Architecture Drivers Specification

* *IoT anyware* –



Team number 1

June 2015

Document History

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| --- | --- | --- |
| Ver. | Date | Description |
| 0.1 | 05/11, 2015 | Create initial ADS.  Add Context, Use cases, Quality attributes, Constraints. |
| 0.2 | 05/14, 2015 | Mentor’s comments |
| 0.3 | 05/18, 2015 | Add detail Quality attribute scenarios |
| 0.4 | 05/21, 2015 | Add functional requirements.  Refine Use cases and Quality attribute scenarios. |
| 0.5 | 05/26, 2015 | Shared on Google docs |
| 0.6 | 05/27, 2015 | Refine QA’s and set priority |
| 0.7 | 05/30, 2015 | Refine use cases |
| 0.9 | 06/17, 2015 | Updated |
| 1.0 | 06/18, 2015 | Move *Use case scenarios* section to “*Team1\_02\_Architecture Design Document.doc*”  Freeze and release v1.0 |
| 1.1 | 06/24, 2015 | Add missing Quality Attribute Scenarios |

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# **1. Introduction**

The aim of this document is to describe the architectural drivers of the IoT project: high level functionality in the form of use cases, quality attributes scenarios and constraints.

## Project Goals

* Create an IoT infrastructure to support accessing sensors and actuators installed in the home or business.
* Create an infrastructure to provide an ecosystem to develop cost competitive home or business IoT products for value-added-resellers and other 3rd party hardware and software application developers, service providers, and installers and maintainers.
* Build a basic data centric infrastructure to provide IoT data sets for developers to create future data mining, analytic operations, and services.

## Stakeholders

* Consumers.
* Sensor/Actuator producers.
* Home builders.
* Third-party service providers.
* IoT application developers.
* Anthony J. Latanze & his development team.

# **2. High Level Functional Requirements**

## Functional Requirements

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| **Access secured services** | FR01 |
| **Description**:  User accesses the system in secured environment. User must login to the system for services. Unauthorized persons are not allowed to control sensors installed in home, register SA Nodes, or access any data gathered in the system. | |

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| **Discover SA Nodes** | FR02 |
| **Description**:  User queries home to find out how many nodes are installed and what sensors/actuators are installed on each node. | |

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| **Determine sensors and control actuators** | FR03 |
| **Description**:  User can determine the temperature/humidity, turn on and off lights, open and close the door, turn on the alarm, and determine if anyone is home. However, user must set the alarm off prior to opening the door. | |

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| **Log user commands and sensor values** | FR04 |
| **Description**:  User commands and sensor values are stored in IoT infrastructure for some period of time. This data set can be utilized by developers to create future data mining, analytic operations, and services. | |

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| **Send emergency message** | FR05 |
| **Description**:  An emergency message is sent to the user when door is opened manually or the house is suddenly occupied while alarm is set. | |

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| **Lock house automatically** | FR06 |
| **Description**:  User is informed upon the vacancy of house and asked to lock the house. If the user failed to respond to the message within 5 minutes, the door is closed, and the alarm is set automatically. | |

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| **Turn off light automatically** | FR07 |
| **Description**:  When no one is home for 10 minutes, the light is turned off automatically. | |

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| **Register SA node** | FR08 |
| **Description**:  User adds nodes to the system. Equipped sensors and actuators are recognized. | |

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| **Unregister SA node** | FR09 |
| **Description**:  User removes nodes from the system. | |

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| **Sharing SA node control right to other user** | FR10 |
| **Description:**  User who registered a node is able to give a right (FR03) to other user (eg. his/her child, his/her mom, or other family). | |

# **3.** **Quality Attribute**

## 3.1. Summary

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| **Total** | **High Priority** | **Medium Priority** | **Low Priority** |
| 9 | 5 | 4 | 0 |

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| **ID** | **PRI** | **Quality**  **Attribute** | **Descriptions** |
| QA01 | H | Security | Hackers or ill minded people try to break into the system. When unauthorized user attempts to login to the system, the system maintains the audit trail. If the attempt is repeated more than 5 times, the account is locked, and the source of tempering is identified. |
| QA02 | H | Security | Hackers or ill minded people try to register the SA node that is not owned by them. When unauthorized user attempts to register the SA node that he/she doesn’t own, the system maintains the audit trail, and cancel the registration in 10 minutes. |
| QA03 | H | Availability | SA node can crash, hang, or be disconnected from the network for various reasons. If SA node is inoperable or out of reach, the system should be aware of such events, and notify user within 1 minutes. |
| QA04 | M | Availability | SA node can be disconnected from the network for various reasons. If SA node is not able to reach the system due to network failure, it should store recent logs at least for one day. When the network is restored, SA node should send the logs to the system. |
| QA05 | M | Scalability | The number of SA node user can be more than one. The system should be able to serve 10 user controls to the same SA node. (Concurrent access and control is not considered in this scenario) |
| QA06 | M | Scalability | More than one SA node can be installed at home. The system should be able to support at least 100 nodes concurrently. |
| QA07 | H | Modifiability | The system should make it easy to add emerging protocols (eg. Bluetooth 802.15, ZigBee 802.15.4) to the system. Average skilled developers should be able to implement it within two months. |
| QA08 | M | Usability | The system should make it easy for users to register or unregister SA nodes. Ordinary user should be able to register or unregister the node within 5 minutes by following the provided manual. |
| QA09 | H | Extensibility | The system should make it easy for application developers (private persons, VARs, or other 3rd parties) to build custom apps, services, and/or make mashups from existing available services. Average skilled developers should be able to build the application in six months. |

## 3.2. Quality Attribute Scenarios

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| **Security** | | **ID:** QA01 |
| **Quality Attribute:**  Hackers or ill minded people try to break into the system. When unauthorized user attempts to login to the system, the system maintains the audit trail. If the attempt is repeated more than 5 times, the account is locked, and the source of tempering is identified. | | |
| Stimulus | Login attempt with an Incorrect id or a password | |
| Source(s) of the stimulus | Human or machine | |
| Relevant environmental conditions | Normal operation | |
| Architectural elements | System | |
| System response | The system bans any further access, and logs all access attempts. | |
| Response measure(s) | Five repeated attempts locks the account, and the source of tempering is identified. | |

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| **Security** | | **ID:** QA02 |
| **Quality Attribute:** Hackers or ill minded people try to register the SA node that is not owned by them. When unauthorized user attempts to register the SA node that he/she doesn’t own, the system maintains the audit trail, and cancel the registration in 10 minutes. | | |
| Stimulus | Unauthorized SA node registration | |
| Source(s) of the stimulus | Human or machine | |
| Relevant environmental conditions | Normal operation | |
| Architectural elements | System | |
| System response | The system prevents the registration of SA node of which ownership is not identified. | |
| Response measure(s) | Undefined SA node registration is canceled in 10 minutes. | |

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| **Availability** | | **ID:** QA03 |
| **Quality Attribute:** SA node can crash, hang, or be disconnected from the network for various reasons. If SA node is inoperable or out of reach, the system should be aware of such events, and notify user within 1 minutes. | | |
| Stimulus | SA node failure | |
| Source(s) of the stimulus | SA node | |
| Relevant environmental conditions | Normal operation | |
| Architectural elements | System, SA node | |
| System response | The system monitors and detects the failure of SA node. | |
| Response measure(s) | System notifies failure to user within 1 minutes. | |

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| **Availability** | | **ID:** QA04 |
| **Quality Attribute:** SA node can be disconnected from the network for various reasons. If SA node is not able to reach the system due to network failure, it should store recent logs at least for one day. When the network is restored, SA node should send the logs to the system. | | |
| Stimulus | Network failure between SA node and the system | |
| Source(s) of the stimulus | Network environment | |
| Relevant environmental conditions | Normal operation | |
| Architectural elements | System, SA node | |
| System response | SA node stores recent logs and send them to the system whenever the system connection is available. | |
| Response measure(s) | SA node should be available to store logs at least for one day. | |

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| **Scalability** | | **ID:** QA05 |
| **Quality Attribute:** The number of SA node user can be more than one. The system should be able to serve 10 user controls to the same SA node. (Concurrent access and control is not considered in this scenario) | | |
| Stimulus | Multiple user access | |
| Source(s) of the stimulus | Human | |
| Relevant environmental conditions | Normal operation | |
| Architectural elements | System | |
| System response | The system services the user controls to the same SA node. | |
| Response measure(s) | The system should allow at least 10 user controls. | |

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| **Scalability** | | **ID:** QA06 |
| **Quality Attribute:** More than one SA node can be installed at home. The system should be able to support at least 100 nodes concurrently. | | |
| Stimulus | Concurrent inbound or outbound SA node messages | |
| Source(s) of the stimulus | User, SA node | |
| Relevant environmental conditions | Normal Operation | |
| Architectural elements | System | |
| System response | The system supports services for multiple SA nodes concurrently. | |
| Response measure(s) | At least 100 nodes should be able be served at the same time. | |

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| **Modifiability** | | **ID:** QA07 |
| **Quality Attribute:** The system should make it easy to add emerging SA node protocols (eg. Bluetooth 802.15, ZigBee 802.15.4) to the system. Average skilled developers should be able to implement it within two months. | | |
| Stimulus | New protocols for SA node | |
| Source(s) of the stimulus | Developer | |
| Relevant environmental conditions | After release | |
| Architectural elements | System, SA node | |
| System response | New protocols is supported by the system and SA node. | |
| Response measure(s) | Average skilled developers can implement it within two months. | |

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| **Usability** | | **ID: QA08** |
| **Quality Attribute:** The system should make it easy for users to register or unregister SA nodes. Ordinary user should be able to register or unregister the node within 5 minutes by following the provided manual. | | |
| Stimulus | Add/Remove a new node to the system | |
| Source(s) of the stimulus | User | |
| Relevant environmental conditions | Normal operation | |
| Architectural elements | System, SA node | |
| System response | The system registers or unregisters SA nodes. | |
| Response measure(s) | User should be able to register or unregister the node within 5 minutes by following the provided manual. | |

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| **Extensibility** | | **ID:** QA09 |
| **Quality Attribute:** The system should make it easy for application developers (private persons, VARs, or other 3rd parties) to build custom apps, services, and/or make mashups from existing available services. Average skilled developers should be able to build the application in six months. | | |
| Stimulus | New application or service | |
| Source(s) of the stimulus | Developers (including 3rd party), VARs | |
| Relevant environmental conditions | After release | |
| Architectural elements | System | |
| System response | The system supports the new application/service. | |
| Response measure(s) | Average skilled developers should be able to build the application in six months. | |

# **4.** **Constraints**

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| **ID** | **Type** | **Description** |
| TC01 | Technical | JAVA compiler, Arduino 1.0.6 |
| TC02 | Technical | Permissible languages for this system (excluding the SA Nodes) include JAVA and Python. |
| TB01 | Business | 5 weeks and about 3 hours/day are available |
| TB02 | Business | It should be delivered on 25th, June. |
| TB03 | Business | 5 developers due to the temporary development organization. |