ICT FP7-ICT-2009-C
Future and Emerging Technologies - FET-Open

SOCNET: Decentralized Online Social Networks

Small of medium scale focused research project (STREP)

Work programme topics addressed
(if more than one, indicate their order of importance to the project) FP7-ICT-2009-C

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Proposal abstract

(copied from Part A, if not in English include an English translation)

The rapid proliferation of Online Social Networking (OSN) sites has made a profound impact on the Internet and tends to reshape its structure, design, and utility. The proposed project aspires to catalyze the transformational change that OSN can bring to Internet and media services by exploring the design and implementation of novel, pervasive, massive-scale Decentralized Online Social Networking (DOSN) infrastructures and services. Our main objective is to design and develop SOCNET, an open-source DOSN platform, based on a combination of advanced understanding in both theoretical and experimental approaches, methodologies and tools. To meet this objective, we plan to work on: 1) designing and demonstrating a software-platform architecture that will enable the deployment of a DOSN infrastructure on a massive scale; 2) designing, developing and demonstrating an innovative distributed storage service, efficient data distribution and media streaming algorithms that will run on top of SOCNET; 3) developing algorithms and mechanisms to support an adaptive, self-managed and fault-tolerant operation for the SOCNET; 4) introducing new mechanisms for security, trust, access control and privacy protection; 5) demonstrating the aforementioned objectives through a proof-of-concept implementation and deployment, in collaboration with Internet and media services. The models and algorithms that will be developed in the context of the SOCNET will be validated in comparison to current state of the art and their impact on future standardized technology will be assessed. Through its breakthroughs, SOCNET is expected to reinforce European industrial strengths in OSN technologies and address Europe's marginalization in a sector of strategic importance to the Future Social Internet. The proposed project will explore significant open problems and research challenges that need to be addressed in order to improve end-user experiences and to allow for a healthy market expansion in future OSN services.

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Section 1: Scientific and/or technical quality, relevant to the topics addressed by the call

1.1 Targeted breakthrough and long-term vision

The rapid proliferation of Online Social Networking (OSN) sites like Facebook and MySpace has made a profound impact on the Internet and tends to reshape its structure, design, and utility. Industry experts believe that OSNs create a potentially transformational change in consumer behavior and will bring a far-reaching influence on traditional industries of content, media, and communications. The significance and potential impact of OSNs has been recognized in the recent "Europe's Digital Competitiveness Report" published by the E.C. in August 2009. The same report recognizes Europe's marginalization in "Internet services and applications, with the US dominating the new interactive web habitat, especially blogs and social networks" (Commission of the European Communities. Europe's Digital Competitiveness Report Volume 1: i2010 — Annual Information Society Report 2009. COM(2009) 390, Aug. 2009).

The proposed project aspires to catalyze the transformational changes that OSN can bring to Internet and media services, by investigating the design and implementation of novel, pervasive, massive-scale Decentralized Online Social Networking infrastructures and services (DOSN). Our long-term vision is to enable the integration of online social-networking capabilities into all aspects of the *pervasive digital landscape*, which results from the convergence of Information Technologies, Telecommunications, Consumer Electronics and Entertainment, the digitization of content, and the pervasiveness of Internet and mobile technologies. This pervasive digital environment comprises the devices, the software and the services used by individuals and organizations for: communication, information exchange, media access, the production, consumption and dissemination of content, and social interactions over the Internet (see Figure 1). At the core of our vision lies the introduction of a network-centric "*Ubiquitous Social-Networking Layer"* (USNEL) that mediates between "netizens" and the emerging pervasive digital landscape (see Figure 2).

The impressive success of the "Social Networking 1.0" applications and services provided by advertisement-supported online social-networking portals (Facebook, MySpace, YouTube etc) offers an early glimpse to the fundamental changes that such a social networking layer can bring into computer-mediated communication, media production and content distribution. However, centralized Social Networking 1.0 solutions come with a variety of serious concerns, which are amplified by the very personal nature of social-networking-related data [SSNS10]: i) first and foremost, it is in the best interest of social networking portals to encourage users to share all their data publicly, lock this data in to discourage users from switching to other services, assume ownership of it and monetize user data by selling it to marketers. Consequently, current solutions come at the cost of user privacy as individuals are forced to trust service providers to not misuse their data or sell it to third parties. Individuals are also required to trust providers with the protection of their data against malicious hackers or repressive governments. ii) Data lock-in facilitates the development of monopolistic service providers, which have the power to enforce the use of proprietary and closed platforms, reducing competition, locking out potential competitors, and potentially harming innovation in the long term. iii) In such a context, concerned users have a very limited set of choices, namely they have to either lock-in all their data with one social networking provider or to scatter their data across different services. Sometimes, users are driven to the second choice by the application-centric design of different OSN services that are optimized to specific, application-oriented, requirements. Nevertheless, the switch between different social networking portals, in order to address different types of service, increases the cognitive cost of using OSNs and renders the management of data a difficult and time consuming endeavor for the average user. iv) Centralized approaches require a heavy investment in infrastructure in order to maintain performance and scalability, thus leading to further barriers of entry to new service providers and limiting user choice

in a market with few competitors. v) Finally, the dangers of data lock-in become even more pronounced in the envisioned scenario of the Ubiquitous Social Networking Layer (USNEL) that is integrated into our pervasive digital landscape and maintains access to the various Internet-enabled devices used by individuals and corporations to produce, distribute, consume, and annotate digital content.

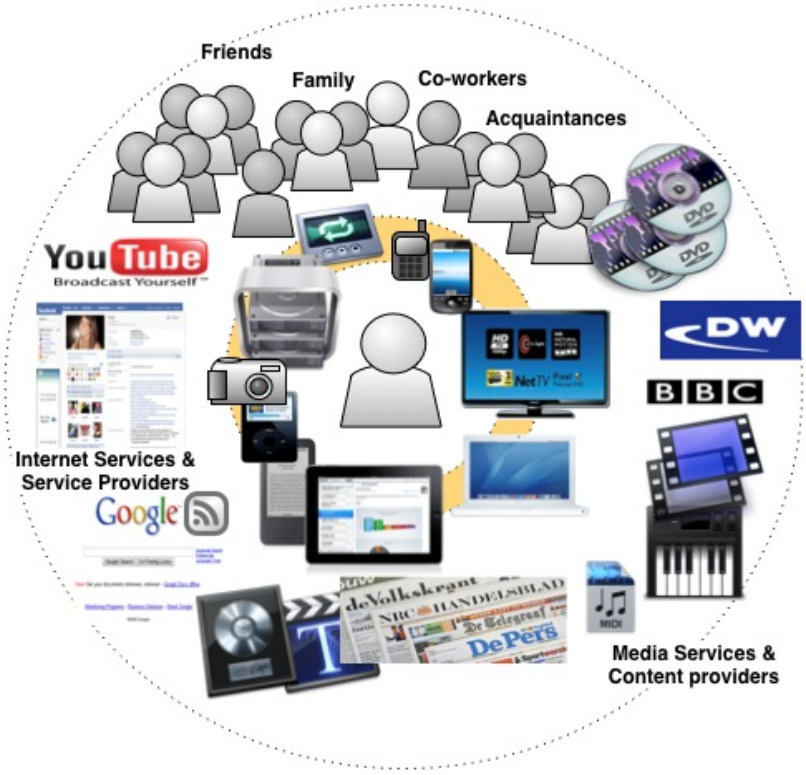


Figure 1: The pervasive digital landscape comprises devices, software, services used by an individual to interact with other individuals; to create, share, and consume digital content; to access media services; to maintain social relationships, etc.

The proposed project strives to address these concerns by investigating: i) the design of a distributed architecture for the Ubiquitous Social Networking Layer (USNEL), and ii) the development of SOCNET, a novel distributed computing substrate that provides USNEL services and supports the seamless development and deployment of new social applications and services, in the absence of central management and control. Decentralization can provide answers to issues that have raised controversy in the context of centralized OSNs, such as the ownership of personal information and the protection of privacy, problems in cross-platform service provision, and fears of personal information exploitation and user data lock-in. Furthermore, OSN decentralization promises higher performance, fault-tolerance and scalability in the presence of an expanding base of users and applications, and has been identified as a key research challenge by the recent Workshop on the "Future of Social Networking" of the World-Wide Web Consortium in April 2009.

To reach the vision of the Ubiquitous Social Networking Layer and enable the seamless integration of social networking capabilities in the emerging digital milieu, while maintaining key requirements of privacy, security, efficiency and scalability, we need to address a number several important scientific and

technical challenges that go beyond our current know-how and research results in related technologies such as Peer-to-Peer Networks and Publish/Subscribe Systems.

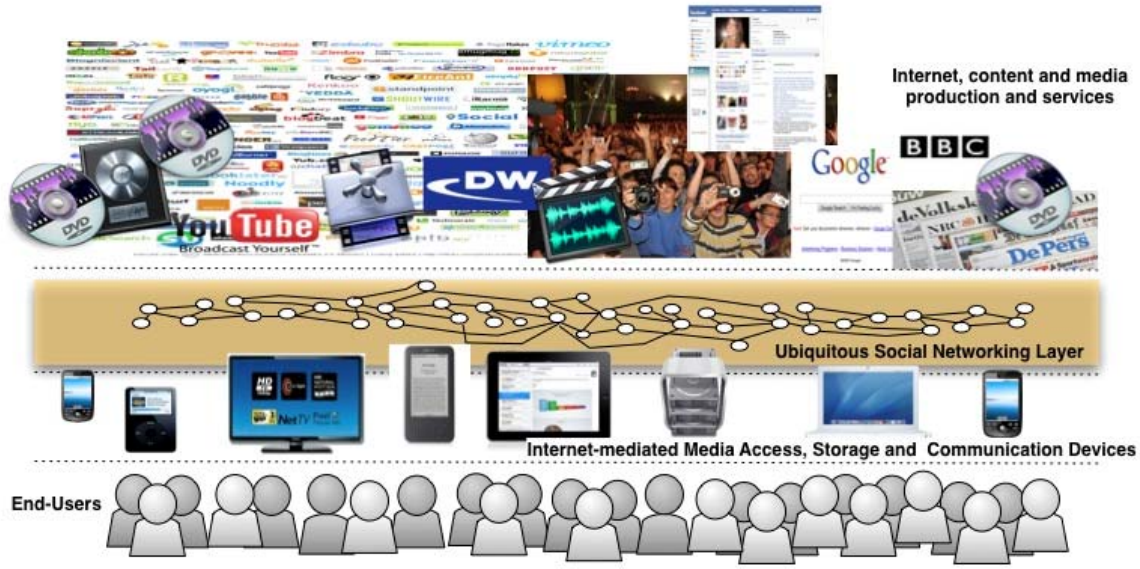


Figure 2: The envisioned Ubiquitous Social Networking Layer (USNEL) enriches the interactions that end-users have with their pervasive digital landscape, integrating social-networking capabilities in the devices that end-users employ to produce and consume digital content, and to communicate over the Internet.

In particular: i) USNEL needs to support an integrated, person-centric, application-neutral service functionality oriented around the user and her social network, rather than an application-specific functionality tailored to particular needs (e.g., file sharing, voice communication); ii) USNEL system software should be ubiquitous, device-independent and enable sharing and communication across different administrative domains; iii) USNEL architecture should impose a clean separation between data storage, social networking functionality, applications, and access control; iv) Top-level concerns are the design of scalable and secure mechanisms for access control, privacy protection, support for trustworthy interactions, and security of the infrastructure from attacks; v) USNEL should be engineered as a software platform that enables the development and secure deployment of new applications running across different administrative domains, rather than as an application-specific system; vi) USNEL should be compatible with and integrable to the emerging computational ecosystem of Cloud computing services. Last, but not least, USNEL should be robust and scalable to sustain an unlimited user base by applying novel mechanisms for self-management and self-awareness, taking advantage of emergent patterns in online social network interactions.

The proposed project plans to achieve a number of scientific and technological breakthroughs leading to:

- A paradigm shift from centralized OSN architectures to **decentralized**, **pervasive, self-managed, large-scale overlay infrastructures for OSN services**. The design of these infrastructures will enable the **seamless integration of OSN capabilities in future Internet, content, and media services**.
- The realization of **efficient distributed storage systems** that will run on top of such infrastructures, guaranteeing fault-tolerance and privacy-protection and **providing the basic storage functionality required by OSN services and applications**.
- The design of **security, trust, and privacy protection mechanisms** dealing with access control and the protection of the infrastructure and its information resources from malicious attacks.

- A deep understanding of the evolution of DOSNs in both macroscopic and microscopic level, leading to the **detection of patterns of network evolution in social networks, the identification of communities and their leaders,** and the **dynamic exploitation of such knowledge for the design of novel self-awareness and self-management DOSN mechanisms**.

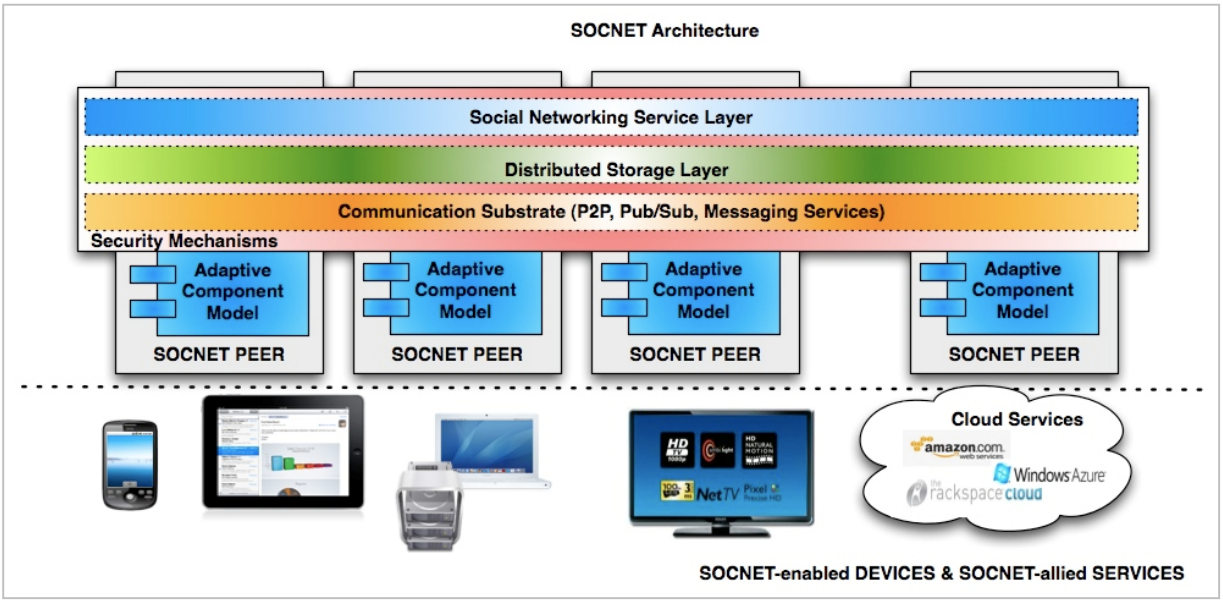


Figure 3: The envisioned SOCNET Architecture comprises peers that run on end-user devices and may use Cloud services for storage and communication while off-line. Peers are implemented on top of a component model that is adaptive and is enhanced with self-management capabilities. The component model implements the key functionalities required for a Decentralized Online Social Networking service, including mechanisms for communication, resource discovery, storage, as well as mechanisms for security and access control.

The main objective of the proposed project is to design and develop **SOCNET**, an open-source Decentralized Online Social Networking platform based on a combination of advanced understanding in both theoretical and experimental approaches, methodologies and tools. Figure 3 depicts the envisioned SOCNET architecture. To meet this objective and achieve the breakthroughs mentioned above, the proposed project will focus on the following scientific objectives:

i. Design and demonstrate a software-platform architecture that will enable the deployment of a decentralized online social networking infrastructure on a massive scale. The design of this architecture will incorporate principles of peer-to-peer overlay networking, expanding those principles in order to encapsulate self-management and pervasive capabilities. The architecture will enable the development and deployment of OSN applications and services on top of the envisioned infrastructure, and the convergence of the Decentralized OSN services with existing and emerging Internet and media services. Furthermore, it will encourage the development and evolution of innovative applications through innovative processes like crowd-sourcing.
ii. Design, develop and demonstrate an innovative distributed storage service that will run on top of the envisioned overlay infrastructure, providing the basic storage functionality required by OSN Services and applications.
iii. Develop algorithms and mechanisms to support an adaptive, self-managed and fault-tolerant operation for the envisioned infrastructure. These algorithms will take into account laws that describe the structure and evolution of social networks, the formation and dissolution of communities, the identification of community leaders, and other results from the science of Complex Networks.

iv. Introduce new mechanisms for security, trust, access control and privacy protection.
v. Demonstrate the aforementioned objectives through a proof-of-concept implementation and deployment, in collaboration with Internet and media services.

Through its expected breakthroughs, the proposed project is expected to reinforce European industrial strengths in OSN technologies and address Europe's marginalization in a sector of strategic importance to the Future Internet.

The proposed project aspires to bring a transformational change in Online Social Service provision, moving away from state-of-the-art centralized services to totally decentralized systems that will pervade our environment and seamlessly integrate with future Internet and media services.

1.2 Novelty and foundational character

1.2.1 State-of-the Art and beyond

The proliferation of rich social media, on-line communities, and collectively-produced knowledge resources has accelerated the convergence of technological and social networks and has resulted to a dynamic ecosystem of online social networking services, environments, and applications, making OSNs a new category of "killer application" on Internet [BE07, CK08, PZD10]. With OSNs becoming the most popular online activity and attracting half a billion users worldwide, researchers have started addressing a variety of interesting questions and challenges that arise in the context of OSNs. Many works are applying advanced data mining techniques to analyze and model the structure of OSN-induced communities and graphs [AHKMJ07, GGCM09, Klein07, KNT06, LLDM08, MMGFB07, SKC09]; other studies are focusing on the dynamics of OSN usage [BML09, BRCA09, CMAG08, GTCZZ09, NRC08, RVM09, VMCG09], and human aspects of OSN-mediated interaction [Join08, Smi08, WBSPZ09]. Several works are investigating the development of novel applications on top of OSN services [CCRB10, FBJW08, HKGM08, KBIK09, MV09, SNIA10], algorithms and systems for information retrieval and social search [AYLY09, AYHY09], the implications of OSN on computer networks and systems [CK08, SFKW09], and the privacy-preserving mining and publishing of OSN data [BF10].

During the last couple of years, OSN decentralization is attracting significant interest from the research and development communities. It is believed that OSN decentralization will enable end-users to maintain ownership of and control upon their data, will bring significant gains in terms of OSN scalability and performance, and will lead to an open ecosystem of OSN services and applications driven by the dynamics of online communities rather than the choices of a small handful of IT corporations. Prior research in distributed computing has produced a great wealth of knowledge in algorithms, protocols and systems for highly decentralized, efficient, and scalable content sharing on top of architectures like overlay networks [ABMK01], structured or unstructured peer-to-peer (P2P) networks [LCPS05, LT10, MKLN02, RD10, RBRG04], publish/subscribe (Pub/Sub) systems [EF03], and combinations thereof [BMPW07, ZHZ07]. Research in Decentralized Online Social Networks is building upon this knowledge. In particular, many works adopt the paradigm of Peer-to-Peer networks, because it fits nicely with the vision of self-organizing OSNs that operate in the absence of central management or hierarchical control. Recent studies focus on: i) the challenges that arise when the peer-to-peer paradigm is adopted to implement OSN over P2P [BD09]; ii) architectural alternatives for DOSN [SVCC09], and iii) the implementation of OSN functionalities over structured P2P networks [BSVD09, LP09, SSNS10, TA09] or Pub/Sub systems [SMBR10]. Also, of particular interest is the study of mobile DOSNs, where the online social network is deployed over smart-phones [BGKJ07, SMBR10, SRA10] or ad-hoc networks [SRSA10], and where bandwidth and energy efficiency represent important concerns. Current research results in system aspects of DOSN include: i) the adaptation of prior techniques to implement some of the basic social networking functionalities over structured P2P networks of Pub/Sub systems (e.g., data and query models, group management, profile sharing, content sharing, and indexing); ii) new middleware for

capturing, managing, and sharing the social network, and iii) new Application Programming Interfaces and programming abstractions for leveraging the social graph.

From the side of data protection, the development of a fully decentralized access control service for OSN is still an open issue, since the majority of proposals appeared so far adopt a centralized architecture (see [CFta] for a survey). The few proposals focusing on DOSN have one or more of the following, serious shortcomings: the inability to manage off-line nodes [CF08, DVSG08]; the high overhead implied by the security/privacy infrastructure [MPGP09]; a lack of support in trust relationships [FS09, MPGP09] or a strong limitation in the policy language [DVSG08, CMS09, FS09], and the fact that they do not prevent that the whole OSN graph can be easily recovered by a malicious party [FS09].

Some of the security and privacy issues related to social networks are also inherited from the underlying technologies currently used for developing them [AMAA08, LC08]. Currently, social networks are built as web applications, and thus they inherit all problems related to Web exploitation [BJM08, HWEJ10, SHPS10]. An effort for building a web framework for delivering social networks designed to be resistant in security and privacy problems is [dia10]. However, this effort is bounded to social networks that are based on web technologies. Today's social networks are built over users' existing trust relations; this renders them vulnerable to attack scenarios that propagate malicious content fast and efficiently. Malicious content may include malware, phishing, spam messages or even pedophile content. To make things worse, so far there is no mechanism for guaranteeing that an identity in a social network is authentic. Thus, social networks can be considered as large distributed systems suffering form common attack scenarios [D02]. In order to identify emerging security issues originating from malicious content shared in DOSNs, current security incidents reported in real-world social networks, like Facebook.com, Twitter.com or MySpace.com should be investigated. There is an ongoing effort for identifying methods and techniques for distributing malicious content in existing social networks through controlled experimentation [LAAA08, AMAA08], as well as measuring their impact [BG09]. Gathering information and data related to real-world incidents can assist in identifying threats that can target already deployed non-decentralized social networks.

Although some of the results previously discussed demonstrate the potential that P2P and Pub/Sub technologies can bring into the realization of the Ubiquitous Social Networking Layer (USNEL) vision, fundamental questions do remain on how these paradigms can be extended to cope with the whole range of OSN requirements. Traditional P2P systems support a narrow set of applications (file sharing, media distribution and collaborative work) with specific needs: efficient resource discovery in the presence of low update rates for stored resources, large-scale replication of popular resources that follow zipfian resource-popularity distributions, and simple access-rights and group-management mechanisms. In contrast, Online Social Networking systems are required to support a variety of social interactions conducted through an open-ended set of distributed applications, going beyond resource discovery and retrieval and involving: synchronous and asynchronous messaging; point-to-point and group communication; "push" and "pull" modes of information access; finer access control for reading and writing shared resources; advanced mechanisms for dynamic application deployment, version control and resource archiving; mechanisms to support crowd-sourced content production and application development, and support for a large variety of resource types and media formats. Furthermore, emerging dynamics in OSN systems and the latent structure of the underlying social networks are quite different and more complex than those observed in P2P networks; the laws that represent these phenomena should be understood and taken into account in the design of optimized DOSN software and protocols. More precisely, social networks usually share the peculiar structural characteristics of other complex networks [DM03], which are characterized by heavy-tailed distributions of node degrees and strong clustering [N03]. These two structural characteristics are mainly responsible for the superior efficiency and robustness of navigation/searching processes in such networks [BS02]. Further, it has been recently suggested that latent hyperbolic metric spaces underlie the observable topologies of complex networks

[KPKVB10]. These spaces are coarse metric abstractions of the approximately hierarchical community structure of complex networks, used to estimate node similarities. Remarkably, it has been shown that these latent spaces could be exploited to efficiently detect communities and facilitate maximally efficient navigation/search [PKBV10, BPK10]. We believe that these recent findings, as well as other facts and results from the young and active area of scientific research in complex networks, will prove extremely useful in understanding and designing efficient DOSN.

Important technical challenges need to be answered as well, due to the recent developments in personal digital content production and services that reside on digital consumer devices [KARV08]. According to the USNEL vision, social networking capabilities should be embedded in mobile phones, TV sets, cameras, portable music players, and game consoles. Although these devices are network-enabled, making their content shareable is a time-consuming process, which requires significant effort and technical expertise on behalf of the end-user. To cope with this issue, we need to come up with DOSN software components that can be easily integrated into the operating systems of digital consumer devices and adapt autonomously to the highly dynamic context of their use.

There exist a number of research efforts on adaptive and self-managed components that our work could benefit from. The MADAM project [GBE08] investigates how a middleware could assist in providing automatic adaptation of the software at run-time depending on the run-time environment. The MUSIC project [RBD09] investigates applications, which are modeled as a component framework and the utility of alternate configurations are evaluated when the execution context changes. Both projects mainly targeted the mobile platform that exhibits constraints such as limited bandwidth, computational resources and battery life. The SELFMAN project [RHR08] demonstrates how applications could become self-managed by combining two technologies: a structured overlay network and component models. The idea is to build self-managing systems as networks of interacting feedback loops by combining the robustness, scalability, communication guarantees, and efficiency of Structured Overlay Networks (SON) whereas the component model provides the framework to extend the self-managing properties of SONs over the entire application. The component model used in SELFMAN is the Kompics P2P component framework [ADH09], which allows the same code base of a P2P overlay system to be both simulated and deployed in production. OverGrid [BBG06] combines the GridKit [GCB05] and OverML [BB05] to produce a complete toolkit that assists the developers in the complete process i.e. the design process, implementation, code generation, and deployment. It combines a modeling framework for overlay design with dynamic component architecture for run-time adaptation. Within the MUSE project, work was done to deploy bundles (OSGi component) over a peer-to-peer network [FR05]. The infrastructure allowed the participants to share their bundles using a deposit request and the other participants could install and run the bundle by providing a hash of the bundle name. The infrastructure also provides for versioning of the bundles, which is a nice feature of distributing new versions of an application using a peer-to-peer network. In [WCLL09] the authors took advantage of the flexibility provided by the OSGi framework, or more specifically the OSGi Service Platform, to implement a prototype for a smart home.

1.2.2 Novelty of the proposal

In summary, the implementation of a massive-scale decentralized online social networking infrastructure to meet the vision of the Ubiquitous Social Networking Layer requires novel solutions to new and old, fundamental and technical challenges in a totally new setting:

- The lack of centralized management and control dictates that software peers that establish the substrate of the DOSN infrastructure, exhibit advanced self-management capabilities and can adapt to a highly dynamic environment. Although self-management mechanisms have been incorporated in existing large-scale distributed computing infrastructures (clusters, grids, peer-to-peer networks), the dynamics and the scale of the envisioned DOSNs are clearly different. It suffices to mention that a DOSN infrastructure should maintain its operation in the presence of

hundreds of millions of peers joining and leaving the system at will; publishing, consuming, annotating and redistributing different kinds of content on a continuous basis; communicating synchronously and asynchronously according to dynamically created communities. **A key novelty of SOCNET will be the discovery of mechanisms for incorporating self-management and adaptivity in the software peers of the DOSN infrastructure (see Tasks 1.2 and 1.3 of WP 1).**

- Large-scale distributing computing systems, like peer-to-peer networks, typically have a fixed functionality, supporting the sharing of files (music, movies), a given computing paradigm (master-slave, SETI@Home), or a standardized approach on how to invoke or deploy new software applications (Web services, Grid applications). **In the case of DOSNs, the infrastructure should be able to provide greater flexibility, efficient distributed storage systems accommodating the dynamic deployment of new applications and software updates on a massive-scale, taking advantage of underlying social network connections and viral distribution mechanisms (see Task 1.1 of WP1 and Task 2.1 of WP 2).**
- Decentralized operation will help end-users maintain the physical ownership of their private data and of their social interactions. Nevertheless, **new mechanisms would be required to secure the infrastructure, to control access to the system as well as to user data, to leverage social trust relationships in achieving infrastructure security and privacy, and to establish the secure deployment of applications and services (see WP 3).**
- The science of Complex Systems and Network Analysis has so far produced a wealth of results analyzing physical, biological, societal and technological systems and discovering laws that describe their structure and behavior. Very little has been done, so far, to take advantage of these results in the design and optimization of large-scale distributed systems. **SOCNET will capitalize on methodologies and results of Complex Systems research in order to envision the expected characteristics of massive-scale DOSN and to employ these characteristics in the design of data distribution and media streaming algorithms and mechanisms leading to optimized operation, improved scalability and adequate fault-tolerance (see Task 1.4 of WP 1 and Tasks 2.2 and 2.3 of WP 2).**

1.2.3 Scientific Foundation to be developed and Contributions to Science & Technology

SOCNET brings together a multidisciplinary group of renowned experts, from both academia and industry, to comprehensively, thoroughly, and realistically meet the objectives mentioned above, with a great potential for the development of new theories, techniques, and system design principles that could shape the future "Social Internet".

The lack of centralized engineering control makes DOSNs truly self-organized systems, and poses many scientific challenges. The realization of DOSNs will require the development of advanced mechanisms (e.g., computer programs, network protocols, social rules and incentives) to combine human behavior, computers and networks into new forms of human organization and social activity. In addition, the lack of predictive power over complex systems either designed by humans or evolved by nature, is a foundational problem in contemporary science. **Decentralized OSNs are envisioned architectures of complex distributed computer systems emerging through, and shaped by, a symbiosis between technological design and human social activities**. A profound integration of System Design and Complex Networks Theory will be needed, where the latter will take a major role in the understanding of the Social Network (formed by humans) and how it interacts with the underlying Computer Network (designed by humans).

SOCNET goes far beyond the complete design and implementation of the first large-scale DOSN. Through SOCNET a number of potentially foundational contributions to Science and Technology will be made. These include:

1. **Enabling efficient human-computer network symbiosis and interaction**, by introducing new techniques and mechanisms for letting the underlying computer system understand and efficiently exploit the context within which users socially act and live, so that users, in turn, can enjoy increased performance and better services;

2. **Enabling efficient, large-scale socially aware communications and systems**, able to seamlessly support people in their social activities;

3. **Enabling privacy and security in individuals of the social network**, by ensuring that the users have full control over personal and sensitive data;

4. **Contributing to the development of a science for the future "Social Internet"**, by applying existing theories and techniques from the new Science of Complex Networks, developing new theories and analyzing experimental data, aiming at understanding the coupling between the development of technological infrastructures and the development of society.

5. **Development of the first large-scale Decentralized OSN infrastructure and engineering principles**, providing a comprehensive approach to the design of distributed social networking infrastructures with essential characteristics and features.

The above challenges and potential contributions are described in great detail in the next Section.

1.3 S/T methodology

1.3.1 Overall Strategy of the Work Plan and S/T methodology

SOCNET is a 36 person-month project that can be subdivided into four main technical parts, together with a work package 5 devoted to project management and dissemination. As described above (and in more detail in the following sections), the main goal of the project is the development of the SOCNET platform depicted in Figure 3. The dependencies (and input–output relations) between the workpackages are depicted in the Pert diagram (Figure 6). Figure 4 depicts an abstract view of the dependencies of WPs.

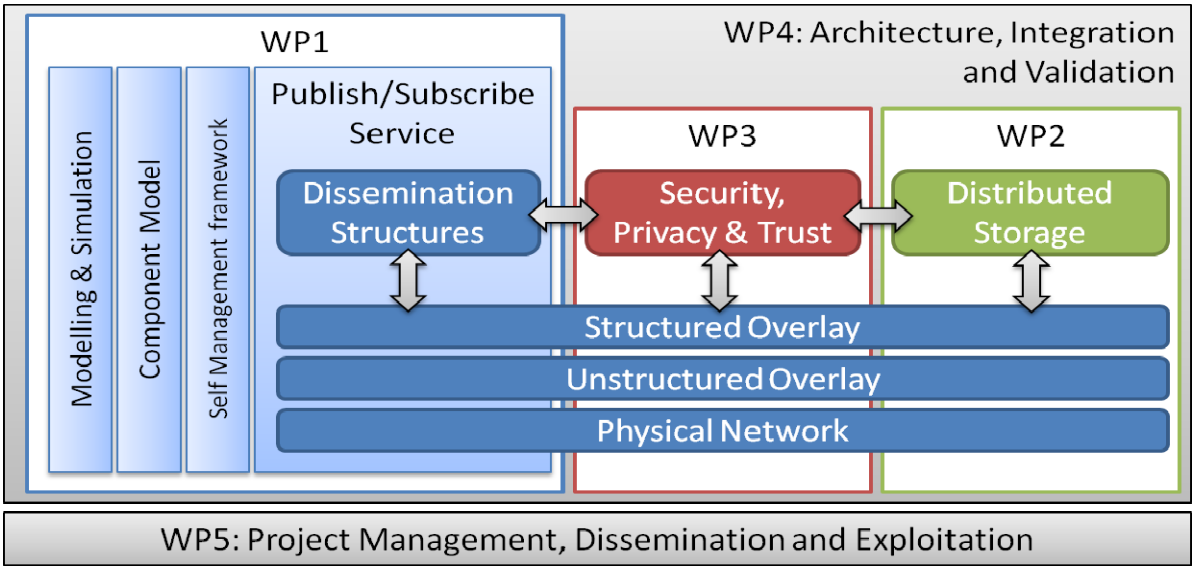


Figure 4: Dependencies between the Workpackages

Work package 1 has as main goal the design and development of the overlay services that will serve as a foundation for the development of all other DOSN services. WP1 will provide an essential decentralized publish/subscribe service, which will act as a backbone for the whole SOCNET infrastructure. It will focus on modeling and simulation, self-organization and topology awareness issues in order to guarantee efficient use of the underlying physical resources and to construct optimal data dissemination structures. WP1 will also be responsible for providing underlying P2P infrastructure for WP2 and WP3.

Work package 2 will focus on the development of a distributed storage system to aggregate user-contributed resources, hiding the complexities and making it appear as a centralized service. This WP will act as an active link between the Ubiquitous Social-Networking Layer (USNEL) realized by the overlay infrastructure in WP1 and the work on security, privacy and trust realized by WP3. Within this WP, efficient media streaming techniques and algorithms for data placement, replication and distribution will be deployed in order to support social services and applications.

Work package 3 will define an overall security architecture for SOCNET and will ensure that all the components from WP1 and WP2 meet the security requirements of this architecture. WP3 will also integrate and deploy efficient solutions to support the increasing demand for security, privacy and trust concern of OSN users. Implementation of a set of suites for decentralized trust based administration and solutions to prevent attacks through malicious content distribution in DOSNs will be provided.

Work package 4 has a higher-level goal of ensuring the technical consistency of SOCNET architecture and integration of the components produced by WP1, WP2 and WP3. In particular, WP4 will engineer the interaction and interoperability of the components designed in the previous work packages in order to provide the complete architectural design of SOCNET. Within this WP we will validate and deploy the proof-of-concept prototype of our system.

Work package 5 has as objective to keep the project on target in a way that the individual task objectives and the overall project objectives can be best achieved. Another objective of this WP is to facilitate the dissemination and exploitation of the project results into the scientific community and industry. Besides the dissemination activity, for which appropriate and standard communication media including a web site, forums, project workshops, and reports will be set up to disseminate the project results, a considerable effort will be dedicated to the exploitation of the project outcomes to industry. In general, while the four technical WPs address technical issues, WP 5 will focus on making the results of the other WPs accessible to, and readily exploitable by, industry designers and developers.

1.3.2 Gantt chart

The timing of the different work packages and their tasks is displayed in the Gantt chart below:

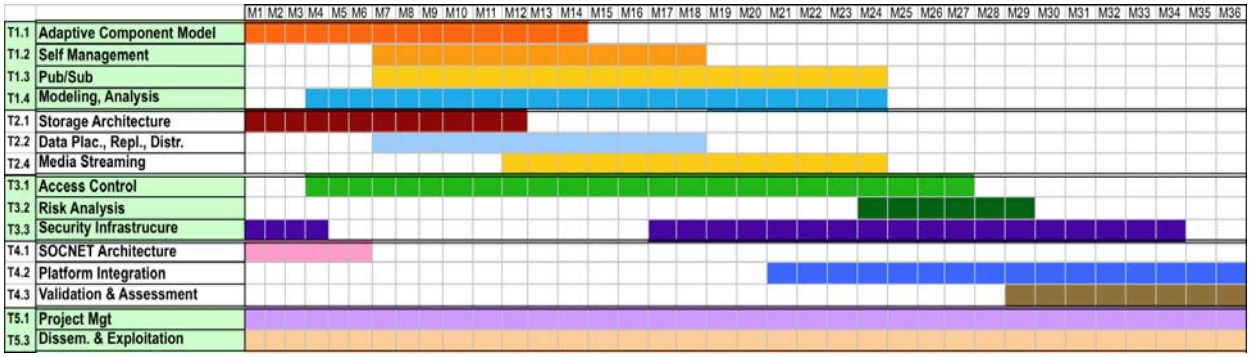


Figure 5: Gantt Chart

1.3.3 Detailed Work Description

1.3.3.1 Work Package List

Work Package No.	Work package title	Type of activity	Lead Participant No.	Lead Participant short name	Person-months	Start Month	End Month
1	Overlay Infrastructure for Decentralized Online Social Networking Services	RTD	2	SICS	88	1	24
2	Data Storage and Distribution	RTD	5	PEER	50	1	24
3	Security, Privacy and Trust in Decentralized Online Social Networks	RTD	3	INSUB	55	1	34
4	Architecture, Integration & Validation	RTD	6	FORTH	59	1	36
5	Project Management, Dissemination and Exploitation	MGT	1	UCY	40	1	36
				TOTAL	292		

1.3.3.2 Deliverables List

Del. no.	Deliverable name	WP no.	Nature	Dissemi-nation level	Delivery date (proj. month)
D1.1	Adaptive component model	1	SOFTWARE	PUBLIC	Month 18
D1.2	Large scale publish/subscribe prototype	1	SOFTWARE	PUBLIC	Month 24
D1.3	Open-source simulation tool for supporting overlay infrastructures for DOSN	1	SOFTWARE	PUBLIC	Month 24
D2.1	Report on storage architecture integration with SOCNET architecture	2	REPORT	PUBLIC	Month 12
D2.2	Experimental platform with software suite of services for data placement, distribution and media streaming in SOCNET	2	SOFTWARE	PUBLIC	Month 24
D3.1	Decentralized service on support of access control privacy protection and security threats	3	SOFTWARE	PUBLIC	Month 28
D3.2	A software platform that can produce simulated runs of virtual DOSNs	3	SOFTWARE	PUBLIC	Month 24
D3.3	A code of ethics and privacy best practices targeted at social network operators	3	REPORT	PUBLIC	Month 34
D.4.1	A proof-of-concept implementation and deployment of SOCNET platform	4	SOFTWARE	PUBLIC	Month 34
D.4.2	Validation and Assessment Report	4	REPORT	PUBLIC	Month 34
D.4.3	SOCNET Tutorial	4	REPORT	PUBLIC	Month 34
D5.1	Project website, Wiki, Social Network.	5	REPORT	PUBLIC	Month 1
D5.2	Periodic Progress Report	5	REPORT	PUBLIC	Month 6
D5.3	3 project workshop or summer school	5	REPORT	PUBLIC	Month 36
D5.4	Annual Progress and Industrial Advisory Board report	5	REPORT	PUBLIC	Month 12

1.3.3.3 Work Package Descriptions

Work package No	**1**	**Start date or starting event:**			**Month 1**		
Work package title	**Overlay Infrastructure for Decentralized Online Social Networking Services**						
Activity type	**RTD**						
Participant number	1	2	3	4	5	6	7
Participant short name	UCY	SICS	INSUB	FORTH	PEER	IBM	FNET
PMs per participant	28	42	2	0	0	16	0

Objectives

WP1 develops the basic overlay-networking platform, which will provide the foundation for the building blocks of the decentralized social networking services, to be developed within WP2 and WP3. WP1 ensures the technical consistency of SOCNET architecture. The main objectives of this work package are to:

- Build an adaptive component model and an underlying deployment platform for the SOCNET infrastructure;
- Devise the algorithms for self-management of the SOCNET network infrastructure;
- Develop efficient group-based communications and information sharing (publish/subscribe) service;
- Deploy modeling and simulation algorithms and mechanisms to support an adaptive, self-managed and fault-tolerant operation for SOCNET network infrastructure

Description of work

The work in this WP is organized around the following tasks:

Task 1.1 Adaptive Component Model [Responsible Partners: UCY, SICS]

Within this task we will develop an adaptive component model, which will provide the programming framework for developing basic social networking, communication, coordination and storage services that are the key building blocks of a DOSN system. The adaptive component model will be based on the Kompics component model (http://kompics.sics.se), developed as part of the SELFMAN EU FP6 project. Kompics is a message-passing reactive component model that is used to build and compose distributed systems and protocols. Kompics allows the same code for components to be run in both simulation and production software. Our component deployment platform will require the extension of an existing platform, such as OSGi, and optimizations to improve performance/safety trade-off of the reconfiguration operations will have to be performed. The model will support the safe addition, removal, hot swapping and reconfiguration of components at runtime. It will require the development of explicit dependency management mechanisms for components and a deployment platform for component loading, migration and replication. The component model will also support the simulation of the production components through the abstraction of the network layer and other system layers. We will apply principles from dynamic software architectures to develop algorithms for the safe adaptation of components and protocols at runtime. We will develop a component dependency model that ensures that changes to components are only allowed if they do not break contracts with existing connections to other components.

Task 1.2 Self-management [Responsible Partners: SICS, IBM]

In this task, we will design novel algorithms and abstractions for self-managing DOSNs. We will develop a self-management framework that unifies novel distributed reinforcement learning and gossiping algorithms, and enables the development of self-managing applications and adaptive protocols for the SOCNET architecture. We will design decentralized feedback models that support the monitoring and evaluation of conditions at nodes that require self-management actions, and a

feedback distribution model that enables self-management actions to propagate to relevant nodes in the system. Algorithms and abstractions developed in Task 1.2, will be integrated with and validated through the Adaptive Component Model of Task 1.1. Hence, the SOCNET infrastructure will be able to adapt to partial failures and maintain availability, as well as optimize system's performance in response to changes in resource availability.

Task 1.3 Publish/Subscribe Services [Responsible Partners: SICS, IBM]

This task aims at building a decentralized, pervasive, self-managed publish/subscribe (pub/sub) service for DOSN, in order to support information dissemination among DOSN nodes. Such a service will act as a communication backbone of the SOCNET infrastructure. It should be able to continuously self-organize and adapt itself to ever-changing properties of the DOSN. This task will consist of two stages. During the first stage we will develop a large-scale scalable topic-based pub/sub system for enabling basic DOSN functionality (e.g., publishing and receiving notifications on posted items, such as photos, status updates, message threads etc). In the second stage we will extend the service to a content-based functionality, while retaining the efficiency and scalability of the pub/sub system. This will enable complex subscription, notification and search functionality within the SOCNET, which is necessary prerequisite for a fully-fledged social network. We will use gossip-based techniques to sense the underlying network connectivity and predict user behavior patterns in order to dynamically organize nodes with similar properties into efficient pub/sub dissemination structures. We will also compare the behavior of pub/sub systems built by using unstructured gossip-based overlays, structured peer-to-peer networks, or a combination thereof. The resulting pub/sub system will be able to cope with very large numbers of users and services, and very high amounts of traffic under ever-changing network conditions.

Task 1.4 Modeling, Analysis & Simulation [Responsible Partners: UCY, INSUB]

Within this task we will develop and validate theoretical models for DOSNs using methodologies and tools from the emerging field of Network Science and Complex Networks. More precisely, we will investigate how the similarity in peers' intrinsic attributes (e.g., content and application interests, geographic location, etc.) affect the structure of the observable overlay topologies, and whether/how more similar nodes tend to connect to each other to form communities. Having a clear understanding of how the resulting overlay networks look like and what drives their formation and evolution, this task will provide insightful implications for developing algorithms and mechanisms to support an adaptive, self-managed and fault-tolerant operation for DOSN infrastructure. The next step is to evaluate and validate the theoretical models for DOSNs from an overlay network perspective. A simulation tool will be developed. A set of experiments will be conducted in order to capture key parameters that define the dynamics and users workload (users' contributions and activities) of DOSNs. The tool will be released as open-source software through the Web. For the development of the simulation tool we will consider the use the OMNET++ framework. OMNeT++ is an extensible, modular, component-based C++ simulation library and framework, with an Eclipse-based IDE and a graphical runtime environment. The datasets for the evaluation will be obtained either by crawling social media sites or by using social network aggregators.

Role of the partners:

- SICS will lead this work package to design the overlay networking infrastructure for DOSNs.
- SICS will lead Task 1.1, Task 1.2 and Task 1.3.
- UCY will lead Task 1.4

Deliverables (brief description) and month of delivery

D1.1– Month 18: Adaptive component model

D1.2 – Month 24: Large-scale publish/subscribe prototype

D1.3 – Month 24: Open-source simulation tool for supporting overlay infrastructures for DOSN

Work package No	2	Start date or starting event:		Month 1			
Work package title	Data Storage and Distribution						
Activity type	RTD						
Participant number	1	2	3	4	5	6	7
Participant short name	UCY	SICS	INSUB	FORTH	PEER	IBM	FNET
PMs per participant	0	0	0	12	16	22	0

Objectives

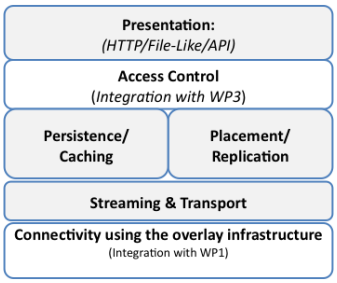
This work package will resume the very important role to develop the main storage architecture and functionality of SOCNET acting as an active link between the Ubiquitous Social-Networking Layer (USNEL) realized by the overlay infrastructure in WP1 and the work on security, privacy and trust.
In summary the main objectives of this work package are to:

- Design the storage architecture model and accompanied detailed specifications.
- Implement algorithms for data placement, replication and distribution that will support and enhance the storage functionality of DOSN services and applications.
- Develop efficient media streaming techniques to support social services and applications.
- Integrate the distributed data storage with the rest of the SOCNET project

Description of work

Task 2.1 Storage Architecture [Responsible Partners: FORTH, PEER, IBM]

In this task, we will define the architecture of a distributed storage system that should act as a replacement for a central cloud-based storage. A sketch of the envisioned architecture is illustrated here (the lightly shaded parts are core stand-alone parts of the storage systems while the others are points of integration with other WPs).



In the presentation layer, we intend to provide abstractions that will hide away the details of distributed storage, this will provide an interface through which all other SOCNET layers can store and retrieve data without being aware of the fact that the data is not located in a central place. Many possible interfaces are possible such as: an http-based service, a programmatic API or a virtual file-system. Depending on the nature of the data, it will either be persisted or transiently cached and we identify 4 different variants: a) Persistent Local Storage: data of a certain user is stored on his local node and naturally assumed that the owner of the node has access to all data in this compartment; b) Persistent Remote Storage: replicas of other users other than the owners of the local node. Naturally, this data is encrypted and not accessible by the user of the local node; c) Transient Local Storage: this is for data that is owned by other users and was made available for viewing for the user of the local node but we can afford to delete it for purposes of durability or availability; d) Transient Remote Storage: this compartment is used on storage nodes with limited storage like mobile phones for instance, in which a user can access his data and caches a small amount of it since the current node storage capacity does not allow for a full persistent storage of a user's data.

Task 2.2 Data Placement, Replication and Distribution Algorithms [Responsible Partners: FORTH, PEER, IBM]

In this task we will develop data placement, replication and appropriate data distribution algorithms for the SOCNET overlay infrastructure. The task will consist of two phases. During the first phase we will examine different methods to perform data placement, replication and distribution exploiting the trust relations of social networks. We will use existing distributed tools from the complex network theory (such as SNAP http://snap.stanford.edu/) to dynamically reveal the communities of trust and around individual peers along with their temporal and behavioral patterns. Subsequently, we will

develop the data placement and distribution algorithms based on the following techniques: i) placement and replication of data at socially trusted individuals, exploiting the community structure of social networks, ii) encrypted data placement and replication of data at un-trusted peers accompanied with appropriate distribution of cryptographic keys, ii) hybrid methods combining storage at trusted individuals, cryptographic storage at un-trusted sites, and as a final alternative, storage at the centralized sites of the SOCNET storage architecture in case of low user availability. In the second phase of this task a real-world simulation tool will be developed to test the performance of the methods under various stress conditions, and to assess the developed methods under the following criteria: data availability and accessibility, data consistency, efficient propagation of updates, user overload, load and bandwidth balancing, prone to security threats. The simulation tool will use existing traces from widely used social networks and will be launched on a large number of nodes of the real-world experimental platform, PlanetLab. The outcome of the simulation phase will be fed back to the algorithm design phase to improve the developed techniques in light of their assessment results.

Task 2.3 Media Streaming Algorithms [Responsible Partners: FORTH, PEER, IBM]

In this task we will develop the basic SOCNET functionality for the streaming of multimedia applications. The Task will be composed of three phases. In the first phase we use develop an XML model with RDF annotations to efficiently store data in strategic locations in the underlying SOCNET storage architecture. In the second phase of this Task will develop efficient distribution and streaming algorithms based on the following techniques: Firstly, algorithms based on content diffusion graphs which will exploit the underlying communities of trust dynamically formed in social networks. Secondly, an appropriate version of trackerless BitTorrent protocol will be developed to fit with the requirements of social networks and to safeguard the privacy, trust and security requirements. In the final phase of the Task a prototype will be developed that will allow an experimental assessment of the developed techniques and the adoption of corrective steps. The developed algorithms will be compared with respect to streaming efficiency, uniform bandwidth utilization, flexibility and adaptation to the dynamic nature of social network peer behavior, and under a series of usage scenarios. The experiments will be performed on the real-world PlanetLab experimental platform that provides a realistic setup for such applications and offers the possibility for large-scale experiments. The distribution and streaming techniques developed in this Task will leverage the development of novel social media applications.

Role of the partners:

- PEERIALISM will lead this work package and will be the main responsible for the development of the distributed storage layer of SOCNET. It is also responsible for tasks 2.1.
- FORTH will lead Task 2.2.
- IBM will lead Task 2.3.

Deliverables (brief description) and month of deliver

D2.1 – Month 12: Report on storage architecture integration with SOCNET architecture

D2.2 – Month 24: Experimental platform with software suite of services for data placement, distribution and media streaming in SOCNET

WP number	3	Start date or starting event:		Month 1		
Work package title	**Security, Privacy and Trust and in Decentralized Online Social Networks**					
Activity type	**RTD**					
Participant number	1	2	3	4	5	6	7
Participant short name	UCY	SICS	INSUB	FORTH	PEER	IBM	FNET
PMs per participant	0	0	34	21	0	0	0

Objectives

This work package will provide practical and efficient solutions to the increasing demand for security, privacy and trust of OSN users. The main objective of this work package are to:

- Design and implement a suite of services in support of decentralized trust-based administration and enforcement of access control policies and privacy preferences in DOSNs.
- Addressing the issue of data trust by providing a framework to assess the quality of the information shared in a DOSN and by investigating techniques able to prevent malicious (i.e., untrusted) content distribution in a DOSN.

Description of work

Task 3.1 - Access control and privacy protection services [Responsible Partners: INSUB, FORTH]

The overall goal of task 3.1 is to design an develop an innovative suite of services by which each user will be able to: (1) easily decide with whom, when and under which circumstances share his/her information, possibly by exploiting trust relationships among DOSN users; (2) locally enforce access control/privacy policies without relying on a central trusted authority. First, we will develop a trust-based access control model for DOSNs able to enforce topology-based access control rules exploiting trust relationships between DOSN users by protecting at the same time the privacy of user relationships. We will define techniques that leverage social trust relationships from DOSN to achieve a controlled information sharing, by studying how trust and distrust propagate in the network and how communities corresponding to different measures of trust are formed and evolve. All the developed techniques will be privacy-preserving, that is, they will be able to provide an accurate measure of user trust without compromising user privacy.

We will design a novel decentralized service to perform access control able to preserve the privacy of user personal and trust relationships during access control enforcement. We will explore alternative methods to achieve this and evaluate them in terms of both the robustness against privacy and security threats and their efficiency and scalability. We will also develop techniques to mitigate the effect of off-line nodes on access control decisions. Decentralized storage mechanisms for access control/privacy enforcement metadata will also be investigated, able to make access control/privacy checks efficient without exposing the needed data to security and privacy threats. We plan to test the efficiency and scalability of the devised privacy-aware information sharing methods on real-life social network data.

Task 3. 2 - Risk analysis [Responsible Partners: INSUB, FORTH]

The flexibility of topology-based access control potentially leads users to loose control of their data. Since access control/privacy policies specify authorized users at an intentional level, i.e., as constraints on relationships, the user specifying a policy might not be able to precisely identify who is authorized to access his/her resources. This possible loss of control generates serious potential risks of unauthorized information flow and it is a serious obstacle to the widespread adoption of a topology-based protection mechanism. The aim of this task is to develop techniques able to

quantify the risk connected to the specification of an access control policy/privacy preference in terms of unauthorized flow of information. We will combine and extend techniques for information flow prediction in such a way that an accurate measure can be obtained without compromising user privacy/confidentiality.

Task 3.3 - Security of DOSN Infrastructure [Responsible Partners: INSUB, FORTH]

This task will address security issues in DOSNs using three different methodologies i) Literature Study, ii) Simulation/Emulation and iii) Real-world experiments in a controlled environment. The initial phase we will perform a deep study over existing published attacks in Social Networks. In order to identify emerging security issues originating from malicious content shared in DOSNs, we plan to initially investigate current security incidents reported in real-world social networks, like Facebook.com, Twitter.com or MySpace.com. There is already an ongoing effort for identifying methods and techniques for distributing malicious content in existing Social Networks through controlled experimentation [LAAA08, AMAAIAM08], as well as measuring their impact [BG09]. Gathering information and data related to real-world incidents can assist in identifying threats that can target already deployed non-decentralized social networks.

With our understanding of already existing security threats occurring in real-world social networks, we will further proceed and investigate if these threats can be applied in DOSNs. This goal can be achieved by emulating already published threats in a controlled environment, which simulates the operation of a DOSN. We plan to reproduce all studied threat models in virtual overlays, composed by a variety of setups, parameterized with overlay size, node profile (resource capacity and network capabilities), as well as graph properties. For threat models that cannot be applied directly to DOSNs, we plan to modify as much as possible their properties, in order to create similar variants that can be applied to DOSNs.

The results of the simulated scenarios will produce a ranking table that has each threat model along with its severity. The ranking table will assist us in identifying the security risks and the impact, which is related to them. We will then carry out real-world experiments using realistic overlays composed by hundreds of nodes. We are going to use the PlanetLab (www.planet-lab.org/) infrastructure for carrying out real-world experiments. The setups that result to more severe attack scenarios, produced by the simulated runs will be used for all experiments. The real-world experiments will give us a better and more realistic picture of the security issues involved in DOSNs. They will also assist in verifying the results of the simulated runs. Finally, based on the real-world experiments we aim on building practical solutions for detecting and preventing all attack scenarios demonstrated in realistic experimental setups. All implemented security prevention techniques will be incorporated into the DOSN infrastructure to be deployed.

Role of the partners:

- INSUBRIA will lead this work package to provide practical and efficient solutions to the increasing demand for security, privacy and trust of OSN users. INSUBRIA will also undertake the leadership of Task 3.1 and Task 3.2
- FORTH will undertake the leadership of Task 3.3

Deliverables

D3.1- Month 28: Decentralized service on support of access control, privacy protection and security threats

D3.2 - Month 24: A software platform that can produce simulated runs of virtual DOSNs, which demonstrate all published security threats, associated with social networks or variants of them.

D3.3 – Month 34: A code of ethics and privacy best practices targeted at social network operators.

WP number	4	Start date or starting event:		Month 1		
Work package title	**Architecture, Integration and Validation**					
Activity type	**RTD**					
Participant number	1	2	3	4	5	6	7
Participant short name	UCY	SICS	INSUB	FORTH	PEER	IBM	FNET
PMs per participant	10	5	5	7	10	16	6

Objectives

This work package aims at providing:

- a reference model of the SOCNET architecture
- an integrated system prototype for validation, experimentation, and demonstration
- a demonstration of the SOCNET system in a number of application scenarios

Description of work

This work package will develop the SOCNET reference architecture and will integrate the main parts of the envisioned DOSN infrastructure, namely: i) the overlay network of self-managed peers providing publish-subscribe, communication and coordination functionality; basic online social networking abstractions and a platform for deploying new OSN applications; ii) the distributed storage service built on top of the overlay network and enabling OSN service provision and integration with Internet, content, and media services; iii) security mechanisms dealing with user identification and access control, information and infrastructure protection. The integrated platform will be validated through targeted experiments in three different application areas. Crowd sourcing will be adopted to allow for the development of and experimentation with new applications.

Task 4.1 – SOCNET Architecture [Responsible Partners: UCY, SICS, INSUB, FORTH, IBM]

The objective of this task is to come up with a detailed definition of architecture for the SOCNET platform. This architecture will be defined at the beginning of the project, and will comprise the overall system architecture, the architecture of SOCNET peers, the architecture of the communication and security subsystems, the software architecture and interfaces between different subsystems, the runtime system, programming abstractions and APIs that will be implemented to support application development and deployment, the definition of the self-management features, etc. A close interaction between Task 4.1 and WP1, WP2 and WP3 is envisaged at the beginning of the project. The task will determine the interoperability of the layers of the SOCNET architecture, which include, from bottom to top: the overlay network infrastructure, the data storage and distribution algorithms, and the social networking services. Furthermore, it will determine how the vertical layers on security, privacy, trust and on the structure and evolution analysis will interact with the basic building blocks under normal functionality and stress conditions. In all cases the effects of the SOCNET architecture on novel social networking applications and vice versa will be taken into consideration. The appropriate abstraction mechanisms will be employed to unambiguously specify in detail all interaction mechanisms. An analysis of privacy and security requirements at different levels of the infrastructure will be performed. Special focus will be devoted to the privacy and security requirements of the decentralized mechanism that will guarantee the communication of data and logic among layers, maximization of decentralization and independence, and the safe and seamless interoperability of the infrastructure as a whole.

Task 4.2 – Platform Integration [Responsible Partners: UCY, SICS, INSUB, FORTH, PEER, IBM]

The objective of this task is to integrate the various components implemented in WP1, WP2, and WP3, in order to provide a working prototype of the SOCNET platform. The integration effort will be guided by the reference architecture developed inside Task 4.1, and detailed further through the

developments in WP1, WP2, and WP3. The goal of the integration effort is to come with a working prototype, to prepare for a deployment of the prototype in a real testbed, and to plan for experiments that will help in evaluating the performance of the SOCNET platform against real user needs, stress conditions and results derived from simulation scenarios.

Task 4.3 – Platform Validation and Assessment [Responsible Partners: UCY, SICS, INSUB, FORTH, PEER, IBM, FNET]
In this task, we will define appropriate metrics to verify and measure the functionalities and performance of the SOCNET platform, in a real deployment scenario involving real users. To this end, we will design a plan for setting up experiments with the SOCNET platform under different application use cases. The objective of those experiments will be to perform: i) platform validation; ii) quantitative assessment of scalability, adaptivity, self-management, security and other aspects of the SOCNET platform, and iii) qualitative and quantitative assessment of SOCNET as a DOSN infrastructure for social-networking application development and deployment. Experimental results will be compared and validated against results from theoretical models and simulation studies conducted with the tools developed in Task 1.4. For the study of real use-cases, we plan to experiment with SOCNET platform and experimental applications in three different deployments involving: i) The customers of FORTHNET, a large ISP in Greece; SOCNET will be used to support typical social networking and media sharing applications. ii) The users of a large intranet belonging to a corporate customer of PEERIALISM; in that case, SOCNET will support the sharing of data and storage among corporate users; and iii) Members of scientific communities involved in the European Grid Infrastructure. SOCNET will be used to experiment with the support of scientific collaboration services over a DOSN infrastructure (sharing of data, publications, scientific practices, dissemination of knowledge, etc). The consortium will explore the use of crowd-sourcing techniques to allow for the development of and experimentation with new applications on SOCNET.

Role of the partners:

- IBM will lead this work package to perform the platform integration and validation. Also, IBM will coordinate the integration effort, leading Task 4.2.
- UCY will undertake the leadership of Task 4.1.
- FORTHNET will lead the validation and assessment, leading Task 4.3.
- All the partners will collaborate during the integration, validation and assessment.

Deliverables (brief description) and month of delivery
D.4.1.Month 34: A proof-of-concept implementation and deployment of SOCNET platform
D.4.2 Month 34: Validation and Assessment Report
D.4.3. Month 34: SOCNET Tutorial

WP number	5	Start date or starting event:		Month 1		
WP title	**Project Management, Dissemination and Exploitation**					
Activity type	**MGT**					
Participant number	1	2	3	4	5	6	7
Participant short name	UCY	SICS	INSUB	FORTH	PEER	IBM	FNET
Person-months per participant	12	4	4	4	5	5	6

Objectives

- To ensure and verify the successful scientific, administrative and financial management of SOCNET. To monitor and maximize SOCNET's scientific progress and impact.
- To initiate project activities with provisions for project and work package objectives, management and reporting processes, and clarifications of roles and responsibilities of all involved partners.
- To plan and monitor activities for the timely delivery of project outcomes with quality guarantees. To monitor and assess progress and resources towards SOCNET goals. To ensure the accelerated and timely information flow within the decision making progress. To interface SOCNET partners with the European Commission.
- To assemble and manage tools, documents and processes required for the efficient and effective communication and cooperation between consortium members.
- To prepare and establish a Consortium Agreement.
- To disseminate the results as widely as possible, through scientific publications, demonstrations, release of software prototypes, and advertisements. To organize a yearly workshop or summer school.

Description of work

This work package will be responsible for the smooth and effective operation of the project, managing and monitoring administrative, financial, dissemination and scientific activities. In particular, the work package will: (i) Monitor work in order to ensure the timely execution of the project plan, taking corrective actions when necessary. Opportunities for improving project progress, such as new application scenarios and publication opportunities, will be monitored and exploited when they occur. (ii) Monitor project expenses and the proper execution of the budget. (iii) Coordinate the collaboration and communication between the partners, introducing and operating the necessary tools (Web site, Wiki, social network, mailing lists, etc). (iv) Disseminate the results as widely as possibly, establishing relations with the industry and with organizations funding innovation (venture capital). As part of the dissemination effort, an annual workshop or summer school will be run, to create a community around the project goals and to disseminate the results. The first workshop will be in Month 18 since the first year it is too early to present project results. (v) Create an Industrial Advisory Board (IAB), consisting of interested companies as represented by their technical leadership. IAB members will observe and guide the project by regular meetings both at the project scale (presentation of overall results) and individual scale (between individual companies and partners).

Task 5.1 – Project management [Responsible Partners: UCY, SICS, INSUB, FORTH, PEER, IBM]

This task will undertake and ensure the efficient administrative, scientific, and financial management of the project. It will define the project standards and guidelines in relation to deliverables, financial reports, presentations, and dissemination. The task will organize official project meetings and reviews. The task will install and operate collaborative tools (Web site, mailing list, Wiki, social network), and will coordinate, compile, and distribute project reports. Also, the task will cover the establishment and

maintenance of financial records, the planning and monitoring of expenses, the co-ordination of cost claim submission by participant organizations, preliminary check of individual cost claims against known criteria, preparation of consolidated cost statements following the rules and format of the EC RTD Programmes, monitoring and follow-up of payments, and preparation of payment summaries to each participant and global overviews. This task will organize also all the necessary work and legal issues for contract management in SOCNET; this covers the tracking of SOCNET contract with the progress in the project to detect inconsistencies or problems, the proposal and preparation of contract amendments when necessary, the monitor of the application of the Consortium Agreement, the monitor and coordination of all the actions related with IPR.
A subtask will carry out the overall technical management and execution of the project. The subtask will ensure overall coordination of the project and resolve technical conflicts. It will closely follow-up the project progress, co-ordinate the quality assurance functions, provide continuous risk assessment and, in case of problems, it will initiate the required corrective actions in co-operation with the concerned partners.

Task 5.2 - Dissemination and exploitation [Responsible Partners: UCY, SICS, INSUB, FORTH, PEER, IBM, FNET]
This task will enrich the project website and Wiki with presentations, reports, a blog, publications, and deliverables. The task will organize project workshops and the open source dissemination of the project software. The task will complement and consolidate the technical evaluations performed in other work packages. It will give the lessons learned in the project, including general principles, insights gained, and the overall assessment of the software developed. Also, the task will explore potential applications of project results and potential collaborations with other projects and companies. Last, but not least, this task will support the establishment and operation of an Industrial Advisory Board (IAB), organizing IAB meetings at least once per year or at the request of the board members. At each meeting, the project results and directions will be presented to the board, and the board will present their conclusions. The first meeting will be held soon after the beginning of the project, and subsequent meetings will be held at least annually.
Role of the partners:

- UCY will lead this work package and Task 5.1, to perform the overall project and financial management. SICS will undertake the technical coordination of the project.
- FORTHNET will coordinate dissemination to the industrial world (Task 5.2).
- All other partners will perform their share of project management, exploitation and dissemination.

Deliverables (brief description) and month of delivery
D5.1 – Month 1: Project website, Wiki, Social Network. (continuously updated)
D5.2 - Month 6: Periodic Progress Report (every 6 months)
D5.3 – Month 36: 3 project workshop or summer school. (M18, M24, M36)
D5.4 – Month 12: Annual Progress and Industrial Advisory Board report. (every 12 Months)

1.3.3.4 Summary effort table (1.3d)

Participant no.	Participant short name	WP1	WP2	WP3	WP4	WP5	Total person months
1	UCY	28	0	0	10	12	50
2	SICS	42	0	0	5	4	51
3	INSUB	2	0	34	5	4	45
4	FORTH	0	12	21	7	4	44
5	PEER	0	16	0	10	5	31
6	IBM	16	22	0	16	5	59
7	FNET	0	0	0	6	6	12
Total		88	50	55	59	40	292

1.3.3.5 List of milestones

Milestone number	Milestone name	Work package(s) involved	Expected date	Means of verification
M1	Establishment of Management Structure & Processes	WP5	Month 1	Appointment of Supervisory Board & Sub-Committees, Administrative Project Manager
M2	Operation of Management Tools & Forms	WP5	Month 1	D5.1 Delivered
M3	Detailed Workplans for all tasks	WP1, WP2, WP3, WP4, WP5	Month 1	Report from WP leaders including working hypotheses and work plan for each task
M4	SOCNET architecture	WP4	Month 6	D4.1 Delivered
M5	1st Project review Successfully completed	WP5	Month 12	Evaluation report form EC
M6	Preliminary version of the SOCNET exploitation plan	WP5	Month 12	D5.3 Delivered
M7	Deployment of SOCNET overlay infrastructure	WP1	Month 18	D.1.1 Delivered
M8	Implementation of tools for SOCNET overlay infrastructure	WP1	Month 24	D1.2, D1.3 Delivered
M9	2nd Project review Successfully completed	WP5	Month 24	Evaluation report form EC
M10	Final version of the SOCNET exploitation plan	WP5	Month 24	D5.4 Delivered
M11	Distributed storage layer	WP2	Month 24	D2.1, D2.2 Delivered
M12	Demonstration scenarios running	WP4	Month 34	D4.2 Delivered
M13	Implementation of tools for security, access control and privacy protection	WP3	Month 34	D3.1, D3.2, D3.3 Delivered
M14	Verification and integration completed	WP1, WP2, WP3, WP4	Month 34	D 4.1, D4.2, D4.3 Delivered

1.3.4 Work Package Interdependences

The objectives detailed in Section 1.1 will be pursued by the SOCNET Consortium through the implementation of a work plan described in section 1.3.3, consisting of a total of 5 Work-Packages (WPs) spanning a temporal frame of 36 months. Several Consortium partners participate in each WP, according to their specific expertise, know-how and business interests.

WPs are independent, yet tightly related. Their execution, to be successful, calls for a significant amount of interaction, information exchange and coordination. Each WP is led by one of the Consortium partners, whose role is to coordinate the work inside the WP and interfacing and communicating with the other WPs. Each WP is further broken down into Tasks; each of them is responsible for a specific portion of the work. A Pert showing the dependencies between the tasks is provided in Figure 6.

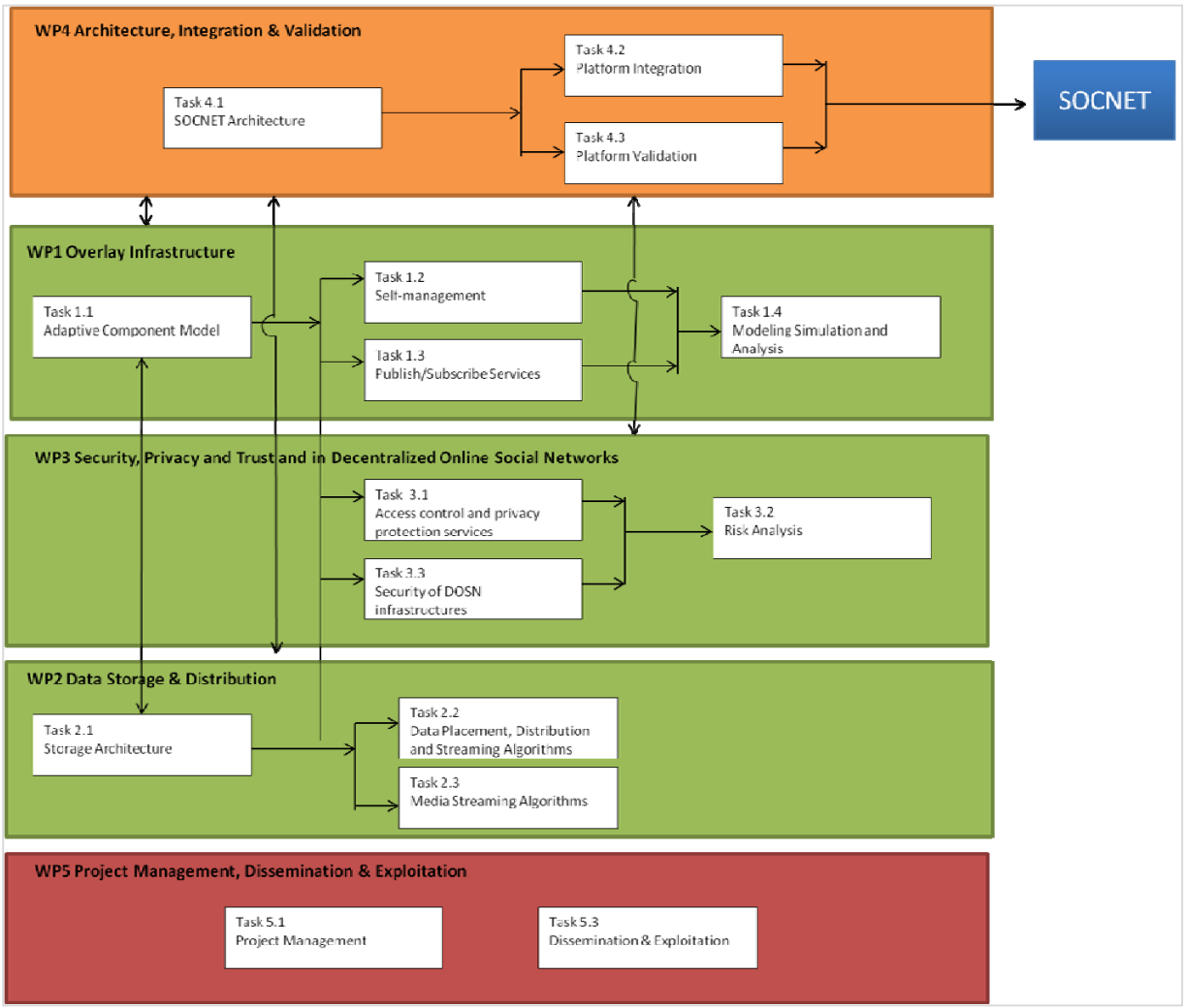


Figure 6. Pert Diagram

1.3.5 Risk Management and contingency strategies

Both the adopted methodology and the planned SOCNET lifecycle will allow a deep control about the potential risks that could arise during the SOCNET project itself. It is in fact true that there is no project without risk and that a project is all the more risky when strong innovation outcomes are expected. It has been stated as mandatory to perform during the life of the SOCNET project a "risk analysis" process. Such analysis comprises three steps:

- identification and definition of the risks;
- evaluation of the probability that the risk becomes reality during the project;
- definition of a contingency plan needed to identify actions that may anticipate the risk and prevent it from occurring. It may also be useful to identify counteractions in case a risk has occurred.

The following table lists the currently identified risks classified in three categories (technical, consortium, management), their probability and planned contingency actions.

Technical Risks		
Risk	**Probability**	**Remedial actions**
Failure to achieve the uptake of the SOCNET platform by end-users, in order to establish within the project's lifetime a "live" testbed for evaluating project results in a real setting	medium/high	The consortium will develop a strategy from the outset, inviting input from external experts in crowd-sourcing and social-media advertising. Our industry partners (IBM, PEERIALISM and FORTHNET) will be the leaders of this action. More specifically, - Strictly survey research environment and market and adopt emerging guidelines. - Interact with main equipment manufacturers and users in order to establish agreements - Share information with other researches/projects in order to orchestrate best practices and best solutions. - Interact with users and technology providers in order to understand and possibly drive trends
Reluctance by the community to decentralized paradigm shift	medium/high	- The partners will provide success stories of SOCNET platform. - Strong dissemination, organising and participating workshops, meetings and articles for sector journals - Survey authorities, to immediately receipt any emerging trend
The time-to-market of Project results is too long and this has as impact other products, technologies, systems in the same domain arrive to the market before the project results are concretely available	medium	- Strictly survey the market to early individuate potential competitors - Create a Project Users Group to immediately start to disseminate the research vision between potential users and customers - Adopt an incremental process model in order to have sooner preliminary results to be shown.
Failure to get users to recognize the privacy-implications of their behavior on social networks, and to understand and define access control policies around these behaviors	medium/high	We will start an initiative to create a code of ethics as well as privacy best practices targeted at social network operators.

Issues ("bugs") with the early releases of the SOCNET platform, resulting in negative publicity and frustration by early adopters. Resulting in the platform being abandoned.	medium	The consortium will need to rely heavily on the expertise of the industrial partners in order to release a product with high quality.
Lack of features, or under-performance of existing features in the frameworks that the SOCNET platform will be built on top of. Resulting in delays in the implementation as features will be needed to be implemented by the consortium.	low	The consortium will need to rely on the expertise of the industrial members which are already using the various frameworks that the SOCNET platform will be built on.
Issues with early releases, that the platform can be taken over and used in DOS attacks. Resulting in network operators trying to block the platform or the platform being seen as an hostile application.	low	The consortium will need to rely highly on the quality assurance methodologies that the industrial partners are using in order to produce a quality product. In addition remedial action schemes should be in place to rapidly distribute and automatically upgrade the software.
Consortium Risks		
Losing a critical partner at a crucial point in the project.	low	The consortium has been constructed with some level of redundant expertise. The most critical skills are available in at least two partners.
Disagreement among partners	low/medium	There will be strong leadership at the work package and project level. If disagreements arise, the project coordinator is responsible for solving conflict situations according to a conflict resolution mechanism that will be part of the Consortium Agreement.
Researchers might leave	low/medium	All work to be regularly documented and stored.
Bad consortium communication	low	Improve team building among members; improve communication facilities; increase face-to-face or teleconference communications.
Management Risks		
Overestimate work load	low	Put more effort on WP4 to improve the proof of concept prototype
Underestimate workload in Work packages	low/medium	Person months can be reassigned from one WP to another.
Failure to meet Milestones	medium	The consortium will ”freeze” certain developments so that other activities can continue on time, in order to reduce the impact of this risk. Tolerance levels will be taken into account in such decisions.
Unrealistic Time Schedule	medium	This is likely to happen only if Task 1 in WP1 is late, since this is the key building block for all tasks in WP2 and WP3. In that case, the other tasks of WP1 will be suppressed reassigning person months to the late task.
Inaccurate budget allocation	low	Identify necessary re-allocations among partners.

Section 2. Implementation

2.1 Management structure and procedures

2.1.1 Management structure

SOCNET recognizes that an effective management and organizational structure is critical for the success of the project. In this section, we discuss how SOCNET will ensure that project resources will be invested towards the prescribed objectives, outline an appropriate management structure, and detail the operation of control structures and internal and external communication mechanisms. The principal management responsibilities for the project are assigned to the following Project Bodies:

- **Project Co-ordination Board (PCB)**. The PCB is the highest-level management body of SOCNET. It is the ultimate decision-making authority of the project and is a body composed of all the partners only; all other project bodies report to and are accountable to the PCB. The body consists of the Project Coordinator (chairing the PCB), the Scientific Coordinator, the Administrative and Financial Manager (Secretary of the PCB with no voting rights), and representatives of all SOCNET partners. The PCB is the principal decision-making body of the Consortium and has the overall responsibility to ensure the timeliness and quality of all project deliverables. The PCB is responsible for all decisions regarding the strategic direction of SOCNET, for managing the relationship between the project and the Commission, and last but not least, for undertaking all administrative arrangements regarding the successful delivery of the project objectives. **Project Technical Board (PTB)**. The PTB is responsible for managing the project day-to-day activities and consists of the Scientific Coordinator (chairing the PTB) and the WP Leaders. The PTB is responsible for providing guidance on the technical directions of the project and for evaluating the performance of the working groups. It makes tactical technical and business decisions, and is responsible for conflict resolution.
- **Project Exploitation Board (PEB)**. The PEB is responsible for ensuring that project outcomes are in-line with SOCNET exploitation strategy and IAB (Industrial Advisory Board) feedback. All contractors can be represented in the PEB by their qualified Exploitation Managers. The PEB monitors and records project planning and execution and coordinates exploitation and dissemination activities across the project. The Chair of the PEB coordinates the activities of and liaises with the IAB.
- **Working Groups (WGs).** WGs are responsible for delivering the project outcomes associated with a particular Work Package as outlined in Section 1.3 of this proposal and consist of experts or executives selected by each partner as appropriate for the task in hand. WG members often have complementary expertise that meets the requirements of a particular work package.

There are also four principal individual management roles within SOCNET:

- **Project Coordinator (PC)**. The PC represents the project and the consortium as a whole, chairs the PCB, manages project resources, monitors overall project performance, reports to the Commission, and promotes project visibility. He is also the chair of the Project Coordination Board meetings and is the primary contact point for all formal communication between the project and the Commission as well as any other external stakeholders. The Project Coordinator will be prof. Marios Dikaiakos (short CV included in Section 2.2, in the description of partner No. 1).
- **Scientific Coordinator (SC).** The role of the SC is to lead the scientific effort and research activities of the project, to audit SOCNET's R&D performance and to ensure successful implementation of the scientific and technical objectives. The SC is responsible to resolve any issue arising from the details of the project work plan and to ensure that effective solutions to any

implementation problems or technical limitations are devised. The SC is also the direct communication link between the Project Coordination Board and those conducting the actual technical work. Finally, the SC chairs meetings of the Project Technical Board. The Project Coordinator will be prof. Seif Haridi (short CV included in Section 2.2, in the description of partner No. 2).

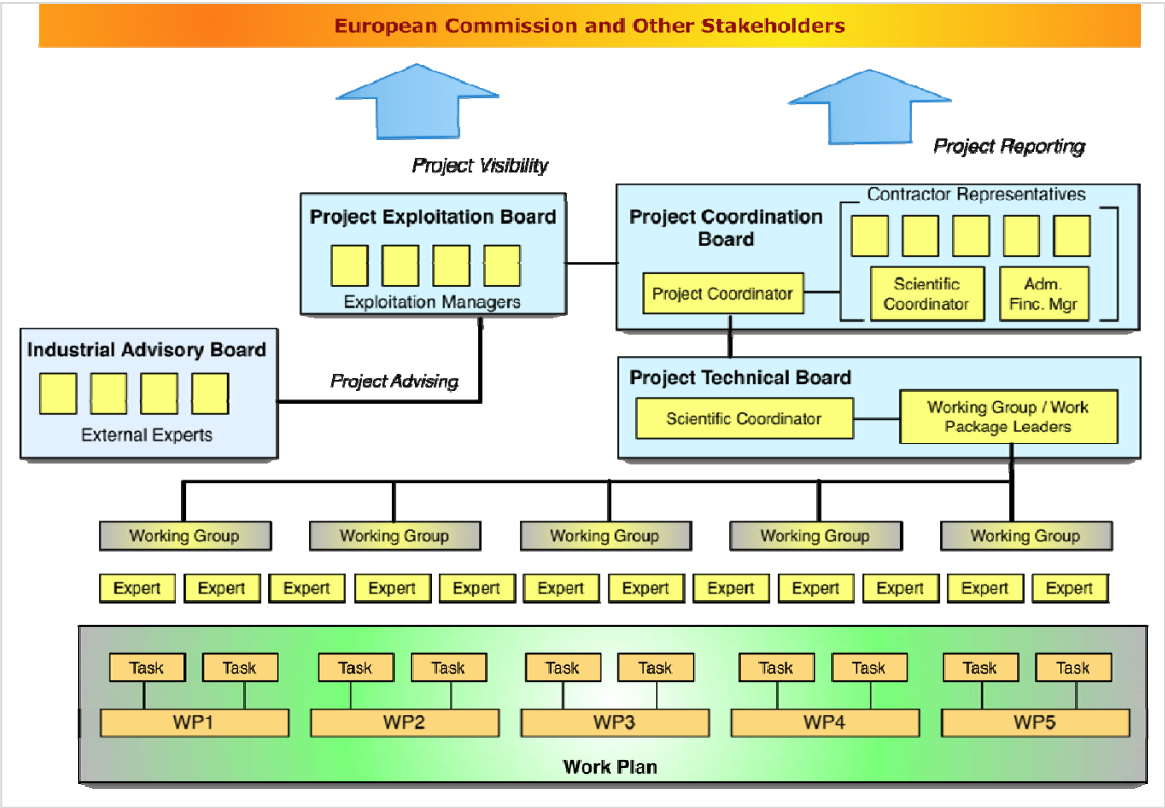


Figure 7. SOCNET Management and Organizational Structure

- **Exploitation Coordinator (EC)**. The EC will undertake and coordinate exploitation activities, such as: (i) the preparation of technical results and technological artifacts in such a way that they can be understood by an audience that may not be aware of the state-of-the-art, and (ii) the clear agreement on expectations and responsibilities by both parties, so that research results can be seen as such, and that they may require substantial work to be turned into products or product development methodologies. In particular, he shall be responsible for: (i) Identifying exploitation potential of project results, follow up all exploitation tracks and promote contacts with potential end users; (ii) Promote and coordinate actions with the Advisory Board; (iii) Regular feedback on the adequacy of research efforts towards the exploitation of related results (in collaboration with end users); (iv) Coordinate the exploitation activities and related IPR issues. The PCB will appoint the Exploitation Coordinator at the beginning of the project.
- **Administrative and Financial Manager (AFM).** The role of the AFM is to coordinate the administrative and financial matters of the project, in close collaboration with and under the supervision of the Project Coordinator. The AFM will be responsible for the distribution of funds, the preparation of financial reports and cost statements to the European Commission, the follow-up of payments, the publication of deliverables prepared by project partners, the control of conformity to quality standards, the interface with external auditors, etc. The AFM is the

secretary of the PCB (with no voting rights), in charge of preparing and managing PCB minutes. The AFM will be Mr Maria Poveda (UCY). Ms Poveda has a long experience in administrative and financial management of many successful RTD projects, funded under FP5, FP6 and FP7.

- **Work Package / Working Group Leaders**. WP Leader refers both to a contractor and its executive and implies the responsibility to ensure the streamlined execution of a particular Work Package as well as the management of the associated working group. Each WP Leader is also responsible for resolving WP internal problems, reviewing WP deliverables and reporting to the Technical Manager. Partners responsible for coordinating each WP will define Working Groups and appoint the Work Package and Working Group Leaders at the beginning of the project.

2.1.2 Project Planning and Control

At project launch, the project plan (cf. Section 1.3) will be analyzed and subdivided in individual components of more restricted scope. Each component will detail the specific steps within the proposed methodology, the responsibilities and the required resources and skills to accomplish each of the related work package objectives and contribute towards fulfilling the project milestones.

The PCB team and the WP leaders, on the basis of the Gantt chart presented in Section 1.3, will continuously monitor progress. Milestones have been defined to provide for easy checking of progress towards the achievement of final goals. Each participant will be asked by the WP Leaders to provide a short progress report on its activity and its advancement towards the established milestones at least every 3 months. Based on this, the WP Leaders will then prepare a WP progress report for the Coordinator. In case of potential delays in achieving milestones, the WP leaders concerned in collaboration will take measures with the coordinator in accordance with the risk fallback strategies (Section 1.3.5). Appropriate and timely actions will be taken against defaulting participants in the best interest of the Consortium.

An important aspect of planning in SOCNET is the definition of *tolerance levels*. Tolerance is the allowed deviation from a predetermined target. It is essential for an R&D project where outcomes cannot always be accurately predicted from the start. We define acceptable tolerance levels either in terms of achieving specific objectives or fulfilling particular deliverable levels so that correcting action does not require intervention of PCB. Tolerance is also defined for resources, costs and quality of each individual component plan, and can vary, for example tolerance is zero for those criteria that are seen as having a core influence in the successful implementation of the work-plan importance. The overall level of tolerance in the project is decided by the PCB before the launch of the project; at work-package level, tolerance levels are defined by the WP leaders and the SC.

To ensure that the work described in the SOCNET proposal is carried out in accordance to project and WP provisions and within the accepted tolerance requirements, SOCNET will implement an appropriate process to monitor and control progress. This involves activities that run through the project duration from project initiation to its close. SOCNET PMB will define specific reporting mechanisms to provide management committees the information required to monitor and control project resources, cooperation among experts and working groups, performance of the overall work and capability of specific techniques employed to deliver targeted outcomes within the time-schedule.

2.1.3 Internal Evaluation

During its lifetime, SOCNET will undergo a systematic internal and external evaluation. For internal evaluation, the Project Board will communicate regularly (by email, telephone, Skype, and meetings) to assess the project's progress and to discuss corrective measures if the progress is insufficient. Objective evaluation of the project will be done according to the following criteria:

1. Evaluation according to the *achievement of the project milestones* and satisfactory progress of the project tasks. The progress of the tasks will be judged by technical discussions between the

coordinator and the partners concerned.

2. *Scientific results*. We will evaluate the project according to the number and quality of publications in international journals and conferences and the number and quality of citations of these publications.
3. *Software results*. We will evaluate the project according to the Open Source software that is released and up-taken by end-users. Is the software of good quality? How many users adopt it and use it to support their social networking needs.
4. *Industrial and societal impact*. We will evaluate the influence of the project on the strategic decisions and results of Peerialism, FORTHNET, IBM and E.U.'s recently established social network group. What is the effect of the project on the products and strategic direction of SOCNET's industrial partners?
5. *Media impact*. Does the project have a good exposure on print and Internet media? Are the project results taken up by technical blogs?

2.1.4 Industrial Advisory Board

External evaluation will be provided by an Industrial Advisory Board formed by senior members of various European industries and academia that have expressed interest/support in the project but that could not participate directly due to time or budget constraints. IAB members will be required to to sign a Non-Disclosure Agreement with the consortium. We will also invite to the IAB representatives from the recently established E.U.'s group of social networking service providers. Over the course of the project, we will have three Advisory Board meetings. We will hold the first meeting at the beginning of the project in the Architecture Definition phase. We will hold the second meeting at month 12 at the beginning of the second phase when the first prototype is ready. We will hold the final meeting at month 24 once results from the second year experiments have been collected and analyzed. This final meeting will serve as a checkpoint before we proceed into the final phases of Evaluation. We will potentially hold an additional meeting (if budget allows) co-located with the final project review, or during a workshop or conference event where the final results of the project will be disseminated.

2.1.5 Quality Control and Assurance

The process of quality management of SOCNET includes several distinct stages of activity, starting with the definition of an appropriate quality plan and leading towards its final implementation. The quality management process has three core ingredients:

1. The **Quality System**, which reflects the structure of the project organogram (cf. Figure 7) and defines the means by which the quality management process is applied in practice.
2. The **Quality Plan** defines the quality objectives, requirements and the quality management approach for the whole project. Furthermore, it specifies the activities required for efficient implementation of the Quality System. Quality Plan actions are detailed within each work package and ensure their successful fulfillment based on detailed quality criteria for each deliverable.
3. The **Quality Control Mechanisms** refer to methods and techniques employed to measure in regular intervals the degree to which deliverables are compliant with the quality standards defined. The Project Coordinator is responsible for the implementation of the Quality Management Process (QMP) within SOCNET. Quality requirements will be qualified with measurable and specific objectives.

It is the responsibility of the SC within the WP5.2 task to identify and clarify possible WP interdependencies so as to ensure that critical deliverables, on which others depend, have been reviewed quality-wise and are accepted before they are used by other parts of the project. This is an iterative on-going process, which is necessary due to the repetitive and progressive definition of SOCNET and the inherent dependences across WPs. As the project progresses it is necessary that the quality system evolve

and be tailored to the emerging situation.

2.1.6 Confidentiality and IPR Handling

IPR Management during the project

For the success of the SOCNET project it is essential that all project partners agree on explicit rules concerning IP ownership, access rights to any Background and Foreground IP for the execution of the project and the protection of intellectual property rights (IPRs) and confidential information before the project starts. Therefore, such issues will be addressed in detail within the Consortium Agreement between all project partners. The main purpose of the Consortium Agreement is to establish a legal framework for the project in order to provide clear regulations for issues within the consortium related to the work, IP-Ownership, Access Rights to Background and Foreground IP for the duration of the project and any other matters of the consortium's interest.

Access Rights to Background and Foreground IP during the project

In order to ensure a smooth execution of the project, the project partners agree to grant each other royalty-free access rights to their Background and Foreground IP for the execution of the project. Any details concerning the access rights to Background and Foreground IP for the duration of the project will be defined in the Consortium Agreement.

IP Ownership

Foreground IP shall be owned by the project partner carrying out the work leading to such Foreground IP. If any Foreground IP is created jointly by at least two project partners and it is not possible to distinguish between the contributions of each of the project partners, such work will be jointly owned by the contributing project partners. The same shall apply if, in the course of carrying out work on the project, an invention is made having two or more contributing parties contributing to it, and it is not possible to separate the individual contributions Any such joint inventions and all related patent applications and patents shall be jointly owned by the contributing parties. Any details concerning the exposure to jointly owned Foreground IP, joint inventions and joint patent applications will be addressed in the Consortium Agreement.

Open Source and Standards

A central aim of this consortium is to provide benefit to the European community. As such, some of the project partners may be either using Open Source code in their deliverables or contributing their deliverables to the Open Source communities. Alternatively, some of the partners may be contributing to Standards, be they open standards or other. Details concerning open source code use and standard contributions will be addressed in the Consortium Agreement.

Conflict Resolution

Any project disputes that may arise, will be settled in accordance to the dispute resolution provision in the consortium agreement.

2.2 Individual participants

Participant Number	**1**	**Participant Short Name**	**UCY**
Participant Full Name		University of Cyprus; Dept. of Computer Science, Lab for Internet Computing	
Persons Responsible		Dr. M. D. Dikaiakos; Dr. G. Pallis, Dr. H. Gjermundrod, Dr. F. Papadopoulos	

Short Description of Organization: Main research organization in the Republic of Cyprus. The *Department of Computer Science* has a full-time staff of 20 faculty members, 6 visiting-faculty members, 4 teaching-staff members, over 50 full-time researchers, 300 undergraduate and 80 postgraduate students. Programs of study include a B.Sc. in Computer Science, four M.Sc. in CS, Internet Computing, Intelligent Systems, and Advanced IT Technologies, and a Ph.D. in CS. During the last 6 years, the Department has been involved in more than 130 national and European research projects with a funding of over 13 million Euros. The *Laboratory for Internet Computing* (LINC) (est. in 2002 as HPCL) is part of the CS Department. Its research activities focus on Large-Scale Distributed Computing Infrastructures (Clouds, Grids, Internet Services, Vehicular Ad-Hoc Networks), Search Computing, Web data management, Software Systems Engineering. LINC's infrastructure includes cluster facilities with 100's of CPUs, 10 TB of storage, nodes to global infrastructures (EGI Grid, PlanetLab).

Scientific Contribution in the Project: UCY will exploit its extensive know how on large-scale distributed systems and Web technologies to lead Task 1.4 (modelling, analysis and simulation) in WP1. It will also collaborate on WP4. UCY will also hold the major part of project management leading WP5.

Participation in Funded Projects: In the last 10 years, UCY/LINC has participated in over 15 research projects funded by national and European agencies: SEARCHiN, CoreGRID NOE, gEclipse, EGEE, EGEE-II, EGEE-III, EGI-Inspire, SafeWeb, eMammoth, ANWIRE, vSENSE, HealthWare, Emispher, eScienceCY

Curriculum Vitae of key staff

Dr. Marios D. Dikaiakos: Chairman of the CS Department. Assc. Professor and Director of the Laboratory for Internet Computing (LINC). Ph.D., Princeton University, 1994. Over 20 years of experience in research projects funded by European and American agencies. Over 120 original publications in books, journals and international conference proceedings; edited books, journals, and conference proceedings; open-source software releases. Founding Chair of ACM Cyprus, served as program chair and program committee member in numerous international scientific conferences, reviewer for research proposals submitted to the E.U. and to European national research agencies, and independent observer of EU proposal evaluations.

Dr. George Pallis: Lecturer. Associate director of LINC. Ph.D., Aristotle University of Thessaloniki, 2006. Editorial board member of the IEEE Internet Computing magazine and editor of the book "Web Data Management Practices: Emerging Techniques and Technologies."

Dr. Fragkiskos Papadopoulos: Lecturer in Cyprus Univ. of Technology. Res. Affiliate to LINC. Ph.D., Univ. of Southern California, 2008. Research interests in Complex Systems Analysis and Computer Networks.

Dr. K. Harald Gjermundrod: Asst. Professor, Univ. of Nicosia. Res. Affiliate to LINC. Ph.D., Washington State University, 2006. Research interests: Software Engineering, Component-based software, distributed systems.

Selected Publications

- "Querying the Data Web -The MashQL approach." M. Jarrar and M. D. Dikaiakos, IEEE Internet Computing, May/June 2010 (Vol. 14, No. 3), pp. 58-67.
- "Cloud Computing: The New Frontier of Internet Computing." G. Pallis, IEEE Internet Computing, 13(5): 70-73, Sep. 2010.
- "Sustaining the Internet with Hyperbolic Mapping." Marian Boguna, Fragkiskos Papadopoulos, and Dmitri Krioukov, Nature Communications, Vol. 1, No. 62, September 2010.

Participant Number 2	Participant Short Name	SICS
Participant Full Name	**Swedish Institute of Computer Science**	
Persons Responsible	Prof. S. Haridi, Dr. S. Girdzijauskas, Dr. J. Dowling	

Short Description of Organization: SICS is a non-profit research organization. SICS' mission is to contribute to the competitive strength of Swedish industry by conducting advanced and focused research in strategic areas of computer science, and actively promoting the use of new research ideas and results in industry and society at large. SICS works in close collaboration with industry and is an active participant in collaborative national, European and other international R&D programs. SICS has a proven record of disseminating and promoting industrial deployment of its research findings, including establishing spin-off companies and licensing of its software and patents. In 2009 SICS had a turn-over of 101,5 MSEK and a research staff of 92, of which 47 PhDs. The SICS Computer Systems Laboratory (CSL) conducts applied and fundamental research in the field of computer systems. The group has deep experience in the areas of programming languages, peer-to-peer systems, component-based software, and media distribution. The group has a successful history of transferring its research results to industry, including SICStus Prolog, Contiki operating system, more recently the media-streaming company, Peerialism.

Scientific Contribution in the Project: SICS will exploit its extensive know how on large-scale distributed systems to lead WP1. It will also collaborate on WP4 and participate to the dissemination activities of WP5.

Participation in Funded Projects: PEPITO (FP5); EVERGROW (FP6); GRID4ALL, SELFMAN (FP7)

Curriculum Vitae of Key staff:

Prof. Seif Haridi is the chief scientist at SICS, as well as a professor at KTH of the computer systems chair. He has managed a large number of EU funded research projects, including PEPITO in FP5 (see http://www.sics.se/pepito), EVERGROW in FP6 (see http://www.evergrow.org) where he was scientific coordinator, and SELFMAN in FP7 (http://www.ist-selfman.org). Haridi has extensive experience of systems development, including: leading the development of SICStus Prolog, the most widely used Prolog system worldwide, co-designing the programming language Oz and the Mozart programming platform (http://www.mozart-oz.org), leading the design of DKS, an architecture based on structured Distributed Hash Table overlay networks for large-scale distributed applications, co-developer of Scalaris, a peer-to-peer distributed transactional storage system that won first prize at the IEEE International Scalable Computing Challenge in 2008, and leading the design of Kompics, a reactive component model for adaptive distributed systems (http://kompics.sics.se).

Dr. Sarunas Girdzijauskas is a postdoctoral researcher who joined SICS in August 2009. He received his B.Sc. (2000) and M.Sc. (2002) in Informatics from Kaunas University of Technology, Lithuania, and his Ph.D. (2009) in Computer Science from Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland. During his Ph.D., he also worked at IBM Haifa Research labs (Jan-Apr 2008) on scalable pub/sub systems and content distribution.

Dr. Jim Dowling is a senior researcher at SICS. He received his B.A. and Ph.D. in Computer Science at Trinity College Dublin (1996, 2004), where he also worked as a lecturer (2001-2005) and managed the FP6 DBE project.

Selected Publications

- Jim Dowling and Seif Haridi, "Decentralized Reinforcement Learning for the Online Optimization of Distributed Systems", Reinforcement Learning: Theory and Applications, Advanced Robotic Systems Journal, Editors Cornelius Weber, Mark Elshaw and Norbert Michael Mayer, I-Tech Education and Publishing, ISBN 978-3-902613-14-1, 2008: 142-167.
- Jim Dowling, Jan Sacha, Seif Haridi: Improving ICE Service Selection in a P2P System using the Gradient Topology. SASO 2007: 285-288
- Bartosz Biskupski, Jim Dowling, Jan Sacha, "Properties and Mechanisms of Self-Organising MANET and P2P

Systems", ACM Transactions on Autonomous and Adaptive Systems (TAAS), Volume 2 , Issue 1, ACM, 2007		
Participant Number **3**	**Participant Short Name**	**INSUBRIA**
Participant Full Name	University of Insubria, Database and Web Security lab (DAWSec)	
Persons Responsible	Prof. E. Ferrari, Prof. B. Carminati, Dr. A. Trombetta	

Short Description of Organization: The University of Insubria, Italy participates to the SOCNET proposal with its Database and Web Security lab (DAWSec), a research laboratory of the Department of Computer Science and Communication. DAWSec offers a solid background in access control, data privacy and trust management. On these topics, DAWSec has well-established collaborations with the University of Texas at Dallas, King's College, U.K., and the National University of Singapore. DaWSec scientific results have been published in the most prestigious scientific journals and conference proceedings (e.g, ACM TISSEC and TODS, IEEE TKDE and TSDSC, VLDBJ, ICDE, VLDB, ICWS, CCS). DaWSec has also been extensively involved in conferences and workshops organization on topics related to the current project (e.g., ACM SIGKDD Int. Workshop on Privacy, Security and Trust in KDD, 3rd IFIP Int. Conference on Trust Management (TM'09), 15th ACM Symposium on Access Control Model and Technologies, COLLABORATECOM Workshop on Collaborative Social Networks).

Scientific Contribution in the Project: INSUBRIA will exploit its extensive know how on security, privacy and trust for social networks to lead WP3. It will also collaborate on WP4 and participate to the dissemination activities of WP5.

Participation in Funded Projects: The laboratory has been involved in a number of funded by several companies and institutions, including EU, Google, EOARD/AFOSR, and the Italian Ministry for University and Research.

Curriculum Vitae of Key staff:

Elena Ferrari, Ph.D., full professor of Computer Science, head of DAWSec. Main research interests: security, privacy and trust. On these topics she has published more than 150 scientific publications. She received the IEEE Computer Society's 2009 Technical Achievement Award for "outstanding and innovative contributions to secure data management". She is the author of the monograph on "Access Control in Data Management Systems", Morgan & Claypool, 2010 and co-editor of the book: "Privacy-Aware Knowledge Discovery: Novel Applications and New Techniques", Chapman & Hall, 2010. She will be the Area PC Vice-Chair for "Privacy and Security" of the 2012 IEEE ***International Conference on Data Engineering* (*ICDE*).** She is or has been principal investigator of research projects funded by EU, US and national agencies.

Barbara Carminati, Ph.D., assistant professor. Research interests: security and privacy for innovative applications. Barbara Carminati is the editor in chief of the Computer Standards & Interfaces journal, Elsevier press.

Alberto Trombetta, Ph.D., assistant professor, and main research interests: trust management and data privacy.

Selected Publications

- Barbara Carminati, Elena Ferrari, Raymond Heatherly, Murat Kantarcioglu, and Bhavani Thuraisinghaim. Semantic Web-Based Social Network Access Control, Computers and Security Journal, to appear.
- Anna Cinzia Squicciarini, Federica Paci, Elisa Bertino, Alberto Trombetta, Stefano Braghin: Group-Based Negotiations in P2P Systems. IEEE Trans. Parallel Distrib. Syst. 21(10): 1473-1486 (2010)
- B. Carminati, E. Ferrari, A. Perego. Enforcing Access Control in Web-based Social Networks. ACM Transactions on Information and System Security, 13(1):1–38, 2009.

Participant Number 4	Participant Short Name	FORTH
Participant Full Name	Foundation for Research and Technology-Hellas, Inst of Computer Science	
Persons Responsible	Prof. E.P. Markatos, Prof. P. Fragopoulou, E. Athanasopoulos	

Short Description of Organization: Established in 1983, FORTH is the largest Greek State R&D Centre. It hosts seven Research Institutes. The Institute of Computer Science (ICS) has established an internationally acknowledged excellence in conducting basic and applied research, developing applications and products, and providing services. Besides its pioneering contributions in the sector of Information and Telecommunications Technologies in Greece, cooperates, in the context of European and international collaborative R&D programmes, with universities, research centres and other organisations at national and international level, thus contributing to the exchange of scientific ideas and the creation and transfer of new technologies. The research directions at ICS take into consideration the state of the art, international trends, research and technological challenges worldwide, as well as the national needs of the public and private sectors. FORTH-ICS represents Greece in the European Research Consortium for Informatics and Mathematics (ERCIM), an organisation dedicated to the advancement of European research and development in the areas of information technology and applied mathematics. Staffed by four faculty members, two researchers, four staff members, and fifteen graduate students, DCS conducts state-of-the-art research in distributed computing systems, in computer networks and in network security.

Scientific Contribution in the Project: FORTH will participate in the project designing novel data distribution, placement and media streaming algorithms and will resume a main role in the design and development of the DOSN infrastructure participating in WP2. With its expertise in data monitoring and security, it will participate in WP3 identifying security threats for the DOSN infrastructure through monitoring and experimentation. It will also collaborate on WP4 and participate to the dissemination activities of WP5.

Participation in Funded Projects: SySec, WOMBAT, GN3, HellasHPC, i-Code, MALCODE, PASS, WOMBAT, Saferinternet, LOBSTER, and SysSec European Network of Excellence.

Curriculum Vitae of Key staff: Prof. Evangelos P. Markatos: received his M.S and Ph.D. degrees in Computer Science from the University of Rochester, NY in 1990 and 1993 respectively. Since 1992, he is with the Institute of Computer Science, FORTH-ICS where he is currently the founder and head of the Distributed Computing Systems Laboratory (DCS). He conducts research in several areas including distributed and parallel systems, the World-Wide Web, Internet Systems and Technologies, as well as Computer and Communication Systems Security. He has been the project manager of the LOBSTER and NoAH European projects, focusing on developing novel approaches to network monitoring and network security. He is a Professor of Computer Science in the University of Crete.

Dr. Paraskevi Fragopoulou: received her M.S. and Ph.D. degrees in Computer Science from Queen's University, ON Canada in 1990 and 1995, respectively. She is an Associated Researcher at the Institute of Computer Science, FORTH-ICS, as member of the DCS Lab. She is a Professor of Computer Science in the Department of Applied Informatics and Multimedia, Technological Educational Institute of Crete. Her research interests are in the areas of Distributed Computing, Peer-to-Peer systems, Grid Computing, Computer Networks, the Internet.

Elias Athanasopoulos: Ph.D. student in the DCS, FORTH-ISC specializing in security and social networks.

- "Antisocial Networks: Turning a Social Network into a Botnet." E. Athanasopoulos, A. Makridakis, S. Antonatos, D. Antoniades, S. Ioannidis, K.G. Anagnostakis and E.P. Markatos. In the 11th Information Security Conf. (ISC 2008), Taipei, Taiwan, Sept. 2008.
- "Imbuing Unstructured P2P Systems with Non-intrusive Topology Awareness." H. Papadakis, M. Roussopoulos, P. Fragopoulou and E.P. Markatos. In the 9th Int. Conf. on Peer-to-Peer Computing, Seattle, WA, US, Sept. 2009.
- "One-Click Hosting Services: A File-Sharing Hideout." D. Antoniades, E.P. Markatos and C. Dovrolis. In

Proc. of the 9th ACM Conference Internet Measuremet (IMC 2009), Chicago, Illinois, US, Nov. 2009.

Participant Number 5	**Participant Short Name**	**PEER**
Participant Full Name	**Peerialism**	
Persons Responsible	Dr. S. El-Ansari, Dr. M. El-Beltagy	

Short Description of Organization: Peerialism (http://www.peerialism.com) is a software company that provides solutions based on p2p techniques to improve the cost-performance of data transport and data storage over Internet. Peerialism's innovation is built on advances in p2p networks and optimization techniques: Peerialism is a leader in the area of NAT and firewall management significantly increasing node connectivity, and has developed new algorithms to optimally optimize large-scale, real-time overlay networks allowing the network to be adjusted in real-time to maximize the use of local network resources. The model adopted by Peerialism is to be able to balance the utilities of relevant stakeholders - service providers, end-users and broadband operators - in order to maximize cost-performance depending on business priorities and the overall economic value. For instance, the solution can be used to complement existing IPTV architecture and multicast solutions to lower costs, increase capacity and to support advanced video functionalities such as networked based video on demand.

Scientific Contribution in the Project: PEERIALISM will leverage its experience in data storage and media transportation and will lead WP2. PEERIALISM will also participate in WP4 and the dissemination activities of WP5.

Participation in Funded Projects: PEPITO, Evergrow and Selfman

Curriculum Vitae of Key staff:

Dr Sameh El-Ansari is an active researcher in the area of large-scale distributed systems with emphasis on p2p structured overlay networks. He holds a Bachelor's and a Master's degree in Computer Science from the American University in Cairo, and a PhD in the same discipline from the Royal Institute of Technology in Stockholm. He worked for 6 years in P2P research at the Swedish Institute of Computer Science (SICS). He is the R&D director of Peerialism where he contributed in the design of P2P video streaming algorithms as well as P2P software development tools. Dr. El-Ansary has participated in several successful EU FP6 and FP7 projects such as PEPITO, Evergrow and Selfman.

Dr. Mohammed El-Beltagy has extensive experience applying optimization, machine learning, simulation, modeling and agent-based models to a variety of business and engineering problems. He has a Bachelor's degree in Mechanical engineering design from the American University in Cairo, a Master's degree in Mechatronics from Lancaster University, and a PhD in Mechanical Engineering from the University of Southampton, England. He started his consulting expertise as a Senior Scientist at BiosGroup, Inc., where he helped optimize various aspects of the operations of Fortune 50 companies. He is a co-founder of Peerialism AB.

Selected Publications

- Supriya Krishnamurthy, Sameh El-Ansary, Erik Aurell, Seif Haridi: Comparing Maintenance Strategies for Overlays. PDP 2008: 473-482
- Marwa Sharawi, Mohammed Sammany, Mohammed El-Beltagy, Imane Saroit: Optimizing Neural Network Architecture Using Tikhonov Regularization Parameter for Intrusion Detection Systems and Classification of Attacks. IKE 2008: 291-296
- Supriya Krishnamurthy, Sameh El-Ansary, Erik Aurell, Seif Haridi: An Analytical Study of a Structured Overlay in the presence of Dynamic Membership. The IEEE/ACM Joint Transactions on Networking. October 2008.

Participant Number 6	Participant Short Name	IBM
Participant Full Name	**International Business Machines (IBM)**	
Persons Responsible	Dr. E. Dekel, B. Mandler	

Short Description of Organization: IBM's Haifa Research Lab has conducted decades of research that has proved vital to IBM's success. Currently, over 500 researchers and engineers work in HRL in areas such as systems management, virtualisation technologies, storage systems, verification technologies, problem determination, information retrieval, optimization technologies, and ICT services. In addition to its long track record in both academic and industrial research, HRL is involved in project coordination and technical leadership of FP7 projects, such as RESERVOIR, which is considered one of the flagships of EU-sponsored projects in the world of Cloud Computing. The Distributed Middleware (DM) group is part of the Software and Services Department, which is involved in developing software technologies to exploit advances in computing infrastructure to benefit businesses. The DM group focuses on scalable and highly available infrastructure for IBM middleware, extreme transaction and events processing, high throughput messaging technologies, technologies for providing Quality of Service, with a focus on dependability, in very large-scale multi-tier environments, and technologies to support hosting web applications and services in large-scale compute clouds. The DM Group organizes the International Workshop on Large Scale Distributed Systems and Middleware (LADIS), which is now in its third year and is sponsored by ACM SIGOPS. The LADIS conference was one of the first workshops to focus on the foundations of "cloud computing".

Scientific Contribution in the Project: IBM will be the leader of WP4 and leverage its experience in scalable P2P networking infrastructure and storage to participate in WP1. It will also participate in the dissemination activities of WP5.

Participation in Funded Projects: RESERVOIR (FP7), CoMiFin (FP7), GRIDCC (FP7)

Curriculum Vitae of Key staff:

Eliezer Dekel is an IBM Senior Technical Staff Member and manages the DM group in HRL. He led the development of the Distribution and Consistency Services component for WebSphere, which serves as the foundation for WebSphere's High Availability. Eliezer is the editor in chief of ICST Transaction on Financial Systems and a subject area editor for the Journal of Parallel and Distributed Computing. He is the business chair of ICST SIB Council on Future Information Systems. Eliezer served on numerous conferences program committees and organized, or served as chair in some of them. Since joining HRL in 1992, he has been involved in research in the areas of distributed and fault-tolerant computing, service-oriented technology, and software engineering. He is currently working on technologies for providing Quality of Service, with a focus on dependability, in very large-scale multi-tier environments. Eliezer is also involved in the EU FP7 ICT funded CoMiFin project. Eliezer has a Ph.D. and M.Sc. in computer science from the University of Minnesota, and a B.Sc. in mathematics from Ben Gurion University, Israel. **Benny Mandler** holds an M.Sc from Boston University, and a B.Sc. (with honors) from the Vesalius College in Brussels (VUB), majoring in Computer Science with a minor in Social Sciences. Benny co-led the development of the Distribution and Consistency Services for WebSphere. He participated in the GRIDCC EU project, and led the HRL portion of the development of IBM's General Parallel File System.

Selected Publications

- Eliezer Dekel, Gera Goft: ITRA: Inter-Tier Relationship Architecture for End-to-end QoS. The Journal of Supercomputing 28(1): 43-70 (2004)
- Alain Azagury, Michael Factor, Yoëlle S. Maarek, Benny Mandler: A novel navigation paradigm for XML repositories. JASIST 53(6): 515-525 (2002)
- Eliezer Dekel: Data as a cloud service-challenges and opportunities. Proceedings of 2nd International Conference on Autonomic Computing and Communication Systems, Autonomics 2008, September 23-

25, 2008, Turin, Italy. 2008.

Participant Number 7	**Participant Short Name**	**FORTHNET**
Participant Full Name	**FORTHNET**	
Persons Responsible	V. Spitadakis	

Short Description of Organization: FORTHNET: Forthnet S.A. is a leading provider of broadband network services in Greece. The company was the first commercial Internet Service Provider in Greece, established in November 1995. The company has more than 270.000 enterprise customers using leased lines and broadband access services; more than 320.000 voice telephony lines and 500 data center customers. Forthnet customer base comprises a major part of the Greek Internet community and the market of alternate voice telephony & network providers. The sales volume for 2005, 2006, 2007 and 2008 was 88 MEuro; 93 MEuro; 114 MEuro; 136 MEuro respectively. Forthnet has a full-time staff of 880 persons. Forthnet operates 75 Points of Presence (PoPs) in respective towns of Greece, interconnected over a high-speed backbone, as well as a network of more than 120 wireless hotspots within Greece. Forthnet group of companies recently acquired Netmed S.A., the leading satellite TV platform provider with more than 300.000 customers in Greece and Cyprus, and launched a major integration project towards converged broadband access and entertainment media services. Forthnet R&D department has participated in several European research projects such as SCAMPI (A Scalable Monitoring Platform for the Internet – IST-2001-32404), LOBSTER (Large-Scale Monitoring of Broadband Internet Infrastructure – IST-2002-2.3.5-004336) and NoAH (European Network of Affined Honeypots – RIDS-011923). It also participates into EU-MESH project (www.eu-mesh.eu) (FP7 ICT, project no. 215320) where innovative wireless mesh infrastructure is being developed, tested and assessed.

Scientific Contribution in the Project: FORTHNET will leverage its experience leading a task (platform validation and assessment) in WP4. It will also lead the dissemination and exploitation activities of WP5.

Participation in Funded Projects: SCAMPI (A Scalable Monitoring Platform for the Internet – IST-2001-32404), LOBSTER (Large-Scale Monitoring of Broadband Internet Infrastructure – IST-2002-2.3.5-004336) and NoAH (European Network of Affined Honeypots – RIDS-011923), EU-MESH project (FP7 ICT, project no. 215320)

Curriculum Vitae of Key staff:

Vassilis Spitadakis, FORTHcrs SA, Managing Director & FORTHNET SA, R&D Manager, received a Msc degree (February 1994) in telecommunications management and computer data networks. He contributed to the development of FORTHnet network - leading convergent network operator in Greece, its billing/OSS platform and the creation of the company, as technical manager (1994) and as assistant manager of FORTHnet S.A. during the start-up phase in 1995. Since September 1996, he is managing FORTHnet R&D department , mainly responsible for the coordination of market - driven research projects. He has been responsible as a co-ordinator and as partner within European projects in the area of electronic services for transportation and tourism. Since 2001, he is Chairman and Managing Director of FORTHcrs - subsidiary company of FORTHnet - providing on-line reservation services for transportation and tourism in Greece and abroad, specialised into the ferry ticketing and distribution systems and services.

2.3 Consortium as a whole

The consortium combines world-class leaders with extensive experience of research in various aspects of the theory and practice of Internet infrastructures and Complex Systems. The expertise and long-standing reputation of the partner institutions, guarantees a professional and excellent collaboration, shepherding their research in both fundamental and applied problems, and providing them with unique opportunities to gain comprehensive knowledge and hands-on experience on a variety of inter-dependent, rapidly evolving, and new research areas, all required for the efficient development of next generation Internet infrastructures.

2.3.1 Past Projects

We present the major projects that partners have been participated:

- UCY has participated in more than 15 research projects with over 2.5 million euros funding from the E.U. (SEARCHiN Marie Curie, EGEE, EGEE-III, EGI-InSPIRE, g-Eclipse, CoreGrid, CROSSGRID, Safernet etc) and the Research Promotion Foundation of Cyprus.
- FORTH currently participates in several European, and international projects, in the areas of network monitoring, network security and GRID Computing, including WOMBAT, FORWARD, MOMENT, SafelineII, PASS, WISDOM, Cyberscope, EGEE-III, and HellasGRID. FORTH has been the founder and coordinator of LOBSTER, the project that installed the largest European Infrastructure on passive network traffic monitoring consisting of more than 30 sensors distributed in nine countries and monitoring more than 2 million IP addresses. FORTH has been the founder and coordinator of NoAH, a design study which deployed a pilot honeypot-based infrastructure to detect cyberattacks over Europe. In its commitment to facilitate Safer Internet Access, FORTH has been a founding member of the Greek (http://www.safeline.gr) Hotline that is now a member of the International Association of Internet Hotlines (INHOPE). UCY and FORTH have been collaborated in several research projects (EGEE, CoreGrid etc).
- SICS has participated in and led European projects for many years (PEPITO in FP5, EVERGROW in FP6, GRID4ALL and SELFMAN in FP7). The group has a successful history of transferring its research results to industry, including SICStus Prolog, Contiki operating system, more recently the media-streaming company, PEERIALISM.
- PEERIALISM has participated in several European projects and is closely collaborated with SICS. The most recent collaboration SICS and PEERIALISM was in the SELFMAN FP7 project.
- INSUBRIA is involved in many EU supported and national projects and it participates as invited expert to the Protocol for Web Description Resources (POWDER) Working Group of the W3C. Also INSUBRIA has been involved in a number of funded by several companies and institutions, including Google.
- FORTHNET R&D department has participated in several European research projects in the past, related to synthesis and interoperability of services, mobile application and personalized services within the tourism and transportation domain, such as SCAMPI (A Scalable Monitoring Platform for the Internet – IST-2001-32404), LOBSTER (Large-Scale Monitoring of Broadband Internet Infrastructure – IST-2002-2.3.5-004336) and NoAH (European Network of Affined Honeypots – RIDS-011923). It also participates into EU-MESH project (www.eu-mesh.eu) (FP7 ICT, project no. 215320) where innovative wireless mesh infrastructure is being developed, tested and assessed.
- IBM is involved in project coordination and technical leadership of FP7 projects, such as RESERVOIR, which is considered one of the flagships of EU-sponsored projects in the world of Cloud Computing. Also, IBM has participated in the development of the Distribution and Consistency Services for WebSphere.

2.3.2 Partner complementary expertise

Each of the partners has expertise in several areas of the SOCNET project, in addition to having a particular area in which it is strongest. The coverage of scientific topics is summarized in Table 1. To summarize briefly the main expertise of each partner and one or two work packages in which it is particularly important: UCY brings expertise in large-scale distributed systems, Grids and Clouds and knowledge for modeling and simulation (useful for WP1 and WP4); SICS brings peer-to-peer systems knowledge and methodology, and knowledge about gossip algorithms and publish/subscribe systems (useful for WP1); INSUBRIA brings its expertise security and privacy knowledge for large-scale distributed systems and DOSNs (useful for WP3 and WP4); FORTH brings knowledge about distributed data management and trust (useful for WP2 and WP3); PEERIALISM specializes in high-performance media distribution and storage services for Internet (useful for WP2 and WP4); IBM brings expertise in Internet services and deployment and programming man-power (useful for WP2 and WP4); FORTHNET brings practical knowledge and product development vision (useful for WP4).

Research Areas & Expertise	UCY	SICS	INSUB	FORTH	PEER	IBM	FNET
Overlay Networks	**x**	**x**		**x**	**x**	**x**	**x**
Publish/Subscribe Systems		**x**				**x**	
Peer-to-Peer Networks		**x**		**x**	**x**	**x**	
Adaptivity & Self-Management	**x**	**x**		**x**		**x**	
Simulation & Modeling	**x**	**x**					
Distributed Storage Systems		**x**		**x**	**x**	**x**	
Distributed Data Management		**x**			**x**	**x**	
Security, Privacy & Trust			**x**	**x**			
Social Network Analysis	**x**		**x**	**x**			
Complex Systems	**x**						
Web Mining & Search	**x**		**x**	**x**			
Semantic Web	**x**		**x**	**x**			
Knowledge Management			**x**				
Data Mining	**x**		**x**				
Internet Services & Deployment		**x**			**x**	**x**	**x**
Business & Innovation Mgt					**x**	**x**	**x**

Table 1. Coverage of Research Areas and Expertise in SOCNET

2.3.3 Partners collaborations

The benefits of SOCNET to the involved partners will be far-reaching and potentially long-term. UCY has already research collaboration with SICS, IBM, INSUBRIA and FORTH. FORTH and SICS are closely collaborated with PEERIALISM and FORTHNET respectively. The partners will be exposed to the unique opportunity to interact with their participation in a high-class research collaboration network, to benefit from the exchange and cross-fertilization of ideas that will result in a deep understanding of the multitude of issues involved in DOSNs. This level of understanding cannot be achieved by a single partner alone, not even by a bilateral collaboration, but can it can become a reality by the consortium of this project. The partners will enhance their research portfolio, resume leadership and produce international excellence in the research area. The collaboration of the partners is expected to be long-term, reaching beyond the end of this project with the establishment of joint M.Sc. or Ph.D. programs.

Collaboration of researchers across these different disciplines has been very limited in Europe, however it is essential to efficiently uptake tasks such as the ones in the proposed work. This proposal provides much needed opportunities for exchange of expertise across different disciplines and formation of long-term collaborations between the academic, research, and industrial institutions involved. Academic and research partners will be able to exchange, between them, and with the industrial partners scientific knowledge and expertise in the various fields, aiming at an efficient decentralization of online social networking services. In return, industrial partners will give the academic and research partners a better understanding of how their science contributes to the accomplishment of such a task.
To summarize, the benefits to the partners of the consortium are:

- Stimulate research across different disciplines that will motivate new research and will result in long-term collaboration among the institutions.
- Produce a new generation of highly qualified young experts through exposure to various activities (research, industrial, project management, industrial, start-ups) and will serve as an asset for the next generation European research community and will continue research in emerging fields.
- Strengthen the relations between academic/research institutions and industrial partners, increasing the intake of research results by the industry on one side, the exposure of academic institutions to the development of services and applications for pragmatic problems coming from the industry.

2.3.4 Industrial Involvement

The industrial group of SOCNET includes an industrial lab that belongs to a world-leader in Internet services and infrastructures (IBM) and an SME company pioneering decentralized storage services (PEERIALISM, Stockholm). Both IBM and PEERIALISM have unparalleled experience in producing successful innovative products and services, and have a strong interest in transforming SOCNET results into innovative services. The third industrial partner, a major national broadband, satellite telecommunications and Internet Service Provider (FORTHNET, Greece) also has a strong interest in exploiting SOCNET results in the context of the services offered to its customers. Both FORTHNET and PEERIALISM are spin-offs from research institutes of the SOCNET collaboration (FORTH and SICS). Industrial partners will bring invaluable experience to SOCNET. The consortium will exploit this experience by integrating the industrial perspective in its research activities: industrial partners will be represented in the Supervisor Board of SOCNET; they will provide access to valuable datasets and know-how.

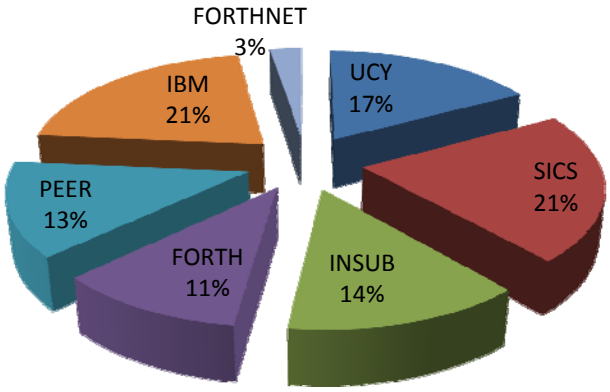
2.3.5 Management know-how and experience of the Coordinator

The Project Coordinator (Marios D. Dikaiakos) possesses outstanding academic leadership and research experience in conducting and administrating national and international research projects (for a more detailed description see profile in Section 2.2). His scientific competence in the areas of Network-Centric Computing, together with his record in establishing and managing a fast growing research laboratory, will greatly benefit this project. In particular, the Coordinator:

- Established and is leading the Laboratory of Internet Computing (formerly High-Performance Computing Systems Laboratory - http://grid.ucy.ac.cy), which has undertaken more than 15 funded projects since year 2001, attracting more than 2.5 MEuros from different funding agencies (IST/FP5, IST/FP6, Safernet Initiative, Eumedis, Research Promotion Foundation of Cyprus, Planning Bureau of the Republic of Cyprus). HPCL was a member of the CoreGRID Network of Excellence and has participated in other networks of scientific collaboration, such as APART-II, Anwire, and NexWay. In all these projects, Dr. Dikaiakos was principal institutional investigator or principal investigator and coordinator. Dr Dikaiakos has also worked as researcher and/or faculty member in Cyprus, the U.S.A, France, and Greece.
- Currently leads the Marie Curie TOK *SEARCHiN* project, which has brought to UCY 5 post-doctoral fellows and several senior researchers from Belgium, Greece, USA and the UK. The two post-doctoral alumni have acquired faculty positions in Cyprus and Palestine.
- Has served as Independent Observer of the FP7/ICT research proposal evaluation exercises, and as evaluator of research proposals and projects under FP5, FP6.
- Has served as National Representative of Cyprus to the IST Committee, the administrative body of the IST program under FP5. He is currently a member of the advisory board of the Cyprus State Library and is often invited to testify as expert in parliamentary committees of the Cyprus House of Representatives on IT issues.

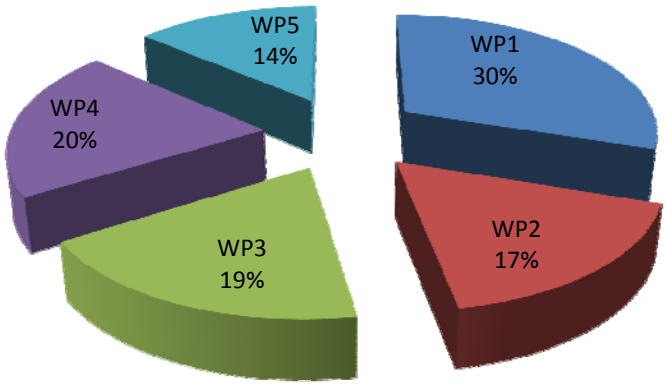
2.4 Resources to be committed

The total budget estimated for the SOCNET Project is about 3.13 M€ composed of a total estimated effort of about 292 person/months and corresponding to 2.15 M€ of requested EC contribution. The requested budget sharing per partner is well balanced. This ensures a good continuity in the commitment in the Project objectives and activities of all involved organizations. The following diagram reports these percentages:



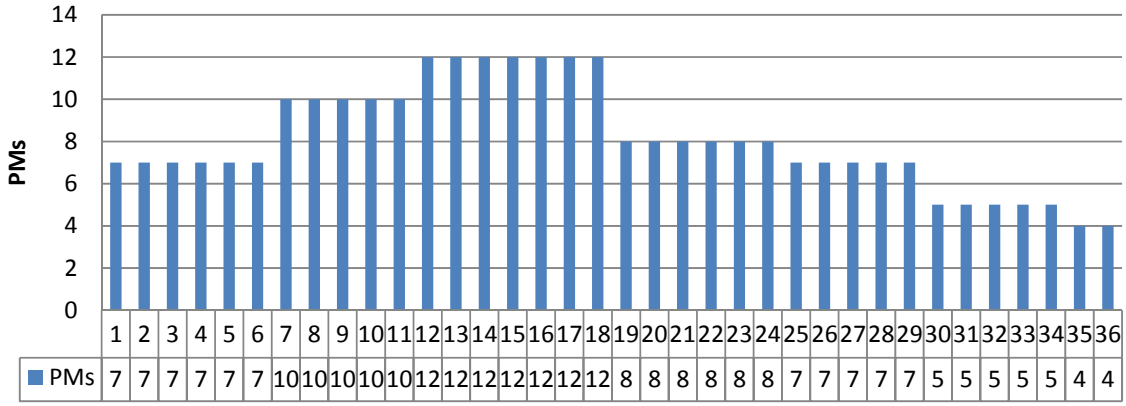
Industry partners receive about one third (37%) of the total requested budget. It has to be highlighted that industrial involvement in this Project is significant in terms of planned effort and costs and also in terms of requested contribution. On the other hand it has to be confirmed that involved industrial partners are strongly committed on this Project because they foresee real business opportunities coming from the expected results of the Project itself.

Concerning the planned effort, the following diagram reports the person/months per WP as described in the implementation part:



The planned effort is well shared among work packages, with no major peaks. Design and development activities receive 66% of the total effort, while integration, validation and trials receive 20% of the total effort. It has to be highlighted that activities related to project management, dissemination and exploitation of obtained results receive 14% of the total effort, this to enforce and address the need to obtain really usable and exploitable results.

The planned 292 person/months over 36 months of the duration of the full Project generate an amount of about 8 person/months per month at the consortium level for the full duration of the Project. The spread of needed resources over the whole duration of the Project is not uniform. The following diagram represents how the planned resources will be used during the 26 months:



The Project lifecycle has a peak in the first part of the second year, where a number of parallel actions are taken places (see Gantt chart – section 1.3.2). The involvement of resources decreases in the second half of the third year, up to the conclusion of the last quarter when quite only demonstration activities are planned.

Going back to costs, the following assumption have been done:

- Partners with a budget over the threshold determined by the Commission rules receive 3500 € as Management costs due to the production of Audit Certificates.

- All partners receive 15000 € as R&D costs and 2000 € as Management costs due to travels and equipments. For IBM and FORTHNET, the travel budget is included in their overhead rate. UCY as coordinator receives 15000 € as Management costs.

Proposal Submission Forms

EUROPEAN COMMISSION

7th Framework Programme for Research, Technological Development and Demonstration

A3.2: Budget

Participant number	Organisation Short Name	Organisation country	Estimated budget (whole duration of the project)							Total receipts	Requested EC Contribution
			RTD	Demonstration	Coordination	Support	Management	Other	Total		
1	UCY	CY	364070	0	0	0	102150	0	466220	0	375203
2	SICS	SE	596800	0	0	0	18156	0	614956	0	465756
3	INSUBRIA	IT	381069	0	0	0	7600	0	388669	0	293402
4	FORTH	EL	299200	0	0	0	9600	0	308800	0	234000
5	PEERIALISM	SE	340800	0	0	0	13760	0	354560	0	269360
6	IBM	IL	855003	0	0	0	33500	0	888503	0	461002
7	FORTHNET	EL	108000	0	0	0	0	0	108000	0	54000
		Total	2944942	0	0	0	184766	0	3129708	0	2152723

Section 3. Impact

Online social networking is a complex, large and rapidly expanding sector of the information economy, with a far-reaching potential impact. User-generated content is already bringing notable changes in the traditional content/media industry structure. In the future, community features will be an integral part of all digital experiences - from information/publishing to business and entertainment. Companies providing services for social networking and media or adding social networking features to existing services must anticipate significant growth.

3.1 Transformational impact on science, technology and/or society

Online Social Networking (OSN) sites are today the most relevant phenomena on the Internet and they are reshaping the way we use it both as end users and IT developers. The phenomenon is continuously growing, as witnessed by the recent data released by Hitwise analytics (http://weblogs.hitwise.com/heather-dougherty/2010/11/facebookcom_generates_nearly_1_1.html), according to which Facebook accounts for almost 25% of all US online traffic, mobile notwithstanding. This means that Facebook has nearly four times the traffic than the second most-visited site, YouTube (6.39%), and is miles ahead of Google's traffic (5.32%). Even as Google sites are added together, Facebook is still US' most popular website. These numbers are just an example of the significance and potential impact of OSNs. However, one of the most serious drawback of today OSNs is that they rely on a centralized architecture. Decentralization of OSNs has been identified as a key research challenge by the social networking community, expected to reshape the Internet structure. Although decentralization of OSN facilities has been recognized by many as a future Internet killer application, up to now no well-developed and mature proposal has appeared. The relevant research has just recently gained momentum, and the space of potential ideas and solutions is still far from being widely explored (see section 1.2.1). The ambition of SOCNET is to give an answer to this pressing need.

The envisioned SOCNET infrastructure is not a pipe dream; it is financially feasible and can bring transformational impact on science, technology and society for the following reasons. First, the super-giant star topology in large portals dictates an expensive infrastructure. For example, Credit Suisse Estimated that YouTube may be losing over $300 million per year (http://tinyurl.com/youtube300M2009). Especially for personal information that is shared between a small number of individuals (such as the numerous baby videos shared on YouTube) a distributed topology is more scalable. Throughput drives the design of decentralized servers. In a distributed context, individuals with PCs can easily afford the computation and networking cost for personal services. Furthermore, it has been postulated by the social science community that people can maintain a relatively small number of stable social relationships. The limit, known as the Dunbar's number (a theoretical cognitive limit to the number of people with whom one can maintain stable social relationships), is commonly believed to be approximately 150. Second, while decentralized social networking does not seem to support advertisement-based models at first glance, it may eventually provide an even better marketing opportunity, allowing the data owner full participation in terms of financial rewards while preserving the privacy of the most sensitive information. Our safe haven of personal information is a marketer's dream because it has all the information about the user's interests. For example, it may contain not just the purchase history from a single site, but history across all stores, online and offline. We advocate a model where advertisers run applications on users' machines. With SOCNET access control policy enforcement, application may access the personal information during the computation but only export information they are explicitly allowed to. For example, a department store may broadcast all the sales items, while an application running on a cell phone can determine which sales items are most appropriate and display those to the end user, without sending personal information such as whose birthday presents the user is buying. Also, we are encouraged by the history of how the closed, walled garden of AOL failed to

compete against the forces of the open Internet. SOCNET will allow users to have control of their data. At the societal level, data lock-in has the tendency of creating an oligopoly, or even a monopoly. When there is a lack of competition, it goes without saying that the consumers suffer, and it is clear that proprietary and closed platforms give the owners the right to limit competition. For example, Apple has strict regulations on the kinds of applications that can be run on the iPhone, and has used these to justify locking out potential competitors. The need for people to interact and share is so fundamental, so people should interact freely with whomever regardless of the vendor they choose. Finally, it is alarming how much intimately personal information some people (particularly those belonging to generations that have grown up using online services) are willing to divulge on OSNs. Beyond basic privacy issues, the difficulty of turning down friends and the lack of good access controls are some of the biggest causes of concern. For example, multiple incidents of job loss as a result of employers gaining access to private information shared on social networks have been reported. Even ignoring the potential for this type of accidental sharing, it is hard to ignore the fact that today's social networking portals either claim full ownership of all user data through their seldom-read end user license agreements (EULA), or stipulate that they reserve the right to change their current EULA without any notice to the users (in effect, meaning that they could retroactively claim ownership of the data at any time in the future). Given these facts, it is very alarming that we leave the stewardship of all this personal data to an enormous and unaccountable company; public outcry would be to no avail were such a "big brother" company to fail and need to sell its data assets. By amassing large amounts of private data in one place, we are not only running the risks already mentioned, but we are also creating an opportunity for large-scale fraud. Like any large collection of valuable information, it would be the target of hackers, crooked employees and malicious organizations.

Within SOCNET project, we will strive to go well beyond the current state of the art and related technologies in a number of fields, such as Peer-to-Peer networks, publish/subscribe systems, decentralized architectures, fault-tolerance and privacy and security. This can only be achieved with a consortium that span the national boundaries and combine some of the best groups with the aim of maintaining Europe one step ahead. In particular, the SOCNET technologies will be disruptive in at least four senses:

- The SOCNET will enable the development of new, effective, useable tools for end-users that will not be forced anymore to totally delegate the control of their data to a particular social network, because this is the only way of exploiting such kind of services. Rather, users will have a choice in services that offer different levels of privacy/trust, or, more generally, different level of quality. Since users will not have to be bounded by a particular social networking service, this can provide even higher level of user interaction with respect to today situation and promote information sharing across the boundaries of specific social networking services.

- The Ubiquitous Social Networking Layer (USNEL) that will be developed as part of this project will have a significant impact on software developers, since it will enable the development and deployment of new open-source social applications and services easily running across different administrative domains, rather than being constraint to an application-specific system. For example, it would be possible to develop an application that allows users in two different social networking sites to interact with each other. This openness will also be a relevant enabling factor to achieve more competition among social application developers and therefore better services for the end users.

- The envisioned SOCNET platform will have a very strong impact on mobile computing systems and applications. During the last few years there has been an increasing number of people-centric sensing projects, which combine location information with other sensors available on smart-phone devices, such as the camera, the microphone or the accelerometer, giving birth to a

different dimension in sensing our environment compared to the existing wireless sensor networks approach. Thanks to the realization of the Ubiquitous Social Networking Layer (USNEL) through SOCNET, we can envision a new complex and dynamic communication paradigm where users develop their own participatory urban sensing projects at a large-scale through the use of social networks. Consequently, users can participate in campaigns created by other users, according to their sensitivities and interests, exploiting the existing enormous social interconnections offered by SOCNET platform. Except of the environmental benefits, this could also result to the improvement of the daily living and health. For example for daily living purposes, we can check the status of the friends and find shopping or walking buddies to promote the mobility of elders. By using semantic representations of information from sensors, we can build on the idea of connecting people through shared activities and interests.

- The paradigm shift, promoted by SOCNET, from centralized OSN architectures to decentralized, pervasive, ubiquitous architectures will fight against the current trend according to which privacy is sometimes an excuse for big OSN players to lock-in the managed data. The SOCNET long-term view is to support an integrated, person-centric view of OSN services as opposed to today's application-specific view. This will place the user at the core of the decision process, by giving her the needed technology to choose how, with whom and for which purpose share her data, instead of being forced to accept the policies of one or more service providers.

3.2 Contribution at the European level towards the expected impacts listed in the work program

The proposed project contributes directly to the European Research Area, since it clearly helps overcome fragmentation and barriers of mobility across both research fields and national borders by building upon work integration, it promotes collaboration, and fosters the development of a world-class research agenda. Also, the development of privacy-preserving DOSN's is well in line with the vision of the "Future Internet," which is one of the key ICT challenges set by the European Union for FP7, and with E.U.'s effort to establish distributed e-Infrastructures and Cloud Computing services for new application domains beyond traditional high-performance computing applications for science and engineering.

The proposed research program is of direct relevance to the Information and Communication Technologies (ICT) Work Program for 2009-10. One of the three ICT challenges that European researchers and engineers have to master is the "Future Internet". The current Internet architecture was not designed to cope with the wide variety, and the ever-growing number of online social networked applications, their business models and their environments that it has now to support. Its structural limitations in terms of scalability, mobility, flexibility, security, trust and robustness of online social networks and their services are increasingly being recognized world-wide. The challenge is to address, comprehensively and consistently, the multiple facets of Future Internet in order to support efficient online social networking services. Understanding DOSNs and how to build them is the main focus of this proposal, thus addressing this challenge. Therefore, the research program proposed in this Network is fully in line with what is viewed in the ICT Work Programme as necessary for Europe in order to overcome technology roadblocks and reinforce European industrial strengths. The notion of DOSN underpins several other important objectives of the ICT Work Programme (e.g., ICT-2009.1.1: The Network of the Future, ICT-2009.1.2: Internet of Services, Software and Virtualization, ICT track - 2009.1.3: Internet of Things and Enterprise environments, ICT-2009.1.4: Trustworthy, ICT-2009.3.5 Engineering of Networked Monitoring and Control systems, ICT-2009.3.6: Computing Systems, ICT-2009.4.3: Intelligent Information Systems), hence the research carried out in this Network fully matches these objectives.

The proposed work brings together a multi-sector and multi-disciplinary team of experts, from academic, research and industrial institutions, aiming at making a significant contribution to the Internet-services sector in Europe. The team consists of widely renowned researchers with expertise ranging from to data mining and knowledge discovery techniques, to rigorous mathematical modeling and analysis of networked systems, to efficient and secure design and implementation of distributed networked infrastructures, just to mention a few.

The objective of the project is to instill in researchers a wide perspective towards the design, analysis and engineering of infrastructures and platforms for social networking services, equipping them with a variety of key skills and relevant knowledge. In particular, the proposed research will speed up the development and uptake of services based on Internet-enabled 'smart' infrastructures. SOCNET will be an open Web-based innovation platform that can ensure access to new ideas and rapid market uptake of innovations. This project aims at providing researchers across Europe in both theoretical and experimental approaches to the design, analysis, and implementation of decentralized, scalable and secure Online Social Networking infrastructures and services, contributing significantly to the development of European innovation in a rapidly developing and strategically important area of the Internet economy.

To summarize, SOCNET will clearly contribute to overcome fragmentation in the area, to enhance integration through mobility across national borders, and to develop and foster a world-class training through research agenda.

3.3 Dissemination and/or use of project results

The dissemination of the project results has a high priority for the SOCNET consortium, and in particular ensuring the visibility of the project not only across Europe, but also internationally. To achieve this we will carry out a focused set of activities and will target the most influential international audience such as international industry partners, clients, students, journalists, researchers and other IT professionals. The following channels will be used to disseminate the results:

- The SOCNET prototype will be released under an Open Source license. This will allow us to leverage the open-source software community, as well as enabling use of DOSN not only by the individuals, but also by small companies. We will actively pursue the presentation and inclusion of SOCNET architecture in to the standardization initiatives, such as W3C's Federated Social Web Incubator Group Charter.

- We will aim to disseminate the results of SOCNET through our industrial partners IBM, PEERIALISM and FORTHNET, as well as though the other industrial contacts, e.g., SICS through sponsor companies Ericsson and TeliaSonera. Currently, over 500 researchers and engineers work in IBM in areas such as systems management, virtualization technologies, storage systems, verification technologies, problem determination, information retrieval, optimization technologies, and ICT services. PEERIALISM has developed a successful media-streaming product, PeerTV, which allows users to watch P2P TV in a scalable fashion; PEERIALISM intends to extend their software to accommodate the SOCNET client into their system. FORTHNET has more than 270.000 enterprise customers using leased lines and broadband access services and more than 320.000 voice telephony lines and 500 data center customers. Recently, FORTHNET has acquired Netmed S.A., the leading satellite TV platform provider with more than 300.000 customers in Greece and Cyprus, and launched a major integration project towards converged broadband access and entertainment media services.

- We will publish our results in major scientific conferences and journals. In particular we will target the conferences on distributed algorithms, P2P and social networking, service-oriented

architecture and middleware, security and privacy, which are very relevant to the research scope of SOCNET. In particular we will target Principles of Distributed Computing (PODC), IEEE International Conference on Peer-to-Peer Computing (P2P), IEEE International Parallel and Distributed Processing Symposium (IPDPS), International Conference on Distributed Computer Systems (ICDCS), the USENIX Conference on File and Storage Technologies (FAST), International Middleware Conference (Middleware), the International Conference on Service-Oriented Computing (ISCOC), Component-Based Software Engineering (CBSE), International Conference on Autonomic Computing (ICAC), IEEE International Conference on Self-Adaptive and Self-Organizing Systems (SASO), Symposium on Reliable Distributed Systems (SRDS), International Conference on Dependable Systems and Networks (DSN), World Wide Web conference, IEEE International Conference on Data Engineering (ICDE), Social Networking Conference (SNC), ACM Conference on Computer and Communications Security, USENIX Workshop on Online Social Networks (WOSN) etc.

- Major international journals and magazines relevant to SOCNET include IEEE Distributed Systems Online, Distributed Systems, ACM Transactions on Computer Systems (TOCS), ACM Transactions on Programming Languages and Systems (TOPLAS), IEEE Transactions on Software Engineering (TSE), Journal of Peer-to-Peer Networking and Applications (PPNA), Journal of Parallel Processing Letters, IEEE Internet Computing, ACM Transactions on the Web, ACM Transactions on Internet Technology, ACM Transactions on Information Systems (TOIS), ACM Transactions on Information and System Security (TISSEC), International Journal of Information Security etc.

- We intend to organize annual workshops, hosted together with major conferences such as Social Networking Conference (SNC), USENIX federated conferences, World Wide Web conference, IEEE International Conference on Peer-to-Peer Computing (P2P) etc. We will also take an active role in the organization of other public events, including demo sessions, tutorials, presentations, and lectures, as well as holding summer schools later on in the project. We will choose locations preferentially in Europe for these events.

- We will set up a project website established and operated in accordance to guidelines agreed upon by all project partners, including a Wiki and technical blog to disseminate news about the project. We will regularly publish articles and commentaries on project-related items in the blog, and advertise the blog through social networking and other means. The intranet component will contain all documents developed in the project (which can be uploaded on an organized structure), serving as project archive, related bibliography and detailed information and contacts about all partners. The Internet component will be public, containing the project presentation, objectives, public deliverables and open activities (trainings, summer schools, workshops) besides other general information such as partners description. This will act as a starting point for industries, organizations and public in general, where they can easily get insight into the activity of SOCNET.

Section 4. Ethical Issues

4.1 Ethical and Gender Issues

The SOCNET consortium totally adheres to the gender issues underlined by the EU Commission and encourage women's participation in many phases of the project: foundational research, evaluation, consultation, implementation, etc. SOCNET partners will pay particular attention that our research activities address women's specific needs and wishes as much as men's needs. Several activities are underway for ensuring that gender-related issues are adequately addressed. For instance, partners will propose internships and visits for female undergraduate and graduate students to introduce them to the research activities of SOCNET.

4.2 Ethical Issues Table

	YES	PAGE
Informed Consent		
Does the proposal involve children?		
Does the proposal involve patients or persons not able to give consent?		
Does the proposal involve adult healthy volunteers?		
Does the proposal involve Human Genetic Material?		
Does the proposal involve Human biological samples?		
Does the proposal involve Human data collection?		
Research on Human embryo/foetus		
Does the proposal involve Human Embryos?		
Does the proposal involve Human Foetal Tissue / Cells?		
Does the proposal involve Human Embryonic Stem Cells?		
Privacy		
Does the proposal involve processing of genetic information or personal data (e.g. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)		
Does the proposal involve tracking the location or Observation of people?		
Research on Animals		
Does the proposal involve research on animals?		
Are those animals transgenic small laboratory animals?		
Are those animals transgenic farm animals?		
Are those animals cloned farm animals?		
Are those animals non-human primates?		
Research Involving Developing Countries		
Use of local resources (genetic, animal, plant etc)		
Impact on local community		
Dual Use		
Research having direct military application		
Research having the potential for terrorist abuse		
ICT Implants		
Does the proposal involve clinical trials of ICT implants?		
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

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Appendix B: Support Letters

Microsoft

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1 November, 2010

Marios D. Dikaiakos
Dept. of Computer Science
University of Cyprus

Dear Marios:

I am very pleased to provide a letter of support to the SOCNET proposal. Understanding mechanisms for advancing the state of the art on the infrastructure for online social network services is of utmost importance both to the operational as well as the academic community.

As a Researcher at Microsoft Research, Cambridge, I am confident that the members of the SOCNET proposal have been around for a long time and have significant experience in the space. I look forward to hearing about the project once it is funded.

Sincerely,

Thomas Karagiannis