Going “Global” with Agile Service Networks

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Abstract. Agile Service Networks (ASNs) can be used to support Global
Software Development (GSD). The requirements of GSD are those of a
social system whose parts need to collaboratively create and share knowl-
dge across different timezones and continents. ASNs can provide an
adaptable social network supporting GSD collaboration and cooperation
needs.

Keywords: Agile Service Networks, Global Software Development, SOA,
Social Networks, Organizational Structures, Cloud Computing

1 Introduction

GSD organizations try to achieve round-the-clock productivity by distributing
production along different continents and timezones [6, 7, 11]. However, teams’
time and space distance pose challenges both social and technical. Social chal-
lenges, such as cultural barriers, language difference, social class, unawareness of
others limit the degree to which teams involved in GSD are able to share infor-
mation effectively and collaborate efficiently. Technical challenges, such as space
distance, information discontinuity between timezones, geolocalization of devel-
opment resources hinder the way productivity can be coordinated on a global
scale. These challenges inhibit communication and collaboration among teams
to a point where project failure risk increases [7, 5, 11].

GSD technical difficulties should be supported through a socially enabled
technology for the above challenges to be overcome [7].

ASNs are emerging networks of collaborative service applications (nodes)
which interoperate through agile transactions (edges), i.e. transactions which
react to context change dynamically adapting themselves [1]. Much like GSD,
ASNs were put forth to allow corporate collaborations to be formed globally, in
pursuit of business gain for the nodes involved (i.e. every corporate partner) [3].

We argue that GSD challenges can be overcome through an ASN-based social
network providing agility of communication to globally located IT professionals.
Such a support can be realized by providing ASNs with the socio-cultural con-
text in which GSD professionals should exchange information. ASNs’ agility
and dynamic adaptation can then be used to adapt to context’s changes, pro-
viding flexible communication and collaboration. Finally, our social ASNs can
be deployed in the cloud, for them to use the cloud’s promises (e.g. scalability, availability, etc.) to further support GSD. Collaborativeness as well as context adaptability make ASNs ideal to develop flexible social-networking tools for GSD. Moreover, ASNs’ emergence makes them ideal to build dynamic communication tools against distance in time and space. The next section provides the research design and challenges for this proposal. Section 3 provides results we have obtained so far, while section 4 concludes the paper.

2 Research Design

This section provides two elements: (a) the problem we want to tackle; (b) the description of the solution we advocate.

2.1 Problem Statement

Distances in time and space make it impossible for GSD teams to communicate and coordinate their effort in an efficient manner [7]. Technical challenges, such as information discontinuity between timezones, limit the advantages of GSD. Social challenges, such as language difference and social class difference, inhibit collaborativeness among GSD teams, increasing its chances of failure [11].

2.2 Our Proposed Solution

The solution we advocate is an ASN-based social network. This technology should exhibit three main characteristics:

1. Agile context awareness. ASNs are able to detect changes in the context and dynamically support different scenarios as needed. In GSD for instance, round-the-clock productivity could be supported by dynamically shifting collaboration between teams depending on timezone and location.

2. Deployed in the cloud. Cloud computing, has potentials which fit with GSD needs [9, 12]. For instance, GSD resources rendered available in the cloud allow for rapid resource location and access on a global scale. Also, communication and information continuity between timezones may be requested as needed.

3. Satisfying GSD social requirements. GSD indeed consists of a social structure, part of a global corporation (also “Organizational Social Structure” - OSS, in technical terms [10]). Social interactions depend on personal- or corporate-specific practices, which include work habits, methods, technologies to support cooperation, etc. In GSD, for instance, supporting social interactions among developers from different companies and cultures, would require letting them use own tools, languages and own methods seamlessly. ASNs can help in doing that through adaptable creation of service compositions and transparent proxying. Also, for example, using ASNs to autonomously assemble and deliver service applications as needed can give teams the same technical space.
To engineer this solution we must address the following research questions:

1. **How can ASNs be defined for our purposes?**
   *Rationale:* Our purpose is to support GSD, a social system involving multiple cultures and societies collaborating actively in a virtual fashion (i.e. is an OSS). Extensive literature studying such systems is present in social sciences, cognitive ergonomics and social network analysis. This literature is rich in requirements for knowledge activities, dynamics for their government, barriers present, context changes possible, etc. These elements constitute the requirements that should drive the engineering of our technology and the principles for its validation. Also, ASNs not have an agreed definition. Since literature on ASNs is very scarce, defining it in a way which is functional for our purposes is very difficult. However, a set of characteristics can be defined by scanning the literature and coding the features that ASNs expose. Finally, a deployment space must be chosen according to our requirements. Cloud computing is a promising space which needs to be evaluated.
   *Expected Outcome:* a) an ASN definition together with defining characteristics; b) a list of “social” requirements from OSS; c) a list of “technical” requirements specific to GSD; d) a feasibility assessment of ASNs for the cloud which includes architectural trade-off analysis.

2. **How can ASNs support the requirements found?**
   *Rationale:* with answers from RQ1, design alternatives for our technology must be studied. Once a best-fit solution is selected, it must be validated in industry.

### 2.3 Research Plan

To answer RQ 1 we need to:

1. define characteristics of ASNs in general. To this end, we systematically searched and analyzed literature on the topic (year 1 - complete [13]);
2. identify the requirements for our purposes. To this aim we identified two complementary requirement layers for our technology: a social one, from Organizational Social Structures and a technical one, specific to GSD. In [14] we have explored the specific challenges and technical requirements of GSD by analyzing relevant literature as well as consulting domain experts. We are still carrying out a survey into Organizational Social Structures [10] (year 1 - finalizing) for the rest of the data.
3. assess the feasibility of deploying ASN-based technologies in the cloud (year 1, initial assessment; year 4, trade-off analysis). So far we have made an initial assessment by comparing ASN characteristics with cloud computing requirements [13]. Architectural trade-off analysis is to be carried out once design alternatives are available (in year 4).

To answer RQ 2, we need to:

1. construct design space based on requirements gathered: identify and list design decisions to be made (year 2).
2. decide best-fit design alternative (i.e. a set of design decisions) by evaluating trade-offs between different decision scenarios (year 2).

3. propose a design prototype based on rapid-prototyping methods [8] (year 2).

4. Validate prototype in action research cycles (each of 6 man-months - year 3 and year 4). Current department collaborations allow for such initiatives to take place in software houses which use GSD. Moreover, department colleagues have previously conducted action research in GSD. Their data could be used as leverage for validation.

2.4 Impact

Major causes for delays and cost explosion in GSD projects are miscommunication on project requirements, deadlines and architecture [2]. We mitigate these causes by supporting GSD teams communication, collaboration and resource sharing (e.g. knowledge, models, tasks, etc.). Agile Context awareness mechanisms reduce miscommunication by adapting information flow between timezones to context changes (e.g. in case of shift-change, team strike, reduced workload, etc.). Round-the-clock productivity is supported by allowing for information continuity between work-shifts (e.g. once the work in a shift is over, the work-package could be automatically delivered to the next shift). Moreover, deployment in the cloud allows for global availability as well as resource mapping and geo-localization (e.g. since the cloud uses massively the mechanisms of inventorying and geocoding).

3 Preliminary Results

In answering RQ 1, we obtained three major contributions so far.

First, the following definition: “ASNs are dynamically emerging networks of service-oriented applications (Nodes) collaborating to achieve business gain. Context adaptation is used to achieve agility”. From this definition, four main characteristics of ASNs are evident: (a) Emergence; (b) Collaborativeness; (c) Business-orientation; (d) Dynamicity. Emergence is defined as ASNs’ ability to dynamically retrieve and connect nodes as needed - this characteristic can be used to define mechanisms for the spontaneous assembly of GSD resources (man-power, tools, documentation, etc) as needed. Business-orientation is stemming from ASNs’ being part of a corporate business strategy; this characteristic acts as a driver for business gain in our technology. Collaborativeness is ASN nodes’ ability to work cohesively towards a common goal (e.g. business gain); this characteristic can help in defining the right mechanisms for global collaboration, much needed in GSD. Dynamicity derives from ASNs’ awareness of their context and adaptability to its changes; this characteristic can help in delivering the flexible and adaptable communication mechanisms for GSD professionals. Moreover, by confronting SOA [4] with GSD we found that indeed SOA practices alone cannot scale to support GSD and its socio-cultural barriers [2]. Conversely, our solution brings together service networks and social networks analysis [1] to
deploy socially-enabled technical support networks. Our goal is to provide IT professionals with the dynamicity and flexibility needed to coordinate and cooperate globally. Literature in both GSD and ASNs already hinted towards this direction [7, 1].

Second, to understand the challenges and technical requirements of our solution we surveyed GSD literature. We obtained a list of GSD-specific requirements. To see if these technical requirements and challenges could be effectively satisfied by ASNs, we produced them into a concept model and merged it with a modeling notation of ASNs (see fig. 1). The matching provided us the feasibility evidence we needed. More details on this result can be found in [14].

Finally, to identify a deployment space for our technology we conducted a literature review in cloud computing. From this review, a list of requirements was extracted. These were matched with ASNs’ defining characteristics, hence showing if and how ASNs satisfy each requirement. The matching evidenced that ASNs are feasible for and in the cloud (i.e. they can be used to engineer applications based on the cloud or using it) [13].

4 Conclusions and Future Work

In this paper we outlined the proposal of an ASN-based social network. We elaborated this proposal into a research plan. We have shown how preliminary results in exploring the research questions have shown promise. Specifically, by analyzing GSD and matching its challenges with ASNs we concluded that indeed ASNs are supportive. In the future we plan to augment the notation in fig. 1 with the requirements from our systematic literature review into OSSs.

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References


Fig. 1. ASN notation for GSD [14]

