

Deep Dive into CIM Client Development with SBLIM

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ABPU - App Aware

Net App

- ❑ **What is SBLIM**
- ❑ Querying Models with SBLIM
- ❑ Making Function Calls
- ❑ Performance Tuning
- ❑ .NET Solution
- ❑ Q&A

Who am I ?

- ❑ Brian Mason
- ❑ brian.mason@netapp.com
- ❑ I work for NetApp
 - ❑ App Aware Group / APBU E-Series Storage
 - ❑ What happen to LSI?
- ❑ 20+ Years in Software Development
- ❑ Last 10 focusing on Managing hardware devices
- ❑ MSCS U of IL

- ❑ Used CIM for vCenter Plugin
- ❑ Code samples pulled from real project
- ❑ Code run against LSI Eagle 2 Provider on Open Pegasus
- ❑ However –
 - ❑ Code Samples **heavily tweaked** for Power Point
 - ❑ Presentation code may have syntax errors

- From their Web Site

“SBLIM (pronounced "sublime") is an umbrella project for a collection of systems management tools to enable [WBEM](#) on Linux.”

- This talk focuses on the Java WBEM Client

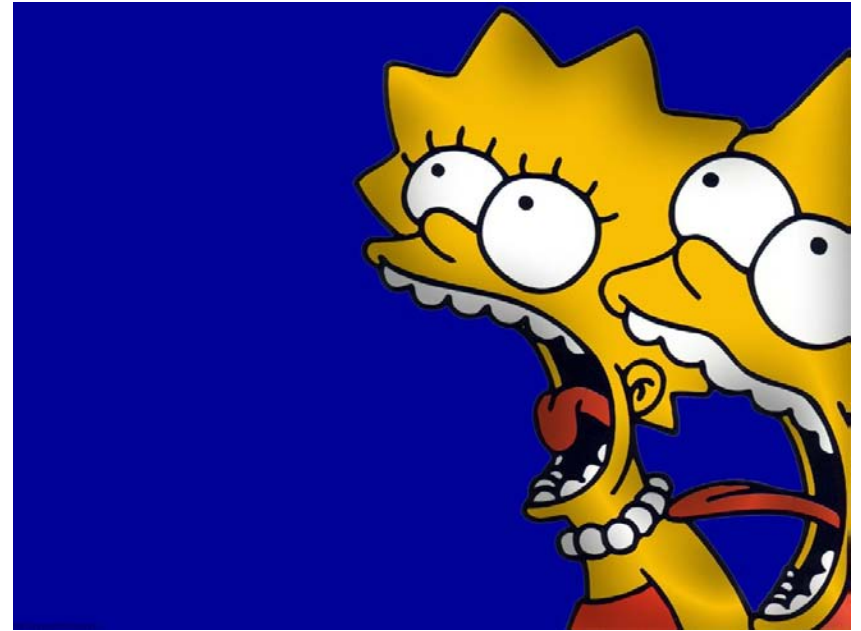
- Is it just for Linux?

- No. We are talking Java so it works everywhere

- Our product runs on Windows

Why use a client package? Isn't CIM XML designed so we can just code it by hand?

- ❑ SBLIM handles XML marshalling /de-marshalling
- ❑ Handles HTTP(s) Details
- ❑ Relieves the programmer of a lot of **Error Prone** Grunt programming
- ❑ Tested by lots of folks



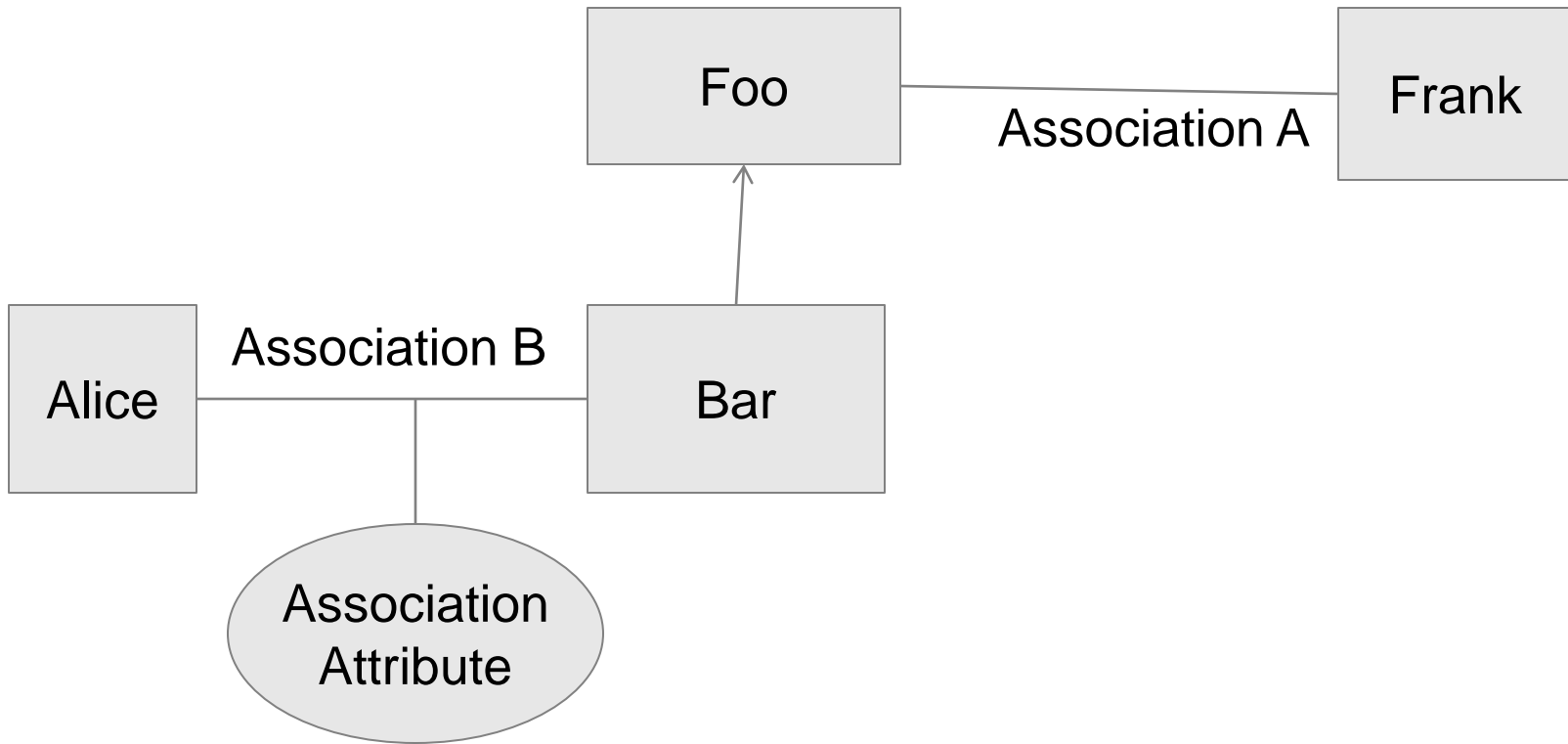
Which Library Stream to use

- ❑ There are two active streams 1.x and 2.x
- ❑ They are **NOT** source code compatible
- ❑ 2.x stream is JSR 48 compliant
- ❑ Use 2.x for all new work
- ❑ Version 2.1 requires Java 5 Generics

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Classes, Associations and attributes

My



- ❑ Class Operations
 - ❑ Enumerate Names and Definitions
 - ❑ Create, Modify and Delete Classes
 - ❑ Enumerate Association Classes
- ❑ Instance Operations
 - ❑ Create, Modify and Delete instances
 - ❑ Query Instance Names, Paths and properties
 - ❑ Invoke Methods

- ❑ Primary Classes follow CIM Abstraction
 - ❑ CIMObjectPath
 - ❑ CIMClass
 - ❑ CIMInstance
 - ❑ CIMProperty
 - ❑ CIMArgument
- ❑ Properties are Key/Value Pairs

Let jump into some code – Enumerating Object Instances

```
1. WBEMClient client=getClient();
2. String cls="CIM_ComputerSystem";
3. String ns="root/LsiArray13";
4. CIMObjectPath path;
5. path = new CIMObjectPath(cls,ns);
6. CloseableIterator<CIMInstance> it;
7. it=client.enumerateInstances(path, true,
   true, true, null);
8. while (it.hasNext()){
9.     //do stuff
10. }
```

Working with an iterator

```
1.  while (it.hasNext()) {
2.      final CIMInstance inst=
it.next();
3.      CIMProperty<?> prop;
4.      prop=inst.getProperty("name");
5.      String name;
6.      name=prop.getValue().toString();
7.      System.out.println(name);
8.  }
9.  it.close();
```

- ❑ Properties have:
 - ❑ A Name
 - ❑ A Type
 - ❑ A Value
- ❑ Values are Objects.

CIM Data Type

CIM Data Type	Java Representation
uint8	UnsignedInteger8
sint8	Byte
uint16	UnsignedInteger16
sint16	Short
uint32	UnsignedInteger32
sint32	Integer
int64	UnsignedInteger64
sint64	Long
string	String
boolean	Boolean
real32	Float
real64	Double
datetime	CIMDataTimeAbsolute CIMDataTimeInterval
<classname> ref	CIMObjectPath
char16	Character

Making a WBEM Client

- ❑ Make an CIMObjectPath instance with:
 - ❑ Protocol - http(s)
 - ❑ Host
 - ❑ Port
- ❑ Make a Subject instances with:
 - ❑ User Id
 - ❑ Password
- ❑ Get an instance WBEMClientFactory
- ❑ Initialize the instance with Path, Subject and locale

Making a client - Code

```
1. WBEMClient client =
    WBEMClientFactory.getClient(WBEMClientConstants.
    PR OTOCOL_CIMXML);

2. final CIMObjectPath path = new
3. CIMObjectPath("host","http", 5988,null,null,null);
4. final Subject subject = new Subject();
5. subject.getPrincipals().add(new
    UserPrincipal("user"));
6. subject.getPrivateCredentials().add(
    new PasswordCredential("passwd"));
7. client.initialize(path, subject, new Locale[]{"US"
    Locale.US});
```

- ❑ Provides a SQL Like Syntax
- ❑ Allows for Filtering on CIM Server
- ❑ Maybe more natural for some developers
- ❑ Need to make sure its supported by CIM Server
- ❑ Supported in SBLIM via execQuery

WQL Example I

```
1. String sql="select * from CIM_ComputerSystem";
2. CIMObjectPath rootPath = new CIMObjectPath("",
   "root/LsiArray13");
3. CloseableIterator<CIMInstance> it =
   client.execQuery(rootPath, sql, "WQL");
4. CIMProperty<?> nameProp;
5. while (it.hasNext()){
6.     final CIMInstance inst = it.next();
7.     nameProp=inst.getProperty("name");
8.     System.out.println(nameProp.getValue());
9. }
10. it.close();
```

WQL Example 2

```
1. String sql="select name,OperationalStatus from
   CIM_ComputerSystem where
   name=\"600A0B800029ECD6000000004D3E8BC8\"";
2. CIMObjectPath rootPath = new CIMObjectPath("",
   "root/LsiArray13");
3. CloseableIterator<CIMInstance> it =
   client.execQuery(rootPath, sql, "WQL");
4. while (it.hasNext()){
5.     final CIMInstance inst = it.next();
6.     final CIMProperty<?> nameProp
   =inst.getProperty("name");
7.     System.out.println(nameProp.getValue().toString());
8. }
9. it.close();
```

- ❑ Use SBLIM to follow associations
- ❑ You can specify
 - ❑ Starting Instance (As a Object Path)
 - ❑ Association Class
 - ❑ Target Class
 - ❑ Role
 - ❑ Properties of target to retrieve
- ❑ Result is an Closeable Iterator of CIM Instances (Sound familiar ?)

Association Example (Storage System to Controllers)

```
final CIMObjectPath sysPath =
    systemInst.getObjectPath();
CloseableIterator<CIMInstance> it;
it=client.associatorInstances(
    sysPath,
    "CIM_ComponentCS",
    "LSISSI_StorageProcessorSystem",
    "GroupComponent",
    null, true, null);
```

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- ❑ Intrinsic are built in
 - ❑ New, delete, modify, query
- ❑ Extrinsic / User Defined take more work
 - ❑ Must declare In and Out parameters
 - ❑ Need Object Path to call method
 - ❑ Handle Return Codes
- ❑ Lets look at an example

Function Example (Delete Volume)

```
1. CIMArgument[] in = new CIMArgument[1];
2. CIMArgument[] out = new CIMArgument[1];
3. UnsignedInteger32 rc = null;
4. CIMDataType type=new
   CIMDataType(CIMDataType.REFERENCE,1);
5. in[0]=new CIMArgument("TheElement",type,path);
6. CIMInstance scs =
   getConfigurationService(sysPath);
7. CIMObjectPath servicePath= scs.getObjectPath();
8. rc = (UnsignedInteger32)
   getClient().invokeMethod(servicePath,
   "ReturnToStoragePool",in,out);
```

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- ❑ The key is **Reduce Network Traffic**
- ❑ Not an absolute
 - ❑ CIM Providers have their quirks
 - ❑ Sometimes client side processing is faster
 - ❑ Association Processing on client maybe better
- ❑ Need to profile your hotspots
- ❑ Primary focus is optimizing client response, but a secondary goal may be reducing server workload

- ❑ Reduce Round Trips
 - ❑ Grab what you need in one call
 - ❑ If looping instances and following associations grab the associations once
- ❑ **CIM XML is VERBOSE**
 - ❑ Reduce Instances Returned
 - ❑ Query on Concrete Classes
 - ❑ Specify Concrete Classes on Associations
 - ❑ Reduce Properties
 - ❑ NULL for props gets them all
 - ❑ Specify only the properties you need

Limit Instances Example

```
String cls="CIM_ComputerSystem";  
String cls="LSISSI_StorageSystem";  
String ns="root/LsiArray13";  
CIMObjectPath path;  
path = new CIMObjectPath(cls,ns);  
String [] props=new String[]{"name"};  
client.enumerateInstances(path, true,  
    true, true,props);
```

Limit Properties Example

```
client.enumerateInstances(path, true,  
    true, true, null);
```

Instead limit properties

```
String [] props=new String[]{"name"};  
it=client.enumerateInstances(path,  
    true, true, true, props);
```

How big is a blank property?

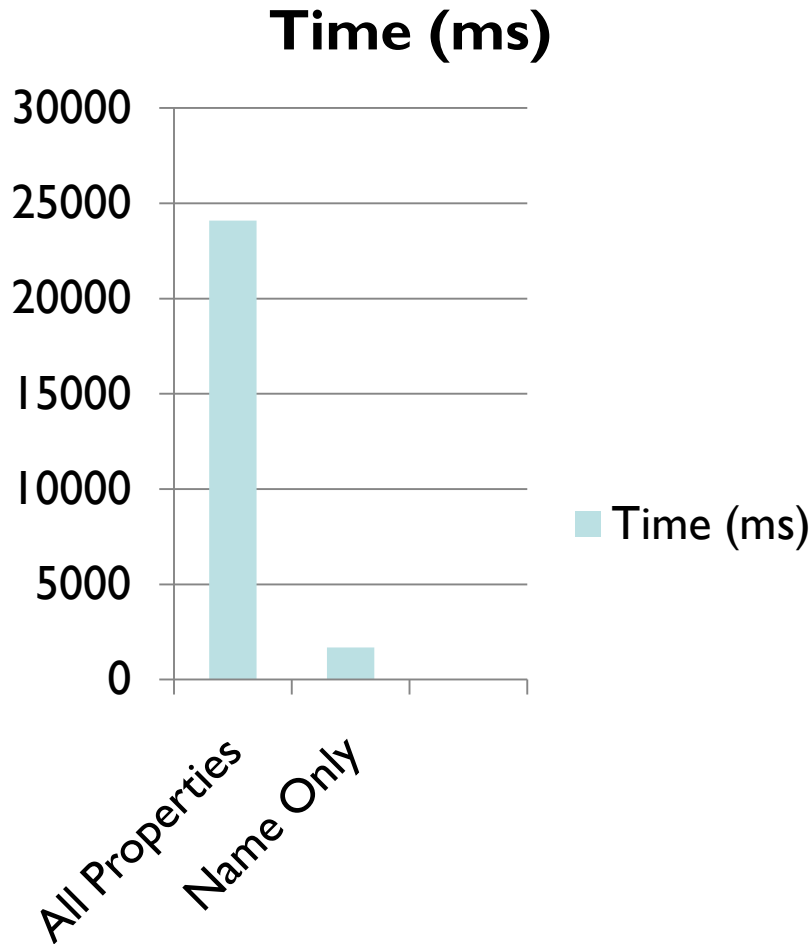
```
<PROPERTY NAME="PropName">
```

```
<VALUE></VALUE>
```

```
</PROPERTY>
```

- ❑ **That's 52 characters for a blank**
- ❑ **This adds up**

Querying Volume Name



- 239 Volumes
- Client and CIM Server on same LAN
- All Properties – 24,085 ms
- Name Only 1,695ms

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- ❑ On Windows .NET might be required
- ❑ No good WBEM Client for .NET that we found
- ❑ IKVM to the Rescue
 - ❑ Converts Java Byte Code to CLR
 - ❑ Provides assemblies for standard runtime classes
- ❑ Can pre-convert or run interpreted
- ❑ .NET code looks just like the Java Code
- ❑ **Disclaimer: We have not shipped a .net solution using IKVM. Lab only**

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- SBLIM Home Page

http://sourceforge.net/apps/mediawiki/sblim/index.php?title=Main_Page

- Java Client Page

<http://sourceforge.net/apps/mediawiki/sblim/index.php?title=CimClient>

- IKVM

<http://www.ikvm.net/>

- JSR-48

<http://www.jcp.org/en/jsr/detail?id=48>

Thank you

