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Augmenting the Internet with a Trust Ecosystem for inter pares interactions

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Abstract

The Internet is an extraordinary communications medium but it is not free from problems that are limiting its potential further development. In this dissertation we analyze and address some of the issues that make it an unsafe and unreliable place and we exhibit the most difficult issues that, as soon as possible, would deserve to be resolved such as: the uncertainty of the identities; the almost complete lack of privacy and of guarantees on the reliability of the counterparts (i.e., the lack of trust among people); the lack of control and ownership of the information regarding a person or a company; the lack of specific information about service providers; the exploitation of anonymity to perform malicious actions. These issues mainly arise from the very nature of the Internet which is a deregulated place where users have the possibility to act and communicate in total freedom while keeping the anonymity. However, these aspects should, in our opinion, be balanced with the protection of the fundamental users' rights.

The main goal of our research is to combine the positive aspects and the strengths of the Internet with the need to introduce environments or areas where users can enjoy greater mutual trust. To this aim, we proposed a solution to augment the Internet to make it a safer and more reliable place. Our proposal allows users to interact with higher security than at present and to have better guarantees on the respect for their rights and their needs. In other words, based on the above reasons, in this work our objective is the design of a comprehensive framework aimed at providing a trust area in the Internet that combines the online and offline world smoothly and seamlessly, including the best solutions in a single model. Our integrated and modular model is called **Trust Ecosystem** (TEco) where "ecosystem" means an environment where the entities (e.g., users and online services) preserve the system and comply with fixed rules, are proactive and responsive as each of

them, using a reward-punishment mechanism (feedback), contribute to the success of the system and, consequently, to their own benefit.

The TEco was built by integrating different innovative systems. It is a Internet-based area in which users: own a Trusted Digital Identity to authenticate keeping anonymity; establish Inter Pares Interactions based on contracted agreements and knowing each other's reputation; can be the owners of the information they produce and protect their privacy. The coexistence of these features makes the TEco a trust area. In fact, users can mutually trust, as they are all identifiable, their reputation is known and while interacting, they can bargain conditions with law effectiveness. Furthermore, depending on their needs and the demands of others, users can decide which information to disseminate, protecting their privacy or maintaining complete anonymity.

The TEco has been conceived without "upheavals" of the current Internet and for this reason the TEco can develop in parallel with it and, in any case, they can coexist. In fact, the users will not be forced to drastically change the way in which they normally use both Internet services and Web browsing.

In our view, to obtain a Trust Area there is the need of effective Trust and Reputation systems. Although new Trust, Reputation and Recommendation (TRR) models are continuously proposed in literature, they lack shared bases and goals. For this reason, in this work we pay special attention to the problems related to Trust and Reputation management that are among the most controversial issues of the Internet. So, we address trust and reputation in all their aspects and we define an innovative meta model to facilitate the definition and standardization of a generic TRR model. Following the meta model, researchers in the field will be able to define standard models, compare them with other models and reuse parts of them. A standardization is also needed to determine which properties should be present in a TRR model.

In accordance with the objectives we were seeking, following our meta model we have: defined a pre-standardized TRR model for e-commerce; identified the fundamental concepts and the main features that contribute to form trust and reputation in that domain; respected the dependence on the context/role of trust and reputation; aggregated only homogeneous trust information; listed and shown how to defend from the main malicious attacks.

Lastly, in this work, we also discuss the feasibility of the Trust Ecosystem, the compatibility with the current Internet and the things to do for putting it into practice. For this purpose, we show some scenarios that also highlight and make advantages and potentiality of the TEco fully understandable.

In the future, the TEco may also act as a "*field of comparison*" and facilitate scientific communication in the sector and, like a digital ecosystem, can play the role of a unification "*umbrella*" over significant, challenging and visionary computing approaches that emerge in parallel.