Ripples Across The Internet of Things: Context Metrics as Vehicles forRelational Self-Organization

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The current paradigm shift in computing has placed mobile computation at the centre of focus. Users are now even more connected; demanding everything everywhere services. These services, such as social networking and media, benefit from the availability of context information seamlessly gathered and shared; providing customized and user-centric experiences. The distribution of context information no longer conforms to the paradigms of the existing Internet with regards to heterogeneity, connectivity and availability. This mandates new approaches towards its organization and provisioning in support of dependent applications and services.

In response to these developments, the work summarized in this thesis addresses the fundamental problem of presenting context information in organized models as relevant subsets of global information. In approaching this problem, I introduced a distributed collection of context objects that can be arranged into simple relevant subsets called context schemata and presented to applications and services in supporting the realization of context based user experiences. Acknowledging the dynamic behaviour inherent of the real world interactions, I introduced an algorithm for measuring the proximities and similarities among these context objects, providing a metric through which to achieve organization. Additionally, I provided a means of ranking heterogeneous and distributed sensors in response to real time interaction between users and their digital ecosystem. Ranking provides an additional metric with which to achieve organization or identifying important and reputable information sources. The work I present here, additionally details my approach to realizing this complete behaviour an a distributed overlay, exploiting its properties for distribution, persistence and messaging. The overlay is also utilized for the provisioning of the supporting context information.

Improvements in the ability to discover and attach new context information sources is fundamental to the ability to continually maintain expressions of context, derived from heterogeneous and disparate sources. By being able to create relevant subsets of organized data related to the requirements of applications and services in an end-point, infrastructures are realized for connecting and supporting the increasingly large numbers of users and their sources of information. Coupled with the distribution, these infrastructures realize

improvements with regards to the effort required to achieve the same results. The culmination of the work presented in this thesis is an effort to enable seamless context-centric solutions on a future Internet of Things and thus constituting an adequate solution to the challenges raised above.