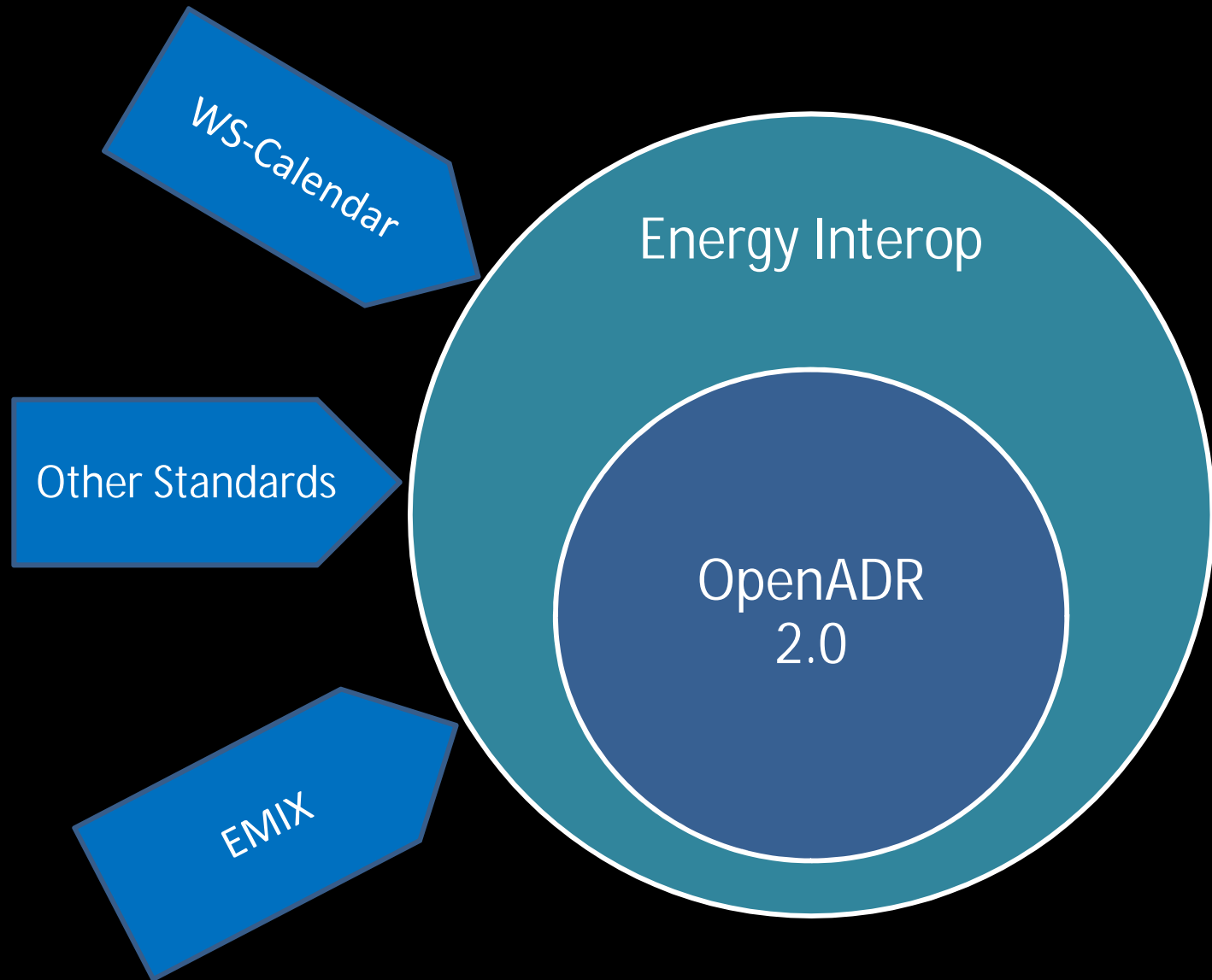


OpenADR 2.0 Big Picture

Jim Zuber
QualityLogic

OpenADR Origins

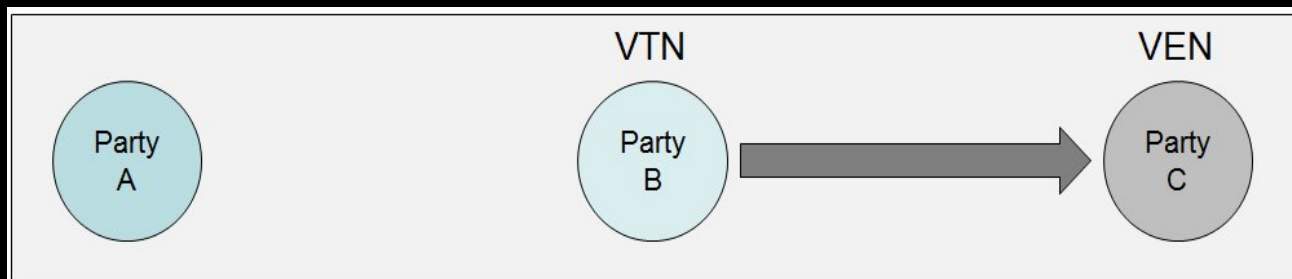
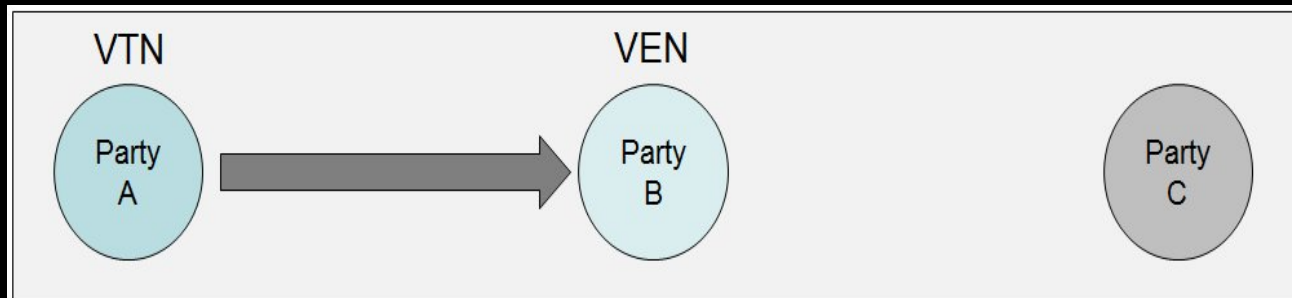


Energy Interoperation 1.0

- Communication Model for:
 - Dynamic price signals
 - Reliability signals
 - Emergency signals
 - Load predictability and generation information
- Energy Information Model (From Emix)
- Scheduling Model (From WS-Calendar)

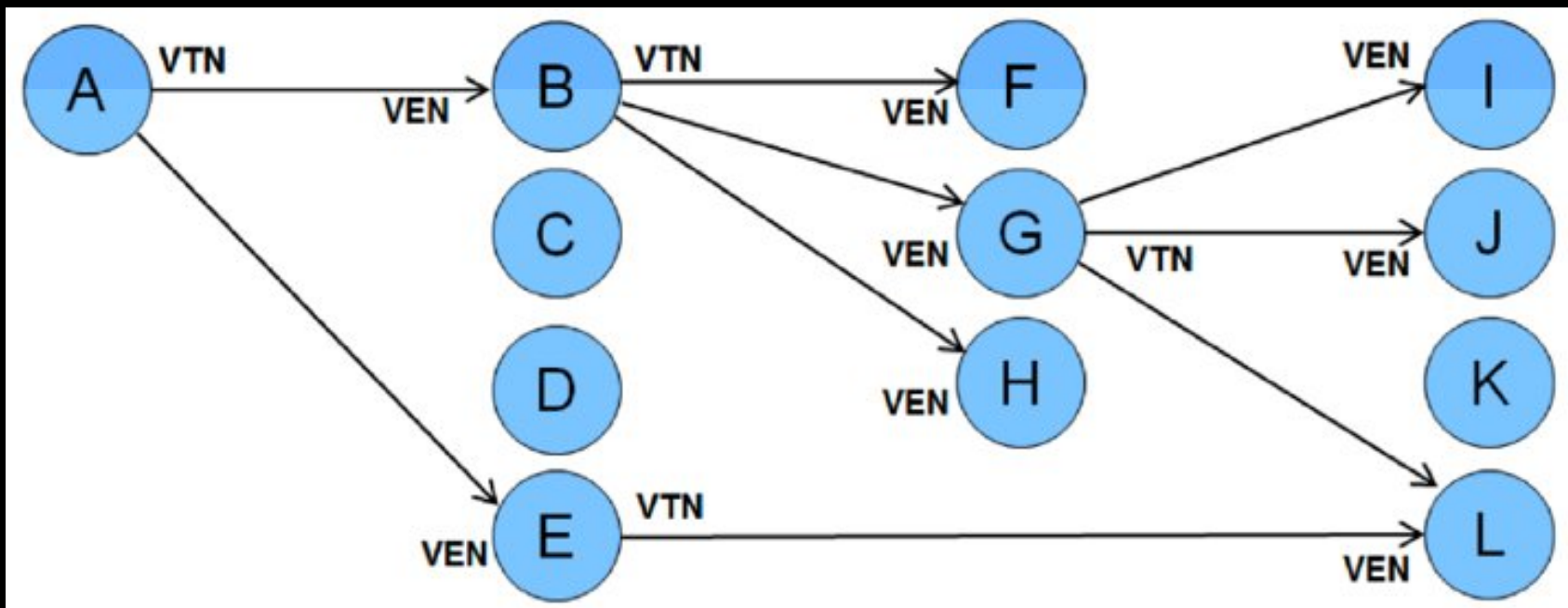
VENs and VTNs

- Two actors in OpenADR communication exchanges
 - Virtual Top Nodes (VTN)
 - Virtual End Nodes (VEN)
- Pair-wise interaction patterns

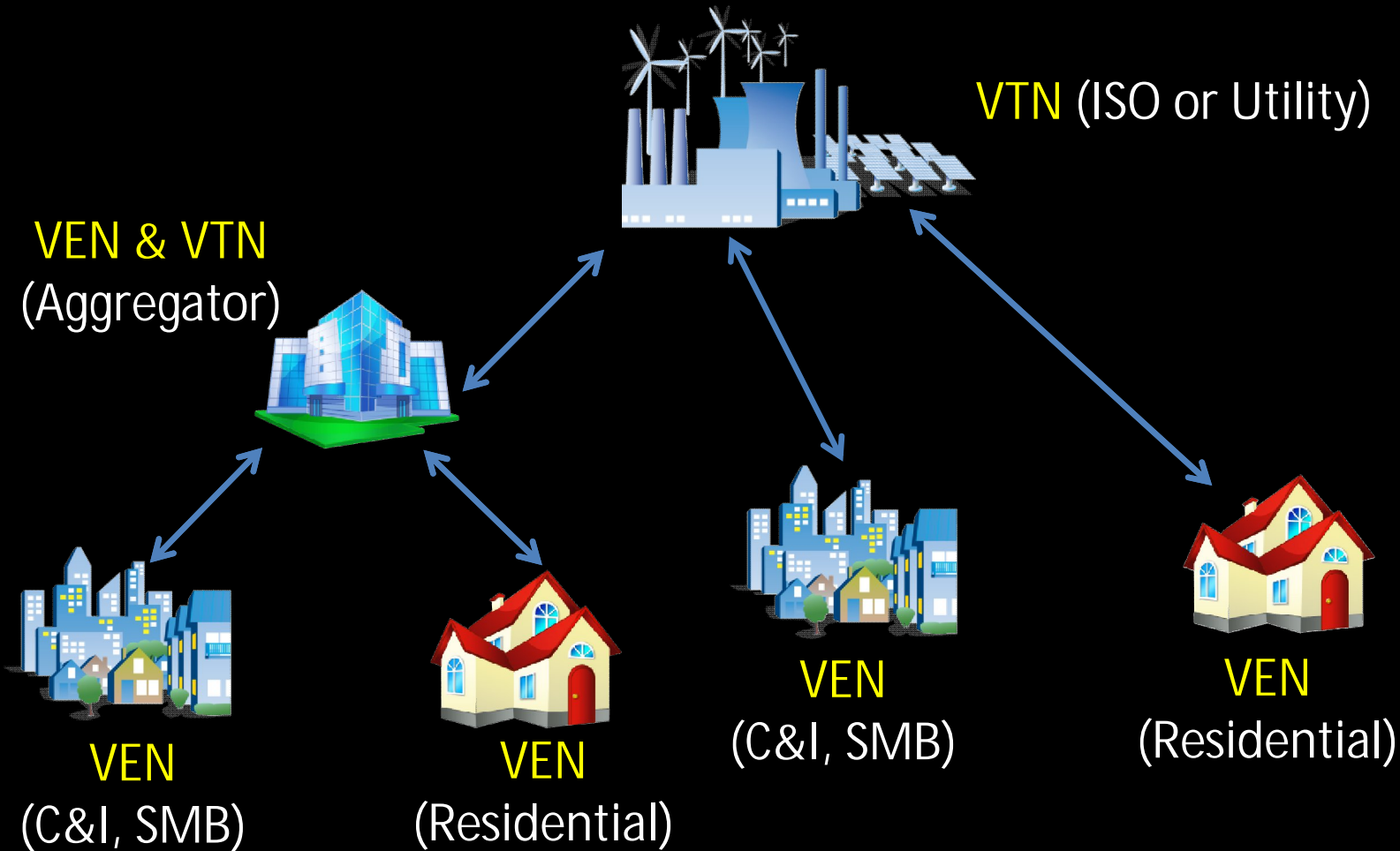


VENs and VTNs

- One-to-many relationship, VTN to VENs



VENs and VTNs



Demand Response Information Exchanged

VTN



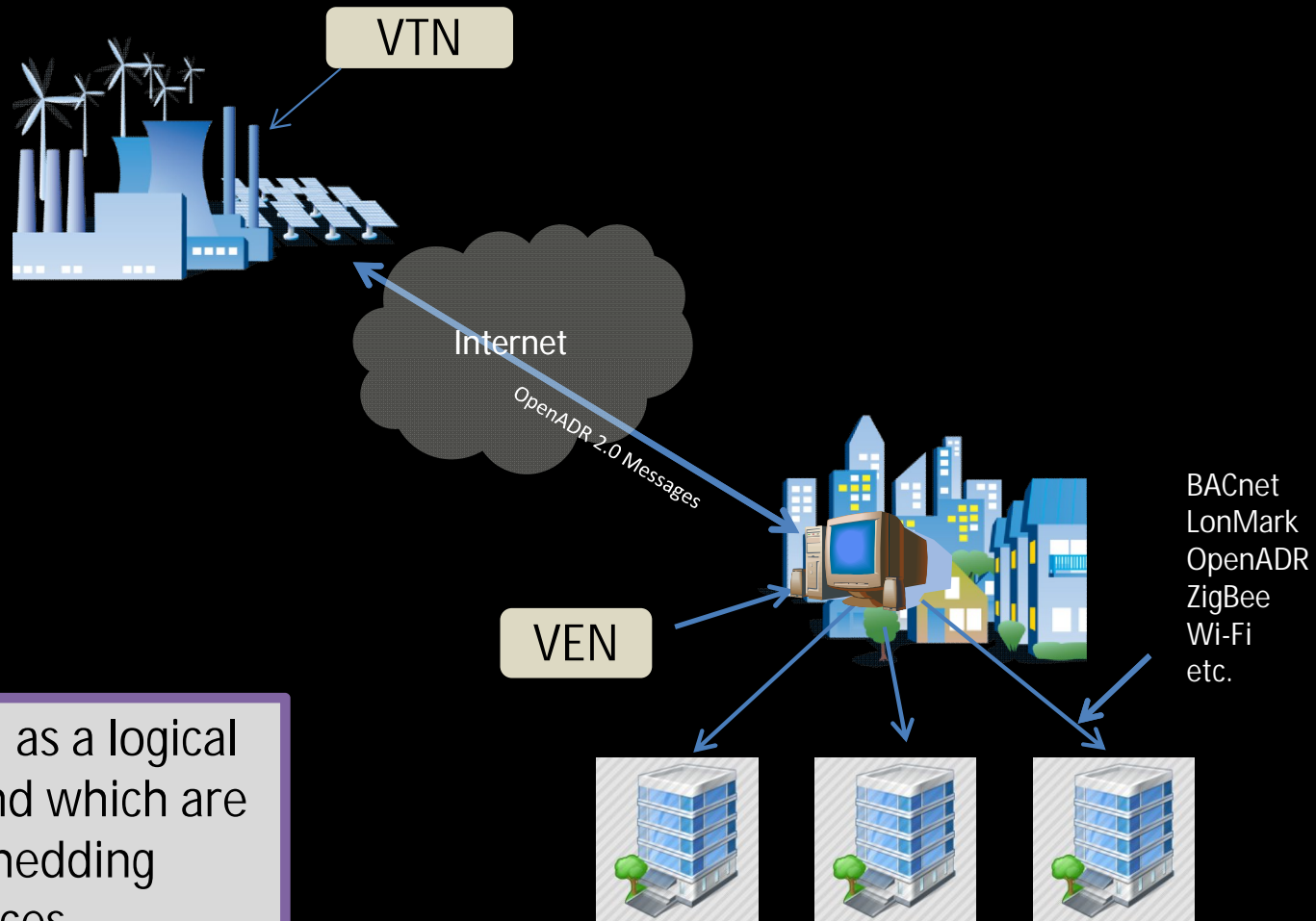
-DR Schedule
-Price/Load Obj
-Targeting

VEN



-Optin/Out
-Reports
-Availability

VENs and VTNs



Think of a VEN as a logical interface behind which are the load shedding resources.

Payloads and Transports

- XML Payloads
- Common endpoint for each service
- Root payload element defines operation
- Two transports supported
 - Simple HTTP – Posts to endpoint
 - XMPPP – Bidirectional XML streaming protocol, persistent connection, low overhead

Security

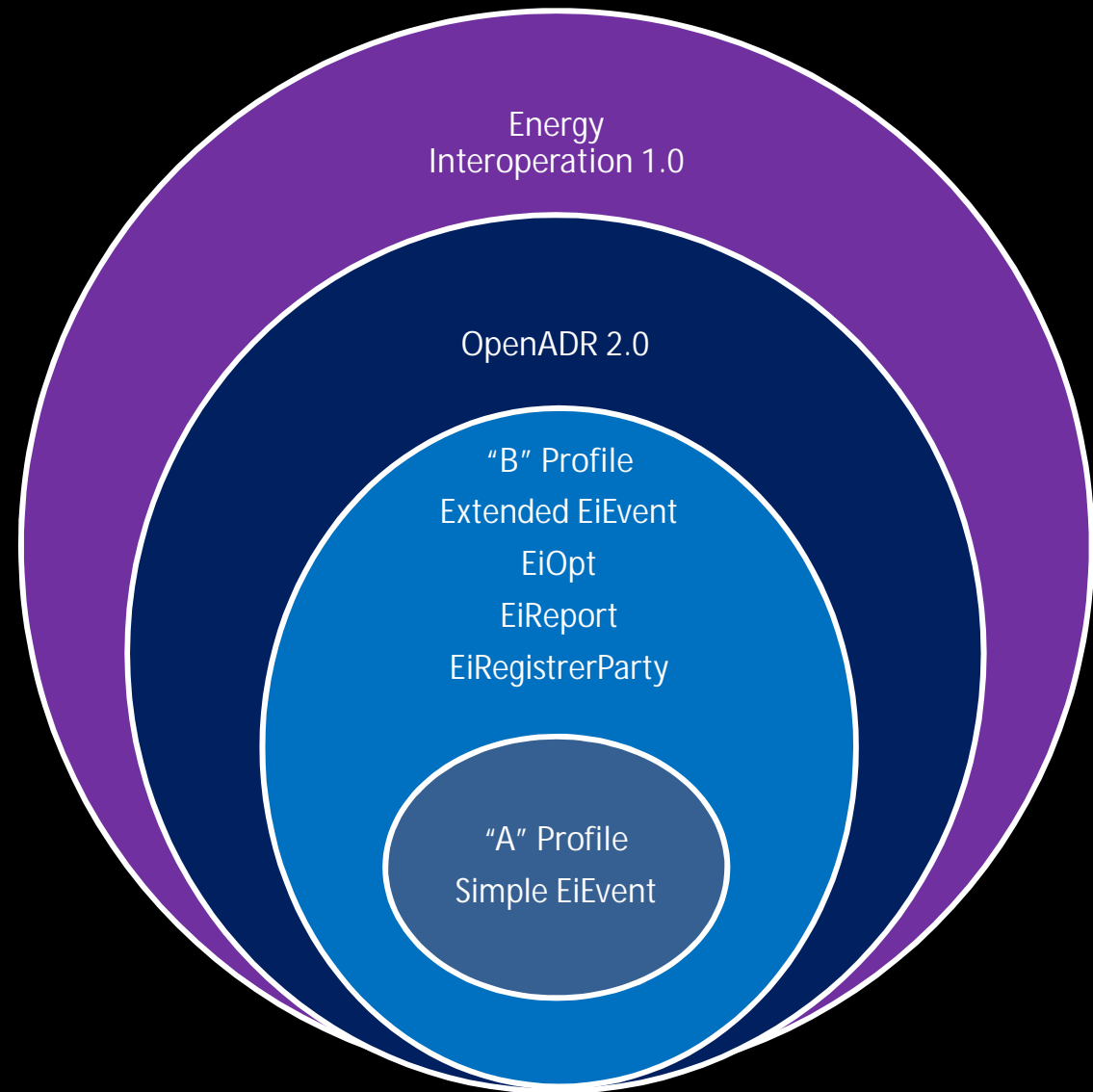
- Client and Server x.509v3 certificates
- TLS 1.0 or greater
- RSA and/or ECC cipher suites
- Fingerprint validation against venID
- Optional signing of XML payloads

Services

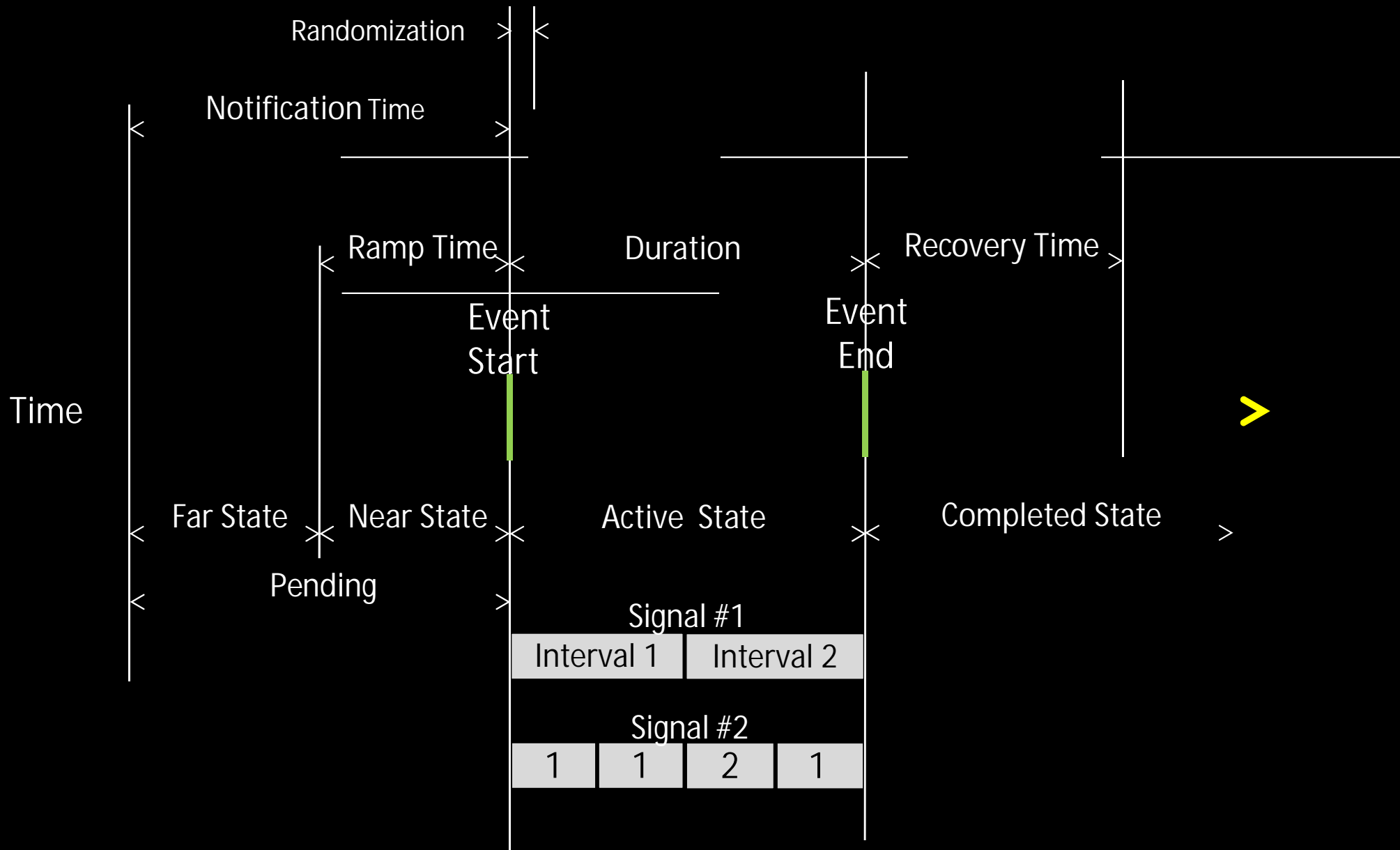
- EiEvent Service
 - Send and Acknowledge DR Events
- EiOpt Service
 - Define temporary availability schedules
- EiReport Service
 - Request and deliver reports
- EiRegisterParty Service
 - VEN Registration, device information exchange

OpenADR 2.0 Profiles

- “A” profile is targeted at limited resource devices and simple DR applications
- “B” profile is targeted at robust devices and sophisticated DR applications



Event Overview

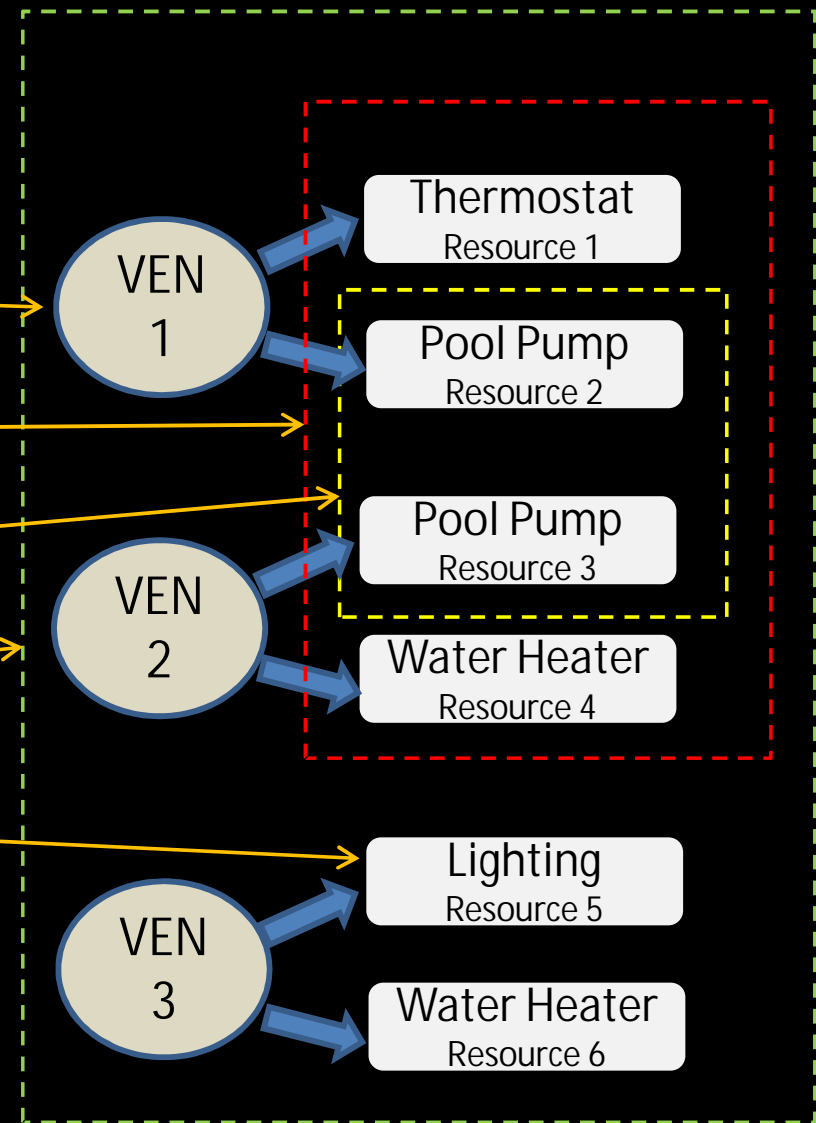


Simple and Extended Events

- A Profile
 - One “simple” signal per event
 - Signal can only have 4 relative values (0,1, 2, 3)
 - Limited event targeting
- B Profile
 - Multiple signals per event
 - Robust range of signals types
 - Support for baselines
 - Richer event targeting

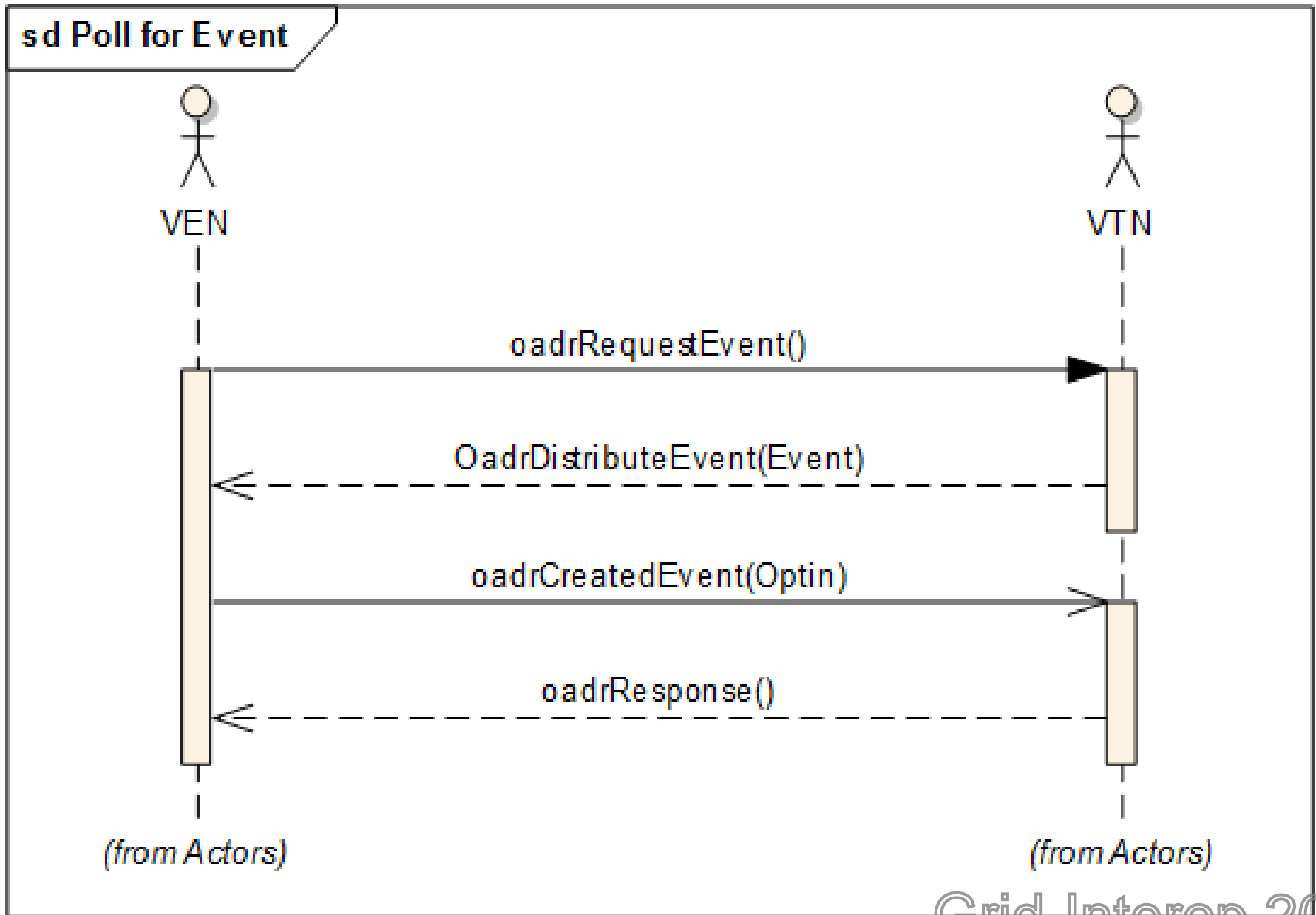
Event Targeting

- Target a VEN
- Target a Group
- Target a Device class
- Target a service area
- Target a Resource
- Etc.



Typical Interaction Pattern

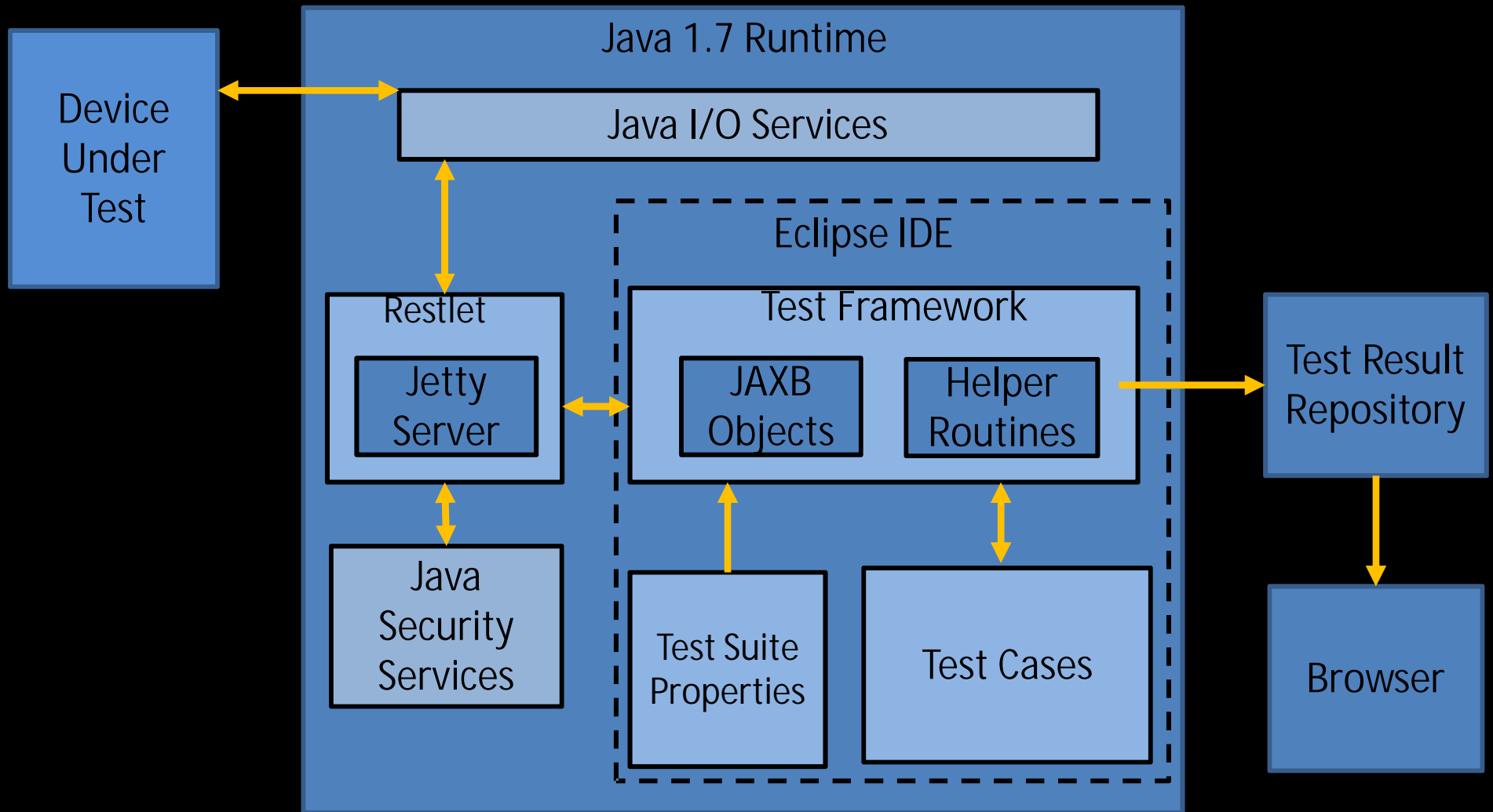
Sequence diagram: Poll for Event



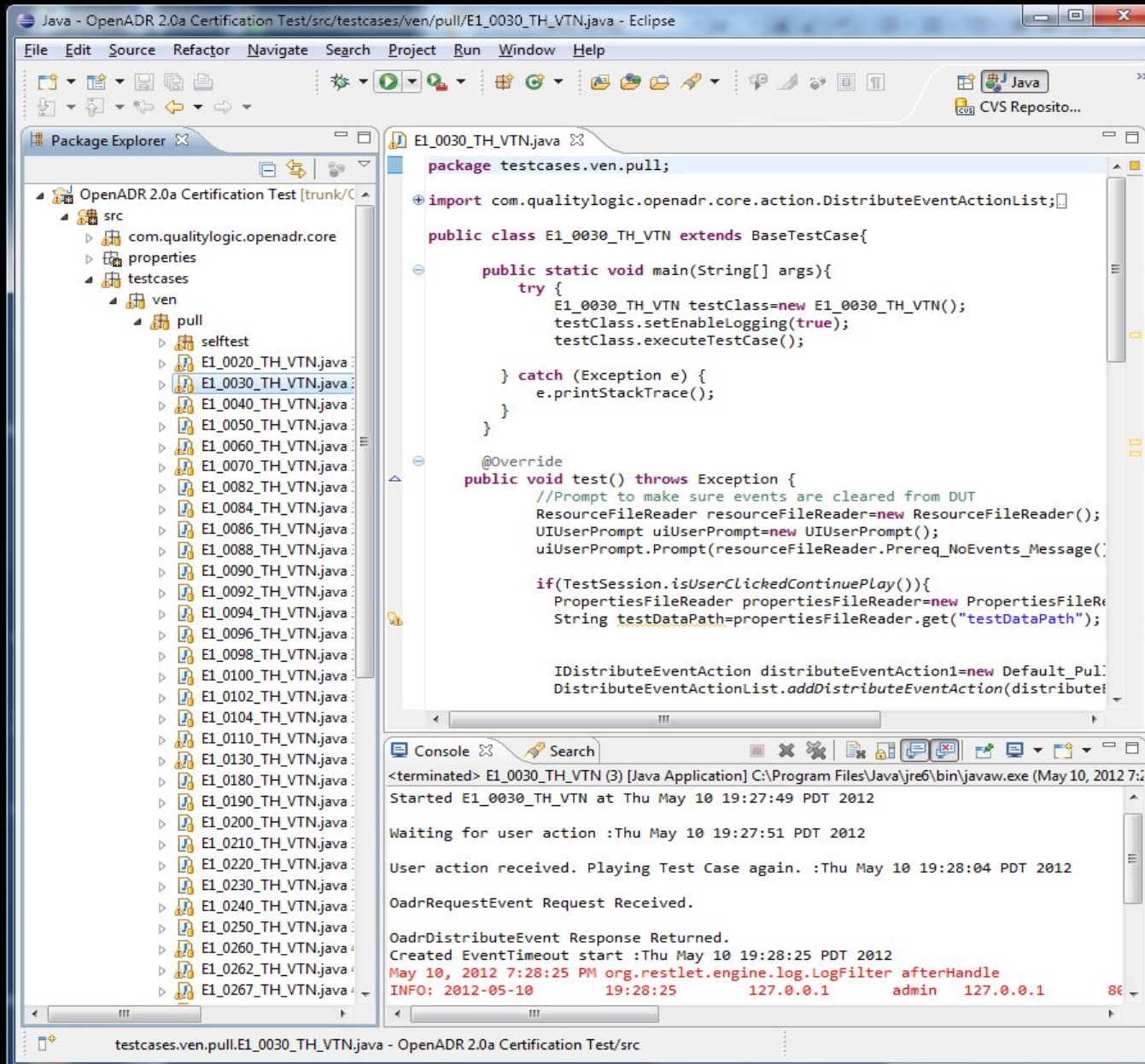
Reports

- History Usage
 - Reports containing previously logged usage data points
- History Green Button
 - Encapsulation of Green Button Atom feeds
- Telemetry Usage
 - Usage data points reported periodically in real time
- Telemetry Status
 - Resource status information reported periodically in real time

Test Harness



Test Harness



The screenshot displays the Eclipse IDE interface. The Package Explorer on the left shows the project structure: OpenADR 2.0a Certification Test [trunk/C...], src, properties, testcases, and ven. The main editor shows the code for E1_0030_TH_VTN.java, which extends BaseTestCase and implements a test method. The Console window at the bottom shows the execution output, including the start time, user action received, and test case execution details.

```
package testcases.ven.pull;

import com.qualitylogic.openadr.core.action.DistributeEventActionList;

public class E1_0030_TH_VTN extends BaseTestCase{

    public static void main(String[] args){
        try {
            E1_0030_TH_VTN testClass=new E1_0030_TH_VTN();
            testClass.setEnableLogging(true);
            testClass.executeTestCase();

        } catch (Exception e) {
            e.printStackTrace();
        }
    }

    @Override
    public void test() throws Exception {
        //Prompt to make sure events are cleared from DUT
        ResourceFileReader resourceFileReader=new ResourceFileReader();
        UIUserPrompt uiUserPrompt=new UIUserPrompt();
        uiUserPrompt.Prompt(resourceFileReader.Prereq_NoEvents_Message());

        if(TestSession.isUserClickedContinuePlay()){
            PropertiesFileReader propertiesFileReader=new PropertiesFileReader();
            String testDataPath=propertiesFileReader.get("testDataPath");

            IDistributeEventAction distributeEventAction1=new Default_Pull
            DistributeEventActionList.addDistributeEventAction(distributeEventAction1);
        }
    }
}
```

Console Output:

```
<terminated> E1_0030_TH_VTN (3) [Java Application] C:\Program Files\Java\jre6\bin\javaw.exe (May 10, 2012 7:28:25 PM)
Started E1_0030_TH_VTN at Thu May 10 19:27:49 PDT 2012
Waiting for user action :Thu May 10 19:27:51 PDT 2012
User action received. Playing Test Case again. :Thu May 10 19:28:04 PDT 2012
OadrRequestEvent Request Received.
OadrDistributeEvent Response Returned.
Created EventTimeout start :Thu May 10 19:28:25 PDT 2012
May 10, 2012 7:28:25 PM org.restlet.engine.log.LogFilter afterHandle
INFO: 2012-05-10 19:28:25 127.0.0.1 admin 127.0.0.1 80
```

Questions?