

CPS Track: Summary Report

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Abstract—Cyber Physical Society (CPS) feature a tight integration between computation, communication, and control in their operation and interactions with the environment in which they are deployed. The concept of capability, which is the semantics of an action or specific functionality, is therefore a cornerstone in modern Cyber Physical Society, especially those service or process aware. In this track, we present dedicated techniques for capability management and engineering, which can be applied and reused in a large number of areas such as SOA, BPM, Cloud Computing and Internet of Things. These techniques will certainly boost several related research efforts in Cyber Physical Society. This track aims at shedding the light on the importance of capability engineering as well as at bringing together researchers and practitioners working in capability engineering to achieve the vision of cyber physical society by means of current techniques.

I. INTRODUCTION TO CPS TRACK

Nowadays sensing devices are becoming cheaper in cost, and stronger in computation, communication, and storage capabilities. Computing is to be embedded in all types of physical equipments, and applications with big societal impact and economic benefit will be created in time and across spaces. Cyber physical society (CPS) is regarded as a future coordination and collaboration environment that connects nature, cyber space, society with certain rules [3]. Leveraging existing techniques such as SOA (Service Oriented Architectures), BPM (Business Process Management), SNs (Social Networks), etc, for achieving the vision of cyber physical society is promising. How the interaction is to be conducted within one space or across multiple spaces is a problem to be investigated [1]. The core scientific problems include the scalability, heterogeneity, integration, security, and the dynamics of the underlying infrastructures. The data management, as well as the semantic interoperability, in the cyber physical society is also posing a great challenge [2].

While CPS describes the future environment of collaboration, nowadays, service oriented architecture (SOA) and business process management (BPM) are coined to specify how the computational resources can coordinate and collaborate, and (wireless) sensor networks (SNs) provide means to

sensing the physical resources and interconnecting physical and cyber resources. Generally, CPS feature a tight integration between computation, communication, and control in their operation and interactions with the task environment in which they are deployed. The concept of capability, which is the semantics of an action or specific functionality, is therefore a cornerstone in modern CPS, especially those service or process aware. Dedicated techniques for capability management and engineering can be applied and reused in a large number of areas such as SOA, BPM, Cloud Computing and Internet of Things and will certainly boost several related research efforts in these areas. Many key techniques for service and process engineering involve capability-based engineering at first. However, despite the importance of this concept, it has not been treated as a first-class citizen and has always been hidden behind other encompassing concepts such as the notions of service and business process. It is our pleasure to bring the track on “Capacity driven Processes and Services for Cyber Physical Society”, which provides the scientific community a dedicated forum for discussing research, development, and deployment efforts in achieving the vision of cyber physical society by means of current techniques.

II. PAPERS SUMMARY

The track includes five carefully chosen peer-reviewed articles that cover the main focus of the track. Detailed description of these papers is as follows:

- In the article “*Analyzing Social Web Services capabilities*”, the authors discussed the notion of capability in the particular context of social Web services. They proposed an approach to supporting social Web services react to the behaviors that their peers expose at run time. Examples of behaviors include selfishness and unfairness. These reactions are associated with actions packaged into capabilities. A capability allows a social Web service to stop exchanging private details with a peer and/or to suspend collaborating with another peer, for example. The analysis of capability in the paper

results into three types referred to as functional (what a social Web service does), non-functional (how a social Web service runs), and social (how a social Web service reacts to peers).

- In the article “*A Decision-Oriented Approach Supporting Enterprise Architecture Evolution*”, the authors discussed the design of Enterprise Architecture EA transformational change and defined an approach to support design decision during EA evolution. An evolution in EA was defined as the transformational change of the set of models describing an EA in a given enterprise state. EA evolutions use artifacts dependencies intra/inter -models to analyze the existing EA model and to create a measurable and clearly aligned change process. The proposed approach reduces misalignment and steers the transformational change by assisting architects in decision making.
- In the article “*A Semantic Similarity Measure for Conceptual Web Services Classification*”, the authors proposed a new semantic similarity measure for Web services which relies on both semantic and syntactic Web services description. The proposed measure appeals for Formal Concept Analysis (FCA) to classify Web services according to their pair-wise similarities into a hierarchy of classes of similar Web services.
- In the article “*ATP: An Aggregation and Transmission Protocol for Conserving Energy in Periodic Sensor Networks*”, the authors proposed a protocol to reduce data transmission of nodes in Wireless Sensor Networks WSNs and consequently save energy. The protocol relies on a cluster-based scheme in which data is sent periodically from sensor nodes to their appropriate Cluster-Heads (CHs). The proposed protocol searches similarities between data captured during a period p in order to eliminate redundancy from raw data. Then in a transmission phase, sensor node searches periodic correlation of data, using one way ANOVA model and Fisher test. The conducted evaluation showed that the protocol can significantly minimize energy consumption, compared to other existing data aggregation techniques, without affecting the quality of data.
- In the article “*Privacy-aware Cloud Services Composition*”, the authors proposed a service-oriented privacy preserving model for data integration across autonomous clouds. The proposed model allows to execute aggregations (i.e., compositions) of data sharing services held by autonomous clouds without revealing any extra information to any of the involved services (i.e., none of involved services (and their providers) should be able to learn/infer any information about the data the other services provide beyond what these services already know).

III. CONCLUSION

An overriding theme of these articles suggests that cyber physical society, as the future coordination and collaboration environment, can certainly benefit from current collaboration techniques in order to achieve its ambitious goal. This track can be regarded as step forward towards exploring this challenge.

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REFERENCES

- [1] Z. Zhou, S. Bhiri, H. Zhuge, and W. Gaaloul. Assessment of service protocol adaptability based on novel walk computation. *IEEE Transactions on Systems, Man, and Cybernetics, Part A*, 42(5):1109–1140, 2012.
- [2] Z. Zhou, M. Sellami, W. Gaaloul, M. Barhamgi, and B. Defude. Data providing services clustering and management for facilitating service discovery and replacement. *IEEE T. Automation Science and Engineering*, 10(4):1131–1146, 2013.
- [3] H. Zhuge. Semantic linking through spaces for cyber-physical-socio intelligence: A methodology. *Artif. Intell.*, 175(5-6):988–1019, 2011.