UNIVERSIDAD DE VALLADOLID

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE TELECOMUNICACIÓN

TRABAJO FIN DE MÁSTER

MÁSTER DE INVESTIGACIÓN EN TECNOLOGÍAS DE LA INFORMACIÓN Y LAS COMUNICACIONES

SOCIEDAD DE LA INFORMACIÓN

INTRODUCCIÓN AL DESARROLLO DE UN PROTOCOLO SEGURO DE COMUNICACIONES ENFOCADO A REDES E-GOVERNMENT Y BASADO EN LA TEORÍA DE SISTEMAS VIABLES

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JUNE 2015

TÍTULO INTRODUCTION TO 'ATLAS': DECENTRALIZED CYBERNETICS PROTOCOL

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RESUMEN

Esta disertación expone, en primer lugar, las características sociales y tecnológicas de un entorno que favorece el desarrollo de un protocolo de comunicaciones basado en Sistemas viables. El uso de diferentes tecnologías para configurar un esqueleto funcional del mismo se desarrolla a continuación, así como la base ideológica del mismo, sobre la Teoría de Sistemas Viables de Stafford Beer. Seguidamente, se introduce su diseño funcional, así como la exposición al potencial trabajo futuro y potencial distribución y evaluación. Conclusiones acerca del desarrollo, impacto social y tecnológico, y fundamentación del proyecto cierran el documento.

ABSTRACTO

Se han realizado considerables esfuerzos para el desarrollo e implementación de mejores estructuras y protocolos de organización y e-Gobernancia en administraciones tanto públicas como privadas. Al mismo tiempo, tendencias sociales actuales muestran una atención y preocupación cada vez más acentuadas con objeto de reducir la corrupción, adquirir transparencia, minimizar la burocracia, y maximizar la eficiencia, con un fuerte énfasis en la privacidad y seguridad de todos los participantes involucrados. Mediante la Teoría de Sistemas Viables de Stafford Beer como esqueleto, esta disertación introduce un diseño tentativo de un protocolo de comunicaciones basado en tales desarrollos, y proporciona una serie de directivas y guías ddi diseño del mismo a ser refinadas y mejoradas en trabajos futuros, sugiriendo asimismo varias direcciones potenciales a perseguir con respecto a desarrollo, implementación, y experimentación.

PALABRAS CLAVE

Administración Pública, Burocracia, E-Gobernancia, Management Cybernetics, Operations Management, Protocolo de Comunicaciones, Stafford Beer, Teoría de Sistemas Viables.

A mi madre, que me da fuerzas y me inspira.
A mi padre, que me apoya y me ayuda.
A mi hermana, que me quiere y me anima.

Carry on my wayward son
There'll be peace when you are done
Lay your weary head to rest
Don't you cry no more

Once I rose above the noise and confusion
Just to get a glimpse beyond this illusion
I was soaring ever higher, but I flew too high

Though my eyes could see I still was a blind man
Though my mind could think I still was a mad man
I hear the voices when I'm dreaming,
I can hear them say

Carry on my wayward son,
There'll be peace when you are done
Lay your weary head to rest
Don't you cry no more

Masquerading as a man with a reason
My charade is the event of the season
And if I claim to be a wise man,
Well, it surely means that I don't know

On a stormy sea of moving emotion
Tossed about, I'm like a ship on the ocean
I set a course for winds of fortune,
But I hear the voices say

Carry on my wayward son
There'll be peace when you are done
Lay your weary head to rest
Don't you cry no more no!

Carry on,
You will always remember
Carry on,
Nothing equals the splendor
Now your life's no longer empty
Surely heaven waits for you

Carry on my wayward son
There'll be peace when you are done
Lay your weary head to rest
Don't you cry,
Don't you cry no more,

No more!

Carry On Wayward Son
Kansas - Leftoverture
1976

TO THE OBSERVANT READER:

THIS INTRODUCTION IS AIMED TO PRESENT A WHOLE NEW PROTOCOL, TO BE FURTHER REVISED AND IMPROVED IN FUTURE DEVELOPMENTS. WHILE CONSIDERABLE EFFORT HAS BEEN MADE TO PRODUCE A THROUGHOUT, INCLUSIVE DOCUMENT, GIVEN THE SCOPE OF THE ENDEAVOUR, IT STANDS TO REASON INTERESTING ARGUMENTS CAN BE ELABORATED AGAINST OR TOWARDS THIS DISSERTATION.

THIS IS BOTH ENCOURAGED AND WELCOMED.

ANY FEEDBACK AND SUGGESTIONS WILL HELP THE AUTHOR TO REINFORCE AND STRENGTHEN THE PROTOCOL.

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1 Introduction

With every power comes great responsibility.

AMAZING FANTASY #15 (AUGUST 1962)
BEN PARKER, QUOTING **WILLIAM LAMB** (1125-1229)

1.1 PRESENTATION

Rome was not built on a day[1] is a very common adage, aimed to attest the demand of time on the development of *complex* —and often *great*— endeavours. But the opposite —in every sense— appears to be also true **[R1]**: Rome collapsed abruptly —as early as the 5th Century— as *Germanic* migrations and invasions quickly overwhelmed the capacity of the *Roman Empire* to assimilate migrants and repel invaders. It was a devastating blow: society actually *regressed*, as the cultural, technological, and economical advancement rate of human civilisation at the time greatly slowed down in comparison with previous or later Historical periods. This period itself was coined as the *Dark Ages* by *Petrarch* **[P1]**, with such a resonance that we continue to use the very same expression when referring to a difficult and underdeveloped period.

And as it could be expected, it was not the last time a civilisation fell under the weight of sudden, *extreme* external pressure, and the inability to cope with such coercion: the *Mongol Invasions* decimated the populations of what is modern China, Russia, Middle East, and Islamic Central Asia, provoking such devastation that what was once a civil, ordered society was forced to became a chaotic, nomadic one **[R2]**. Similar grisly examples can be found in the very first encounters with European explorers and New World cultures: Spanish *conquistadores* were actually helped by the *Smallpox* they brought along themselves in their conquest: it ravaged what it is now Mexico in the 1520s, killing almost 150.000 residents in *Tenochtitlán* alone, including the emperor, *Cuitlahuac* **[P2]**.

If one is tempted to apply *Occam's Razor*[2] to this issue, it could be argued civilisations are prone to collapse, and they do so with enough insistence, either of social, economical, biological, or technological nature. It is not much of a far-fetched thought: in fact, examples of such lines of thought can be found as early as the end of the 19th Century **[R3]**, blooming several proposals and theories about an unified set of underlying causes for this phenomena **[R4]** **[R5]**. Epitomising, they amount to the same scenery: civilisations whose *hubris* —regarded here as *excessive* confidence on one's abilities— balloons up to a *fatal* point become *bloated*: their own designs are unable anymore to effectively *adapt* to their environment and any potential issues, becoming unable to *survive* in long, or even short terms.

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[1] Usual *English* translation of of a medieval *French* expression, *Rome ne fu pas faite toute en un jour*, collected in the *Li Proverbe du Villain*, circa 1190.

[2] Problem-solving principle devised by *William of Ockham* **[P3]**, stating that among hypotheses that predict *equally well*, the one with the *fewest* assumptions should be selected.

In short, they find *irresolvable problems*.

It *is* indeed a bleak scenery, and perhaps, inordinately *pessimistic*. But not entirely devoid of clear-sighted sense: hubris points to a increasing *loss of contact* with the environment, and a growing *overestimation* of one's own competence, especially in regards with any position of power. This is upsettingly corresponding with the *House of Cards* scenario **[R6]**, where the society has grown *so large*, and include *so many* complex institutions, that becomes inherently *unstable*, and prone to *collapse*.

This issue blossoms precisely due to our own *advancements* and *breakthroughs* as an ever-pushing-forward community: we have managed to pierce the *skies* and scoop on the unfathomable *bottom* of the seas. We can *communicate* instantly through incredible distances, with a single *swipe* of a finger. We have devised astounding *devices*, able to provide us with an almost *boundless* wealth of *information*.

And at the same time, each tiny step forward has also payed a toll towards *complexity*: with each success, we also feed the ever-increasingly *bloated* societal structure, slowly advancing towards *collapse*. It is a beautiful, yet cruel *irony*: order-focused societies are often born to solve complex problems through creative and comparably complex solutions… Leading to eventual —and *apparently unavoidable*— stagnation and breakdown through *complexity surfeit*, and the eventual *corruption* of *bureaucracy* and the government systems they chose to employ.

Once again, the future appears *bleak*: it is sadly appealing to think of a never-ending *cycle* of *genesis*, *growth*, *decay*, and *disintegration*, which from there is no escape, as the remains of previous civilisations —once great, now fallen— serve as silent warnings of potential *doom*.

Be that as it may, tentative formulas to elude this terminal fate can still be discussed, as those civilisations were never able to evolve towards a *Information Society*[3], and thus unable to enjoy the information creation, analysis, and dissemination capabilities which *could* make a factual difference on this problem.

Thus, it appears that a *Information Technology* oriented *communications protocol* could indeed *mitigate* or even *solve* such issues: any member of any enterprise —may it be a *family*, a *business*, or a *country*— should be able to access an *automated* and *responsive* system through a *plethora* of devices, which would provide *dynamic* responses to *multiple* situations: in fact, it should be able to infer the best *outcomes* and *decisions* based on the very shared decisions and opinions of all members, which are able to freely *express* and *communicate* themselves, without the *pressure* of any *coercive* forces. The system itself should be *heavily shielded* against any *perverse* or *corruptive* societal effects, and would provide the means to *ensure* the most *efficient* and *reliable* means of communication among members and the *viable* structures supported by those.

[3] Term coined by *Daniel Bell* **[P4]**, referring to how technological capabilities would allow to *revolutionise* and *transform* human relations in regards to *culture*, *politics*, *communications*, *transport*, among others **[R7]**.

1.2 THESIS ANATOMY

Therefore, this thesis is *structured* through a series of *chapters*, tasked to expose different *aspects* of the main project:

REQUISITES	This section details how particular concepts of government and management -cardinal to this dissertation- along with the idea of the Information Society and related electronic means of governance allow to infer many common and not-so-common administrative and organisational challenges and potential solutions. These are grouped and refined into a main taxonomy of threats and solution criteria, to be used as the skeleton of any potential architectural models.
TECHNOLOGIES	Up from the shoulders of giants, this project uses a series of established technologies already available: this section outlines and briefly describes their use and context within the project.
ANALYSIS	A detailed, step-by-step description of the potential solution is presented, outlining the workflow and the base layout of any structures conforming the solution itself, along with a glossary breakdown of any decisions and choices taken to define the scope and implementation intentions of the solution. On the whole, this chapter describes the what of this dissertation.
DESIGN	Through schematics and a more deeper perspective, the interaction of the structures and the base layout is described in detail, along any particular complexities in regards with design, interface, scripting, and others. On the whole, this chapter describes the how of this dissertation.
CONCLUSIONS	Specific remarks regarding the duration of the project, design issues, and any other problems —along with the solutions and measures taken to minimise or remove their influence—, and a personal comment of the quality and results of the work itself.
FUTURE WORK	This project was never considered as an static artifact to be thrown and eventually forgotten in a drawer after its completion. In fact, quite the opposite: this project is but the beachhead of a Ph.D thesis, along with potential work into business and governance areas. This section encompasses some of the future steps to be taken towards some of these goals, along with a tentative milestone road layout.
APPENDIX A - VIABLE SYSTEMS THEORY	The proposed architectural model heavily lies upon the foundation cybernetics management theory, which is gently adapted to both acquiesce the solution criteria and the potential challenges outlined before, and to the potential of new technologies into new communication structures.

TABLE 1. Thesis anatomy structure.

1.3 AVAILABLE RESOURCES

Given the *Information Technology* focus of this project, the resources used for the elaboration of this project can be *summarized* into *two* broad areas:

PHYSICAL	A MacBook Pro of early 2011, with a 2.2 GHz Intel Core i7 processor, and 16 Gb 1333 Mhz DDR3 memory banks, as well as a series of mobile devices, including a iPhone 6 Plus, and and a third generation iPad.
DIGITAL	Xcode IDE development (versions 6.4.1, 7.01), Sublime Text (version 3.0).

TABLE 2. Resource inventory list.

1.4 STAGES AND METHODOLOGY

To ensure the *successful* completion of this project, a series of *stages* were planned to *s* the staggering complexity into more manageable and revisable *phases*:

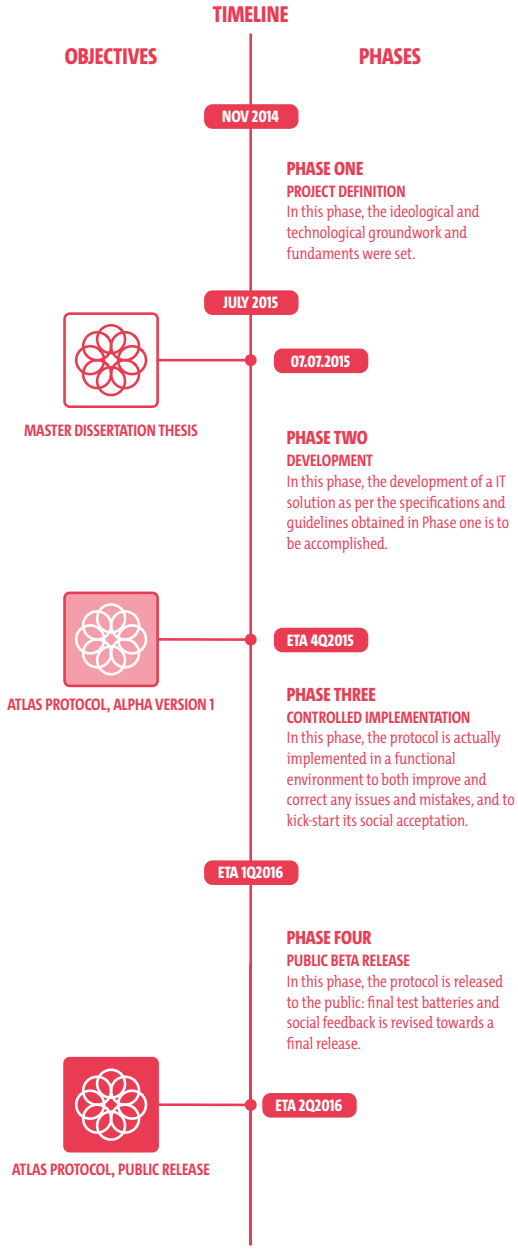

FIGURE 1. Timeline of the project.

As described in the figure, this project is *not* meant to be *halted* after a *successful academical presentation*; on the contrary, the remaining stages are meant to be exercised and *completed afterwards*: this dissertation —the *Introduction of the communications protocol*— is a *cardinal*, yet *preliminary* step towards the *final development*, *implementation*, and *public deployment* stages.

The methodology used for the development of this dissertation heavily sources from the *Agile Methodology*[4] and *Kanban philosophy*: both are briefly explored in the *Appendix B - Agile Methodology* and *Appendix C - Kanban Philosophy*, respectively.

To allow for the best performance possible, a *Continuous Integration model* was developed, as outlined below:

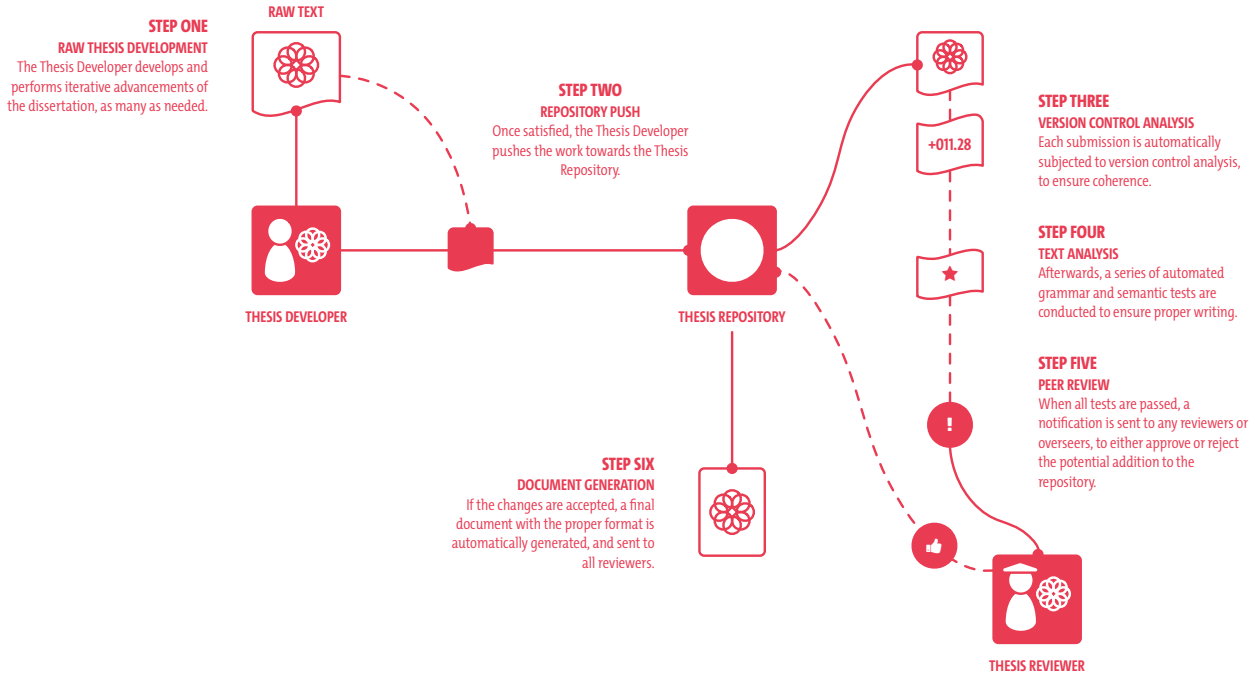

FIGURE 2. Continuous Integration diagram used for the thesis development.

1.5 OBJECTIVES

It is fundamental to note, that this dissertation in *no way* does *engage* any of these *features* to be actually *implemented* in a *functional prototype*: while they are to be *discussed* and *outlined*, the actual *engineering* and *implementation* is to be performed in a *future Ph.D. thesis project*.

Therefore, the general objective is outlined as

To outline and design a protocol, based on the viable system model Theory, which will allow for a series of issue criteria to be either minimised or removed, in the context of management and e-government enterprises.

In order to achieve this *global* objective, several *partial* objectives -which were meant to be met in a *incremental* progression- were also defined:

[4] *Agile Manifesto*, accessible at http://agilemanifesto.org. Last accessed at 15.06.2015.

1. **Generate a functional taxonomy of criteria, from most-common, most-relevant, most-endangering societal and enterprising issues, identifying their base attributes and how could they be solved through technological means, in the context of Viable System correlations.**

   In an uneven, lush societal environment, a myriad of multiple threats to societies and enterprises are bound to appear: while this dissertation does not aim to provide a throughout taxonomy of such issues —and such work would warrant a complete thesis on its own—, a functional taxonomy is indeed to be constructed from the most common and relevant examples of societal decay, along with proposed solutions by using technological communication means.

   This objective is addressed in *Requisites*, starting at page *21*, and provides a functional taxonomy of societal collapse criteria and related solution criteria.

2. **Outline a relationship among the solution criteria obtained beforehand, and potential technologies to be used as foundation stones towards a protocol framework.**

   Once a set of solution criteria have been chosen, they can be implemented towards a technological communications protocol. Instead of trying to solve each technological issue by itself, it appears far more efficient and agreeable to stand on the shoulders of Giants, and use open, accessible, and freely available technologies to construct a fundamental skeleton of the protocol.

   This objective is addressed in *Technologies*, starting at page *42*, and provides a skeleton of the communications protocol supported by the proposed technologies.

3. **Develop the structure of the communications protocol from the analysis of the technological skeleton framework, outlining any structures needed for the protocol to perform into a high-level sketch of the protocol framework.**

   The technological skeleton framework now allows for a throughout analysis of how the solution criteria can be implemented by outlining a series of structures to provide any functionalities as needed.

   This objective is addressed in *Analysis*, starting at page *48*, and provides a high-level sketch of the protocol framework, outlining base and fundamental structures.

4. **Design each structure and function of the protocol framework, as outlined by the high-level sketch previously developed.**

   Once outlined, the high-level sketch of the protocol framework allows to refine and design a more throughout framework, at a much lower level.

   This objective is addressed in *Design*, starting at page *54*, and provides a low-level sketch of the protocol framework, outlining specific characteristics and attributes of the protocol.

1.6 CONFIGURATION PREMISES

Due to the *massive*, *ambitious* scope of the protocol, and to ensure its *robustness* against both outer and inner *threats*, a series of base *premises* are proposed:

1. **Unfavourable environment.**

   The traffic on every node, every connection, and every peer on the network is *z* to be about to be subjected to monitoring methods, either to disclose or to influence the information contained in the network.

2. **Unsympathetic citizenry.**

   At random intervals, a series of peers -from one, to an undisclosed number- are believed to be trying to actually subvert, damage, or threaten the integrity of the entire network or the protocol layout itself.

3. **Uneven landscape.**

   The protocol will have to cope with different situations regarding signal strength, and network usage: from a ideal area where no problems of any sort are detected, to a vastly damaged location where it is almost impossible to correctly send or receive data.

4. **Unforeseen consequences.**

   The protocol will have no immediate feedback on any actions deployed: the time delay will vary, and the eventual input of the consequences spawned is completely unpredictable until the moment they appear.

2 | Requisites

If you build it, he will come.

FIELD OF DREAMS (1988)
SHOELESS JOE JACKSON

2.1 THE EDGE OF SOCIETY

Societal collapse due to degenerative, perverse forces can then feasibly be extended to any kind of *enterprise* —defined in this context as *any kind* of relevant undertaking, carried along by *any number* of individuals, grouped in *any sort* of social structures—. It is not a moot subject at all: proper management of social structures is observed to remain a primary trend after communities undergo the aptly called *Information Revolution* **[R8]**.

Such transformative process alters the way societies use their acquired knowledge to perform *better-informed* decisions about their own future. That is, to better *govern* themselves. Therefore, it can be argued that societal collapse —thus corruptive forces and effects, such as the described above— strike at the *heart of enterprises*, severely threatening their own continuance, because it severely affects our government capacity. In order to *assess* how enterprise governments are specifically affected by the corruptive forces and effects leading to societal collapse, the very *concept* of government should be addressed in the first place.

2.1.1 DEFINING GOVERNMENT

To define the concept of government seems a much more easier endeavour than it really is: to create a *typology* or *taxonomy* of governments has always been a long-standing goal of political sciences, but the *mercurial* nature of human societies has always hindered such efforts **[R9]**.

For example, self-identification leads to *conflicts*: elections are a *defining*, cardinal characteristic of a *democracy*, but while *Francoist Spain*[5] celebrated elections, those were strictly *controlled*, *segregated*, and *censored*, and took place in a *single-party state*, subverting the very definition of democracy as it is widely accepted **[R10]**. Besides, governance systems tend to blur themselves as they adopt characteristics at their own necessity: for example, the *United States of America*, at the time of writing of this dissertation, cannot be regarded as a true *capitalist society*, as their government[6] actually provides a measure of social services and welfare.

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[5] Term used to refer to the period of *Spanish History* between *1939* and *1978*, where *Francisco Franco* **[P5]** forcefully took control of *Spain* from the government of the *Second Spanish Republic* in the aftermath of the *Spanish Civil War*, up to his death and the establishment of the *Spanish Constitution* of *1978*.

[6] *United States of America Government Site*, accessible at *http://www.usa.gov*. Last accessed at 22.05.2015.

But a whole *taxonomy* of governance systems is perhaps not needed for the purposes of this essay: instead, it is far easier to take into account *how* they can *react* towards themes of *information management* —how decisions are made—, *society management* —how and who elects those empowered to enforce government—, and *governance structure* —how power is structured—. Inspired by *Plato's five regimes*[7], a chart of the most broad governance structures can be outlined according to these features:

	ANARCHIC	AUTOCRATIC	OLIGARCHIC	DEMOCRATIC
SEAT OF POWER How society structures enforcement of power over all components of the community.	There is no publicly enforced government.	A single individual holds all the power over the entire society.	A selected group of individuals holds the power over the entire society.	All available individuals are able to vote and decide over themselves.
INFORMATION EXCHANGE How much information is traded among empowered structures, towards non-empowered ones.	None	Small, Medium		Large
GOVERNANCE STRUCTURE How society configures all the elements composing the overall community.	None	Linear, hierarchical		Polyhedrical

TABLE 3. Governance systems chart according to information exchange, and governance structure.

A *correlation* appears, then, between *governance structures* and *information exchange*: as power becomes *distributed* among more individuals or government elements, information exchange *increases* at the expense of *increased* governance structure *complexity*.

Moreover, conclusions can be already inferred: *better*, more *efficient* ways to manage information are to be *developed* as society *traverses* from a *anarchic state* (where information exchange is *minimal*, or too *chaotic* to be managed) towards a *democratic state* (where information exchange is *maximal*). Perhaps, an argument can be made about how ***governance information systems (GIS)*** need to evolve at the same rate as information exchange *increases*, in order to provide sufficient support.

In fact, and within the context of an *Information Society*, the use of *Information Technology (IT)* and *Information and Communication Technologies (ICT)* provide the technological foundation to actually *support* this evolution, providing for all aspects of the society itself to undergo *fundamental* changes, as outlined below:

[7] Regimes discussed by *Classical Greek philosopher Plato* **[P6]** in his *Republic (Book VIII)*. According to him, there are *five* types of regimes: *aristocracy*, *timocracy*, *oligarchy*, *democracy*, and *tyranny*. They are ordered as they *degenerate* in one to other, from the most *desirable* and *ordered* (aristocracy) to the most *chaotic* and *loathed* (tyranny).

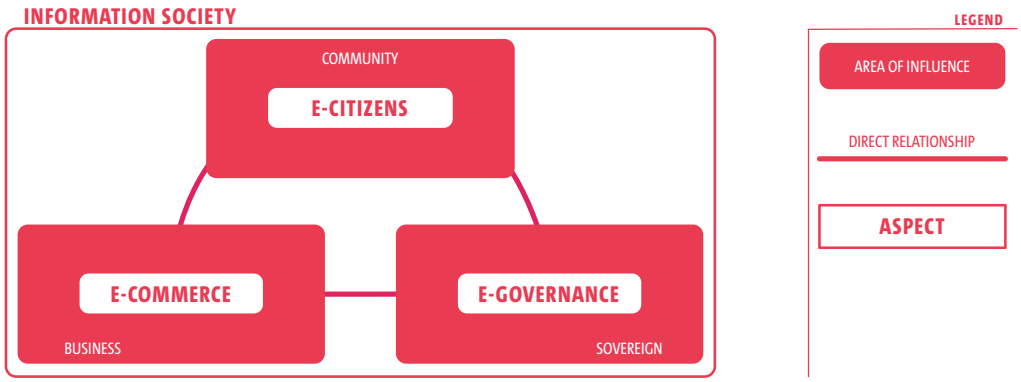

FIGURE 3. Information Society layout, outlining areas of influence, aspects, and their relationships.

E-Citizens (E-Cit). Able and willing to take a deeper, more immersive role in society, politics, and business endeavours through IT and ICT-supported systems. Any citizen is liable to become an e-citizen as the community steadily evolves towards an Information Society state, where knowledge about how to use such systems becomes widespread and easily accessible.

E-Governance (E-Gov). Able to provide a whole new set of services to both businesses and communities through IT and ICT-supported systems, where information becomes the cardinal element. Any governance system is liable to become an e-governance system as the sovereign steadily evolves towards an Information Society state, where technical knowledge finally provides better, more transparent, and more accurate solutions.

E-Commerce (E-Com). Able to trade products, services, and commodities through and aided by IT and ICT-supported systems, drawing on the power of automated management, remote transaction processing, electronic data interchange, automated inventory management systems, and many other capabilities to provide unprecedented efficiency and improved results.

In regular governance, distinct areas of action can be identified —*government*, *citizens*, and *businesses*—. However, *Electronic Governance* makes no distinction whatsoever, as they are *all* seen as different shades and scopes of *enterprises* to be managed **[R11]**.

2.1.2 E-GOVERNANCE

The terms of *electronic government* and *electronic governance* appear to have gained traction from the first years of the 1990 decade and onwards **[R12]**, yet it is possible to track initial attempts to *automate* bureaucracy through electronic means, more than fifty years before that date **[R13]**.

In later times, E-governance has slowly yet steadily *spiked* the interest of multiple countries, becoming increasingly involved in both its *development* and *implementation* **[R14] [R15]**: even supranational groups such as the *European Commission* regularly forwards *E-Government action plans*[8], to be formally adopted by all members.

[8] *European eGovernment Action Plan 2011-2015*, accessible at http://ec.europa.eu/digital-agenda/en/european-egovernment-action-plan-2011-2015. Last accessed at 23.05.2015.

E-governance can be roughly summarised into *four broad areas* according to their partnership foundation:

Government-to-citizen (G2C). Offers ICT-enabled services to citizens: for example, two-way communication allows for instant communication between administrators and subjects, remote voting, and immediate feedback. Economical transactions —such as city utilities— can then be completed in a matter of seconds, by using devices such as computers, tablets, or smart phones. Social services —social status update, applying for services or grants, or service conveying, for example— no longer need physical presence.

Government-to-government (G2G). Provides new ways to reduce complexity and heighten efficiency on governance systems: for example, by reducing the workload of government employees, or improving their interaction with other sub-systems. Information can be easily provided and shared among peers, either of national nature —such as XXX— or supra-national —such as the *Schengen Information System (SIS)*[9]—.

Government-to-employee (G2E). Enables a true weightless, paperless information model to be enjoyed by all employees: documents can be stored online and accessed anywhere, anytime, and shared in every occasion. In fact, all regular services —for example, services such as payroll management, social services, service or business training— are empowered by ICT services. The use of databases allow for a quicker, more efficient record management.

Government-to-business (G2E). Provides *business information (BI)* and advice on transactions between government and business structures —for example, *recommendations* to complete measurement and evaluation of business books and contracts—, intending to relieve stress over the business, providing immediate feedback over relevant demands.

At the same time, the inverse partnerships are also observed:

Citizen-to-government (C2G). Engages on information and communication transactions through IT and ICT services provided by the government.

Employee-to-government (E2G). Provides feedback from the results of performance, information policies, career management, and knowledge management, and others, through IT and ICT services.

Business-to-government (B2G). Provides feedback from the results of taxing, business licenses and management, registers, law-abiding services, administrative responsibilities, and others, through IT and ICT services.

All areas form a complete diagrammatic model of E-Governance areas based on their relationships, as outlined below:

[9] Governmental database used by *European* countries to maintain, collaborate, and distribute information on relevant persons or items. After the initial endorsement of the *Schengen Agreement Application Convention (SAAC)* of 14 June 1985, other countries began to slowly *adhere*, up to *27 counties* in total as of 2015. A second technical version, *SIS II*, became active on 9 April 2013, expanding on the types of relevant information to be managed, and on the institutions able to interact with the database.

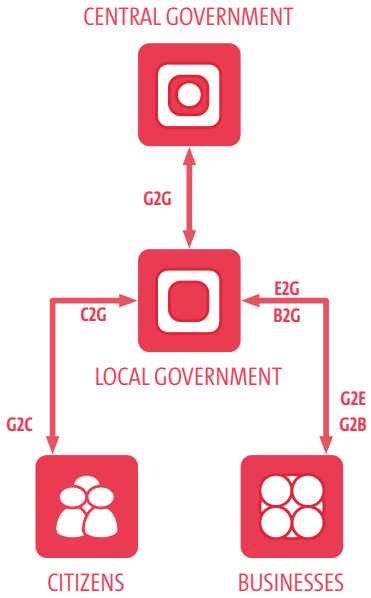

FIGURE 4. E-Governance diagrammatic model, outlining relationships among feasible elements.

1.3 THE THRESHOLD OF REVOLUTION

In an environment of *multiple* and *differently-evolved* societies, complications arise when citizens of less-evolved cultures wish to *bridge* the *schism* between them and their goal of an *Information Society*, awed by the potential boons.

Actually, the temptation to look to the Information Society as a whole *new* kind of society —a revolution on *itself*, in contraposition to the *Information Revolution* as a *stage* in a series of steps onwards— is often a *danger* on itself, because it tends to presume the societal issues of before shall not *compromise* the new societal system.

In fact, it can be argued the *Information Society* does *not exist at all*: it is but an *adaptation* of previous societal systems to the new features provided by the *Information Revolution*. The main critique is at the very *core* of the Information Society itself: most contemporary societies, at the time of writing of this dissertation, are *capitalistic* societies based and oriented towards accumulating *capital* —either *economical*, *political*, or *social*—. While it is acknowledged that *Information Society* provides engaging new features, it is not clear if they are *not new*, but simply *adapted* from *previous* ideologies through *IT* or *ICT* technologies: instead of Information Society, terms like *transactional network capitalism*, or *informational capitalism* have been already suggested **[R16-18]**. The figure below expresses both perspectives:

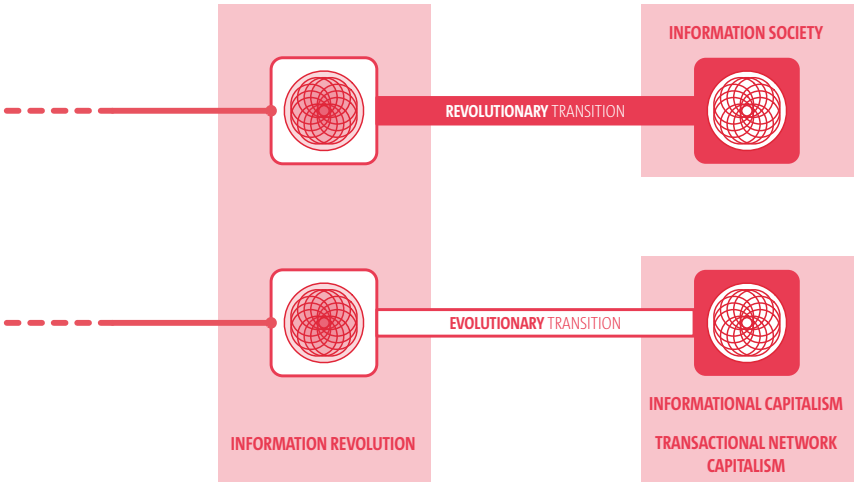

FIGURE 5. Societal evolution theories towards either a Information Society, or an Information Capitalism Society.

Intriguingly, they may very well be *both* valid approaches, at the same time.

Instead of looking at them as conflicting theories, both can be condensed into a *single* theory, if the *Information Revolution* is considered to be not a *single* societal development, but a *series* of *multiple* societal events within the *same* framework:

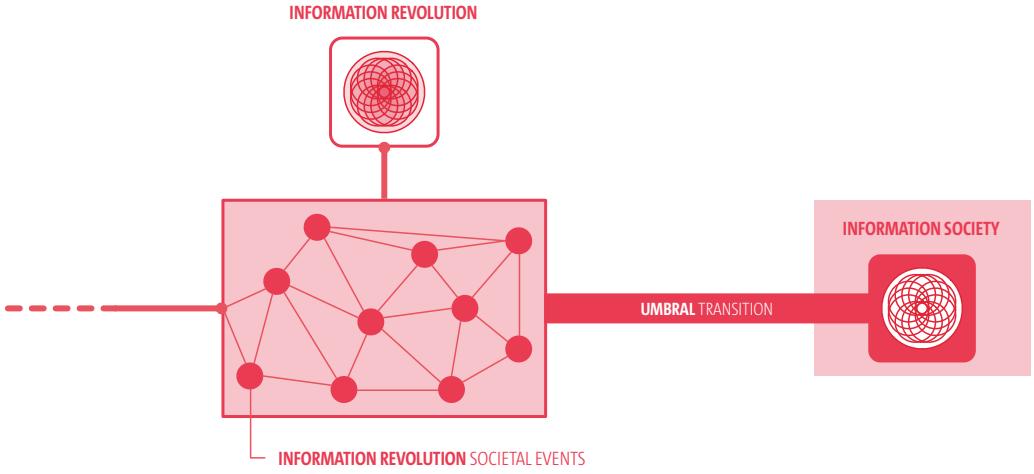

FIGURE 6. Unified social evolution theory towards a Information society.

Each societal event within the information revolution *narrows* the gap between the actual state of the society, and the *Information Society*: instead of searching for a definite event to kickstart the transition, multiple, smaller societal events can be pictured, each *adding* to the same advancement goal. As the umbral gap *shortens*, so does the 'distance' to the Information Society itself, up to the point that once passed a *threshold*, the gap does not exist anymore: the society has become the *Information Society*.

Such societal events include those already described and outlined before: the eventual evolution of *E-Governance*, *E-Business*, and *E-Citizen* features within the context of *Information Society*, backed out by IT and ICT-enabled technologies. However, the *opposite* is also true: *wrongful* application of these features,

or the eventual *degradation* by perverse forces —such as those described above— can potentially *broaden* the gap, or even *halt* whatsoever any progress. Each feature is to be affected either positive or negatively: hence, it becomes paramount to look at the abyss, and find the exact nature of the perils ahead, to accordingly *tune* the characteristics any technological solution should provide.

1.3.1 LOOKING AT THE ABYSS

The last two innermost circles of *Hell*, according to *Dante* **[P7]**, punish sins that involve *conscious fraud* or *treachery*. The depiction of *Geryon*[10], the winged monster who carries both Dante and his guide, *Virgil*[11], to the circles below —as they can only be reached by *descending* a very steep cliff— is quite filled with *symbolism*: he is described as the *mix* of *three* different *natures*: *human*, *bestial*, and *reptilian*. Indeed, he has the features of a *honest* man, on the body of a multicoloured *wyvern*[12], with the furry paws of a *lion*, and a poisonous sting similar to a *scorpion*[13].

The knowingly fraudulent —those guilty of deliberate, knowing deceit— are thrown to the eight circle and ninth circles, called *Malebolge*[14] and *Cocytus*[15] respectively. Interestingly, Hell does discern among *two kinds* of fraud: sinners guilty of *simple* fraud —without particularly malicious intent— are punished in *Malebolge*, while those guilty of *compound* fraud —which goes deliberately against bonds of love, blood, honour, or hospitality— are thrown to the ninth and deepest circle, *Cocytus*. Hence, this final circle is reserved for those guilty of willing *treachery*: they are as fraudulent as those of the Malebolge, but they *betrayed* and *shattered* a special, unique *bond*.

In this sense, *Hell*, as depicted by Dante, is amusingly efficient: it does *filter* sin into *categories* —circles — and even in more throughout divides within: *Malebolge*, a large, funnel-shaped cavern, is itself divided into *ten* concentric circular trenches —called *bolgia* in the original text—, and each of these corresponds to a particular *aspect* of fraud. *Cocytus* is also divided in *four* concentrical domes within a lake of ice: *Satan* himself resides trapped in the innermost circle, at the very centre of *Hell*.

Dante chose fraud and treason as the most *detestable* sins, which is a recurrent theme observed in many cultures and philosophies: *corruption* in public administration —*fraud* of *honour*, *hospitality*, or *professionalism*— violates one of the basic principles of *republicanism* in regards of the centrality of *civic virtue* **[R19]**.

In any enterprise, *corruption* eventually *erodes* and *minimises* the *capability* of the *management* and *government* structures: as resources are *conveyed out* and offices are *bought* or *perverted*, corruption

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[10] In the Greek mythos, *Geryon* was a fearsome giant who dwelt on the island *Erytheia* of the *Hesperides*, in the far west of the *Mediterranean*.

[11] In the Divine Comedy, the Roman poet *Virgil* **[P8]** is sent by *Beatrice*, the ideal woman according to *Dante*, to guide him on his journey to the underworld.

[12] Legendary winged creature with a dragon's head and wings, a reptilian body, two legs, and a barbed tail.

[13] This scene is described in the opening lines of the *Canto XVII* from the first part, *Inferno*, of the *Divine Comedy* of *Dante*, which began writing circa *1308*, and completed in *1320*, a year before his *death* in *1321*.

[14] Roughly translated from Italian, *Malebolge* means *evil ditches*.

[15] In the Greek mythos, *Cocytus* or *Kokytos* —from the Greek Κωκυτός, meaning *lamentation*—is a river in the underworld, surrounding *Hades*.

actually *increases* the cost of *enterprising* and *distorts* the *environment*, shielding those who have the power from *negative* effects of *competition*, *assessment*, or *law-abiding*: in short, *allowing ill-fitted* enterprises to *survive* and *prosper*, at the *expense of others*.

Erosion of once honest and principled persons, groups, and enterprise structures into dishonest and roguish ones through fraudulent or deceptive actions is precisely one of the recurrent themes in the *Hell* of the *Divine Comedy* of *Dante*. Hence, the *taxonomy of sin* performed by *Dante* in his work is very appealing, as it can be extended to identify precise themes of fraud to be applied in the *relationships* between individuals in a *society*, as seen below:

	THEME	CASE SCENARIO IN THE DIVINE COMEDY
FIRST BOLGIA Reserved to panderers and seducers who used the passions of others to do their bidding.	Coercion and subversion.	Virgil points out Jason, who in the Greek mythos gained the favor and power of Medea, daughter of King Aeëtes of Colchis, by seducing and marrying her, only to later desert her for Creusa, the daughter of King Creon of Corinth.
SECOND BOLGIA Reserved to flatterers who exploited users by using sweet language and persuasion.	Coercion and subversion.	Thaïs, a famous Greek *hetaera*, is condemned here: she was the one who caused the burning of Persepolis by convincing Alexander the Great to do so.
THIRD BOLGIA Reserved to simonists: those who sold church offices and roles.	Bribery and subornation.	Simon Magus, a Samaritan magician which tricked his peers for power and fame, is seen dwelling down there: he offered gold in exchange for holy power to Saint Peter.
FOURTH BOLGIA Reserved to charlatans, false prophets, and astrologers: those who claimed to see the future and deceived others for power, fame, or personal gain.	Fraud.	Dante is surprised to meet Amphiaraus, a greatly honoured Seer in the Greek mythos, with his head twisted around on his body, and endlessly forced to walk backwards.
FIFTH BOLGIA Reserved to corrupt politicians and administrators. It is considered the political analogue of the Third Bolgia.	Bribery and subornation.	Ciampolo, a character found there, is believed to be loosely related to the King Theobald II of Navarre. He is immersed in a lake of boiling pitch, symbolising the *sticky* fingers and dark secrets of their corrupt deals.
SIXTH BOLGIA Reserved to the hypocrites and those of multiple morals.	Shady alliances and covert, subversive operations.	Caiaphas, the high priest responsible for having Jesus crucified, is seen there, crucified to the ground and trampled.
SEVENTH BOLGIA Reserved to the thieves.	Embezzlement and larceny.	Here, the thieves are endlessly pursued and bitten by snakes and lizards. Once pricked, the thieves are robbed of their identities and transformed into hideous creatures or simply tortured: Vanni Fucci, a minor thief, is endlessly turned to ashes, and then resurrected as the cycle begins anew.
EIGHT BOLGIA Reserved to fraudulent advisers or evil counsellors: those who used their position to advise others to engage in fraud.	Disinformation and willing deception.	Guido da Montefeltro, an Italian military strategist and lord of Urbino, ill-advised Pope Boniface VIII to capture the fortress of Palestrina, by offering the Colonna family inside a false amnesty, and then razing it to the ground after they surrendered.
NINTH BOLGIA Reserved to the sowers of discord: those who divided others.	Disinformation and calculated antagonism.	Dante meets Betran of Born, an Occitan Baron who —as Dante believes— fomented the rebellion of Henry the Young King against his father Henry II: he is condemned to be endlessly hacked away and reformed. He carries his severed head around, like a lantern.
TENTH BOLGIA Reserved to the falsifiers.	Fraud and counterfeit.	Virgil and Dante found the Achaean spy Sinon, responsible for tricking the Trojans to take the Trojan House into their city. Interestingly, he is in the Tenth and not in the Eight Bolgia because his advice was false, as well as perverse.

TABLE 4. Taxonomy of sin, in regards to fraud, in the Malebolge (eight Circle of Hell), as described by Dante in the Divine Comedy.

	THEME	CASE SCENARIO IN THE DIVINE COMEDY
FIRST ROUND: CAÏNA Reserved to those who betrayed the next of kin.	Betrayal to the closest ones.	Mordred, who attacked and fatally wounded his uncle and father (both the same person: interesting family), the King Arthur, is trapped here, immersed in the lake of ice up to his chin.
SECOND ROUND: ANTENORA Reserved to those who betrayed their parties, cities, or countries.	Betrayal to one's oath of honor to a party, city, or country.	Count Ugolino della Gherardesca, an Italian nobleman, lies there, and actually briefly stops gnawing on the head of his former partner-in-crime, Archbishop Ruggieri degli Ubaldini to explain to Dante and Virgil how Ruggieri turned against him after an accidental death of Ruggieri's illegitimate son during a riot and had him imprisoned along with his sons and grandsons, condemning them to death by starvation.
THIRD ROUND: PTOLOMEA Reserved to those who betrayed their guests and the hospitality offered.	Betrayal to the oath of hospitality.	Fra Alberigo, a 13 Century friar from Faenza, lies here: condemned after having armed soldiers kill his brother at banquet, he is forced to lay supine over the surface of the lake. The ice covers the sinners, except for their faces.
FOURTH ROUND: JUDECCA Reserved to those who betrayed their lords and benefactors.	Betrayal to those who lent a helping or guiding hand.	None: every sinner here is completely trapped on ice, and while awake, they cannot move or talk anymore.

TABLE 5. Taxonomy of sin, in regards to fraud, in the Cocytus (ninth Circle of Hell), as described by Dante in the Divine Comedy.

This structure is very helping to provide a *starting point* to create a series of *solution criteria*: agreeing on the main themes of fraud and treason as causes for society decay, the *countermeasures* are organised as below:

NEGATIVE SOCIETAL EFFECT	MANAGEMENT EFFECT	SOLUTION CRITERIA
COERCION AND SUBVERSION	**INFLUENCE PEDDLING:** individuals selling their influence over the decision-making process to benefit a third party.	**PUBLIC INFLUENCE ASSESSMENT**: If all individuals are subjected to public evaluation whenever they may be liable to influence others over a decision-making progress,
BRIBERY AND SUBORNATION	**BRIBERY:** Payment —of any nature— given to one with more power in exchange of his use of power.	**PUBLIC FACULTY ASSESSMENT:** Bribery is a solid investment because it provides solid benefits[15]: therefore, to minimise or remove bribery, those benefits must be removed. If those in power must be always accountable and transparent for their actions, they won't be able to sell it.
FRAUD	**DECISION FRAUD:** illegal interference with the process of an election. **FORGERY:** adapting or imitating objects, statistics, or documents with the intent to deceive or earn profit by selling the forged item. Fraud can be committed through an infinity of media: the common denominator leads to deliberate deception, to secure undeserved gain.	**FORENSIC MANAGEMENT ANALYSIS:** as already performed for financial fraud, the same techniques of data collection, preparation, analysis, and even predictive analytics and intelligence inference can be used to discern fraud in management.
SHADY ALLIANCES AND COVERT, SUBVERSIVE OPERATIONS	**UNHOLY ALLIANCES:** coalitions among seemingly antagonistic groups or ad-hoc or hidden gain, supplying funding in exchange for the favorable treatment.	**PUBLIC ASSOCIATION ASSESSMENT:** collaborations which need of covert operations to prosper cannot do so if they are on the public spotlight. All associations are to be made visible and transparent.

[16] *You get what you pay for*, from *The Economist*, accessible at http://www.economist.com/node/21556255. Last accessed at 08.06.2015.

NEGATIVE SOCIETAL EFFECT	MANAGEMENT EFFECT	SOLUTION CRITERIA
EMBEZZLEMENT AND LARCENY	**EMBLEZZLEMENT:** theft of trusted funds.	**PEER ASSESSMENT, VIABLE MODEL:** Embezzlement is often performed when multiple roles are joined in a single person, who accounts to anyone but himself. This is solved through a Viable Model (See Chapter 2, page XX), and peer assessment of all the actors involved: theft cannot appear if for someone to perform the theft, the others would have to peer accept it.
DISINFORMATION AND WILLING DECEPTION	**MANIPULATION:** deliberate spreading of false information, to obtain benefit from the consequences derived from such misleading.	**PUBLIC ASSESSMENT AND CRITIC:** Disinformation appears when there is no way to contrast and review the information available. Hence, to solve this issue information must be always related to each other and freely, publicly available to any assessment. Even those assessments must be freely able to be reviewed and assessed themselves.
BETRAYAL	**DECEPTION:** Deliberate deception to hide or cover deliberate unwarranted actions or movements, often to obtain benefits from such deeds, or to enact any other negative effects as desired.	**PEER AND MANAGEMENT ASSESSMENT, VIABLE MODEL:** as with the embezzlement issue, they both share the same clandestine characteristics, so they can be solved in the very same way: casting light and providing public viable assessment and organisation to inhibit such corruptive activities.

TABLE 6. Initial solution criteria, in regards with loss of trust, fraud, and betrayal effects, related to societal and management effects.

But fraud and betrayal, while seemingly pivotal for any perverse societal effects to appear, are bound to the behaviour of those belonging or in relation to the enterprise itself: the very environment can favour corruptive actions. To form a complete perspective of tentative solution criteria, the abyss must not only be faced, but charted.

1.3.1 CHARTING THE ABYSS

Thomas Jefferson **[P9]** did confront this very same problem when outlining the very core of the to-be-formed *Free States*, wishing to be free from the *British* sovereign. The very idea was outraging at the time: a brand *new kind* of governance structure, where there would be *no Kings* whatsoever. In fact, the two opening lines of the *Declaration of Independence of the United States* are regarded of some of the most *beautiful* **[R20]** and *powerful* **[R21]** lines ever written in *English* language.

> When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

> We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.

In fact, the very structure of the *Declaration* follows a very precise order, which in fact was aimed to plot the *issues* found with the previous government structure, and why they should be *addressed*, as shown below:

	ORIGINAL TEXT
INTRODUCTION Asserts as a matter of Natural Law the ability of people to assume political independence.	In CONGRESS, July 4, 1776. The unanimous Declaration of the thirteen United States of America, When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.
PREAMBLE Decides by a main philosophy of government, justifying the concept of revolution when the previous government harms natural rights.	We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed, That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same Object evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security.
INDICTMENT A list of particulars and issues of the observed injuries from the previous government — headed for the maximum figure of government, the King—.	Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world. He has refused his Assent to Laws, the most wholesome and necessary for the public good. He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them. He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only. He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their Public Records, for the sole purpose of fatiguing them into compliance with his measures. He has dissolved Representative Houses repeatedly, for opposing with manly firmness of his invasions on the rights of the people. He has refused for a long time, after such dissolutions, to cause others to be elected, whereby the Legislative Powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the mean time exposed to all the dangers of invasion from without, and convulsions within. He has endeavoured to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new Appropriations of Lands. He has obstructed the Administration of Justice by refusing his Assent to Laws for establishing Judiciary Powers. He has made Judges dependent on his Will alone for the tenure of their offices, and the amount and payment of their salaries. He has erected a multitude of New Offices, and sent hither swarms of Officers to harass our people and eat out their substance.

He has kept among us, in times of peace, Standing Armies without the Consent of our legislatures.
He has affected to render the Military independent of and superior to the Civil Power.
He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legislation:
For quartering large bodies of armed troops among us:
For protecting them, by a mock Trial from punishment for any Murders which they should commit on the Inhabitants of these States:
For cutting off our Trade with all parts of the world:
For imposing Taxes on us without our Consent:
For depriving us in many cases, of the benefit of Trial by Jury:
For transporting us beyond Seas to be tried for pretended offences:
For abolishing the free System of English Laws in a neighbouring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these states
For taking away our Charters, abolishing our most valuable Laws and altering fundamentally the Forms of our Governments:
For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.
He has abdicated Government here, by declaring us out of his Protection and waging War against us.
He has plundered our seas, ravaged our coasts, burnt our towns, and destroyed the lives of our people.
He is at this time transporting large Armies of foreign Mercenaries to compleat the works of death, desolation, and tyranny, already begun with circumstances of Cruelty & Perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation.
He has constrained our fellow Citizens taken Captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.
He has excited domestic insurrections amongst us, and has endeavoured to bring on the inhabitants of our frontiers, the merciless Indian Savages whose known rule of warfare, is an undistinguished destruction of all ages, sexes and conditions.
In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury. A Prince, whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people.

DENUNCIATION

Resumes and uses the cases below to fundament the declaration of independence.

Nor have We been wanting in attentions to our British brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which, would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity, which denounces our Separation, and hold them, as we hold the rest of mankind, Enemies in War, in Peace Friends.

CONCLUSION

Resumes and asserts the conditions for revolution, and the statement of Independence for all Colonies.

We, therefore, the Representatives of the united States of America, in General Congress, Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by Authority of the good People of these Colonies, solemnly publish and declare, That these united Colonies are, and of Right ought to be Free and Independent States; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain, is and ought to be totally dissolved; and that as Free and Independent States, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which Independent States may of right do. And for the support of this Declaration, with a firm reliance on the protection of divine Providence, we mutually pledge to each other our Lives, our Fortunes and our sacred Honor.

SIGNATURE All authors freely sign the document, also representing each one of the newly-formed United States.	New Hampshire: Josiah Bartlett, William Whipple, Matthew Thornton Massachusetts: Samuel Adams, John Adams, John Hancock, Robert Treat Paine, Elbridge Gerry Rhode Island: Stephen Hopkins, William Ellery Connecticut: Roger Sherman, Samuel Huntington, William Williams, Oliver Wolcott New York: William Floyd, Philip Livingston, Francis Lewis, Lewis Morris New Jersey: Richard Stockton, John Witherspoon, Francis Hopkinson, John Hart, Abraham Clark Pennsylvania: Robert Morris, Benjamin Rush, Benjamin Franklin, John Morton, George Clymer, James Smith, George Taylor, James Wilson, George Ross Delaware: George Read, Caesar Rodney, Thomas McKean Maryland: Samuel Chase, William Paca, Thomas Stone, Charles Carroll of Carrollton Virginia: George Wythe, Richard Henry Lee, Thomas Jefferson, Benjamin Harrison, Thomas Nelson, Jr., Francis Lightfoot Lee, Carter Braxton North Carolina: William Hooper, Joseph Hewes, John Penn South Carolina: Edward Rutledge, Thomas Heyward, Jr., Thomas Lynch, Jr., Arthur Middleton Georgia: Button Gwinnett, Lyman Hall, George Walton

The *Indictment* reveals a very *harsh* governance environment, where the management structures do not correctly *address* any societal issues anymore: the document often complains about the *betrayal* of such structures to those supporting them —the *Colonists*—, in *benefit* of *others* —according to the authors, the *British sovereign*—. Therefore, this structure is appealing to *construct* another set of issues —based on the *indictment*— and initial *solution criteria*, as shown below:

	NEGATIVE SOCIETAL EFFECT	MANAGEMENT EFFECT	SOLUTION CRITERIA
He has refused his Assent to Laws, the most wholesome and necessary for the public good.	**REFUSAL TO LAW**	**DISRUPTION:** individuals provoking schisms or altercations sizeable enough to provoke fundamental damage to the whole structure.	**COMMON LAW CHARTER**: if all individuals are subjected to the same set of charted laws, no one can continue in the enterprise while not abiding by them.
He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them.	**TYRANTISM**	**CENTRALISM:** the entire organisation is focused on a single group, individual, or structure, from where all decisions have to be sanctioned before their enactment. **CUMBERSOME BUREAUCRACY:** the structure is organised in such a way that it is very slow to react to decisions.	**DISTRIBUTED MANAGEMENT**: allowing the management and governance structures to spread and react to each other solves centralism issues, and provides a more secure and efficient scenario, where responsibilities are shared and exchanged as needed.
He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only.	**COERCION**	**INFLUENCE PEDDLING:** individuals selling their influence over the decision-making process to benefit a third party.	**PUBLIC INFLUENCE ASSESSMENT**: If all individuals are subjected to public evaluation whenever they may be liable to influence others over a decision-making progress, they will refrain themselves to do so if such actions will damage their identity, position, or reputation.

	NEGATIVE SOCIETAL EFFECT	MANAGEMENT EFFECT	SOLUTION CRITERIA
He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their Public Records, for the sole purpose of fatiguing them into compliance with his measures.	**TYRANTISM**	**RULE OF IRON:** individuals are unable to object or discuss any decisions whatsoever, and must perform as told, or leave the enterprise.	**DYNAMIC MODELING**: instead of static bureaucracy, which often leads to cumbersome methods to alter or object to the enactment of decisions, technology can now abide for dynamic methods, where the bureaucracy changes itself, responding at the decisions, objections, and polls done by the members of the enterprise.
He has dissolved Representative Houses repeatedly, for opposing with manly firmness of his invasions on the rights of the people. He has refused for a long time, after such dissolutions, to cause others to be elected, whereby the Legislative Powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the mean time exposed to all the dangers of invasion from without, and convulsions within. He has endeavoured to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new Appropriations of Lands.	**TYRANTISM**	**UNCHALLENGED RULE:** management directors or coordinators have no challenges when enacting their decisions.	**RULE OF MANY**: instead of vertical management, where one rules and all the others heed, power management is distributed and shared among all stakeholders as needed and accorded.
He has obstructed the Administration of Justice by refusing his Assent to Laws for establishing Judiciary Powers.	**REFUSAL TO LAW**	Similar as above.	Similar as above.

	NEGATIVE SOCIETAL EFFECT	MANAGEMENT EFFECT	SOLUTION CRITERIA
He has made Judges dependent on his Will alone for the tenure of their offices, and the amount and payment of their salaries.	**COERCION**	Similar as above.	Similar as above.
He has erected a multitude of New Offices, and sent hither swarms of Officers to harass our people and eat out their substance.	**MISMANAGEMENT**	**STAGNATED BUREAUCRACY:** the entire organisation has become too bloated and cumbersome to effectively solve any problems anymore.	**VIABLE MODELING**: the structure of the organisation is based on a Viable System Model (see Viable Systems, XX), ensuring the best efficiency possible in regards to the minimum of bureaucracy.
He has kept among us, in times of peace, Standing Armies without the Consent of our legislatures.	**DISRUPTION**	**REFUSAL TO SOCIETY:** members of the organisation are not privy to the decisions or choices made by the management members, and must only abide by the consequences taken.	**PUBLIC INFLUENCE ASSESSMENT**, as seen above.
He has affected to render the Military independent of and superior to the Civil Power.	**TYRANTISM**	**UNCHALLENGED RULE:** management directors or coordinators have no challenges when enacting their decisions.	**RULE OF MANY**, as seen above.
He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legislation:	**DISRUPTION**	**EXTERNAL INFLUENCE:** the set of rules is not the same, or it provides from an alien source rather than the very members of the organisation.	**COMMON LAW CHARTER**, as seen above.
For quartering large bodies of armed troops among us:	**DISRUPTION**	**HIDDEN AGENDA:** management members of the organisation perform decisions based on their own interests or pursuits, rather than in the interest of the overall organisation.	**PUBLIC INFLUENCE ASSESSMENT**, as seen above.
For protecting them, by a mock Trial from punishment for any Murders which they should commit on the Inhabitants of these States:	**TYRANTISM**	**UNCHALLENGED RULE:** management directors or coordinators have no challenges when enacting their decisions.	Similar as above.
For cutting off our Trade with all parts of the world:	**DISRUPTION**	**ISOLATION:** some members are forced to become isolated from any other agent or structure, because of punitive or coercive reasons.	**COMMON LAW CHARTER**, as seen above.

	NEGATIVE SOCIETAL EFFECT	MANAGEMENT EFFECT	SOLUTION CRITERIA
For imposing Taxes on us without our Consent.	**COERCION**	Similar as above.	Similar as above.
For depriving us in many cases, of the benefit of Trial by Jury. For transporting us beyond Seas to be tried for pretended offences:	**DECEPTION**	**BIASED BUREAUCRACY:** there are multiple sets of rules, to be used in different sets of organisation members.	**COMMON LAW CHARTER**, as seen above.
For abolishing the free System of English Laws in a neighbouring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these states.	**DECEPTION** **COERCION**	**BIASED BUREAUCRACY, HIDDEN AGENDA, COERCION.** Similar as above.	Similar as above.
For taking away our Charters, abolishing our most valuable Laws and altering fundamentally the Forms of our Governments: For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever. He has abdicated Government here, by declaring us out of his Protection and waging War against us. He has plundered our seas, ravaged our coasts, burnt our towns, and destroyed the lives of our people.	**DISRUPTION**	**EXTERNAL INFLUENCE:** the set of rules is not the same, or it provides from an alien source rather than the very members of the organisation.	**COMMON LAW CHARTER**, as seen above.

	NEGATIVE SOCIETAL EFFECT	MANAGEMENT EFFECT	SOLUTION CRITERIA
He is at this time transporting large Armies of foreign Mercenaries to compleat the works of death, desolation, and tyranny, already begun with circumstances of Cruelty & Perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation. He has constrained our fellow Citizens taken Captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.	**COERCION** **EXTERNAL INFLUENCE**	Similar as above.	Similar as above.
He has excited domestic insurrections amongst us, and has endeavoured to bring on the inhabitants of our frontiers, the merciless Indian Savages whose known rule of warfare, is an undistinguished destruction of all ages, sexes and conditions.	**HIDDEN INTENTIONS**	Similar as above.	Similar as above.
In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury. A Prince, whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people.	**TYRANTISM** **HIDDEN INTENTIONS** **RULE OF ONE**	Similar as above.	Similar as above.

TABLE 7. Initial solution criteria, in regards with a damaged societal environment, related to societal and management effects.

One of the most recurring themes is the *biased*, partisan perspective of those allegedly charged with the development and support of the societal structures: it can be argued that the very main theme is *betrayal*, once again reverting to the same themes unfolded in the *Divina Comedia*.

Therefore, the very locals of the *Abyss* are to be *explored*, to finally compose a functional *taxonomy* of *societal issues* and potential *solution criteria*.

1.3.1 REGISTERING THE LOCALS

Up to this point, it may be tempting to think that the issues previously discussed are from *ancient* and *foreign times* and *places*, and that they do not apply anymore in a world of *ever-increasing access* to *information* and *knowledge*.

But these are very dangerous thoughts, at the light of the events disclosed by *Edward Snowden* **[P10]**. In *March 2012*, Snowden was reassigned by his *IT* company, *Dell*, to *Hawaii* to work as a *lead technologist* for the information-office of the *National Security Agency*. He had already grown *dissatisfied* with the allegedly *controversial* and *illegal* practices performed there, and secretly had began *gathering* a myriad of *classified documents* regarding such operations. In early *June 2013*, he flew to *Hong Kong* after leaving his job, and then he *revealed* the entire set of documents to several *journalists*, who gradually *disclosed* them to several *media outlets*.[17]

These disclosures allow to map a brand new set of *issues* regarding *betrayal* of *trust* and illegal societal practices by the very government officials endorsed not to perform such activities, and in collaboration with other enterprises and businesses which willingly provided confidential information from their customers:

	NEGATIVE SOCIETAL EFFECT	MANAGEMENT EFFECT	SOLUTION CRITERIA
Massive amounts of information were captured from monitored data traffic worldwide, by placing bugs in in EU diplomatic facilities, and infiltrating their computer networks.	**BETRAYAL OF TRUST**	**EAVESDROPPING:** members of the society are unable anymore to partake on private or confidential exchanges: everything is monitored for further review, based on the potentially biased interests of the few.	**SHIELDED COMMUNICATIONS:** communications should be shielded from any wiretapping or eavesdropping practices as possible, to ensure the privacy of the partakers.
Multiple enterprises willingly allowed confidential access from their clients and subscribers to be shared.	**BETRAYAL OF TRUST**	**BOSKY COLLABORATION:** enterprises, structures, or members of the society must abide to provide confidential information to the governors.	**FAIR TRADE:** communications are to be held under the same umbrella of regulations and restrictions, and nobody shall be able to enforce any kind of coercion.

TABLE 8. Initial solution criteria, in regards with betrayal of trust, related to societal and management effects.

[17] *Edward Snowden: The Untold Story of the most wanted man in the world*, written by *James Bamford* at *Wired* (*August 13, 2014*), accessible at http://www.wired.com/2014/08/edward-snowden/.

These *solution* criteria *enhance* the overall description of the potential *solution criteria index*, in regards to all of the *observed potential sources* of perverse forces leading to *societal corruption* and *decay*. The complete issue and solution *index* is shown in the diagram below:

FIGURE 7. Diagram of proposed challenges and related proposed solution criteria.

Each of the societal challenges and solution criteria are *grouped* into *categories*, to allow a throughout *identification* of *analysis* of further developments. In the same way, a series of *prime directives* are created: they will *define* the *boundaries* of the communications protocol. The directives themselves have no *structure* among themselves: they are to be *equally developed*.

	DESCRIPTION
SECURE	End-to-end transport encryption will be performed: it is fundamental in a management context, where sensitive data or information is shared among peers. Besides, it also ensures every communication through the network will be anonymous. At the same time, the protocol itself will be shielded from any profiling or snooping from external partners, trying to extract information from data package units
DECENTRALISED	End-to-end transport encryption will be performed: it is fundamental in a management context, where sensitive data or information is shared among peers. Besides, it also ensures every communication through the network will be anonymous. At the same time, the protocol itself will be shielded from any profiling or snooping from external partners, trying to extract information from data package units
VIABLE	The protocol itself allows users to share, communicate, and collaborate with each other following the system structure outlined in Stafford Beer's Viable System Theory.
FAIR	The concept of fairness, in the context of the protocol, refers to the attainment of that which was accorded by the peers of the network: given both the set of rules and directives agreed by the peers, and the viable structures they shape themselves within the network, and in any situation, the protocol will always strive for the closest approximation possible to fairness.
RESOLUTE, YET ANONYMOUS	Probably one of the most conceptually difficult features: each network peer will both desire to both communicate privately and publicly with a single partner, or with several ones. The peer will then need a resolute identification of its persona within the network, but at the same time -and ironically- the protocol should be able to provide incognito contextualisation. This paradox can be observed on a voting poll: each participant needs to identify its persona, while at the same time, the vote itself will be hidden from each partaker.

TABLE 9. Protocol directives.

3 Technologies

We can rebuild him. We have the technology.

CYBORG (1972)
OSCAR GOLDMAN

2.1 BITTORRENT

There are several ways to exchange *information* among *multiple* members of a *community*: by using *technological* features, *distribution* can be easily *empowered*. The most *fundamental* paradigm, where a repository of information —*server*— provides the information to any interested individuals —*clients*— remains one of the *most used* due to its *simplicity* and *efficiency*.

However, the paradigm of client-server is, in fact, quite *easy* to subvert, given its *single-point* structure:

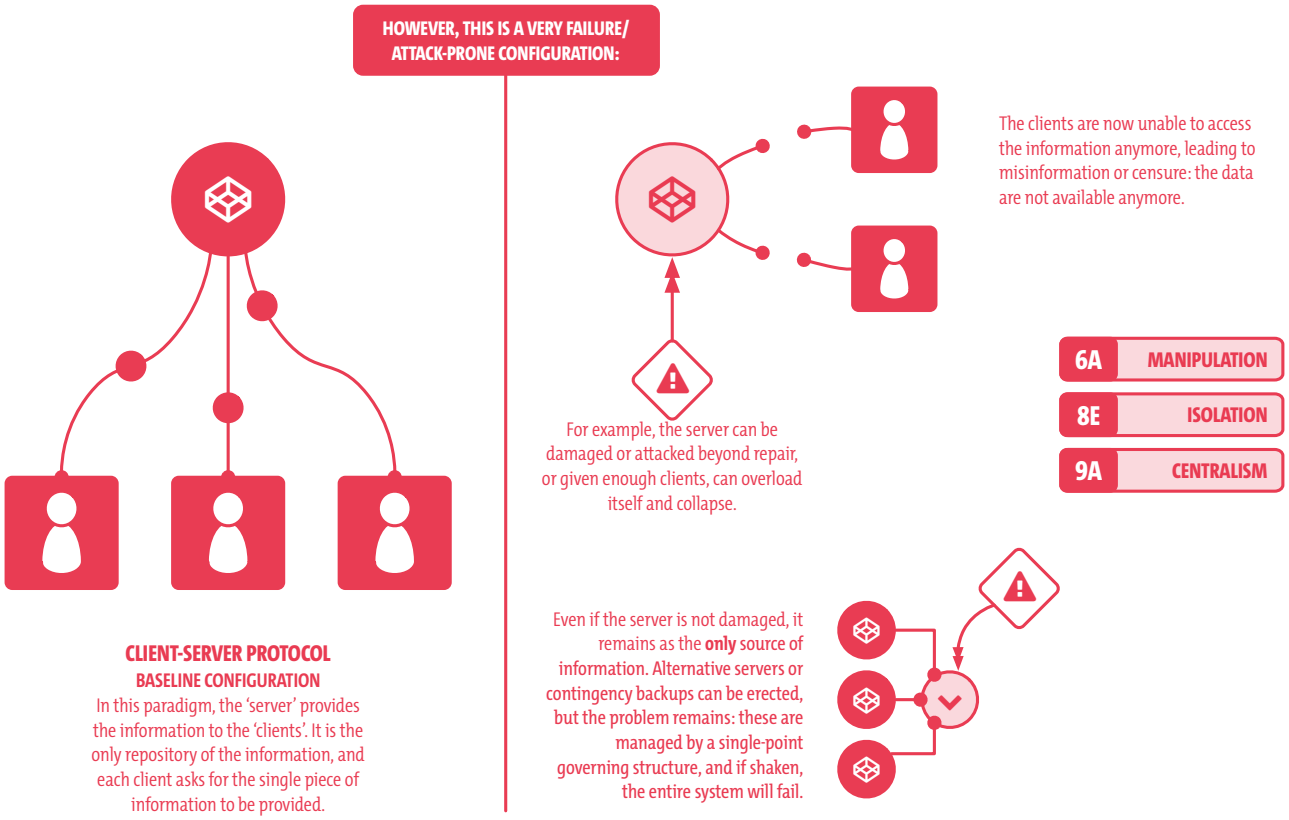

FIGURE 8. Server-client paradigm structure.

Interestingly, the *BitTorrent* protocol does solve many of these issues by using a decentralised paradigm, where the information is shared within a swarm of hosts:

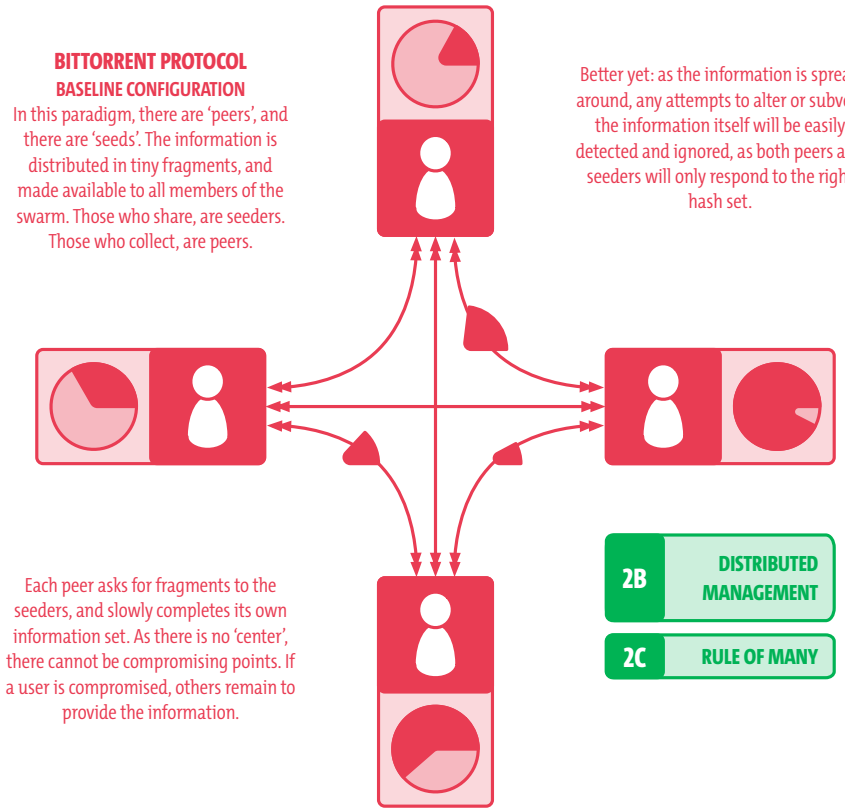

FIGURE 9. BitTorrent paradigm structure.

This paradigm also allows to prevent large *spikes* in *traffic* in a given area, keeping *bandwidth speed* consistently *high* for all users in general, regardless of if they are using *BitTorrent* transmissions, or not. The information is divided into *segments* —*pieces*—; as each *member* of the *swarm* successfully *receives* a piece, it becomes a *seeder* for that particular piece to all other members.

Each piece is protected by a *cryptographic hash*, contained in the descriptor of the file —*torrent*—[18]. This ensures *coherence*, and provides *resilience* to attacks, both *internal* and *external*: changes to subvert the information embedded in the pieces are easily *spotted* by the clients. The *torrent descriptor* provides the information to *verify* the *authenticity* of the constructed information set.

Pieces are gathered at *random*, and constructed by the *client* as they are *received*: the pieces have a *common* size —for example, a *100 Megabyte file* will be *segmented* into *10 pieces* 10 Megabytes *each*—. Therefore, any information *download* can be *halted* at any time, and then later *resumed*, without any *loss* of information.

[18] *The BitTorrent Protocol Specification* (version *f61df4010379f5c40090a9b77b73e57db7045dee*, *1.0*), available at *http://www.bittorrent.org/beps/bep_0003.html*.

The *distributed* nature of the system provides *redundancy* against *compromised* agents, and offers *transient* information, easy to *disappear*, exposing no traces for anyone to *follow*.

On the other hand, *BitTorrent* does *not* support *privacy*: it is *possible* to obtain the *IP address* of *all current* and *previous* participants in a *swarm* from the *tracker server*. Moreover, the tracker itself is the *weakest* point of the entire *BitTorrent* protocol, as it once again relies on *server-client paradigm*:

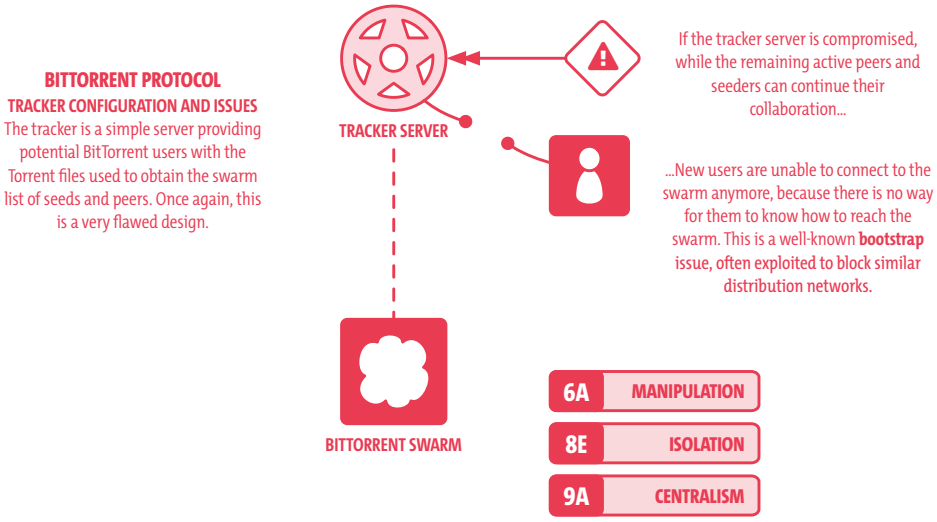

FIGURE 10. BitTorrent tracker configuration and issues.

2.1 IP MULTIMEDIA SUBSYSTEM (IMS)

To provide the means of communication among partners is often *not enough*: in a very complex telecommunications environment, where a plethora of *devices* on both *fixed* and *mobile* networks are forced to *coexist* and *collaborate*, the protocols governing such devices focus on *different* systems and structures, and a *schism* appears between these two broad areas:

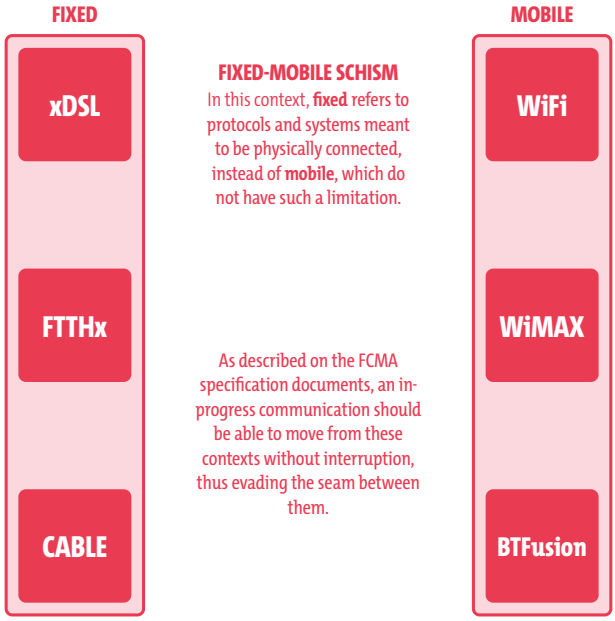

FIGURE 11. Fixed and mobile environments, in regards to their interaction.

The very concept of seamless, in this context, is hard to pinpoint: the *Fixed-Mobile Convergence Alliance* [19] defined *seamless services* as the ability of an in-progress call to move from contexts without any interruption or perceptible loss of quality[20], and it is also often used to express the equivalence of services across any termination points, either fixed or mobile.

In behalf of terminological *exactitude*, it is more useful to think of *network agnostic services*, where are *no seams* whatsoever to be found: therefore, the use of architecture frameworks to *standardise* information exchange *regardless* of *context* or *information type* would be highly *beneficial* to industrial efforts. *IP Multimedia Subsystem* —*IMS*— is such an architectural framework.

[19] *The Fixed-Mobile Convergence Alliance*, formed in *2004*, was a *non-profit* global organisation intended to *improve* products through the *convergence* of *telecommunications* systems. The Alliance had a base of *20* leading telecommunication *operators*, in both *fixed* and *mobile* settings (*British Telecom*, *NTT*, *Rogers Wireless*, *Brasil Telecom*, *Korea Telecom*, and *Swisscom* were the main founders). It was *disbanded* in *March 2010*, because of an alleged *lack of demand* for their services.

[20] *FMCA Specification Documents*, available at *http://www.thefmca.com/convergence-zone*. Last accessed at *16.06.2015*.

According to the *3rd Generation Partnership Project*[21] —the main and original designers of the protocol— *IMS* was intended to be the *evolution* of mobile networks beyond *GSM*. With each subsequent improvement and release from the *3GPP* and other partnership groups such as the *3GPP2*[22], and the *ETSI TISPAN*[23], IMS became increasingly successful, reliant, and comprehensive:

	FEATURES
RELEASE 1999	The first release of the Third Generation —3G— specifications were essentially a consolidation of the underlying GSM specifications, and the development of the new UTRAN radio access network.
RELEASE 4	Global text telephony. Transparent end-to-end PS mobile streaming operations enabled. Multimedia messaging enabled. Multiple GERAN improvements. UTRAN improvements. Charging and OAM&P enabled. Location services enhancements. Terminal interfaces.
RELEASE 5	SIP-based multimedia support enabled. Support for older GSM, GRPS networks also enabled. Provisioning of IP-based multimedia services. High Speed Downlink Packet Access. Enhanced Power Control. Security enhancements. IP transport in the UTRAN enabled. Alignment of 3G funcional split.
RELEASE 6	Interworking with WLAN enabled. Interoperatibility between IMS and different IP connectivity networks enabled. Routing group identities. Multiple registration and forking. Presence. Speech recognition and speech-enabled services.
RELEASE 7	Support for fixed networks (by working alongside TISPAN R1.1, AGCF —Access Gateway Control Function— and PES —PSTN Emulation Service—) enabled. Voice call continuity between circuit-switching and packet-switching domains enabled. Interworking with non-IMS networks. Policy and charging control. Emergency sessions.
RELEASE 8	Support for LTE/SAE networks enabled. Multimedia session continuity. Enhanced emergency sessions. IMS Centralised services.
RELEASE 9	Support for IMS emergency calls over GPRS and EPS. Enhancements to multimedia telephony. IMS media plane security. Enhancements to security and centralisation services.
RELEASE 10	Support for inter-device transfer. Enhancements to single-radio voice call continuity —SRVCC—. Enhancements to IMS emergency sessions.
RELEASE 11	USSD simulation service added. Network-provided information for IMS. SMS submit and delivery without MSISDN in IMS enabled. Overload control enhanced.
RELEASE 12	Codec for enhanced voice services. SIPTO Service Continuity of IP Data Session. LIPA mobility and SIPTO at the Local Network. Interworking between Mobile operators using the Evolved Packet System and Data Application Providers.
RELEASE 13	LTE compatibility for the USA: added support for the 1670-1675 Megahertz band. User Plane Congestion management. RAN sharing enhancements. Service Exposure and Enablement Support. Security Assurance Specification for 3GPP network products. IMS Signaling Activated Trace. Enhancements to Proximity-based services. Dedicated core networks.
RELEASE 14	Multimedia priority Service Modifications. Enhancing Location Capabilities for Indoor and Outdoor Emergency Communications. Password based service activation for IMS Multimedia Telephony service.

TABLE 10. IMS Release specifications, up to Release 14.

[21] The *3rd Generation Partnership Project*, formed from a *strategic initiative* between *Nortel Networks* and *AT&T Wireless*, is a *collaboration partnership* among several *industrial conglomerates* and *research groups*, first aimed to *develop* a *globally* applicable *third generation* —*3G*— *mobile phone system* specification, based on an improvement of the *Global System for Mobile Communications* —*GSM*—. The scope has later been *augmented* to include *development*, *maintenance*, and *improvement* of *GSM*, *UMTS*, *LTE*, and *IMS protocols*, and related *subsystems*.

[22] The *3rd Generation Partnership Project 2*: The Vengeance, formed in *1998* with the *ARIB/TTC*, *China Communications Standards Association*, the *USA Telecommunications Industry Association*, and the *South Korea Telecommunications Industry Association*, is a *collaboration partnership* effort *similar* to the before mentioned *3GPP*, but aimed to *standardise* the *CDMA2000* standards of the *third generation* —*3G*— *mobile phone system* specification. Initially on favour of its main project, the *Ultra Mobile Broadband* -*UMB*-, which was meant to eventually replace its *predecessor*, *CDMA2000*, but eventually the scope was *shifted* towards *LTE*.

[23] The *Telecoms & Internet converged Services & Protocols for Advanced Networks* group is a *standardisation* body of the *European Telecommunications Standards Institute* —*ETSI*—, formed in *2003* from an amalgamation of two *ETSI* groups: the *Telecommunications and Internet Protocol Harmonisation over Networks* group —*TIPHON*—, and the *Services and Protocols for Advanced Networks* group —*SPAN*—. It specialises on *fixed* networks and *Internet convergence*, and aims to define the particular *European* perspective of the *Next Generation Networking* —*NGN*— paradigm.

IMS itself is a *collection* of different functions, grouped together by *standardised interfaces*, to form a *single* administrative network. The real strength of *IMS* relies on the ability of any implementer to *combine* and *merge* multiple functions on a single node —regarded in this context as a *hardware* item—. In fact, nodes can be used *at will*: they can *merge multiple* functions, or use *multiple* nodes for *dimensioning*, *load balancing*, *redundancy*, or *management*.

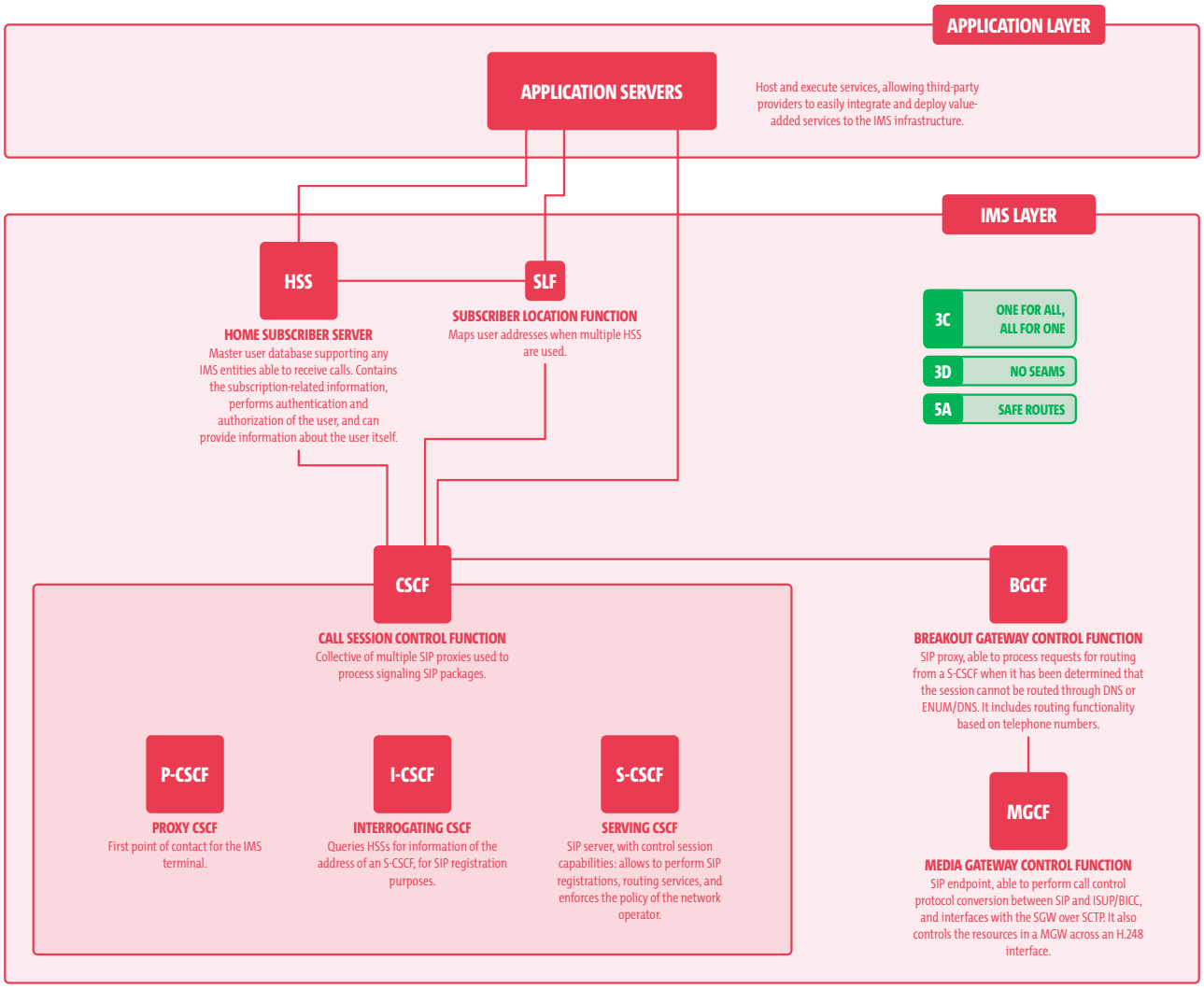

FIGURE 12. IMS architectural model, outlining Application and IMS Layers.

The *Application* and *IMS* layers exposed above[24] already outline the capacity of IMS to provide *interoperability* with any other *operators* and *networks*, allowing for a real and *seamless convergence of services*.

[24] The complete *IMS* architectural model can be found at the *3GPP* website, at *http://www.3gpp.org*. Last accessed at *29.06.2015.*

4 Analysis

The trouble with research is it tells you what people are thinking about yesterday. It is like driving a car using a rear-view mirror.

BERNARD LOOMIS (1923-2006)

ONE OF THE GREAT TOY VISIONARIES, DEVELOPER OF *BARBIE* AND *HOT WHEELS*: THE MAN WHO MADE FILM MERCHANDISING INTO A HUGE INDUSTRY, EVEN COINING A WORD —TOYETIC— TO DESCRIBE INTELECTUAL PROPERTIES RIPE FOR EXPLOITATION. FAMOUSLY AND IRONICALLY, HE TOLD *STEVEN SPIELBERG* THAT *CLOSE ENCOUNTERS (1977)* WAS NOT ONE OF THESE, SO SPIELBERG PUT IN TO HIS FRIEND *GEORGE LUCAS*, THEN STRUGGLING TO MAKE AN APPARENTLY UNPROMISING SCI-FI FILM CALLED *STAR WARS*. THE REST IS HISTORY.

4.1 PROTOCOL SKELETON

The protocol itself aims to *solve* each of the challenge criteria exposed above, upholding the *directives* also outlined above. The technologies previously mentioned —*BitTorrent*, *IMS*— and the viable systems theory developed by *Stafford Beer* allow to construct a whole new *protocol architecture* by *combining* all the individual *strengths* and *features* of each single technology alone.

4.1.1 MODEL COMPOSITION

To compose such an structure, it is far easier to describe the ideal setting as defined by the protocol *Directives* and *Solution* criteria previously mentioned:

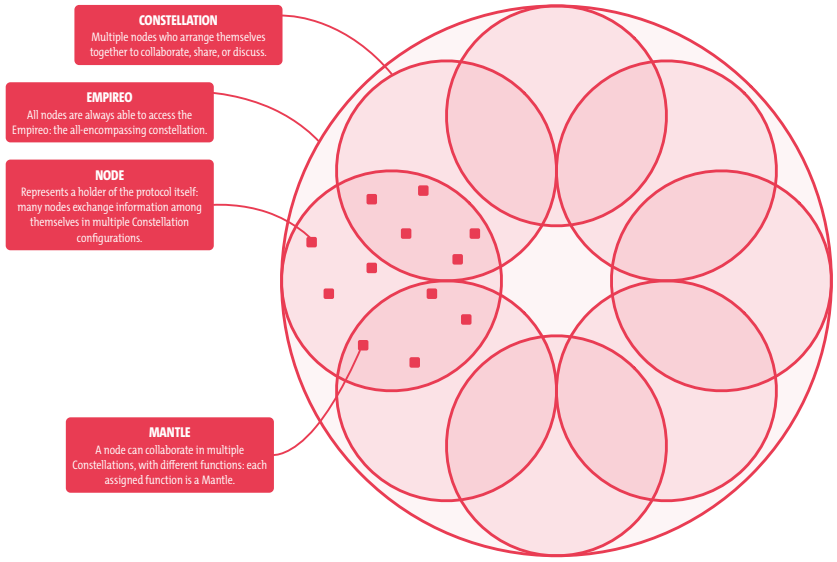

FIGURE 12. Main simplification of the protocol, exposing Constellations, Node, Mantles, and the Empireo.

The entire set of *members* —those who *agree* to use the protocol— arrange themselves in a *formless*, *boundless* structure as they interact and decide themselves to take part in *different roles* and *assignments*. Each citizen thus becomes an *Agent*: a single *atomic* unit, representing the *influence* of the member within the protocol. The *Agent* is but one of the several bodies composing a *Node*: a complete *viable* structure within the protocol.

As *Nodes* arrange themselves in particular *compositions* following their interests and particular endeavors, they form *Constellations*: definite structures, lasting yet transient, as they dynamically setup themselves because of the *actions* or *intentions* of the member *Nodes*, driven by their *Agents* within. A *Node* can join, or depart from a *Constellation*, and multiple *Constellations* can merge or intersect with each other based on the unique features of their composing *Nodes*.

These actions and intentions do *shape* the particular features any *Nodes* can attain inside the protocol itself, so *Mantles* act as *representatives* of such actions, bestowed to *Agents*: a *Node* can *obtain*, *manage*, *remove*, or *adapt* a *Mantle*, either from itself or from the joined wish of other *Nodes*, to bestow the ability to perform *particular* actions or to react to particular features.

Finally, the *Nodes* themselves are *included* in a *maximum-denominator Constellation*, from where all *Nodes* converge, and all *Constellations* diverge: the *Empireo*, the abode of all members in the protocol network.

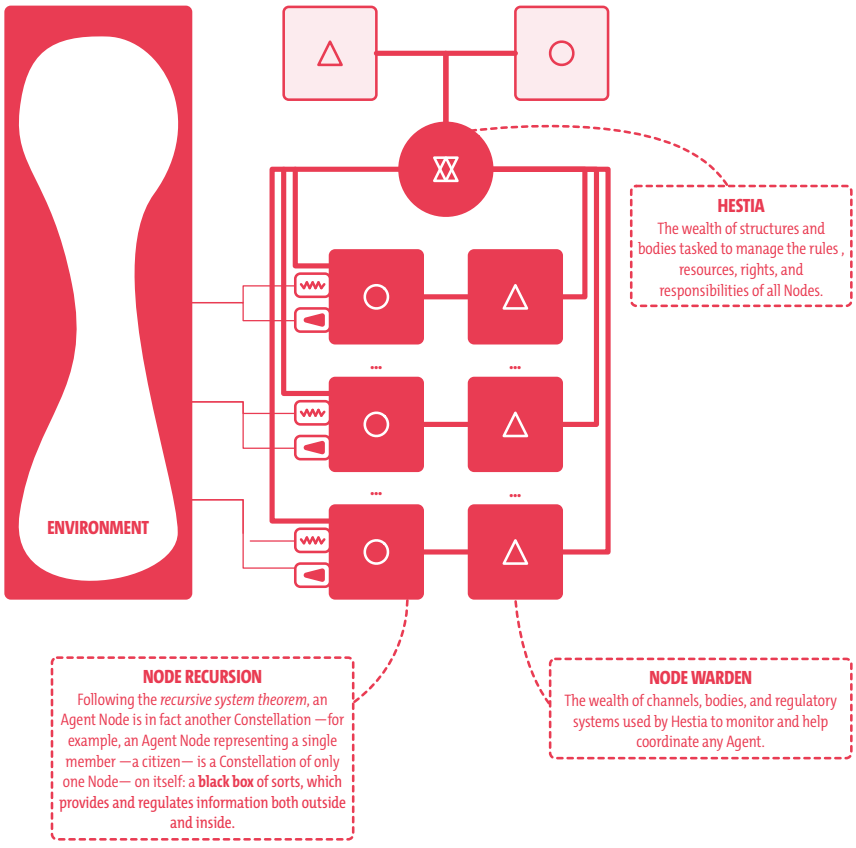

FIGURE 13. Dynamic Viable model of the protocol in regards to the Node.

In this level of abstraction, the *Node* becomes the most relevant unit in the protocol, and reveals its *recursive* characteristic, as in fact, *a Node is but a Constellation*: to other nodes in the same level, the node is seen as an *atomic* unit: a *black box* which offers and manages information both outside and inside its body.

However, once *inside*, the *Node* reveals its *dynamic Constellation structure*, based on the relationships of any other *Nodes* contained within with the other subsystems.

4.1.2 NODE COMPOSITION

The *atomic* structure of a single *Constellation*, containing a single *Node* onto itself, is pictured below:

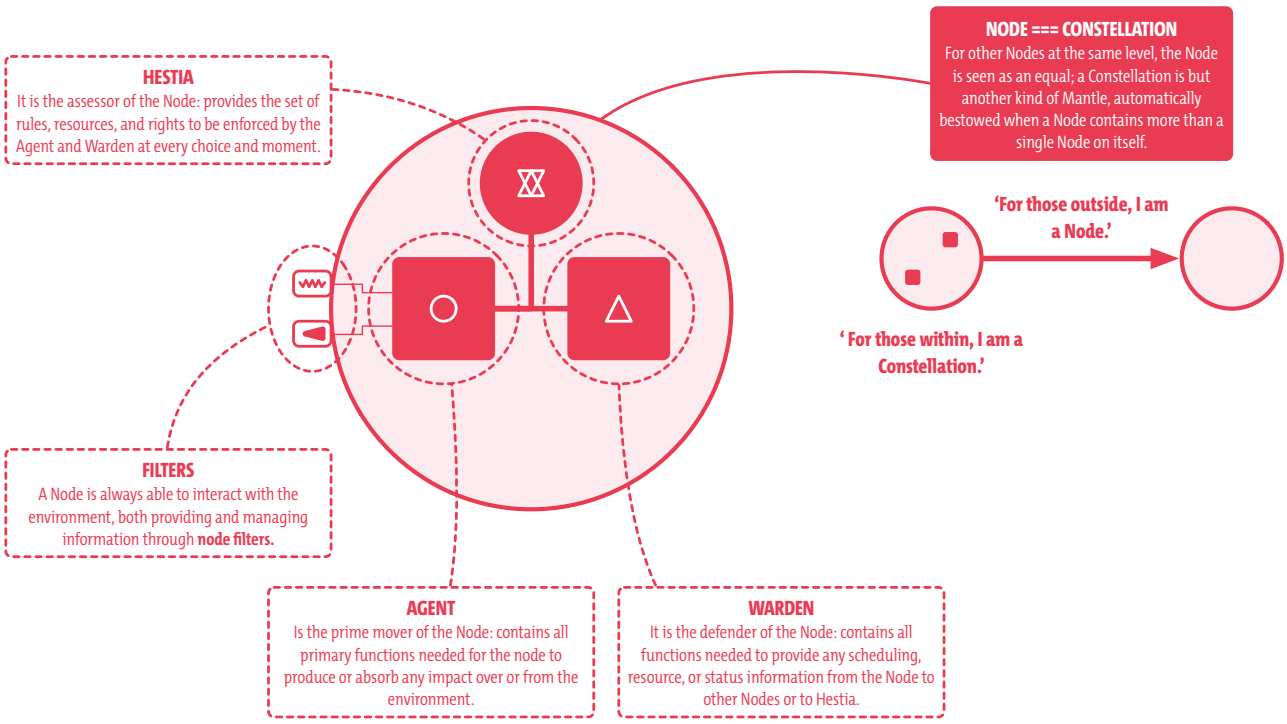

FIGURE 14. Atomic structure of a Node.

It is important to stress how the *recursive* characteristic of *Nodes* blurs the simplest definition of *Constellations* as simple arrangements of *Nodes* to the point that in fact, *Nodes are Constellations*: in the landscape of the protocol, a *Node* is only able to see other *Nodes*: however, a *Node* can *contain* any number of *Nodes* within itself, and thus it *acquires* a special condition, that of *Constellation* itself.

Hence, this layout supports all *regulatory aphorisms* of the *Viable Model*, because it is *not* necessary for a *Node* to know if other *Nodes* are *Constellations* or not, to *understand* their nature or to *calculate* any variety it may generate.

Within the *Node*, *three* main bodies appear, each corresponding to one of the viable systems:

BODY	VIABLE MODEL	FUNCTION
AGENT	SYSTEM 1	Prime mover of the Node: contains all primary functions needed for the node to produce or absorb any impact over, or from the environment.
WARDEN	SYSTEM 2	Defender of the Node: contains all functions needed to provide any scheduling, resource, or status information from the Node, or to other Nodes, or to Hestia.
HESTIA	SYSTEM 3	Assessor of the Node: provides the set of rules, resources, and rights to be enforced by the Agent and Warden at every choice and moment.

TABLE 11. Node composition and relation to a Viable Model, of the three first Systems.

Hestia[25], being the assessor and evaluator of all the rules and rights the *Node* is set to enforce, shifts to a *central* place in the layout of the *Node*: it is far from being a governing body, because *Hestia* only *reacts* to the information *gathered*, providing *inferred advice* based on the current *wealth* of rules, which those *bestowed* with the *responsibility* to enforce must do so, and its own *computing* structure.

These *Mantles* thus complete the system layout of the *Viable Model*, yet maintaining *dynamism*, as they are not fixated bodies within the Node:

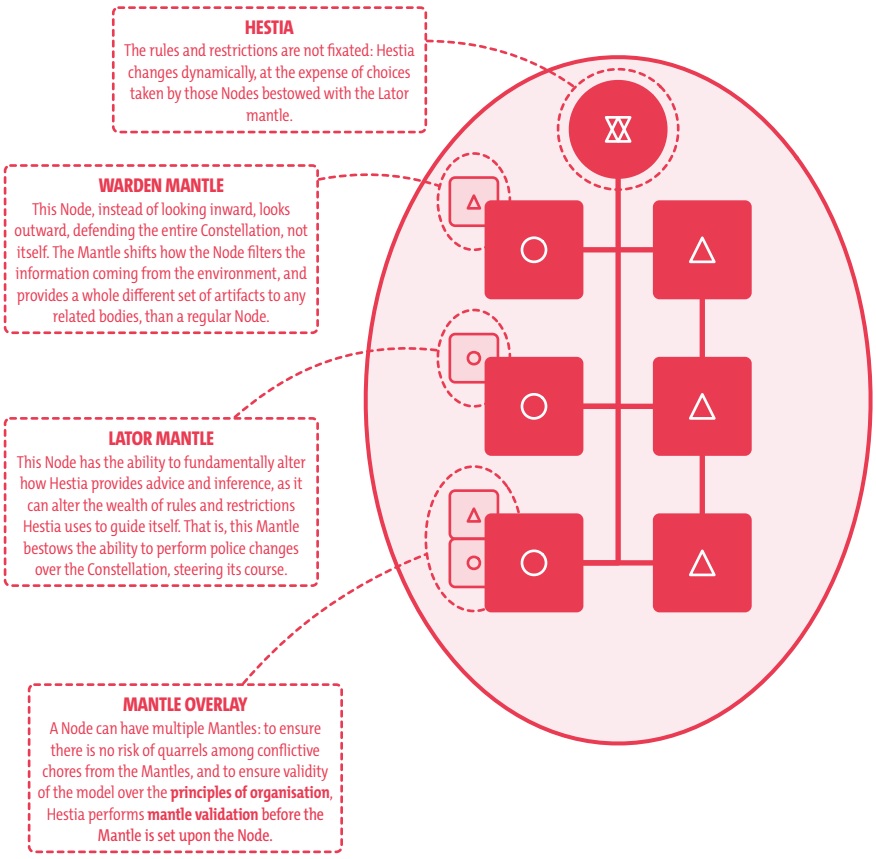

FIGURE 15. Mantles bestowed over multiple Nodes.

[25] Hestia, according to the Greek and Roman mythos, is the virgin goddess of the hearth, architecture, and order.

The Mantles represent, in fact, the remaining subsystems of the Viable Model:

	VIABLE MODEL	FUNCTION
WARDEN	SYSTEM 4	Instead of looking inward, the Node is tasked to look outward, to the Environment itself, and using the data filtered to defend and provide the information necessary to maintain the viability of the entire Constellation.
LATOR	SYSTEM 5	The Node is now able to alter the set of rules and restrictions used by Hestia to provide inference and advice: in that way, the Node is now tasked to steer the Constellation, providing policy decisions and governance.

TABLE 12. Node composition and relation to a Viable Model, of the two last Systems.

Mantles are the most *powerful* feature of the *Dynamic Model*, as they provide a means for any *Node* to take part on specific *features* of the entire *Constellation*, but still abiding by the principles of organisation and regulatory aphorisms, and still acting as a *Viable Model*.

To better understand how the *Dynamic Model* performs based on a *policy* decision, a *Wheel of Policy* can be outlined:

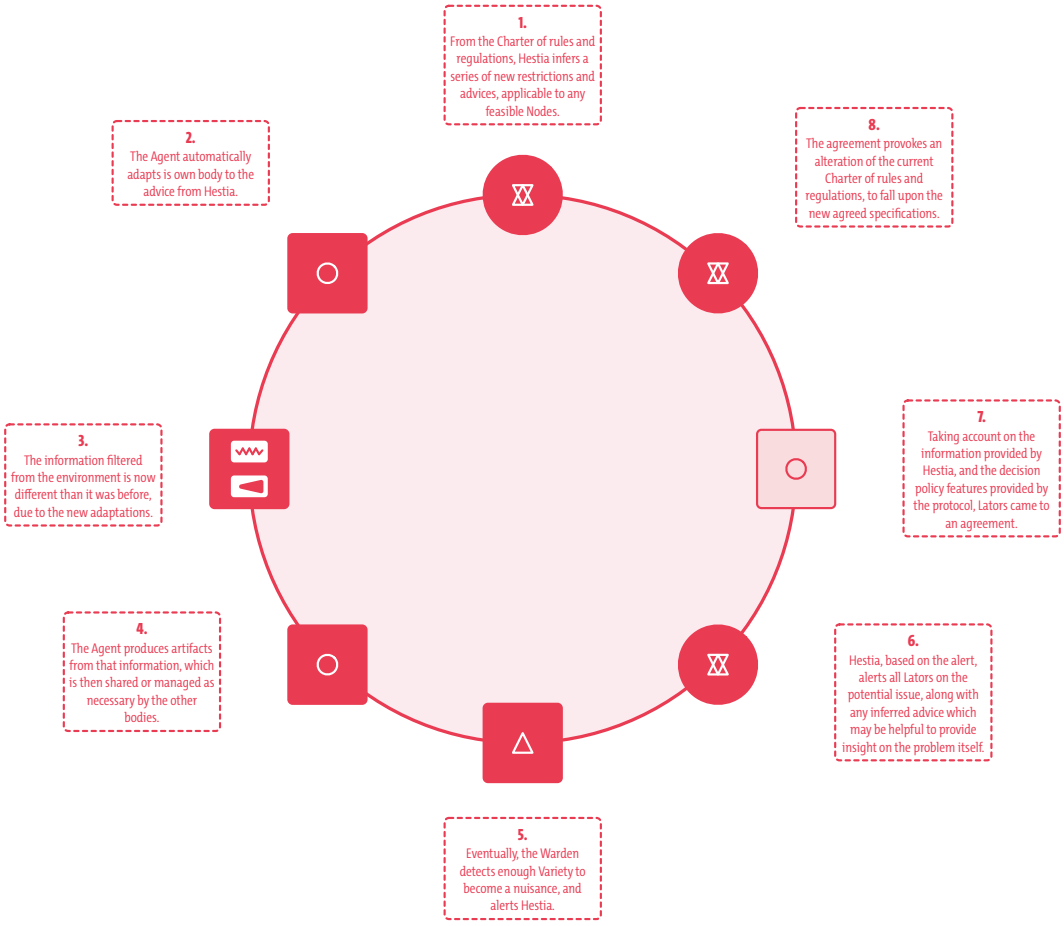

FIGURE 16. Wheel of Policy.

4.1.3 ARCHITECTURE COMPOSITION

The *recursive* structure of the model allows for a seemingly *infinite* layout of *Nodes*, from where is no *center* of the *architecture* whatsoever: this is a very *difficult concept* to grasp in a seemingly *ordered* layout, where a head is always present as the source of policy.

Thankfully, the use of *decentralised* paradigms and the *fluid* functionality provided by the *Mantle* paradigm allow to provide a feasible solution:

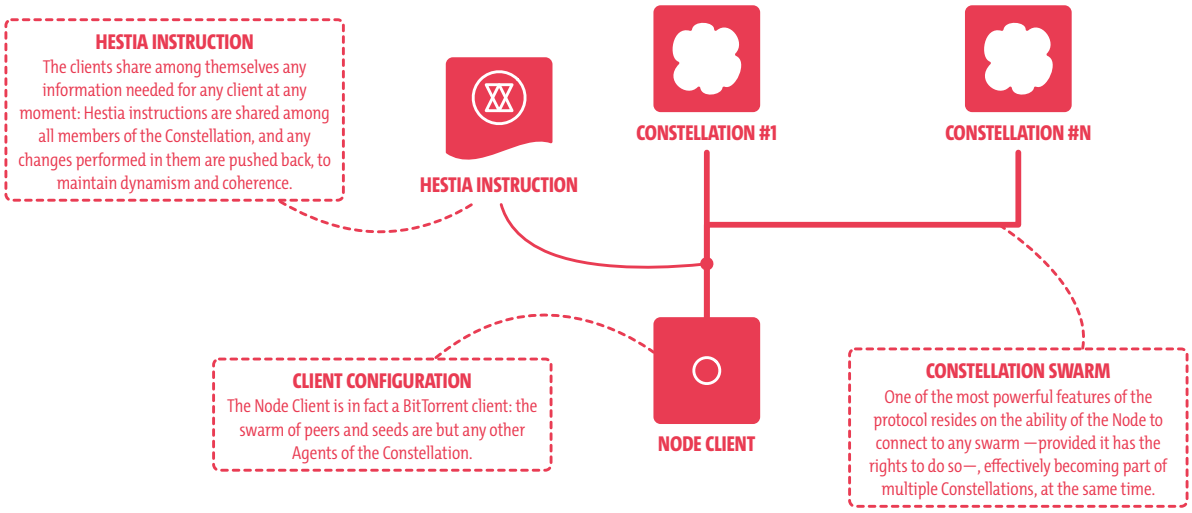

FIGURE 17. Architecture composition in regards to other clients.

In fact, the scheme is very similar to a *distributed repository* service: each client, once adhered to a particular *Constellation swarm*, obtains a copy of the main *Hestia instruction set*, which contains all the instructions needed for the *Node* to properly function and collaborate with any other *Nodes*.

Each interaction among *Nodes* within a *Constellation* is performed through changes to these instruction sets, which are *pushed* back into the swarm, and then *dynamically* updated among all peer *Nodes*. This system ensures a very *quick update* on any changes, and forbids any unwanted *snooping* over the Nodes, as *no information* about the *Nodes* is exchanged, but only *Variety*, *environmental*, and *policy information*.

Even better: due to the *recursive* feature of all *Nodes*, every single *Hestia* body is also *recursively* connected. This structure allows for communication among *Nodes* when needed —for example, a *Node* trying to access another *Node* outside any known *Constellation* will do so through any *Hestia*—, and for enforced confirmation of validity, due to *Hestia* inheritance: when a *Hestia* allows for the bestowment of a *Mantle*, it is ensured the *Node* abides by *both* the requirements of its own *Constellation Hestia*, and all of the requirements of all *parent Hestia*.

5 Design

'It's got three keyboards and a hundred extra knobs, including twelve with ? on them.'

THE UNSEEN UNIVERSITY ORGAN, AS DESIGNED BY B. S. JOHNSON
MEN AT ARMS, WRITTEN BY **TERRY PRATCHETT (1948-2015 GNU)**

5.1 INITIAL STAGE

At the very beginning, when a single user decides to *arise* the very first *Constellation*, the conditions are such as described below:

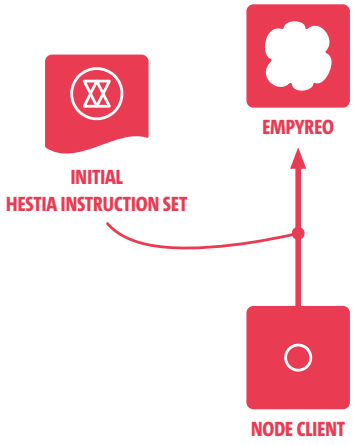

FIGURE 18. Initial stage of the protocol.

This event is *segmented* in several phases: some of them are *automated* —the client performs the phase automatically, without need for *user* input— and others require *voluntary*, conscious input or agreement, depending on the available *choices* presented at that moment:

PHASE	STATUS	DESCRIPTION
ONE	VOLUNTARY	The user initiates the client.
TWO	VOLUNTARY	The user decides to create a whole new Constellation. The client will ask for a series of attributes and characteristics to be regarded in the composition of the main Charter (see *5.X.X. - Charter*, in page *XX).*
THREE	AUTOMATED	The client will create a functional Charter as part of the initial Hestia instruction set.
FOUR	AUTOMATED	Once created, the initial Hestia Instruction Set is distributively shared among all Nodes of the Empireo (the minimum-denominator Constellation).

TABLE 13. Initial stage of the protocol.

It is evident the protocol itself will not be really *useful* if there is only a single *Node* active within the *Empireo*. Therefore, the protocol must allow for *procedures* to *authorise* any other potential members to join the Constellation.

As mentioned before, this is a *weak* point for *BitTorrent* networks, as *bootstrapping* servers are often the most exploited weakness in directed *attacks*; to evade this problem, the protocol *removes* the use of bootstrapping severs whatsoever, and instead favors an *invitation* model, where instead of allowing others to freely connect the *Constellation*, they must be *summoned*.

5.1.1 MEMBER SUMMONING

In comparison to *BitTorrent* or other distributed protocols, where *anyone* is liable in any moment and situation to become a peer, this *protocol* may seem much more severe. However, due to the *nature* of the protocol itself, a series of *restrictions* are already enforced on any potential *candidate* to join any *Constellation*, as part of an initial *assessment*:

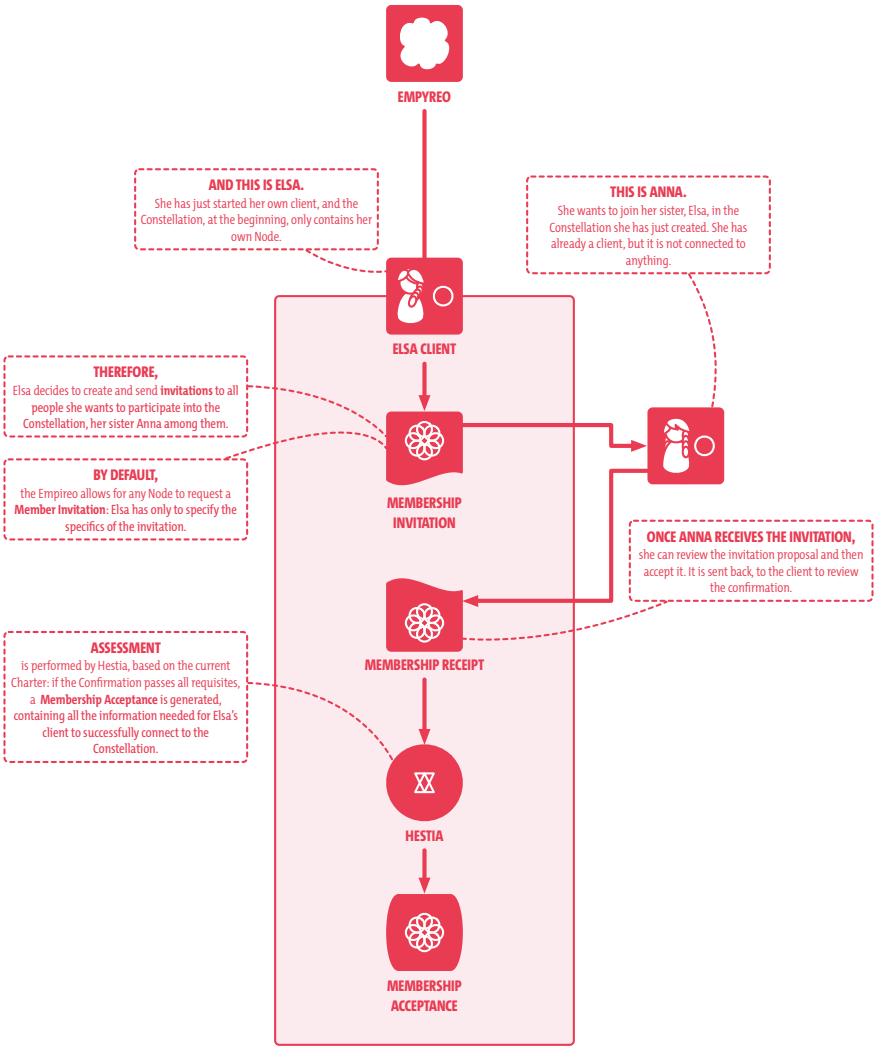

FIGURE 19. Member summoning, under initial conditions of a single Node.

In an initial setting, the protocol abides for *all* users to be able to generate *Membership Invitations*, which are immediately sent to the potential candidate. The invitation is received by the client of the potential candidate, who is able to review and also complete any particular requests the *Constellation* may need —and are specified on the *Charter*— to accept a candidate. Once the *receipt* is *generated*, *sent*, and *received*, the *Node* automatically *assess* the receipt, checking back as needed with the *Charter* to evaluate the feasibility of the candidate. Once accepted, the *Node* sends back a *Membership Acceptance* with all the information needed for the client of the candidate to be introduced into the *Constellation*.

This paradigm ensures any candidate accepted into the *Constellation* will abide by any requirements or specifics of the *Constellation Charter*.

However, this configuration quickly changes as more *Nodes* enter into the system:

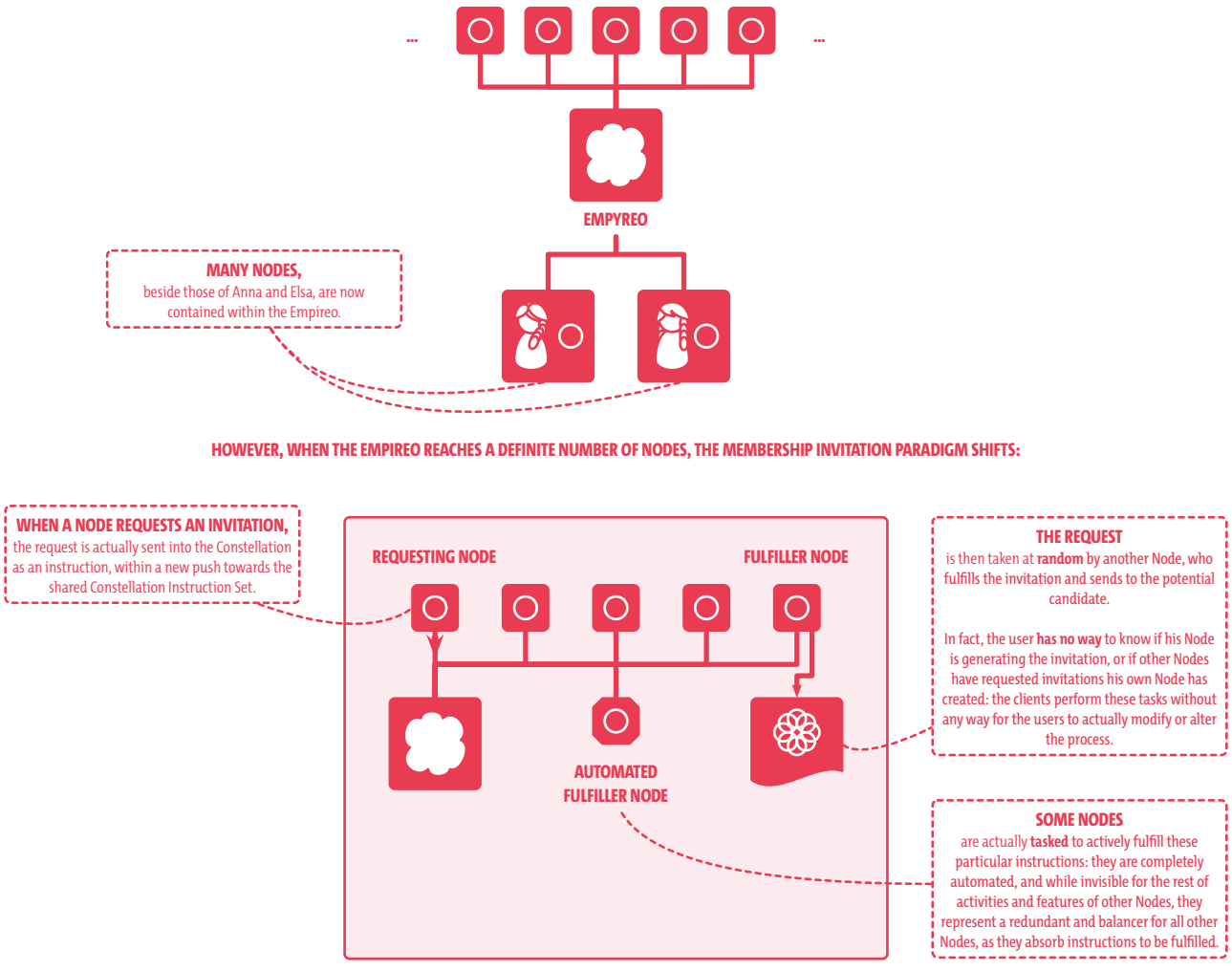

FIGURE 20. Member summoning, under initial conditions of multiple Nodes.

The actual number of *Nodes* to trigger this *paradigm shift* is configured as an *initial* characteristic defined on the default *Charter* of the protocol, but as with any other *Charter* directives, it can be dynamically changed at *any moment* (see *5.3.1 - Charter*, at page *62*).

The *Membership Invitation instruction* —*MIInt*—, when pushed towards the *Constellation*, has a *timestamp* and a series of *trigger* flags included: any other *Node*, when pulling any *Instruction Set* updates, will read the *Instruction*, and then, depending on the *flags* and the *timestamp*, will decide to fulfill the instruction.

Another instruction to *invalidate* further attempts of any other *Nodes* to fulfill the *MIInt* is quickly pushed back to the *Constellation* while the *Node* actually generates the *Membership Invitation*, minimising the possibilities of the potential candidate to receive multiple invitations: still, each one has an unique *hash* embedded into the invitation, based on the *request event*. The client will automatically *dismiss* any more invitations from the same event if received more than one.

Fulfiller Nodes are introduced to minimise the impact of these instructions on the clients of a *Constellation*: as they grow *larger*, the number of nodes can become *staggering* enough to provoke potentially *tiresome* waits for the instruction set to be *pushed* or *pulled* as necessary. While the complete *instruction set* of all *Constellations* is not meant to be *downloaded*, and only accessed as necessary, *Fulfiller Nodes* help to reduce the load inflicted on regular Nodes (see *5.1.3 - Constellation Meiosis*, at page *58*, and *6.1.2 - Automated Agents*, at page *65*).

5.1.2 MANTLE ENTITLEMENT

Eventually, either the members of the *Constellation* will abide to take different responsibilities within the network, or the network itself will automatically bestow them:

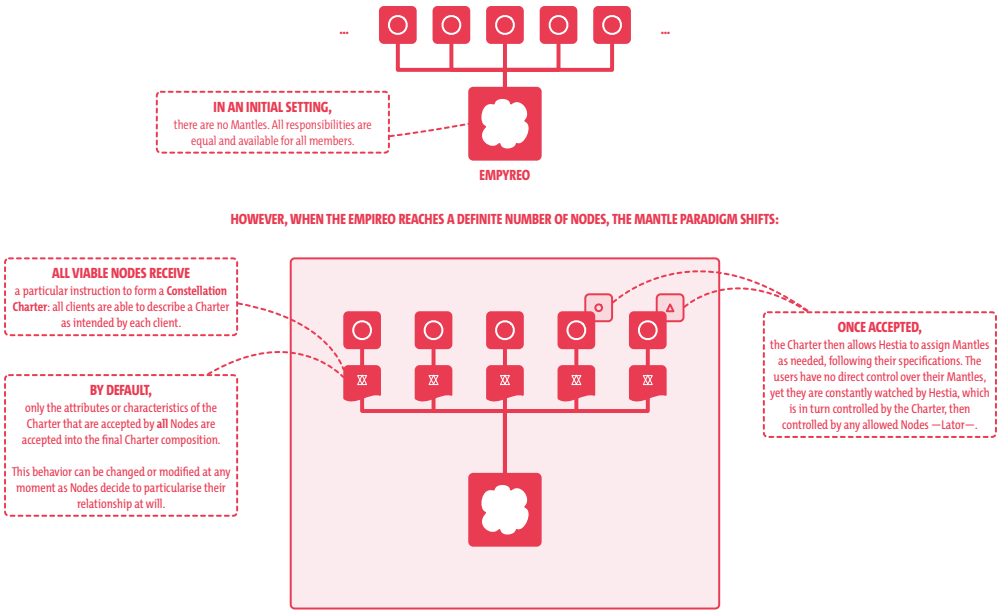

FIGURE 21. Mantle entitlement, under initial conditions.

By default, all *Nodes* share the same amount of responsibilities and restrictions as they are introduced within the *Constellation*; however, once reached a definite number, the paradigm shifts: all clients generate a *Constellation Charter Template*, which their clients are entitled to complete as they see fit: by

default, the final *Charter* will be composed of any requirements or specifications accepted for all *Nodes*. *Definite* specifications are formed for the entitlement of *Mantles*, to be bestowed *automatically* to *Nodes*. Users have no direct control over their *Mantles*, which are constantly monitored by *Hestia*, monitored itself by the *Charter*, accesible to any modifications by all allowed *Nodes* —*Lator*—, and available for all (see Figure *16* - *Wheel of Policy*, at page *52*).

However, this behavior can be altered at any moment as Nodes decide to particularise or modify the *Charter* of their *Constellation* as they see fit (see *5.3.1* - *Charter*, at page *62*).

Once the new *Charter* is updated, it is enforced *immediately* by all clients, which dispense *Mantles* as needed.

5.1.3 CONSTELLATION MEIOSIS

As the network becomes more *complex* —more *Nodes* and *Mantles*—, the need for new *Constellations* will eventually *arise*: this is *encouraged*, given the strong inspiration and influence of *Nature* over the *Viable System Model*, and this very own *project*.

New *Constellations* answer the need of the entire *Organisation* to begin having new areas where *specialisation* occurs: seen as single *Nodes* for other *Nodes* at the *same* level of abstraction, they provide *specific* information *artifacts* of a much more *defined* and *specific* essence than other *Nodes*, which may specialise in any other fields at will.

A *Constellation* can form on its own *will*, or form itself when an enough number of *Nodes* appear within a *Constellation* (see *5.3.1* - *Charter*, at page *62*):

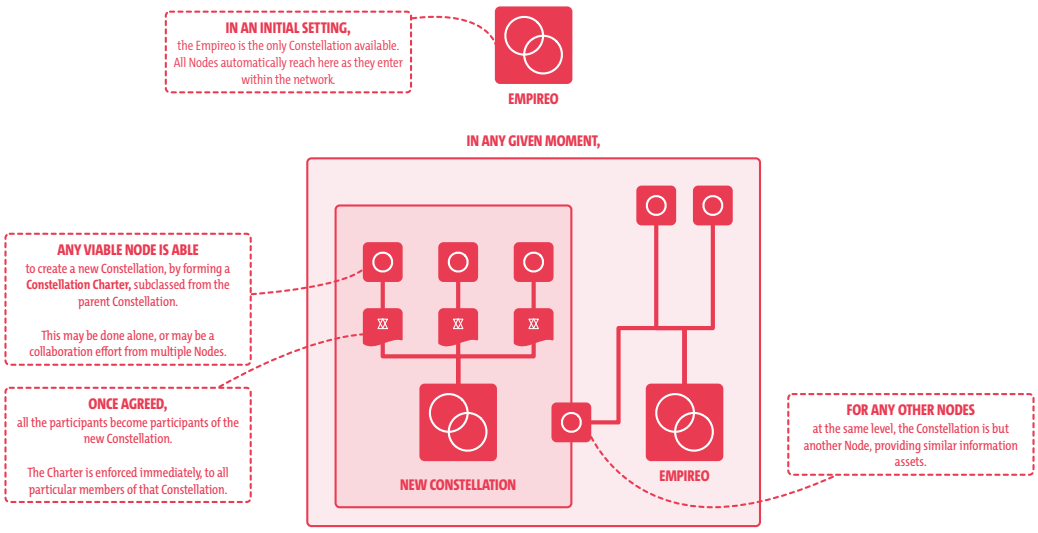

FIGURE 22. Constellation Meiosis, under initial conditions.

Constellations divide in a similar way to *cellular meiosis*[26]: the specific *Charter* of the *Constellation* —which can be roughly identified as the *chromosome* of the cell— is used as the *template* of the new *Charter* of the new *Constellation*: any new specifics can be *developed* from the parent *Charter*, but cannot be *ignored* or *invalidated* until the invalidation on itself is accepted from the parenting *Constellation* (see *5.3.1* - *Charter*, at page *62*).

This is one of the most *relevant* aspects of *Constellations*: the *hereditary* properties of *Charters* allow for infinite replication and specification, yet maintaining strict coherence along the entire network.

5.2 ROUTING

The protocol differences four different broad types of routing among Nodes in the protocol:

CONSTELLATION	NODE	DESCRIPTION
SAME	MANY	The Node wishes to communicate with multiple other Nodes, within the same Constellation. This is akin to a **broadcast**.
	ONE	The Node wishes to communicate with one other Node, within the same Constellation. This is akin to a **onecast**.
DIFFERENT	MANY	The Node wishes to communicate with multiple other Nodes, outside its Constellation. This is akin to a **broadcast**.
	ONE	The Node wishes to communicate with one other Node, outside its Constellation. This is akin to a **onecast**.

TABLE 14. Main routing types.

In fact, the routing made to a one single Node is but a specific condition of the many routing type —in where the Node only wishes to communicate with a single Node—.

The distributed nature of the protocol, and the layered, hereditary composition of Constellations, allows for specific routing procedures:

5.2.1 TOKEN STRUCTURE

Each client provides to its user of an *unique Identification Token*, which is *public*: any interaction of the *user* with the *Node* within the network is signed by his token, enforcing the *authenticity* and *authoring* of any provided content. However, the protocol does *difference* between *authoring*, and actual *representation*: because of the *resolute*, yet *anonymous* protocol *directive*, users of the network must be able to become *anonymous* whenever as they see fit, but at the same time becoming completely *different* from each other in any unique artifact within the *network*.

Therefore, two kinds of *Tokens* appear:

[26] *Meiosis* is a specialised type of *cell division*, which reduces the chromosome number by *half*. This process occurs in *all sexually reproducing eukaryotes* —both *single*, and *multicellular*—, including *animals*, *plants*, and *fungi*.

TOKEN	DESCRIPTION
PUBLIC	The token does reference the user as the author of any content, but does not directly relate him to the content. He is the author, and his artifact is unique, but the nature of the artifact may still be anonymous.
PRIVATE	The token does reference the user as the author of any content, and does relate him to the content. He is the author, and, and his artifact is unique, and at the same time, he can be traced back from the artifact.

TABLE 15. Main token types.

The relationship between tokens is *balanced* by the very own client: the private *Token* can be referenced against a distributed *Private Token Table*, which relates the *tokens* to the definite information of the client *Nodes* (for example, *Constellation*, *IP*, and others). *Private Token Tables* are embedded within the information distributed among the *Constellation*, and are dynamically segregated as *Constellations divide* or *merge*. Clients have no means to *know* which actual piece of the *Table* is actually in the client, or its actual contents: the *Private Token Table* is dynamically *encrypted* by using an unique key provided by the client: based on *Deniable Encryption*[27] paradigms, each client will *encrypt* its own particular information details, to be *recovered* at any needed moment.

As each *Node* has its own *public* token, so *Constellations* also do have theirs: each *Constellation* has a *public* token, and sending requests or messages to a *Constellation* confers, in practice, to sending a *broadcast* to *all* members of the *Constellation*.

5.2.2 ROUTING PROCEDURE

In the following scenario, of two *Constellations*, *Elsa* does want to start a conversation with *Anna*:

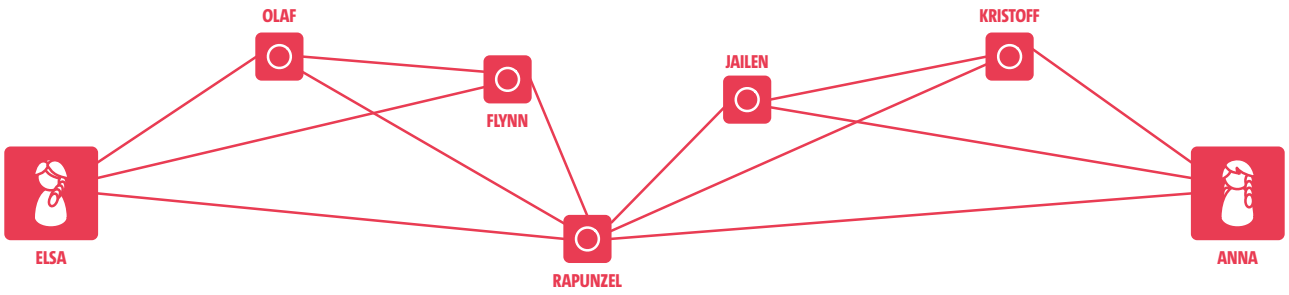

FIGURE 23. Routing to one Node scenario, with two overlapping Constellations.

This scenario outlines two *Constellations* of several *Nodes* each, and within each a single *Agent* (the one formed by Elsa, Olaf, Flynn, and Rapunzel, and the other formed by Rapunzel, Jailen, Kristoff, and Anna). *Elsa* does not know *Anna's private token*, so she cannot *directly* form a *Constellation* with her. She will have to greet and meet her first, to earn her *trust* and her private *Token*.

[27] *Deniable Encryption* describes any *encryption* techniques where the existence of an *encrypted* file or message is *deniable* in the sense that the *adversary* cannot *prove* that the plain data *exists*.

To do so, the *distributed* nature of the protocol comes *forward*:

STEPS	DESCRIPTION
ONE	Elsa pushes a **request** to talk with Anna to all members in her own Constellation, trying to disclose if any of the members does know Anna.
TWO	Eventually, everyone replies to the request, either nodding or negating the question. In this case, Rapunzel is a member of both Constellations, and her client does know Anna's public Token (being on her own list of acquaintances).
THREE	Rapunzel replies, providing Elsa Anna's public token, along with the Constellation's token. Now Elsa has all the information she needs to push another **request**, this time directly in the Constellation provided by Rapunzel, where Anna is known to be a member.
FOUR	Elsa pushes the request directly to Anna in her Constellation.
FIVE	Anna sees now the request, where Elsa's public Token is included: now Anna is able, if she wants, to reply back to her sister.

TABLE 16. Step-by-step evolution of the routing to one node, with overlapping Constellations scenario.

In no moment specific information about nodes is *exchanged*: all requests and resolutions are but *constructs* to publish *information* in definite *Constellation Instruction Sets*, which in practice are but *distributed*, text-based *structures*. In fact, when *Elsa* and *Anna* decide to confide in one another, they are only allowing their clients to *note* their current location information. If either *Elsa* or *Anna* abandon their respective *Constellations*, they will need to find each other *again*. To avoid this, they can form a *private Constellation*, where the two are the only members.

This scenario, however, assumed that there was a *Node* (the one belonging to *Rapunzel*, specifically) which *knew* both sisters, being in both *Constellations* at the same time. This may not be always the case:

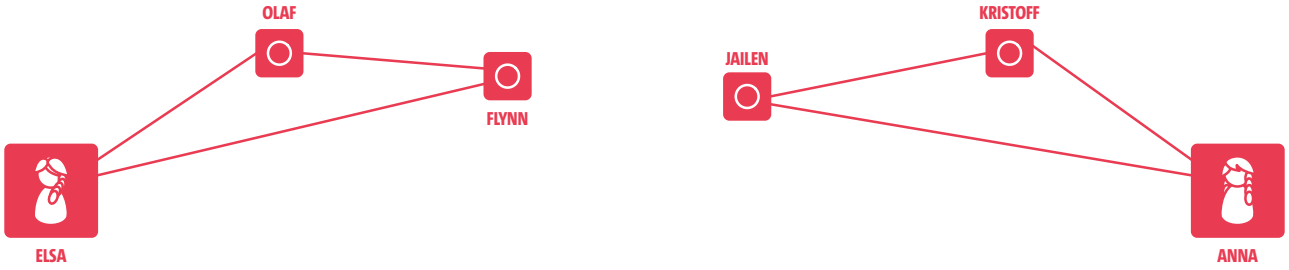

FIGURE 24. Routing to one Node scenario, with two separate Constellations.

In this situation, there is *no obvious* way to connect Elsa and Anna together; however, the recursive nature of the protocol, and the hierarchical structure of *Constellations* allow the protocol to solve this issue:

STEPS	DESCRIPTION
ONE	Elsa pushes a **request** to talk with Anna to all members in her own Constellation, trying to disclose if any of the members does know Anna.
TWO	Eventually, everyone replies to the request, either nodding or negating the question. In this case, no one knows nothing. When all Nodes turn down the request, or a timestamp limit is reached, the request **follows up** the Constellation hierarchy, up to the parenting Constellation. An information message is left to inform the client that the search is still
THREE	Here, the process is repeated indefinitely, until someone answers positively.
FOUR	Once replied, the process is the same as described previously, in Table XX.

TABLE 17. Step-by-step evolution of the routing to one node, with separate Constellations scenario.

This structure allows for a *throughout* research of the entire network: to minimise *flooding* and enhance the overall *speed* of the network, any requests after the *first* one from the same event are *ignored* (as already seen with similar instructions).

5.3 HESTIA

It is evident *Hestia* is one of the most focal points in the entire protocol: it has already being mentioned several occasions in the protocol, and its *position* as the *automated* processing core of the protocol merits a more *throughout* description.

Hestia represents the *hearth* of every single *Node*: each client provides a core of automated processes and functions which *monitors* and *manages*, at every instant, the *information* the client provides or receives from the network. Besides, *Hestia* provides *computing* capabilities to perform inference from the gathered data, based on the *Charter* and the collaborations of any *Agents*: in short, *Hestia* is able to *discern* based on the *input* provided.

As each *Node* is also a *Constellation*, the individual *results* of each *Node* within the *Constellation*, being curated and managed by their respective *Hestia*, become *coherent* as a single cohesive *artifact*. The *Constellation* on itself does *not* have a *physical* processing *Hestia* as regular clients of *Nodes* do, but the results, to the external *Node*, are the same.

5.3.1 CHARTER

In the previously mentioned *Declaration of Independence*, or in any other structured declaration of order, rules are *tabulated* according to a *series* of *definite* and concrete *magnitudes*, *arrangements*, *bodies*, and *areas of influence*. This precise composition is very fitting for an *automated* ruling system: the *Charter* is based on these rules, which can be modified or altered in any shape or composition as needed.

The *Charter* itself is described as a series of *inter-related taxonomies* and descriptive bodies, revolving around a *frame* of *rules*:

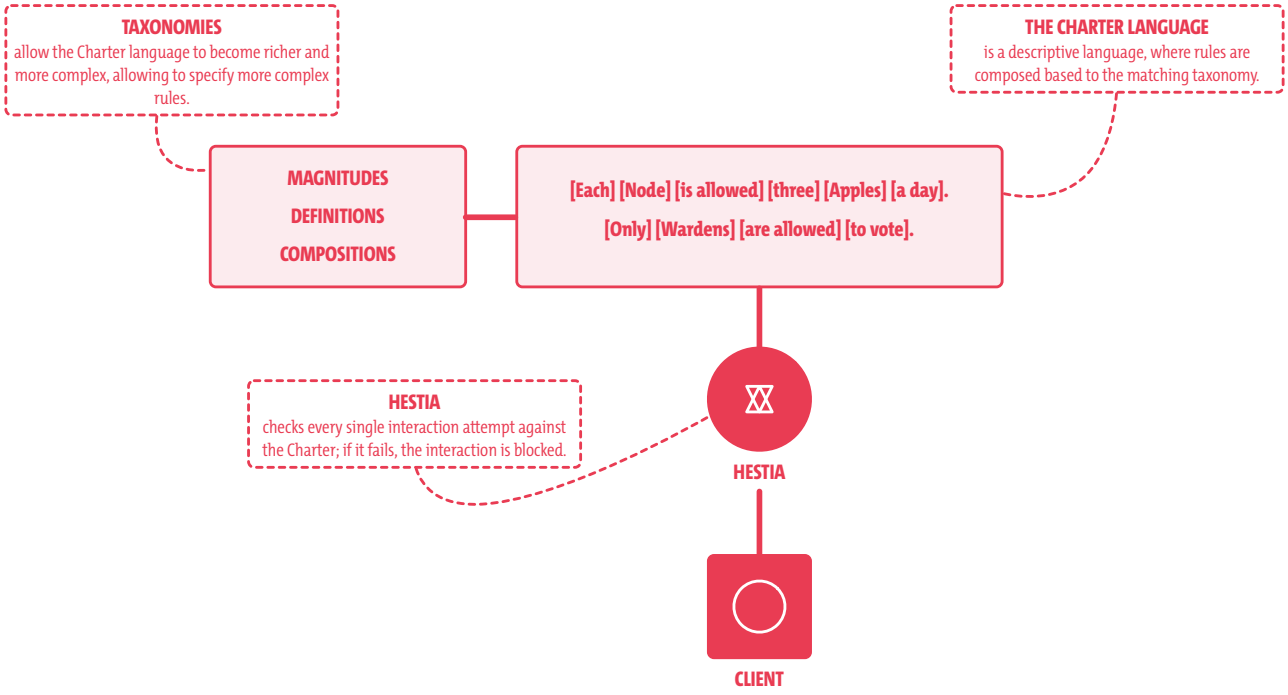

FIGURE 25. Structure of the Charter, in relation to Hestia and the client.

The *Charter language* is a descriptive *metalenguage*, using multiple *taxonomies* shared by all members of the *Constellation*, and *updated* and *modified* in the same way the *Charter* is shared along. And as *Constellations inherit* the base structure of their parent as they divide, they also *inherit* the rules: each new *Charter* is derived from the *parent*, and a *parent* rule cannot be *altered* from a *lower Constellation*, unless *accorded* that way by the members, and also *embedded* in the *Charter* itself.

This approach allows for *limitless branding* and *specialisation* among *Constellations*: while two Constellations can have *different* sets of rules, they must abide to the *same* parent rule set, and if they merge, they must find a *shared common ground* to reframe their respective *Charters* into one single Charter.

Furthermore, it allows users to grasp the *consequences* and effects of their own actions at a much more *fine-grained level*: they are *instantly informed* of the potentially *illegal* —as per the *Chapter* dictates— actions *before* they are *enacted*, and the protocol actually *enforces security* and *prevents* error with every user interaction.

6 Future work

'You can't stop the signal, Mal.'

MR. UNIVERSE, TO MALCOM 'MAL' REYNOLDS
SERENITY, WRITTEN AND DIRECTED BY **JOSS WHEDON (1964)**

6.1 IN REGARDS TO THE PROTOCOL

As it is, this dissertation is but a *teaser*: taking inspiration on the release structure observed in *IMS*, this protocol is intended to be a *continuous* research endeavor, matching the *continuous* and *ever-changing environment* of enterprises.

Hence, the work ahead in regards to the protocol is both *exciting* and *intimidating*: the development of a *successful* protocol is but the very *first* step on a *very long path* towards successful *deployment* among *enterprise* and *governance* cultures:

6.1.1 CLIENT SOFTWARE

It has already mentioned how *Agents* make use of their *clients* to interact among other *Nodes* within the network. The use of *IMS* allows for a very *broad* range of *potential application environments* and *hardware specifications*:

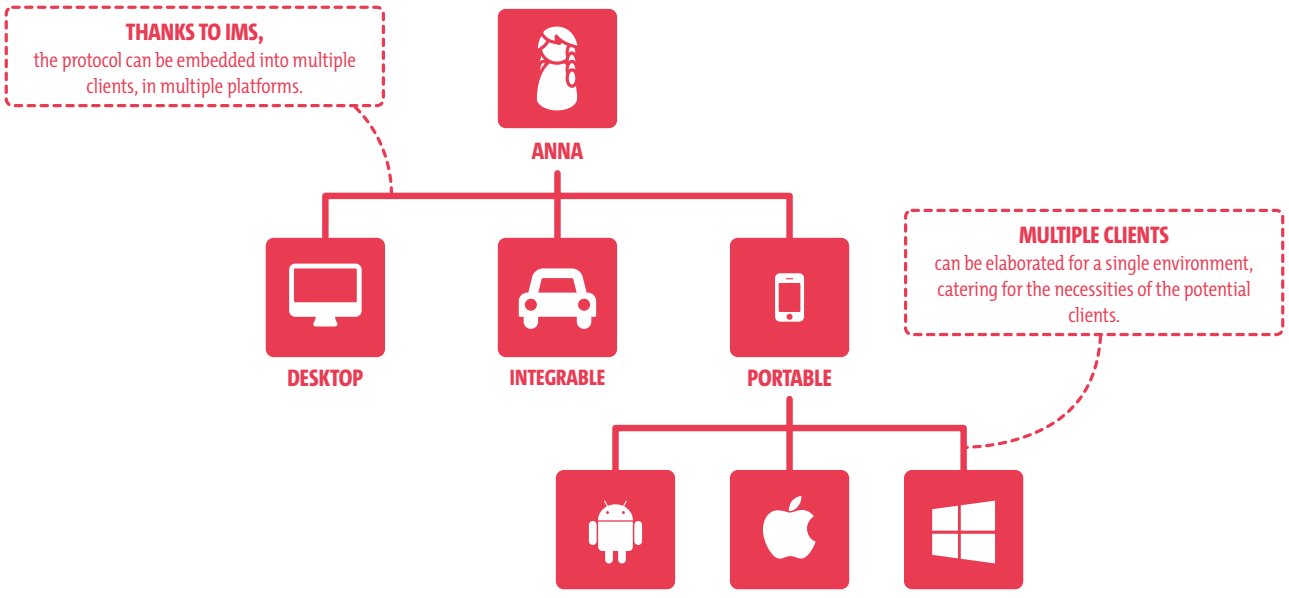

FIGURE 26. Potential scope of clients, in relation to environments and users.

In fact, this layout bases on the *free distribution* of a protocol *SDK*, aiming to seed a *rich* environment of *partners*, *associates*, and *enterprises* interested in the *development*, *maintenance*, or *evolution* of the potential clients.

6.1.2 AUTOMATED AGENTS

Through this dissertation, the aim of this protocol to *absorb* and *integrate* information into the environment has been *strongly established*: it is fairly *evident* any enterprise will benefit from the data extracted and converted into coherent knowledge.

This interaction has been represented through the work of *Agents*, standing for any *human* interaction over the environment. However, many tasks of *interaction* appear to be often *repetitive* or *menial*, and therefore prone to *automated management*.

Automated Agents appear as a way to *minimise* the impact of such tasks on *Agents*, in the very same way other *structures* and bodies of the protocol have been created to *minimise* the impact of intensive tasks: their *procedures* and results are directly controlled by *Hestia*, and therefore by the remaining user-controlled *Agents*. Their structure, therefore, makes them completely *modular* and prone to *extensions*, to cover particular needs of any *Constellation*:

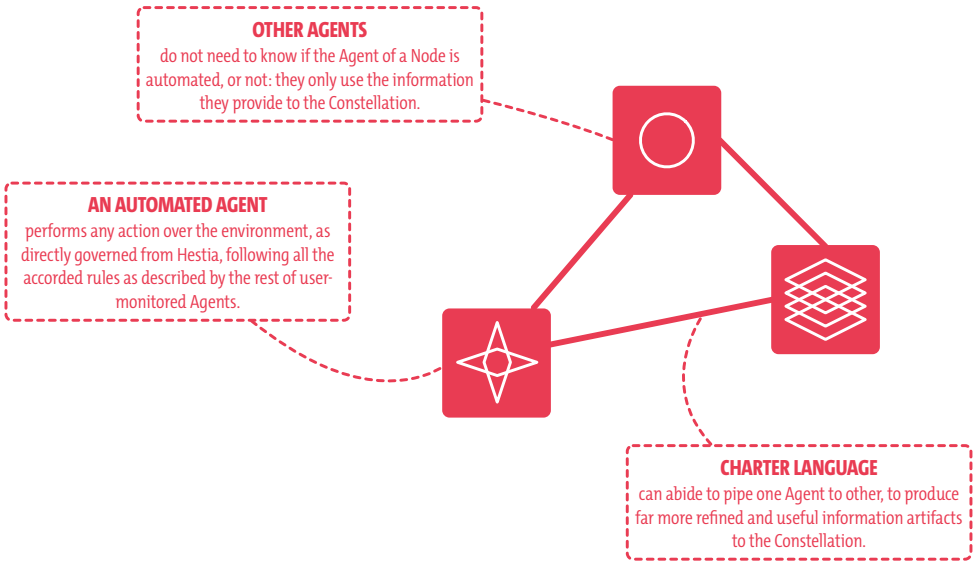

FIGURE 27. Automated agents scenario.

Two different types of *Automated Agents* are *suggested*, but the extension and *modular* nature of *Nodes* allows to design a brand *whole* line, aiming to *cater* the *specific requirements* of *Constellations*.

6.1.2.1 PYLONS

Pylons are specific automated *Agents*, aiming to either *gather* or *impact* the *environment* in a specific manner: they can be regarded as *specific sensors* and *actuators*, extracting *meaningful* raw data to be used over the *Constellation*:

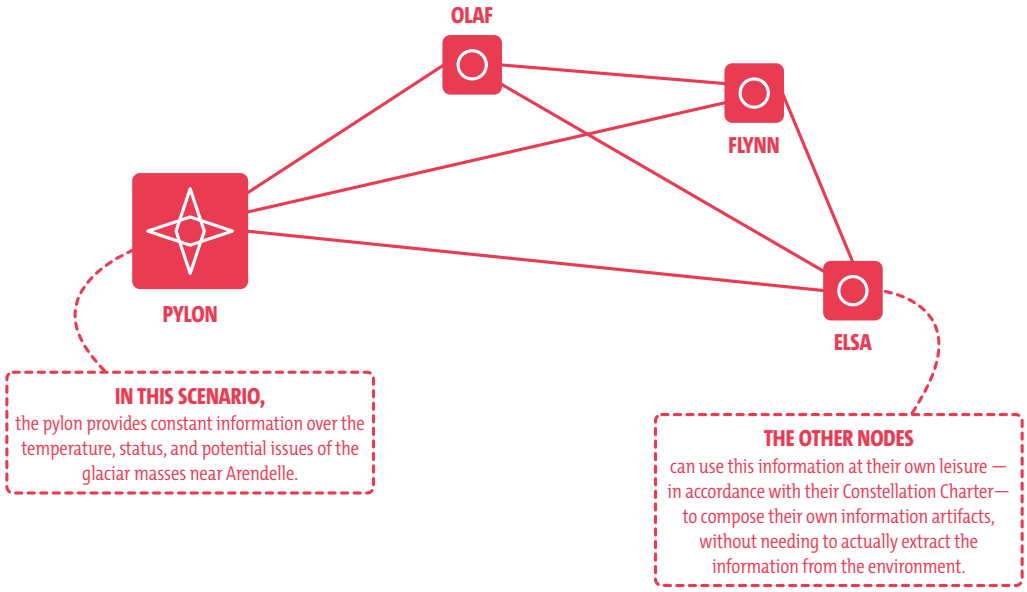

FIGURE 28. Pylon example scenario.

The precise structure of a *Pylon*, as already outlined, is of *no importance* to any other *Nodes* in the Constellation: multiple *Automated Agents* can be *piped* in completely automated *Constellations*, to provide single *artifacts* of information which are much more *refined* than the data extracted over a puntual moment.

6.1.2.2 ARKS

Arks do not extract *information* from the external environment, but from the *Constellation* itself: they are aimed to provide a *means* for any *Nodes* to store, if needed, allowed, and intended, any actual information artifacts *generated* over time:

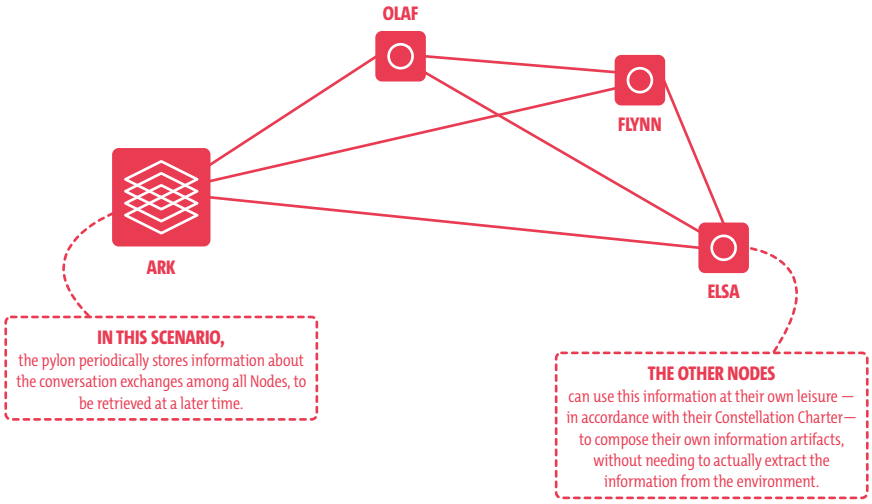

FIGURE 29. Ark example scenario.

Once again, *Nodes* do not know the actual *internal* working of the *Ark*: the protocol simply uses the *Ark*, if *present* on a *Constellation*, and if allowed over the *Charter*, to store any information *artifacts* —as defined in the *Charter*— to later retrieval as needed for any *Node*.

The actual storage remains distributed within the *Ark Constellation*: for example, an *array* of *Automated Ark Agents* over automated distributed servers store media information files, *freely* available to any Nodes as they retrieve them with the right *Hash* key.

Given the defined *structures* and future *specifications*, a very engaging user case scenario can be sketched:

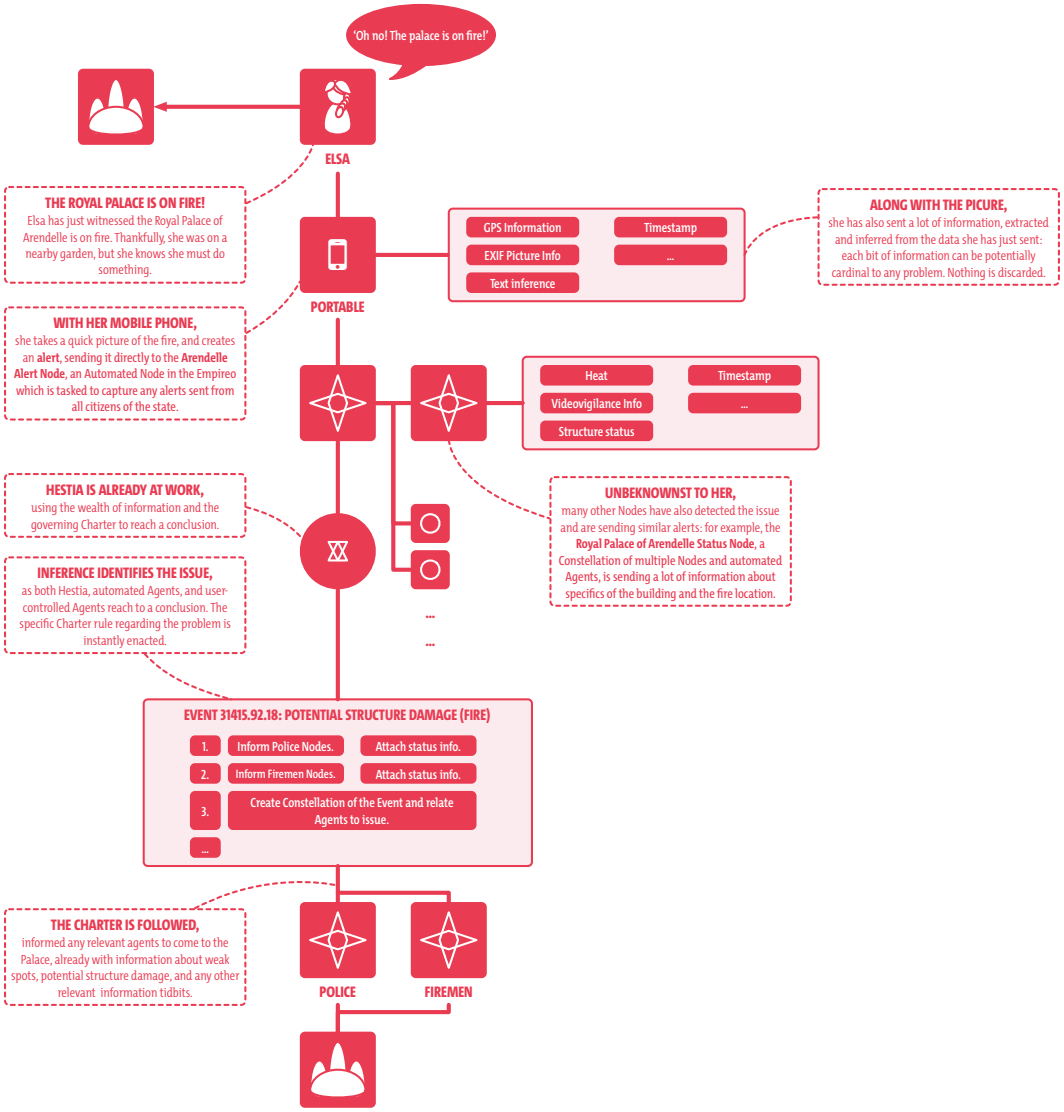

FIGURE 30. Future user case scenario.

The actual value of this scenario is that *no conventional alarms were triggered*: *specific* information about the status of the issue, along with *information* of *witnesses*, and any other relevant data were used to produce *relevant* information artifacts. There was no need of specific *human* administrative bodies or security guards to alarm or take into *attention*, as the protocol *minimised* such tasks into the *barely imprescindible* for the entire enterprise —in this case, the citizens of *Arendelle*— to survive to the event —in this case, a *fire* in the *Royal Palace*—.

The scenario does *not end* here: it can extend *indefinitely*, as more interactions among multiple *Nodes* and the possibilities these *interactions* and the information they provide are taken into *account*: the *Charter* can, for example, also allow *Press* to present at the site, sending them a brief *report* of the issue —the actual portions to be *disclosed*, according to a *Charter*, can be generated *automatically*— along with coordinates of a *prearranged*, secure space to take pictures and provide information for their clients and viewers.

6.2 IN REGARDS TO THE SOCIETY

This protocol represents a very *transformative* series of events to be fulfilled in a *society* where information management is lacking or affected with *bureaucracy* or *perverse* societal issues. It is, in short, *shocking*.

It can be *assumed* —and it is far more *cautious* to think in these terms— that many societies will either *reject*, or even outwardly *wage* against the protocol. And in fact, it is a very *welcomed* reaction: *indifference* may be the *worst* kind of *feedback* against a *distributed*, *freely accesible* protocol, which relies in the *interaction* of the members. *Feedback*, either positive and negative, is very welcomed.

Therefore, work to *shift* from a *revolutionary*, harsh event, to an *evolutionary* series of steps seems far more *attentive*, and will provide very *interesting* feedback artifacts to *empower* and *enhance* the protocol deployment in society.

6.2.1 PROTOCOL DEPLOYMENT SCENARIO FRAMEWORK

To provide a protocol, and the fundamental *hardware* and *software* tools to either *use*, develop, or monitor its development is *not enough* in actual scenarios where social *issues* are present: the best development *available* can inherently *fail* against a very *poorly* designed deployment scenario, where the *specifics* of the environment are ignored.

For example: to *inject* the use of the protocol over a start-up enterprise of *twenty* members will be a strikingly *different* endeavor, than to inject it over an *entire* country. And while it is *tempting* to think about *scale*, *structure*, *motive*, *coherence*, or *cultural-based motivations* as the source of the deployment *issues*, seems more fitting that without a *real identification* and *taxonomy* of potential risk *issues*, and the *establishment* of a series of *injection* and deployment *guidelines*, the protocol will be rendered *damaged*, or simply *useless*.

This framework should allow any *third-party enterprises* to take onto themselves their own *protocol deploy* and *integration procedures*, which could be even *merged* into the protocol itself: a newly-formed *Constellation* of the start-up members mentioned above would highly *benefit* from the *experience* and *knowledge* gathered from previous *Constellations* —and could be provided from *template* or *default* A*rk Automated Agents*, automatically *installed* as they *deploy* clients within their network—.

7 Conclusions

When a distinguished, but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong.

CLARKE'S FIRST LAW

The only way of discovering the limits of the possible, is to venture a little way past them, into the impossible.

CLARKE'S SECOND LAW
ENACTED BY **ARTHUR C. CLARKE (1917-2008)**

CLARKE ACTUALLY CAME UP WITH AN IDEA THAT WAS MOCKED AS THE CONCEPT OF A FOOL: HE FIRST MOOTED THE THOUGHT OF SATELLITES TRAVELLING AT THE SAME SPEED AS THE EARTH BEING USED FOR TELECOMMUNICATIONS IN 1945. NOW THERE ARE MORE THAN 300 OF THEM.

7.1 WHY?

The most *difficult endeavors* are often expressed as the *extenuating*, *arduous effort* of *climbing* a *massive*, *dangerous mountain*. As one climbs, the *experience* gathered *transforms* back into *knowledge*, and once at the *top*, one is able to see the entire *landscape*.

In this privileged *view*, the analogy tells of a single minuscule *point*, far in the horizon, where the *answer* is to be found. Once located, one must climb *down*, this time carefully *pinpointing* the path towards the final answer, and then *traveling* along the landscape, to eventually reach the *goal*.

But this analogy is, in the opinion of the author, *dead wrong*.

The analogy does present the endeavor as something to be *solved looking down*, towards a point where *no one* has looked yet —or has *overlooked*—, *hoping* to be useful *enough* to present an useful *enough* answer or result for the quest to be *fulfilled*, *no matter how* or at *what length* it was fulfilled at all. *Compromises* are made to *restrict* the endeavor to this particular result, *hoping* that others may *fill* the gaps or take the *solitary* roads *not taken*, in any *future* endeavors.

But *if everyone looks down*, and looks towards *overlooked spots*, eventually *there will be no more spots*, or *no more roads* to be taken. To expect *others* will climb up the shoulders of others before is a *perversion* of

the *cite*[28] often used towards such *undertakings*: there will be *unexplored* fields, where *no one has ever set foot before*. Expecting *others* to take the *hard work*, and then *hopping* on them to find a *niche* to *exploit*, is an exercise of *arrogance* and *hubris*: what would happen if there is *no one anymore* to take the *risk* to *venture* into the *unexplored*?

The answers are always *up*, *beyond* the sky, and *way beyond* our current *paradigms* and *beliefs*. The real *answers* are not found by *looking down* or settling on *partial* outcomes, but to *looking up*, to the *stars* and *beyond*, climbing ever always *higher*. Searching for *bigger* mountains to *climb* and *overcome*.

This *dissertation*, and the *protocol* it *outlines*, may be one of the *largest mountains ever attempted*. And as expressed *before*, the *attempt* to solve *such* an *ancient*, *extensive*, and *complex* issue may once again seem as an exercise of *hubris*, and one of the *very largest* if all.

But this *protocol* is not *meant* to become the *solution*: it is, however, *meant* to provide a *tool* for any enterprise to *heal* itself. As already *discussed*, it is not the *first* tool —and hopefully, it will not be the *last* —. And extensive *research*, *deployment*, and *monitorisation* will be needed to discern if it is indeed an useful tool.

But bit by bit, we appear to *advance* towards an *Information Society*, where *information development*, *management*, and the very *understanding* of what *information* really means, appears to be *cardinal*. Bit by bit, we are *engaging* ourselves to use more *advanced* instruments and devices to *push* ourselves *forward*, while we *stagnate* ourselves at the same time, forcing us to *repeat* the same mistakes of the past, perhaps because we are, perhaps, so very *inclined* to look down.

The pressing question should be *why not*?

7.1.1 BECAUSE IT IS IMPOSSIBLE!

Again, the *scope*, *height*, and surroundings of this particular *mountain* is *threatening* enough to *intimidate* at first sight. Yet *any* single endeavor is *intimidating*, until it is *solved*. Afterwards, the issue appears *trivial* enough to be even ignored at all.

For example: would be considered *possible*, as near as *fifty* years from the moment of the writing of this dissertation, to ask anyone to provide a *map* outlining every single street, on every single *town* and city in the *globe*? Today, we use *a solution*[29] which provides *images*, *video*, and even *real-time traffic conditions*. Such a technological *marvel* would border in *science-fiction* to the readers of the previous century.

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[28] The expression *nanos gigantum humeris insidentes*, which can be roughly translated from *Latin* to *dwarfs standing on the shoulders of giants*, expresses the significance of *discovering truth by building on previous discoveries*. While it can be traced to at least the *12th* century, attributed to *Bernard of Chartres*, its most familiar expression in *English* is found in a *1676* letter of *Isaac Newton*.

[29] Google Maps is a desktop and mobile web mapping service, offering satellite imagery, street localisation, panoramic view images of streets, real-time traffic conditions, and route planning.

And it is *not* the only example available: in *1988*, and led by the *World Health Organisation*, *UNICEF*, and the *Rotary Foundation*, an effort was made to reduce eradicate *Poliomyelitis*. At first sight, this could be outrageously *arrogant*: *Polio* is known since *prehistory*: *Egyptian* carvings and paintings depict otherwise healthy people, with *withered limbs*, and *children* walking with *canes* at a young age.

FIGURE 31. An Egyptian stele thought to represent a polio victim, 18th Dynasty.

But the *combined* efforts of these groups and *countless specialists* and *health advisors*, *researchers*, and *developers* have brought an *astonishing* result: the number has been *reduced* from *hundreds of thousands*, to *291* in *2012*, representing a *99.9% reduction*[30]. And the efforts continue, to finally *eradicate* the sickness once and for all. Once again: what would a physician *think*, thirty years ago from this point, of the *possibility* to *eradicate* such a common, ancient sickness?

7.1.1 BECAUSE IT CANNOT BE DONE!

Science-fiction has often made *promises* about *technologies* which appeared to *dabble* in the realm of *outrageous*, *wild fantasy*: *Star Trek*, the *TV* series created by *Gene Roddenberry* took very daring *cultural* and *technological* assumptions thought at the time of *too bold*[31] or simply mistaken.

One of these assumptions was the *Universal Translator*, a device used to *decipher* and *interpret* alien languages into the *native* language of the user. The actual *development* of such a device appears absolutely *mystifying*: how could a device could *correctly interpret* completely *foreign* signals and sounds into coherent information for the user?

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[30] *Wild Poliovirus weekly update*, accessible at http://www.polioeradication.org/Dataandmonitoring/Poliothisweek.aspx. Last accessed at *28.06.2015*.

[31] *Plato's stepchildren*, the *tenth* episode of the *third* season of the original series, originally aired at *22.11.1968*, featuring a *kiss* between *James T. Kirk*, captain of the interstellar vessel *Enterprise*, and the litenuant *Uhura*, being the one of the very *first kisses* in recorded *television* to be held *between a white male and a black woman*. *William Shatner*, the actor portraying *Kirk*, often told that the television producer company, *NBC*, *insisted* that their lips would *never* touch, and was *hesitant* to release the *episode* to the general public.

However, this is already *happening*: *Microsoft* unveiled its *Skype Translator* service[32], allowing users to speak *different languages* in real time, while providing automatic translation. It was demonstrated with a live conversation among an *English* and *German* user, and it has been slowly expanding to include *Chinese*, while improving on the efficiency of the system.

7.2 ATLAS

In *Greek* mythology, atlas was the primordial *Titan* who held up the celestial spheres. Son of the *Titan Iapetus*, and the *Oceanid Asia*, he sided with the *Titans* in their war against the *Olympians*. When they were defeated, many of them were confined to *Tartarus*; however, *Zeus* condemned *Atlas* to stand at the *western* edge of *Gaia*, and to hold up *The Heavens* on his shoulders, to prevent the two from *resuming* their primordial embrace.

His story *echoes* that of this protocol: it is a tool to hold up a *myriad* of interconnected *Constellations* and *Nodes* together, helping them to *exchange* information and collaborate to *survive* in a harsh environment.

[32] *Skype Translator Service Preview*, available at http://blogs.skype.com/2014/12/15/skype-translator-preview-an-exciting-journey-to-a-new-chapter-in-communication/. Last accessed at *28.06.2015*.

A | Viable Systems Theory

> Britain has invented a new missile. It is called the civil servant: it doesn't work, and it can't be fired.
>
> GENERAL SIR WALTER WALKER [KCB, CBE, DSO & TWO BARS] (1912 — 2001)

A.1 ORIGIN

Many key figures, such as *John von Neumann* **[P11]**, *Jay Forrester* **[P12]**, or *Norbert Wiener* **[P13]**, have researched how to *self-regulate* complex systems, either on the field of *industrial dynamics* **[R22]**, *operations research*[33], or many others: *cybernetics* uses a *transdisciplinary* approach to explore how complex systems can be *regulated*.

In regards to *management cybernetics*, *Stafford Beer* **[P14]** becomes the most *relevant* figure: he had already *observed*, through his stay in the *British Army*, the advantages of *operational research*, and his first book expands on the *cybernetics* groundwork laid out by *Wiener* **[R23]**.

In the next decade, and up to *1970*, Beer *expanded* and *improved* upon his own works, eventually setting the *cornerstone* of a *regulation theory* of a system, designed in such a way as to *meet* the demands of *surviving* and *adapting* to an *ever-evolving* environment: this viable system model *encompasses* any kind of *organisation* capable of *autonomy*.

A.2 VIABLE SYSTEM MODEL

The first mention of such a model is found in the *founding* work *Beer* published as a series of *volumes* detailing *viable organisation modelling* **[R24]**. Beer took *advantage* of his *philosophy* and *natural sciences* knowledge, observing how the *body* is *governed*, and establishing a series of systems based on the *relationships* between the different *organs* and *structures*:

[33] *The John von Neumann Theory Prize of the Institute for Operations Research and the Management Sciences (INFORMS)* is awarded annually to an *individual* (or sometimes a *group*) who has made *fundamental* and sustained *contributions* to *theory* in *operations research* and the *management sciences*. It is regarded the *Nobel Prize* of the field.

BODY STRUCTURE	BODY FUNCTION	SYSTEM	SYSTEM FUNCTION
Muscles, organs.	Primary activities.	System 1	Primary activities.
Sympathetic nervous system.	Stabilisation of muscles and organs.	System 2	Conflict resolution and stability.
Base brain, pons, and medula.	Internal regulation and optimisation.	System 3	Internal regulation, optimisation, and synergy.
Diencephalon.	Input from senses and forward planning.	System 4	Adaptation, forward planning, and strategy.
Cortex.	Higher brain functions.	System 5	Policy: ultimate authority and identity.

TABLE 18. Relationship among body structures, and viable systems.

The systems are themselves organised depending on their function:

SYSTEM	AREA	FUNCTION
System 1	Operation	Those who perform changes to the environment.
System 2	Management	Those to ensure all operational units work together efficiently, harmoniously, coherently: they hold the entire structure together.
System 3		
System 4		
System 5		

TABLE 19. Relationship among systems and areas, and their base function.

Both body structures and system *structures* -from which they *inspired* to *devise* the *systems* themselves- react *themselves* to the environment: every single part of the *habitat* which is relevant to the overall system in focus:

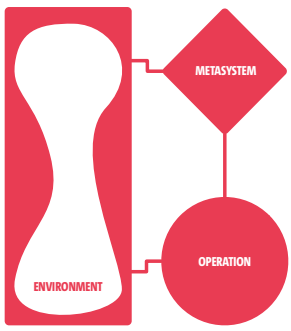

FIGURE 32. Relationship among body structures, and viable systems.

Using the system *paradigm* mentioned before, the *entire structure* can be then *drawn*:

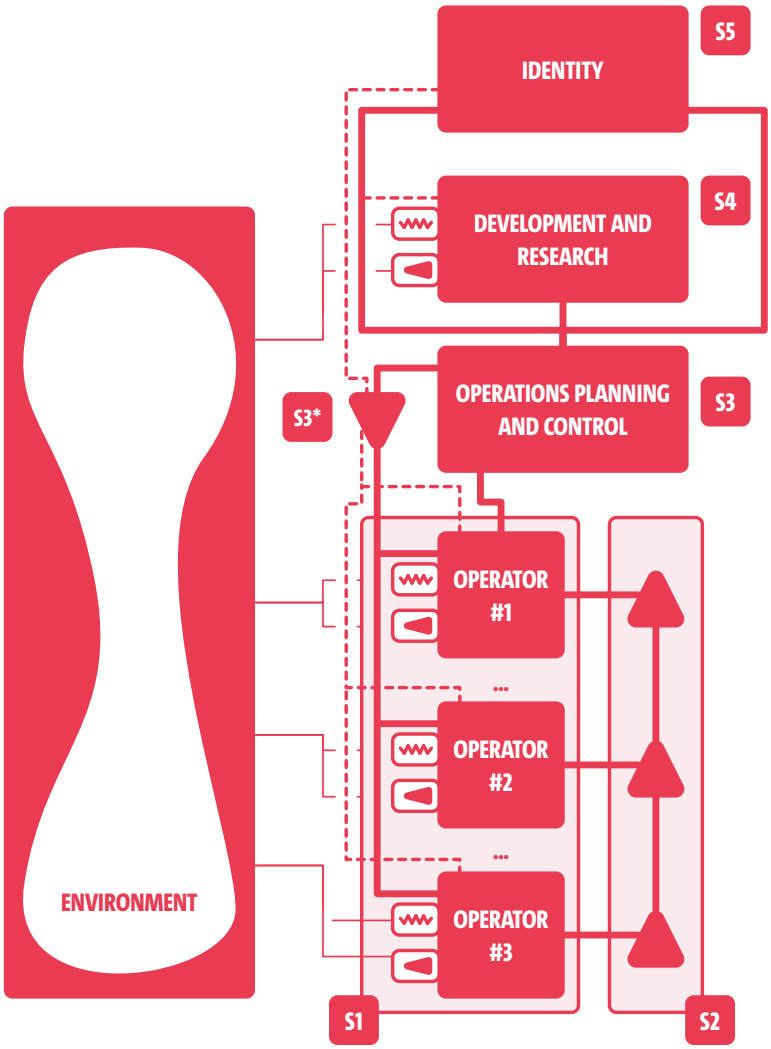

FIGURE 33. Viable system model schematic representation.

In his methodology, *Beer* uses a series of different *symbols*, *lines*, and *figures* to represent all key aspects of the viable system structure:

GLYPH	FUNCTION	DESCRIPTION
S1	System 1	Contains all primary operators, which perform all activities the entire structure may need.
S2	System 2	Represents the information channels and network systems all systems uses to communicate, and allows System 3 to coordinate any activities within System 1.
S3	System 3	Represents any structures and controls placed to establish any rules, rights, and responsibilities enforced by System 1: provides an interface to upper Systems.
S3*	System 3*	Subset system, which supports System 3, gathering information regarding the actual operation of System 1, and not fed through the main channels.
S4	System 4	Monitors all the external changes and evolution to devise how to adapt the structure and maintain the viability of the model.
S5	System 5	Performs any policy decisions within the entire structure to maintain balance and to steer its course in the environment.
	Attenuator	Filters relevant information from the entire environment.
	Amplifier	Enhances any action from the structure to be deployed to the environment.
	Regulator	Adjusts and tunes any fluctuation occurred among operators as they perform their assigned duties.
	Auditor	Evaluates any fluctuation occurred among operators, and redirects the information wherever is better managed.
	Main channel	Allows information to be steered through the entire structure.
	Environment channel	Allows information to be steered between the environment, and the structure.
	Algedonic channel	Allows generated alerts to reach any inferred system, depending on its alarm status.

TABLE 20. Resume of main glyphs -symbols, lines, figures- used in viable system model representations.

PERSONALITIES

INTRODUCTION 13

P1 **Francesco Petrarca (July 20, 1304 – July 19, 1374)**, commonly anglicised as *Petrarch*, was an Italian scholar and a poet in Renaissance Italy, considered as one of the earliest humanists. His discovery of Cicero's letters is often credited as the starting point of 14th Century Renaissance.

P2 **Cuitláhuac (circa 1476 – 1520)**, was the 10th *tlatoani* (ruler) of the Aztec city of Tenochtitlan. He ruled for 80 days; afterwards, he died of Smallpox, brought into the New World by Spanish Europeans. He was a younger brother of Moctezuma II, the previous ruler of Tenochtitlan, who was killed in the aftermath of the Massacre in the Great Temple, on 20 May 1520.

P3 **William of Ockham (circa 1287 – 1347)**, was an English Franciscan friar, scholastic philosopher, and theologian, believed to have been born in Ockham, a small village in Surrey, England. He is considered to be one of the major figures of medieval thought, and was at the centre of the major intellectual and political controversies of the 14th Century.

P4 **Daniel Bell (May 10, 1919 – January 25, 2011)**, was an American sociologist, writer, and professor emeritus at Harvard University, best known for his contributions to the study of post-industrialism. He outlined a new kind of society, based on information and services, which would eventually replace the industrial society as the dominant system.

P5 **Francisco Franco (December 4, 1892 – 20 November, 1975)**, was a Spanish general, and the dictator of Spain from 1939 until his death in 1975. A strong conservative, he was appalled when the monarchy was removed and replaced with a republic in 1931. In the aftermath of 1936 elections, where conservatives lost by a narrow margin, he staged a coup d'etat with other military forces, partially succeeding into stirring the Spanish Civil War.

P6 **Plato (428-427 or 424/423 BCE – 348/347 BCE)**, was a philosopher and mathematician in Classical Greece. He is considered as pivotal in the development of Western philosophy, founding the Academy in Athens, the first higher-learning institution in Western society. Along with his mentor Socrates, and his pupil Aristotle, Plato laid the foundations of Western philosophy and science.

P7 **Duante degli Aglighieri (circa 1265 – 1321)**, commonly referred as Dante, was one of the most relevant Italian poets of the late Middle Ages. His Divine Comedy, originally called Comedia, and eventually renamed Divina by Bocaccio, reflects how in high regard was already considered: it remains considered as the greatest literary work composed in the Italian language, and a world marvel. In Italy, he is referred as *il Sommo Poeta;* he, Petrarch, and Boccaccio are referred as *the three fountains*, or *the three crowns*.

P8 **Publius Vergilius Maro (October 15, 70 BCE – September 21, 19 BCE)**, commonly referred as Virgil or Vergil, was an ancient Roman poet of the Augustan period. He is known by three of the most relevant Latin works: the Eclogues (or Bucolics), the Georgics, and the epic Aeneid, considered as the national epic of Ancient Rome from the time of its composition to present day.

P9 **Thomas Jefferson (April 13, 1743 – July 4, 1826)**, was the principal author of the Declaration of Independence of the Thirteen Colonies from the British Empire in 1776, the third president of the United States, and regarded as an American *Founding Father*. He was an ardent proponent of democracy, and embraced the principles of republicanism and the rights of the individual, with long-lasting worldwide influence, up to our day.

P10 **Edward Joseph "Ed" Snowden (June 21, 1983)**, is an USA computer professional, former CIA employee, and USA government contractor who leaked classified information from the USA National Security Agency in 2013, infuriated about the illegal surveillance programmes and data mining from multiple collaborative enterprises.

P11 **John von Neumann (December 22, 1983 — February 8, 1957)**, was a Jewish born Hungarian and later American pure and applied mathematician, physicist, inventor, polymath, and polyglot. He made major contributions to a staggering number of fields, and pioneer of the application of the operator theory to quantum mechanics, the development of functional analysis, and a key figure on the development of game theory, and the concepts of cellular automata, the universal constructor, and the digital computer.

P12 **Jay Wright Forrester (July 14, 1918)**, is an American pioneering computer engineer, and systems scientist. He is regarded as the founder of system dynamics, which deals with the simulation of interactions between objects in dynamic systems.

P13 **Norbert Wiener (November 26, 1894 – March 18, 1964)**, was an American mathematician and philosopher. He is regarded as the originator of cybernetics, a formalisation of the notion of feedback, with implications for engineering, systems control, computer science, biology, neuroscience, philosophy, and the organisation of society.

P14 **Stafford Beer (September 25, 1926 – August 23, 2002)**, was a British theorist, consultant and professor at the Manchester Business School. He is regarded as the originator of management cybernetics, and renown for his work in the field of operational research.

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