# Introduction

*oBIX is designed to provide access to the embedded software systems which sense and control the world around us.*

*oBIX Version 1.1, Working Draft 06, 08 June 2010*

oBIX is expected to help improve operational efficiencies for end-users by bridging the gap between facility systems and enterprise applications. Facility operators, building owners, and tenants will be able to make decisions based on a comprehensive view of their enterprise including lifecycle costs, environmental considerations, operations, and other performance factors.

## Normalization

Version 1.0 of oBIX provides a normalized representation for three of these:

* **Points:** representing a single scalar value and its status – typically these map to sensors, actuators, or configuration variables like a setpoint;
* **Histories:** modeling and querying of time sampled point data. Typically edge devices collect a time stamped history of point values which can be fed into higher level applications for anlaysis;
* **Alarming:** modeling, routing, and acknowledgment of alarms. Alarms indicate a condition which requires notification of either a user or another application.

# Architecture

The oBIX architecture is based on the following principles:

* **Object Model:** a concise object model used to define all oBIX information
* **XML Syntax:** a simple XML syntax for expressing the object model
* **URIs:** URIs are used to identify information within the object model
* **REST:** a small set of verbs is used to access objects via their URIs and transfer their state via XML
* **Contracts:** a template model for expressing new oBIX “types”
* **Extendibility:** providing for consistent extendibility using only these concepts

# Operations

## Requests

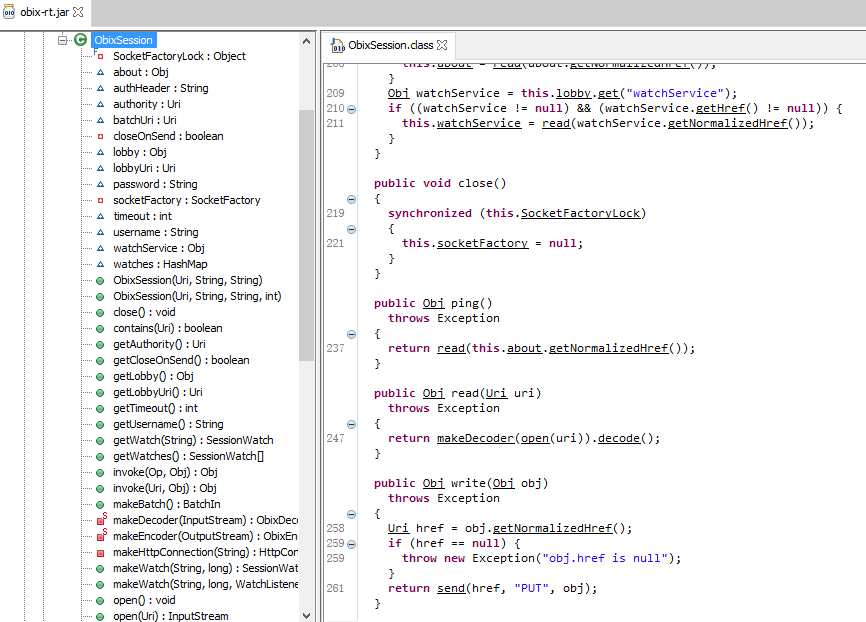
The following table describes the mapping of oBIX request and its HTTP equivalent:

|  |  |  |
| --- | --- | --- |
| **oBIX Request** | **HTTP Method** | **Target** |
| Read | GET | Any object with an href |
| Write | PUT  Send <obj> message | Any object with an href and writable=true |
| Invoke | POST  Send <op> message holding input parameters as children | Any op object with an href |

See here the examples:

|  |  |
| --- | --- |
| **Client** | **Server** |
| HTTP GET  all oBIX servers must provide an object which implements obix:Lobby.  the Lobby object serves as the central entry point into an oBIX server, and lists the URIs for other well-known objects defined by the oBIX specification.  http://localhost/obix/ | <obj href="http://localhost/obix/" is="obix:Lobby" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <ref name="watchService" href="watchService/" is="obix:WatchService"/>  <ref name="config" href="/obix/config/" is="/obix/def/baja:Station" display="Station" displayName="Config" icon="/ord?module://icons/x16/database.png"/>  <ref name="about" href="about/" is="obix:About"/>  <ref name="histories" href="histories/" display="com.tridium.history.db.BLocalHistoryDatabase" displayName="History" icon="/ord?module://icons/x16/historyDatabase.png"/>  <ref name="continuousControl" href="/obix/config/Drivers/ObixNetwork/exports" is="/obix/def/obixDriver:ObixExportFolder /obix/def/baja:Folder" display="Obix Export Folder" displayName="Exports" icon="/ord?module://icons/x16/folder.png"/>  <op name="batch" href="batch/" in="obix:BatchIn" out="obix:BatchOut"/>  <ref name="alarms" href="/obix/config/Services/AlarmService" is="/obix/def/alarm:AlarmService obix:AlarmSubject" display="Alarm Service" displayName="AlarmService" icon="/ord?module://icons/x16/alarm.png"/>  </obj> |
| HTTP GET  retrieve the point information  http://localhost/obix/config/examples/BooleanWritable/ | <bool val="false" href="http://localhost/obix/config/examples/BooleanWritable/" is="/obix/def/control:BooleanWritable /obix/def/control:BooleanPoint obix:Point" null="true" display="- {null} @ def" icon="/ord?module://icons/x16/control/booleanPoint.png" range="/obix/config/examples/BooleanWritable/out/~bool" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <bool name="out" val="false" href="out/" is="/obix/def/baja:StatusBoolean" null="true" display="- {null} @ def" displayName="Out" icon="/ord?module://icons/x16/statusBoolean.png" range="out/~bool">  </bool>  <bool name="in1" val="false" href="in1/" is="/obix/def/baja:StatusBoolean" null="true" display="- {null}" displayName="In1" icon="/ord?module://icons/x16/statusBoolean.png" range="in1/~bool">  </bool>  ......  <bool name="in16" val="false" href="in16/" is="/obix/def/baja:StatusBoolean" null="true" display="- {null}" displayName="In16" icon="/ord?module://icons/x16/statusBoolean.png" range="in16/~bool">  </bool>  <bool name="fallback" val="false" href="fallback/" is="/obix/def/baja:StatusBoolean" null="true" display="- {null}" displayName="Fallback" icon="/ord?module://icons/x16/statusBoolean.png" range="fallback/~bool">  </bool>  <op name="emergencyActive" href="emergencyActive/" displayName="Emergency Active"/>  <op name="emergencyInactive" href="emergencyInactive/" displayName="Emergency Inactive"/>  <op name="emergencyAuto" href="emergencyAuto/" displayName="Emergency Auto"/>  <op name="active" href="active/" in="/obix/def/control:Override" displayName="Active"/>  <op name="inactive" href="inactive/" in="/obix/def/control:Override" displayName="Inactive"/>  <op name="auto" href="auto/" displayName="Auto"/>  <op name="set" href="set/" in="obix:bool" displayName="Set"/>  </bool> |
| HTTP PUT  oBIX server may automatically free the Watch because the client fails to poll after a predetermined amount of time.  http://localhost/obix/watchService/defaultLeaseTime/  <reltime val="PT20S" /> | <reltime val="PT20S" href="http://localhost/obix/watchService/defaultLeaseTime/" display="20secs" displayName="Default Lease Time" writable="true" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0"/> |
| HTTP POST  create one new empty Watch  http://localhost/obix/watchService/make/ | <obj href="http://localhost/obix/watchService/watch60/" is="obix:Watch" display="Obix Watch" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <reltime name="lease" val="PT20S" href="http://localhost/obix/watchService/watch60/lease/" display="20secs" displayName="Lease" writable="true"/>  <op name="add" href="http://localhost/obix/watchService/watch60/add/" in="obix:WatchIn" out="obix:WatchOut"/>  <op name="remove" href="http://localhost/obix/watchService/watch60/remove/" in="obix:WatchIn" out="obix:Nil"/>  <op name="pollChanges" href="http://localhost/obix/watchService/watch60/pollChanges/" in="obix:Nil" out="obix:WatchOut"/>  <op name="pollRefresh" href="http://localhost/obix/watchService/watch60/pollRefresh/" in="obix:Nil" out="obix:WatchOut"/>  <op name="delete" href="http://localhost/obix/watchService/watch60/delete/" in="obix:Nil" out="obix:Nil"/>  </obj> |
| HTTP POST  once a Watch has been created, the client can add new objects to watch.  http://localhost/obix/watchService/watch32/add/  <obj is="obix:WatchIn">  <list names="hrefs">  <uri val="/obix/config/examples/BooleanWritable/" />  <uri val="/obix/config/examples/NumericWritable/" />  <uri val="/obix/config/examples/StringWritable/" />  <uri val="/obix/config/examples/EnumWritable/" />  </list>  </obj> | <obj is="obix:WatchOut" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <list name="values" of="obix:obj">  <bool val="false" href="/obix/config/examples/BooleanWritable/" is="/obix/def/control:BooleanWritable /obix/def/control:BooleanPoint obix:Point" null="true" display="- {null} @ def" icon="/ord?module://icons/x16/control/booleanPoint.png" range="/obix/config/examples/BooleanWritable/out/~bool">  <bool name="out" val="false" href="/obix/config/examples/BooleanWritable/out/" is="/obix/def/baja:StatusBoolean" null="true" display="- {null} @ def" displayName="Out" icon="/ord?module://icons/x16/statusBoolean.png" range="/obix/config/examples/BooleanWritable/out/~bool">  </bool>  <bool name="in1" val="false" href="/obix/config/examples/BooleanWritable/in1/" is="/obix/def/baja:StatusBoolean" null="true" display="- {null}" displayName="In1" icon="/ord?module://icons/x16/statusBoolean.png" range="/obix/config/examples/BooleanWritable/in1/~bool">  </bool>  ……  <op name="inactive" href="/obix/config/examples/BooleanWritable/inactive/" in="/obix/def/control:Override" displayName="Inactive"/>  <op name="set" href="/obix/config/examples/BooleanWritable/set/" in="obix:bool" displayName="Set"/>  </bool>  <real val="0.0" href="/obix/config/examples/NumericWritable/" is="/obix/def/control:NumericWritable /obix/def/control:NumericPoint obix:Point" null="true" display="- {null} @ def" icon="/ord?module://icons/x16/control/numericPoint.png" unit="obix:units/null">  <real name="out" val="0.0" href="/obix/config/examples/NumericWritable/out/" is="/obix/def/baja:StatusNumeric" null="true" display="- {null} @ def" displayName="Out" icon="/ord?module://icons/x16/statusNumeric.png" unit="obix:units/null">  </real>  ……  <op name="set" href="/obix/config/examples/NumericWritable/set/" in="obix:real" displayName="Set"/>  </real>  <str val="" href="/obix/config/examples/StringWritable/" is="/obix/def/control:StringWritable /obix/def/control:StringPoint obix:Point" null="true" display="- {null} @ def" icon="/ord?module://icons/x16/control/stringPoint.png">  <str name="out" val="" href="/obix/config/examples/StringWritable/out/" is="/obix/def/baja:StatusString" null="true" display="- {null} @ def" displayName="Out" icon="/ord?module://icons/x16/statusString.png">  </str>  ……  <op name="emergencyOverride" href="/obix/config/examples/StringWritable/emergencyOverride/" in="/obix/def/baja:String" displayName="Emergency Override"/>  <op name="set" href="/obix/config/examples/StringWritable/set/" in="/obix/def/baja:String" displayName="Set"/>  </str>  <enum val="0" href="/obix/config/examples/EnumWritable/" is="/obix/def/control:EnumWritable /obix/def/control:EnumPoint obix:Point" null="true" display="- {null} @ def" icon="/ord?module://icons/x16/control/enumPoint.png" range="/obix/config/examples/EnumWritable/out/~range">  <enum name="out" val="0" href="/obix/config/examples/EnumWritable/out/" is="/obix/def/baja:StatusEnum" null="true" display="- {null} @ def" displayName="Out" icon="/ord?module://icons/x16/statusEnum.png" range="/obix/config/examples/EnumWritable/out/~range">  </enum>  ……  <op name="set" href="/obix/config/examples/EnumWritable/set/" in="obix:enum" displayName="Set"/>  </enum>  </list>  </obj> |
| HTTP POST  the client can remove objects from the watch list.  http://localhost/obix/watchService/watch32/remove/  <obj is="obix:WatchIn">  <list names="hrefs">  <uri val="/obix/config/examples/BooleanWritable/" />  </list>  </obj> | <obj null="true" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0"/> |
| HTTP POST clients should periodically poll the server for changes.  http://localhost/obix/watchService/watch32/pollChanges/ | <obj is="obix:WatchOut" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <list name="values" of="obix:obj">  <real val="1.23" href="/obix/config/examples/NumericWritable/" is="/obix/def/control:NumericWritable /obix/def/control:NumericPoint obix:Point" display="1.2 {ok} @ def" icon="/ord?module://icons/x16/control/numericPoint.png" unit="obix:units/null">.  <real name="out" val="1.23" href="/obix/config/examples/NumericWritable/out/" is="/obix/def/baja:StatusNumeric" display="1.2 {ok} @ def" displayName="Out" icon="/ord?module://icons/x16/statusNumeric.png" unit="obix:units/null">  </real>  <real name="in1" val="0.0" href="/obix/config/examples/NumericWritable/in1/" is="/obix/def/baja:StatusNumeric" null="true" display="- {null}" displayName="In1" icon="/ord?module://icons/x16/statusNumeric.png" unit="obix:units/null">  </real>  ……  <op name="set" href="/obix/config/examples/NumericWritable/set/" in="obix:real" displayName="Set"/>  </real>  </list>  </obj> |
| HTTP POST  invoke set operation on numericwritable  http://localhost/obix/config/examples/NumericWritable/set/  <real val="12.45" /> | <real val="12.45" is="/obix/def/control:NumericWritable /obix/def/control:NumericPoint obix:Point" display="12.4 {ok} @ def" icon="/ord?module://icons/x16/control/numericPoint.png" unit="obix:units/null" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <real name="out" val="12.45" href="out/" is="/obix/def/baja:StatusNumeric" display="12.4 {ok} @ def" displayName="Out" icon="/ord?module://icons/x16/statusNumeric.png" unit="obix:units/null">  </real>  <real name="in1" val="0.0" href="in1/" is="/obix/def/baja:StatusNumeric" null="true" display="- {null}" displayName="In1" icon="/ord?module://icons/x16/statusNumeric.png" unit="obix:units/null">  </real>  ......  <op name="set" href="set/" in="obix:real" displayName="Set"/>  </real> |
| HTTP POST  Invoke set operation on enumwritable  http://localhost/obix/config/examples/EnumWritable/set/  <enum range="/obix/def/control:PriorityLevel/~range" val="level\_4" /> | <enum val="level\_4" is="/obix/def/control:EnumWritable /obix/def/control:EnumPoint obix:Point" display="4 {ok} @ def" icon="/ord?module://icons/x16/control/enumPoint.png" range="/obix/def/control:PriorityLevel/~range" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <str name="facets" val="range=E:control:PriorityLevel" href="facets/" display="range=control:PriorityLevel" displayName="Facets" writable="true"/>  <ref name="proxyExt" href="proxyExt/" is="/obix/def/control:NullProxyExt" null="true" display="null" displayName="Proxy Ext" icon="/ord?module://icons/x16/control/controlExtension.png"/>  <enum name="out" val="level\_4" href="out/" is="/obix/def/baja:StatusEnum" display="4 {ok} @ def" displayName="Out" icon="/ord?module://icons/x16/statusEnum.png" range="/obix/def/control:PriorityLevel/~range">  </enum>  ……  <op name="emergencyOverride" href="emergencyOverride/" in="obix:enum" displayName="Emergency Override"/>  <op name="emergencyAuto" href="emergencyAuto/" displayName="Emergency Auto"/>  <op name="override" href="override/" in="/obix/def/control:EnumOverride /obix/def/control:Override" displayName="Override"/>  <op name="auto" href="auto/" displayName="Auto"/>  <op name="set" href="set/" in="obix:enum" displayName="Set"/>  </enum> |
| HTTP POST  add alarm feed to a Watch  http://localhost/obix/watchService/watch122/add/  <obj is="obix:WatchIn">  <list names="hrefs">  <uri val="/obix/config/Services/AlarmService/~alarmFeed/" />  </list>  </obj> | <obj is="obix:WatchOut" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <list name="values" of="obix:obj">  <feed name="feed" href="/obix/config/Services/AlarmService/~alarmFeed/" of="obix:Alarm" in="obix:AlarmFilter">  </feed>  </list>  </obj> |
| HTTP POST  force an update of alarm  http://localhost/obix/watchService/watch122/pollRefresh/ | <obj is="obix:WatchOut" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://obix.org/ns/schema/1.0 /obix/xsd" xmlns="http://obix.org/ns/schema/1.0">  <list name="values" of="obix:obj">  <feed name="feed" href="/obix/config/Services/AlarmService/~alarmFeed/" of="obix:Alarm" in="obix:AlarmFilter">  <obj href="/obix/alarm/539c64e3-1659-471c-a27a-abfe16056594" is="obix:Alarm obix:AckAlarm obix:PointAlarm obix:StatefulAlarm" display="">  <op name="ack" href="/obix/alarm/539c64e3-1659-471c-a27a-abfe16056594/ack" in="obix:AlarmAckIn" out="obix:AlarmAckOut"/>  <ref name="source" href="/obix/config/examples/NumericWritable/OutOfRangeAlarmExt"/>  <real name="alarmValue" val="12.45"/>  <abstime name="timestamp" val="2017-09-26T16:39:02.785+08:00" tz="Etc/GMT-8"/>  <str name="niagara-uuid" val="539c64e3-1659-471c-a27a-abfe16056594"/>  <int name="priority" val="255"/>  <str name="alarmClass" val="defaultAlarmClass"/>  <str name="presentValue" val="12.4"/>  <str name="fromState" val="normal"/>  <str name="toState" val="lowLimit"/>  <str name="lowLimit" val="30.0"/>  <str name="offnormalValue" val="12.4"/>  <str name="msgText" val=""/>  <str name="deadband" val="2.0"/>  <str name="sourceName" val="NumericWritable"/>  <int name="Count" val="1"/>  <str name="highLimit" val="100.0"/>  <str name="status" val="{ok} @ def"/>  <str name="TimeZone" val="Etc/GMT-8 (+8)"/>  <str name="escalated" val=""/>  <str name="sourceStation" val="demo"/>  </obj>  </feed>  </list>  </obj> |

# oBIX Java Toolkit



# References

* [A Beginner’s Guide to oBIX – Part 4](https://www.niagara-community.com/articles/Product_Guide/A-Beginner-s-Guide-to-oBIX-even-if-you-re-not-a-developer---Part-4?retURL=%2Fapex%2FComm_Search%3Fq%3Dobix&popup=false): subscribe, query and acknowledge alarms from oBIX
* [A Beginner’s Guide to oBIX – Part 5](https://www.niagara-community.com/articles/Product_Guide/A-Beginner-s-Guide-to-oBIX-even-if-you-re-not-a-developer---Part-5?retURL=%2Fapex%2FComm_Search%3Fq%3Dobix&popup=false): access histories using oBIX
* [A Beginner’s Guide to oBIX – Part 6](https://www.niagara-community.com/articles/Product_Guide/A-Beginner-s-Guide-to-oBIX-even-if-you-re-not-a-developer---Part-6?retURL=%2Fapex%2FComm_Search%3Fq%3Dobix&popup=false): make batch operation