The Networking Site of Things

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As software quickly eat up the world,[1] the connectivity of all things, living and non-living, is imminent. The growing phenomena of connecting non-living entities to the Internet is often referred to as The Internet of Things (IoT).[2] Just as humans have gravitated towards social networking sites,[3] other things are being, or will soon be, connected to social networking sites. In an analogy to how users can track and provide feedback on other users in social networking sites, users would be able to track and provide feedback or control to things in the Networking Site of Things (NSoT).

In order for such a networking site to provide economies of scale that covers as many entities as possible, an object-oriented representation of the state of things can be defined. One convenient ORM (Object-Relation Mapper)-centric framework for storage is the popular open-source database MongoDB.[4] Since connected devices will produce different data types, e.g. integers, floats, strings, MongoDB's integration with JavaScript frameworks such as Node.js [5] and MeteorJS[6] will prove to be strategic due to JavaScript's untyped architecture[7] and prevalence as an essential technology of World Wide Web content production.[8] Furthermore, the JavaScript Object Notation (JSON)[9] that forms the foundation of the aforementioned frameworks will serve useful for transferring data over the Internet.

<table>
<tr>
<td>

```
{
   "people": [
      {
         "firstName": "John",
         "lastName": "Doe"
      },
      {
         "firstName": "Anna",
         "lastName": "Smith"
      },
      {
```

</td>
<td>

```
{
   "devices": [
      {
         "_id": "YaANT5rsxIDhEtcA",
         "datatype": "string"
      },
      {
         "_id": "ywBvHJoc2usa3",
         "datatype": "integer"
      },
      {
```

</td>
</tr>
</table>

[1] Andreessen, Marc (20 August 2011). "Why Software is Eating the World". *Life & Culture* (The Wall Street Journal). Retrieved 3 August 2012.
[2] Wood, Alex. "The internet of things is revolutionizing our lives, but standards are a must". theguardian.com. The Guardian. Retrieved 31 March 2015.
[3] boyd, danah; Ellison, Nicole (2008). "Social Network Sites: Definition, History, and Scholarship". Journal of Computer-Mediated Communication 13: 210–230.
[4] https://www.mongodb.org/
[5] https://nodejs.org/
[6] https://www.meteor.com/
[7] http://www.ecma-international.org/publications/standards/Ecma-262.htm
[8] https://en.wikipedia.org/wiki/JavaScript
[9] https://tools.ietf.org/html/rfc7159

<table>
<tr>
<td>
<pre>
        "firstName": "Peter",
        "lastName": "Jones"
    }
  ]
}
</pre>
</td>
<td>
<pre>
        "_id": "usa3GcdWT1ejwd",
        "datatype": "object"
    }
  ]
}
</pre>
</td>
</tr>
</table>

Above is an example of a JSON object consisting of a collection of people, which is represented as an array of JSON objects, which consists of the first and last names of people. On the proposed NSoT, such an object can be used for user accounts. For the device accounts, a similar approach can be used for specifying the device identification code and data type used. Note that because JSON objects can be nested under other JSON objects, the complexity in data representation is endless.

So far, the document collections presented are analogous to SQL's dimension tables.[10] The NSoT will ultimately need to have more data collections to represent the analogous fact tables,[11] which will involve the devices' time-varying data. Below are two examples of such factual data. Note that all JSON objects--those above and below--are to be stored on the server a la MongoDB.

<table>
<tr>
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<pre>
{
  "status": [
    {
      "_id": "YaANT5rsxIDhEtcA",
      "data": "off",
      "createdAt": 1444626453
    },
    {
      "_id": "YaANT5rsxIDhEtcA",
      "data": "warming up",
      "createdAt": 1444612343
    },
    {
      "_id": "YaANT5rsxIDhEtcA",
      "data": "on",
      "createdAt": 1444655341
    }
  ]
}
</pre>
</td>
<td>
<pre>
{
  "measurements": [
    {
      "_id": "ywBvHJoc2usa3",
      "data": 80,
      "createdAt": 1444612432
    },
    {
      "_id": "ywBvHJoc2usa3",
      "data": 82,
      "createdAt": 1444609221
    },
    {
      "_id": "ywBvHJoc2usa3",
      "data": 83,
      "createdAt": 1444609123
    }
  ]
}
</pre>
</td>
</tr>
</table>

[10] https://en.wikipedia.org/wiki/Dimension_table
[11] https://en.wikipedia.org/wiki/Fact_table

To accommodate the architecture presented thus far, the NSoT will need to maintain REST API endpoints. Communication between the NSoT and the devices should always be initiated by the device as an HTTP request to avoid restrictions and limitations imposed by firewalls and proxies. Each HTTP request will be accompanied by headers containing the device's identification code, API access key and hardware/MAC address. Human users on the NSoT can track their devices based on the identification code or hardware MAC address, as the API access key will be visible only to the device. For devices accessing the NSoT for the first time, those identification code and API access key headers can be left blank, and the HTTP response will contain the identification code and API access key generated by the NSoT server. The device should store the credentials and use it in subsequent requests.

To facilitate ongoing or pseudo-realtime control, the device should be responsible for periodically performing HTTP requests to the NSoT. The response from the periodic requests can contain information to update or control the device. In such a manner, users and devices can securely coexist on the NSoT. In order to find the device of interest, the human user must know the device's hardware/MAC address.

This document outlines my ideas on how the IoT will scale and evolve to engage society at large scale and is still in progress.