



NEW WORK ITEM PROPOSAL

Proposer Secretary	Date of proposal 2001- 04-05
TC/SC TC 57	Secretariat Germany
Date of circulation 2001-05-18	Closing date for voting 2001-08-17

A proposal for a new work item within the scope of an existing technical committee or subcommittee shall be submitted to the Central Office. The proposal will be circulated to the P-members of the technical committee or subcommittee for voting, and to the O-members for information. The proposer may be a National Committee of the IEC, the secretariat itself, another technical committee or subcommittee, an organization in liaison, the Committee of Action or one of the advisory committees, or the General Secretary. Guidelines for proposing and justifying a new work item are given in ISO/IEC Directives, Part 1, Annex C (see extract overleaf). **This form is not to be used for amendments or revisions to existing publications.**

The proposal (to be completed by the proposer)

Title of proposal IEC 61968-4 System Interfaces For Distribution Management – Part 4: Interface Standard for Records and Asset Management		
<input checked="" type="checkbox"/> Standard	<input type="checkbox"/> Technical Report	
Scope (as defined in ISO/IEC Directives, Part 3, 6.2.1) This document is Part 4 of the IEC 61968 standard and specifies the information content of a set of message types that can be used to support many of the business functions related to Asset Management. Typical uses of the message types defined in Part 4 include network extension planning, copying feeder or other network data between systems, network or diagram edits and asset inspection. Message types defined in other Parts of IEC61968 may also be relevant to these use cases. The mapping of these messages to specific technologies such as XML will be described at a later date following receipt of National Committee comments.		
Purpose and justification , including the market relevance and relationship to Safety (Guide 104), EMC (Guide 107), Environmental aspects (Guide 109) and Quality assurance (Guide 102) . (attach a separate page as annex, if necessary) The purpose of the 61968 series of standards is to define interfaces among major DMS functional components so that interoperability may be achieved between application software running on system distributed throughout the utility. Realization of this objective will provide utilities with increased flexibility in combining software and systems from multiple sources. This should result in each DMS being composed of integrated functions that are optimized to manage the utility's distribution system. Part 4 emphasizes support for utility asset management.		
Target date	for first CDV 2002-07	for IS 2003-08
Estimated number of meetings 5	Frequency of meetings 3 per year	Date and place of first meeting: Keystone, Colorado, 2001-02
Proposed working methods	<input checked="" type="checkbox"/> E-mail	<input checked="" type="checkbox"/> ftp
Relevant documents to be considered 1. Draft IEC 61968-1, System Interfaces For Distribution Management – Part 1 Interface Architecture and General Requirements 2. Draft IEC 61968-2, System Interfaces For Distribution Management – Part 2 Glossary 3. Draft IEC 61970-1, EMS-API Guidelines and General Requirements 4. Draft IEC 61970-301, Common Information Model (CIM) Base		
Relationship of project to activities of other international bodies Not Applicable		

Liaison organizations Open Application Group (OAG), IEEE	Need for coordination within ISO or IEC IEC TC57: SPAG, WG10, WG13
Preparatory work Check one of the two following boxes <input checked="" type="checkbox"/> A draft is attached for vote and comment <input type="checkbox"/> An outline is attached We nominate a project leader as follows in accordance with ISO/IEC Directives, Part 1, 2.3.4 (name, address, fax and e-mail): Mr. Greg M. Robinson President Xtensible Solutions, Inc. 20405 Brightwater Place Sterling, VA 20165 USA Tel.: +1 703 421 9419 Fax: +1 703 421 9419 e-mail: g.m.robinson@worldnet.att.net	
Concerns known patented items (see ISO/IEC Directives, Part 2) <input type="checkbox"/> yes <input checked="" type="checkbox"/> no If yes, provide full information as an annex	Name and/or signature of the proposer Dr. Andreas Huber, Secretary TC 57
Comments and recommendations from the TC/SC officers	
Comments with respect to the proposal in general, and recommendations thereon 1) Work allocation <input type="checkbox"/> Project team <input type="checkbox"/> New working group <input checked="" type="checkbox"/> Existing working group no: 14 2) Draft suitable for direct submission as <input checked="" type="checkbox"/> CD <input type="checkbox"/> CDV 3) General quality of the draft (conformance with ISO/IEC Directives, Part 3) <input type="checkbox"/> Little redrafting needed <input type="checkbox"/> Substantial redrafting needed <input type="checkbox"/> no draft (outline only) 4) Relationship with other activities In IEC In other organizations	
Other remarks Remarks from the TC/SC officers The National Committees are requested to submit comments on the draft attached.	
Remarks from the Sector Board Members of Sector Board 1, 'Electricity transmission and distribution', and Sector Board 3, 'Industrial automation systems', were asked to comment on the market relevance of this proposal. Two comments were received, both favourable to the development of the standard. One also pointed out that the increased complexity could lead to short-term cost increases.	

Elements to be clarified when proposing a new work item
Title

Indicate the subject matter of the proposed new standard.

Indicate whether it is intended to prepare a standard, a technical report or an amendment to an existing standard.

Scope

Give a clear indication of the coverage of the proposed new work item and, if necessary for clarity, exclusions.

Indicate whether the subject proposed relates to one or more of the fields of safety, EMC, the environment or quality assurance.

Purpose and justification

Give details based on a critical study of the following elements wherever practicable.

- The specific aims and reason for the standardization activity, with particular emphasis on the aspects of standardization to be covered, the problems it is expected to solve or the difficulties it is intended to overcome.
- The main interests that might benefit from or be affected by the activity, such as industry, consumers, trade, governments, distributors.
- Feasibility of the activity: Are there factors that could hinder the successful establishment or general application of the standard?

- d) Timeliness of the standard to be produced: Is the technology reasonably stabilized? If not, how much time is likely to be available before advances in technology may render the proposed standard outdated? Is the proposed standard required as a basis for the future development of the technology in question?
- e) Urgency of the activity, considering the needs of the market (industry, consumers, trade, governments etc.) as well as other fields or organizations. Indicate target date and, when a series of standards is proposed, suggest priorities.
- f) The benefits to be gained by the implementation of the proposed standard; alternatively, the loss or disadvantage(s) if no standard is established within a reasonable time. Data such as product volume or value of trade should be included and quantified.
- g) If the standardization activity is, or is likely to be, the subject of regulations or to require the harmonization of existing regulations, this should be indicated.

If a series of new work items is proposed, the purpose and justification of which is common, a common proposal may be drafted including all elements to be clarified and enumerating the titles and scopes of each individual item.

Relevant documents

List any known relevant documents (such as standards and regulations), regardless of their source. When the proposer considers that an existing well-established document may be acceptable as a standard (with or without amendments), indicate this with appropriate justification and attach a copy to the proposal.

Cooperation and liaison

List relevant organizations or bodies with which cooperation and liaison should exist.

Preparatory work

Indicate the name of the project leader nominated by the proposer.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

System Interfaces For Distribution Management –**Part 4: Interface Standard for Records and Asset Management**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
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- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61968 has been prepared by Working Group 14, of IEC technical committee 57: Power System Control And Associated Communications.

The text of this standard is based on the following documents:

FDIS	Report on voting
57/-----	57/-----

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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IEC 61968

System Interfaces For Distribution Management –

Part 4: Interface Standard for Records and Asset Management

Introduction

The IEC 61968 series of standards is intended to facilitate *inter-application integration* as opposed to *intra-application integration*. Intra-application integration is aimed at programs in the same application system, usually communicating with each other using middleware that is embedded in their underlying runtime environment, and tends to be optimized for close, real-time, synchronous connections and interactive request/reply or conversation communication models. IEC 61968, by contrast, is intended to support the inter-application integration of a utility enterprise that needs to connect disparate applications that are already built or new (legacy or purchased applications), each supported by dissimilar runtime environments. Therefore, these interface standards are relevant to loosely coupled applications with more heterogeneity in languages, operating systems, protocols and management tools. This series of standards is intended to support applications that need to exchange data every few seconds, minutes, or hours rather than waiting for a nightly batch run. This series of standards, which are intended to be implemented with middleware services that exchange messages among applications, will complement, not replace utility data warehouses, database gateways, and operational stores.

As used in IEC 61968, a DMS consists of various distributed application components for the utility to manage electrical distribution networks. These capabilities include monitoring and control of equipment for power delivery, management processes to ensure system reliability, voltage management, demand-side management, outage management, work management, automated mapping and facilities management. Standards interfaces are defined for each class of applications identified in the Interface Reference Model (IRM), which is described in Part 1: Interface Architecture and General Requirements

This Part contains the following clauses:

Clause	Title	Purpose
1.	Scope	The scope and purpose of the document are described.
2.	Normative References	Documents that contain provisions which, through reference in this text, constitute provisions of this International Standard.
3.	Reference and Information Models	Description of the relevant parts of the interface reference model, static information model and message type naming convention.
4.	Asset Management Message Types	Requirements common to all message types described in clauses 5 to 8.
5.	Logical Network Message Types	Message types related to the exchange of information for logical Network Data e.g. for analysis.
6.	Diagram Message Types	Message types related to the exchange of information for diagram symbol placements.
7.	Reference Data Message Types	Message types related to the exchange of information for static reference data used by Network message types.
8.	Asset Documents Message Types	Message types related to the exchange of information for physical assets.
Annex	Informative Use cases	Informative section illustrating how the message types could be used.

Table 1: Document Overview For IEC 61968 - Part 4

1 Scope

1.1 Scope of full standard

The IEC 61968 standard, taken as a whole, defines interfaces for the major elements of an interface architecture for Distribution Management Systems (DMS). Part 1:Interface Architecture and General Requirements, identifies and establishes requirements for standard interfaces based on an Interface Reference Model (IRM). Parts 3-10 of this standard define interfaces relevant to each of the major business functions described by the Interface Reference Model.

As used in IEC 61968, a DMS consists of various distributed application components for the utility to manage electrical distribution networks. These capabilities include monitoring and control of equipment for power delivery, management processes to ensure system reliability, voltage management, demand-side management, outage management, work management, automated mapping and facilities management.

This set of standards is limited to the definition of interfaces and is implementation independent. They provide for interoperability among different computer systems, platforms, and languages. Methods and technologies used to implement functionality conforming to these interfaces are considered outside of the scope of these standards; only the interface itself is specified in these standards.

1.2 Scope of this Part

This document is Part 4 of the IEC 61968 standard and specifies the information content of a set of message types that can be used to support many of the business functions related to Asset Management. Typical uses of the message types defined in Part 4 include network extension planning, copying feeder or other network data between systems, network or diagram edits and asset inspection. Message types defined in other Parts of IEC61968 may also be relevant to these use cases.

The mapping of these messages to specific technologies such as XML will be described at a later date following receipt of National Committee comments.

2 Normative references

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 61970-301 *Energy Management System Application Program Interfaces – Part 301 Common Information Model Core.*

3 Reference and Information Models

3.1 Introduction

The message types defined in this document are based on a logical partitioning of the DMS business functions and components called the IEC 61968 Interface Reference Model.

The contents of the message types are based on a static information model to ensure consistency of field names and data types. Each message type is defined as a set of fields copied from the information model classes. The message types defined in this standard are intended to satisfy a majority of typical applications. In some particular project implementations, it may be desirable to modify the set of fields using a methodology such as that described in Part 1.

3.2 Interface Reference Model

It is not the intention of this standard to define the applications and systems that vendors should produce. It is expected that a concrete (physical) application will provide the functionality of one or more abstract (logical) components as listed in this standard. These abstract components are grouped by the business functions of the Interface Reference Model.

In this standard, the term abstract component is used to refer to that portion of a software system that supports one or more of the interfaces defined in Parts 3 to 10. It does not necessarily mean that compliant software is delivered as separate modules.

Part 1 of this standard describes infrastructure services common to all abstract components whilst Parts 3-10 define the details of the information exchanged for specific types of abstract component.

IEC 61968 defines that:

1. An inter-application infrastructure is compliant if it supplies services defined in Part 1 to support at least two applications with interfaces compliant to sections of Parts 3 to 10.
2. An application interface is compliant if it supports the interface standards defined in Parts 3 to 10 for the relevant abstract components defined in the Interface Reference Model.
3. An application is only required to support interface standards of the applicable components listed in Column 3. It is not required to support interfaces required by other Abstract Components (Column 3) of the same Business Sub-Function (Column 2) or within the same Business Function (Column 1). While this standard primarily defines information exchanged among components in different business functions, it will occasionally also define information exchanged among components within a single Business Function when a strong market need for this capability has been realised.

3.3 Asset Management Functions and Components

The following table shows those functions and typical components that are applicable to the message types defined in this document: IEC 61968 Part 4: Interface Standard for Records and Asset Management.

For the message types defined in this document, it is expected that the typical abstract components listed below will be producers of information. Typical consumers of the information are the other components as listed in IEC 61968 Part 1.

Business Functions	Business Sub-Functions	Abstract Components
Records and asset management (AM)	Substation and network inventory (EINV)	Equipment characteristics Connectivity model Asset maintenance and failure History Substation display Telecontrol database
	Geographical inventory (GINV)	Network displays Cartographic maps
	Asset Investment Planning (AIP)	Maintenance strategy Life-cycle planning Reliability centred analysis Performance measurements Risk management Environmental management Decision support Budget allocation Maintain work triggers Asset maintenance groups (lists) Long term load forecasting

3.4 Message Types

3.4.1 Message Type Names

Each message type defined within this standard has a name consisting of a Verb and a Noun. The Verb describes what the message is required to do. The Noun describes the type of data in the message body. In principle, any of the standard verbs listed in Clause 3.2 can be combined with any of the Document nouns in Clause 3.3 to form a Message Type. In practice some combinations are not applicable and have therefore been omitted from Clauses 5 to 8.

3.4.2 Message Type Verbs

The verbs used in IEC 61968 messages are described below.

61968 Verb	Meaning	Message Body
New	This the first time that data for this document reference code has been published.	All sections
Change	Data has changed for this document reference code since it was last published by a New or Show message.	All sections
Show	A publication of data as a result of a Request or Subscribe.	All sections

61968 Verb	Meaning	Message Body
Close	No more data will be published for this document reference code due to normal completion of activities e.g. CloseNetworkChangeSet could mean a proposed network edit has been merged with the main 'as built' model.	Document reference code, Person, Date/time only
Cancel	No more data will be published for this document reference code due to some sort of error, e.g. the document was created inadvertently. An additional Show message may be required to pass information to assist the receiving components to rollback to a correct state.	Document reference code, Person, Date/time only
Delete	Any references to this document reference code can be removed. This is the opposite of New. It may be used instead of or in addition to Close or Cancel	Document reference code, Person, Date/time only
Get	A request for data for a given document reference code or set of documents.	Document reference code or list of codes or query clause
Request	Alternative to 'Get'. Request is a more correct term for asynchronous messaging, but Get is shorter and is an existing OAG verb (and used by listserv protocols)	Document reference code or list of codes or query clause
Ack	An acknowledgement that a document reference code or set has been received	Document reference code or list of reference codes
Subscribe	A request for future messages for a set of documents based on some filter criteria	Document reference code or list of reference codes or query clause
Unsubscribe	A request to stop receiving messages for a set of documents based on some filter criteria	Document reference code or list of reference codes or query clause

3.4.3 Message Type Nouns

The following set of nouns can be used within message types. Each noun corresponds to a class name in the static information model.

Nouns that are of type 'Document' are groupings of other objects and are used to form message type names.

Nouns that are of type 'Part' refer to objects that only exist as part of a larger document.

Other class names such as PowerSystemResource are defined in IEC 61970 Part 301.

Noun	Type	Description
Annotation	Part	An Annotation is used to display text strings or text fields of objects (e.g., name of an instance of a PowerSystemResource).
Asset	Part	A tangible resource of the utility, including power system equipment, cabinets, buildings, etc. For electrical network equipment, the role of the asset is defined in the Wires Model (refer to IEC 61970-301). This role is associated with an asset description, which places emphasis on the physical characteristics of the equipment fulfilling that role. This is the parent class for asset sub classes.
AssetList	Document	A list of (physical) Asset identifiers with corresponding (logical) PowerSystemResource identifiers
ConductorCatalogue	Document	A list of ConductorTypes. This is reference data that does not change as often as the network described in NetworkDataSet or NetworkChangeSet.
CoordinateSystem	Part	Multiple coordinate systems may be used to display and/or map PowerSystemResources and Assets. X/Y coordinates are specified as applicable for each coordinate system, which may be specified for several scale factors for state plane, internal view, or other
Diagram	Document	A list of SymbolPlacements corresponding to a PowerSystemResources. Schematic diagrams may be transferred between systems. Geographic diagrams are probably specific to GIS only.
DiagramChangeSet	Document	A set of Diagram changes related to NetworkChangeSet. Geographic diagrams are probably specific to GIS only.
EquipmentList	Part	A generic set of PowerSystemResources with common states or characteristics. The purpose of this class is to simplify model diagrams by avoiding a large number of relationships with PowerSystemResource for different Documents.
LandBaseDataSet	Document	Geographic data that complements a Network Data Set.

Noun	Type	Description
LoadDataSet	Document	Supply point or area load data that complements the Network Data set. This does not include Meter records for customers, which are defined in another Part of the standard.
MachineCatalogue	Document	A list of generic SynchronousMachine type data e.g. ratings and impedances. Used as reference data in some types of analysis study.
Map	Part	A Map is a type of diagram that is usually printed on paper. It normally depicts part of the earth's surface, showing utility assets, right of ways, topological data, coordinates, grids, etc. Maps vary depending on whether they are used for dispatch, design, schematic, etc.
NetworkChangeSet	Document	A special type of NetworkDataSet. The equipment, symbol placement, connectivity and parameter data is either deleted if the equipment Id is in the delete list, updated if the Id is in the update list or inserted if not on either delete or update list.
NetworkDataSet	Document	A document with a list of the equipment for part of a distribution network, including symbol placements, connectivity and parameters. Could be one or more feeders selected for analysis or a 'diagram patch'.
OrganisationList	Document	A list of fields describing details of one or more Organisations. Brief details of Organisations are included in the general Document header.
SymbolPlacement	Part	Location for symbol to be placed on a diagram

3.5 Static Information Model

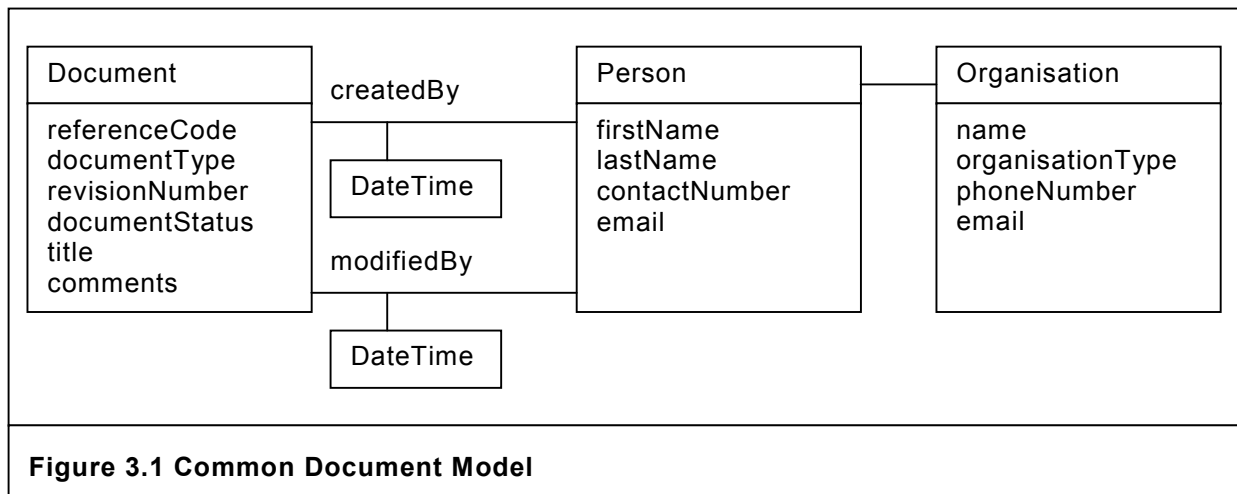
The information model relevant to Records and Asset Management consists of classes as described by the Nouns listed in Clause 3.3 together with the related classes that provide attributes for each message.

This standard also refers to classes from the Core, Topology, Wires and Meas packages in IEC 61970 Part 301 “Energy Management System Application Program Interfaces – Part 301 Common Information Model Core.”

Later versions of this document will include tables listing the descriptions of all the relevant classes, relationships and attributes including data types such as integer, double, string, datetime.

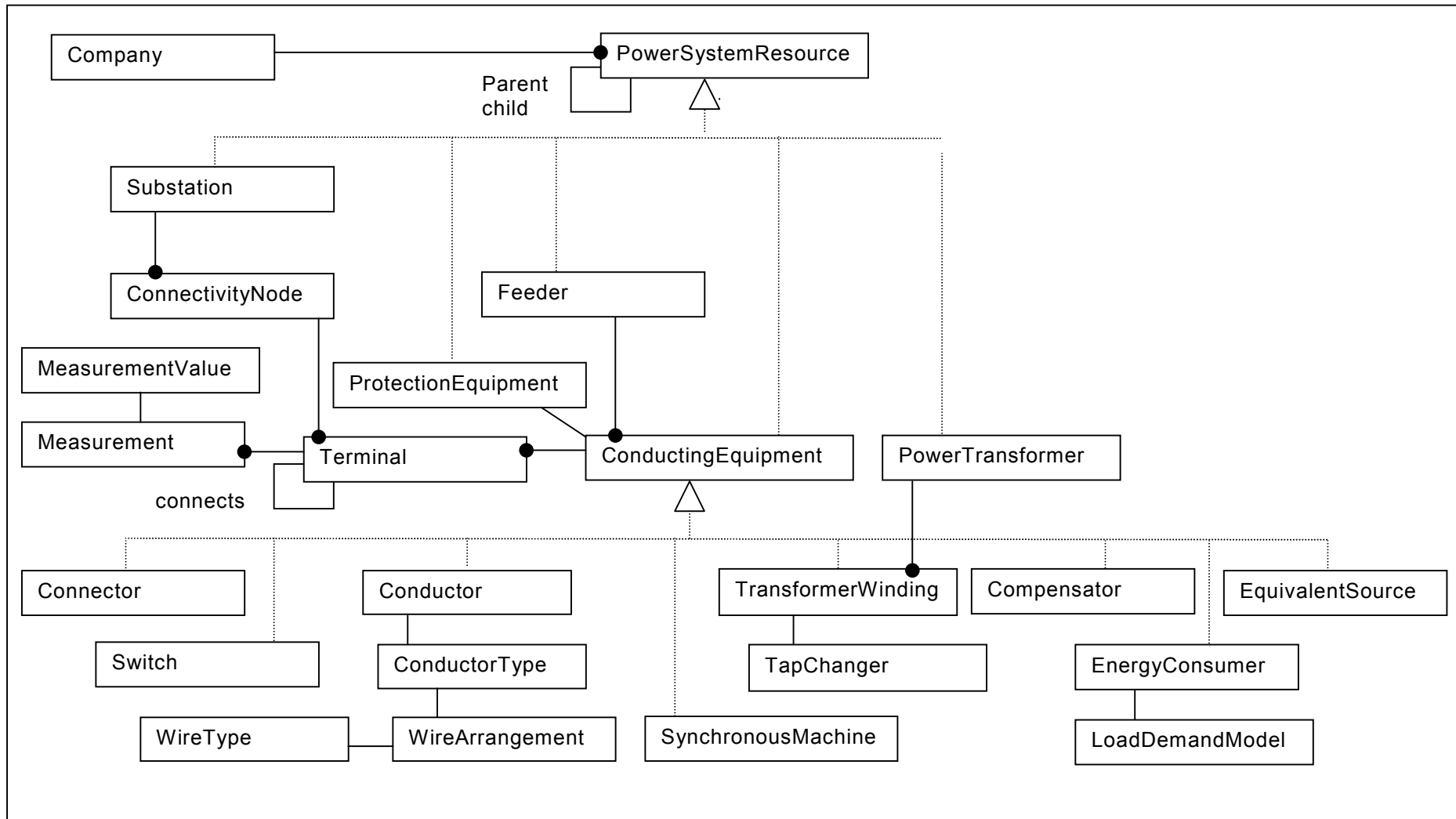
3.5.1 Base Document Model

All message types are based on the same model of a document and its associated authors. An organisation may be a company or a division within a company.



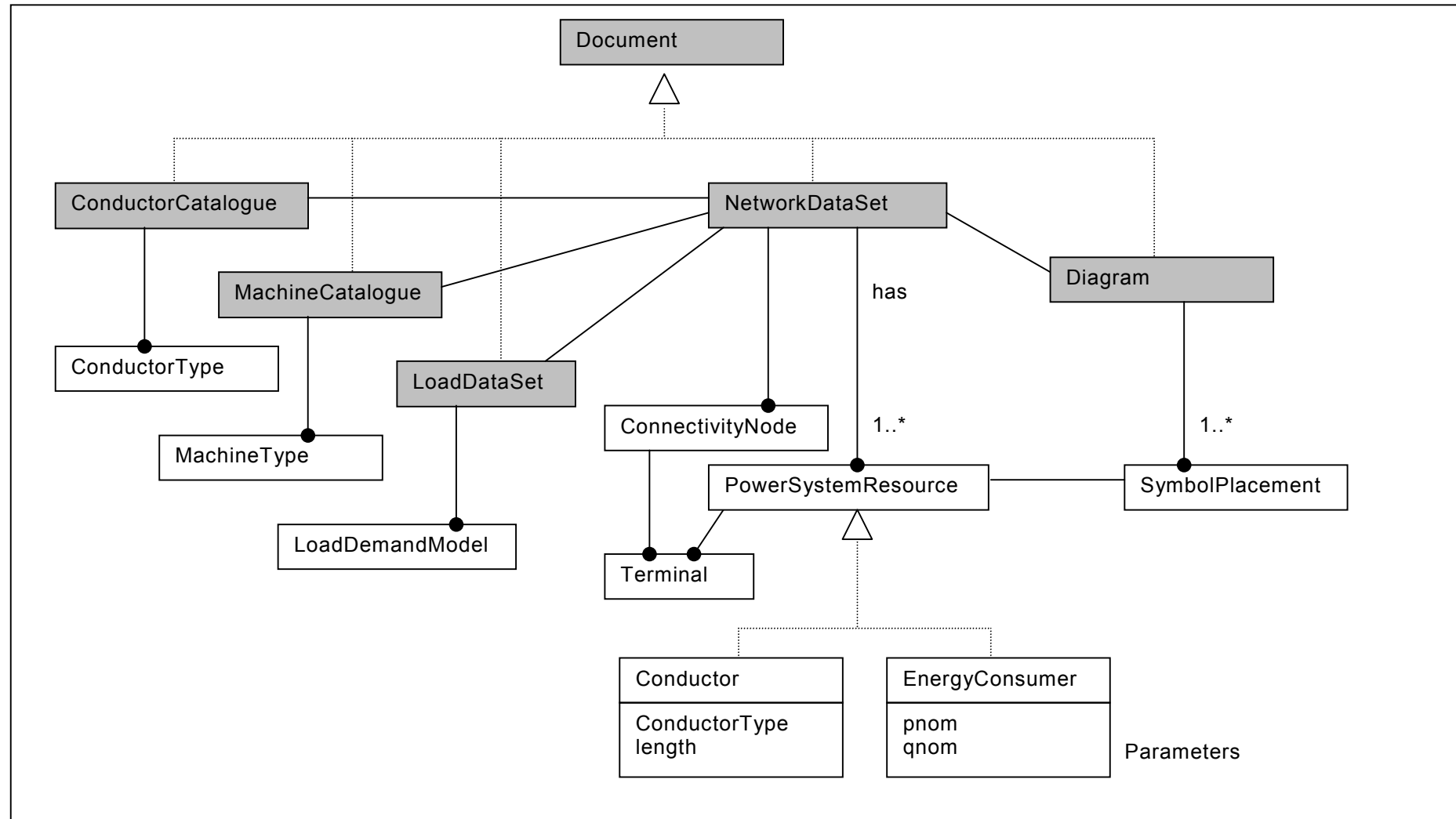
3.5.2 Network Equipment Information Model

Distribution network equipment can be represented by a subset of the classes defined in the Core, Topology, Wires and Meas packages of IEC 61970 Part 301.



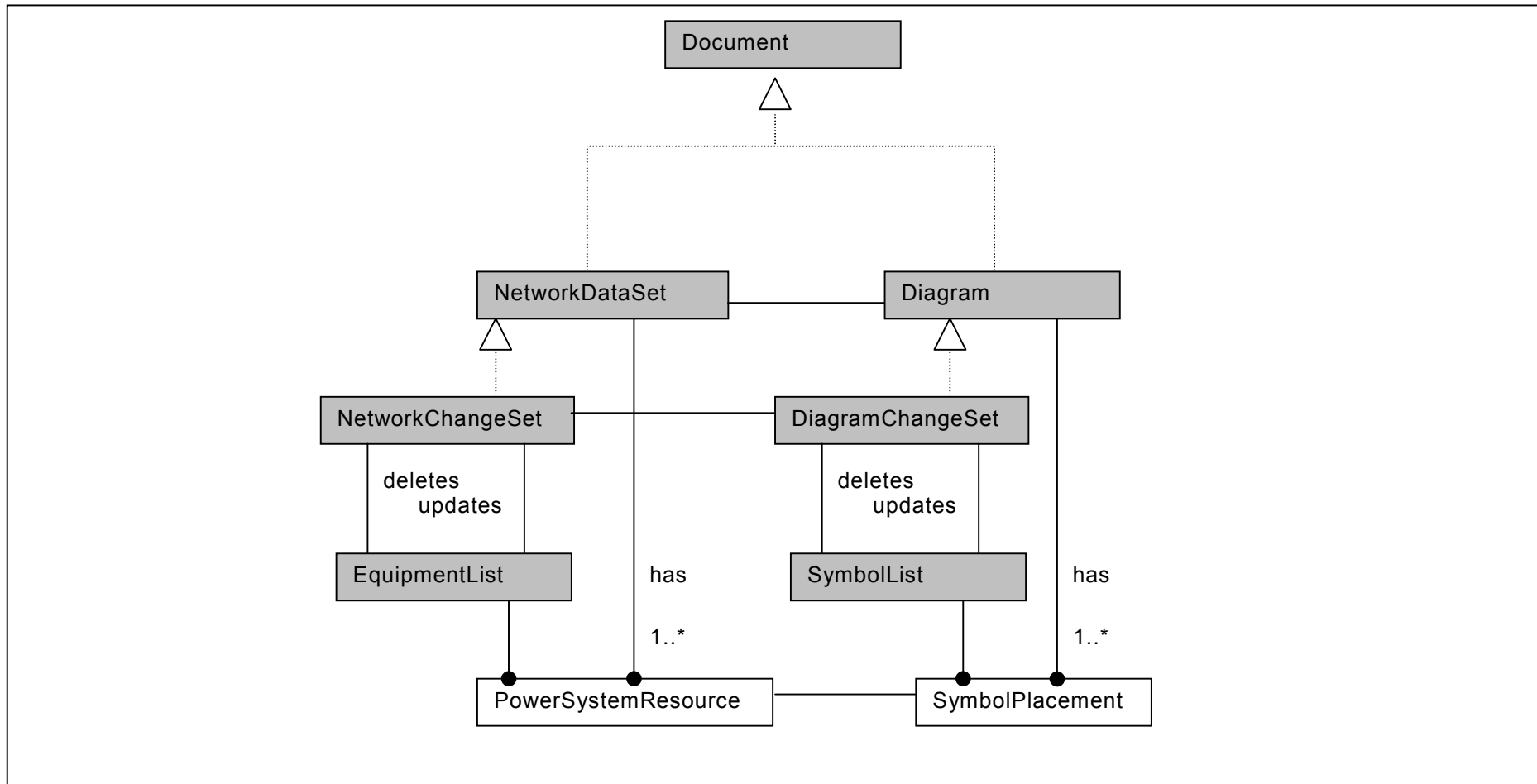
3.5.3 Network Data Set Model

The following diagram shows the relationships between the types of Document that describe a network data set. Only the major associations to classes in the Core, Topology & Wires packages are shown. Shaded entities are Document type classes specific to IEC 61968.



3.5.4 Network Change Set Model

By default, the NetworkDataSet and Diagram classes describe data to be added or inserted into network. The following diagram shows how these classes can be extended to describe changes to a network by the addition of two lists. One list is of items to be deleted altogether and the other list is of items where existing data is to be updated.



3.5.5 Assets Documents Model

Asset Documents inherit from the base Document class and have associations with entities representing the physical Assets. These Assets have associations with the logical PowerSystemResources of the NetworkDataSet.

4 Records and Asset Management Message Types

4.1 Message Usage

The simplest way of using the message types defined in this document, is for an information consumer component to send a Get message type, to which an information producer component will respond with a Show message type.

In addition, this standard also defines a set of message types that can be used for subscribing for multiple sets of data. The standard does not define when such data updates will be sent. It is expected that the message definitions are equally applicable for changes following utility data events, timer events or computer system events.

4.2 Message formats

In general message types have been defined with fields that may hold different representations of the same data. It is expected that producer applications will set some fields with default null values.

In the message format descriptions, terms like Document.* mean all attributes of class Document from the static information model. Multiple copies of sets of attributes are indicated by the term [0..*].

4.3 Query-by-example

Some messages with verbs such as Get, Subscribe, Unsubscribe, can contain data used to select the data of interest. In some cases, the message body would simply be a set of explicit document reference numbers. In other cases the message body fields would contain expressions which allow a query to be constructed. If there are no message body fields, then this shall be interpreted to mean all documents of the relevant type.

Expressions will match ANSI standard SQL including

=, <, >, <=, >=, <>

LIKE

IN [<value1, ..., <valueN>]

4.4 Common message type fields

The following fields shall be part of all message types defined in this standard.

Document.documentType
Document.referenceCode
Document.revisionNumber
Document.documentStatus
Document.title
Document.comments

Document.createdBy.Person.*
Document.createdBy.Person.Organisation.*
Document.createdDateTime
Document.modifiedBy.Person.*
Document.modifiedBy.Person.Organisation.*
Document.modifiedDateTime

4.5 Equipment identifiers

IEC 61970 Part 301 does not define a way of identifying equipment with a single attribute. It is however usual for utilities to use unique alphanumeric codes to identify their equipment and substations. In some implementations, these codes may have to be prefixed with additional characters to guarantee uniqueness across organisation boundaries.

In this standard, the term “PowerSystemResource.ID”, “ConnectivityNode.ID” or “Asset.ID” means one of these alphanumeric codes.

4.6 Compliance

Comments are particularly welcome on this section

This committee draft of the standard defines the logical names of message types and fields within message types. It is expected that the final version will include a mapping to XML.

Compliance to XML mapping will be defined in terms similar to:

Compliance can be assessed separately for each message types.

A software component is deemed to be compliant to any specific message types if

1. The component can produce an XML message as defined in this standard and including all the fields with names and data types as defined in this standard. Data may be set to default values if it is not available within a component.
2. The component can read an XML message as defined in this standard and correctly interpret those fields that have a meaning within the component and ignore those fields that have no meaning.

5 Logical Network Message Types

5.1 General

A `NetworkDataSet` message can contain data for any part of a distribution network typically selected for operational or extension planning studies. The message contents could be part of a feeder, a single feeder or more than one feeder. The data could be either the 'As built' network or a proposed network selected for analysis. The `Document.title` and `Document.comments` fields can be used to describe the context of the data.

A `NetworkDataSet` message may have one or more associated `Diagram` messages that describe the graphical arrangement of symbols representing the network. Note that a single logical network may be represented on multiple diagrams showing different views of the network.

A `NetworkDataSet` message may contain references to other Documents containing static reference data such as a `ConductorCatalogue`, `MachineCatalogue` or `LoadDataSet`.

It is expected that many systems will only use messages like `GetNetworkDataSet` and `ShowNetworkDataSet`. The other message types have been defined to support more automated publish/subscribe scenarios.

5.2 ShowNetworkDataSet message structure

The basic structure is a hierarchy as shown in the figure below. The initial dynamic state of the network including switch positions is defined as a set of `MeasurementValues`. These values can be updated using the `ShowMeasurementList` message defined in IEC 61968 Part 3.

The class names and attributes are described in IEC 61970 Part 301 with the following exceptions and clarifications.

- For consistent treatment of all `ConductingEquipment` subtypes, `Conductors` that connect between multiple substations are listed under the 'from end' substations.
- To define associations between entities, alphanumeric identifiers are required for some entities such as `ConnectivityNode.ID` and `ConductingEquipment.ID` (see section 4.5).
- The generic model of an electrical network describes the static connectivity using the `ConductingEquipment-Terminal-ConnectivityNode` associations. A consumer component would therefore have to perform its own topology processing. To allow for cases where this is not possible or desirable, the producer component can pass additional information that can be used to associate `ConductingEquipment` with a `Feeder` and to define the upstream equipment. In the case of looped networks, there will be more than one upstream equipment. The meaning of 'Feeder' depends on the context of the information exchange. The same message types are applicable to 'As built' or any other configuration.
- The particular subtypes of `ConductingEquipment` e.g. `Breaker`, `Fuse`, `BusbarSection`, `Junction` may be derived from the contents of the `typeName` field.
- IEC 61070 Part 301 defines the target voltage for regulating equipment with general purpose schedules that can describe how the target voltage changes based on time or another parameter. This document defines a simpler model using a field called '`regulationKV`'.
- `ConductingEquipment 'terminals'` has been replaced by '`numterminals`'.
- `PowerTransformer 'numWindings'` has been added.
- 'Compensator' is expected to replace 'CapacitorBank', 'ReactorBank' in the earlier drafts of IEC 61970 Part 301.

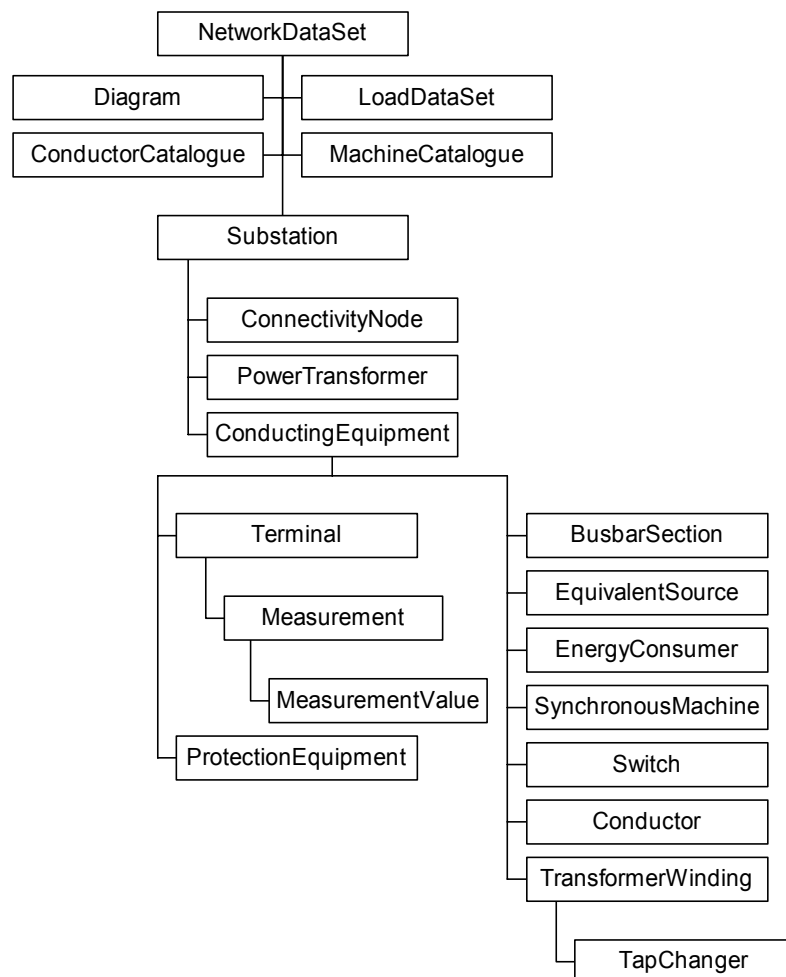


Figure 5.1: ShowNetworkDataSet message structure hierarchy

5.3 NetworkDataSet message types

5.3.1 NewNetworkDataSet

Usage: sent as the first response to a SubscribeNetworkDataSet message.

Preconditions: a SubscribeNetworkDataSet message has just been received.

Message Format: Identical to ShowNetworkDataSet.

5.3.2 ChangeNetworkDataSet

Usage: sent as second or later response to a SubscribeNetworkDataSet message, following some change in the data values.

Preconditions: a SubscribeNetworkDataSet message has been received some time ago.

Message Format: Identical to ShowNetworkDataSet.

5.3.3 ShowNetworkDataSet

Usage: sent as a response to a GetNetworkDataSet message, or as an alternative to NewNetworkDataSet or ChangeNetworkDataSet messages following a subscription for relevant changes defined in a SubscribeNetworkDataSet message.

Preconditions: Either a GetNetworkDataSet or a SubscribeNetworkDataSet must have been received by the producer component.

Postconditions: None

Message Format: As shown below.

Document.*

```
[0..*]Diagram.referenceCode
[0..*]LoadDataSet.referenceCode
[0..*]ConductorCatalogue.referenceCode
[0..*]MachineCatalogue.referenceCode
[0..*]
    Substation.name
    Substation.description
    Substation.typeName
    [0..*]
        ConnectivityNode.ID
    [0..*]
        PowerTransformer.ID
        PowerTransformer.name
        PowerTransformer.typeName
        PowerTransformer.phases
        PowerTransformer.numWindings
    [0..*]
        ConductingEquipment.ID
        ConductingEquipment.name
        ConductingEquipment.typeName
        ConductingEquipment.phases
        ConductingEquipment.numterminals
        ConductingEquipment.nominalVoltage
        ConductingEquipment.partof.Feeder.name
    [0..*]
```

```

    ConductingEquipment.upstream.ConductingEquipment.ID
[0..*]
    ConductingEquipment.has.Terminal.name
    ConductingEquipment.has.
        Terminal.connects.ConnectivityNode.ID
    [0..*]
        Measurement.name
        MeasurementUnit.name
        Measurement.MultiLevelDescription
        Measurement.key
        MeasurementValue.value
        MeasurementValue.quality
        MeasurementValue.timestamp
        MeasurementValue.alarmState
        MeasurementSource.name
        [0..*]
        SymbolPlacement.coordinate
        SymbolPlacement.coordinateList
        SymbolPlacement.polygonFlag
        SymbolPlacement.rotation
        SymbolPlacement.xScale
        SymbolPlacement.yScale
        SymbolPlacement.size
        SymbolPlacement.MemberOf.CoordinateSystem
[0..*]
    ProtectionEquipment.ID
    ProtectionEquipment.name
    ProtectionEquipment.typeName
    ProtectionEquipment.powerDirectionFlag

```

then as applicable for each type of ConductingEquipment

```

BusbarSection.baseVoltage
BusbarSection.highVoltageLimit
BusbarSection.lowVoltageLimit

EquivalentSource.nominalVoltage
EquivalentSource.voltageMagnitude
EquivalentSource.voltageAngle
EquivalentSource.ppsResistance
EquivalentSource.ppsReactance
EquivalentSource.npsResistance
EquivalentSource.npsResistance
EquivalentSource.zpsResistance
EquivalentSource.zpsResistance

EnergyConsumer.isConformingLoad
EnergyConsumer.customerCount
EnergyConsumer.pfixed
EnergyConsumer.pnom
EnergyConsumer.pFexp
EnergyConsumer.pVexp
EnergyConsumer.qfixed
EnergyConsumer.qnom
EnergyConsumer.qFexp
EnergyConsumer.qVexp
EquivalentLoad.feederLoadMgtFactor
EquivalentLoad.mWColdPickUpFactor
EquivalentLoad.mVArColdPickUpFactor
EnergyConsumer.has.LoadDemandModel.name
EnergyConsumer.has.NonConformLoadSchedule.name

```

Compensator.aVRdelay
Compensator.maximumkV
Compensator.minimumkV
Compensator.nominalkV
Compensator.nominalMVar
Compensator.r
Compensator.x
Compensator.normalSections
Compensator.maximumSections
Compensator.mVArPerSection
Compensator.voltSensitivity
Compensator.switchOnCount
Compensator.switchOnDate
Compensator.regulates.ConductingEquipment.ID
Compensator.regulates.ConductingEquipment.terminal.name
Compensator.regulationKV

SynchronousMachine.typeName (from MachineCatalogue)
SynchronousMachine.ratedMVA
SynchronousMachine.baseKV
SynchronousMachine.baseMW
SynchronousMachine.baseMVar
SynchronousMachine.maximumKV
SynchronousMachine.minimumKV
SynchronousMachine.maximumMVar
SynchronousMachine.minimumMVar
SynchronousMachine.regulates.ConductingEquipment.ID
SynchronousMachine.regulates.
ConductingEquipment.terminal.name
SynchronousMachine.regulationKV

Switch.normalOpen
Switch.switchOnCount
Switch.switchOnDate
Switch.ampRating
Breaker.inTransitTime

Conductor.length
Conductor.r
Conductor.r0
Conductor.x
Conductor.x0
Conductor.bch
Conductor.b0ch
Conductor.gch
Conductor.g0ch
Conductor.ConductorType.name

TransformerWinding.PowerTransformer.ID
TransformerWinding.windingID
TransformerWinding.connectionType
TransformerWinding.isGrounded
TransformerWinding.rground
TransformerWinding.xground
TransformerWinding.r
TransformerWinding.r0
TransformerWinding.x
TransformerWinding.x0
TransformerWinding.b

```

TransformerWinding.g
TransformerWinding.ratedKV
TransformerWinding.insulationKV
TransformerWinding.ratedMVA
TransformerWinding.shortTermMVA
TransformerWinding.emergencyMVA
[0..1]
    TapChanger.highStep
    TapChanger.lowStep
    TapChanger.neutralKV
    TapChanger.neutralStep
    TapChanger.normalStep
    TapChanger.phaseShift
    TapChanger.stepVoltageIncrement
    TapChanger.tculControlMode
    TapChanger.regulates.ConductingEquipment.ID
    TapChanger.regulates.
        ConductingEquipment.terminal.name
    TapChanger.regulationKV

```

5.3.4 CancelNetworkDataSet

Usage: Sent following a SubscribeNetworkDataSet message if no more data will be published for this document reference code due to some sort of error, e.g. the document was created inadvertently.

Message format:

Document.*

5.3.5 CloseNetworkDataSet

Usage: Sent following a SubscribeNetworkDataSet message if no more data will be published for this document reference code due to normal completion of activities.

Message format:

Document.*

5.3.6 DeleteNetworkDataSet

Usage: Sent following a SubscribeNetworkDataSet message if no more data will be published for this document reference code due to any reason. Any references to this document reference code can be removed within the consumer system. This message is the opposite of New. It may be used instead of or in addition to Close or Cancel.

Message format:

Document.*

5.3.7 GetNetworkDataSet

Usage: sent by a consumer application to request a set of network data.

Preconditions: None.

Postconditions: A ShowNetworkDataSet will be returned.

Message format: Same as ShowNetworkDataSet except that the message body contains either the required identities; or a set of query-by-example patterns.

5.3.8 SubscribeNetworkDataSet

Usage: sent by a consumer application to create or add network data sets to a subscription for updates.

Preconditions: None.

Postconditions: Values are passed in subsequent NewNetworkDataSet, ChangeNetworkDataSet, or ShowNetworkDataSet messages. The subscription is cancelled by an UnsubscribeNetworkDataSet message.

Message format: Same as ShowNetworkDataSet except that the message body contains either the required identities; or a set of query-by-example patterns.

5.3.9 AckNetworkDataSet

Typical Usage: sent by producer application following a SubscribeNetworkDataSet message.

Preconditions: None.

Postconditions: A ShowNetworkDataSet will be sent later containing a full set of data.

Message format: the same as a SubscribeNetworkDataSet message i.e. the original message is returned.

5.3.10 UnsubscribeNetworkDataSet

Usage: sent by a consumer application to delete all or some data sets from a subscription.

5.4 Network Change Set Message Types

A NetworkChangeSet message is similar to a NetworkDataSet message but with additional fields listing the Equipment to be deleted and Equipment to be updated. Any other equipment described in the message is assumed to be new i.e. for inserting.

A reference to a DiagramChangeSet replaces the reference to a Diagram.

Separate NetworkChangeSets may have to be applied in a specific order and hence a NetworkChangeSet message has an optional field with the reference code of the preceding change.

5.4.1 NewNetworkChangeSet

Usage: sent as the first response to a SubscribeNetworkChangeSet message.

Preconditions: a SubscribeNetworkChangeSet message has just been received.

Message Format: Identical to ShowNetworkChangeSet.

5.4.2 ChangeNetworkChangeSet

Usage: sent as second or later response to a SubscribeNetworkChangeSet message, following some change in the data values.

Preconditions: a SubscribeNetworkChangeSet message has been received some time ago.

Message Format: Identical to ShowNetworkChangeSet.

5.4.3 ShowNetworkChangeSet

Usage: sent as a response to a GetNetworkChangeSet message, or as an alternative to NewNetworkChangeSet or ChangeNetworkChangeSet messages following a subscription for relevant changes defined in a SubscribeNetworkChangeSet message.

Preconditions: Either a GetNetworkChangeSet or a SubscribeNetworkChangeSet must have been received by the producer component.

Postconditions: None

Message Format: As for **ShowNetworkDataSet** with additional fields.

```
previous.NetworkChangeSet.referenceCode
[0..*]DiagramChangeSet.referenceCode
[0..*]
    deletes.Substation.name
    [0..*]
        deletes.ConnectivityNode.ID
    [0..*]
        deletes.PowerTransformer.ID
    [0..*]
        deletes.ConductingEquipment.ID
    [0..*]
        deletes.Measurement.key
    [0..*]
        deletes.ProtectionEquipment.ID
[0..*]
```

```
updates.Substation.name
[0..*]
updates.ConnectivityNode.ID
[0..*]
updates.PowerTransformer.ID
[0..*]
updates.ConductingEquipment.ID
[0..*]
    updates.Measurement.key
[0..*]
    updates.ProtectionEquipment.ID
```

5.4.4 CancelNetworkChangeSet

Usage: Sent following a SubscribeNetworkChangeSet message if no more data will be published for this document reference code due to some sort of error, e.g. the document was created inadvertently.

Message format:

Document.*

5.4.5 CloseNetworkChangeSet

Usage: Sent following a SubscribeNetworkChangeSet message if no more data will be published for this document reference code due to normal completion of activities.

Message format:

Document.*

5.4.6 DeleteNetworkChangeSet

Usage: Sent following a SubscribeNetworkChangeSet message if no more data will be published for this document reference code due to any reason. Any references to this document reference code can be removed within the consumer system. This message is the opposite of New. It may be used instead of or in addition to Close or Cancel.

Message format:

Document.*

5.4.7 GetNetworkChangeSet

Usage: sent by a consumer application to request a set of network data.

Preconditions: None.

Postconditions: A ShowNetworkChangeSet will be returned.

Message format: Same as ShowNetworkChangeSet except that the message body contains either the required identities; or a set of query-by-example patterns.

5.4.8 SubscribeNetworkChangeSet

Usage: sent by a consumer application to create or add network data sets to a subscription for updates.

Preconditions: None.

Postconditions: Values are passed in subsequent NewNetworkChangeSet, ChangeNetworkChangeSet, or ShowNetworkChangeSet messages. The subscription is cancelled by an UnsubscribeNetworkChangeSet message.

Message format: Same as ShowNetworkChangeSet except that the message body contains either the required identities; or a set of query-by-example patterns.

5.4.9 AckNetworkChangeSet

Typical Usage: sent by producer application following a SubscribeNetworkChangeSet message.

Preconditions: None.

Postconditions: A ShowNetworkChangeSet will be sent later containing a full set of data.

Message format: the same as a SubscribeNetworkChangeSet message i.e. the original message is returned.

5.4.10 UnsubscribeNetworkChangeSet

Usage: sent by a consumer application to delete all or some data sets from a subscription.

6 Diagram Document Message Types

6.1 Diagram Message Types

Symbol placements could be optional for application components that do not have or do not need diagram data. For example some systems can synthesize a schematic tree diagram from the feeder connectivity.

Within an Asset Management or Network Operations system, there may be more than one diagram e.g. for different voltage levels, for different regions, or schematic and geographic views.

It is assumed that each application component has its own symbol library used for diagram display of electrical equipment. The information exchange has only to transfer the location, scaling and orientation of the symbols not the symbols themselves.

Subscribing systems often need to be able to display object in different views: a "primary view" with a scale of 1":600'; a detail view with a scale of 1":40'; a schematic view; and also internal views for cabinets, vaults, manholes, and sites. Typical use is that minimal operational information shows up at the primary view, but when the vault is selected on a display, a detailed internal view of the vault is displayed. This capability can be nested so that internal views of cabinets inside vaults can be displayed. The publishing and subscribing systems may also support the ability to specify that certain attributes should be shown in one mode (e.g., primary view) for objects that only show up in the internal world. For example, the operational name label for a switch inside a cabinet could be shown at a X/Y coordinate, rotation, etc. outside the cabinet symbol on the primary view.

Support is provided for each object to be able to have multiple geometries associated with it. This feature enables a subscribing system, without being required to use its database editing capability, to be able to display the object in one or many different types of diagrams. Referencing the following Location Package class diagram, each view has one associated CoordinateSystem class. The underlying electrical model is not impacted by having support for multiple geometries on a per object basis. However, the subscribing system is now able to render objects and labels for various display views, each being the correct size at the correct location that is appropriate for each view.

As shown in the NetworkDataSet messages, geometries may be passed with the relevant power system resources. When being passed in that manner, each geometry must identify (through association) which coordinate system that the instance is applicable for. Groups of symbols, referred to as diagrams, may also be exchanged independent of network data sets. Since application components differ widely in the units used to describe symbol coordinates, a parent document called a Diagram is used to define the units used for coordinates. Each application component may need a specific overall scaling factor and/or maximum dimensions that needs to be applied to the symbol placements.

Conductor sections do not necessarily need diagram data. Conductors can be drawn in the receiving application component by straight lines between symbol placements for busbars, T-points, switches and transformers. For those components that are capable of drawing conductor section midpoints, additional data can be defined for the coordinates.

Document.*

Diagram.name

Diagram.positionUnitName

Diagram.defaultPrintScale

Diagram.id

CoordinateSystem.name

CoordinateSystem.scale

CoordinateSystem.description

CoordinateSystem.xMin

CoordinateSystem.yMin

CoordinateSystem.xMax

CoordinateSystem.yMax
PointAsset.IsAt.Location
PowerSystemResource.IsAt.Location
[0..*]
 SymbolPlacement.coordinate
 SymbolPlacement.coordinateList
 SymbolPlacement.polygonFlag
 SymbolPlacement.rotation
 SymbolPlacement.xScale
 SymbolPlacement.yScale
 SymbolPlacement.size

 Annotation.text
 Annotation.font
 Annotation.fontSize
 Annotation.rotation
 Annotation.xPosition
 Annotation.yPosition

6.2 Diagram Change Set Message Types

To be defined similar to NetworkChangeSet message types

7 Reference Data Message Types

7.1 Conductor Catalogue Message Types

To be defined by ??? using attributes like

Document.*
ConductorType.*
WireType.*
WireArrangement.*

7.2 LoadDataSet Message Types

To be defined by ??? using attributes like

Document.*
LoadDemandModel.*
NonConformingLoad.*
other Load package classes

7.3 Machine Catalogue Message Types

To be defined by ??? using attributes like

Document.*
SynchronousMachine.r
SynchronousMachine.xd
SynchronousMachine.xd'
SynchronousMachine.xd''
SynchronousMachine.xq
SynchronousMachine.xq'

8 Asset Document Message Types

For the meaning of each message see section 3.4 Message Type Verbs and section 3.5 Message Type Nouns.

8.1 Organisation List Message Types

8.1.1 NewOrganisationList

Message format: Identical to ShowOrganisationList except that the producer application is indicating that this is the first occasion that data for this document reference code has been published.

8.1.2 ChangeOrganisationList

Message format: Identical to ShowOrganisationList except that the producer application is indicating that some of the data sections have different values since the previous message for the same document reference code.

8.1.3 ShowOrganisationList

Message format:

```
Document.*  
[0..*]  
Organisation.name  
Organisation.organisationType  
Organisation.code  
Organisation.number  
Organisation.phoneNumber  
[0..*]  
Organisation.ConsistsOf.Persons.*  
[0..*]  
Organisation.Has.Roles.*  
[0..*]  
Organisation.Has.Location.*  
[0..*]  
Organisation.Has.Documents.*  
[0..*]  
Organisation.IsParentOf.Organisation.*  
[0..*]  
Organsiation.isChildOf.Organisation.*
```

8.1.4 CancelOrganisationList

Message format:

```
Document.*
```

8.1.5 CloseOrganisationList

Message format:

```
Document.*
```

8.1.6 DeleteOrganisationList

Message format:

Document . *

8.1.7 GetOrganisationList

Message format: Identical to ShowOrganisationList except the message body contains the query-by-example pattern.

8.1.8 SubscribeOrganisationList

Message format: Identical to ShowOrganisationList except the message body contains the query-by-example pattern.

8.1.9 AckOrganisationList

Message format:

Document . *

8.1.10 UnsubscribeOrganisationList

Message format: Identical to ShowOrganisationList except the message body contains the query-by-example pattern.

8.2 Asset List Message Types

8.2.1 NewAssetList

Message format: Identical to ShowAssetList except that the producer application is indicating that this is the first occasion that data for this document reference code has been published.

8.2.2 ChangeAssetList

Message format: Identical to ShowAssetList except that the producer application is indicating that some of the data sections have different values since the previous message for the same document reference code.

8.2.3 ShowAssetList

Document.*

[0..*]

Asset.name

Asset.id

[0..*]

Asset.HasA.PowerSystemResource.id

8.2.4 CancelAssetList

Message format:

Document . *

8.2.5 CloseAssetList

Message format:

Document.*

8.2.6 DeleteAssetList

Message format:

Document.*

8.2.7 GetAssetList

Message format: Identical to ShowAssetList except the message body contains the query-by-example pattern.

8.2.8 SubscribeAssetList

Message format: Identical to ShowAssetList except the message body contains the query-by-example pattern.

8.2.9 AckAssetList

Message format:

Document.*

8.2.10 UnsubscribeAssetList

Message format: Identical to ShowAssetList except the message body contains the query-by-example pattern.

8.3 Asset Message Types

8.3.1 NewAsset

Message format: Identical to ShowAsset except that the producer application is indicating that this is the first occasion that data for this document reference code has been published.

8.3.2 ChangeAsset

Message format: Identical to ShowAsset except that the producer application is indicating that some of the data sections have different values since the previous message for the same document reference code.

8.3.3 ShowAsset

Document.*

[0..*]

Asset.code

Asset.condition

Asset.corpStandard

Asset.critical

Asset.description

Asset.financialValue

Asset.id

Asset.inServiceDate

Asset.installationDate
 Asset.manufacturedDate
 Asset.name
 Asset.number
 Asset.remarks
 Asset.removalDate
 Asset.removalReason
 Asset.serialNumber
 Asset.status
 Asset.statusDate
 Asset.type
 Asset.usage
 Asset.utc
 Asset.version
 Asset.warrantyDate
 Asset.purchaseOrder
 Asset.purchaseDate
 Asset.purchasePrice
 [0..*]
 Asset.HasA.PowerSystemResource.*
 [0..1]
 TypeModel.modelName
 TypeModel.modelDescription
 TypeModel.modelNumber
 TypeModel.modelVersion
 TypeModel.IsManufacturedBy.Organisations
 [0..*]
 AssetRatingSet.name
 AssetRatingSet.description
 AssetRatingSet.type
 AssetRatingSet.property
 AssetRatingSet.id
 [0..*]
 AssetPropertySet.name
 AssetPropertySet.description
 AssetPropertySet.type
 AssetPropertySet.id
 AssetPropertySet.value
 AssetPropertySet.units
 [0..*]
 Asset.inJursidictionOf.Organisations.*
 [1..1]
 Asset.InstalledBy.WorkOrder.id
 [0..1]
 Asset.RemovedBy.WorkOrder.id
 [0..*]
 Asset.IsMaintainedBy.Organisations.*
 [0..*]
 Asset.IsMaintainedBy.MaintenanceTicket.id

 Asset.IsAt.Location.*

 Asset.Has.InspectionRoutines.id

 Asset.Has.Specifications.*

 Asset.Has.QualificationRequirements.id

8.3.3.1 Linear Assets

LinearAsset inherits from Asset:

- Asset.*
- LinearAsset.material
- LinearAsset.insulated
- LinearAsset.HasDistribute.Locations
[0..1]
 - Volume.description
 - Volume.sizeUnits
 - Volume.sizeLength
 - Volume.sizeDepth
 - Volume.sizeWidth
 - Volume.sizeDiameter
- [0..*]
 - Location.*

8.3.3.1.1 Duct Banks

DuctBank inherits from LinearAsset:

- LinearAsset.*
- DuctBank.numDucts
- DuctBank.numCircuits

8.3.3.1.2 Structure Support

StructureSupport inherits from LinearAsset:

- LinearAsset.*
- StructureSupport.size
- StructureSupport.direction
- StructureSupport.length
- StructureSupport.numRods
- StructureSupport.rodLength
- [0..1]
 - StructureSupport.secures.Structure.*

8.3.3.2 Point Assets

PointAsset inherits from Asset:

- Asset.*
- [0..1]
 - PointAsset.IsAtOne.Location.*

8.3.3.2.1 Structure

Structure inherits from PointAsset:

- PointAsset.*
- Structure.height
- Structure.weedAbate
- Structure.weedRemDate
- Structure.fumigant
- Structure.fumigantApplyDate
- [0..1]

Structure.Has.StructureSupport.*

8.3.3.2.2 Pole

Pole inherits from Structure:

Structure.*
Pole.classification
Pole.species
Pole.treatment
Pole.base
Pole.preservative
Pole.treatedDate
Pole.breastBlock
[0..*]

Pole.Has.StreetLights.*

8.3.3.2.3 Street Light

StreetLight inherits from PointAsset:

PointAsset.*
StreetLight.rating
StreetLight.armLength

8.3.3.2.4 Cabinets

Cabinet inherits from PointAsset:

PointAsset.*
[0..1]
Volume.*

8.3.3.2.5 Vault

Vault inherits from PointAsset:

PointAsset.*
Vault.ventilation
Vault.sealingDate
Vault.sealingWarranty
[0..1]
Volume.*

8.3.3.2.6 Tools

Tool inherits from PointAsset:

PointAsset.*
Tool.lastCalibrationDate

8.3.3.2.7 MeterAsset

MeterAsset inherits from PointAsset:

PointAsset.*
Meter.type

Meter.KH
Meter.regR
Meter.noWires
Meter.ratedAmps
Meter.ratedVolts
Meter.noDials
Meter.form
Meter.sealNo
Meter.multiplier
Meter.demandMultiplier

8.3.3.2.8 Conducting Equipment

ConductingEquipment inherits from PointAsset:

PointAsset.*
ConductingEquipment.ratedVolts
ConductingEquipment.ratedAmps

8.3.4 DeleteAsset

Message format:

Document.*

8.3.5 GetAsset

Message format: Identical to ShowAsset except the message body contains the query-by-example pattern.

8.3.6 SubscribeAsset

Message format: Identical to ShowAsset except the message body contains the query-by-example pattern.

8.3.7 AckAsset

Message format:

Document.*

8.3.8 UnsubscribeAsset

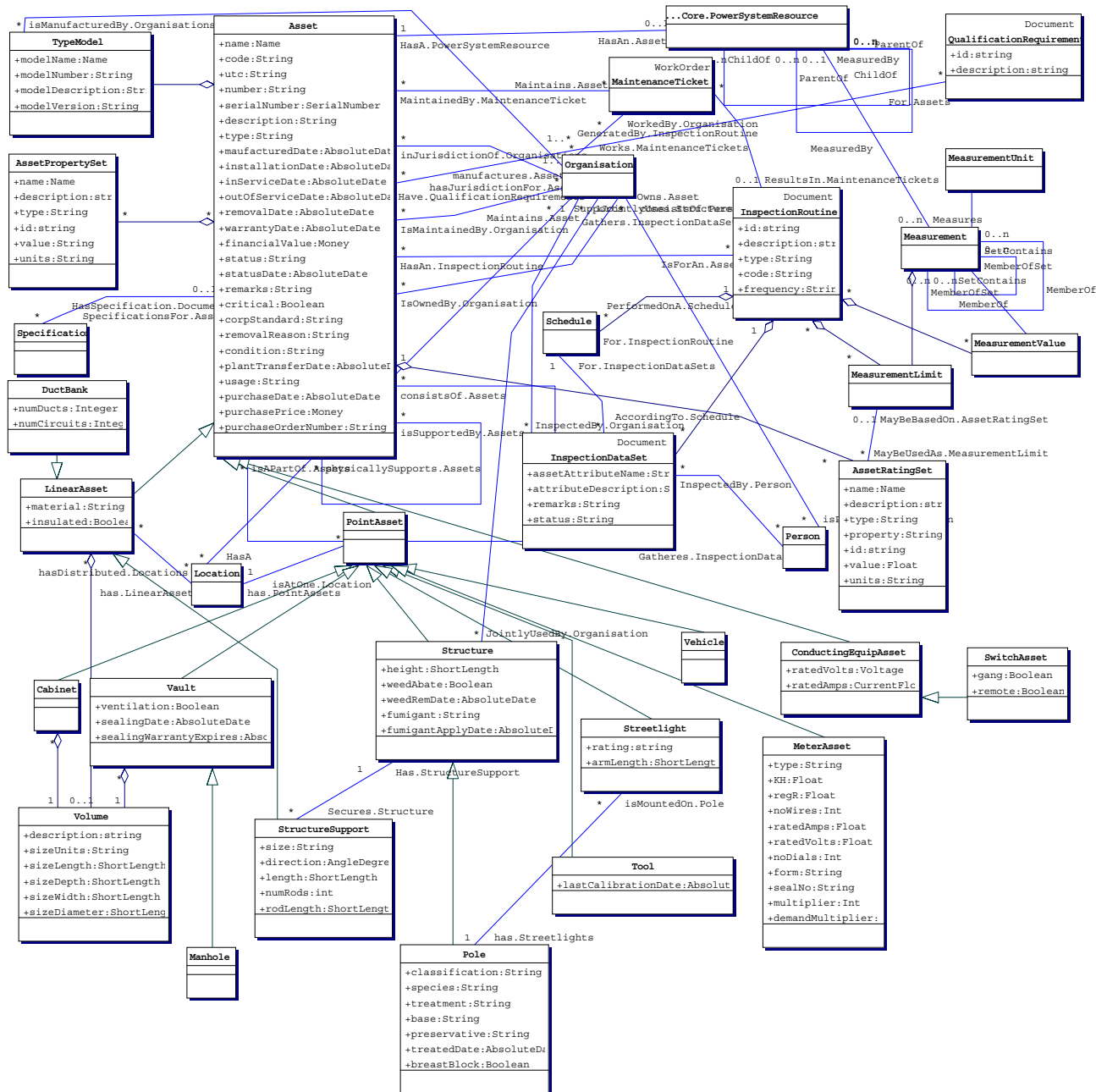
Message format: Identical to ShowAsset except the message body contains the query-by-example pattern.

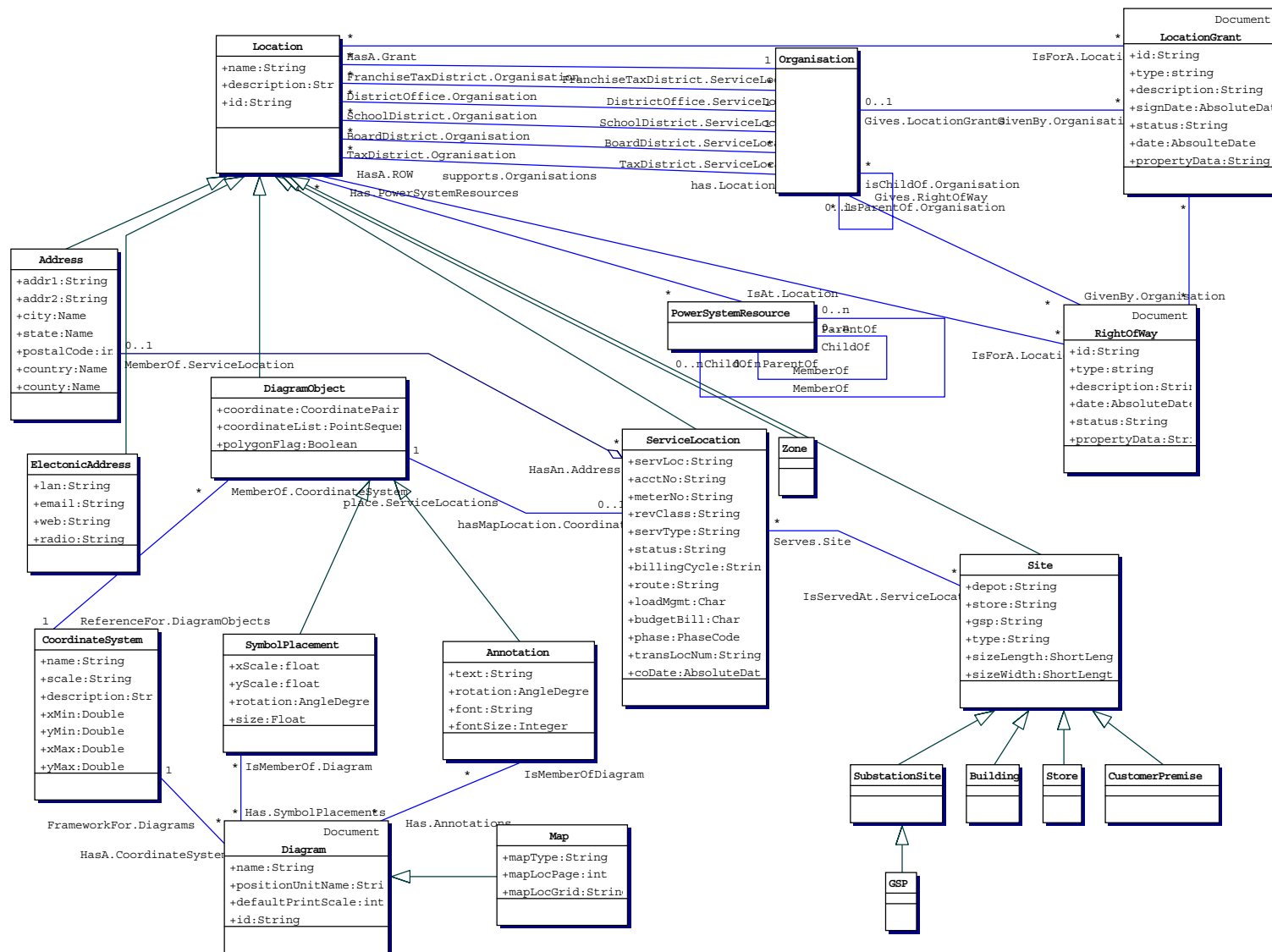
Informative Annex

ANNEX A: Relevant Packages of the Common Information Model (IEC 61968-11)

For a detailed description of the Common Information Model (CIM) classes and their attributes and relationships used in this specification's message types, refer to IEC 61968-11 and IEC 61970-301. For convenient reference, the most frequently used classes of the CIM are depicted in the following packages.

Asset Package





ANNEX B: Informative: Use cases**UC13_ExtendNetworkPlan (New Service for Developer)****Summary:**

Extension planning deals with the evaluation and the definition of projects for all proposed network changes

Actor(s):

Name	Role description
Planning Engineer	<ul style="list-style-type: none"> • Designs all extensions to the electrical network. • Perform “What if” analysis on the network to Ascertain the optimum running arrangement and protection requirements.
Management	<ul style="list-style-type: none"> • Sets the utility’s objectives and strategy. • Supervises and controls the actions of company personnel so as to bring about the desired objectives.

Participating Business Functions:

Acronym	Business Function, Sub-Function and Abstract Component
NE	Network Extension Planning
AM	Records and Asset Management
FIN	Financial
MC	Maintenance and Construction

Assumptions / Design Considerations:

- New building development results in a request for electricity supply (by a municipality or by a building promoter, or by and industry, or by private organisation, etc),
or
- Analysis of outages ‘statistics and customers’ trouble call records shows weaknesses in the system (systematic faults and supply quality problems)
or
- Analysis of the voltage’s and load on feeders, highlighting critical areas
or
- Maintenance department raises a request for equipment renewal.

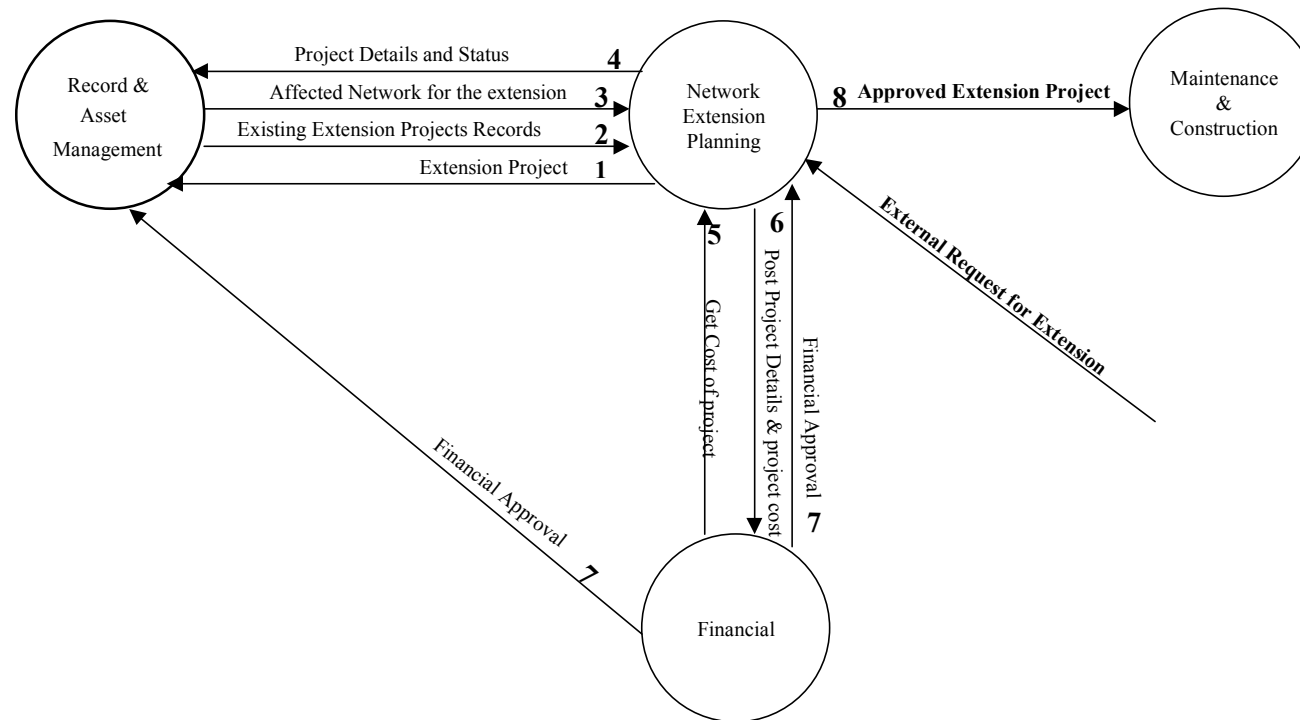
Normal Sequence:

Use Case Step	Event	Description Of Process	Information To Be Exchanged	<u>ProducerTo Receiver Abstract Component</u>	<u>Message Type (Verb/Noun)</u>
1.	Receive Request	<ul style="list-style-type: none"> New Supply. New Development. Setup new Project. 	Extension Project Request: 1. Extension Project ID 2. Location 3. Description	NE to AM	New ExtensionProject
2.	Compare with other projects in similar location	<ul style="list-style-type: none"> Find relationships to other projects 	Extension Project Record: Iteration of: 1. Extension Project Id 2. Location 3. Description 4. Project Details 5. Project Materials 6. Revision No 7. Project cost 8. Actual Cost 9. Project Status	AM to NE	Get ExtensionProjectRecords
3.	Receive Existing Network arrangement	<ul style="list-style-type: none"> Get affected network by Area required / Network required. 	Affected Network for Extension: 1. Plant Data 2. Connectivity Data 3. Load Data 4. Landbase	AM to NE-NCLC	Get AffectedNetworkDataset (For Current Model) Get LoadDataSet Get LandBaseDataSet
4.	Design Proposal	<ul style="list-style-type: none"> Design change Network Analyse network change 	Extension Project Details: 1. Extension Project Id 2. Project Details Extension Project Status: 1. Extension Project Id 2. Project Status	NE to AM	Change ExtesionProjectDetails Show ExtensionProjectDetails Show ExtensionProjectStatus
5.	Receive costs of Plant, Material and Manpower	<ul style="list-style-type: none"> Get current costs of Materials/Manpower 	Extension Project Cost: 1. Extension Project Id 2. Project Cost 3. Materials	FIN To NE	Get ExtensionProjectCost
6.	Send for financial	<ul style="list-style-type: none"> Send Design and Costs 	Extension Project Approval	NE to FIN	Request ExtensionProjectApp

	approval.	<ul style="list-style-type: none"> to management for approval. Project evaluated Financially and Technically 	Request: <ol style="list-style-type: none"> Extension Project Id Project Details Materials Revision Number Project Cost 		roval
7.	Financial approval Received	<ul style="list-style-type: none"> Financial Approval given to continue. Financial Approval not given Return to Step 5 	Financial Approval: <ol style="list-style-type: none"> Extension Project Id Project Status 	FIN to NE FIN to AM	Show ExtensionProjectStatus
8.	Send Completed Design	<ul style="list-style-type: none"> Process Completed 	Approved Extension Project: <ol style="list-style-type: none"> Extension Project ID Location Description Project Details Materials Cost Status 	NE to MC	New ApprovedExtensionProject

Integration Scenarios

The Diagram below shows the sequence of operations and the data flow between the Business Functions.



Information Model for normal sequence

Interface Class	Class Attribute	Attribute Type	Operations	Relations
ExtensionProjectRequest:	ExtensionProjectId Location Description		New	
ExtentionProjectRecord:	ExtensionProjectId Location Description ProjectDetails MaterialList RevisionNumber ProjectCost CostToCompletion ProjectStatus		Get	
NetworkDataSet	ExtensionProjectId PlantDetails Connectivity		Get	
LoadDataSet	ExtensionProjectId LoadData		Get	
LandBaseDataSet	ExtensionProjectId LandBase		Get	
ExtensionProjectCost	ExtensionProject Id ProjectCost MaterialList		Get	
ExtensionProjectDetails	ExtensionProjectId ProjectDetails		Change Show	
ExtensionProjectStatus	ExtensionProjectId ProjectStatus		Show	
ExtensionProjectApproval	ExtensionProjectId Location Description ProjectDetails RevisionNumber ProjectCost		Request	
ApprovedExtensionProject	ExtensionProject D Location Description ProjectDetails MaterialList ProjectCost Status		New	

Message Type Table

Message Type Identifier	Message Type Verb/Noun	Message Type Content Class.Attribute (Modelling team to identify the class)	Revision Number
	New ExtensionProject	ExtensionProjectId Location Description	1
	Get ExtensionProjectRecords	ExtensionProjectId Location Description ProjectDetails MaterialList RevisionNumber ProjectCost CostToCompletion ProjectStatus	1
	Get AffectedNetworkDataset (For Current Model)	ExtensionProjectId PlantDetails Connectivity	1
	Get LoadDataSet	ExtensionProjectId LoadData	1
	Get LandBaseDataSet	ExtensionProjectId LandBase	1
	Get ExtensionProjectCost	ExtensionProject Id ProjectCost MaterialList	1
	Change ExtesionProjectDetails	ExtensionProjectId ProjectDetails	1
	Show ExtensionProjectDetails	ExtensionProjectId ProjectDetails	1
	Show ExtensionProjectStatus	ExtensionProjectId ProjectStatus	1
	Request ExtensionProjectApproval	ExtensionProjectId Location Description ProjectDetails RevisionNumber ProjectCost	1
	New ApprovedExtensionProject	ExtensionProject D Location Description ProjectDetails MaterialList ProjectCost Status	1

Revision History:

No	Date	Author	Description
1	31 st Jan 200	Paul Fleeman Peter Walker, Shahed Ansar	Network Extension Planning
2	18 th Sept'2000	Paul Fleeman Peter Walker, Shahed Ansar	Network Extension Planning

UC34_CopyFeeder**Summary:**

This use case describes the process of copying data for one or more distribution feeders from an asset management, electrical inventory (AM-EINV) component to a network extension, network calculation (NE-NCLC) application component.

This use case is similar to copying feeder data from a real time network operations, network monitoring (NO-NMON) component to a network operations, network calculation (NO-CLC) component. This use case describes the specific case of copying complete feeders. A related document message type is proposed for 'as built' updates or diagram patches for an alternate sequence. This alternate sequence is applicable to the general case of export and import of distribution feeder data between any two systems.

In those countries where regulations permit, individual customer's meter records of kWh can be used to calculate the lumped kW values for each distribution transformer. This is a separate use case to process address/network connection data held in a customer inquiry, customer information system (CI-CIS) systems together with the load characteristics and/or consumption meter data held in a meter reading system (MR-RMR).

Actor(s):

Name	Role description
Data maintenance technician	A person who inserts, updates and deletes data within the Asset Management (AM) system.
Analyst	A person who performs network analysis functions on the data. May be a Planning Engineer looking at possible network extensions. May be a Control Engineer looking at potential network switching operations.
Control engineer	A person responsible for network operations

Participating Business Functions:

Acronym	Business Function Abstract Component	Services or information provided
AM	Records and asset management	
AM-EINV	Substation and network inventory	Substation and network inventory including equipment characteristics and connectivity.
AM-GINV	Geographical inventory	Geographic or schematic display of network and substations.
FDT	Feeder Data Transform	An adapter component that transforms data. This may be part of AM, part of NE or a separate process.
NE	Network extension planning	
NE-NCLC	Network calculations	Power flows Short-circuit analysis Energy loss optimization Feeder voltage profiles Relay coordination
Alternatives		
NO	Network operations	
NO-NMON	Network monitoring	Network switching state data acquired from SCADA data acquired from field crews
NO	Network operations	
NO-CLC	Network calculation component.	Power flows Short-circuit analysis

Assumptions / Design Considerations:

1. Feeder Case Document

A Feeder as specified in the IEC 61970 Part 301 Common Information Model is “a static collection of conducting equipment originating at a main distribution center and supplying one or more secondary distribution centers, one or more branch-circuit distribution centers, or any combination of these two types of equipment.”

A Feeder could be ‘as-built’, ‘real-time’ or ‘proposed’ depending on the application component and its context. The collection of equipment belonging to ‘as-built’ feeders depends on the position of open-points. The collection of equipment belonging to ‘real-time’ feeders depends on the real time switch positions. It is expected that equipment identifiers have a longer lifetime (and hence are more useful as keys), than feeder identifiers.

For optimization studies it is usually necessary to have a single case which is a set of adjacent Feeders. For other use cases it may be useful to describe part of a Feeder e.g. between different ProtectionEquipment.

In conclusion, the most generic description of a feeder case is a `NetworkDataSet` that is a single list of equipment, rather than a list of Feeders, each of which has equipment. In addition, the `NetworkDataSet` has to include appropriate diagram symbol placements.

This use case defines a document type to hold the full set of data required for network calculations. Other use cases may require subsets of the data; for example, outage management only needs the connectivity data.

2. De-clutter of unwanted detail

Although all systems in this use case exchange data using the same types of objects, it is possible that a network extension analyst is not interested in all the instances of asset or operational objects. This use case therefore includes a step where the network connectivity can be simplified for Analysis purposes. For example, the asset management system may define the individual switches within a Ring Main Unit plus the cable section connecting this to a distribution transformer. For analysis purposes, it may be clearer to replace the switches with a single network node.

3. Equipment Identifiers

In the normal sequence, this use case describes a one-way data transfer to a network calculation component. It is assumed that the asset management components hold identifiers (names) for equipment but not necessarily for `ConnectivityNodes`. One of the steps in the sequence synthesizes unique names for `ConnectivityNodes` as this is required by typical network calculation components.

In the alternate sequence, where data is exchanged for changes in the network between components that may have different conventions for naming objects, it may be necessary to have a cross-reference table of identifiers. This could be a separate component or multiple identifiers could be stored within the asset management inventory components.

4. Diagram Symbols

Firstly, symbol placements could be optional for application components that do not have or do not need diagram data. For example some systems can synthesize a schematic tree diagram from the feeder connectivity.

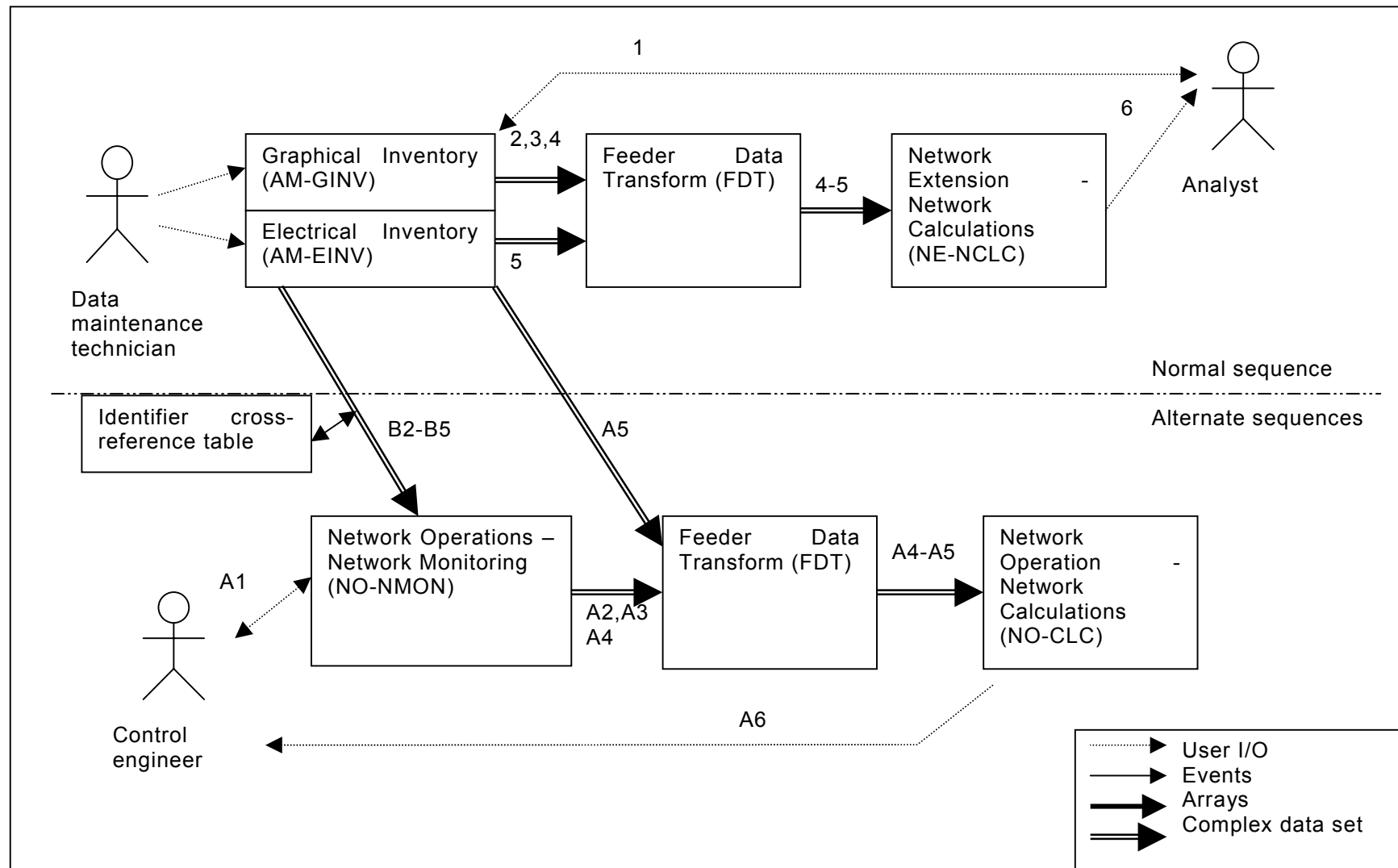
Within an Asset Management or Network Operations system, there may be more than one diagram e.g. for different voltage levels, for different regions, or schematic and geographic views.

It is assumed that each application component has its own symbol library used for diagram display of electrical equipment. The information exchange has only to transfer the location, scaling and orientation of the symbols not the symbols themselves. Since application components differ widely in the units used to describe symbol coordinates, a parent document called a Diagram is used to define the units used for coordinates. Each application component may need a specific overall scaling factor and/or maximum dimensions that needs to be applied to the symbol placements.

Conductor sections do not necessarily need diagram data. Conductors can be drawn in the receiving application component by straight lines between symbol placements for busbars, T-points, switches and transformers. For those components that are capable of drawing conductor section midpoints, it is easy to define an optional entity for the coordinates.

Integration Scenario Diagram:

This diagram shows the Asset Management & Network Extension Planning components used in the normal sequence; and also the Network Operations components used in an alternate sequence. The numbers refer to the sequence steps.



Pre-conditions:

A data maintenance engineer or technician has populated the Electrical Inventory and the Geographic Inventory of the Asset Management system with relevant data for the network. The kW load demand values for each EnergyConsumer and LoadDemandModel have been calculated from historical measured data, customer meter records or equipment ratings.

Normal Sequence:

(This shows in time order, the sequence of information exchanges between the subsystems)

Use Case Step	Event	Description Of Process	Information To Be Exchanged	ProducerTo Receiver Abstract Component	Message Type (Verb/Noun)
1.	Analyst selects diagram and equipment of interest and requests feeder highlighting	Asset Management System traces feeder connections	Highlight feeder on display.	AM-GINV to User Interface	Get Diagram Show EquipmentList
1.1.	(optional) Analyst selects other feeders	As step 1	Highlight feeder on display.	AM-GINV to User Interface	Show EquipmentList
2.	Analyst requests export of list of equipment	Asset Management System traces feeder connections Asset Management locates Electrical data corresponding to Graphical data	PowerSystemResource association with SymbolPlacement List of device identifiers	AM-GINV to AM-EINV AM-GINV to FDT	Create NetworkDataSet (for) Diagram (with) EquipmentList
3.	Analyst requests addition of connectivity and parameter data	Feeder Data Transform component fetches connectivity data	Site, Equipment Terminal, and ConnectivityNode associations	AM-GINV to FDT	Show Site Show Terminal Show ConnectivityNode
3.1.	(optional) Analyst requests de-clutter of unwanted detail	Feeder Data Transform simplifies feeder network by merging closed switches.		FDT internal	Not applicable

Use Case Step	Event	Description Of Process	Information To Be Exchanged	<u>ProducerTo Receiver Abstract Component</u>	<u>Message Type (Verb/Noun)</u>
4.		Feeder Data Transform processes graphical data			
4.1.	Automatic	Feeder Data Transform synthesizes node names from site-equipment-terminal names		FDT internal	Not applicable
4.2.	Automatic	Feeder Data Transform component processes diagram coordinate data for nodes	Node names, X,Y locations, orientation, scales	AM-GINV to NE-NCLC	GetList SymbolPlacement Show ConnectivityNode
5.		Feeder Data Transform processes electrical data			
5.1.	Automatic	Feeder Data Transform processes source and general data	Source voltage and impedance, load scaling factors	AM-EINV to NE-NCLC	GetList EquivalentSource Show EquivalentSource GetList LoadDemandModel Show LoadDemandModel
5.2.	Automatic	Feeder Data Transform processes switch data	From, to nodes, phases, type, name, normal and current state	AM-EINV to NE-NCLC	GetList Switch Show Switch
5.3.	Automatic	Feeder Data Transform component processes line and cable data	From, to nodes, phases, type, length. Conductor type impedance per unit length, ratings	AM-EINV to NE-NCLC	GetList Conductor Show Conductor
5.4.	Automatic	Feeder Data Transform component processes step-down transformer data	From, to nodes, phases, type, rating, impedance, tap type, target voltage, control mode	AM-EINV to NE-NCLC	GetList Transformer Show Transformer
5.5.	Automatic	Feeder Data Transform component processes load data	Node, phases, kW, kVAR, category, type	AM-EINV to NE-NCLC	GetList EnergyConsumer Show EnergyConsumer
5.6.	Automatic	Feeder Data Transform component processes embedded generation data	Node, phases, kW, kVAR, category, type	AM-EINV to NE-NCLC	GetList SynchronousMachine Show SynchronousMachine

Use Case Step	Event	Description Of Process	Information To Be Exchanged	<u>ProducerTo Receiver Abstract Component</u>	<u>Message Type (Verb/Noun)</u>
5.7.	Automatic	Network Calculation component validates data		NE-NCLC internal	Not applicable
6.	Analyst runs analysis function	Network Calculation component executes	Calculation results e.g. Voltages, currents	NE-NCLC to User Interface	

Exceptions / Alternate Sequences

Steps 2 and 5 are optional. They affect which entities are parts of the information exchange.

Alternate Sequence A.

A similar sequence of steps (A1-A6) can be used to copy feeder data from a real time network operations, network monitoring (NO-NMON) component to a network operations, network calculation (NO-CLC) component.

Alternate Sequence B.

An alternative is that the producer component transfers information on a set of changes to the real time network operations, network monitoring (NO-NMON) component. A NetworkChangeSet is a special type of NetworkDataSet that lists the identities of equipment to be deleted, and details of existing equipment to be modified or moved or new equipment to be inserted. A NetworkChangeSet document may be part of a sequence of alterations that must be applied in a specific order.

Use Case Step	Event	Description Of Process	Information To Be Exchanged	<u>ProducerTo Receiver Abstract Component</u>	<u>Message Type (Verb/Noun)</u>
B1	Data maintenance technician updates inventories	Edit the diagram Enter equipment modifications.	Changes to SymbolPlacements Changes to equipment	User interface to AM-GINV User interface to AM-EINV	Create NetworkChangeSet
B2-B5	Control engineer applies system alteration to real time system	Network Monitor (NO-NMON) component deletes, updates, inserts data	Changes to SymbolPlacements Changes to equipment.	AM-GINV to NO-NMON AM-EINV to NO-NMON	Get NetworkChangeSet

Post Conditions

The network calculation component contains a copy of the feeder data.

Information Model for normal sequence.

Class	Class Attributes	Attribute Type	Operations	Relations
NetworkDataSet Container for the description of the equipment for part of a distribution network. Could be one or more feeders selected for analysis or a 'diagram patch'..	Inherit from Document author referenceNumber savedDate		Create Show	Has (0..1) Diagram Has (1..1) EquipmentList Has (0..1) ConductorCatalogue
EquipmentList List of equipment identifiers that can be used to get associated electrical parameters and SymbolPlacements			Create GetList List	Has PowerSystemResources (1..N)
From Core and Topology packages Equipment connectivity without electrical parameters. Possibly output from Geographical Inventory (GINV). May be useful for outage management to locate upstream protection devices.	<i>an optional part of NetworkDataSet</i>			Equipment, terminals & nodes SymbolPlacement
Subset of Wires package Parameters from Electrical Inventory (EINV) Data not included in connectivity but required for network calculations	<i>an optional part of NetworkDataSet</i>			Equipment, types, lengths, ratings, loads
ConductorCatalogue Reference data that does not change as often as the network.	Inherit from Document			Reference table of ConductorTypes

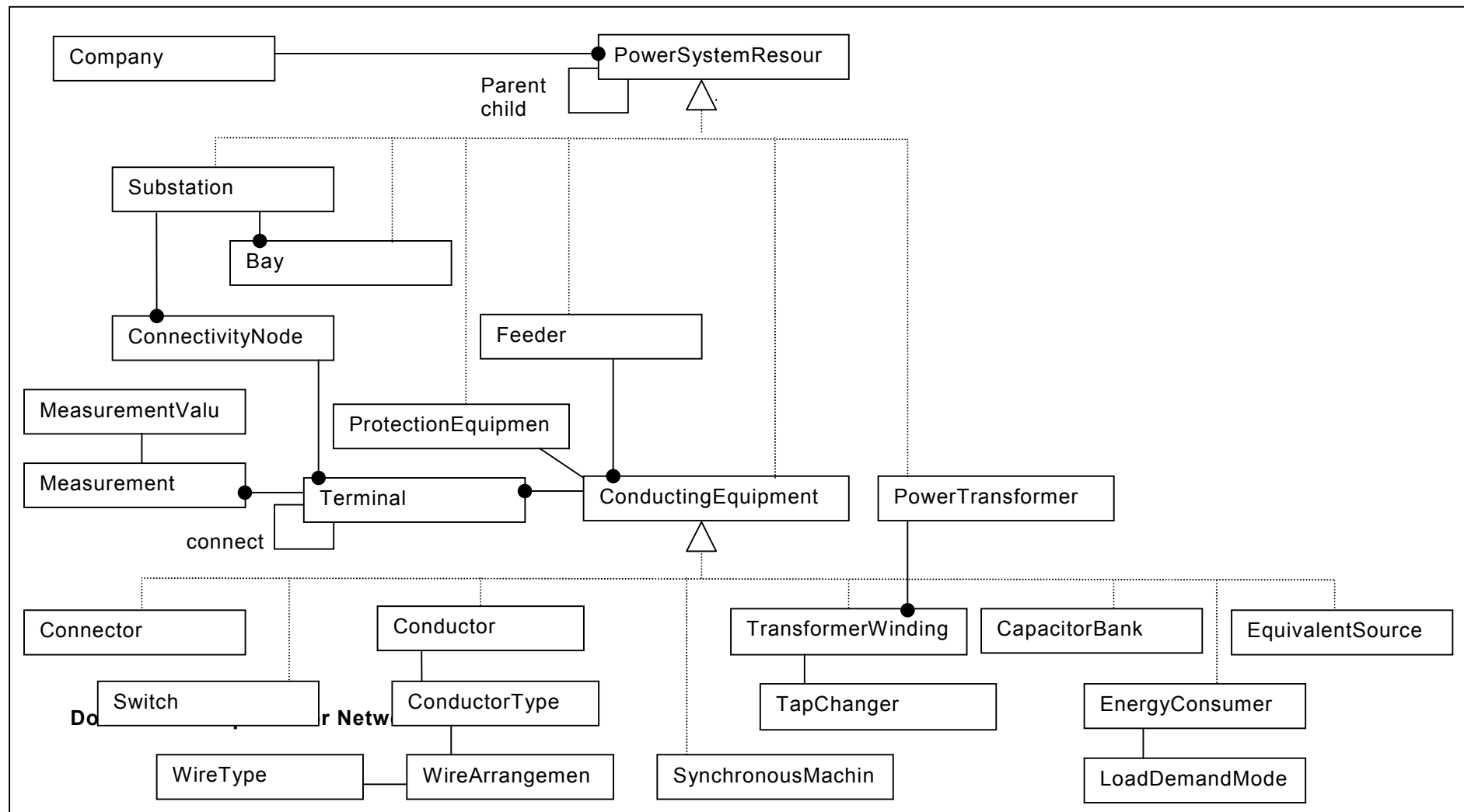
Class	Class Attributes	Attribute Type	Operations	Relations
<p>Diagram</p> <p>Document that owns a set of SymbolPlacements. The diagram could be schematic or geographic.</p> <p>The positionUnits attribute is a string to describe the units of the symbol placements whether physical (feet, metres, latitude/longitude), page oriented (in, mm, cm, pt) or screen oriented (pixels, dimensionless).</p> <p>The defaultPrintScale attribute is the number of positionUnits per pt (1/72 in) when a diagram is printed at the default magnification.</p>	<p>Inherit from Document</p> <p>diagramName savedDate</p> <p>positionUnitName</p> <p>DefaultPrintScale</p>	<p>String Date</p> <p>String</p> <p>Float</p>	<p>Get Show</p>	<p>Has SymbolPlacements</p>
<p>SymbolPlacement</p> <p>Defines the location of a graphical symbol on a diagram for a single PowerSystemResource (except conductors). The type of symbol would be created within each application component depending on the type of the PowerSystemResource.</p> <p>The textCode controls the orientation and visibility of text labels associated with the symbol.</p>	<p>x_position y_position x_scale y_scale rotation</p> <p>textCode</p>	<p>positionUnit positionUnit Float (no units) Float (no units) Float (degrees)</p> <p>Enumeration</p>	<p>GetList List</p>	<p>Placed on exactly one Diagram</p> <p>A PowerSystemResource may have zero or more symbol placements (but only one per diagram)</p>
<p>ConductorPoint</p> <p>Defines the location of mid-points of conductor sections for those components that can draw them.</p> <p>The point order is from terminal 1 to terminal 2.</p>	<p>sequenceNum x_position y_position</p>	<p>Integer positionUnit positionUnit</p>	<p>GetList List</p>	<p>Placed on exactly one Diagram</p> <p>A PowerSystemResource (of type Conductor) may have (0..N) ConductorPoints.</p>

Information Model for alternate sequence B: As-Built Update

Interface Class	Class Attributes	Attribute Type	Operations	Relations
NetworkChangeSet A special type of NetworkDataSet with the addition of a list of Equipment to be deleted, and a list of Equipment to be updated. Within the receiving component, the equipment, symbol placement, connectivity and parameter data is either updated (if the equipment is in the update list) or inserted (if its not in the update list). A NetworkChangeSet may be part of a sequence that must be applied in a specific order.	Inherit from NetworkDataSet which inherits Document author referenceNumber savedDate		Create Show	Has (0..N) Diagram Has (1) EquipmentList Deletes (1) EquipmentList Updates (1) EquipmentList Prev (0..1) NetworkChangeSet Next (0..n) NetworkChangeSet

Feeder Equipment Data Model – Relevant classes from Core, Topology and Wires packages

Note: PowerSystemResource can be a non-network object e.g. a Ring Main Unit. Substation could be any equipment location. TapChanger & CapacitorBank associations with RegulationSchedule and Measurement omitted for clarity.



References:

IEC 61970 Part 301 Common Information Model - Draft 5

Issues:

ID	Description	Status
1.	This use case needs a number allocated	Closed
2.	Erich Weurgler of TC57 WG13 will describe some related use cases. One use case will include a symmetrical line with all the electrical characteristics defined in the conductor object. Another use case will be for an asymmetric line where a catalogue of wire configurations is defined and then used for defining the geometrical layout, which is then used by the calculation package to calculate the electrical characteristics.	Waiting for reference
3.	Should FeederConnectivity, FeederParameters exist as separate documents? They could simply be optional parts of NetworkDataSet. This depends on the overlap with other use cases.	Closed Use optional parts (WG14 Birmingham)
4.	What are standard GIS units for diagrams? Answer: there aren't any – add description of units to Diagram.	Closed
5.	ConductorType does not have R,X per unit length – this must be calculated from WireType and WireArrangement	Co-ordinate with Erich Weurgler.
6.	WireType only has one ampRating attribute. How should seasonal ratings be modeled?	Co-ordinate with Erich Weurgler
7.	Add reference to use case for calculation of transformer loads from customer records.	Open
8.	Add section showing outline of NetworkDataSet document parts	Open
9.	Clarify how system alteration defines connectivity and parameters	Closed

Revision History:

No	Date	Author	Description
1.	22-Oct-99	T. Berry	Original.
2	4-Nov-99	T. Berry	Add data model diagram
3a	22-Nov-99	T. Berry	Convert to WG14 format, add LoadDemandModel
3b	1-Dec-99	T. Berry	Use 61968 Function & Component acronyms Add SymbolPlacement attributes Add SystemAlteration
3c	2-Dec-99	T. Berry	Extend design assumptions section to include comments from Bill Wilson and Guangsheng Wang Add separate NetworkDataSet diagram
3d	3-Dec-99	T. Berry	Add ConductorPoint, SynchronousMachine Describe SystemAlteration as alternate sequence
4	10-Dec-99	T. Berry	Add Diagram.positionUnitName, defaultPrintScale Add Identifier cross-reference table & other comments from Eric Lambert
5	14-Feb-00	T. Berry	Rename FeederCase as NetworkDataSet Rename SystemAlteration as NetworkChangeSet and inherit from NetworkDataSet Delete FeederConnectivity and FeederParameters as separate entities. Define internal steps as sub-steps.
6			

UC35_NetworkEdit**Summary:**

This is a use case to define the information to be exchanged from GIS to DMS. The data model is obtained from Midland Electricity

Data downloaded from the GIS is used to populate the network model to represent 'as build' model of the electrical network

GIS sends validated data representing the current 'as build' model. This data consists of HV/LV network inventory database information, HV/LV connectivity information, Customer data and their attachment to the network. The information also include various graphical representation e.g. HV Schematic diagrams and EHV/HV Geographical maps, LV Geoschematics maps and Ordnance Survey maps. It

Once the initial set of data representing the 'as build' model of the electrical network has been transferred, it needs to be maintained in the receiving systems. Regularly, changes are made to the 'as build' network model and implemented in the GIS Model. These modifications need to be transferred as when required.

Actor(s):

Name	Role description
Planning Engineer	<ul style="list-style-type: none"> • Designs all extensions to the electrical network. • Perform "What if" analysis on the network to Ascertain the optimum running arrangement and protection requirements.
Control Engineer	Approving Planned Switching Schedules Safety from the System Network operations within thermal and short circuit ratings Direction of switching to release plant for work or restore supplies following a fault

Participating Business Functions

Acronym	Business function, Sub function and Abstract Component
NE	Network Extension Planning
AM	Records and Asset Management
NO	Network Operations

Pre-conditions:

The Planning Engineer has approved network Edits. See also UC-14 Network Extension Implementation

Assumption/Design Consideration

MEB terminology has been used. A 'Patch' defines an edit to Add/Modify/Remove devices in the network model. DMS will use the data transmitted through this interface to populate it's own 'as build' electrical network model, also referred as the 'preferred model'.

Initial population is effectively a Patch with only Additions. In other words, GIS will provide the initial download data in the form of a huge patch, in which every item of plants and connectivity link are 'Added'.

GIS groups together the Edits made to the 'as build' model in a form of 'transaction package' called a Patch.

Once a patch is formed and sent across to DMS, the receiving component will process it as a 'single unit of work', in the sense that all the edits contained in a patch will be applied or none at all, should an error occur.

Graphical representation files are also sent to DMS for the followings:

- HV schematics
- HV geographics
- EHV geographics
- LV geo-schematics
- Service Area Map
- Ordnance Survey

All patches will have to be validated by an operator before being committed to the active electrical model

Patches depends on each other and so a mechanism must be provided to explicitly declare dependencies between patches. It could be a 'Patch Dependency table', where each records declares a parent-child relationship between two patches. Any patch may have one or more 'parent', and one or more 'child'.

Irrespective of the date/time/sequence number associated with their creation, DMS should never apply a patch if all of its declared parents have not been previously applied.

A mechanism has to be provided to allows patches to be 'applied' in a **simulated** subset of the network model, thus enabling viewing of their content, validating and writing switching schedules against plants that may not exist yet in the field

The interface mechanism need also to transfer 'Interface Control Entities' to control access, manage the operations of the interface also to enforce referential integrity between various data elements

Normal Sequence:

This sequence deals with applying Project Patch, followed by a Final Patch. A Project Patch consists of many Edits affecting graphical representations of the as build model

No graphic files are transferred to DMS in a 'Project Patch'. Because patches can be produced a long time ahead of their actual implementation and they might not reflect the current state. Hence cannot be committed 'completely' in GIS until they have been applied in DMS. Until such time, GIS will not be able to generate 'Final' versions of all the graphic files (schematic, geographic, etc.). In addition, the GIS might not have at hand some specific information at the time the project patch is created. Only when it is actually implemented in the field will that information become available.

The downloading of the "Final Patch" corresponding to the Project Patch completes the Network Edits

Please see Use Case: *Extension Planning Implementation* for the other steps associated with Network Edits

Use Case Step	Event	Description Of Process	Information To Be Exchanged	Producer To Receiver Abstract Component	Message Type (Verb/Noun)
1.	GIS Downloads Project Patches		(Details are given at the end of this section) 1. Interface Control 2. Dependencies between Patches 3. Transactions (changes to the plant) 4. Plant Details 5. Connectivity Changes 6. LV/HV/EHV Customer Premises	AM to NO	NewNetworkPatch
2.	DMS applies the Project patches successfully				
3.	GIS downloads Final Patch		1. Interface Control 2. Dependencies between Patches 3. Transactions (changes to the plant) 4. Plant Details 5. Graphical Location Reference 6. Sheet Index 7. HV schematics 8. HV geographics 9. EHV geographics 10. LV geo-schematics 11. Service Area Map 12. Support File Changes		NewFinalPatch

Details of the Interface Information to be exchanged

Interface Control

Description
Interface Patch ID Every Job is given a unique job ID. This is the 'key' to every transactions (attributes / connectivity) contained within a job.
Job Type:
System Job Number
System Name of sender:
System Name of Destination
Submitting User Name:
Receiving User Name: This field should contain the name of the individual who applied/canceled/ rejected the patch, or the name of the processing system when in error.
Date / Time Submitted
Date / Time Committed/Rejected/in Error
Job / Project Status (<i>see section 3.3.8</i>) 'R' = Received 'S' = Simulating 'P' = Prepare for Committing 'A' = Applying 'C' = Canceled Patch
Error textual description, blank if no error.
Description
Processing state: (<i>see section 3.3.8</i>) 'S' = Submitted 'P' = Processing 'C' = Completed 'D' = Data Error 'E' = System Error

Description
'T' = Transaction Conflicts
'X' = Dependency Conflicts
'R' = Rejected Processing

Dependencies between Patches

Description
Patch ID of the patch being analyzed
Patch ID of a 'parent' patch

Transaction Table

Within a patch , changes made to items of plants are expressed in a set of transactions. The purpose of the Transaction Table is identify transactions affecting only plant items and changes to their attributes and group them

A transaction record will always imply additional information in the form of attributes tables and are described using the « Add/Modify/Remove » along with appropriate plant attributes tables.

Description
Interface Patch ID
PLANT_ID – Unique reference of an item of plant.
Operation Code, valid values are: 'A' = Add Plant Item 'M' = Modify Plant Item 'R' = Delete Plant Item
Device Type

Sheet index

GIS is responsible for creating and maintaining Schematic, Geographic and Geo-Schematic (LVNMS) diagrams and the Service Area Map. DMS requires not only access to a copy of these files, but also requires to be notified of any changes made to them by owning system, in order to distribute them to their proper location. The Sheet Index provides notification of any changes made to graphic files.

Description
Interface Patch ID
Sheet Filename the filename of the actual DGN file

Description
Sheet type '1'=SCHEMATIC '2'=HV GEOGRAPHIC '3'=EHV GEOGRAPHIC '4'=LV GEOSCHEMATIC '5'=ORDNANCE SURVEY '6'=SERVICE AREA MAP
Operation 'A' = Add Sheet file 'M' = Modify Sheet file 'R' = Delete Sheet file

Support File

The purpose of this table is to provide a mechanism to notify DMS of any changes made to any binary support files e.g Font library files.

Description
Interface Patch ID
Support file name Contains the actual filename of the entity being changed
Operation 'A' = Add Support file 'M' = Modify Support file 'R' = Remove Support file
Support file type

Connectivity Changes.

INT_PATCH_ID
PLANT_ID
OPCODE (add or remove)
FROM_NODE
NODE_1
TO_NODE
NODE_2
ZERO_SET_VAL
SEGMENT_ID
RB_PRIMARY
RB_SECONDARY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

Plant Details

The Plant Details provides attributes information of a plant.

Every plant are identified by a unique identifier named PLANT_ID. This is unique across HV and LV networks.

For each entity it will consist of the

INT_PATCH_ID

Plant Model

The plant models are defined below. (Here we need the modeling team to rationalize these to extend the CIM Model)

HC_BUSBAR

HC BUSBAR Attributes
PLANT_ID
MR OF LV SWGR SITE
SURGE DIVERTER
RATING
RATING UNITS
FAULT LEVEL HV MVA
VT
ASSEMBLY
ON MAIN
SOURCE PRN
ASSOC PROTECTION
ASSOC METERING
SWITCH SECTION ID
OPER VOLTAGE KV
VOLT PH ANG RD
VOLT PH ANG RD NEG
VOLT PH ANG RD ZER
CALC VOLTAGE KV
CALC VOLT KV NEG
CALC VOLT KV ZERO
PROTECTION 1
PROTECTION 2
CMR FLAG
SCH FLAG
NET FLAG
NOMENCLATURE
MEMBER OF SITE
SEGMENT ID
X COORDINATE
Y COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK

CCT_BREAKER:

CCT_BREAKER Attributes
PLANT_ID
PRMS_NUMBER
ISOLATABLE
VISITRACE_STAGE_NB
FAULT_PASSAGE_IND
ON_MAIN
SOURCE_PRN
DESIGNATION
OPERATIONAL_STATUS
NORMAL_OPEN_POINT
RATED_VOLTAGE_KV
OPER_VOLTAGE_KV
CURRENT_RATING
THREE_PH_FT_RT_MVA
ONE_PH_FT_RT_MVA
CCT_BREAKER_TYPE
EXISTING_LOAD_AMPS
MEB_OWNERSHIP
ASSOC_METERING
REMOTE_TRIPPING
AUTO_RECLOSING
ASSOC_EARTHING_FAC
OP_CAT_EAR_SW_CCT
OP_CAT_EAR_SW_BBAR
INTERLOCKS
SEQUENCE_SCHEME
OPERATED_BY
AUTOMATIC
PHASE_FAULT_TRIPS
EARTH_FAULT_TRIPS
NOMENCLATURE
PROTECTION_1
PROTECTION_2
PROTECTION_3
PROTECTION_4
PHASES
MEMBER_OF_SITE
ASSOCIATED_VT
CCT_NODE
BBAR_NODE
SUPERVISORY
SEGMENT_ID
X_COORDINATE
Y_COORDINATE
ROTATION
RB_PRMRY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
OPT_BAR
MSLINK
RB_LOCK

HC_CIRCUIT:

HC_CIRCUIT_ATTRIBUTES
PLANT_ID
RATING
RATING_UNITS
TYPE
PHASES
DUALLED_WITH
ACTIVE_CIRCUIT
PARALLEL_FEEDER
ON_MAIN
SOURCE_PRN
OPER_VOLTAGE_KV
POS_SEQ_R
POS_SEQ_X
NEG_SEQ_R
NEG_SEQ_X
ZERO_SEQ_R
ZERO_SEQ_X
CHARGE_SUSCEPTANCE
FWD_ACT_PW_FL_MW
FWD_REA_PW_FL_MVAR
REV_ACT_PW_FL_MW
REV_REA_PW_FL_MVAR
REAL_COMP_AMPS
IMAG_COMP_AMPS
CURRENT_MAG_AMPS
ACT_POWER_LOSS_MW
REACT_PW_LOSS_MVAR
POS_CURRENT_AMPS
POS_CURRENT_ANG_RD
NEG_CURRENT_AMPS
NEG_CURRENT_ANG_RD
ZER_CURRENT_AMPS
ZER_CURRENT_ANG_RD
RATING_LOCK
SEGMENT_ID
OTHER_SEGMENT_ID
X_COORDINATE
Y_COORDINATE
ROTATION
RB_PRMRY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

HC_CROSSING:

HC_CROSSING
PLANT_ID
REFERENCE_1
REFERENCE_2
MEMBER_OF_CONDUCTOR
MR_OF_CIRCUIT_1
MR_OF_CIRCUIT_2
GRID_REF_EASTING
GRID_REF_NORTHING
SEGMENT_ID
X_COORDINATE
Y_COORDINATE
ROTATION
RB_PRMRY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

HC_LC_DGN:

Column Name
INT_PATCH_ID
FILENAME
OPCODE
CLASS
DGN_CLASS_NAME
DGN_CLASS_TYPE ¹
DGN_SCALE
TYPE
DRAWING_NUMBER
SCH_DIAGRAM_REF
SCH_DIAGRAM_SECTOR
NETWORK_MAP_REF
CMR_REF
X_MIN
Y_MIN
X_MAX
Y_MAX
NAUFID
DGN_CLASS_TYPE
SEGMENT_ID
RB_PRMRY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

¹ DGN_CLASS_TYPE values:

1=SCHEMATIC

2=HV GEOGRAPHIC

3=EHV GEOGRAPHIC

4=LV GEOSCHEMATIC
 5=ORDNANCE SURVEY
 6=SERVICE AREA MAP

HC_DIST_TRANS

PLANT ID
PRMS NUMBER
LOAD TYPE
DESIGNATION
NUM OF CONSUMERS
VECTOR GROUP
PHASES
ON MAIN
SOURCE PRN
LV INTERCONNECTION
COOLING
RATING KVA
EXIST MD KVA
EXIST MD KVAR
EXIST MD HV AMPS
LOAD READ METHOD
LOAD FACTOR
ACTIVE POWER MW
REACTIVE PW MVAR
STD LOSSES
MAX LV FUSE AMPS
GEOG_ZONE
PME
CALC VOLTAGE KV
PRI VOLT IN USE KV
PRI VOLT OTHER KV
MEMBER OF SITE
SUPERVISORY
SEGMENT ID
X COORDINATE
Y COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK

HC_DUMMY_JOINT

PLANT ID
SOURCE PRN
OPER VOLTAGE KV
X COORDINATE
Y COORDINATE

SEGMENT_ID
OTHER_SEGMENT_ID
ROTATION
RB_PRMRY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

HC_GEN_INFEED

PLANT_ID
MODEL_TYPE
FLT_LEV_REAL_COMP
FLT_LEV_IMAG_COMP
SYS_FREQUENCY_HZ
PRIMARY_VOLTAGE_KV
ON_MAIN
SOURCE_PRN
DESIGNATION
RATING_MVA
ACT_POWER_MW
REACT_POWER_MVAR
REACT_UP_LIM_MVAR
REACT_LO_LIM_MVAR
GENERATOR_EARTHED
POS_SEQ_R
POS_SEQ_X
NEG_SEQ_R
NEG_SEQ_X
ZERO_SEQ_R
ZERO_SEQ_X
EARTH_RESISTANCE
EARTHING_REACTANCE
TERM_VOLTAGE_KV
IN_PARALLEL
MEMBER_OF_SITE
SUPERVISORY
SEGMENT_ID
X_COORDINATE
Y_COORDINATE
ROTATION
RB_PRMRY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

HC_GMHV_SWGEAR

PLANT ID
SURGE DIVERTER
PRMS NUMBER
ISOLATABLE
OPERATING CATEGORY
VISITRACE STAGE NB
FAULT PASSAGE IND
ON MAIN
SOURCE PRN
DESIGNATION
OPERATIONAL STATUS
NORMAL OPEN POINT
RATED VOLTAGE KV
OPER VOLTAGE KV
CURRENT RATING
THREE PH FT RT MVA
ONE PH FT RT MVA
FUSE RATING AMPS
MEB OWNERSHIP
ASSOC METERING
REMOTE TRIPPING
ASSOC EARTHING FAC
OP CAT EAR SW CCT
OP CAT EAR SW BBAR
INTERLOCKS
NOMENCLATURE
MEMBER OF SITE
AUTO ISOLATING
OPERATED BY
SUPERVISORY
SEGMENT ID
X COORDINATE
Y COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK

HC_HV_LOAD

PLANT ID
ANN DESIGN MD KVA
ACT MONTHLY MD KVA
REACT MON MD KVAR
PRESCRIBED MD KVA
ON MAIN
SOURCE PRN
ACTIVE POWER MW
REACT POWER MVAR
CALC VOLTAGE KV
MEMBER OF SITE
MR OF HV CUSTOMER
SEGMENT ID
X COORDINATE
Y COORDINATE

ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK

HC_JOINT

PLANT_ID
TYPE
PHASE_CONFIG
DATE_MADE
JOINTER_NAME
ON_MAIN
SOURCE_PRN
OPER_VOLTAGE_KV
CMR_FLAG
SCH_FLAG
NET_FLAG
GRID_REF_EASTING
GRID_REF_NORTHING
SEGMENT_ID
X_COORDINATE
Y_COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK
GRID_REF_EASTING
GRID_REF_NORTHING

HC_PMHV_SWGEAR

PLANT_ID
NUMBER_1
NAME_1
NAME_2
NAME_3
PRMS_NUMBER
TYPE
OPERATING_CATEGORY
ON_MAIN
SOURCE_PRN
OPERATIONAL_STATUS
NORMAL_OPEN_POINT
RATED_VOLTAGE_KV
OPER_VOLTAGE_KV
CURRENT_RATING

THREE PH FT RT MVA
ONE PH FT RT MVA
FUSE RATING AMPS
SUIT FOR HOTSTICK
OPERATED BY
AUTO ISOLATING
PHASE FAULT TRIPS
EARTH FAULT TRIPS
NOMENCLATURE
MEMBER OF SITE
FAULT PASSAGE IND
MOUNTING
SUPERVISORY
ASSOCIATED VT
SURGE DIVERTER FROM
SURGE DIVERTER TO
SEGMENT ID
X COORDINATE
Y COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK

HC_REF_BUSBAR, HC_REF_CCT, HC_REF_COND, HC_REF_JOINT,
 HC_REF_SITE, HC_REF_SOTX, HC_REF_TERM

SEGMENT ID
RB PRMRY
PLANT ID
OPCODE
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK
RB SCNDRY

HC_REGULATOR

PLANT ID
PRMS NUMBER
TYPE
DESIGNATION
OPER VOLTAGE KV
ON MAIN
SOURCE PRN
COOLING
RATING MVA
LOW TAP RATIO
HIGH TAP RATIO

NO TAP POSITIONS
NOMINAL TAP POS
TAPPING METHOD
CONTROLLED NODE
TARGET VOLTAGE KV
NOMENCLATURE
TERTIARY VOLT KV
AVC STATUS
EHV FLAG
DIS FLAG
DWD FLAG
MEMBER OF SITE
ASSOCIATED VT
SUPERVISORY
SEGMENT ID
X COORDINATE
Y COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK

HC_SITE

PLANT ID
NUMBER 1
NAME 1
NAME 2
NAME 3
PRMS NUMBER
TYPE
DIVISION
GRID REF EASTING
GRID REF NORTHING
PLANT ARRANGEMENT
ON MAIN
SOURCE PRN
LOCATION OF EARTHS
TELEPHONE NUMBER
FIRE FIGHTING TYPE
ALARM TELECONTROL
RADIO MAST
DIALYSIS
ASSOCIATED DGN 1
ASSOCIATED DGN 2
RESULTS 1
RESULTS 2
RESULTS 3
RESULTS 4
RESULTS 5
RESULTS 6
RESULTS 7
RESULTS 8
RESULTS 9

RESULTS 10
CMR FLAG
SCH FLAG
NET FLAG
SEGMENT ID
X COORDINATE
Y COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB LOCK

HC_SOURCE_TRANS

PLANT ID
PRMS NUMBER
TYPE
DESIGNATION
NUM OF CONSUMERS
VECTOR GROUP
COOLING
RATING MVA
EXIST MD MVA
FUTURE MD MVA
LINKED TO
POS SEQ R
POS SEQ X
PRIM ZERO SEQ R
PRIM ZERO SEQ X
SEC ZERO SEQ R
SEC ZERO SEQ X
EARTHING RES HV
EARTHING REA HV
EARTHING RES LV
EARTHING REA LV
LOW TAP RATIO
HIGH TAP RATIO
NO TAP POSITIONS
NOMINAL TAP POS
TAPPING METHOD
CONTROLLED NODE
TARGET VOLTAGE KV
LDC
LDC RESISTANCE
LDC REACTANCE
NEUTRAL EARTH METH
PRIMARY CONN TYPE
SEC CONN TYPE
NOMENCLATURE
PRIMARY VOLTAGE KV
SEC VOLTAGE 1 KV
SEC VOLTAGE 2 KV
TERTIARY VOLT KV
FWD ACT PW FL MW
FWD REA PW FL MVAR
REV ACT PW FL MW
REV REA PW FL MVAR
REAL COMP AMPS
IMAG COMP AMPS
ACT POWER LOSS MW
REACT PW LOSS MVAR
FULL LOAD LOSS MVA
NO LOAD LOSSES MVA
COOLER LOSSES MVA
TERT ZERO SEQ R
TERT ZERO SEQ X
POS CURRENT AMPS
POS CURRENT ANG RD
NEG CURRENT AMPS
NEG CURRENT ANG RD
ZER CURRENT AMPS
ZER CURRENT ANG RD
AVC STATUS
EHV FLAG

DIS_FLAG
DWD_FLAG
MEMBER OF SITE
ASSOCIATED VT
SUPERVISORY
SEGMENT ID
X COORDINATE
Y COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB_LOCK

HC_TERMINAL

PLANT ID
TYPE
TERMINAL NUMBER
SURGE DIVERTER
FAULT LEVEL HV MVA
VISITRACE STAGE NB
FAULT PASSAGE_IND
ON MAIN
SOURCE PRN
OPER VOLTAGE KV
CALC VOLTAGE KV
CMR_FLAG
SCH_FLAG
NET_FLAG
MEMBER OF SITE
GRID REF EASTING
GRID REF NORTHING
SUPERVISORY
SEGMENT ID
X COORDINATE
Y COORDINATE
ROTATION
RB PRMRY
RB SCNDRY
RB FSC
RB STATE
RB COMPONENT
RB VERSION
RB OCCURRENCE
MSLINK
RB_LOCK

HC_SYMBOL

PLANT ID
SYMBOL TYPE
PRMS NUMBER
MEMBER OF SITE

X_COORDINATE
Y_COORDINATE
ROTATION
RB_PRMR
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_BUSBAR

Column Name
PLANT_ID
MEMBER_OF_SITE
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_BUS_SECTION

PLANT_ID
WAY_NUM_1
WAY_DSG_1
WAY_TYPE
WAY_RTG
FUSE_SIZE
CIRCUIT_RTG
NOTE_1
NOTE_2
MEMBER_OF_SITE
NETCAP_SCALE
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT

RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_GENERATOR

PLANT_ID
MODEL_TYPE
FAULT_LEV_REAL_COM
FAULT_LEV_IMAG_COM
SYSTEM_FREQUENCY
PRIMARY_VOLTAGE
DESIGNATION
RATING_MVA
ACTIVE_POWER_MW
ACTIVE_POWER
REACTIVE_POWER
REACT_UPPER_LIMIT
REACT_LOWER_LIMIT
GEN_IND_EARTHED
EARTH_RESISTANCE
EARTH_REACTANCE
METHOD_OF_ISO
POS_SEQ_R
POS_SEQ_X
NEG_SEQ_R
NEG_SEQ_X
ZERO_SEQ_R
ZERO_SEQ_X
TERMINAL_VOLTAGE
NOTE_1
NOTE_2
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMV
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LINKBAR

PLANT_ID
MEMBER_OF_LBOX

(can also be a member of Linking Pillar)
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LINKBOX

PLANT_ID
LINKBOX_REF
LINKBOX_TYPE
LINKBOX_RTG
NOTE_1
NOTE_2
LINKBOX_MFTR
NO_OF_WAYS
NGR_EASTING
NGR_NORTHING
NE
NB
LAST_INSP
INSULATION
LOCATION
LINK_TYPE
NETCAP_SCALE
FUSED
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LINKING_PILLAR

PLANT_ID
IDENTIFIER
RATING
FUSE_SIZE
NOTE_1
NOTE_2
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMV
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LINKWAY

PLANT_ID
LINKWAY_NUM
LINKWAY_DSG
LINKWAY_RTG
NOTE_1
MEMBER_OF_LBOX (can also be a member of Linking Pillar)
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMV
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LV_CUTOUT

PLANT_ID
CUTOUT_TYPE
NAME
DESCRIPTION
NUM_OF_1PH_SRVC

NUM_OF_3PH_SRVC
INCOMING_FUSE_RTG
NOTE1
NOTE2
NE
NB
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_FUSE

PLANT_ID
FUSE_RATING
MEMBER_OF
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LV_POLE

PLANT_ID
POLE_REF
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMY
RB_SCNDRY
RB_FSC
RB_STATE

RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LV_SITE

PLANT_ID
NUMBER_1
NAME_1
NAME_2
NAME_3
PRMS_NUMBER
DIVISION
REGION
SUBSTN_TYPE
HVMS_SITE_PLANT_ID
NOTE_1
NOTE_2
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LV_SRVC_JNT

PLANT_ID
OWNING_FAC_ID
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LV_WAY

PLANT_ID
WAY_NUM_1
WAY_DSG_1
WAY_TYPE
WAY_RTG
FUSE_SIZE
CIRCUIT_RTG
NOTE_1
NOTE_2
MEMBER_OF_SITE
NETCAP_SCALE
NORMAL_OPEN_POINT
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMV
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LVO_CABLE

PLANT_ID
ID
MATERIAL
SUPPLIER
CONSTR_DATE
NET_TYPE
EDGE_LEVEL
DIAMETER
CORES
ISP
DUCTED
PHASE
NOTE_1
NOTE_2
PH_POS_SEQ_R
PH_POS_SEQ_X
PH_NEG_SEQ_R
PH_NEG_SEQ_X
PH_ZERO_SEQ_R
PH_ZERO_SEQ_X
PH_FAULT_SEQ_R
PH_FAULT_SEQ_X

PH_FAULT_R
PH_FAULT_X
NEU_POS_SEQ_R
NEU_POS_SEQ_X
NEU_NEG_SEQ_R
NEU_NEG_SEQ_X
NEU_ZERO_SEQ_R
NEU_ZERO_SEQ_X
NEU_FAULT_R
NEU_FAULT_X
CSA
LENGTH
RATING
CABLE_FUNCTION
DRAWN_TEXT
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LVU_CABLE

PLANT_ID
ID
MATERIAL
SUPPLIER
CONSTR_DATE
NET_TYPE
EDGE_LEVEL
DIAMETER
CORES
ISP
DUCTED
PHASE
NOTE_1
NOTE_2
PH_POS_SEQ_R
PH_POS_SEQ_X
PH_NEG_SEQ_R
PH_NEG_SEQ_X
PH_ZERO_SEQ_R
PH_ZERO_SEQ_X
PH_FAULT_SEQ_R

PH_FAULT_SEQ_X
PH_FAULT_R
PH_FAULT_X
NEU_POS_SEQ_R
NEU_POS_SEQ_X
NEU_NEG_SEQ_R
NEU_NEG_SEQ_X
NEU_ZERO_SEQ_R
NEU_ZERO_SEQ_X
NEU_FAULT_R
NEU_FAULT_X
CSA
LENGTH
RATING
CABLE_FUNCTION
DRAWN_TEXT
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LVU_JOINT

PLANT_ID
ID
MATERIAL_ID
SUPPLIER
CONSTR_DATE
NET_TYPE
JOINT_TYPE
DATE_MADE
JOINTER_NAME
PHASE_CONFIG_3PH
PHASE_CONFIG_2PH
SOURCE_PRN
NE
NB
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY

RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_MISC_PLANT

PLANT_ID
DESIGN_TYPE
IDENTIFIER
RATING
FUSE_SIZE
NOTE_1
NOTE_2
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_OHTX_WAY

PLANT_ID
WAY_NUM_1
WAY_DSG_1
WAY_RTG
FUSE_SIZE
CIRCUIT_RTG
NOTE_1
NOTE_2
MEMBER_OF_SITE
HVMS_TX_PLANT_ID
TRANSFORMER_TYPE
NETCAP_SCALE
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY

RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_POLEWAY

PLANT_ID
POLEWAY_NUM
POLEWAY_DSG
NOTE_1
NORMAL_OPEN_POINT
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_REF_LVU

PLANT_ID
SEGMENT_ID
X_COORDINATE
Y_COORDINATE
RB_PMY
OPCODE
RB_SCNDRY
MSLINK
RB_LOCK
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
RB_REFPRMY
RB_REFSCNDRY

LC_REF_LVO

PLANT_ID
SEGMENT_ID
X_COORDINATE
Y_COORDINATE
RB_PRMR
OPCODE
RB_SCNDRY
MSLINK
RB_LOCK
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
RB_REFPRMR
RB_REFSCNDRY

LC_SECTION_POLE

PLANT_ID
POLE_REF
LINE_REF
CONN_METHOD
PNB
NOTE_1
NOTE_2
NO_OF_WAYS
SECTIONPOLE_TYPE
VALIDATION_TYPE
NETCAP_SCALE
NE
NB
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_TX_WAY

PLANT_ID
WAY_NUM_1
WAY_DSG_1

WAY_TYPE
WAY_RTG
FUSE_SIZE
CIRCUIT_RTG
NOTE_1
NOTE_2
MEMBER_OF_SITE
HVMS_TX_PLANT_ID
NETCAP_SCALE
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_WALLBOX

PLANT_ID
FUSE_SIZE
NB
NE
NOTE_1
NOTE_2
FUSED_STATUS
NETCAP_SCALE
FUSE_RATING
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LV/HV/EHV Customer/Premises**HC_HV_CUST**

INT_PATCH_ID
PLANT_ID
NAME
ADDRESS_1
ADDRESS_2
ADDRESS_3
ADDRESS_4
ADDRESS_5
POST_CODE
CONS_REF_NUMBER
PHASES
ON_MAIN
SOURCE_PRN
PRIORITY_CONSUMER
NUISANCE_LOAD
TELEPHONE_NUMBER
LARGEST_MTR_RT_KVA
LARGEST_WLD_RT_KVA
MAIN_UNITS
DAY_UNITS
NIGHT_UNITS
LAST_READING_DATE
GENERATION
CONNECTION_DATE
CUSTOMER_OF
CONN_CHGS_REGS_APP
MEMBER_OF_SITE
CMR_FLAG
SCH_FLAG
NET_FLAG
MEMBER_OF_PROJECT
SEGMENT_ID
X_COORDINATE
Y_COORDINATE
ROTATION
RB_PRMRY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

HC_HV_CUSTOMER

INT_PATCH_ID
PLANT_ID
BILLING_STATUS

CRITICAL_FLG
CUST_NO
FIRST_NAME
CUST_INITIAL
LAST_NAME
PHONE_NO
CUST_TYPE_ID
COMPLAINT
ELECT_STATUS
ORG_NAME
PREFIX
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK
TRANSACT_ID

HC_HV_PREMISE

INT_PATCH_ID
PLANT_ID
ACCESS_DETAIL
PREMISE_NO
HOUSE_NO
HOUSE_TYPE
ROAD
LOCALITY
DISTRICT
POST_TOWN
COUNTY
POSTCODE
PROP_NAME1
PROP_NAME2
SBUILD_NAME
SECDRY_NO
SECDRY_TYPE
BILLING_MARKER
REGION
SEGMENT_ID
EASTING
NORTHING
ROTATION

RB_PRMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK
TRANSACTION_ID

HC_HV_CUST_PREM

INT_PATCH_ID
PREMISE_NO
CUST_NO
OPCODE
TRANSACTION_ID

HC_HV_DEV_PREM

INT_PATCH_ID
PREMISE_NO
DEVICE_PLANT_ID
OPCODE
TRANSACTION_ID

HC_REF_HVCUST

INT_PATCH_ID
SEGMENT_ID
RB_PRMY
PLANT_ID
OPCODE
MEMBER OF SITE
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK
RB_SCNDRY

LC_CUST_PREM

INT_PATCH_ID
PREMISE_PLANT_ID
CUST_PLANT_ID
OPCODE

LC_DEV_PREM

INT_PATCH_ID
PREMISE_PLANT_ID
DEVICE_PLANT_ID
OPCODE
OWNING_FAC_ID
SITE_WAY_ID

LC_LV_CUSTOMER

INT_PATCH_ID
PLANT_ID
BILLING_STATUS
CRITICAL_FLG
CUST_NO
FIRST_NAME
INITIAL
LAST_NAME
PHONE_NO
CUST_TYPE_ID
COMPLAINT
ELECT_STATUS
ORG_NAME
PREFIX
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PRMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

LC_LV_PREMISE

INT_PATCH_ID
PLANT_ID
ACCESS_DETAIL
PREMISE_NO
HOUSE_NO

HOUSE_TYPE
ROAD
LOCALITY
DISTRICT
POST_TOWN
COUNTY
POSTCODE
PROP_NAME1
PROP_NAME2
SBUILD_NAME
SECDRY_NO
SECDRY_TYPE
BILLING_MARKER
REGION
SEGMENT_ID
EASTING
NORTHING
ROTATION
RB_PMY
RB_SCNDRY
RB_FSC
RB_STATE
RB_COMPONENT
RB_VERSION
RB_OCCURRENCE
MSLINK
RB_LOCK

Graphical location reference files

This helps to locate various entities on schematic and geographic diagrams

Electrical Network Graphical Representation

The actual diagrams relevant to this interface are:

- HV schematics
- HV geographics
- EHV geographics
- LV geo-schematics

Along with each Patch, DMS expects to receive from GIS all affected master HV Schematic and E/HV Geographic diagrams, all affected geo-schematic diagrams. More often than not, HVMS changes to items of plants and/or connectivity implies a corresponding change to HV schematic diagrams.

Control Engineers will validate these changed diagrams against 'Single Line Diagrams' in order to accept changes made. In order to help identify sections of diagrams that have changed, some form of colour coding is necessary ,

Service Area Map

This contains a map of the entire service area of an Utility

Note that this file is required for both Phase I and Phase II, and that at least in phase I the

Graphic file Layering scheme and usage

Description
Interface Patch ID
Layer number Values: 0 to 63
Operation 'A' = Add Layer entry 'M' = Modify Layer entry 'R' = Remove Layer entry
Zoom Level ON Zoom level at which this level should start being displayed
Zoom Level OFF Zoom level at which this level should stop being displayed.
Usage Bit field (bit 0 = least significant) bit 0 ON = printing bit 1 ON = display
Description E.g. 'Secondary roads + Primary Substations'

CIM Classes

Interface Class	Class Attribute	Attribute Type	Operations	Relations
NetworkPatch			New	
FinalPatch			New	

Revision History:

No	Date	Author	Description
1	31 st Jan 200	Paul Fleeman Peter Walker, Shahed Ansar	Network Edit
2	18 th Sept'2000	Paul Fleeman Peter Walker, Shahed Ansar	Network Edit

UC39_AssetInspection**Summary:**

This use case describes the process by which an asset manager issues inspection requirements to a service provider who performs the work and updates the relevant asset records. This service provider may be either an internal segmented group or a third party external to the organization. This process may be enabled by e-Business deployed in a business to business role.

Actor(s):

Name	Role description
Asset Manager	A person responsible for managing the asset base on behalf of the Asset Owner
Records Administrator	A person responsible for maintaining the asset records on behalf of the Asset Manager
Work Programme Manager	A person responsible for managing the allocation of inspection tasks to the Inspectors
Inspector	A person responsible for carrying out asset inspections
Control engineer	A person responsible for network operations

Participating Business Functions:

Acronym	Business Function/Abstract Component	Services or Information Provided
AM	Records and asset management	Substation and network inventory including equipment characteristics and connectivity. Geographic or schematic display of network and substations. Responsible for Investment decisions, policy and standards
AM-EINV	Substation and network inventory	
AM-GINV	Geographical inventory	
AM-MGR	Asset Manager/Owner	
MC	Maintenance & Construction	Work scheduling and crew management Inspection of network assets to validate inventory records and record condition
MC-MWK	Maintenance Work scheduling & Control	
MC-INSP	Network Asset Inspection	
NO	Network operations	Provision of network status and authorisation to access or switch
NO-CTL	User Access Control and Assisted Control	

Assumptions / Design Considerations:

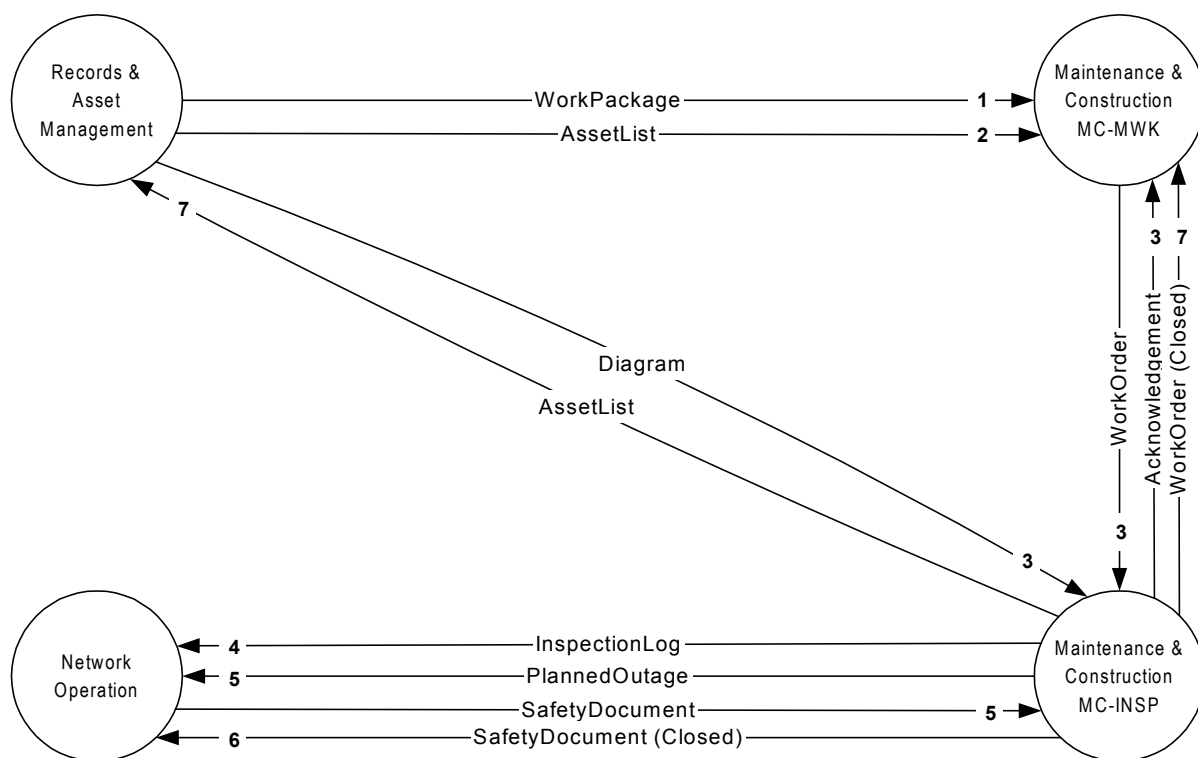
1. Control of the network is provided by centralised control
2. Inspection is a discrete activity separate from Maintenance but for the purposes of this Use Case it has been included as a sub-function of Maintenance and Construction
3. Inspections are undertaken on Network assets (i.e. any object that is recorded within the asset inventories) only and not non-network assets such as tools, test equipment etc.
4. Minor remedial work can be undertaken during the inspections. These will have been defined within the contract and would be reported back as variations.
5. The Asset Manager does not undertake the inspections and is responsible for asset policy and investment decisions only. The assumption made is that all work is undertaken by internal or external service providers.

6. All inspectors are authorised to the appropriate levels for access to the electrical network.
7. Introduction of e-Business. It is assumed that the introduction of e-Business technologies could change the mechanisms for data interchange as follows:
 - a) Access by the service provider to the IT systems of the asset owner could be provided via a web-based portal. The portal controls log on and user access permissions for specific service providers.
 - b) Information may be disseminated to service providers by posting it on the secure web site, and notifying them of the update via a message.
 - c) Service providers access the substation, network and geographic information required to undertake their responsibilities as and when required via the web portal.
 - d) Similarly, service providers upload updated information arising from asset inspections and remedial work directly into the asset owner's systems. This does not preclude the asset owner from validating the updated information via its own quality assurance procedures prior to committing the updates to the master asset databases.
 - e) Exchange of information between the work program manager and each inspector may be via wireless communications (e.g. WAP) to the inspector's hand-held device.
 - f) Similarly the creation and updating of safety documentation by both the inspector and the control engineer may be managed by software in the control room and on the hand-held device that synchronises the interactions between the two parties via wireless communications to ensure that safety-related operating procedures are carried out in sequence.

Normal Sequence:

Use Case Step	Event	Description Of Process	Information To Be Exchanged	ProducerTo Receiver Abstract Component	Message Type (Verb/Noun)
1	Issue inspection work package	Asset Manager issues a work package specifying the assets by contractual grouping (geographical, time period etc.)	Work package	AM-MGR to MC-MWK	New WorkPackage
2	Service provider (Inspections) produces schedule				
2.1	Construct asset inspection schedule	Produces a list of assets to be inspected that complies with work package definition	Equipment list by grouping from Substation and Network Inventory	MC-MWK to AM-EINV AM-EINV to MC-MWK	Get AssetList Show AssetList
3	Create work schedules				
3.1	Produce schedules	Create work orders		MC-MWK internal	
3.2	Scheduler runs optimiser	Optimise work orders		MC-MWK internal	
3.3	Issue to work crews	Scheduler issues work orders to Inspectors	Work orders – assets and associated geographical information and work instructions	MC-MWK to MC-INSP	New WorkOrder
3.4	Confirm receipt of work order	Inspector confirms receipt of work order		MC-INSP to MC-MWK	Ack WorkOrder
3.5	Retrieve maps	Inspector downloads	Diagrams for	MC-INSP to AM-	Get Diagram

		relevant maps	related work orders	GINV AM-GINV to MC-INSP	Show Diagram
4	Notify Network Operations	Inspector advises Control Engineer of network to be inspected	Lists of circuits and/or substations to be inspected	MC-INSP to NO-CTL	New InspectionLog
5	Obtain Access permission (optional)	To closely inspect assets connected or in the proximity of live electrical network, access permission must be obtained			
5.1	Request access	Verbally request access	Name of asset and work content	MC-INSP to NO-CTL	New PlannedOutage
5.2	Safe area of work created	Asset to be inspected is electrically isolated or cordoned off from the live network.	See Use Case UC02 (network switching and isolation and issuing of safety documents)	NO-CTL to MC-INSP	New SafetyDocument
5.3	Work authorised			NO-CTL to MC-INSP	Change SafetyDocument
6	Undertake work				
6.1	Inspect asset	Establish condition of asset and record defects and condition data	Asset condition and defects	MC-INSP to HHT	
6.2	Validation of inventory data	Validate substation, network and geographic data	Correct or complete asset attribute records	MC-INSP to HHT	
6.3	Correct inventory data	Red-line geographic data and correct substation and network data.	Correct or complete Geographic records	MC-INSP to HHT or MC-INSP to paper records	
6.4	Minor remedial work (optional)	Undertake minor remedial work	Notify Control Engineer that work is complete	MC-INSP to NO-CTL	Close SafetyDocument
6.5	Update event history	Update asset history with task details	Task details	MC-INSP to HHT	
7	Update records				
7.1	Upload inspection data	Upload inspection data to Records Office for QA validation	Asset attribute and geographic record changes	HHT to AM-EINV and HHT to AM-GINV	New AssetList
7.2	Quality Audit	Records Office to validate field data prior to committing to databases	Validated asset attribute and geographic record changes		
7.3	Commit changes	Update databases	Asset attribute and geographic record changes		
7.3	Work order complete	De-programme work order	Work content, status, and time spent	MC-INSP to MC-MWK	Close WorkOrder

Integration Scenarios

Information Model for normal sequence:

Class	Class Attributes	Attribute Type	Operations	Relations
WorkPackage	contractNumber status completeNotBeforeDate completeNotAfterDate Inherit from Document: referenceCode documentStatus	String EnumeratedType AbsoluteDate AbsoluteDate	New	IssuedBy Organisation HasA Specification HasA AssetList
AssetList	[0..*] Asset.serialNumber Asset.number Asset.name Asset.type Asset.lastMaintainedDate [0..*]Asset.PropertySet.*	String String String EnumeratedType AbsoluteDate	Get Show New	AssetsAt.Location Asset.IsManufacturedBy .Organisation Asset.HasA .PowerSystemResource Asset.HasA.Specification
WorkOrder	id completeByDate workCompletedDate workStartedTime workFinishedTime Serial number Inherit from Document: createdOn	String AbsoluteDate AbsoluteDate DateTime DateTime	New Ack Close	ImplementedByFieldCrew Person IssuedBy Person HasA Specification HasA AssetList
Diagram	name id	String String	Get Show	
InspectionLog	inspectionDate workOrder.id [1..*]PowerSystemResource.id	AbsoluteDate String	New	ImplementedByInspector Person HasA Specification HasA WorkOrder
PlannedOutage	InspectionDateTime workOrder.id [1..*]PowerSystemResource.id	Datetime String	New	HasA WorkOrder
SafetyDocument	appliedBy appliedTo appliedAt isolatedBy earthedBy permits issuedBy issuedDateTime receivedBy receivedDateTime clearedBy clearedDateTime cancelledBy cancelledDateTime	SwitchingSchedule PowerSystemRes Location PowerSystemRes PowerSystemRes PowerSystemRes Person DateTime Person DateTime Person Datetime Person Datetime	New Change Close	

Pre-conditions:

The inspection periods, inspection content, and data exchange formats have been predetermined by the Asset Manager and communicated and agreed with Service Providers. The Electrical and Geographic Inventories are populated although this data may be of variable quality.

Exceptions / Alternate Sequences:

Step 5 is optional and is dependent upon the network to be inspected and upon local control policies.

Step 7.2 may be either automatic or manual.

Step 7.1 may include a summary of time (cost) spent against the asset inspection or alternatively an additional step (7.4) may be required:

7.4	Update costs	Consolidate task time against asset inspected	Time taken to inspect	MC-MWK to AM-EINV	New AssetList
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The introduction of e-Business technologies into this Use Case may result in the following changes:

Step 1 may result in a simple notification message, rather than the details of the work package, which may now be posted on the web:

A1	Issue inspection work package	Asset Manager posts a work package on secure web site, specifying the assets by contractual grouping (geographical, time period etc.)	Notification to service provider(s) of new work package on web site	AM-MGR to MC-MWK	New InspectionNotice
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Steps 2.1, 2.2 and 7.1. The contents of the messages may include additional security-related information, since the service providers now have direct but restricted access to the systems of the asset owner.

Steps 5.1, 5.3 and 6.4. The messages may include additional status information to support the software-driven synchronization of the safety documentation in the control room and out in the field that is made possible by e-Business.

Post-conditions:

The asset databases contain corrected data fields, condition data and inspection work history. It is assumed that Notification of Fault or follow-up work will be covered by other use cases (e.g. Use Case XX)

It is assumed that Analyses of Inspection data will be covered by other use cases (e.g. Use Case XX)

Information Model for alternate sequence B: As-Built Update:

Interface Class	Class Attributes	Attribute Type	Operations	Relations
InspectionNotice	contractNumber status completeNotBeforeDate completeNotAfterDate Inherit from Document: referenceCode documentStatus	String EnumeratedType AbsoluteDate AbsoluteDate	New	HasA Specification

Message Type Table:

Message Type Identifier	<u>Message Type</u> (Verb/Noun)	Message Type Content (Class.Attribute)	Revision Number
	New WorkPackage	WorkPackage.referenceCode WorkPackage.documentStatus WorkPackage.contractNumber WorkPackage.status WorkPackage.IssuedBy.Organisation.ID WorkPackage.completeNotBeforeDate WorkPackage.completeNotAfterDate [0..*] WorkPackage.HasA.specification.id [0..*] WorkPackage.HasA.AssetList.Asset.type WorkPackage.HasA.AssetList.Asset.id	1.0
	New AssetList	[0..*] Asset.serialNumber Asset.number Asset.name Asset.type Asset.lastMaintainedDate Asset.HasA.PowerSystemResource.id [0..*] Asset.PropertySet.*	1.0
	Get AssetList	[0..*] Asset.serialNumber Asset.number Asset.name Asset.type Asset.lastMaintainedDate Asset.HasA.PowerSystemResource.id [0..*] Asset.PropertySet.*	1.0
	Show AssetList	[0..*] Asset.serialNumber Asset.number Asset.name Asset.type Asset.lastMaintainedDate Asset.HasA.PowerSystemResource.id [0..*] Asset.PropertySet.*	1.0
	New WorkOrder	WorkOrder.id WorkOrder.createdOn WorkOrder.completeByDate WorkOrder.workCompletedDate WorkOrder.workStartedTime WorkOrder.workFinishedTime WorkOrder.ImplementedByFieldCrew.Person.id [1..*] WorkOrder.HasA.AssetList.Asset.id WorkOrder.HasA.AssetList.Asset.name	1.0
	Ack WorkOrder	WorkOrder.id	1.0
	Close WorkOrder	WorkOrder.id	1.0
	Get Diagram	Diagram.name Diagram.id	1.0
	Show Diagram	Diagram.name Diagram.id	1.0
	New InspectionLog	InspectionLog.inspectionDate InspectionLog.HasA.WorkOrder.id InspectionLog.ImplementedBy.Person.id [0..*] InspectionLog.HasA.Specification.id [1..*]	1.0

		InspectionLog.HasA.PowerSystemRes ource.id	
	New PlannedOutage	PlannedOutage.inspectionDate PlannedOutage.HasA.WorkOrder.id [1..*] PlannedOutage.HasA.PowerSystemRe source.id	1.0
	New SafetyDocument	SafetyDocument.appliedBy SafetyDocument.appliedTo SafetyDocument.appliedAt SafetyDocument.isolatedBy SafetyDocument.earthedBy SafetyDocument.permits SafetyDocument.issuedBy SafetyDocument.issuedDateTime SafetyDocument.receivedBy SafetyDocument.receivedDateTime SafetyDocument.clearedBy SafetyDocument.clearedDateTime SafetyDocument.cancelledBy SafetyDocument.cancelledDateTime	1.0
	Change SafetyDocument	SafetyDocument.receivedBy SafetyDocument.receivedDateTime	1.0
	Close SafetyDocument	SafetyDocument.clearedBy SafetyDocument.clearedDateTime SafetyDocument.cancelledBy SafetyDocument.cancelledDateTime	1.0
	New InspectionNotice	InspectionNotice.referenceCode InspectionNotice.documentStatus InspectionNotice.contractNumber InspectionNotice.status InspectionNotice.HasA.specification.id InspectionNotice.completeNotBeforeDate InspectionNotice.completeNotAfterDate	1.0

References:**Issues:**

ID	Description	Status
1.	Requires allocation of a use case number.	Closed
2.	Need to identify numbers of external use cases referred to	Open
3.	Need to check consistency of naming and definitions of WorkOrder, WorkPackage, InspectionLog, with the definitions in forthcoming 61968 Part 5 document	Open

Revision History:

No	Date	Author	Description
1.	06/04/00	S Morris, C Macqueen	Original.
2.	14/10/00	S Morris, C Macqueen	Revised to use IEC use case template, and established information model classes where appropriate. New scenario diagram.
3.	20/12/00	S Morris, C Macqueen	Added class attributes and message types