Mango is browser-based, Ajax-enabled M2M software that enables users to access and control electronic sensors, devices, and machines over multiple protocols simultaneously.

It provides a database to store the collected data, a Human-Machine Interface to provide

graphs, diagnostic data, and management information. Mango can present the

information to the operating personnel in an easy to use graphical interface, in the

form of a mimic diagram. For example, a picture of a thermometer can show the

operator the temperature of the room where one of the sensors is located.

Furthermore, it enables the administrator to set up alarms on specific events, to log

these events, and to react to these events in an automated fashion. The system is

designed for multiple users: it has a sophisticated user management system, where one

can finely tune what ordinary users can see and do.

Collecting data begins with setting up a “data source”. Different kind of data sources are available, based on their underlying protocol for gathering data. Examples for protocols are Modbus IP, Modbus Serial, 1-wire, SNMP. Mango can also receive data through HTTP: it can download an image, and it is able to parse HTML, so with the help of a well-formed regular expression, one can easily extract valuable information (e.g. temperature data) from any web page (website of a weather station). Related source files are com.serotonin.mango.rt.dataSource.DataSourceRT and com.serotonin.mango.vo.dataSource.DataSourceVO. DataSourceVO represents the configuration of a DataSourceRT, and it is the DataSourceVO whose parameters can be set at the data\_source\_edit.shtm. DataSourceRT is only an interface for the specific data sources implemented under the /src/com/serotonin/mango/rt/dataSource directory.

After setting up a data source, one must define so-called “data points”. One data source can have many different data points. A physical measurement device (a data source, that is) can, for example, supply data about the temperature, the humidity and the brightness of a room. The latter three objects are the data points. It is crucial not to confuse data points with their actual values: a data point is simply a concept (i.e. humidity), while its value will be 10%. Data points thus have data point values. Data points do not change, only their values do. Interesting files are the following: com.serotonin.mango.vo.DataPointVO, com.serotonin.mango.rt.dataImage.DataPointRT and com.serotonin.mango.db.dao.DataPointDao. The actual values are represented by the com.serotonin.mango.rt.dataImage.PointValueTime class, and are handled by the following classes: com.serotonin.mango.rt.dataImage.PointValueFacade and com.serotonin.mango.db.dao.PointValueDao

One can examine and follow these data points (and their values) by using “watch lists”

or “graphical views”. Watch lists are a tabular set of points that one wishes to view all

at once. Point values and value times update automatically, there is no need to refresh

the page.

A graphical view is similar to a watch list, but instead provides a graphical

representation of selected points. The representation of each point in one's view

depends upon that point's configuration. Points can be rendered as simply a current

value (like in a watch list), or an arbitrary icon set can be used that visually represents

the point's value (e.g. a thermometer showing the temperature). Graphical views are

visually more pleasing to the eye.

For example, graphical views may optionally be presented upon background images.

In this thesis the emphasis is on watch lists, so for now, the interesting classes are:

com.serotonin.mango.vo.WatchList,

com.serotonin.mango.web.dwr.WatchListDwr and

com.serotonin.mango.db.dao.WatchListDao*.* With the 1.7.0 release of Mango,

a new concept, the so-called “mobile watch lists”, has appeared. These are simplified,

lightweight versions of the original heavyweight watch lists. Normal watch lists use

massive amount of JavaScript, they are slow or sometimes even unable to load on

mobile devices, that is why something lighter was needed.

com.serotonin.mango.web.mvc.controller.MobileWatchListController

and com.serotonin.mango.web.mvc.controller.MobileWatchListState are

the most important classes here.

Mango provides a robust and highly configurable event management system, where users can programmatically react to specific events. One can define and attach an “event detector” to a data point (for example, the temperature of the room exceeded a certain limit), after which the “event handling” system kicks in and alerts those users (by email), who are subscribed for this type of event.