

# Comparison of MultiSpeak® Connectivity Model and the IEC CIM NetworkDataSet

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# Outline

- Background on MultiSpeak® and CIM
- **Why** MultiSpeak and CIM should be harmonized
- **How** harmonization can occur
- MultiSpeak and CIM power system data models



# Standards for Integration of Distribution Applications

## MultiSpeak

- Developed by NRECA in collaboration with key industry vendors
- Covers applications of interest to distribution utilities; currently doesn't include power scheduling or generation
- Standard is mature, but scope is continuing to grow
- In use at over 200 utilities
- Mature interoperability testing program, applies to all interfaces
- Uses XML; web services and batch transport profiles defined
- More information and specification available at [www.MultiSpeak.org](http://www.MultiSpeak.org)



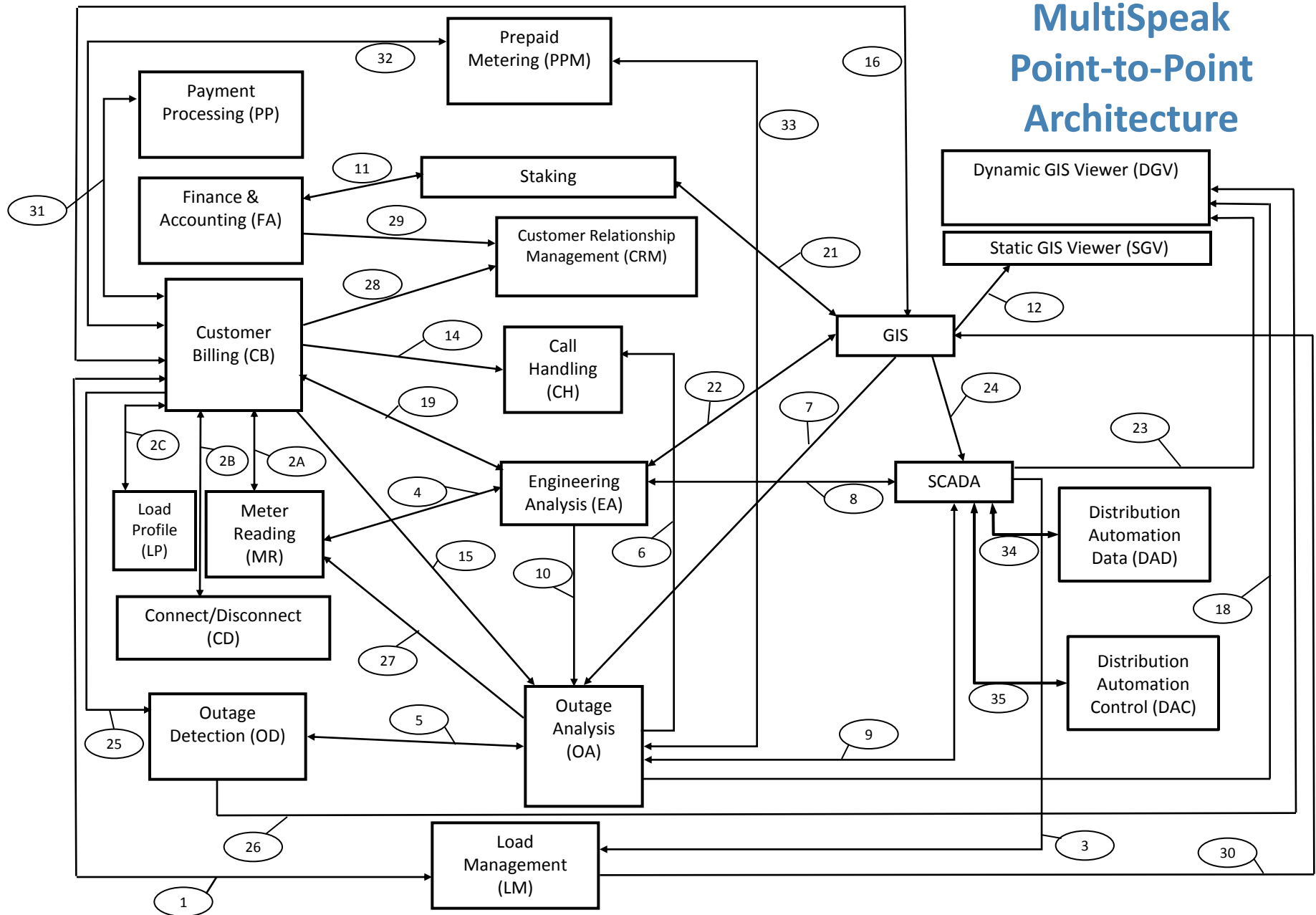
# Standards for Integration of Distribution Applications

## CIM with Distribution Extensions

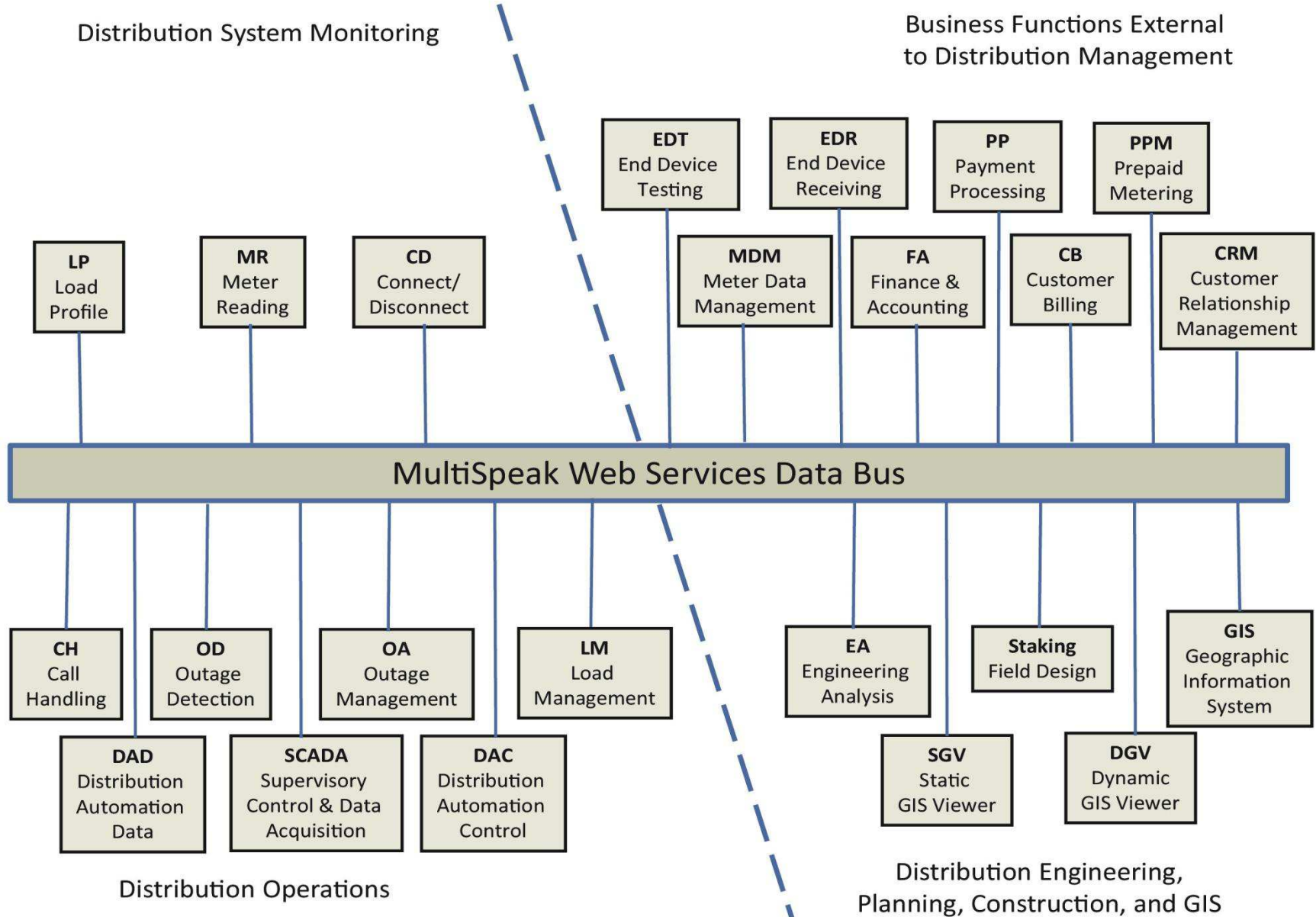
- Maintained by IEC Technical Committee 57
- Scope is larger than MultiSpeak, but is less mature
- Implementations based on CIM data model in place at dozens of utilities
- Implementation is messaging-based and transport agnostic, currently no transport profiles defined
- Interoperability testing is in place for two limited profiles (transmission and distribution power system model exchange)
- Core CIM in IEC 61970; distribution extensions in IEC 61968



# MultiSpeak Point-to-Point Architecture

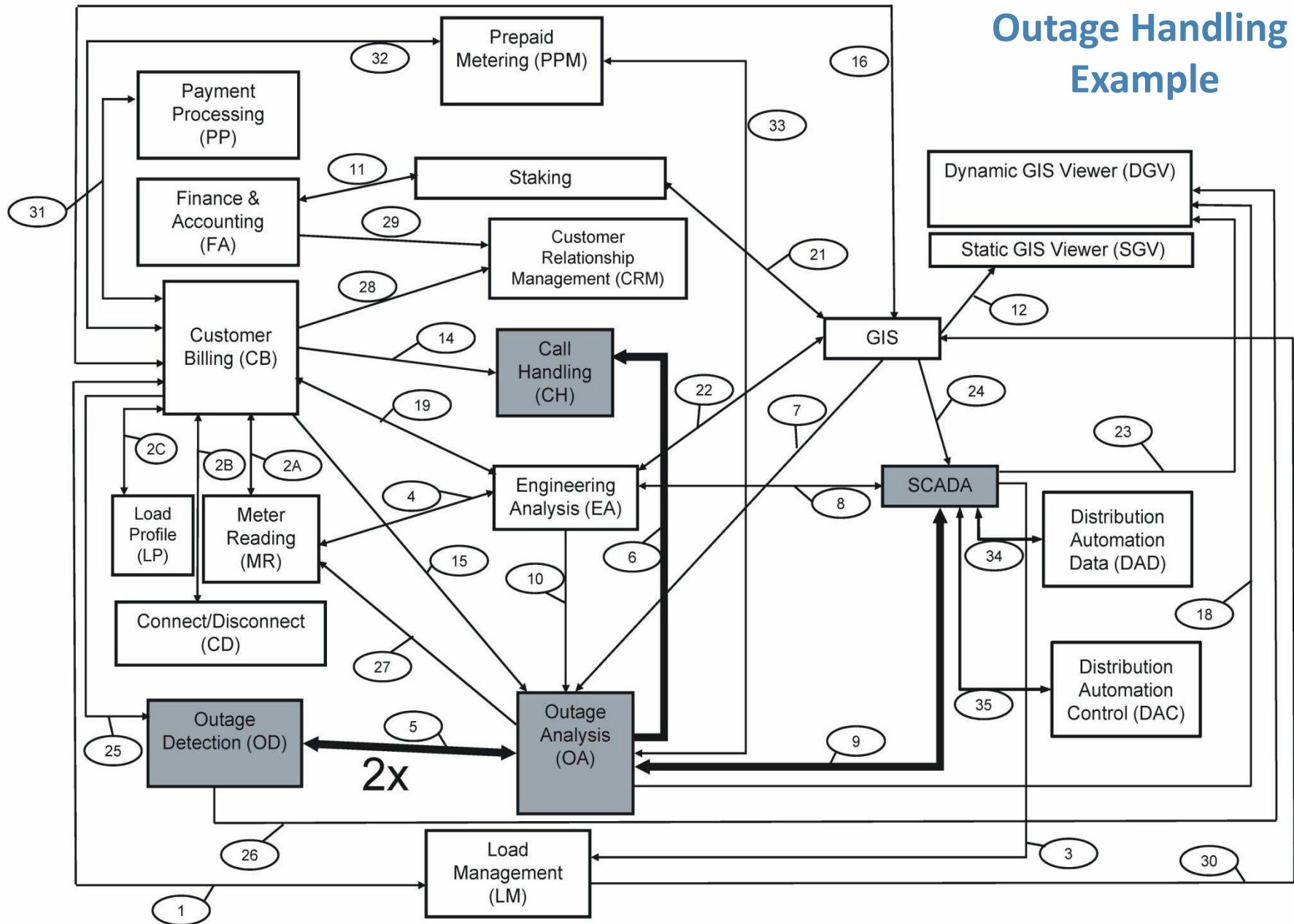


# MultiSpeak Services Bus Architecture

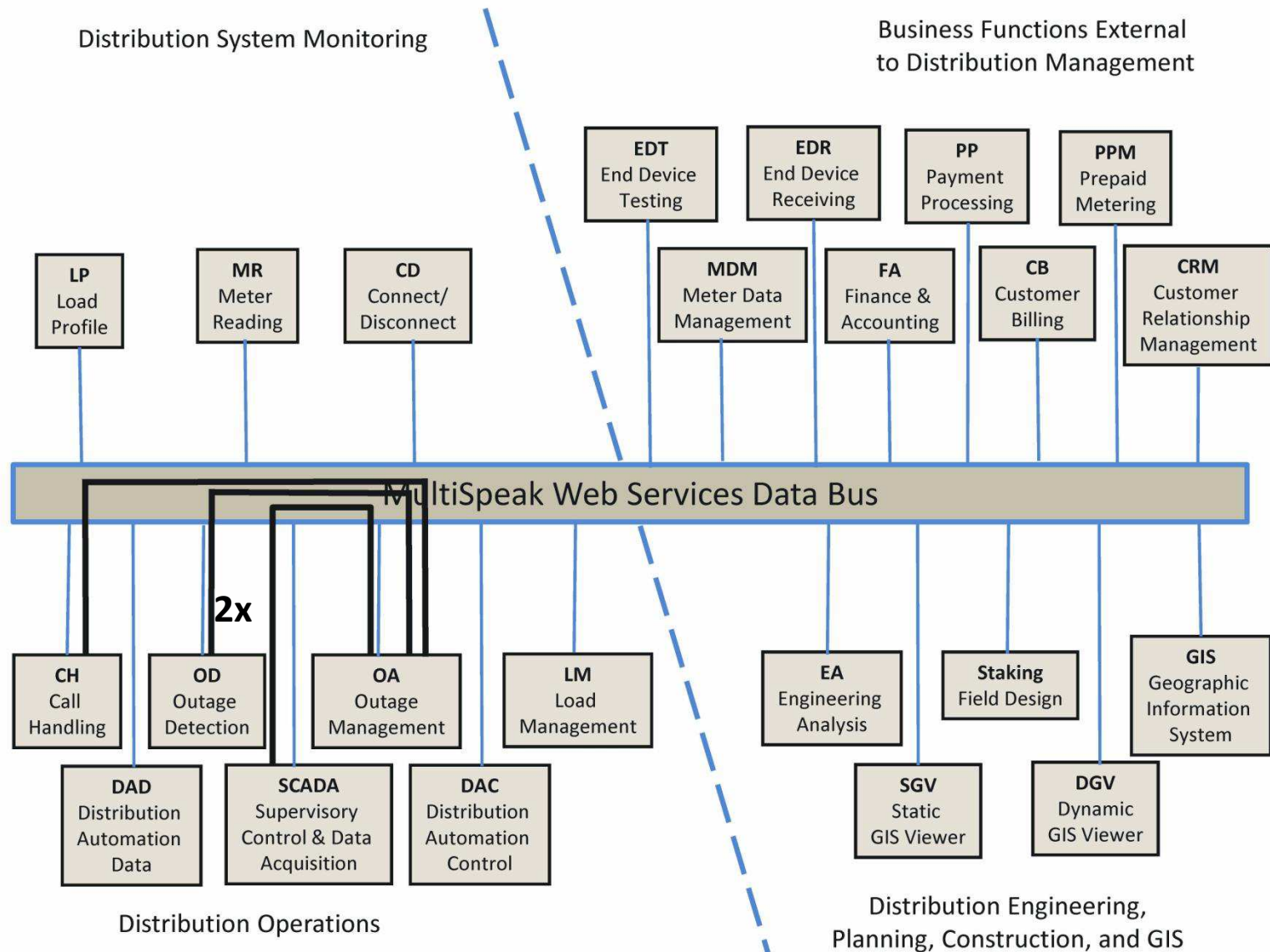




## Point-to-Point Outage Handling Example



# Outage Handling Example - Bus Architecture





# Why Harmonize MultiSpeak and CIM?

- Both standards have value and likely will co-exist in market
- Both standards will undoubtedly be simultaneously implemented in some utilities
- Inter-company messaging will likely be required among companies using different standards



# Steps in Harmonization

1. Map MultiSpeak web service **methods** to WG14 CIM **messages** (use case steps).
2. Compare WG14 and MultiSpeak data payloads for each use case step.
3. Create electronic data payload transformation.
4. Create adapter layer to handle data transformation and messaging conversion.



# Harmonization Example

1. Map MultiSpeak web service **methods** to WG14 CIM **messages**. **Choose network connectivity**
2. Compare WG14 and MultiSpeak data payloads for each use case step.
3. Create electronic data payload transformation.
4. Create adapter layer to handle data transformation and messaging conversion.

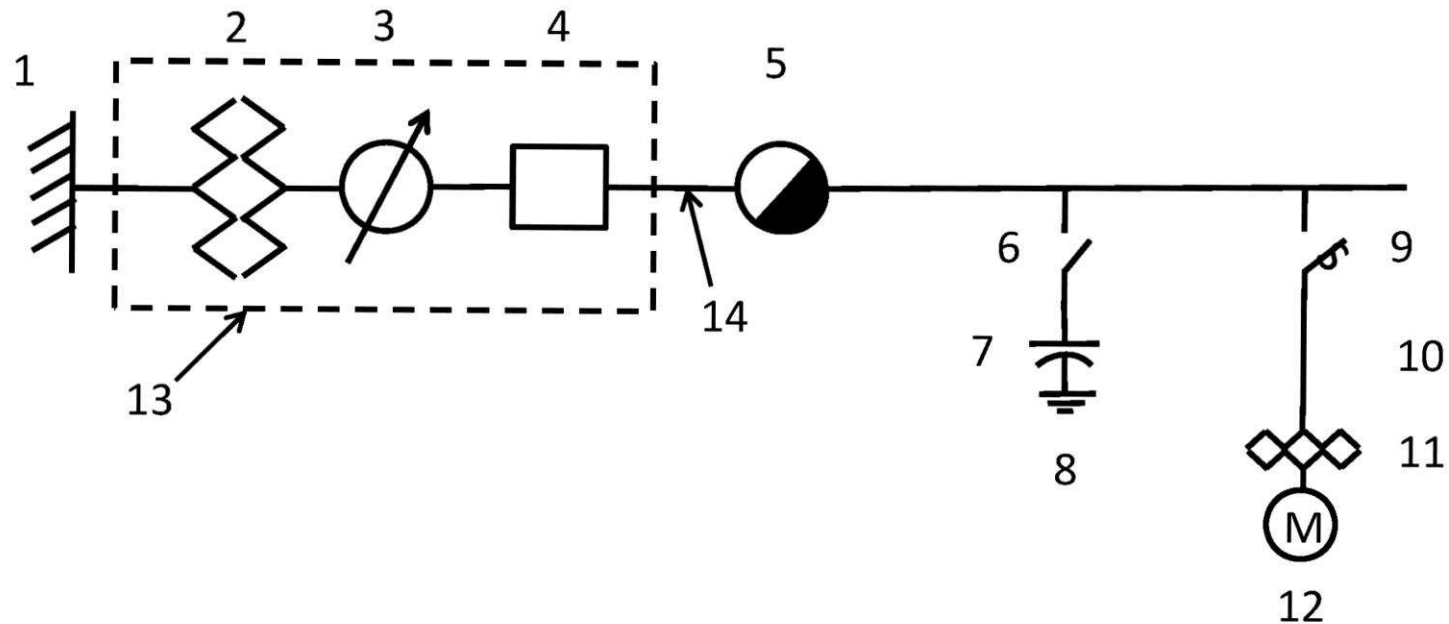


# Harmonization Example

1. Map MultiSpeak web service **methods** to WG14 CIM **messages**.
2. Compare WG14 and MultiSpeak data payloads for each use case step. **Compare MultiSpeak Connectivity and CIM NetworkDataSet payloads**
3. Create electronic data payload transformation.
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# Sample Distribution Circuit





# Basic Differences

- MultiSpeak can handle section-oriented or node oriented models; CIM uses nodes.
- CIM can have terminals associated with nodes; MultiSpeak does not have terminals.
- MultiSpeak does not explicitly model ground.
  - One terminal devices have an implied ground.
  - Three terminal devices are modeled with two terminals and implied ground.



# MultiSpeak and CIM Equivalence

Power System Element	MultiSpeak Object	NetworkDataSet Object
1) <b>Equivalent source</b>	Included in <b>Substation</b> object.	<b>EnergySource</b>
2) <b>Power transformer</b>	<b>TransformerBank</b> (containing one or more <b>Transformer</b> units)	<b>PowerTransformer</b> (containing two or more <b>Windings</b> )
3) <b>Voltage regulator</b>	<b>Regulator</b>	Modeled as a <b>PowerTransformer</b> with a <b>TapChanger</b> and <b>RegulationSchedule</b> .
4) <b>Breaker</b>	<b>OvercurrentDeviceBank</b> (containing breaker object(s) )	<b>Breaker</b>
5) <b>Recloser</b>	<b>Recloser</b>	Modeled as a <b>Breaker</b> with <b>RecloserProperties</b> .
6) <b>Switch</b>	<b>SwitchDeviceBank</b> (containing <b>Switch</b> units).	<b>Switch</b>
7) <b>Shunt capacitor bank</b>	<b>CapacitorBank</b>	<b>ShuntCompensator</b>
8) <b>Ground</b>	Assumed to be part of <b>CapacitorBank</b> .	<b>Ground</b>
9) <b>Fuse</b>	<b>OvercurrentDeviceBank</b> with ( <b>Fuse</b> objects)	<b>Fuse</b>
10) <b>Single phase distribution line</b>	<b>ohPrimaryLine</b> or <b>ugPrimaryLine</b> as appropriate.	<b>ACLineSegment</b>
11) <b>Distribution transformer</b>	<b>TransformerBank</b> (containing one or more <b>Transformer</b> units).	<b>PowerTransformer</b> (containing two or more <b>Windings</b> )
12) <b>Customer service location</b>	<b>ServiceLocation</b>	<b>ServiceDeliveryPoint</b>
13) <b>Substation</b>	<b>Substation</b>	<b>Substation</b>
14) <b>Three phase distribution feeder</b>	<b>FeederObject</b> in substation. Upon leaving the substation, the line is modeled as a set of <b>ohPrimaryLine</b> or <b>ugPrimayLine</b> objects which model line sections between connectivity nodes.	<b>Circuit</b> in substation. Upon leaving the substation, the line is modeled as a set of <b>ACLineSegments</b> (also called <b>CircuitSections</b> ) between connectivity nodes.

# Fuse Equivalence – Peeling the Onion

- 1. CIM Fuse contains more than MultiSpeak fuse**
  - Equivalent is MultiSpeak **overcurrentDeviceBank** containing **fuse** units.
- 2. MultiSpeak overcurrentDeviceBank contains more than a CIM Fuse**
  - Missing parts are in **SwitchProperties** child of the **Fuse**.
- 3. CIM Fuse w/ SwitchProperties has more than MultiSpeak OCD w/ fuses**
  - Missing parts are in **eaEquipment** catalog

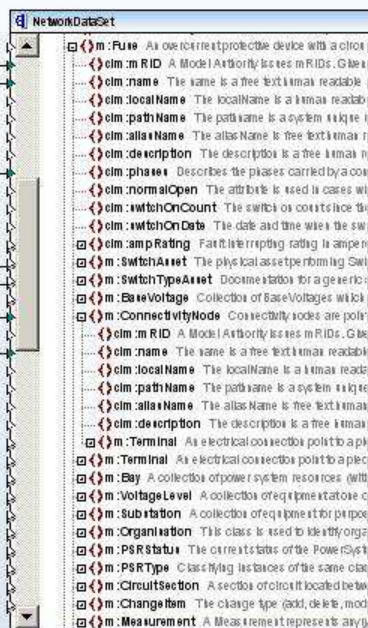
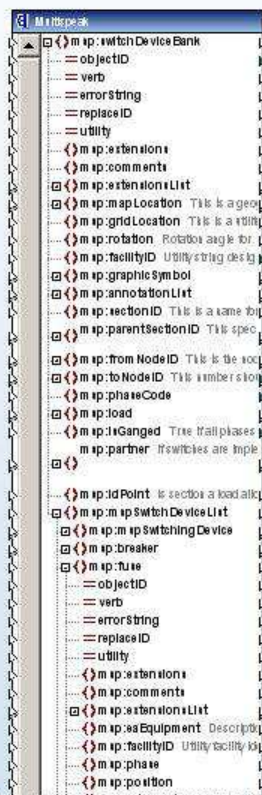


# Steps in Harmonization

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# Steps in Harmonization

1. Map MultiSpeak web service **methods** to WG14 CIM **messages** (use case steps).
2. Compare WG14 and MultiSpeak data payloads for each use case step.
3. Create style sheet data payload transformation.
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# Conclusions

- CIM and MultiSpeak are both complete, consistent data models for distribution modeling
- There are stylistic differences reflecting the needs and perspectives of the modelers
- The models are symantically and topologically equivalent
- It is possible to electronically convert payloads between the data models
- The two data models can co-exist if desirable



# For More Information

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