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Automatic sensor clustering: connectivity for the internet of things

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Current predictions from industry envision that within a decade, the Internet will be populated by tens of billion of devices. Already today, smart Internet devices have sensors that provide an enormous potential for creating new applications. The challenge at hand is how this information can be shared on the future Internet in order to unlock the full capability of applications to interact with the real world. Therefore, there is an urgent need for scalable and agile support for connecting people, places and artifacts in applications via a vast number of devices and sensors on the future Internet. Clearly, this poses a challenge of sharing and thus storage of so-called context information. Beyond scalable context storage lays another challenge to identify and locate devices that are important to the user. In a support for billion of continuously changing sensors and actuators, a search engine would not work. Therefore an intelligent way to group devices is required. This thesis deals with mainly three issues: Firstly, propose a method for devices to be reachable and thus addressable independent of their location in the infrastructure. Secondly, how can the proposed method be used to insure automatic connectivity anywhere between clients and services offered by the device, in particular associated sensors and actuators. Thirdly, how can the grouping and support be combined and used to dynamically associate sensors from across the Internet with applications, assuming that the aforementioned grouping exists. The proposed solution to the first issue is to store identifier-locator pairs in an overlay. For the second issue we propose a sensor socket introduced which exploits the identifier/locator pairs to enable device mobility. The third issue is addressed by providing a group-cast operation in the sensor socket. This arrangement allows communication with peers determined by a grouping algorithm which operates on context information on the context overlay. Thus we have enabled the creation of automated dynamic clustering of sensors and actuators in the Internet of Things. The sensor socket is designed as a stand-alone module to support any context overlay that provides the same basic functionality. The sensor socket embodies a support to automatically interconnect and communicate with devices. Using bridging software, remote devices can be dynamically found and inserted into legacy local area network where current devices can benefit from the connectivity. For future work the bridge can be extended to actively locate and identify nearby sensors that are unable to participate in the overlay network otherwise.