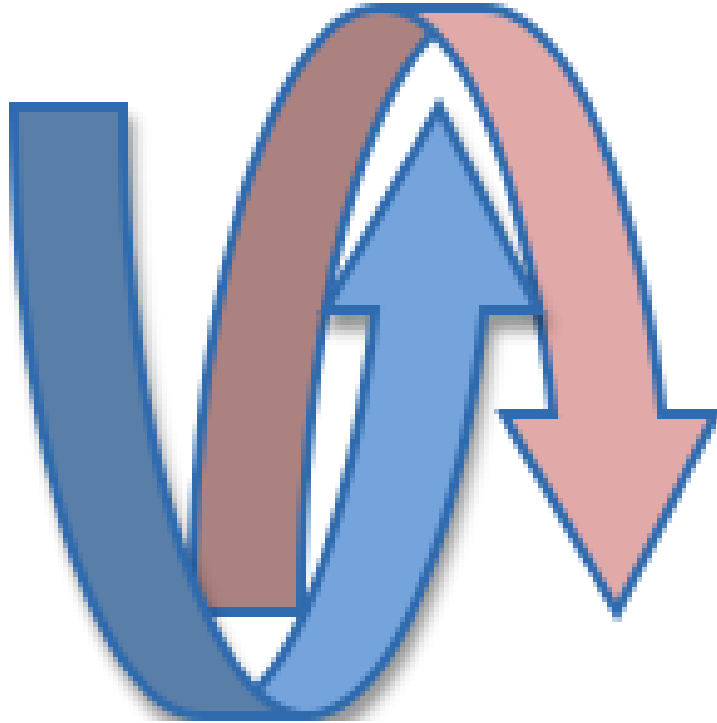


Atmosphere Pro



White Paper

V 4.5.0 @ January 2020

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| | |
|--|-----------|
| Atmosphere Satellite | 4 |
| How to install Satellite | 5 |
| Reaching the Maximum Atmosphere Pro Licenses | 6 |
| Configuring Satellite using Hazelcast's hazelcast.xml | 7 |
| Configuring Satellite using Hazelcast using web.xml only | 7 |
| Configuring Satellite using external Hazelcast Support | 8 |
| Configuring Satellite using external Hazelcast Client | 8 |
| How replication works | 9 |
| Broadcaster Replication | 9 |
| AtmosphereResource Replication | 10 |
| AtmosphereResource Retrieval | 11 |
| Message Replication | 12 |
| Failing to deliver a message | 13 |
| Configuring Satellite Receiver Thread Pool for optimal performance | 13 |
| Atmosphere Tower Control | 14 |
| Installing Tower Control | 14 |
| Starting Tower Control | 15 |
| io.async.control.AsyncSupport | 17 |
| io.async.control.AtmosphereFramework | 18 |
| io.async.control.broadcaster | 19 |
| io.async.control.cache | 19 |
| io.async.control.config | 20 |
| io.async.control.factory | 20 |
| io.async.control.interceptors | 21 |

| | |
|-----------------------------|-----------|
| io.async.control.resource | 21 |
| io.async.control.statistics | 22 |
| io.async.control.websocket | 22 |
| Atmosphere Postman | 23 |
| How to install Postman | 23 |
| Installing the client side | 24 |
| Callbacks | 24 |
| How it works | 24 |

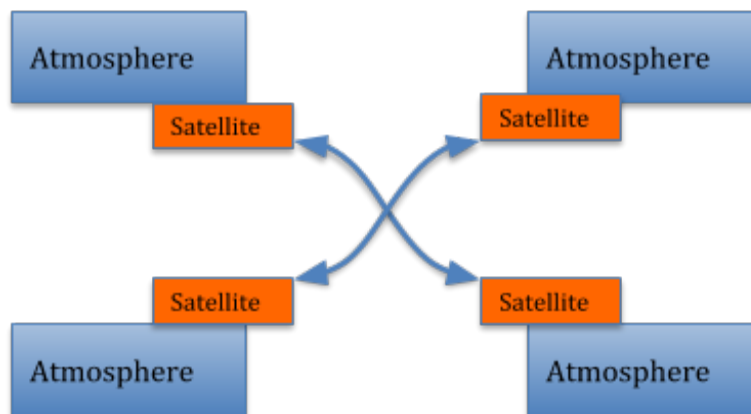
Atmosphere Satellite

Applications using Atmosphere Satellite gain the following superpowers:

- Elastic Scalability (just add more servers and they cluster auto magically, i.e. automatically)
- Super Speeds (in memory transaction speeds)
- High Availability
- Fault Tolerance
- Cloud Readiness
- 100% State Replication of AtmosphereResource, Broadcaster and BroadcasterCache
- Powered by Hazelcast 3.x (www.hazelcast.org): An In-Memory Data Grid

Atmosphere Satellite is easily able to handle this type of use case with in-memory performance, linear scalability as you add new nodes and reliability.

Satellite is small and gets transparently enabled by Atmosphere. Because of its design approach as well as Satellite's ability to automatically discover and cluster with peers, Satellite provides drop-in session clustering ability for any Atmosphere enabled server. It requires no additional investment in hardware and elastically scales as you add Atmosphere's application. This is a great way to ensure that Atmosphere's session state is maintained when you are clustering Atmosphere servers.



How to install Satellite

To install Satellite, all you need to do is to add the following dependency in your pom.xml:

```
<dependency>
  <groupId>io.async</groupId>
  <artifactId>atmosphere-satellite</artifactId>
  <version>2.5.3</version>
</dependency>
```

Atmosphere will auto-detect the jar and will install Satellite automatically. Once installed, you should see in your log:

```
Sep 12, 2014 11:02:17 AM com.hazelcast.cluster.MulticastJoiner
INFO: [10.0.1.4]:5701 [dev]
Members [1] {
  Member [10.0.1.4]:5701 this
}
Sep 12, 2014 11:02:17 AM com.hazelcast.core.LifecycleService
INFO: [10.0.1.4]:5701 [dev] Address[10.0.1.4]:5701 is STARTED
11:02:17.098 INFO [main] i.a.s.Satellite [Satellite.java:81]
Atmosphere Satellite e6ba40a1-29ab-493c-9295-30bcc7a2aaea
11:02:17.106 INFO [main] o.a.c.AtmosphereFramework [AtmosphereFramework.java:1906]
Auto detecting WebSocketHandler in /WEB-INF/classes/
```

When another Atmosphere Satellite instance is getting installed, the log for the first installation will show

```
Sep 12, 2014 11:14:31 AM com.hazelcast.cluster.ClusterService
INFO: [10.0.1.4]:5701 [dev]
Members [2] {
  Member [10.0.1.4]:5701 this
  Member [10.0.1.4]:5702
}
}
```

Addition and removal of Atmosphere Satellite are dynamic and will always be reflected in the log of each Atmosphere Satellite installation. You can also browse Satellite's MBeans using your favorite JMX client under the 'io.async.satellite' package.

Reaching the Maximum Atmosphere Pro Licenses

If you install more Atmosphere Pro instances than the number bought, any new instance will throw

```
io.async.satellite.Satellite$MaxLicensesException: Maximum Licenced Satellite 27  
at io.async.satellite.Satellite.dispatchMessage(Satellite.java:164)  
at io.async.satellite.Satellite.access$100(Satellite.java:46)  
at io.async.satellite.Satellite$2.on(Satellite.java:79)  
at  
io.async.satellite.HazelcastSatelliteTransport$1.onMessage(HazelcastSatelliteTransport.java:  
43)  
at com.hazelcast.topic.impl.TopicService.dispatchEvent(TopicService.java:135)  
at  
com.hazelcast.spi.impl.EventServiceImpl$EventPacketProcessor.process(EventServiceImpl.ja  
va:545)  
at  
com.hazelcast.spi.impl.EventServiceImpl$RemoteEventPacketProcessor.run(EventServiceIm  
pl.java:625)  
at com.hazelcast.util.executor.StripedExecutor$Worker.process(StripedExecutor.java:189)  
at com.hazelcast.util.executor.StripedExecutor$Worker.run(StripedExecutor.java:173)
```

Please contact licenses@async-io.org for more licenses.

Configuring Satellite using Hazelcast's hazelcast.xml

You can configure Hazelcast by following the normal way, as recommended by the Hazelcast team

<http://hazelcast.org/docs/latest/manual/html/config.html>

By default, a Hazelcast instance named "AtmosphereSatellite" will be created. If your application already use a HazelcastInstance or want to create a new instance with a different name, just define in web/atmosphere.xml:

```
<init-param>
  <param-name>io.async.satellite.HazelcastSatelliteTransport.instanceName</param-name>
  <param-value><<name>></param-value>
</init-param>
```

If the HazelcastInstance name exists, it will be picked and if not, created. It is strongly recommended to configure Hazelcast instance via **hazelcast.xml**

There might be transient failures when publishing on a topic. Satellite allows to automatically retry a publish that failed. You can configure it by settings a value for the following init parameters:

io.async.satellite.HazelcastSatelliteTransport.topicPublish.numRetries: Number of retries that Satellite with do before failing a publish. Default: 0 (no retry).

io.async.satellite.HazelcastSatelliteTransport.topicPublish.delaySeconds: delay in seconds before retrying a publish that failed. Default: 1.

Configuring Satellite using Hazelcast using web.xml only

If your application only use Hazelcast TCP/IP configuration, you can also configure it directly using the following properties

```
<init-param>
  <param-name>io.async.satellite.HazelcastSatelliteTransport.tcpIp.enabled</param-name>
  <param-value>true</param-value>
</init-param>

<init-param>
  <param-name>io.async.satellite.HazelcastSatelliteTransport.tcpIp.members</param-name>
  <param-value>5701</param-value>
</init-param>

<init-param>
  <param-name>io.async.satellite.HazelcastSatelliteTransport.group.name</param-name>
  <param-value>opd-poc</param-value>
</init-param>

<init-param>
  <param-name>io.async.satellite.HazelcastSatelliteTransport.group.password</param-name>
  <param-value>opd-poc-pass</param-value>
```

Configuring Satellite using external Hazelcast Support

You can configure Satellite's internal Hazelcast instance by implementing an HazelcastConfigurator:

```
package io.async.satellite;

import com.hazelcast.core.HazelcastInstance;
import org.atmosphere.cpr.AtmosphereConfig;

public interface HazelcastConfigurator {

    HazelcastInstance getOrCreateHazelcastInstance(AtmosphereConfig config);

}
```

and by defining

```
<init-param>
  <param-name>io.async.satellite.HazelcastConfigurator.className</param-name>
  <param-value>xxxxx</param-value>
</init-param>
```

Configuring Satellite using external Hazelcast Client

If you already have a running Hazelcast instance, you can also configure Satellite to use it instance by adding to your configuration file:

```
<init-param>
  <param-name>io.async.satellite.HazelcastSatelliteTransport.useClient</param-name>
  <param-value>true</param-value>
</init-param>
<init-param>
  <param-name>io.async.satellite.HazelcastSatelliteTransport.address</param-name>
  <param-value>127.0.0.1:5701</param-value>
</init-param>
```


How replication works

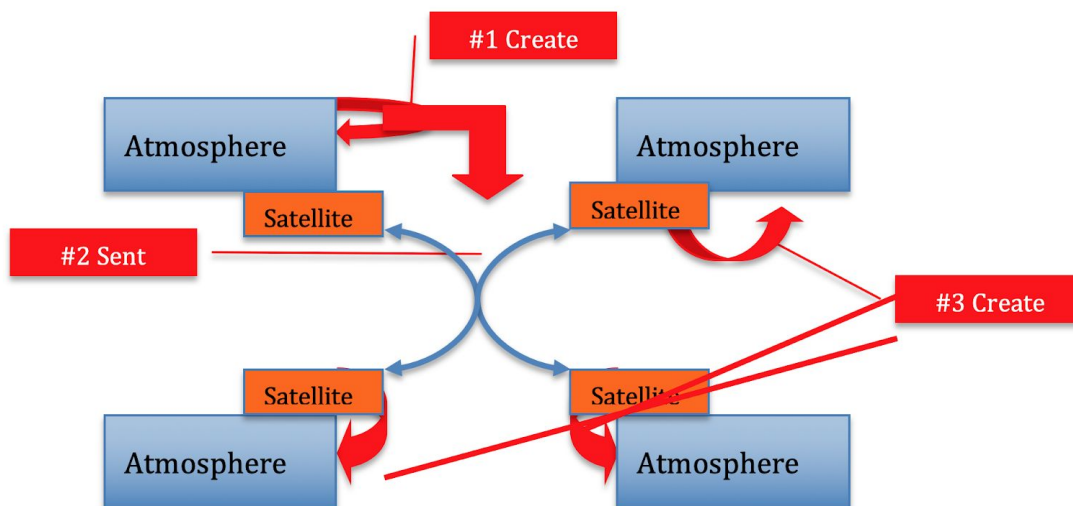
A Satellite always publishes its state at the moment it changes. Changing states includes:

- **Broadcaster:** when a Broadcaster is created by one Satellite, a message will be sent to all others Satellites, asking them to create the Broadcaster. Hence all available Satellites will have the same set of created Broadcasters. The same will happen when a Broadcaster is destroyed from one of the Satellite, e.g. the removal will also be execute by all Atmosphere Satellite.
- **AtmosphereResource:** when an AtmosphereResource is created (when a users/browsers connects), a message will be sent to all others Satellites, asking them to register the AtmosphereResource's UUID with its associated broadcaster. When an AtmosphereResource gets registered with a Broadcaster, the AtmosphereResource becomes candidate for message caching. The same will happens when an AtmosphereResource gets removed.
- **BroadcasterCache:** BroadcasterCache are tightly coupled with Broadcaster. Hence, BroadcasterCache are getting created everytime a Broadcaster is. Every time a new AtmosphereResource is added to a Broadcaster, a message will be sent to all others Satellites, and the AtmosphereResource's UUID will be added to the list of active BroadcasterCache's.

Broadcaster Replication

As noted, Broadcaster are getting replicated by following:

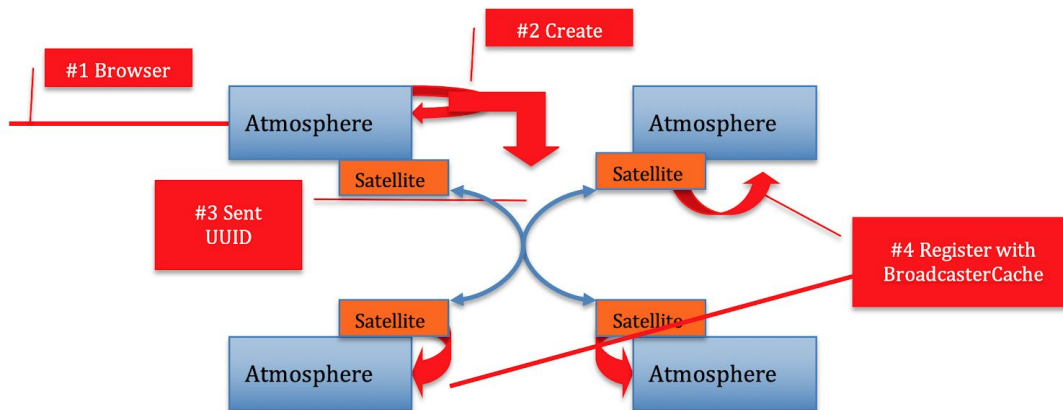
1. In a Satellite, a Broadcaster is getting created (#1)
2. The Satellite send a message to other Satellites (#2)
3. The Broadcaster is created in the other Satellite (#3)



AtmosphereResource Replication

When a user/browser connect, an AtmosphereResource is always created. With Satellite, the UUID of that AtmosphereResource will be shared amongst the Satellites:

1. Browser connects
2. AtmosphereResource gets created
3. The Atmosphere's UUID is sent to all Satellites
4. The UUID is registered with BroadcasterCache. Registering UUID with BroadcasterCache means message will be cached for that resource unless one of the Satellite successfully deliver the message.



AtmosphereResource Retrieval

It is possible to retrieve an AtmosphereResource located on another node by using the *AtmosphereResourceFactory.locate(uuid, Async)* API. Under the hood class *AtmosphereResourceFactory* will communicate with the remote Satellites and create a local “stub” for the remote AtmosphereResource if located.

```
factory.locate(message.getMessage(), new
AtmosphereResourceFactory.Async() {
    @Override
    public void available(AtmosphereResource r) {
        // Do something with the resource
        r.write("Hello World" );
    }
});
```

The operation of locating an AtmosphereResource is asynchronous, and it is left to the application developer to block in case of the retrieval must be done synchronously:

```
final AtomicReference<AtmosphereResource> resource
    = new AtomicReference<AtmosphereResource>();
final CountDownLatch latch = new CountDownLatch(1);

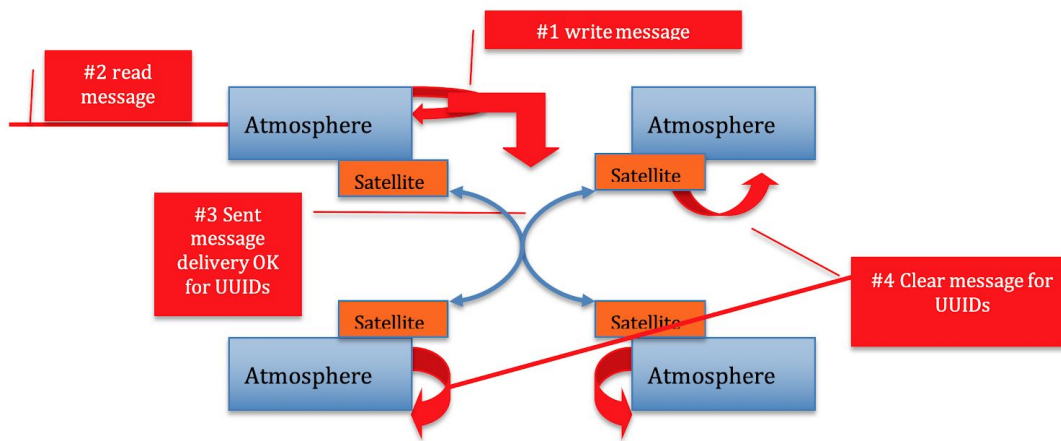
factory.locate(message.getMessage(), new
AtmosphereResourceFactory.Async() {
    @Override
    public void available(AtmosphereResource r) {
        resource.set(r);
        latch.countDown();
    }
});
latch.await();

AtmosphereResource stub = resource.get();
stub.write("Hello World");
```

Message Replication

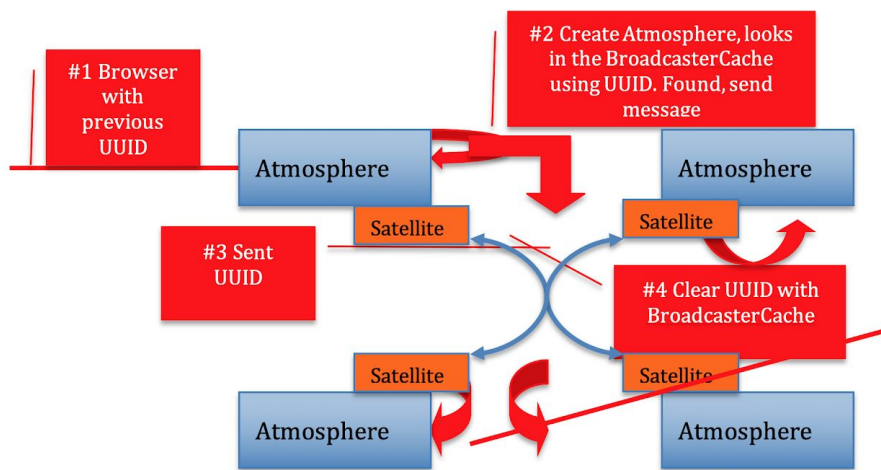
When a message is broadcasted in one Satellite, the message will be sent to all Satellites, which in turn will broadcast to their set of AtmosphereResources and cached for AtmosphereResource not located on that Satellite.

As soon as the message is successfully delivered in one Satellite, the information will be sent to all other Satellites so they can remove the message from their BroadcasterCache.



Failing to deliver a message

If, for any reason the message is not delivered to the AtmosphereResource, the message will stay in all Satellite's BroadcasterCache so when the browser reconnects using its previous AtmosphereResource's UUID, the message will be pulled from the cache and send. Then all Satellites will be advised the message has been delivered and



Configuring Satellite Receiver Thread Pool for optimal performance

If your application sends and receives thousand of messages, it is important to properly configure the Satellite's receiver thread pool size:

```
<init-param>
  <param-name>io.async.satellite.HazelcastSatelliteTransport.threadPoolSize</param-name>
  <param-value>200</param-value>
</init-param>
```

By default, the number of available processors will be used.

Atmosphere Tower Control

Atmosphere Tower Control is designed with ease of use and flexibility in mind and delivers unprecedented power to Atmosphere's Developers. Atmosphere Tower Control is a complete ecosystem for developers, offering a complete end to end solution for monitoring and debugging an Atmosphere application.

Tower Control offers the ability to completely configure Atmosphere, collect statistics, reload Atmosphere applications and hot swap an Atmosphere applications remotely.

Installing Tower Control

To install Satellite, all you need to do is to add the following dependency in your pom.xml:

```
<dependency>
  <groupId>io.async</groupId>
  <artifactId>atmosphere-tower-control</artifactId>
  <version>2.4.6</version>
</dependency>
```

Atmosphere will auto-detect the jar and will install Tower Control automatically. Once installed, you should see in your log:

```
11:56:17.411 INFO [main] o.a.c.AnnotationHandler [AnnotationHandler.java:63] Found
Annotation in class io.async.control.TowerControlInterceptor being scanned: interface
org.atmosphere.config.service.AtmosphereInterceptorService
```

```
11:56:17.537 INFO [main] i.a.c.TowerControlInterceptor [TowerControlInterceptor.java:58]
```

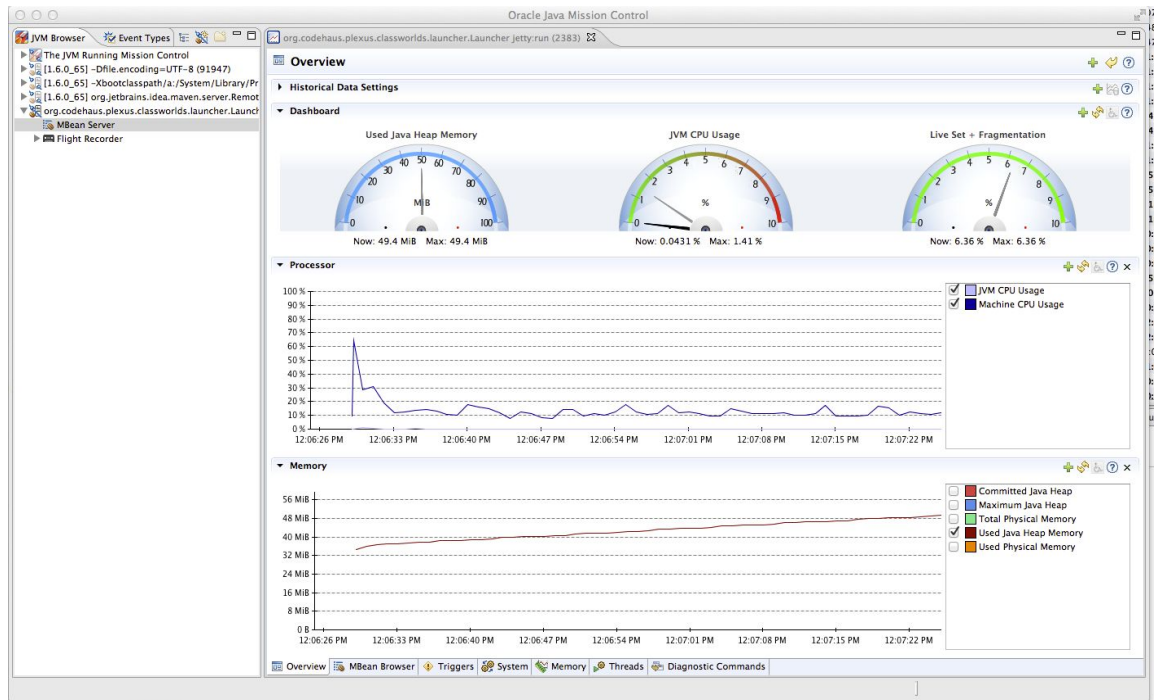
Atmosphere Tower Control

```
11:56:17.538 INFO [main] o.a.c.AnnotationHandler [AnnotationHandler.java:63] Found
Annotation in class io.async.control.TowerControlListener being scanned: interface
org.atmosphere.config.service.BroadcasterListenerService
```

Starting Tower Control

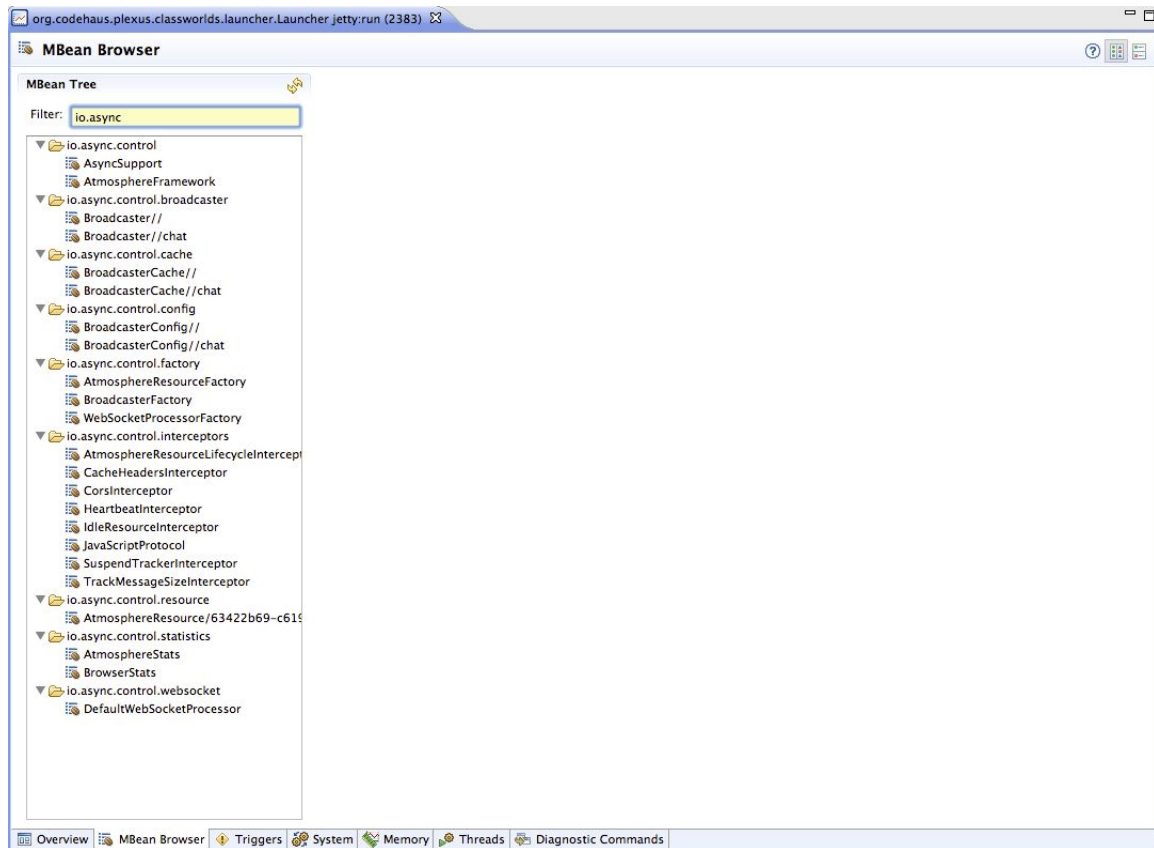
To start Tower Control, all you need to have is a tool supporting JMX. For example, both Java Mission Control(JMC) and jVisualVM supports JMX. Let's assume we will use JMC. To start JMC, just do:

```
% jmc
```



Next, select under the JVM Browser Tab, select the Java process, which started your Atmosphere Application. On the right side, select the MBean Tab. You should see

To make things simpler, type `io.async` in the Filter field, so we just see Tower Control Beans



All the Atmosphere's MBeans are grouped by type:

- **io.async.control**: Contains information about installed AsyncSupport and AtmosphereFramework classes.
- **io.async.control.broadcaster**: The current set of created Broadcaster with their associated state.
- **io.async.control.cache**: The current set of created BroadcasterCache with their associated state.
- **io.async.control.factory**: The BroadcasterFactory, AtmosphereResourceFactory and WebSocketProcessorFactory with their associated state.
- **io.async.control.interceptors**: The current set of installed AtmosphereInterceptor with their associated state.
- **io.async.control.resource**: The current set of connected clients, represented by their AtmosphereResource.
- **io.async.statistics**: Live statistic like number of connections, messages, transport used as well as Browser's used.

- **io.async.control.websocket:** Contains information about installed WebSocketProcessor

Let's explore them one by one and see what kind of information is available from those beans.

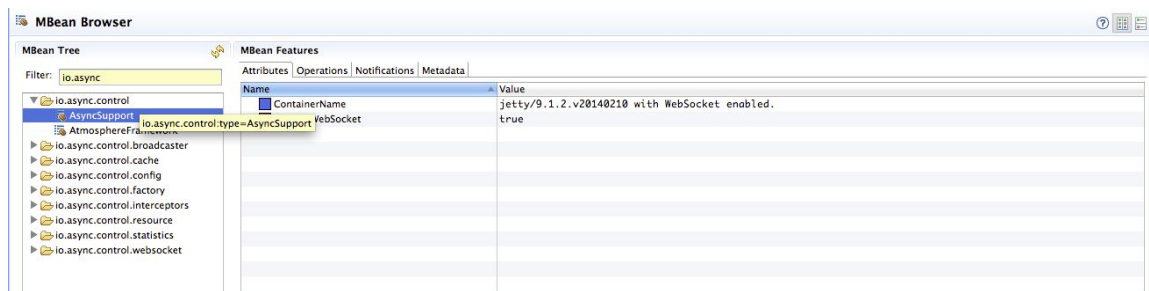
io.async.control.AsyncSupport

Attributes

Contains information about the server used and if websocket is supported or not.

Operations:

No operation available



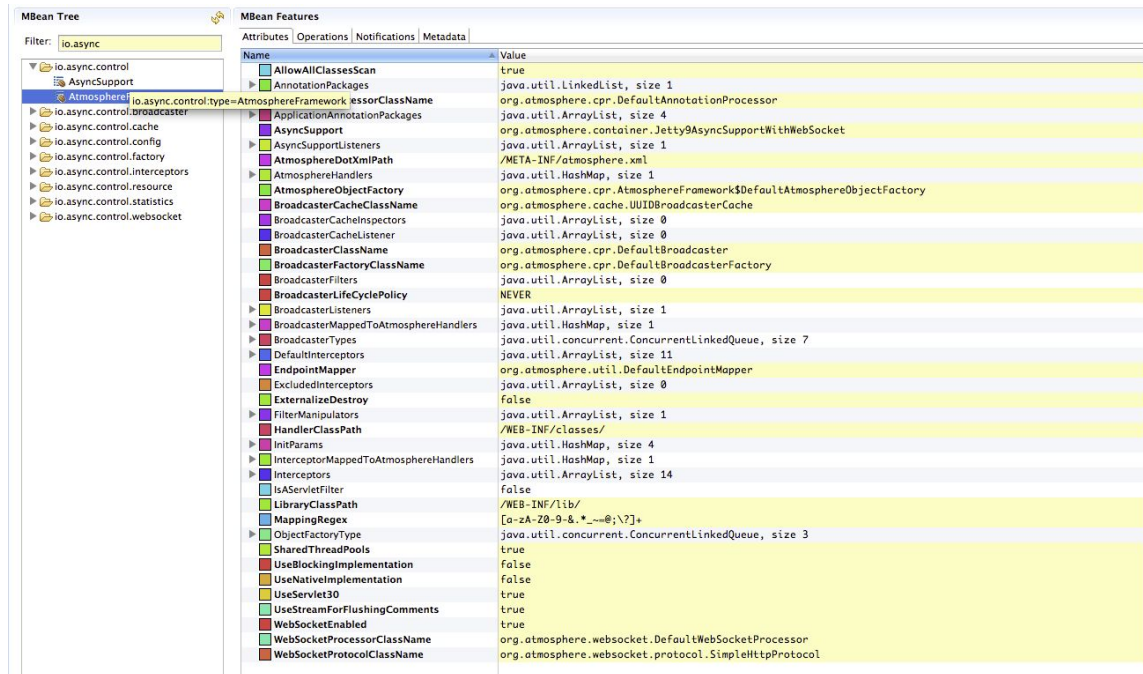
io.async.control.AtmosphereFramework

Attributes

Contains information about how Atmosphere has been started and configured. Everything configured by default or via web/application.xml is getting reflected.

Operations:

You can reconfigure the AtmosphereFramework via the MBean's operations. For example, you can add BroadcasterListener, init-params etc. and then click on reload to reconfigure the AtmosphereFramework.



| Name | Value |
|---------------------------------------|--|
| AllowAllClassesScan | true |
| AnnotationPackages | java.util.LinkedList, size 1 |
| ApplicationAnnotationPackages | org.atmosphere.cpr.DefaultAnnotationProcessor |
| AsyncSupport | java.util.ArrayList, size 4 |
| AsyncSupportListeners | org.atmosphere.container.Jetty9AsyncSupportWithWebSocket |
| AtmosphereDotXmlPath | java.util.ArrayList, size 1 |
| AtmosphereHandlers | /META-INF/atmosphere.xml |
| AtmosphereObjectFactory | java.util.HashMap, size 1 |
| BroadcasterCacheClassName | org.atmosphere.cpr.AtmosphereFrameworkDefaultAtmosphereObjectFactory |
| BroadcasterCacheInspectors | org.atmosphere.cache.UUIDBroadcasterCache |
| BroadcasterCacheListener | java.util.ArrayList, size 0 |
| BroadcasterClassName | java.util.ArrayList, size 0 |
| BroadcasterFactoryClassName | org.atmosphere.cpr.DefaultBroadcaster |
| BroadcasterFilters | org.atmosphere.cpr.DefaultBroadcasterFactory |
| BroadcasterLifeCyclePolicy | java.util.ArrayList, size 0 |
| BroadcasterListeners | NEVER |
| BroadcasterMappedToAtmosphereHandlers | java.util.ArrayList, size 1 |
| BroadcasterTypes | java.util.HashMap, size 1 |
| DefaultInterceptors | java.util.concurrent.ConcurrentLinkedQueue, size 7 |
| EndpointMapper | java.util.ArrayList, size 11 |
| ExcludedInterceptors | org.atmosphere.util.DefaultEndpointMapper |
| ExternalizeDestroy | java.util.ArrayList, size 0 |
| FilterManipulators | false |
| HandlerClassPath | java.util.ArrayList, size 1 |
| InitParams | /WEB-INF/classes/ |
| InterceptorMappedToAtmosphereHandlers | java.util.HashMap, size 4 |
| Interceptors | java.util.HashMap, size 1 |
| IsServletFilter | java.util.ArrayList, size 14 |
| LibraryClassPath | false |
| MappingRegex | /WEB-INF/lib/ |
| ObjectFactoryType | [a-zA-Z0-9-@;~\?]* |
| SharedThreadPools | java.util.concurrent.ConcurrentLinkedQueue, size 3 |
| UseBlockingImplementation | true |
| UseNativeImplementation | false |
| UseServlet30 | false |
| UseStreamForFlushingComments | true |
| WebSocketEnabled | true |
| WebSocketProcessorClassName | org.atmosphere.websocket.DefaultWebSocketProcessor |
| WebSocketProtocolClassName | org.atmosphere.websocket.protocol.SimpleHttpProtocol |

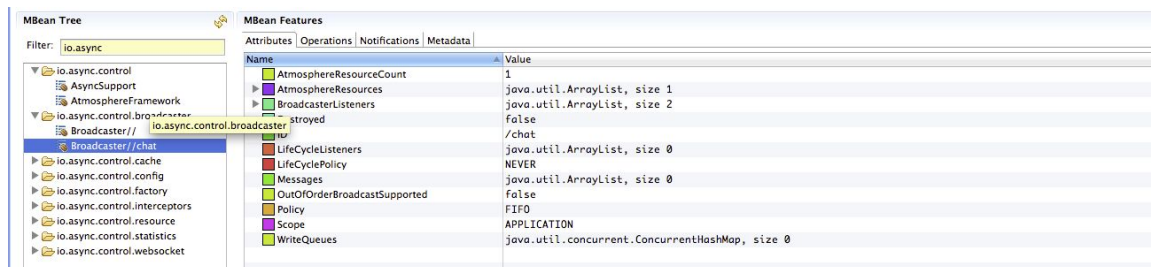
io.async.control.broadcaster

Attributes

Contains information about the current state of a Broadcaster. For example, the AtmosphereResource, the number of them, the installed BroadcasterListener, etc.

Operations:

Several operations are available, like adding, on the fly, AtmosphereResource, broadcasting messages, resuming AtmosphereResources etc.



The screenshot shows the JMX console with the MBean Tree on the left and the MBean Features table on the right. The MBean Tree is filtered for 'io.async'. The MBean Features table has tabs for Attributes, Operations, Notifications, and Metadata. The Attributes tab is selected, showing a list of attributes with their names and values.

| Name | Value |
|------------------------------|--|
| AtmosphereResourceCount | 1 |
| AtmosphereResources | java.util.ArrayList, size 1 |
| BroadcasterListeners | java.util.ArrayList, size 2 |
| destroyed | false |
| /chat | /chat |
| LifeCycleListeners | java.util.ArrayList, size 0 |
| LifeCyclePolicy | NEVER |
| Messages | java.util.ArrayList, size 0 |
| OutOfOrderBroadcastSupported | false |
| Policy | FIFO |
| Scope | APPLICATION |
| WriteQueues | java.util.concurrent.ConcurrentHashMap, size 0 |

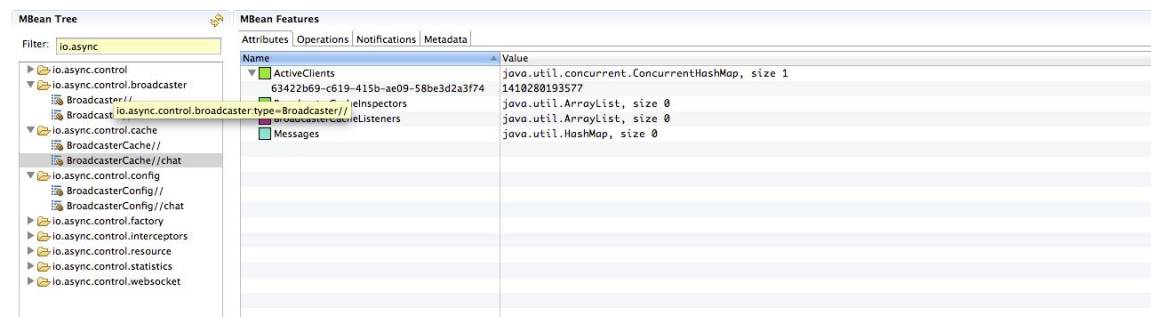
io.async.control.cache

Attributes

Contains information about the current state of the BroadcasterCache like active AtmosphereResource, installed listeners etc.

Operations:

Message can be added,excluded or deleted from the cache



The screenshot shows the JMX console with the MBean Tree on the left and the MBean Features table on the right. The MBean Tree is filtered for 'io.async'. The MBean Features table has tabs for Attributes, Operations, Notifications, and Metadata. The Attributes tab is selected, showing a list of attributes with their names and values.

| Name | Value |
|--------------------------------------|--|
| ActiveClients | java.util.concurrent.ConcurrentHashMap, size 1 |
| 63422b69-c619-415b-ae09-58be3d2a3f74 | 1410280193577 |
| inspectors | java.util.ArrayList, size 0 |
| listeners | java.util.ArrayList, size 0 |
| Messages | java.util.HashMap, size 0 |

io.async.control.config

Attributes

Contains information about the BroadcasterConfig likes Thread, Thread Pool, etc.

Operations:

You can destroy or remove BroadcastFilter

The screenshot shows the MBean Tree on the left with the filter 'io.async'. The MBean Features table on the right is expanded for 'io.async.control.config'. The table has columns 'Name' and 'Value'.

| Name | Value |
|------------------------------|-----------------------------|
| AsyncWriteServiceSize | 20 |
| BroadcastFilters | java.util.ArrayList, size 0 |
| ExecutorServiceSize | 0 |
| HandleExecutors | false |
| ScheduledExecutorServiceSize | 8 |

io.async.control.factory

Attributes

Contains information about the number of AtmosphereResource, Broadcaster and WebSocketProcessor

Operations:

You add find AtmosphereResource based on their UUID

The screenshot shows the MBean Tree on the left with the filter 'io.async'. The MBean Features table on the right is expanded for 'io.async.control.factory'. The table has columns 'Name' and 'Value'.

| Name | Value |
|---------------------|--------------------------------------|
| AtmosphereResources | java.util.ArrayList, size 1 |
| [0] | 63422b69-c619-415b-ae09-58be3d2a3f74 |
| Count | 1 |

io.async.control.interceptors

Attributes

Contains information about the installed AtmosphereInterceptors

Operations:

For example, you can configure on the fly the SuspendTrackerInterceptor.

MBean Tree

Filter:

- Implementation
- com.sun.management
- io.async.control
- io.async.control.broadcaster
- io.async.control.cache
- io.async.control.config
- io.async.control.factory
- io.async.control.interceptors
 - AtmosphereResourceLifecycleInterceptor/chat
 - CacheHeadersInterceptor
 - CorsInterceptor
 - HeartbeatInterceptor
 - IdleResourceInterceptor
 - JavaScriptProtocol
 - SuspendTrackerInterceptor**
 - TrackMessageSizeInterceptor
- io.async.control.statistics
- io.async.control.websocket
- java.lang
- java.nio
- java.util.logging

MBean Features

Attributes | Operations | Notifications | Metadata

Operations

| Name | Value | Description |
|-------------------|-------|-------------|
| addTrackedUUID | void | |
| clear | void | |
| removeTrackedUUID | void | |

io.async.control.resource

Attributes

The list of current connected users, or AtmosphereResource.

Operations:

You can close and or resume an existing AtmosphereResource

MBean Tree

Filter: Type filter text, e.g. "java"

- Implementation
- com.sun.management
- io.async.control
- io.async.control.broadcaster
- io.async.control.cache
- io.async.control.config
- io.async.control.factory
- io.async.control.interceptors
- io.async.control.resource
 - AtmosphereResource/4204388c-0df6-403d-92d5-519538001129**
- io.async.control.statistics
- io.async.control.websocket
- java.lang
 - GarbageCollector
 - MemoryManager
 - MemoryPool
 - ClassLoading
 - Compilation
 - Memory
 - OperatingSystem
 - Runtime
 - Threading
- java.nio
- java.util.logging

MBean Features

Attributes | Operations | Notifications | Metadata

Attributes

| Name | Value | Update I |
|-------------------|--|----------|
| AsyncWriter | java.util.ArrayList, size 2 | Default |
| AtmosphereHandler | org.atmosphere.config.managed.ManagedAtmosphereHandler | Default |
| Attributes | java.util.HashMap, size 21 | Default |
| Broadcaster | /chat | Default |
| Cancelled | false | Default |
| Headers | java.util.HashMap, size 17 | Default |
| Listeners | java.util.ArrayList, size 5 | Default |
| QueryString | | Default |
| RequestDestroyed | false | Default |
| ResponseDestroyed | false | Default |
| Resumed | false | Default |
| Serialized | | Default |
| Suspended | true | Default |
| Transport | WEBSOCKET | Default |
| UserAgent | Mozilla/5.0 (Macintosh; Intel Mac OS X 10_9_4) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/37.0.2062.120 | Default |
| Uuid | 4204388c-0df6-403d-92d5-519538001129 | Default |

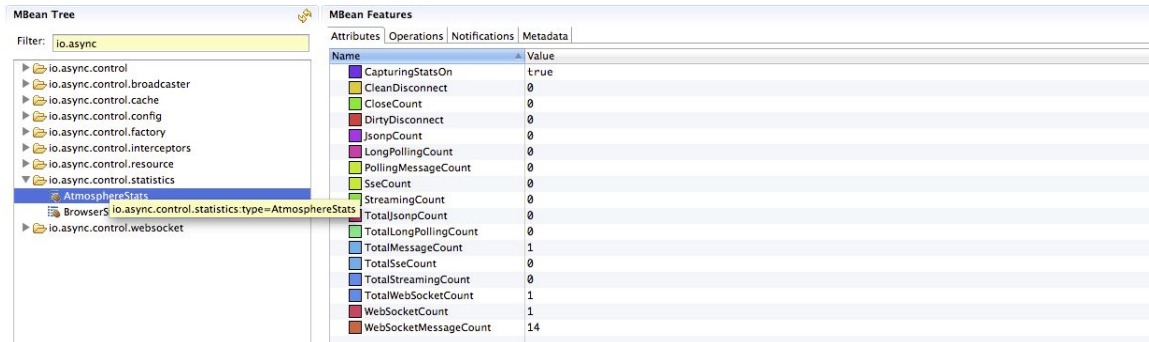
io.async.control.statistics

Attributes

Collect statistics about the current number of connections, disconnected count, total received messages etc.

Operations:

Enable/Disable statistics collection.



| Name | Value |
|-----------------------|-------|
| CapturingStatsOn | true |
| CleanDisconnect | 0 |
| CloseCount | 0 |
| DirtyDisconnect | 0 |
| JsonpCount | 0 |
| LongPollingCount | 0 |
| PollingMessageCount | 0 |
| SseCount | 0 |
| StreamingCount | 0 |
| TotalJsonpCount | 0 |
| TotalLongPollingCount | 0 |
| TotalMessageCount | 1 |
| TotalSseCount | 0 |
| TotalStreamingCount | 0 |
| TotalWebSocketCount | 1 |
| WebSocketCount | 1 |
| WebSocketMessageCount | 14 |

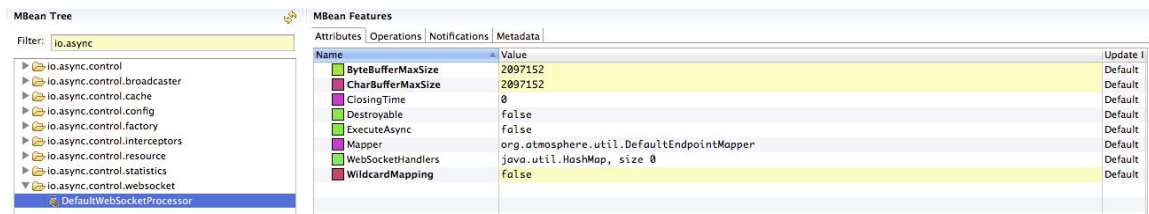
io.async.control.websocket

Attributes

Information about how websockets are installed and configured

Operations:

None



| Name | Value | Update I |
|-------------------|---|----------|
| ByteBufferSize | 2097152 | Default |
| CharBufferSize | 2097152 | Default |
| ClosingTime | 0 | Default |
| Destroyable | false | Default |
| ExecuteAsync | false | Default |
| Mapper | org.atmosphere.util.DefaultEndpointMapper | Default |
| WebSocketHandlers | java.util.HashMap, size 0 | Default |
| WildcardMapping | false | Default |

Atmosphere Postman

With Guaranteed Delivery, the Atmosphere Postman system uses a built-in data store to persist messages. Atmosphere Postman guarantees the client that when sending a message; the message will always be delivered to the server. In case of a failure, the message will be re-sent until it reaches the server. Postman guarantee client's messages delivery.

When combined with Atmosphere Satellite, when a websocket or fallback transport delivers a message, the send operation does not complete successfully until the message is safely stored in the sender's data store. Subsequently, the message is not deleted from one data store until it is successfully forwarded to and stored in the next data store. As a result, once a websocket or fallback transport successfully sends a message, it is also stored in memory on at least one Atmosphere Satellite until the message has been successfully delivered and acknowledged by the browser. **Installing Satellite and Postman guarantee 100% messages delivery, both from the browser and the server.**

How to install Postman

To install Satellite, all you need to do is to add the following dependency in your pom.xml:

```
<dependency>
  <groupId>io.async</groupId>
  <artifactId>atmosphere-postman</artifactId>
  <version>1.0.0</version>
</dependency>
```

Atmosphere will auto-detect the jar and will install Tower Control automatically. Once installed, you should see in your log:

```
17:23:33.409 INFO [main] i.a.p.ClientAckInterceptor [ClientAckInterceptor.java:46]
```

```
Atmosphere Postman : io.async.postman.ClientAckInterceptor
```

```
17:23:33.409 INFO [main] o.a.c.AtmosphereFramework [AtmosphereFramework.java:2362]
Installed AtmosphereInterceptor io.async.postman.ClientAckInterceptor with priority
AFTER_DEFAULT
```

```
17:23:33.409 INFO [main] i.a.p.ReloadAckInterceptor [ReloadAckInterceptor.java:64]
```

```
Atmosphere Postman : io.async.postman.ReloadAckInterceptor
```

Installing the client side

Client side, you need to add to you application's main page

```
<script type="text/javascript" language="javascript" src="atmosphere.js"></script>
```

```
<script type="text/javascript" language="javascript" src="atmosphere.postman.js"></script>
```

Callbacks

You can trace and react using two client's side function

```
atmosphere.onAckSuccess = function(res) {  
    console.log("onAckSuccess");  
    console.log(res);  
};  
  
atmosphere.onAckFailed = function(req) {  
    console.log("onAckFailed");  
    console.log(req);  
};
```

How it works

If `atmosphere.postman.js` is loaded in client and `ClientAckInterceptor` is included in interceptor stack in server, when you sends a message using the `push` method, the followings will happen:

1. A JSON consisting of 'id' and 'message' is created and sent instead of the message.
2. At the same time, the timer handling ACK is set in client.
 - 3.1 If server receives it,
 - 4.1. `ClientAckInterceptor` parses that JSON, restore the message and send the ACK using the id.
 - 4.2. If the ACK is arrived in client, `atmosphere.onAckSuccess` will be executed with `AtmosphereResponse`.
 - 3.1 If server can't receive it,
 - 5.1 After `AtmosphereRequest.ackInterval` in ms or 5 seconds if it's not set, `atmosphere.onAckFailed` will be executed with `AtmosphereRequest`.
 - 5.2 At the same time, the original message is sent again then the situation goes to step 1.