WHITE PAPER

Astreea Product Proposal: Fill-Level Sensors and 3D Product Models

This document assumes that Astreea will develop and market a line of dispenser products in which are embedded sensors which measure the level of soap/sanitizer in each dispenser, so as to track usage and flag when the device should to be refilled. The specific technology LTS would implement depends on the supplier of the sensors used, but we can describe a typical setup based on industry standards. E-Cube labs, for instance, deploy fill-level monitors (for both solids and liquids) as part of their "CleanCityNetwork" (**CCN**). A German organization, the Fraunhofer Institute for Integated Circuits, has similarly deployed its so-called "s-net" wireless sensor network in a "washroom information service" which, among other fixture sensors, tracks soap fill levels and also each occasion when a soap dispenser's "pump" is activated. The sensor data is packaged via s-net and transmitted from each building using this system to servers hosted by a company called CWS-Boco. In general, the sensor providers also maintain a central web service, such as **CCN**, which integrates data from all buildings/locations into one data access point. The software stack directly managed by Astreea, then, would need to interface with this central data source.

E-Cube's sensor network is a good example of a typical **IoT** data stack. All sensor data is aggregated onto E-Cube's **CCN** servers, which maintain web and mobile applications allowing E-Cube customers to visualize data for each sensor on the network. E-Cube also provides an **API** allowing customers to obtain raw data, rather than relying exclusively on E-Cube's own software. Using the **API** affords companies greater flexibility, because they can use the raw data however they see fit, but it requires companies to implement their own software. One benefit of using custom-built software, rather than the generic web service provided by **IoT** providers, is that companies can benefit from a self-contained application exclusively focused on managing sensor data, which can be fully customized for the company's needs.

It is quite common for **IoT** manufacturers to make sensor data available to customers only via web sites and mobile apps, both of which offer limited functionality. It is usually possible, however, to access the data in machine-readable form via **API**s or some other low-level mechanism, so that companies can design their own **IoT** applications. This can be a worthwhile investment first because of convenience: the software for managing sensor data can be installed directly on computers in the company's offices (or employees' homes), instead of residing solely on employee's personal devices (in contrast to smart-phone access modes). Likewise, the custom applications can be entirely organized around the tasks having to be performed with respect to sensor data: there is no need for employees to browse to a specific website to obtain data, nor could then browse the web in general while using the custom application. In addition to this basic convenience, customized desktop applications also offer superior User Experience: they are not constrained by small screen size and limited touch-screen interactions as with mobile apps, nor are they constrained by the limited screen layouts and interaction modes of web sites (where most user actions need to be implemented by clicking hyperlinks). Customized desktop applications, by contrast, can employ the full range of **GUI** features associated with native software, such as context menus, dialog boxes, multi-window displays, and dedicated windows for **2D** and **3D** data visualization. Moreover, by acquiring raw sensor data, companies can perform their own market analytics customer metrics, rather than relying exclusively on the analytic information shared by sensor manufacturers. In the context of sanitizer dispensers, Astreea could track data to indicate which dispensers are being used the most/least; which customers are delayed in refilling empty dispensers; which customers are refilling with Astreea's own sanitizer or with some other product; and so forth.