MultiSpeak V4.1
Revision History

Version 4.1.2 Release – Issued 1/10/2011.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

UML and Schema Changes:

1) Changed the namespace in all of the schemas to be http://www.multispeak.org/Version_4.1.2_Release
2) CPSM and GML namespaces are now versioned. (ID:0000003)
3) Made the mspDate simple type be built by restriction rather than as a list. (ID: 0000004)
4) Made the priorityOrder simple type be built by restriction rather than as a list. (ID:0000005)
5) Deleted unnecessary neutralConductorList complexType. (ID:0000007)
6) Changed the tagged value on MultiSpeak.documentType. The TaggedValue "Fixed" on MultiSpeak.documentType should not have any value. (ID:0000013)
7) Changed the "any ##targetNamespace" on the MultiSpeak class to be "any ##targetNamespace cpsm gml cim" and changed the processContents attribute to be "strict" instead of "lax". (ID:0000014)

Web Service Method Changes:

1) Added errorString parameter to the GetFeaturesNearLatLong method on OA_Server. (ID:0000015)
2) Changed the annotation on the PointSubscriptionList in the SCADA_Server to be: "Client notifies SCADA of a new list of points to which it would like to

subscribe. This list replaces any prior lists. The client SHALL provide the RegistrationID under which this subscription is being requested, unless the SCADA server does not support automated registration for services. If automated subscription is supported, the subscriber SHALL include the RegistrationID in the message header for this method. SCADA returns failed transactions by returning an array of errorObjects. Subscriber specifies the URL to which information is to be published by sending the responseURL. " (ID:0000006)

Other Changes:

1) Removed dependency on MHT files. PDF files are now used instead of MHT files.
(ID:0000012)

Version 4.1.1 Release – Issued 11/15/2010.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

UML and Schema Changes:

1) Changed the namespace in all of the schemas to be http://www.multispeak.org/Version_4.1.1_Release
2) Added AuditID and AuditPassword to message header schema.
3) Corrected batch message header to match the web services message header.
4) Refactored intervalData object
5) Refactored accountsReceivable.
6) Added receivedDate to endDeviceShipment.
7) Added configuredReadingTypes to configurationGroup.
8) Fixed spelling of outageEvent.completed.
9) Added installedDate and removedDate to mspMeter.
10) Added bufferedObjectCollection.
11) Added domainMemberChange.
12) Corrected GPS.latitude, GPS.longitude, gpsLocation.lataitude, gpsLocation.longitude, gpsPoint.latitude, gpsLocation.altitude,

gpsPoint.longitude and gpsPoint.altitude to be of type double, rather than float.

13) Added outageReasonContainer, outageReasonList, outageReasonItem, outageReportingCategory, outageReason, outageReasonCodeList, and outageReportingCode.
14) Added ServiceRestored to enumeration list for CDReasonCode.
15) Added the following elements to the electricMeterExchange, waterMeterExchange, gasMeterExchange, propaneMeterExchange, and otherMeterExchange: lastRead, lastReadDate, and averageConsumption.
16) Added “Other” and/or “Unknown” to the following enumeration lists:
    a. baseType
    b. capacitorConnectionCode
    c. swType
    d. swStatus
    e. extType
    f. readingStatus
    g. mounting
    h. wdgCode
    i. treatment
    j. regulatorWindingType
    k. nemaType
    l. qualityDescription
    m. controlStatus
    n. assignmentStatus
    o. balanceType
17) outageEvent.faultType was marked as being deprecated.
18) Added serviceLocationID, serviceID and meterID to outageCustomer.

Web Service Method Changes:

1) Added HistoryLogChangedNotification to OA_Server.
2) Added transactionID to the FormattedBlockNotification in the EA_Server to ensure consistent formatting with the same method on other servers.
3) Fixed incorrect calling parameter in GetNextNumber in FA_Server.
4) Removed GetNextNumber and ReturnGeneratedNumber in OA_Server.
5) Corrected ModifyCBDataforCustomer in MDM_Sserver to carry an array of customer rather than a single customer.
6) Corrected returned parameter in PoleChangedNotification to be changedPoles rather than changedpoles in GIS_Server.
7) Ensured consistent format of the following methods in CB_Server and MDM_Server:
    a. GetMeterGroupNamesByMeterID
    b. GetModifiedMeters
    c. GetModifiedServiceLocations
    d. GetServiceLocationByAccountNumber
    e. GetServiceLocationByGridLocation

    f. GetServiceLocationByMeterID
    g. GetServiceLocationByServiceStatus
    h. GetServiceLocationByShutOffDate
8) Added GetCircuitElementStatus and GetFeaturesNearLatLong to OA_Server.
9) Added annotation to SetOutageElementStatus method on OA_Server to recommend verifying the current status with a call to GetCircuitElementStatus before setting the status.
10) Added AssessmentLocationChangedNotification to OA_Server.
11) Added GetActiveAssessmentLocations to INSP_Server.
12) Deleted AssessmentChangedNotification from OA_Server.
13) Delete GetCircuitElementsNearLatLong from INSP_Server.
14) Addded GetOutageReasonCodes, OutageReasonContainerChangedNotification, and OutageReasonChangedNotification to OA_Server.
15) Added the following calling parameters to the existing RestoreOutage method:

callbackCustomersThatCalled (bool), outageReasonContainer, and dispatcherResponsible (string).

16) Added dispatcherResponsible (string) to the existing SetOutageElementStatus method.
17) Changed CDStateChangedNotification to carry a CDStateChange object instead of a meterID and stateChange parameters.
18) Added an errorString parameter to the following methods that do not carry an object that inherits from an mspObject:
    a. PointSubscriptionListNotification
    b. FormattedBlockNotification
    c. IntervalDataNotification
    d. ReadingScheduleResultNotification
    e. AVLChangedNotification
    f. NumberCreatedNotification
19) Added InitiateLoadManagementEvent, InitiateLoadManagementEvents, InitiatePowerFactorManagementEvent, InsertInHomeDisplayInIHDGroup and RemoveInHomeDisplayFromIHDGroup on MDM_Server.
20) Added OutageEventChangedNotification method to OD_Server and MDM_Server.
21) Changed EnableReadingSchedule to be EnableReadingSchedules in MDM_Server and MR_Server.

Version 4.1 Release – Issued 06/30/2010.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use

of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

UML and Schema Changes:

1) Changed namespace for this release to be: http://www.multispeak.org/Version_4.1_Release.
2) Added utility element to objectRef. This change applies both to the MultiSpeak UML model and the mspCPSM schema.
3) Added mspAlarm, blinkAlarm, and voltageAlarm.
4) Added the following elements to the content object: fileName, sourceFilePath, attachDateTime, and caption.
5) Revised identifiedObject fields in the mspObject to match the proposed CIM naming object. This change applies both to the MultiSpeak UML model and the mspCPSM schema.

Web Service Method Changes:

1) Changed the namespace for all web services to be: http://www.multispeak.org/Version_4.1_Release.
2) Added BlinkAlarmNotification and VoltageAlarmNotification to the OA_Server, MDM_Server, and NOT_Server.
3) Added the following parameters to the AddAttachmentToWorkOrder method: workOrderID and objectRef.
4) Revised description of DeleteAttachmentFromWorkOrder to note that the binary content of an attachment (attachment.content) should not be included in the returned array of attachments.
5) Add the following methods to the DGN_Server: GetAttachmentList and GetAttachment.
6) Add the following methods to the AM_Server and GIS_Server: GetAttachmentList, GetAttachment, AddAttachmentToWorkOrder, and DeleteAttachmentFromWorkOrder.
7) Add the following methods to the NOT_Server: AddAttachmentToWorkOrder, and DeleteAttachmentFrom WorkOrder.
8) Changed the capitalization of “ID” to match the convention in the following methods:
    - CB_Server.GetMeterByMeterID
    - CB_Server.GetCustomerByCustomerID

- CB_Server.GetServiceLocationByCustomerID
- CB_Server.GetMeterBaseByObjectID
- MDM_Server.GetMeterBaseByObjectID
- GIS_Server.GetTransformerBankByUnitID

Version 4.1 Release Candidate e – Issued 06/11/2010.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

UML and Schema Changes:

Added notation in the web services message header schema that the Version attribute must contain the version number, release candidate and/or build information in the format shown in the message schema used for data included in the message to which this header is attached.

6) Changed namespace for this release to be: http://www.multispeak.org/Version_4.1_RC_e
7) Corrected the multiplicity on worker.skillslist.skillID to be (0-*) rather than (0-1).
8) Renamed mspDeviceHistoryEvent to be mspAssetHistoryEvent.
9) Added mspAssetHistoryEvent.informationList.
10) Added assetHistoryEvent.
11) Refactored intervalData.
12) Changed electricNameplate.multiplier to be of type float instead of type long.
13) Refactored accountsReceivable. Made acRecvBal, acRecvCur, acRecv30, acRecv60, and acRecv90 inherit from a new acctsReceivable class and added acRecvOtherList and acRecvItem to accommodate other types of accounts receivable.
14) Changed meterStatus to have a soft enumeration rather than a hard enumeration list.
15) Deleted meterReading.serviceType since serviceTye is already a part of meterReading.meterID.
16) Renamed connectDisconnectEvent.reasonCode to be connectDisconnectEvent.CDReasonCode.
17) Added PPMBalanceNegative, PPMBalancePositive, Other and Unknown to the enumeration for CDReasonCode.

18) Change name of intervalDataStatusCode, intervalDataStatusCodeEntry, and IntervalDataStatusCodeList to be readingStatusCode, readingStatusCodeEntry, and readingStatusCodeList.
19) Refactored readingStatusCode to match IEC 61968-9, Annex D QualityCodes.
20) Added meterReading.eadingValues.readingStatusCode.
21) Removed virtualMeter from model since it is not ready for release. It will be added back in the V4.2.1 prerelease build.
22) Added outageEventStatus.outageAttachments to carry either Text-to-Speech message transcriptions or pointers to voice recordings describing outageEvent status.
23) Added meterID.utility and the annotation to suggest that the contents of the meterID be the string concatenation of the utility, serviceType and objectID attributes separated by periods as follows: <utility>.<serviceType>.<objectID> .
24) Added “D-Y one” to enumeration list for wdgCode.
25) Changed the name of readingTypeID to be readingTypeCode to avoid confusion with the objectID of a readingType object.
26) Added readingTypeCode to a readingValue.
27) Added “any” attribute to readingStatusCode and meterEvent for extensibility and flexibility to adopt changes issued in these elements by future versions of IEC 61968-9.
28) Added domainNameChange and domainMember.action to facilitate publishing changes to domain information.

Web Service Method Changes:

9) Changed the namespace for all web services to be: `"http://www.multispeak.org/Version_4.1_RC_e"`
10) Made all Initiate-type, Modify-type, or Notification-type services return an optional array of errorObjects.
11) Added DomainNamesChangedNotification and Domain MembersChangedNotification to all servers.
12) Added the following methods to the AM_Server:

- CDDeviceAddNotification
- CDDeviceChangedNotification
- CDDeviceExchangeNotification
- CDDeviceInstalledNotification
- CDDeviceRemoveNotification
- CDDeviceRetireNotification
- EndDeviceShipmentNotification
- GetMeterTestByMeterID
- InHomeDisplayAddNotification
- InHomeDisplayChangedNotification
- InHomeDisplayExchangeNotification
- InHomeDisplayInstalledNotification

- InHomeDisplayRemoveNotification
- InHomeDisplayRetireNotification
- InspectionNotification
- LMDeviceAddNotification
- LMDeviceChangedNotification
- LMDeviceExchangeNotification
- LMDeviceInstalledNotification
- LMDeviceRemoveNotification
- LMDeviceRetireNotification
- MeterAddNotification
- MeterBaseAddNotification
- MeterBaseChangedNotification
- MeterBaseExchangedNotification
- MeterBaseInstalledNotification
- MeterBaseRemoveNotification
- MeterBaseRetireNotification
- MeterChangedNotification
- MeterEventNotification
- MeterExchangeNotification
- MeterInstalledNotification
- MeterRemoveNotification
- MeterRetireNotification
- MeterTestNotification
- ODDeviceChangedNotification
- PMChangedNotification
- PoleChangedNotification
- PPMMeterExchangeNotification
- SecurityLightChangedNotification
- ServiceOrderOpenedNotification
- ServiceOrderChangedNotification
- ServiceOrderClosedNotification
- StreetLightChangedNotification
- TrafficLightChangedNotification
- TransformerBankChangedNotification
- WorkOrderNotificationToGIS

13) Added the following methods to the NOT_Server:
    - InspectionNotification
    - MeterTestNotification
    - ServiceOrderOpenedNotification
    - ServiceOrderChangedNotification
    - ServiceOrderClosedNotification
14) Deleted LoadManagementDeviceChangedNotification from the GIS_Server and NOT_Server.
15) Added the following methods to the GIS_Server, FA_Server, and DGN_Server:
    - AddAttachmentToWorkOrder
    - DeleteAttachmentFromWorkOrder
16) Added the following methods to the CB_Server:
    - GetServiceOrdersByStatus
    - GetServiceOrdersByServiceLocation
    - GetServiceOrderByServiceOrderID
17) Removed the following methods from CB_Server and MDM_Server:

- GetMeterByMeterNo

18) Added the following methods to the DGN_Server, MR_Server, and MDM_Server:
    - ServiceOrderOpenedNotification
    - ServiceOrderChangedNotification
    - ServiceOrderClosedNotification
19) Added IntervalDataNotification to EA_Server.
20) Added lastReceived to the following methods on MR_Server and MDM_Serverthat return a formattedBlock so that these methods can be sent in manageable blocks:
    - GetLatestMeterReadingsByMeterGroups
    - GetLatestReadingsByMeterIDAndFieldName
21) Added the following methods to return metered data in intervalData blocks in addition to the existing formattedBlocks:
    - GetReadingsByBillingCycleIntervalData
    - GetReadingsByMeterIDIntervalData
    - GetReadingsByDateIntervalData
    - GetLatestMeterReadingsByMeterGroupIntervalData
    - GetLatestReadingsByMeterIDAndFieldNameIntervalData
    - GetLatestReadingsByFieldNameIntervalData
    - GetReadingsByDateAndFieldNameIntervalData
    - GetReadingsByMeterIDAndFieldNameIntervalData
    - GetLatestReadingsByMeterListIntervalData
22) Change name of GetIntervalDataStatusCodes to be GetSupportedReadingStatusCodes on MR_Server and MDM_Server.
23) Changed name of MeterTestTransaction to be MeterTestNotification to match our naming convention and fixed the method to carry an array of testedElectricMeter rather than meterTest. Changed on CB_Server, MR_Server, and MDM_Server.
24) Added MeterTestNotification to NOT_Server.
25) Changed the name of the InitiateMeterReadsByFieldName to be InitiateMeterReadingsByFieldName and modified annotation to reflect that data could be returned in ReadingChangedNotification, IntervalDataNotification or FormattedBlockNotifcation. Changes made on MR_Server and MDM_Server.
26) The following methods were renamed on the MR_Server and MDM_Server:

Name in V4.1 RC d	Name in V4.1 RC e
GetLatestReadingByMeterNoAndType	GetLatestReadingByMeterIDAndFieldName
GetReadingsByDateAndType	GetReadingsByDateAndFieldName
GetReadingsByMeterNoAndType	GetReadingsByMeterIDAndFieldName
InitiateMeterReadByMeterNoAndType	InitiateMeterReadingByMeterIDAndFieldName
GetLatestReadingByType	GetLatestReadingByFieldName
InitiateMeterReadByMeterNumber	InitiateMeterReadByMeterID
InitiateGroupMeterRead	InitiateGroupMeterReading
ScheduleGroupMeterRead	ScheduleGroupMeterReading
InitiateMeterReadByObject	InitiateMeterReadingByObject
InitiateLPMeterReadByMeterNumber	Deleted
InitiateLPMeterReadsByMeterID	InitiateLPMeterReadingsByMeterID

InitiateMeterReadsByFieldName	InitiateMeterReadingsByFieldName

27) The following methods were renamed on the CB_Server:

Name in V4.1 RC d	Name in V4.1 RC e
GetAccountByMeterNumberAndServiceType	GetAccountByMeterIDAndServiceType
GetServiceLocationByMeterNo	GetServiceLocationByMeterID
GetMeterByMeterNo	Deleted
GetMeterGroupNamesByMeterNo	GetMeterGroupNamesByMeterID
GetUsageByMeterNo	GetUsageByMeterID
GetCustomerByMeterNumberAndServiceType	GetCustomerByMeterIDAndServiceType

28) The following methods were renamed on the DR_Server:

Name in V4.1 RC d	Name in V4.1 RC e
GetLoadManagementDeviceByMeterNumber	GetLoadManagementDeviceByMeterID

29) The following methods were renamed on the EA_Server:

Name in V4.1 RC d	Name in V4.1 RC e
GetMeterConnectivityByMeterNo	GetMeterConnectivityByMeterID

30) The following methods were renamed on the OD_Server:

Name in V4.1 RC d	Name in V4.1 RC e
GetOutageDetectionDevicesByMeterNo	GetOutageDetectionDevicesByMeterID

Version 4.1 Release Candidate d – Issued 03/30/2010.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Schema Changes:

Added notation in the web services message header schema that the Version attribute must contain the version number, release candidate and/or build information in the format shown in the message schema used for data included in the message to which this header is attached.

29) Added statuses to meterStatus enumeration.
30) Added meterStatusList to mspMeter.
31) Added meterBaseExchange object.
32) Added acRecv30DateDue, acRecv60DateDue, acRecv90DateDue elements to account.accountsReceivable.
33) Deleted meterRead.
34) Added virtualMeter class.
35) Added formattedBlockTemplate
36) Added expirationTime and sampleRate simpleTypes.
37) Added fieldName to meterReading.readingValues.readingValue. Deleted meterReading.readingValues.readingValue.readingValueType and meterReading.readingValues.readingValue.otherReadingValueType.
38) Renamed tender.transactionID to be tender.financialTransactionID to avoid confusion with the transactionID in the method parameter list.
39) Added electricMeter.meterBaseID..
40) Added annotation in the UML model and schema to indicate that the any in the MultiSpeak container object should be restricted to contain objects that inherit directly or indirectly from the mspObject..
41) Added actions to actionTaken enumeration.
42) Added mspDeviceHistoryEvent.
43) Added MeterHistoryEvent of type mspDeviceHistoryEvent.

44) Changed MeterConnectivity.oldFeeder to be oldFeederName, MeterConnectivity.newFeeder to be newFeederName, MeterConnectivity.oldFeederNo to be oldFeederNumber, MeterConnectivity.newFeederNo to be newFeederCode for consistency.
45) Changed electricMeter.electricLocationFields.feeder to be feederCode for consistency and fixed annotation.
46) Added intervalDataStatusCodeList class.
47) Changed attachment to inherit from mspObject so instances can be acted on.

Web Service Method Changes:

1) Added the following methods to the SCADA_Server and DA_Server:
    a. GetSCADAAnalogsByDateRangeAndPointID
    b. GetSCADAStatusesByDateRangeAndPointID
    c. GetSCADAStatusesByDateRange
    d. GetSCADAAnalogsByDateRangeAndPointIDFormattedBlock
    e. GetSCADAStatusesByDateRangeAndPointIDFormattedBlock
    f. GetSCADAStatusesByDateRangeFormattedBlock
2) Added GetMeterBaseByObjectID to the MDM_Server and CB_Server.
3) Added the following methods to the CB_Server, MDM_Server, and NOT_Server:
    a. MeterBaseExchangeNotification
    b. MeterBaseInstalledNotification
4) Added the following methods to the MR_Server, MDM_Server, and NOT_Server:
    a. MeterBaseAddNotification
    b. MeterBaseChangedNotification
    c. MeterBaseExchangeNotification
    d. MeterBaseRemoveNotification
    e. MeterBaseRetireNotification
5) Added the following methods to the MR_Server and MDM_Server:
    a. InitiateMeterReadsByFieldName
6) Added the following methods to the MR_Server and MDM_Server:
    a. GetFormattedBlockTemplates
    b. GetLatestReadingsByMeterListFormattedBlock
7) Documented in the MDM_Server interface chart that an MDM application can have SCADA analogs, statuses and accumulator changes published to it by implementing a DA_Server endpoint.
8) Add InitiateODEventRequestByServiceLocation to the MDM_Server. This method was inadvertently omitted previously.
9) Add the MeterConnectivityNotification method that is currently in MR_Server to the CB_Server.
10) Add an optional expirationTime parameter to the end of the calling parameter list for the following methods:
    a. In DA_Server and SCADA_Server:

i. InitiateStatusReadByPointID and InitiateAnalogReadbyPointID.

b. In CD_Server and MDM_Server:
   i. InitiateArmCDDevice
   ii. InitiateCDStateRequest
   iii. InitiateConnectDisconnect
   iv. InitiateDisableCDDevice
   v. InitiateEnableCDDevice

c. In OD_Server and MDM_Server:
   i. InitiateODEventRequestByObject
   ii. InitiateODEventRequestByServiceLocation
   iii. InitiateODMonitoringRequestByObject
   iv. InitiateOutageDetectionEventRequest

d. In MR_Server and MDM_Server
   i. InitiateDemandReset
   ii. InitateGroupMeterRead
   iii. InitateMeterReadByMeterNoAndType
   iv. InitatiateMeterReadByMeterNumber
   v. InitatiateMeterReadByObject

11) Remove readingType and add optional formattedBlockTemplateName and array of fieldname to the following methods in MR_Server and MDM_Server:
   a. GetReadingsByBillingCycle
   b. GetReadingByMeterNumberFormattedBlock
   c. GetReadingsByDateFormattedBlock
   d. GetLatestMeterReadingsByMeterGroup
   e. GetLatestReadingsByMeterNoAndType
   f. GetLatestReadingsByType
   g. GetReadingsByDateAndType
   h. GetReadingsByMeterNoAndType
   i. GetLatestReadingsByMeterNoList
12) Added GetAllConnectDisconnectEventsByReasonCode to CB_Server and MDM_Server.
13) Added ConnectDisconnectChangedNotification to MDM_Server.
14) Added ModifyWorkOrderStatusByObjectID to DGN_Server.
15) Added GetMeterHistoryByMeterID to CB_Server..
16) Replaced GetSupportedReadingTypes with GetSupportedFieldNames in MR_Server and MDM_Server.
17) Replaced readingType with fieldname in calling parameter list for the following methods in MR_Server and MDM_Server:
   a. InitiateMeterReadByMeterNoAndType
18) Added GetIntervalDataStatusCodes to MR_Server and MDM_Server.

Version 4.1 Release Candidate c – Issued 11/30/2009.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Schema Changes:

1) Fixed objectRef to inherit from xs:string by extension.
2) Fixed shortCircuitAnalysisResult.faultImpedance to be of type complexImpedance rather than impedance.
3) Added definition of gpsPoint.
4) Rolled back the addition of the GPS element to mspPointObject that was made in V4.1, release candidate b and added two new optional elements: gpsPoint and gpsLocation.
5) Added a new element, callBackListType, to the callBackList.
6) Made latitude and longitude mandatory in the gpsLocation object.
7) Added a new accumulatedValue object to act as a SCADA accumulator and added “accumulator” to the simpleType scadaPointType.
8) Added new content, attachment, and attachments objects to carry binary content files.
9) Replaced assessment.photo with assessment.attachments.
10) Added attachments to assessmentLocation.
11) Deleted message.wavPointer and added attachments and transcription to message.
12) Added attachments to station and design objects and removed contentReferences from station and design.
13) Deleted inspectionDataSet, inspectionSetDraft and added inspection.
14) Removed assetFields from transformerBank, since transformerBanks are not assets. The assetFields should properly only be on the transformer instances which are assets. Similarly, assetFields were added to capacitors, regulators, secondaryJunctionBoxes, primaryCabinets, inHomeDIsplays, loadManagementDevice, outageDetectionDevices, measurementDevices, meterBases, streetlights, securityLights,

trafficLights and power systemDevices, along with objects that inherit from the mspDevice and mspSwitchingDevice.

15) Removed maxLength attributes from firstName and middleName. These should have been removed during the transition to V4, but were overlooked.
16) The usageInstance.rate is now the new rate object rather than merely a string field.
17) Added description element to serviceLocation.
18) Made the UTCOffset attribute mandatory on the timeZone object.
19) Added rateCode to rate object.
20) Specified that meterEvent.type and meterEvent.value should be of type string; previously they were undefined.
21) Deleted diagnosisDataSet and added observation.
22) Changed the element assessment.created to be assessment.closedOn.
23) Reordered assessment.closedOn and assessment.closedBy.
24) Added assessment.elementID.
25) Added extensions and extensionsList to the switchingDevice choice and to the overCurrentDevice choice.
26) Added gpsPoint to mspMeter.utilityInfo.
27) Changed the name of mspMeter.utilityInfo.mapLocation to be mspMeter.utilityInfo.GMLLocation to match V4 practice.
28) Changed the name of billingAccountLoad.mapLocation to be billingAccountLoad.GMLLocation to match V4 practice.
29) Replaced the inspection.GMLLocation with an inspection.geometry so that the inspection could exhibit polygon or line geometry if appropriate.
30) Renamed waterMeter.waterLocationFields.**gas**ServiceID to be waterMeter.waterLocationFields.**water**ServiceID.
31) Renamed waterMeter.waterlocationFields.**msp**extensionsList to be waterMeter.waterlocationFields.extensionsList.
32) Added readingTypeID to readingValue.
33) Added impedances object to eliminate anonymous type on capacitorBank object.
34) Added “Service drop” to list of enumerated values for the equipmentType simple type.
35) Changed the “ratedAmps” element on the recloserEntry to be “ratedCurrent” to match established usage.
36) Added extensions, extensionsList, and inHomeDisplayList elements to meterBase.deviceList.
37) Added missing extensions element definition.
38) Added “Other” and “Unknown” as enumerations in powerMonitor, measurementDeviceStatus and outageDetectDeviceStatus.
39) Added “Unknown” to outageDetectDeviceType enumeration list.
40) Fixed spelling of initialReactiveCapabilityCurve on synchronousMachine.
41) Added cut, jumper, and elbow to physicalObjectList.
42) Removed length restriction on electrican and contractor simple types.
43) Added taskListItem and changed taskList to be a list of taskListItem.

44) Changed name of taskListItem.workTask to be taskListItem.workTaskID to match convention.
45) Declared taskAggregation.workTaskID to be of type objectID.
46) Changed billingAccountLoad.serviceType to be billingAccountLoad.servType, to reflect the fact that this is intended to be a rate code not a utility type (serviceType).
47) Added “Opened” and “Close” to the enumeration list loadActionCode.
48) Made ppmBalanceAdjustment.serviceType to be of type serviceType rather than xs:string.
49) Corrected spelling of switchingDeviceBank in enumeration list of circuitElement.elementType.
50) Added electricService, streetlight, securityLight, and trafficLight to and deleted serviceLocation and substation from enumeration list of circuitElement.elementType.
51) Fixed spelling of contentReference.
52) Fixed customersAttachedToDevice.deviceID to be of type objectRef.
53) Fixed spelling of contactInfo.otherContactInformation.
54) Added “Kilometers” to enumeration list for materialItems.
55) Renamed resource.workerList to be resource.workers to avoid confusion with workerList that inherits from crewMemberList.
56) Fixed inHomeDisplayBillingMessage.usedLastMonth, inHomeDisplayBillingMessage.usedFourWeeksAgo, and inHomeDisplayBillingMessage.usedThisMonthLastYear to be of type money rather than commodityUsage.
57) Eliminated simpleType “value” and replaced with simple type”valueFloat” of type float. Added complex type “value” of type float with attribute “units” of type “uom”.
58) Added back in electricMeter.sealNumberList, which was inadvertently dropped in the transition to V4.0.0.
59) Deleted empty and unused “specifiedDate complexType.
60) Changed workTicket.wrhsCode to be workTicket.warehouseID to match workOrder practice.
61) Changed workTicket.crewCode to be workTicket.crewID to match workOrder practice.
62) Corrected case on overcurrentDevice and overcurrentDeviceList.
63) Added transactionID to tender.
64) Added callerID to outageCustomer.
65) Added cpsm:TimeSpan and made cpsm:Accumultor.timeSpan to be of type TimeSpan to eliminate anonymous element definition.

Changes that have been made in UML-generated version of the V4.1 schema:

1) Added guyList to pole to implement a guy-pole association, previously missing in MultiSpeak.

2) Added optional list of accounts, workList, workOrderList, maintenanceOrderList, and serviceOrderList to customer object.
3) Added optional list of serviceLocations, workList, workOrderList, maintenanceOrderList, and serviceOrderList to account.
4) Added an optional workList, workOrderList, maintenanceOrderList, and serviceOrderList to serviceLocation.
5) Added optional electricMeter and inHomeDisplays (list object) to the meterBase.
6) Added an optional meterBase object on the electricService.
7) Added an optional waterMeter on a waterService.
8) Added an optional gasMeter on a gasService.
9) Added optional otherMeter to otherService.
10) Added optional serviceOrderList, maintenanceOrderList, jobList, outageTicketList, workList and workOrderList to project.
11) Added optional premiseObjectList to parcel.
12) Added optional serviceLocations to premise.
13) Ordered uom enumeration alphabetically.
14) Ordered physicalObjectList and CIMObjectList alphabetically.
15) Changed workOrder.contentReference to be workOrder.attachments.
16) Added workers, crewEquipmentList, vehicles, and capabilities to crew.
17) Added workers, crews, vehicles, and crewEquimentlist to resource.
18) Added tasks on work object.
19) Added outageEventStatus and outageCustomerList to outageEvent object to build associations.
20) Added optional profile object to intervalBlock.
21) Added optional switchingScheduleList and switchingSteps to work and resource objects.
22) Added optional crewActionEvents list on the outageEvent object.
23) Added inHomeDisplays to inHomeDisplayGroup.
24) Added inHomeDisplayBillingMessageList and inHomeDisplayMessageList to inHomeDisplay object.
25) Changed measurementItems.accumulator to be of the new accumultatedValue type instead of cpsm:Accumulator.

Web Service Method Changes:

1) Added AccumulatedValueChangedNotification to SCADA_Server, DA_Server, and NOT_Server.
2) Added to MR_Server, and rolled back addition to CB _Server made in V4.1 RC b:
    a. GetConfigurationGroupNames
    b. GetConfigurationGroupMembers
    c. GetConfigurationGroupNamesByMeterNo

Version 4.1 Release Candidate b – Issued 08/26/2009.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Schema Changes:

1) Added RegistrationID to the MultiSpeak web services message header (MultiSpeakMsgHeader).
2) Added registrationInfo object.
3) Added switchingOrder, switchingSchedule, switchingStep, and clearance objects.
4) Fixed spelling of GMLPolygons object.
5) Added CDState object.
6) Added timeZone object and added timeZone on mspPointObject. Note that this is a breaking change from V4.0.0, but the group agreed to adopt this breaking change.
7) Added GPS element to mspPointObject and thus, to every object that inherits directly or indirectly from the mspPointObject. Note that this is a breaking change from V4.0.0, but the group agreed to adopt this breaking change- **Rolled back 09/29/2009. Added modified mapLocation.**
8) Added assessment, assessmentList, assessmentLocation, GPSLocationAndTolerance, and CircuitElementAndDistance objects.
9) Changed the streetlight and securityLight to inherit from the mspElectricPoint rather than the mspPointObject. Note that this is a breaking change from V4.0.0, but the group agreed to adopt this breaking change.
10) Added a new trafficLight object that inherits from the mspElectricPoint.
11) Change the outageEvent to inherit from the mspPointObject rather than an mspObject
12) Added meterEvent to CDStateChange.
13) Added the following actions to the loadActionCode: Arm, Enable, Disable.
14) Added the following states to the loadActionCode: Armed, Enabled, and Disabled.

15) Added the following states to the RCDState: Enabled and Disabled.
16) Added MessageID, TimeStamp, and Context to the MultiSpeak web services message header.
17) Added schedule, readingSchedule, readingScheduleResult, periodicSchedule, absoluteSchedule, timePoint, cimTimePoints, meterGroupList, configurationGroup, and configurationGroupList objects.
18) Added inHomeDisplayMessage, inHomeDisplayBillingMessage, inHomeDisplayGroup, and inHomeDisplayList objects.
19) Added rate, rateInfo, commodityUsage, usageOtherPeriod, and usageOtherPeriodList.
20) Added eventInstance, eventInstances and meterEventList.
21) Added outageEvent.outagedPhase.

Web Service Method Changes:

3) Added the following new functions:
    a. Switching Orders (SWO).
    b. Asset Management (AM)
    c. Inspection (INSP)
    d. Notification (NOT)
    e. HAN Communications (HAN)
4) Added the following optional methods to all functions:
    f. RequestRegistrationID
    g. RegisterForService
    h. UnregisterForService
    i. GetRegistrationInfoByID
    j. GetPublishMethods
5) Added a note in the description of every unsolicited notification-type message that the registrationID should be added in the message header to indicate to the subscriber under which registrationID they received this notification data.
6) Added the following methods to the SCADA_Server:
    k. SCADAPointChangedNotification
    l. SCADAPointChangedNotificationForAnalog
    m. SCADAPointChangedNotificationForStatus
    n. SCADAAnalogChangedNotification
    o. SCADAAnalogChangedNotificationByPointID
    p. SCADAAnalogChangedNotificationForPower
    q. SCADAAnalogChangedNotificationForVoltage
    r. SCADAStatusChangedNotification
    s. SCADAStatusChangedNotificationByPointID
7) Added to CD_Server and MDM_Server. These methods are added to support harmonization with IEC 61968-9, Annex F.
    t. InitiateCDStateRequest
    u. InitiateArmCDDevice
    v. InitateEnableCDDevice

w. InitateDisableCDDevice

8) Added to MR_Server and MDM_Server:
    a. InitateDemandReset – This method is added to support harmonization with IEC 61968-9, Annex F.
    b. InsertMetersInConfigurationGroup
    c. RemoveMetersFromConfigurationGroup
9) Added to CB_Server, MDM_Server, and OA_Server:
    a. CDStateNotification
    b. CDStatesNotification
10) Added to CB_Server, and MDM_Server: Sense is wrong, should be MR_Server
    d. GetConfigurationGroupNames
    e. GetConfigurationGroupMembers
    f. GetConfigurationGroupNamesByMeterNo
    g. ReadingScheduleResultNotification
11) Added InitiateAVLUpdateRequest to AVL_Server.
12) Added transactionID to AVLChangedNotification in GV_Server, GIS_Server, and SCHED_Server.
13) Added the following methods to the CB_Server:
    x. GetAllStreetLights
    y. ModifyCBDataForStreetLights
    z. GetAllSecurityLights
    aa. ModifyCBDataForSecurityLights
14) Added the following methods to the GIS_Server.
    bb. StreetLightChangedNotification
    cc. SecurityLightChangedNotification
    dd. TrafficLightChangedNotification
15) Added the following methods to FA_Server, and DGN_Server:
    a. GetAllLaborCategories
    b. GetModifiedLaborCategories
    c. LaborCategoryNotification
16) Added to MR server and MDM server:
    ee. EstablishSchedules
    ff. DeleteSchedule
    gg. GetSchedules
    hh. GetScheduleByID
    ii. EstablishReadingSchedules
    jj. EnableReadingSchedule
    kk. DisableReadingSchedule
    ll. DeleteReadingSchedule
    mm. GetReadingSchedules
    nn. GetReadingScheduleByID
    oo. GetLatestReadingsByMeterNoList
17) Corrected the following methods to carry an array rather than a single instance in CB_Server:
    pp. ModifyCBDataForCustomer

qq. ModifyCBDataForServiceLocation

18) Added to INSP_Server:
    rr. AssessmentChangedNotification
    ss. AssessmentLocationChangedNotification
    tt. GetAssessmentLocations
    uu. GetCircuitElementNearLatLong
    vv. GetOutageByCircuitElement
19) Added to OA_Server:
    ww. ResolvedCaller
    xx. UpdateMessageStatus
20) Added the following methods to the to the PPM_Server and the HAN_Server:
    yy. InHomeDisplayMessageNotification
    zz. InHomeDisplayBillingMessageNotification
    aaa. GetAllInHomeDisplays
    bbb. InsertInHomeDisplayInIHDGroup
    ccc. RemoveInHomeDisplayFromIHDGroup
    ddd. EstablishIHDGroup
    eee. DeleteIHDGroup
21) Added the following methods to the HAN_Server:
    fff. InHomeDisplayAddNotification
    ggg. InHomeDisplayChangedNotification
    hhh. InHomeDisplayExchangeNotification
    iii. InHomeDisplayRemoveNotification
    jjj. InHomeDisplayRetireNotification
22) Add in CB_Server:
    kkk. GetIHDGroupNames
    lll. GetIHDGroupMembers
    mmm. GetIHDGroupNamesByInHomeDisplayID
23) Added to SWO_Server:
    nnn. GetSwitchingOrderByID
    ooo. GetSwitchingOrderByDateRange
24) Added to CB_Server, WTG_Server, EA_Server, GIS_Server, SCADA_Server, OA_Server, and NOT_Server:
    ppp. SwitchingOrderChangedNotification
25) Added to CB_Server, MDM_Server, and NOT_Server:
    qqq. MeterEventNotification
26) Added to OA_Server:
    rrr. GetOutageByCircuitElement
27) Changed the description of the InitiateGroupMeterRead method on MR_Server and MDM_Server to reflect that this method schedules a reading from devices rather than returning the most recent read in the MR database.

Version 4.0.1 Release Candidate a – Issued 04/14/2009.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Schema Changes:

1) Added switchingOrder, switchingSchedule and switchingStep objects.
2) Added CDState object.
3) Eliminated faulty xs:unique constraints for workOrderIdentifier, stationLocation, and stationed.

Web Service Method Changes:

None.

Version 4.0.0 Release – Issued 02/01/2009.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Schema Changes:

1) Added elbow, jumper and cut objects.
2) Added elbow, jumper and cut as optional switchingDevices to the switchingDeviceBank.

Web Service Method Changes:

1. Made the following changes in the AVL_Server:
    a. Changed the name of the GetAVLMessagesByVehicleAndDate to be GetAVLMessagesByAVLID for consistency with other naming conventions.
    b. Changed the name of the GetLastAVLPositionByVehicle to be GetLastAVLPositionByAVLID for consistency with other naming conventions
    c. Changed the name of the GetLatestAVLMessages to be GetLastAVLMessages for consistency with other naming conventions
    d. Added a new GetAVLMessagesByVehicleName for completeness.
2. Added the following methods to the OA_Server:
    a. InitiateCut
    b. RestoreCut

Version 4.0, Release Candidate d – Issued 1/22/2009.

General Comments:

1) The Apache Axis web services toolkit has problems properly generating anonymous complex types. In this release candidate, all anonymous complex types were replaced by defined complex types.
2) In most cases, cardinality that was defined on an element was replaced with a list object that defines cardinality on the sequence for stylistic consistency. Exceptions are the MultiSpeak, CPSM, physicalObjectList and spatialFeatureGroup containers. In these cases the list objects would create significant, needless bloat.
3) In all cases the terms phase, phaseCode, and phases have been modified as necessary to have the following consistent meanings:
    a. **phase** is the single phase or neutral designation as defined using the mspPhase enumerated simpleType.
    b. **phases** is the number of phases included at that point in the system.
    c. **phaseCode** is the combination of phase and neutral designations defined using the phaseCode enumerated simpleType.
4) The meterID has been replaced with a complexType that has three attributes: meterNo, serviceType, and objectID. This is necessary to clearly establish which meter is bein indicated since there could be an electricMeter, and a gasMeter with the same objectID.
5) The serviceID has been replaced with a complexType that has two attributes, serviceType and objectID.
6) All value type objects have been rebuilt so that the units in the unit/value pair is carried in an attribute and the value is carried directly in the object, not as a sub-element in the object.
7) Added to the MultiSpeak message header schemas two new optional attributes: CoordinateSystemAuthority and CoordinateSystemAuthorityCode. These were added to support the addition of coordinate systems defined by coordinate system authorities, as described in the annotation to these new attributes.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple

types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Schema Changes:

1) Fixed the gml namespace declaration in the multispeak.xsd schema.
2) Rolled back the change in nodeID that was made in release candidate c (Schema change #4).
3) Annotation was used to clearly identify any elements added simply to facilitate compliance with the CIM CPSM profile or to facilitate future CIM compatibility.
4) Added a new object geometry that includes multiple types of geometry. Used this new object in the definition of workLocation and the new abstract multi-geometry object (named mspMultiGeometryObject). Changed the station object to inherit from the mspMultieometryObject abstract class.
5) Added contentReferences to designs and stations on designs.
6) Added designIdentifier and workFlowStatus to design object.
7) Eliminated the use of different service locations for each service type (electric, gas, water, propane, etc). Instead added “services” structures to a single serviceLocation object to support multiple electricService, waterService, gasService, propaneService instances at a single serviceLocation.
8) Enumerated the serviceType simpleType using the following enumeration list: Electric, Gas, Water, Propane, Refuse, Sewer, Telecom, TV, Cable, Heating, Steam, Transportation, All, Other, Unknown.
9) Renamed the AVLEvent to be AVLState and modified content.
10) Renamed AVLLocation to be AVLLog and changed content.
11) Added AVLPosition object.
12) Replaced employee and crewmember objects with worker object.
13) Added a human-readable objectName element on the mspObject. This designator can be used to provide further information or identification where the objectID might be unknown or too terse. This can be used in a similar manner to facilityID or meterNo.
14) Adopted the Utilities Standards Board meter event codes structure.
15) In numerous locations:
16) Replaced the string “kW” in element names with “realPower”
17) Replaced “kV” with “voltage”
18) Replaced kVAr with “reactivePower”
19) Added complex types for real energy (kwh) and reactive energy (kVArh).
20) Moved the ssImedance, transImedance, and stImpedance from the inductionMachine to the synchronousMachine. Added replaced leakageReactance with magnetizingImpedance on inductionMachine and inductionMachineEntry.
21) Added “CenterTapSecondary” to the enumeration for the transformer winding code.

22) Added the historyComment object.
23) Added a thickness object and thicknessUnits.
24) Added ROWAttributes, inductionMachineEntry, and synchronousMachineEntry engineering catalog entries.
25) Moved fuse.linkRtg to fuseEntry.linkRtg. Added fuseSpeed to fuseEntry.
26) Removed condPerPhase from line definitions since it is now carried in the conductors child object.
27) Moved regulator.kVA to regulatorEntry and renamed ratedPower.
28) Added counts element to sectionalizer. Added maxCounts, isLoadBreak, and resetTime to sectionalizerEntry.
29) Changed transformer winding phase shift to be measured in "clock position" rather than degrees to match industry practice.
30) Removed the following unused simpleTypes: conductorPerPhase, mspPhaseA, mspPhaseB, and mspPhaseC.
31) Added enumeration list (Hot, Cold, Other, Unknown) to station.constType.
32) Added affectedRelay element to powerFactorManagementEvent.
33) Rolled back the deletion of groupName in the loadManagementEvent object.
34) Moved the backgroundGraphics object from the workOrder to the design object.
35) Fixed odometer to match unit/value convention.
36) Added taskAggregation object.

Web Service Method Changes:

1) Added the following methods to MR_Server and MDM_Server:
    a. GetLPReadingsByMeterIDIntervalData
    b. GetLPReadingsByDateIntervalData
    c. GetLPReadingsByBillingCycleIntervalData
    d. InitiateLPMeterReadsByMeterID
2) Added the following methods to the MDM_Server:
    a. IntervalDataNotification
    b. GetElectricMetersByAccountNumber
    c. GetGasMetersByAccountNumber
    d. GetWaterMetersByAccountNumber
    e. GetPropaneMetersByAccountNumber
3) Added the following methods to the CB_Server:
    a. IntervalDataNotification
    b. TaskListNotification
    c. WriteAccountHistoryComments
    d. GetProjects
    e. GetAllOtherMeters
    f. GetElectricMetersByAccountNumber
    g. GetGasMetersByAccountNumber
    h. GetWaterMetersByAccountNumber
    i. GetPropaneMetersByAccountNumber

4) Added the following methods to the DGN_Server:
    a. ProjectChangedNotification
    b. GetFAProject
    c. GetTaskAggregation
5) Added the following method to the WTO_Server:
    a. GetTaskAggregation
6) Added NumberCreatedNotification method to the WTG_Server.
7) Added the following methods to the WTP_Server:
    a. GroupAssignmentNotification
    b. UnassignmentNotification
8) Added the following methods to the FA_Server:
    a. GetProjects
    b. UpdateProjects
9) Modified description on GetDomainNames on every server to reflect the suggested practice of returning domain names in the form of noun.fieldname where “noun” is a defined MultiSpeak noun and fieldname is a sub-element of “noun”.
10) Added the following methods to the AVL_Server (within a date/time range):
    a. GetAVLPositionsByAVLID
    b. GetAVLPositionsByVehicleName
    c. GetLastAVLPositions (all vehicles)
    d. GetLastAVLPositionByVehicle
    e. GetAVLMessages (with parameter = #of messages to return, keep asking until all returned)
    f. GetLatestAVLMessages
    g. GetAVLMessagesByVehicleAndDate
11) Removed AVLNotification from OA_Server.
12) Fixed the spelling of the following method names on the DR_Server:
    a. InitiateLoadManagementEvent
    b. InitiateLoadManagementEvents
    c. InitiatePowerFactorManagementEvent
13) Modified the GetAVLLocation methods on the AVL_Server to return AVLPosition objects. Also these methods were changed to return only positions within a date/time range.

Version 4.0, Release Candidate c – Issued 11/17/08.

General Comments:

1) This is the first release of MultiSpeak that has a complete implementation of the Common Power System Model (CPSM), an international standard profile for the exchange of transmission system model information that is based in the Common Information Model (CIM). The complete CIM data model and the subset of CIM that constitutes the CPSM are both maintained by the International Electrotechnical Commission (IEC) Technical Committee 57 (TC57) as parts of the IEC61970 series and the IEC61968 series of standards. Numerous changes have been made throughout the MultiSpeak connectivity model to facilitate support of CPSM and to permit additional harmonization efforts with other CIM profiles, as such are developed in the future. A new included schema, named mspCPSM.xsd, has been added to the MultiSpeak specification for this release. However, not all of the contents of that schema come from the CIM, since some MultiSpeak objects must be copied there in order to build a complementary set of CIM objects for use in the combined MultiSpeak implementation. Furthermore, it should be noted that changes have been made in the multispeak.xsd schema to support the CPSM implementation. Although this revision history document will outline the significant changes made to the MultiSpeak schema, the changes are too numerous and pervasive to document exhaustively. Users who are familiar with Version 3.0 of the MultiSpeak specification should use care in the use of MultiSpeak Version 4.0 to flag changes that may not be explicitly described herein.

2) This is the first release of MultiSpeak that has consistently and completely supported water, gas, and propane service types in addition to electric service on an equal basis. Meters, meter readings, meter exchanges, and service locations are associated with specific service types. Both schema objects and web service methods have been modified to make clear the service type(s) being handled. Users should take care and be aware that web service methods in the

   `http://www.multispeak.org/Version_4.0`

   namespace may be named the same as a method that was previously published under the

   `http://www.multispeak.org/Version_3.0`

   namespace, but may be changed to clearly identify the service types(s) to which they apply.

3) This is the first release of the MultiSpeak specification that supports international conventions for telephone numbers, addresses, currencies, and units of measures. Currencies are expressed using a currencyCode, as defined in the international standard ISO 4217, “Currency Names and

Code Elements". The new currencyCode simple type has an extensive list of currency codes as defined in ISO 4217. A new defaultCurrencyCode has been added to the MultiSpeak message header. If this value is set, then it is not necessary to add a currency code attribute in each element that carries currency values. If neither the currencyCode attribute, nor the defaultCurrencyCode are is set then the type of currency being referred to is indeterminate; it should not be assumed that monetary amounts are expressed in USD (United States dollars).

4) In previous releases of MultiSpeak, there was extensive use made of XSD substitutionGroups, both in defining the object hierarchy and in some cases (for instance, overCurrentDeviceBank and switchDeviceBank) in defining flexible choices within an object. Although these uses were acceptable within the W3C specification for XML Schemas, they created problems with certain software tools. Present best practice suggests that the only use of XSD substitutionGroups is to define container objects and that substitutionGroups not be nested (that is to say that they not be used to define object hierarchies of more than one layer in depth). In this release, choice selectors are used rather than substitutionGroups in object definitions. Furthermore, the only use of substitutionGroups is to ensure that (i) elements created from complex types that inherit from the mspObject, either directly or indirectly, are included in the MultiSpeak root container class and (ii) elements created from complex types that inherit from the mspCIMObject in the mspCPSM schema, either directly or indirectly, are included in the CPSM root container class. The CPSM root container class is then included in the MultiSpeak root container class so that the MultiSpeak class can contain an unbounded number of instances of all top level objects. This is in line with the current best practice recommendations.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). Changes have been made in this release candidate to address the substitution group issues observed in earlier releases; it is believed that this has addressed all of the earlier substitution group issues. The only work-around for the cardinality issues that is known at this time is either to edit the affected objects directly or to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Schema Changes:

1) Throughout the schema, the use of xs:string, objectID and objectRef was standardized when used to refer to object identifiers. In all cases objectID was used to refer to an object where the name of the element or the context made it clear which MultiSpeak noun was being referred to. If it was unclear which MultiSpeak noun was being referred to then an objectRef was used. All pointers that were previously of type xs:string were replaced with the appropriate choice (objectID or objectRef) to match the previous rule. For instance, customerID always refers, both by context and by the name of the element, to a customer object; therefore the use of objectRef is not necessary. In the case of a parentSectionID (a pointer to a parent section of indeterminate noun type), it is unclear what type of noun is being referred to. In this case the use of an objectRef is appropriate so that the receiving system can tell which noun type and objectID for that noun type are being pointed to. Wherever xxxxID is used in MultiSpeak, it should be assumed that this element is a pointer to the xxxx object, either of objectID type or of type objectRef, as appropriate.
2) Added CIM IdentifiedObject (naming) fields as optional elements to the mspObject and all objects that inherit from it – effectively all top level objects in MultiSpeak. This will facilitate future harmonization between CIM and MultiSpeak.
3) Renamed mapLocation to be GMLLocation and complexLine to be GMLLine to clarify that they are Geography Markup Language objects and to match CIM use.
4) Changed all node identifiers from MultiSpeak style nodeIdentifier elements to a new object called NodeFields, which includes a nodeIdentifier, an optional pointer to a containing substation (which is required by the CPSM) and potentially pointers to measurements made at that node (which is also required by CPSM).
5) Renamed the V3.0 meterReading object, which was originally developed from the ANSI C12.19 meter reading object, to be meterReadingC1219 and deprecated its use in V4.0.
6) Added a new meterReading object that is appropriate for all service types. Eliminated mspMeterReading, electricMeterReading, waterMeterReading, gasMeterReading, propaneMeterReading, which were added in V4.0, rc b.
7) Added new elements to carry arrays of objects from all service types: meterExchanges, meters, serviceLocations.
8) Eliminated electric-specific fields from the utilityInfo object and added it to the mspMeter abstract class. The electric-specific fields were added back to the electricMeter in the electricLocationFields object. Similarly gasLocationFields, waterLocationFields and propaneLocationFields elements were added to the gasMeter, waterMeter, and propaneMeter respectively. Unless and until specific fields are defined for those objects, an extensionList was added to the gasLocationFields, propaneLocationFields, and waterLocationFields elements.
9) Added waterReceivedMeters, gasReceivedMeters, and propaneReceivedMeters as optional lists in the existing endDeviceShipment

object and eliminated separate mspMeterShipment, waterMeterShipment, gasMeterShipment and propaneMeterShipment objects.

10) Added a new account object.

11) Reworked the mspServiceLocation to eliminate account-specific information and added it to the new account object. Revised layout of electricServiceLocation, gasServiceLocation, waterServiceLocation and propaneServiceLocation objects accordingly. Note that an account does not specify a service type, but it is linked to by serviceLocation(s) that specify service types. Thus, a single customer account could be used only for a single service type or for multiple service types as is the custom for a specific customer billing system. It is however assumed that accountNumber (the objectID of account objects) is unique across all service types.

12) The previously unused primary key designators were eliminated, for example:

```
<xsd:key name="loadManagementEventPK">
                <xsd:selector xpath="loadManagementEvent"/>
                <xsd:field xpath="@objectID"/>
</xsd:key>
```

13) Revised the spelling of numerous elements to match more modern conventions. For instance, in mspServiceLocation, budgBill became budgetBill, servStatus became serviceStatus, etc. Other affected fields and the affected objects include:

- const => construction (mspElectricLine)
- phaseCd => phaseCode (all locations)
- operVolt => operatingVoltage (mspElectricLine and objects that inherit from it).
- swType => switchType (capacitorBank)
- swStatus=> switchStatus (capacitorBank)
- connectionCd => connectionCode (capacitorBank)
- swType => switchType (capacitorBank)
- swOn => switchOn (capacitorBank)
- swOff => switchOff (capacitorBank)
- cntrCkt =>controlCircuit (capacitorBank)

14) The following elements were changed on the mspMotorGenerator:

- ssDesc(of type string) => ssImpedanceID (pointer to new ZsmImpedanceEntry)
- tranDesc(of type string) => tranImpedanceID (pointer to new ZsmImpedanceEntry)
- stDesc(of type string) => stImpedanceID (pointer to new ZsmImpedanceEntry)
- ratedkV => ratedVoltage.

15) The motor object was renamed inductionMachine and significantly changed to support CIM CPSM requirements and to generalize the motor model for either induction motors or induction generators.

16) The generator object was renamed synchronousMachine and significantly changed to support CIM CPSM requirements and to generalize the generator model for either synchronous motors or synchronous generators.
17) The NEMA type code was carried in an element named nemaTyp, of type long, which was a numeric code that referred to the string NEMA types. This was replaced with an element named nemaType, of type enumerated string, which contains the strings directly in an enumeration list.
18) In numerous cases an element that presumes the unit used to express it was replaced by an element named generally and a list of units. For instance ratedKV would be replaced with ratedVoltage, bankKvar would became bankRating, etc.
19) The previously named switchDeviceBank was renamed switchingDeviceBank for consistency, since a switchingDeviceBank is a bank of switchingDevice(s).
20) The name of the MultiSpeak date/time data type was changed from mspDate to mspDateTime to avoid confusion.
21) Added the crewName element to the crew object.
22) Made the association between vehicles, employees, and equipment with a crew be pointers rather than encapsulated objects.
23) Changed the name of the people associated with a crew to be crew members rather than employees, since members of a crew might not be employed by the utility. Added a new crewMember object that inherits from the mspPerson abstract class.
24) Removed mspVehicle abstract class and truck object. All vehicles are referred to as being vehicles rather than having both vehicles and trucks.
25) Made a feeder be a container class so that equipment could be encapsulated in a feeder if desired.
26) Associated an inHomeDisplay with a meterBase rather than a meter, since neither the meterBase nor the inHomeDisplay are unlikely to change location, while meters are more likely to be moved.
27) Added complexVoltage and complexImpedance objects.
28) Deleted the distributionSubstation object that was added in V4.0, rc a. Now any substation, regardless whether it is a transmission or distribution substation is modeled with the substation class.
29) Added the following objects:
    - VoltageMagnitude
    - voltageAngle
    - multiPartIdentifier
    - resource
    - workRequest
    - workStatus
    - assignment
    - work
    - workTask
    - project
    - design
    - maintenanceOrder

- demandResponseEvent
- substationLoadControlStatus
- ZsmImpedanceEntry
- meterGroups
- catalogEntries

30) Added a pointer to an equipmentContainer to the mspElectricLine and mspElectricPoint fo compliance with CPSM. Note that in CIM EquipmentContainer can be both a concrete class and an abstract class from which other classes are inherited (such as substation, Bay, VoltageLevel, Line, etc), thus the pointer to an EquipmentContainer must be an objectRef, not an objectID.
31) Added the CPSM LoadCurve as an optional element on the loadSection.
32) Fixed kW and kVAr on the allocated object to match the new unit/value pair convention.
33) Added isRemotelyOperable element to mspSwitchingBank.
34) The simple type frequency was deleted and the complex type frequency was added to replace it, with a unit value pair.
35) Updated the spatialFeatureGroup and physicalObjectList containers to incorporate all appropriate items.
36) Added ohTransmissionLine and ugTransmissionLie objects.
37) Added “Substation” to the transformerBank.mounting enumeration list.
38) Added phaseTripRating to mspOverCurrentDeviceBank.
39) Revised the scadaAnalog to be compatible with the CIM Analog type measurement.
40) Added the following elements to the capacitorBank object in order to be compatible with CPSM:
    - reactiveRating
    - reactivePerSection
    - maximumSections
    - normalSections
    - regulatingControlID
    - impedances
41) Added a skill object to document the certified skills that a person can have, such as hot work, underground work, chain saw, traffic management, hazardous waste disposal, etc.
42) Added a capability object to describe the types of work that a crew is qualified to perform, such as hot work, tree trimming, etc.
43) Added inspectionDataSet, diagnosisDataSet and maintenanceDataSet to report on field inspection, failure diagnosis, and maintenance activities respectively.
44) Added mspMultiGeometryObject abstract type and made station be of type mspMultiGeometryObject.
45) Added “Transfer” and “Salvage” to unitActn.
46) Added transferMH and hotTransferMH to laborComponent. Added transferCost to laborCategory.
47) Added genericPolygonFeatureList to backgroundGraphics object.

48) Added “All” to the enumeration list for serviceType.
49) Added serviceType to the connectDisconnectEvent.

Web Service Method Changes:

1) Combined the following servers:
    - MR_Server and LP_Server =>MR_Server
    - EDR_Server and EDT_Server => EDTR_Server
    - DAD_Server and DAC_Server => DA_Server
    - DGV_Server and SGV_Server => GV_Server

2) Added the following servers:
    - AVL_Server.
    - WTG_Server
    - SCHED_Server
    - WTO_Server
    - WTP_Server
    - WV_Server

3) Renamed the following servers:
    - STK_Server => DGN_Server)Staking => Field Design)
    - LM_Server =>DR_Server (Laod Management => Demand Response)

4) All methods that refer to the meter object by objectID, meterNo, or meterID were rebuilt using the new meters object so that meters of all service types could be returned, unless the return type is explicitly of one service type. In addition, the serviceType parameter was added to all Get type methods requesting meter data so that meters could be requested by serviceType, unless there was already a specific method to get the meters by serviceType.
5) All methods that refer to the serviceLocation object were rebuilt using the new serviceLocations object so that service locations of all service types could be returned, unless the return type is explicitly of one service type. In addition, the serviceType parameter was added to all Get type methods requesting serviceLocations so that service locations could be requested by serviceType.
6) All methods that refer to the meterExchange object were rebuild using the new meterExchanges object so that meter exchanges of all service types could be returned, unless the return type is explicitly of one service type. In addition, the serviceType parameter was added to all Get type methods requesting meterExchange data so that meterExchanges could be requested by serviceType.
7) All objects that refer to the meterGroup object were rebuilt using the new meterGroups object so that meterGroups of all different service types and mixed service types could be sent.

8) Changed the input parameter of the GetEngineeringEquipment method on the EA_Server to be of type equipmentType, which is an enumeration of the names of the types of engineering catalog entries. The returned object is a new object called catalogEntries.
9) Added a GetCatalogEntries method to the EA_Server to return the defined engineering catalog entries. The calling parameter is an array of the catalogEntries returned by calling the GetElectricalEquipment method and the return parameter is a new container object called returnedCatalogEntries.
10) The following methods were added to the MR_Server and MDM_Server to exchange load profile information using formattedBlocks:
    - GetLPReadingByMeterNumberFormattedBlock
    - GetLPReadingsByDateFormattedBlock
    - GetLPReadingsByBillingCycle
    - InitiateLPMeterReadByMeterNumber

11) Added the following methods to support work management:
    - AssignmentNotification (DGN_Server, WTP_Server, CB_Server)
    - InitiateWorkRequest (FA_Server, CB_Server, WTG_Server)
    - NumberCreatedNotification (DGN_Server, WTO_Server)
    - InitiateTaskGeneration (WTG_Server)
    - TaskListNotification (SCHED_Server)
    - UpdateWorkStatus (SCHED_Server)
    - UpdateOutageStatus (OA_Server)
    - GetTaskStatus (SCHED_Server)

12) Changed the name of StakedWorkOrderNotification to be DesignedWorkOrderNotification to complement the revised name of the design server.
13) Modified GetMeterByAMRType to request meters by AMRVendor and AMRDeviceType rather than the deprecated AMRType. Also made the reference to meter plural to reflect our convention.
14) Modified the GetMeterGroupMembers to return the new meterGroups object rather than an array of strings.
15) Added the following methods to the AVL_Server:
    - GetAVLSupportedVehicles
    - GetAVLLocationByVehicleID
    - GetAVLLocationByVehicleName
16) Added AVLChangedNotification to the following servers:
    - GIS_Server
    - GV_Server
    - OA_Server
    - SCHED_Server
17) Added AccountChangedNotification to the following servers:
    - MR_Server

- CD_Server
- OA_Server
- CRM_Server
- GIS_Server
- GV_Server
- CH_Server
- MDM_Server

18) Added the following methods to the CB_Server and MDM_Server:
    - GetAllAccounts
    - GetAccountByCustomerID
    - GetAccountByMeterNumberAndServiceType
    - GetAccountByServiceLocationAndServiceType

Version 4.0, Release Candidate b – Issued 08/25/08.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. In addition, substitution groups are not created properly. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes and incorrect creation of some classes created using substitution groups (notably the MultiSpeak object). The only known work-around at this time is to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Schema Changes:

1) Changed the namespace for XML data types to be xs: rather than xsd: to match common industry practice and IEC use.
2) Separated GML data objects into the gml: namespace.
3) Separated the CIM CPSM objects into the cpsm: namespace and removed them from the multispeak.xsd schema. Corrected object name capitalization to match CIM conventions and removed the “cim” prefix on objects imported from CIM.
4) Updated some of the CIM objects to match the CIM release named 61968MessagesSchemasRev09.zip, dated 10/1/2007. Complete harmonization will occur after IEC releases the final CIM V12 in late 2008.
5) Corrected the abstract attribute of all abstract complex types and elements.
6) Replaced the simple type poleUseCode with poleUse for consistency.
7) Added billingCycle to the utilityInfo element.
8) Added materialItemID to the pickList object.

9) Added optional detailed addressing fields to the proposed international address object.
10) Changed the currencyCode element on the money object to be an attribute.
11) Changed the units on all values and measurements to be attributes rather than elements.
12) Changed voltage ratings in overcurrent devices, generators, regulators, and transformers to match the voltages defined in the engineering equipment catalogs.
13) Added draft mspMeterReading, electricMeterReading, gasMeterReading and waterMeterReading objects.
14) Added requestedNumber structure that will be used to send work order, service order or other information.
15) Added strategy and scheduleDateTime to the loadManagementEvent.
16) Changed the base class for mspElectricLine/constr from xs:string to be msp:eaEquipID so that all pointers to engineering equipment catalogs are of type eaEquipID.
17) Added new object complexImpedance.
18) Added groundingImpedance element on mspBankObject, of type complexImpedance.

Web Service Method Changes:

1) Added new methods GetNextNumber and ReturnGeneratedNumber to the following web services:
    - CB_Server
    - FA_Server
    - OA_Server
    - STK_Server
2) Added GetWorkOrderSelectionByStatus and GetWorkOrderSelectionList to the FA_Server web service.
3) Added InitiateLoadManagementEvents method to the LM_Server web service to permit sending an array of loadManagementEvents.
4) Added GetMeterGroupNamesByMeterNo to MDM_Server and CB_Server web service.
5) Added GetMeterConnectivityByMeterNo, GetCircuitElementByObject, and GetConnectivityByObject to EA_Server web service.
6) Added the following methods to the LM_Server web service:
    - SCADAAnalogChangedNotification
    - SCADAAnalogChangedNotificationByPointID
    - SCADAAnalogChangedNotificationForPower
    - SCADAAnalogChangedNotificationForVoltage
    - SCADAStatusChangedNotification
    - SCADAStatusChangedNotificationByPointID
    - SCADAPointChangedNotification

- SCADAPointChangedNotificationForStatus
- SCADAPointChangedNotificationForAnalog

Version 4.0, Release Candidate a – Issued 05/15/08.

Known issues with this release:

1) WDSLs included with this (and all previous releases) do not enforce all of the cardinality restrictions in the XML schemas included in the release. The use of the xsd.exe command line tool to generate C# classes from the core (multispeak.xsd) schema results in incorrect cardinality in some classes (notably the MultiSpeak object). The only known work-around at this time is to delete the complex and simple types listed in a WSDL and to import the multispeak.xsd XML schema into the WSDL. Further investigation of this issue is on-going.

Version 4.0, release candidate a was based on Version 3.0, build q with the changes described below.

I. Changes to Implement Internationalization and Foster Harmonization with IEC CIM

1) Internationalized address format for all addresses. Added townCode to address.
2) Internationalized telephone number formats for all telephone numbers. Added new telephoneNumber complex type.
3) Changed all instances of money/currency to a new complex type, money, that includes an optional currency code, based on ISO 4217 currency codes. Added default currencyCode attribute to message header to eliminate the need to send the currencyCode element with every instance of money.
4) Changed all measurements and measured elements to be a complex type with a value and unit pair. This is done to internationalize the measurements, to more closely harmonize with the IEC CIM approach to measurements, and to add flexibility. The new elements include:
    - length
    - height
    - seconds
    - voltage
    - current
    - realPower
    - reactivePower
    - apparentPower
    - activePower
    - resistance
    - reactance
    - impedance
    - admittance

- susceptance
- conductance
- capacitance
- resistivity
- temperature
- pressure
- percent
- angle
- exponent
- PowerFactor
- systemFrequency
- tapStep
- speed
- odometer
- powerLimitationValue

5) Changed phaseCd to be phaseCode with more complete list of possible phase combinations.
6) Added switchTimeDelay to capacitorBank.
7) Eliminated powerLimitationUnits from ConnectDisconnectEvent, since it is now in the revised powerLimitationValue complex type.
8) Added new abstract type mspPerson. Made customer and employee of type mspPerson. This more closely harmonizes with IEC CIM and makes use of new internationalized telephone numbers and address types.
9) Added capabilitiesList to crew object.
10) Added skillsList to employee.
11) Changed milesFromSource to be distanceFromSource in mspResultsBase for internationalization.
12) Eliminated customer-related fields and added in customer object in WorkOrder object. Changed all phone numbers to new internationalized format.
13) Added Mils, Yards, Millimeters, Decimeters, Centimeters, Meters, Kilometers, and Unknown to lengthUnits.
14) Added velocity units of measure to uom.
15) Added the following new objects to support transmission data exchanges using the IEC CPSM:
    - IEC61970Version
    - identifiedObject (nameFields)
    - geographicalRegion, subGeographicalRegion
    - hostControlArea, subControlArea
    - organization
    - basePower, baseVoltage, cimBasePower
    - equipmentContainer
    - connector, busbarSection, connectivityNode
    - transmissionSubstation

- mspCIMObject, mspCIMConductingEquipment (abstract types)
- regulatingCondEq
- powerSystemResource
- cimSwitch
- recloseSequence
- protectedSwitch
- electricalProperties, switchProperties, breakerProperties
- transmissionBreaker
- disconnector
- loadBreakSwitch
- voltageLevel, bay
- seriesCompensator, shuntCompensator, staticVarCompensator
- curve, curveData, basicIntervalSchedule, regularIntervalSchedule, irregularIntervalSchedule, regulationSchedule, regularTimePoint, irregularTimePoint
- powerTransformer, transformerWinding, terminal, tapChanger
- cimLine
- acLineSegment
- nodeFields, toEndFields, fromEndFields
- cimMeasurement, cimLimitSet, cimAnalog, cimAnalogLimit, cimAnalogLimitSet, cimDiscrete, cimAccumultor, cimStringMeasurement,cimAnalogValue, cimAccumultorValue, cimDiscreteValue, cimStringMeasurementValue, cimMeasurementValue, cimMeasurementType, cimMeasurementValueSource
- energyConsumer, customerLoad, equivalentLoad, inductionMotorLoad, stationSupply, loadArea, areaLoadCurve, season, nonConformLoadCurve
- synchronousMachine, generatingUnit, thermalGeneratingUnit, hydroGeneratingUnit,

II. Power System Model Changes. These changes implement (i) changes necessary to facilitate IEC Common Power System Model (CPSM) profile model exchanges, (ii) changes necessary to implement engineering equipment catalog exchanges, and (iii) changes recommended by T. E. McDermott in his IEEE articles, “Distribution System Data Exchanges to Support Line and Cable Parameter Calculations”, *Proceedings of the 2007 Power Engineering Society General Meeting*, Tampa, Florida, and “Open Source Data Translation for Distribution System and Transient Modeling”,.

1) Added engineering line data catalogs for: conductors, conecentric neutral cables, tape shield cables, service cable, line construction, material attributes, line environment attributes, and right-of-way attributes.
2) Added engineering equipment catalogs for: transformers, regulators, breakers, fuses, reclosers, sectionalizers, switches, and load mixes.

3) Eliminated substation; replaced with distributionSubstation. Added mspSubstation and new transmissionSubstation. Made transmissionSubstation and distributionSubstation of type mspSubstation. Added nameFields and equipmentContainer objects to mspSubstation (and by reference to distributionSubstation) to more closely harmonize with IEC CIM.
4) Eliminated equivalent source information from distributionSubstation and added new equivalentSource object.
5) Replaced position in mspOverCurrentDevice with normalPosition. Added currentPosition element in mspOverCurrentDevice. Added interruptingRating in mspOverCurrentDevice.
6) Added groundTripEnabled and groundTripRating to recloser.
7) Added vOutV, fhHiV, reverseFlowR, and reverseFlowX to regulator. Changed units of ldcR and ldcX to be voltage on the regulator PT base rather than impedances.
8) Added enumerations for regType and wdgType on regulatorBank object.
9) Added "shuntUngroundedWye" as an option in the connectionCode simple type to describe capacitorBank connections.
10) Added horizontal and vertical coordinates, bundle spacing and number of conductors in a bundle to conductorList entries, and replaced condN entries with conductorList entries with phaseCode of "N".
11) Changed type of billRef from xsd:long to xsd:string.

III. Other Changes

1) Changed all instances of custID to customerID and servLoc to serviceLocationID to attempt to standardize objectID references to be nounID where "noun" is the MultiSpeak noun to which the ID refers.
2) Changed noOfCustomers in allocatedLoad from being of type float to being of type integer.
3) Removed meter; replaced with electricMeter. Eliminated serviceLocation; replaced with electricServiceLocation. Eliminated nameplate; replaced with electricNameplate. Replaced meterExchange with electricMeterExchange.
4) Added mspMeterShipment, gasMeterShipment, propaneMeterShipment, and waterMeterShipment.
5) Added received waterMeter, receivedGasMeter, and recievedPropaneMeter.
6) Removed the following simple types:
    - accountsReceivableBalance
    - addressLine
    - city
    - state
    - zip
    - custID
    - poleHeight