EPRI | ELECTRIC POWER RESEARCH INSTITUTE

# Common Information Model (CIM) Compliance Testing

*November 2018 Summary of Results*

*3002014800*

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Technical Update, December 2018

EPRI Project Managers

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# ABSTRACT

On October 31 – November 1, 2018 EPRI conducted Common Information Model (CIM) compliance tests at the EPRI facilities in Knoxville, Tennessee.

Tests were performed on EPRI's OpenDERMS 2.0, per forthcoming standard IEC 61968-5, - Distribution Energy Optimization and on Tsunami's Snap DPL 6.0, based on IEC 61968-6, Maintenance & Construction.

EPRI's freely available 2018 *Test Script for International Electrotechnical Commission 61968-5 Distributed Energy Optimization*, Third Edition, Product ID 3002014703, was used at the event to validate results of tests of OpenDERMS.

IEC 61968-6 (Application integration at electric utilities – System interfaces for distribution management – Part 6: Interfaces for maintenance and construction) was the basis for the Tsunami test. The freely available 2015 EPRI test script, *Program on Technology Innovation: Test Script for International Electrotechnical Committee 61968-6: FDIS Messages,* Product ID 3002006862 was used for the tests.

OpenDERMS tests passed and Tsunami received CIM Compliance Certification for its data integration product SnapDPL 6.0.

**Keywords**
Certification
Common Information Model (CIM)
Compliance
OpenDERMS
Test script
Tsunami

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# INTRODUCTION

The second EPRI Common Information Model (CIM) compliance testing event was held October 31-November 1, 2018 at the EPRI Knoxville, Tennessee facility.

The IEC 61968-5, Distributed Energy Optimization is under development and EPRI's freely available 2018 *Test Script for International Electrotechnical Commission 61968-5 Distributed Energy Optimization, Third Edition*, Product ID 3002014703, was used at the event to validate results on OpenDERMS (All OpenDERMS tests were conducted in server role, not the client role).

IEC 61968-6 (Application integration at electric utilities – System interfaces for distribution management – Part 6: Interfaces for maintenance and construction) was the basis for the Tsunami test. The freely available 2015 EPRI test script, *Program on Technology Innovation: Test Script for International Electrotechnical Committee 61968-6: FDIS Messages,* Product ID 3002006862 was used for the tests.

### Key Results

- Tsunami passed tests and received a CIM compliance certificate for its Human+ SnapDPL version 6.0, an application for integrating data from various sources. (See https://risecorp.com/snapdpl-2/). The tests passed were Work Requests, Maintenance Orders, and Service Orders.
- OpenDERMS passed CIM compliance tests in server role for DER Groups (create/change/delete/query), DER Group Dispatch (create), and DER Group Statuses (query). Specific tests passed are DERG-1a, DERG-1b, DERG-1c, DERG-1e, DERG-2a, DERG-2b, DERG-4, DERG-5a, DERGD-1a, DERGD-1b, DERGS-1a, DERGS-1b, and DERGS-1c. (See OpenDERMS Test Results).



**Figure 1 Displaying the Tsunami CIM compliance certificate**

*From left to right:* Daniel Lowe EPRI, Engineer Scientist I, Dr. Gerald R. Gray, EPRI, Senior Program Manager, Suresh Ketha, Tsunami XR, Frank Wilhoit, Broadheath Consulting & Test Witness, Nick Orndorf, ESTA and Test Witness

# WHAT IS THE COMMON INFORMATION MODEL?

The International Electrotechnical Commission (IEC) Common Information Model (CIM) is designed to allow application software to exchange information about an electric network based on open standards.

The CIM is robust in terms of the depth and breadth of information that the associated standards cover about utility semantics. The set of standards associated with the CIM are IEC 61970, 61968, and 62325. These three standards cover transmission, distribution, and energy markets, respectively. They address hundreds of use cases and have been used to design and transmit network model maps, provide guidance on application integration for utilities, and describe how pricing information is exchanged between wholesale markets and utilities.

The term Common Information Model comes about from the fact that each of these standards families reference a common model (a data-class diagram) using Uniform Modeling Language (UML), which describes all the classes, attributes, and relationships among the classes. This common model allows each of these standards to share common semantics.

# NEED FOR CIM COMPLIANCE TESTING

The robustness of CIM and IEC standards are reflected in their growing adoption, which has been shown in EPRI longitudinal surveys. However, as robust as the standards are, even as their

use continues to grow, even as the body of use cases reflected in the CIM continues to see additions, there are challenges that come with CIM adoption, and this has been due to a lack of certification and testing as robust as the standards themselves.

Certification and testing are needed because they address a gap in standards development involving *the interpretation of the standard in how it is applied in a specific integration context*. Such a specification reduces confusion within those portions of the standard that are optional or open to interpretation; providing clarity and reducing the effort to integrate systems. System integration can be expensive and use of vendor products that have been certified as compliant with CIM can help utilities reduce costs.

Compliance testing has been supported by EPRI since publication of *A Call to Action: Certification Testing for the Common Information Model* in early 2016. EPRI and other industry stakeholders began working with the CIM Compliance Committee (www.cimtesting.org) to address the "actionability" gap with the CIM family of standards.

# WHAT IS EPRI OPENDERMS 2.0?

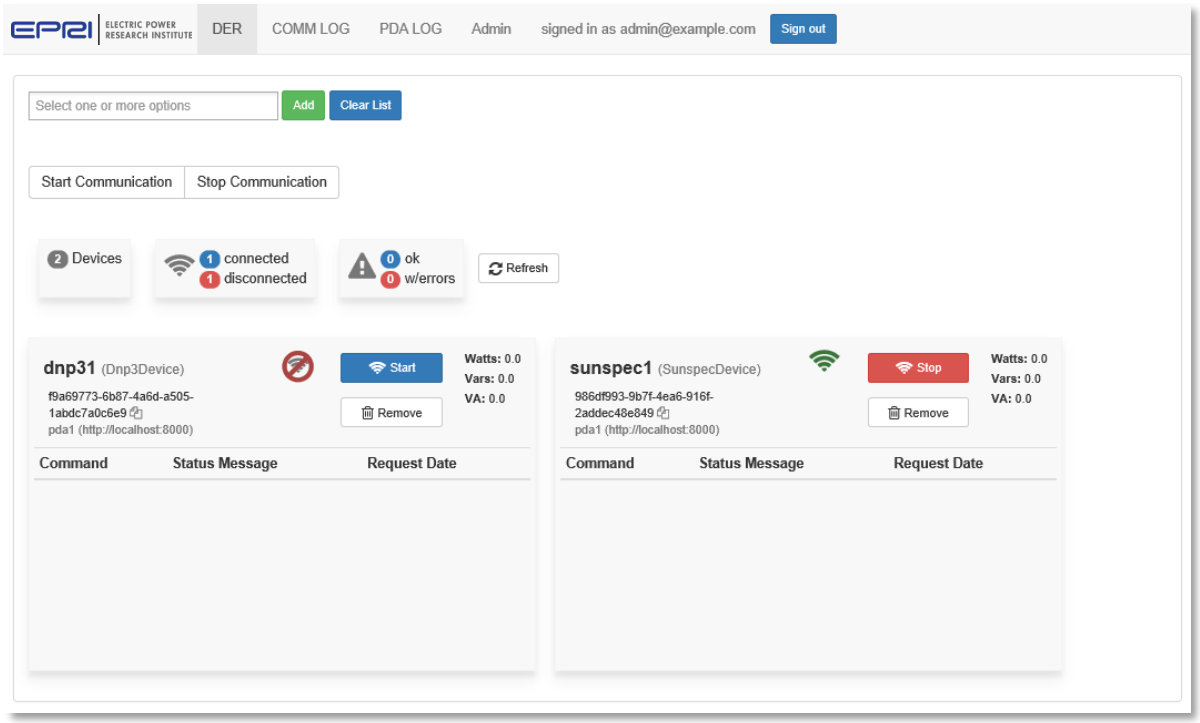



**Figure 2 Example of EPRI OpenDERMS user interface**

Per EPRI's 2018 update of the *DER Integration Toolkit*, Product ID 3002009856, OpenDERMS 2.0 is a reference implementation of a distributed energy resource management system. It consists of tools for management of smart inverters and an interface to connect to other enterprise systems and receive aggregation requests.

The DERMS tool allows the connection of many DER. It allows organization into logical groups and the monitoring and management by group or individual levels. This tool supports all the IEC standard functions for smart inverters, including volt-var control, power limiting, power factor, etc. These tools are useful for performing lab evaluations, to back-up RFP requirements and to speed and simplify field integration. These tools can also be directly referenced in RFPs and extended to partner companies to aid their engineering and development processes. In this way, compatibility is guaranteed upfront.

Currently OpenDERMS 2.0 supports DNP3 and SunSpec Modbus for downstream solar and storage devices. The largest improvement over OpenDERMS 1.0 is the addition of an API to easily add new downstream protocols. OpenDERMS 2.0 is a web application that runs on any operating system.

OpenDERMS 2.0 is available by request from EPRI technical contacts for this product: Ben Ealey bealey@epri.com; Dr. Gerald Gray, ggray@epri.com;

# TEST SCRIPT FOR IEC 61986-5

Setting the appropriate expectations and interpretations of a standard for implementers is the role of a test script.

This specification reduces confusion within those portions of the standard that are optional or open to interpretation, providing clarity and reducing the effort to integrate systems. Although the CIM describes a data model that shows the classes, attributes, and associations of the data to support a use case, and the functional requirements describe what should be done, it remains both to describe how the functional requirements are implemented and how that implementation can be tested for compliance with the associated standards (IEC 61968-100:2013 Application Integration at Utilities and the forthcoming IEC 61968-5 Distributed Energy Optimization). This effort created standards-compliant web services definition languages (WSDLs), eXtensible markup language (XML) schema definitions (XSDs), and a test script that can be used to verify compliance.

The EPRI test script IEC 61986-5 technical report[1] includes WSDLs and XSDs that can be used to develop standards-compliant web services that conform to the international IEC standards for application integration, and to support enterprise integration of functionality of DER management systems. Further, the test script can then be used to test whatever software is developed using the WSDL and XSD artifacts, to ensure that it is in fact compliant with the standard.

Utilities can use it to verify vendor claims of standards-compliance when acquiring a Distributed Energy Resources Management System (DERMS) or a Distribution Management System (DMS) that also includes DERMS functionality, or systems that would interface with a DERMS

[1] https://www.epri.com/#/pages/product/3002014703/

# TEST RESULTS

The test sessions were held October 31, 2018 and ending November 1, 2018 at the EPRI offices in Knoxville, Tennessee.

The products tests were:

- EPRI OpenDERMS 2.0
- Tsunami SnapDPL 6.0

### OpenDERMS Test Results

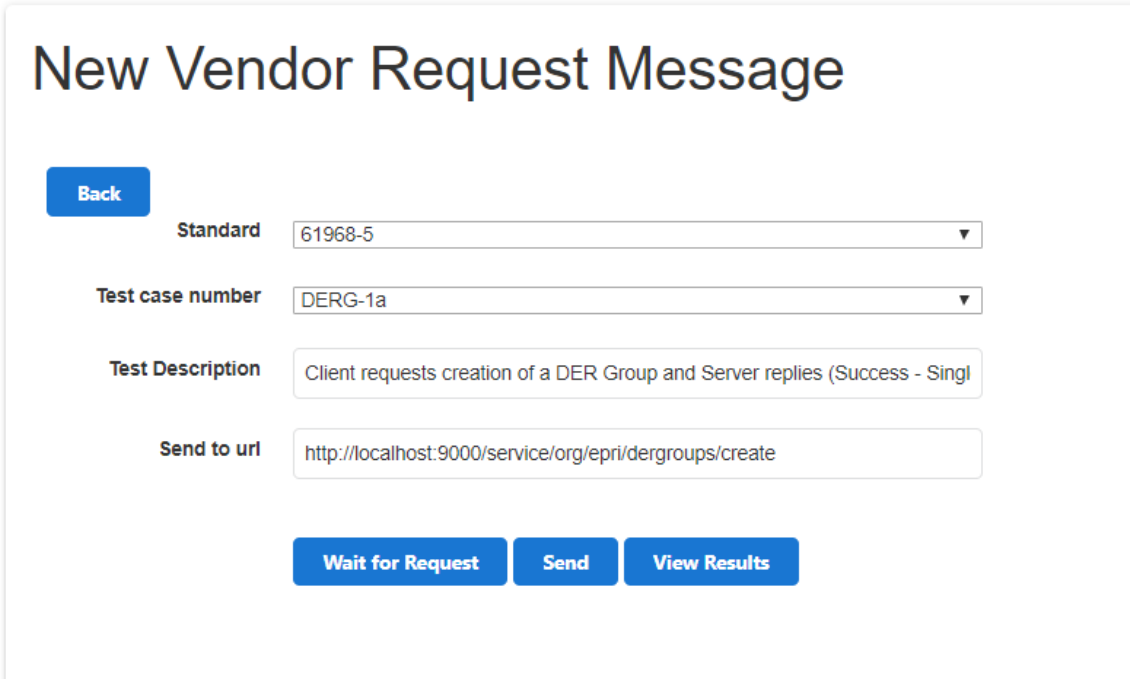
OpenDERMS uses a CIM Web Service to create/modify/delete/query DERGroups, to create DERGroupDispatch requests for reactive/real power, and to request DER Group Statuses. *OpenDERMS only acts in the server role for this operation*, so testing it for CIM compliance requires that the test harness act in the client role, and the OpenDERMS endpoints are only used when sending the messages.

The following test cases in the 61968-5 Test Script correspond to the messages outlined above:

- DER Groups
  - **Create**
    - DERG-1a
    - DERG-1b
    - DERG-1c
    - DERG-1d
    - DERG-1e
  - **Change**
    - DERG-2a
    - DERG-2b
  - **Delete**
    - DERG-4
  - **Query**
    - DERG-5a
    - DERG-5b
- DER Group Dispatch
  - **Create**
    - DERGD-1a
    - DERGD-1b
    - DERGD-1d
- DER Group Statuses
  - **Query**
    - DERGS-1a
    - DERGS-1b
    - DERGS-1c
    - DERGS-1d

Test details are provided below, including a test log for OpenDERMS in Table 1.

To run the tests, EPRI accessed the test harness at http://localhost:3000/vendor_request_message/new where “localhost” is replaced by the IP address where the harness is located. Once all fields were populated, the “Send” button was hit. An example screenshot for the Test Case DERG-1a is shown below:




Note that the IP address must be changed to that of whatever machine is hosting the CIM Web Service for OpenDERMS. This can be accessed by opening command prompt and typing *ipconfig -all*. If using a wireless network, look for the IPv4 address that says *(preferred)* next to it.

### *Creating the End Devices*

Since the following Test Cases are for creating DER Groups and not EndDevices, the individual devices need to be made in advance. The following mRIDs are used for EndDevices in these Test Cases

- DG1
  - 23cbd502-128a-4c4e-b7cd-5eaf6d9ae275
  - 7fc50292-2e8a-4e9c-80ae-9105f50ce3ea
  - 63d092b7-baed-4bfe-ad97-5709f2ce4ec9
- DG1 (failure case)
  - 646bd360-9519-4c60-8c1f-c4d225e806f7
  - 8b0e2733-0c5d-4d69-be89-c8ed1d8564b7
- DG2
  - 46029b51-8d94-4a06-b242-74d4a3fc2390
  - 13a801e1-b45d-4dbe-960f-84f04ef39fcb
- DG3
  - c3af4062-e6a9-4a05-bbac-e0215875fda2
  - 7195c25f-4b54-4714-a90e-710dd7b1bcdd
  - 9d6b55b4-e320-45d5-8ff8-6f947afa4b02
  - d1062c85-a938-4d11-af45-9ba97d444d5e
- DG4
  - c378df3a-294c-4743-ad78-65f970231b5b
  - 6de3d770-6087-45bc-a5c8-6fca25f5a318

- DG5 (fails)
  - 8e5439f8-e95a-43ca-8b95-7bc176fa8a35
- DG6
  - e8a2f05b-aca9-46dc-971b-be22fcedc00b

This is a total of 15 devices that are used in OpenDERMS, though due to cases where creation of a DER Group fails, not all of them will necessarily be assigned to a DER Group. To easily add 15 devices at once, the following segment from OpenDERMS "Getting Started" documentation explains a way to make multiple devices at once:

> Ruby script files placed in **ui\war\derms20\webapp\WEB-INF\lib\scripts** can be executed from the rails console. A sample script called *load_devices.rb.sample* is located in this directory. To execute the script: 1) Remove sample from the file name (scripts must end with .rb) 2) Execute the rails console by running the *derms-console.cmd* script. 3) Run the following command in the console window: ***LoadDevices::execute***

The following script was used to generate 15 devices belonging to no group in OpenDERMS following the above directions (mRIDs will have to be manually adjusted to match those listed earlier).

```
module LoadDevices

  def self.execute

    # remove all devices
    Device.destroy_all

    pda = ProtocolDriverAgent.find_by_name!('pda1')

    15.times do |index|
      dnp3 = Dnp3Device.create!(ip_address: "127.0.0.1", port: "2000#{index}" )
      device = Device.create!(name: "dnp3_#{index+1}", watts: 2000, volts: 240, va:
2000, var: 2000, device_instance: dnp3, protocol_driver_agent: pda)

    end

  end

end
```

**Table 1 Test Log DER Groups OpenDERMS**

| Test Case ID | Server Scenario | COMMENTS |
|---|---|---|
| DERG-1a | PASS | |
| DERG-1b | PASS | |
| DERG-1c | PASS | |
| DERG-1d | FAIL | Defect in OpenDERMS |
| DERG-1e | PASS | |
| DERG-2a | PASS | |
| DERG-2b | PASS | |
| DERG-4 | PASS | |
| DERG-5a | PASS | |
| DERG-5b | PASS | |
| DERGD-1a | PASS | Although a pass; experienced bug in OpenDERMS software issues |
| DERGD-1b | PASS | |
| DERGD-1d | FAIL | Error returned indicating that creation of the DER Group Dispatch for DER Group DG7 failed |
| DERGD-1e | PASS | |
| DERGCD-1a | PASS | |
| DERGCD-1b | PASS | |
| DERGCD-1c | PASS | |
| DERGCD-1d | PASS | |

## *DER Group Create/Change/Delete/Get*

For the following Test Cases, all OpenDERMS tools but the PV Simulator were in use. Verification that the requests worked as intended were double checked using DERMS UI.

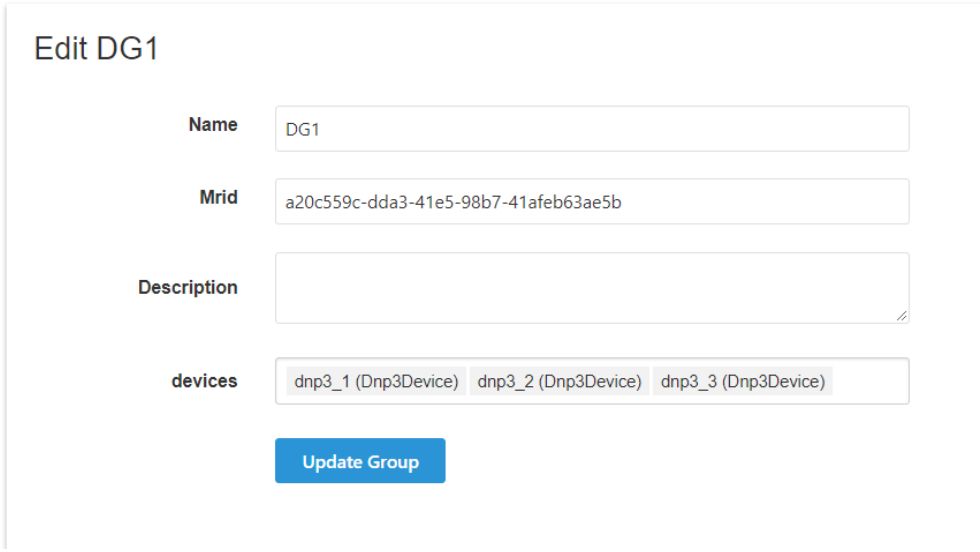
### DERG-1a: Client requests creation of a DER Group and Server replies (Success – Single DER Group)

Pre-Condition(s) None
Post Condition(s**):** A new DER Group is created with the mRID and Names identifier(s) that were passed in the request message.
Endpoint: http://localhost:9000/service/org/epri/dergroups/create
Results: The following SOAP Message was returned:

```
<soap:Envelope xmlns:soap='http://schemas.xmlsoap.org/soap/envelope/'>
  <soap:Body>
    <ns2:DERGroupsResponseMessage
xmlns='http://iec.ch/TC57/2011/schema/message'
xmlns:ns2='http://iec.ch/TC57/2017/DERGroupsMessage'
xmlns:ns3='http://iec.ch/TC57/2017/DERGroups#'>
      <ns2:Header>
        <Verb>created</Verb>
        <Noun>DERGroup</Noun>
        <ReplayDetection>
          <Nonce>bda8683e-832e-4106-bdea-d81c43a303bb</Nonce>
          <Created>2018-10-22T15:10:02.627-04:00</Created>
        </ReplayDetection>
        <Context>TESTING</Context>
        <Timestamp>2018-10-22T15:10:02.627-04:00</Timestamp>
        <Source>COM.EPRI.CIMDER-SERVICES</Source>
```

```
      <AsyncReplyFlag>false</AsyncReplyFlag>
      <MessageID>46bb5c0d-b393-455f-b823-a56e3ef3b823</MessageID>
      <CorrelationID>3b69d29d-6c5a-4764-8152-94080185ba6f</CorrelationID>
      <Comment>COM.EPRI.CIMDER-SERVICES</Comment>
    </ns2:Header>
    <ns2:Reply>
      <Result>OK</Result>
    </ns2:Reply>
    <ns2:Payload>
      <ns3:DERGroups>
        <ns3:EndDeviceGroup>
          <ns3:mRID>a20c559c-dda3-41e5-98b7-41afeb63ae5b</ns3:mRID>
          <ns3:description>DER Group 1</ns3:description>
          <ns3:DERFunction>
            <ns3:connectDisconnect>true</ns3:connectDisconnect>
            <ns3:frequencyWattCurveFunction>false</ns3:frequencyWattCurveFunction>
            <ns3:maxRealPowerLimiting>false</ns3:maxRealPowerLimiting>
            <ns3:rampRateControl>false</ns3:rampRateControl>
            <ns3:reactivePowerDispatch>false</ns3:reactivePowerDispatch>
            <ns3:realPowerDispatch>true</ns3:realPowerDispatch>
            <ns3:voltageRegulation>false</ns3:voltageRegulation>
            <ns3:voltVarCurveFunction>false</ns3:voltVarCurveFunction>
            <ns3:voltWattCurveFunction>false</ns3:voltWattCurveFunction>
          </ns3:DERFunction>
          <ns3:EndDevices>
            <ns3:mRID>23cbd502-128a-4c4e-b7cd-5eaf6d9ae275</ns3:mRID>
          </ns3:EndDevices>
          <ns3:EndDevices>
            <ns3:mRID>7fc50292-2e8a-4e9c-80ae-9105f50ce3ea</ns3:mRID>
          </ns3:EndDevices>
          <ns3:EndDevices>
            <ns3:mRID>63d092b7-baed-4bfe-ad97-5709f2ce4ec9</ns3:mRID>
          </ns3:EndDevices>
          <ns3:Names>
            <ns3:name>DG1</ns3:name>
          </ns3:Names>
          <ns3:version>
            <ns3:date>2017-05-31T13:55:01-06:00</ns3:date>
            <ns3:major>1</ns3:major>
            <ns3:minor>0</ns3:minor>
            <ns3:revision>0</ns3:revision>
          </ns3:version>
        </ns3:EndDeviceGroup>
      </ns3:DERGroups>
    </ns2:Payload>
  </ns2:DERGroupsResponseMessage>
 </soap:Body>
</soap:Envelope>
```


DG1 was successfully created in OpenDERMS.




## DERG-1b: Client requests creation of a DER Group and Server replies (Failure – Single DER Group)

| | |
|---|---|
| Pre-Condition(s) | Assumed completion of Test Case DERG-1a |
| Post Condition(s): | Creation of the DER Group failed as indicated in the Step 2 response message. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/create |
| Results: | PASS |

## DERG-1c: Client requests creation of two DER Groups and Server replies (Success – Two DER Groups in a single message)

| | |
|---|---|
| Pre-Condition(s) | None |
| Post Condition(s): | Two new DER Groups are created with the Names identifiers that were passed in the request message. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/create |
| Results: | PASS |

## DERG-1d: Client requests creation of two DER Groups and Server replies (Two DER Groups in a single message – One succeeds and one fails)

| | |
|---|---|
| **Pre-Condition(s)** | Assumed completion of Test Case DERG-1c |
| **Post Condition(s):** | One new DER Group is created with the Names identifier that was passed in the request message. An error is returned indicating that instantiation of the second DER Group failed. |
| **Endpoint:** | http://localhost:9000/service/org/epri/dergroups/create |
| **Results:** | FAIL (Defect in OpenDERMS) |

## DERG-1e: Client requests creation of a DER Group and Server replies (Success – Single DER Group, Responder supplies mRID)

| | |
|---|---|
| Pre-Condition(s) | None |
| Post Condition(s): | A new DER Group is created with the Names identifier that was passed in the request message. The server responds with an indication of success and adds the mRID identifier in the Payload section of the response message. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/create |
| Results: | PASS |

## DERG-2a: Client requests modification of an existing DER Group and Server replies (Success – Change supported DER functions to include voltage regulation)

| | |
|---|---|
| Pre-Condition(s) | A DER Group with a Names.name identifier DG1, as created in Test Case DERG-1a, is assumed to exist. |
| Post Condition(s): | The subject DER Group is modified to support the voltage regulation DER Function. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/change |
| Results: | PASS |

## DERG-2b: Client requests modification of an existing DER Group and Server replies (Success – Add an additional DER)

| | |
|---|---|
| Pre-Condition(s) | A DER Group with an mRID of 228650bf-7f77-44fa-9576-db4bbce8a07f as created in Test Case DERG-1c is assumed to exist. |
| Post Condition(s): | The subject DER Group is modified to have a third member. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/change |
| Results: | PASS |

## DERG-4: Client requests deletion of an existing DER Group and Server replies (Success)

| | |
|---|---|
| Pre-Condition(s) | DER Group with a Names.name identifier of DG1, as created in Test Case DERG-1a, is assumed to exist. |
| Post Condition(s): | The subject DER Group is deleted. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/change |
| Results: | PASS |

## DERG-5a: Client requests retrieval of an existing DER Group and Server replies (Success – Single DER Group)

| | |
|---|---|
| Pre-Condition(s) | A DER Group with a Names.name identifier of DG2, as created in Test Case DERG-1c and modified in DERG-2b, is assumed to exist. |
| Post Condition(s): | The full content of the subject DER Group is returned in response to the query. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/query |
| Results: | PASS |

## DERG-5b: Client requests retrieval of two DER Groups and Server replies (Success – Two DER Groups in a single message)

| | |
|---|---|
| Pre-Condition(s) | DER Groups with Names.name identifiers of DG2 (as created in Test Case DERG-1c and modified in Test Case DERG-2b) and DG4 (as created in Test Case DERG-1d) are assumed to exist. |
| Post Condition(s): | The full contents of the subject DER Groups are returned in response to the query. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/query |
| Results: | PASS |

## *Create DER Group Dispatch*

For these tests, nearly all components of OpenDERMS need to be run to ensure they're working as intended. This includes connecting the devices to the PV Simulator and creating the proper dispatch settings at http://localhost:9000/dispatchsettings/list prior to attempting these requests.

The Test Script uses the Names.name identifier for these Test Cases, whereas OpenDERMS will only search by mRID for these. If the reply message results in an error (such as not being able to retrieve available watts), then chances are the proper functions weren't enabled via DERMS UI, such as Adjust Max Gen or Power Factor. These functions must be enabled for proper replies during these Test Cases.

Note that **the Test Cases cannot be run as-is.** The timestamp for starting the dispatch needs need to be changed; each EndDeviceGroup must have its mRID provided in the request.

**Table 2 Test Log DER Group Dispatch OpenDERMS**

| Test Case ID | Server Scenario | COMMENTS |
|---|---|---|
| DERGS-1a | PASS | |
| DERGS-1b | PASS | |
| DERGS-1c | PASS | |
| DERGS-1d | PASS | |

### DERGD-1a: Client requests creation of a single DER Group Dispatch and Server replies (Success – Single DER Group)

| | |
|---|---|
| Pre-Condition(s) | DER Group DG2, as previously created in Test Case DERG-1c and modified in Test Case DERG-2b, is assumed to exist. |
| Post Condition(s): | A new DER Group Dispatch is created with the mRID and Names identifiers that were passed in the request message. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/dispatch |
| Results: | PASS, BUT OpenDERMS HAS INTERNAL ISSUES |

### DERGD-1b: Client requests creation of a DER Group Dispatch and Server replies (Failure – Single DER Group)

| | |
|---|---|
| Pre-Condition(s) | DER Group DG1 is assumed not to exist, as it was previously deleted in Test Case DERG-4. |
| Post Condition(s): | Creation of the DER Group Dispatch failed as indicated in the Step 2 response message. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/dispatch |
| Results: | PASS |

## *Query DER Group Status*

For these tests, nearly all components of OpenDERMS need to be run to ensure they're working as intended. This includes connecting the devices to the PV Simulator and creating the proper dispatch settings at http://localhost:9000/dispatchsettings/list prior to attempting these requests.

Note that the Test Scripts use the Names.name identifier for these Test Cases, whereas OpenDERMS will only search by mRID for these.

**Table 3 Test Log DER Group Status OpenDERMS**

| Test Case ID | Server Scenario | COMMENTS |
|---|---|---|
| DERGS-1a | PASS | |
| DERGS-1b | PASS | |
| DERGS-1c | PASS | |
| DERGS-1d | PASS | |

## DERGS-1a: Client requests status of a DER Group and Server replies (Success - Single DER Group)

| | |
|---|---|
| Pre-Condition(s) | A DER Group with a Names.name identifier of DG2, as created in Test Case DERG-1c and modified in Test Case DERG-2b, is assumed to exist. |
| Post Condition(s): | The current status of the subject DER Group is returned in response to the query. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/getstatus |
| Results: | PASS |

## DERGS-1b: Client requests status of a DER Group and Server replies (Failure - Single DER Group)

| | |
|---|---|
| Pre-Condition(s) | DER Group DG1 is assumed not to exist. |
| Post Condition(s): | The request fails since DER Group DG1 does not exist. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/getstatus |
| Results: | PASS |

## DERGS-1c: Client requests status of two DER Groups and Server replies (Success - Two DER Groups in a single message)

| | |
|---|---|
| Pre-Condition(s) | DER Groups with Names.name identifiers of DG3 and DG4, as created and /or modified in Test Cases DERG-1c, DERG-1d, and DERG-3 are assumed to exist. |
| Post Condition(s): | The current statuses of the subject DER Groups are returned in response to the query. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/getstatus |
| Results: | PASS |

## DERGS-1d: Client requests status of two DER Groups and Server replies (Two DER Groups in a single message - One succeeds and one fails)

| | |
|---|---|
| Pre-Condition(s) | The DER Group with a Names.name identifier of DG6, as created in Test Case DERG-1e, is assumed to exist. A DER Group with a Names.name identifier of DG7, is assumed not to exist as it was previously deleted in Test Case DERG-9. |
| Post Condition(s): | The response message contains the current status of DER Group DG6 and an indication of an error for DER Group DG7. |
| Endpoint: | http://localhost:9000/service/org/epri/dergroups/getstatus |

Results: UNABLE TO TEST

# WHAT IS TSUNAMI SNAPDPL?

Tsunami's Snap DPL 6.0 was the vendor product for which CIM compliance tests were conducted. Per the Tsunami website, "SnapDPL is an application for integrating data from various data sources…The program can extract and aggregate data across multiple sources, apply…data transformations and migrate high volume data to virtually any other data handling application. Data Process Logic can…be used as a back-end to existing reporting systems or Microsoft® Excel.[2]"

# THE IEC 61986-6 TEST SCRIPT

The freely available 2015 EPRI test script, *Program on Technology Innovation: Test Script for International Electrotechnical Committee 61968-6: FDIS Messages,* Product ID 3002006862 was used for the tests.

The International Electrotechnical Commission (IEC) published a Final Draft International Standard (FDIS) in 2015 that supports maintenance, construction, and service work for utilities. This FDIS is formally designated IEC 61968-6: FDIS, "Application Integration at Electric Utilities—System Interfaces for Distribution Management—Part 6: Interfaces for Maintenance and Construction." IEC 61968-6: FDIS documents normative message payloads for WorkRequests, MaintenanceOrders, and ServiceOrders.

IEC 61968-6: FDIS is one component of the IEC 61968 series of standards dealing with system interfaces for distribution management. Another key standard in the series is IEC 61968-100:2013, "Application Integration at Electric Utilities—System Interfaces for Distribution Management—Part 100: Implementation Profiles." It documents a normative message wrapper and methods for communicating IEC 61968 messages using a variety of protocols, including Java Message Service, generic web services, and strongly typed web services.

For practitioners attempting to implement interfaces that are compliant with both IEC 61968-100:2013 and a domain-specific standard such as IEC 61968-6: FDIS. This test script represents an attempt by EPRI to bridge some of the common gaps in understanding. It combines, in a single document, background information that demystifies some of the subtleties of IEC messaging, detailed information concerning the construction of messages and their transport by various protocols, and test cases with extensive sample XML to illustrate the full life-cycle of work request, maintenance order, and service order documents.

The test cases describe in detail the population of both message wrapper and payload elements, and they illustrate both bi-directional request/response and uni-directional publish messaging

[2] https://risecorp.com/snapdpl-2/

patterns. For request/response patterns, the test cases also illustrate the normative conventions for indicating success and failure results.

Although this report is presented in the context of testing IEC 61968-6: FDIS maintenance and construction messages, much of its information applies equally to messaging involving other IEC 61968 domain-specific standards, including, for example, IEC 61968-9:2013, the Meter Reading and Control standard.

# TSUNAMI SNAPDPL TEST RESULTS

Notes on conduct of the test:

- The return side message needs to be assembled into a single message to be CIM compliant (Tsunami's software splits up the CIM message into separate files for header and payload).

- A scenario in which you need to pass of the CIM message to another party, such as IBM (regarding keeping the message together) should not be neglected.

- Do not omit the time zone entirely. It must have a Z or some other denotation of the time zone. Note that this time zone issue is not in reference to Tsunami's software, but rather is based on a discussion on how timestamps were handled for the DER Dispatch messages.

**Table 4 Test Log Work Requests Tsunami**

| Test Case | Result | Notes |
|---|---|---|
| WR-1a | Pass | The message should be preserved as a whole message. |
| WR-1b | Pass | |
| WR-1c | Pass | |
| WR-1d | Pass | |
| WR-2a | Pass | |
| WR-2b | Pass | |
| WR-3 | N/A | File wasn't present. Internal mapping failed on Tsunami end so this test case wasn't ready. |
| WR-4 | Pass | |
| WR-5a | Pass | Typo was present in the IEC 61968-6 document that needs to be addressed (WR number in Test Case Overview at the beginning doesn't match the one in the sample XML) |
| WR-5b | Pass | |

**Table 5 Maintenance Orders**

| Test Case | Result | Notes |
|---|---|---|

| | | |
|---|---|---|
| MO-1a | Pass | |
| MO-1b | Pass | |
| MO-1c | Pass | |
| MO-1d | Pass | |
| MO-2a | Pass | |
| MO-2b | N/A | File wasn't present. Internal mapping failed on Tsunami end so this test case wasn't ready. |
| MO-3 | N/A | File wasn't present. Internal mapping failed on Tsunami end so this test case wasn't ready. |
| MO-4 | Pass | |
| MO-5a | Pass | |
| MO-5b | Pass | |

# NEXT STEPS

The 2018 CIM compliance test was successful and EPRI will be expanding tests in 2019. In partnership with the U.S. Department of Energy (DOE), EPRI will be conducting additional tests including Open Data-Link Interface (ODI) and IEC 61968-8 Customer Support standards.

EPRI plans to invite other user groups to co-locate their compliance, interoperability, or "plug-fests" with the 2019 CIM Compliance test event. Groups such as OpenFMB, Green Button, OpenADR will be invited.

# APPENDIX ACRONYMS AND INITIALISMS

CIM – Common Information Model

DER – distributed energy resource

DERMS- distribute energy resource management system

DERG – distributed energy resource group

DERGD – distributed energy resource group dispatch

DERGS – distributed energy resource group statuses

DG – identifier for a DER group

DOE – Department of Energy

EPRI - Electric Power Research Institute

mRID – master record identification

SOAP – Simple Object Access Protocol

UI – user interface

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