



SNS College of Engineering

An Autonomous Institution

Accredited by NAAC-UGC with 'A' Grade,
Approved by AICTE, Recognized by UGC and Affiliated to Anna University, Chennai

Redesigning Common Mind & Business Towards Excellence



Build an Entrepreneurial Mindset Through Our Design Thinking FrameWork

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Data Collection, Storage and Computing using a Cloud platform



Prepared by
Dr.M.Sudha

Associate Professor, ECE
SNSCE



IoT Cloud-based Data Collection, Storage and Computing Services Using Nimbits

Redesigning Common Mind & Business Towards Excellence



Build an Entrepreneurial Mindset Through Our Design Thinking Framework

- Nimbits enables IoT on an open source distributed cloud. Nimbits cloud PaaS deploys an instance of Nimbits Server at the device nodes.
- Nimbits functions as an M2M system data store, data collector and logger with access to historical data.
- Nimbits architecture is a cloud-based Google App Engine. Nimbits server is a class hierarchy `com.nimbits.server.system.ServerInfo` of `java.lang.Object`.

Nimbits PaaS services offer the following features:

- Edge computing locally on embedded systems, built up of local applications. It runs the rules and pushes important data up to the cloud running when connected over Internet and an instance of Nimbits Server hosts at the device nodes which is then enabled.
- It supports multiple programming languages, including Arduino, new Arduino library, push functions from Arduino cloud, JavaScript, HTML or the Nimbits.io Java library.
- Nimbits server functions as a backend platform. Nimbits data point can relay data between the software systems, or hardware devices such as Arduino, using the cloud as a backend.
- An open source Java library called nimbits.io enables easy development of JAVA, web and Android solutions (Nimbits data, alerts, messages on mobile).
- It provides a rule engine for connecting sensors, persons and software to the cloud and one another. Rules can be for calculations, statistics, email alerts, xmpp messages (Section 3.3.3), push notifications and more.



IoT Cloud-based Data Collection, Storage and Computing Services Using Nimbits

- It provides a data logging service and access, and stores the historical data points and data objects.
- Storage in any format that can be serialised into a string, such as JSON or XML.
- It filters the noise and important changes sent to another larger central instance.
- It processes a specific type of data and can store it.
- Time- or geo-stamping of the data.
- Nimbits clients provide over Internet, data collection in real time, charts, chart and graphical plots of collected data and data entry.
- Data visualisation for data of connected sensors to IoT devices.
- Supports the alerts subscription, generation and sending in real time over the Internet.
- It creates streams of data objects and stores them in a data point series.
- Data accessibility and monitoring from anywhere, and is used to shape the behaviour of connected devices and software.
- It supports the mBedTM, Arduino, Raspberry Pi based and other hardware platform based IoT devices.
- Web service APIs are easy to implement on device hardware acting as clients to Nimbits web services, and connect to the web service and send data.
- It deploys software on Google App Engine, any J2EE server on Amazon EC2 or on a Raspberry Pi.

Figure 6.3 shows connected devices, sensor nodes, network data points, Nimbits server, deployment at the device network nodes, and networked with the Nimbits Server (PaaS, SaaS and IaaS services) at cloud for applications and services.

Architecture shown in Figure 6.3 shows a NimbitsServerL which deploys at each device node and is an instance of the NimbitsSeverS at the cloud. Each NimbitsServerL of the device node generates the calculation objects for device nodes.

Each node also hosts an XMPPServerL, an instance of the XMPPSeverC at the cloud.

XMPPServerL deploys at each device node and generates the data feed channels for the XMPP messages and alerts. Each XMPPServerL sends feeds to XMPPSeverC.



IoT Cloud-based Data Collection, Storage and Computing Services Using Nimbits

Redesigning Common Mind & Business Towards Excellence



Build an Entrepreneurial Mindset Through Our Design Thinking FrameWork

- Figure 6.3 shows connected devices, sensor nodes, network data points, Nimbits server, deployment at the device network nodes, and networked with the Nimbits Server (PaaS, SaaS and IaaS services) at cloud for applications and services.
- Architecture shown in Figure 6.3 shows a NimbitsServerL which deploys at each device node and is an instance of the NimbitsSeverS at the cloud.
- Each NimbitsServerL of the device node generates the calculation objects for device nodes. Each node also hosts an XMPPServerL, an instance of the XMPPSeverC at the cloud. XMPPServerL deploys at each device node and generates the data feed channels for the XMPP messages and alerts. Each XMPPServerL sends feeds to XMPPSeverC
- Data Points A data point means a collected value of a sensor in a group of sensors. Data points organise the data in a number of ways.
- For example, points can have child points (child points mean subpoints; for example, if light level is a data point then light on or off is a child point and light level above or below the threshold can be another child point.) Points can be in the folders. The folders can go as deep as like in a tree (Tree means a folder having several subfolders, a subfolder having several subfolders, till the leaf subfolder.)



IoT Cloud-based Data Collection, Storage and Computing Services Using Nimbits

Redesigning Common Mind & Business Towards Excellence



Build an Entrepreneurial Mindset Through Our Design Thinking FrameWork

- Any type of document can upload and organise them with the points. Files can be shared publicly or with the connections. A subscription data feed is a special point for each user that logs system messages, events, alerts from other points which are subscribed by a service and more.
- Data Channels A user can create a data feed channel which shows the system events and messages that also shows data alerts which are subscribed to show up in the feed.
- The user can subscribe to the data point of other users also, and configure the subscription(s) to send messages to the feed. The user can observe the idle, high or low alerts here in real time. The user data feed is just another Nimbits data point.

Using Advanced Features An application can create a connection to another Nimbits application or service.¹⁰ The application sends an invitation and if the invitee approves, then the application can see invitee's points and data in their tree (if they set the objects permission level to public or connection viewable).



IoT Cloud-based Data Collection, Storage and Computing Services Using Nimbits

Nimbits 3.6.6 introduced H2 database engine. Nimbits 3.8.10 includes H2 database engine. H2 is Java SQL database. APIs are in pure Java, The main features of H2 are:

- Very fast, open source, JDBC API
- Embedded and server modes; in-memory databases
- Encrypted database
- ODBC driver
- Full text search
- Multi-version concurrency
- Browser-based console application
- Small footprint (around 1.5 MB jar file size)

MySQL is not in pure Java and have no provisions for in-memory or encrypted databases. Footprint (DLL) is nearly 4 MB. (JAR means Java archive while DLL stands for dynamically linked library.)

Security Tokens

Nimbits 3.9.6 provides security tokens in a new way.

Breakthrough Performance and Data Integrity

Nimbits server 3.9.10 version launched in June 2015 provisions for the breakthrough performance and data integrity.

Alerts

A filter means applying some rule to get new data for a data point. The filter item in the tree called “ah” is for XMPP alerts (Section 3.3.3). A user application can now have many JIDs (Jabber IDs) for a single point—alerts and messages can be sent over XMPP using the custom JID of points.



IoT Cloud-based Data Collection, Storage and Computing Services Using Nimbits

Redesigning Common Mind & Business Towards Excellence



Build an Entrepreneurial Mindset Through Our Design Thinking Framework

Jabbing

Jabbing means pushing the alerts or messages down quickly or pushing repeatedly. Each type of alert or message is assigned a Jabber ID, called JID. Each JID consists of three main parts, viz. the node identifier (optional), domain identifier (required) and resource identifier (optional). A JID is written in notations as `<JID>:= [<node>"@"<domain>["/"<resource>].`

Subscriptions

A user can create many subscriptions for a single point. It may subscribe to one of the points, other user, or anyone's public point to get the alerts. The user gets alerts when the point goes into an alarm state, or receives new data. Alarm state means reaching preset value. For example, a pressure boiler reaching critical pressure necessitating action or water reaching boiling point necessitating action.

Subscriptions are alternative to the configurations of alert (an alert-configuration means specifying when a point became idle, high, low using the point property menu). A subscription to a point creates on configuring the subscription—how an application is programmed to get alerts (XMPP, Twitter, Email or other) and what events trigger the alert (new data, high or other alerts).

IoT Cloud-based Data Collection, Storage and Computing Services Using Nimbits

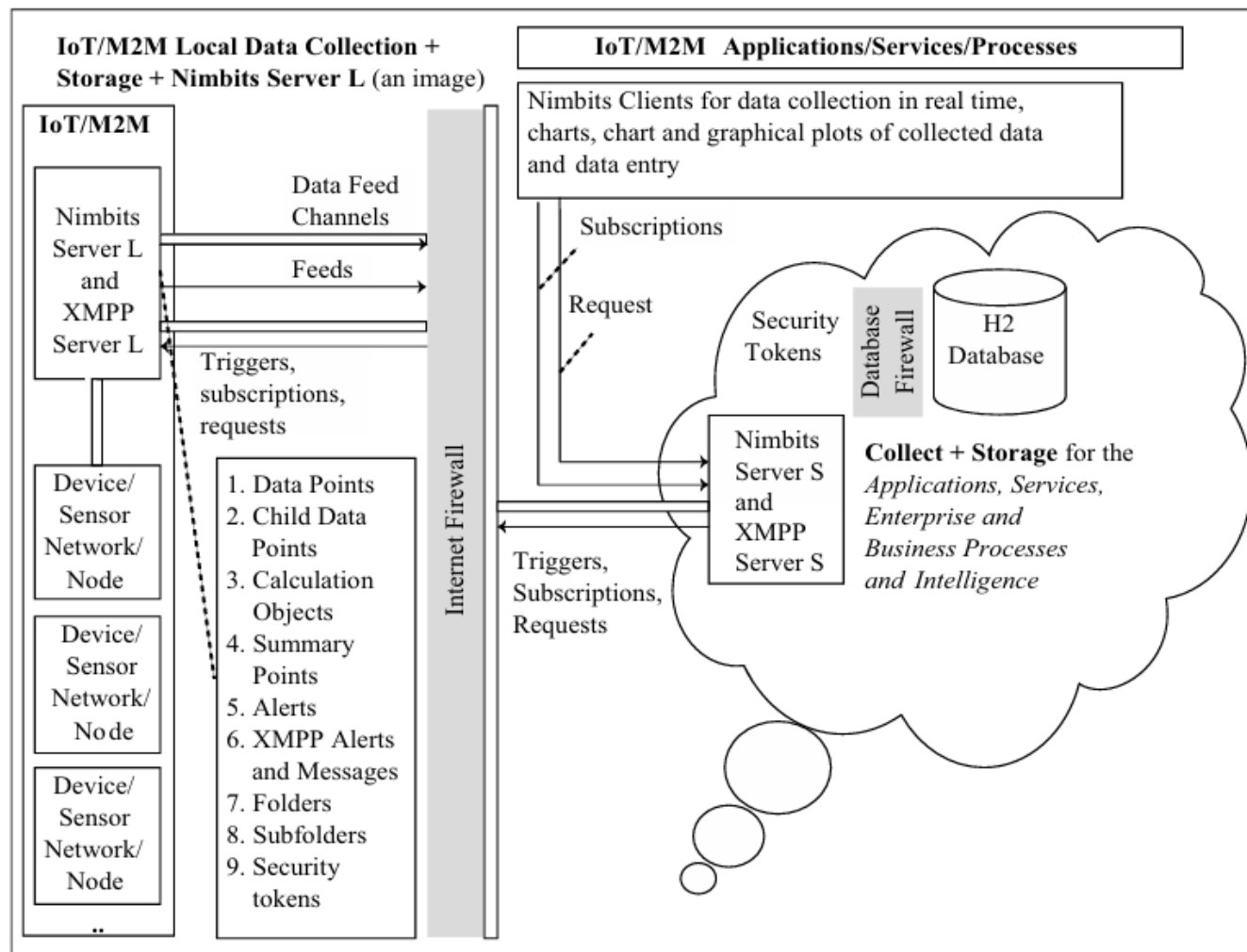


Figure 6.3 Connected devices, sensor nodes, network data points, Nimbits server, deployment at the device network nodes, and networked with the Nimbits Server (PaaS, SaaS and IaaS services) at cloud for applications and services.



Redesigning Common Mind & Business Towards Excellence



sign Thinking FrameWork

Thank
You