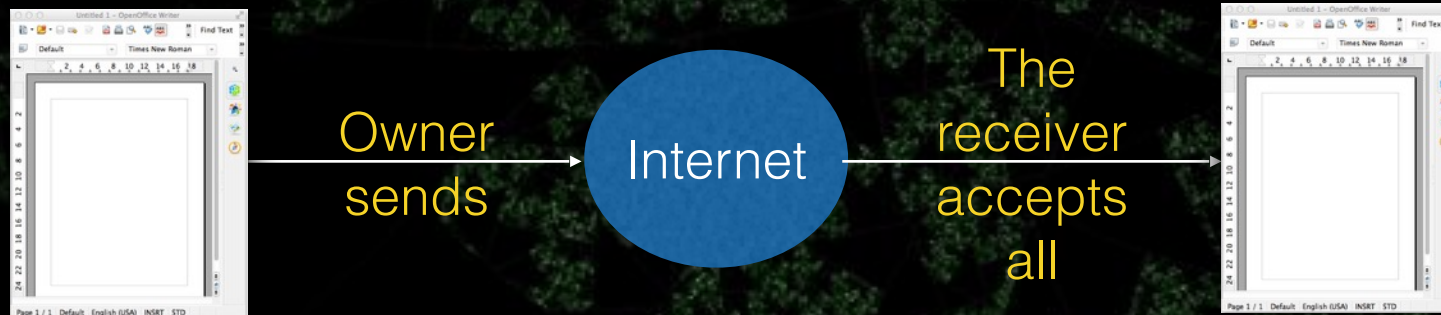
PROVENANCE AND TRACEABILITY



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COMMUNICATION MODEL

Today

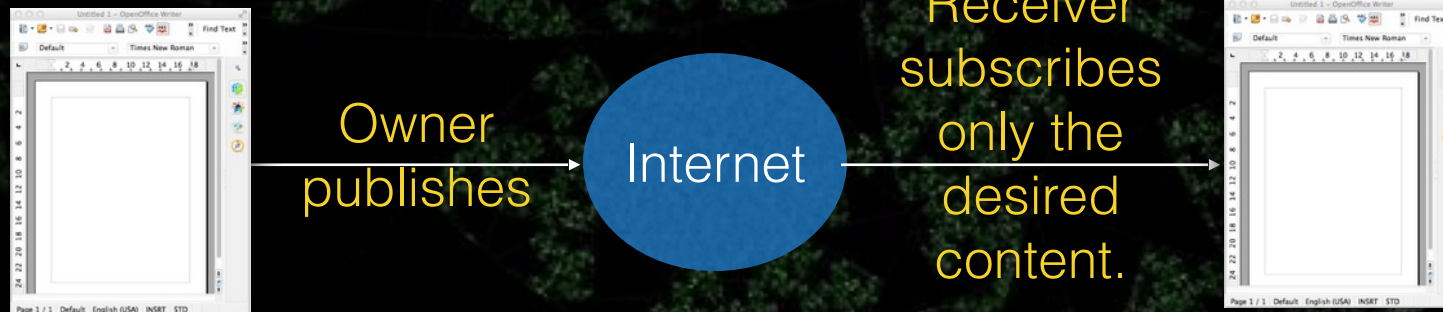


Facilitates
spam!

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COMMUNICATION MODEL

Future



**Minimization
of spam
problem!**

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MOBILITY

Today

ID=**143.106.52.3**
LOC=**143.106.52.3**



Local Net 1



ID=**10.0.0.3**
LOC=**10.0.0.3**

Local Net 2

MOBILITY

Future

ID=FFFF12211243865...
LOC=FEFEF1421412411...



Local Net 1



ID=FFFF12211243865...
LOC=AAAA2734573453...



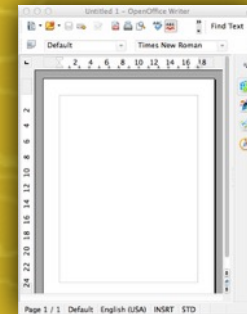
Local Net 2

IOT - INTERNET OF THINGS

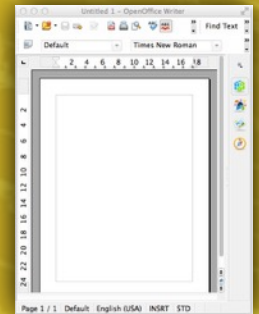


SOCIAL "THINGS" SWARMS

SERVICES SWARMS



Proxy/Gateways

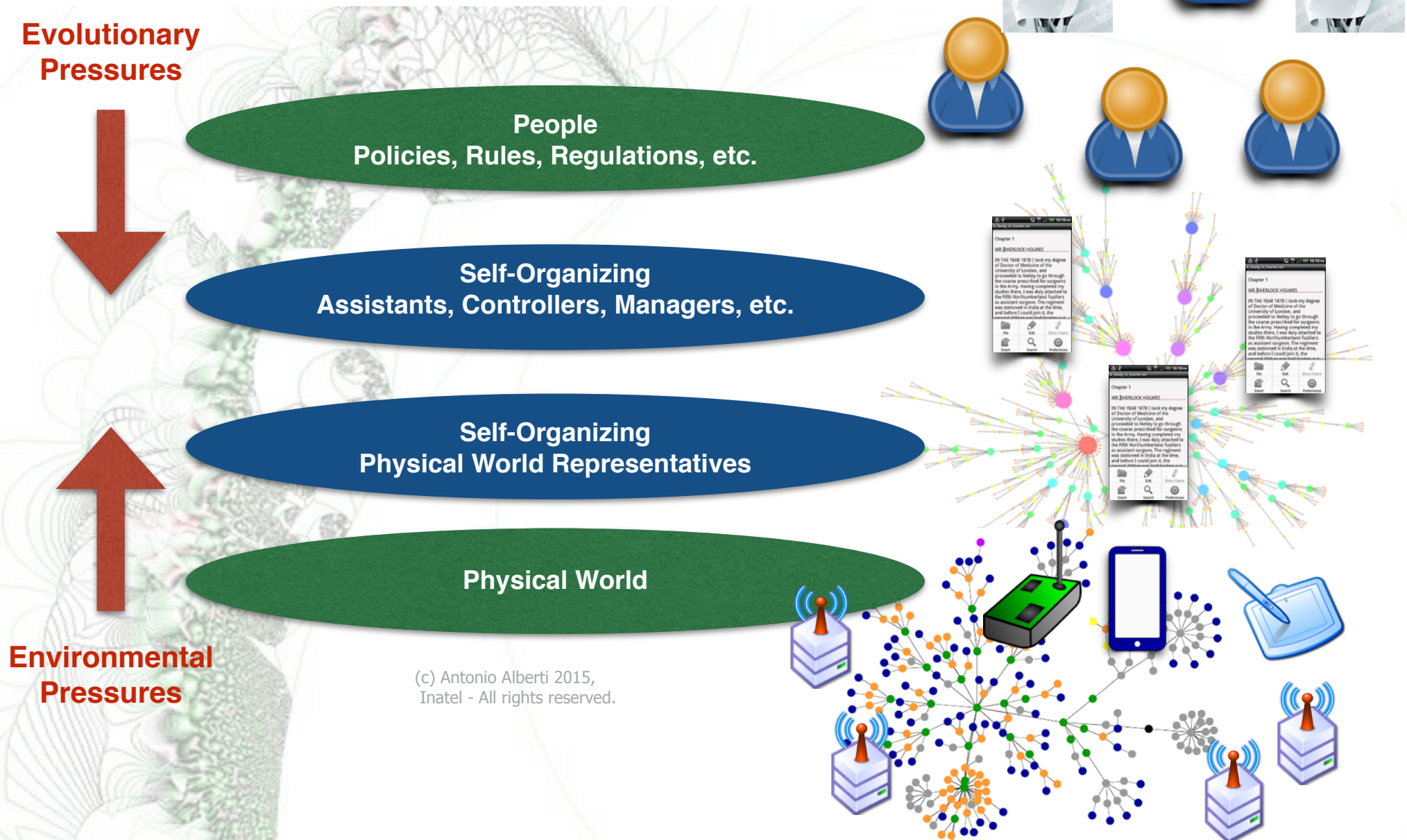


Controllers/
Managers

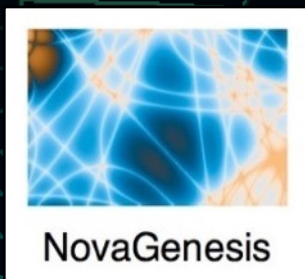
**"THINGS" NEED SERVICES TO REPRESENT
THEM TOWARDS CONTRACT-BASED
TRUSTABLE SELF-ORGANIZATION**

The Essence of NovaGenesis Model

Smart Convergent Information Architecture



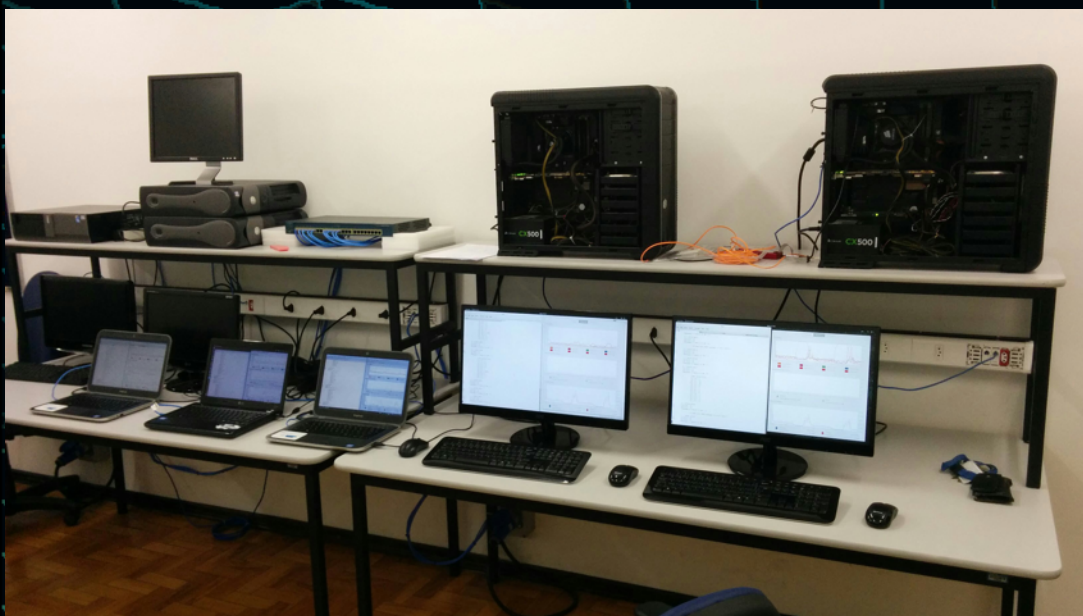
Prototype



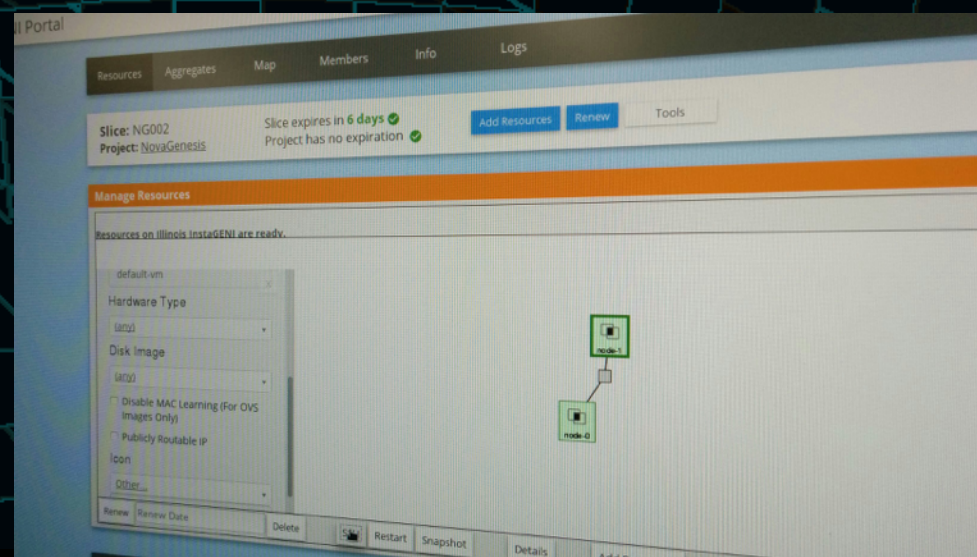
**LIVE DEMO @
SAO PAULO
CAMPUS PARTY
JAN. 2015**



**SCALABILITY@
INATEL
AUG. 2015**



**FIRST TEST@
GENI
SEPT. 2015**



- **SYNERGISTIC INTEGRATION, PERFORMANCE EVALUATION, AND COMPARISON OF EMERGING ARCHITECTURES AND ITS INGREDIENTS.**

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NOVAGENESIS**



**Information and
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Obrigado!



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