# Interface Specification

## LINKWARE IEC 61968

## WORK ORDER

| | | |
|---|---|---|
| Status | Draft | M-Files workflow state: Draft, Waiting for Comments or Approved |
| Version | 1.15 (3) | Document version (M-Files version) |

# Contents

# 1 Overview

The purpose of this Linkware interface is to allow managing work orders between Aidon systems and external systems. The interface is implemented as a web service using the IEC 61968 standards, especially IEC 61968-6.

## References

| Reference | Document |
|---|---|
| IEC 61968-100 ed.1 Implementation profiles | The document describes how message payloads defined by parts 3-9 of IEC 61968 are conveyed using web services and the Java Messaging System. |
| IEC 61968-6 ed.1 Interfaces for maintenance and construction | The purpose of this part of IEC 61968 is to define a standard for the integration of Maintenance and Construction Systems (MC), which would include Work Management Systems, with other systems and business functions within the scope of IEC 61968. |
| IEC 61968-9 ed.2 Interfaces for meter reading and control | The purpose of this document is to define a standard for the integration of metering systems (MS), which would include traditional (one or two-way) automated meter reading (AMR) systems, with other systems and business functions within the scope of IEC 61968. |
| Interface Specification – Linkware IEC 61968 Common | Common Linkware IEC 61968 interface specification. Contains general specifications, guidelines and restrictions, including i.e. message headers, error handling and security policies. |

# 2 Interface specification

## 2.1 Common Message Envelope

The common structure for all messages can be found in document Interface Specification – Linkware IEC 61968 Common.

### 2.1.1 Header

The common header can be found in the document Interface Specification – Linkware IEC 61968 Common.

### 2.1.2 Reply

The common reply can be found in the document Interface Specification – Linkware IEC 61968 Common.

## 2.2 Inbound and outbound work orders

Work orders can be created and/or updated either from Aidon system or from an external system. Linkware provides inbound and outbound integration of work orders using the same service description and provides orchestration functionalities which defines where work order information should be sent.

The external work order system can be defined in Linkware configuration in which case Linkware will send outbound work orders to the endpoint of the external system. The external system must implement the web service described in this document and *IECWorkOrder.wsdl* service description.

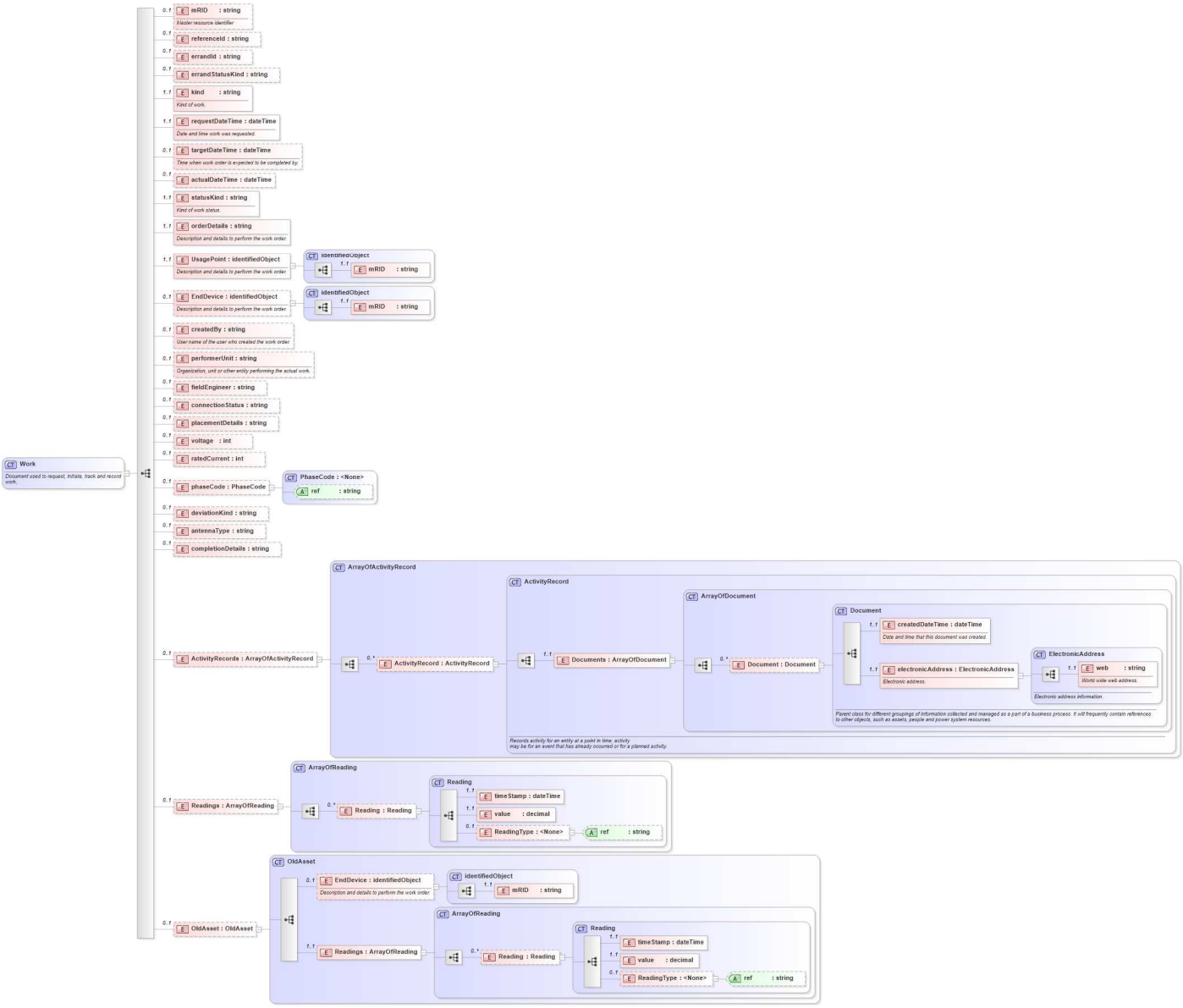
The external system must have pre-defined Source identifier in messages related to work orders for inbound and outbound messaging to work correctly.

## 2.3 Work order management

The interface enables a client to maintain work orders from Aidon system and into Aidon system.

## 2.3.1 Work message

This message is used for creating, reading and updating work orders.




### 2.3.1.1 m:Work

| Element | Data type | Cardinality | CRU* | Description and usage |
|---|---|---|---|---|
| mRID | xs:string | 0..1 | CU | Work order unique identifier. Can be left out for new work orders which are sent to master work order management system which creates an unique identifier. Mandatory in update and delete operations. |
| referenceId | xs:string | 0..1 | CU | Reference identifier related to work order. Can be used to |

| | | | | |
|---|---|---|---|---|
| | | | | identify work orders in other systems. |
| errandId | xs:string | 0..1 | CU | Identifier of an errand the work order is attached to. This may be used to link multiple work orders to a same logical errand. |
| errandStatusKind | xs:string | 0..1 | CU | Status of an errand the work order is attached to. |
| kind | xs:string | 1 | CU | Work order type.<br>Recommended values:<br>- service: general service work that is required to be done. Order details should describe actual work / issue that should be resolved.<br>- deviceReplacement: replace exisnting device to a new device in the metering point.<br>Other values can be used as well depending on systems that are participating in the integration. |
| requestDateTime | xs:dateTime | 1 | CU | Time when work order was created |
| targetDateTime | xs:dateTime | 0..1 | CU | Time when work order is expected to be completed by |
| actualDateTime | xs:dateTime | 0..1 | U | Actual time when the work was executed |
| statusKind | xs:string | 1 | CU | Work order status.<br>Recommended values:<br>- waitingToBeScheduled<br>- inProgress<br>- completed<br>- closed<br>- cancelled<br>Other values can be used as well depending on systems that are participating in the integration. |
| orderDetails | xs:string | 1 | CU | Description and details to perform the work order |
| UsagePoint | | 1 | CU | Metering point where work is expected to be performed |
| UsagePoint/mRID | xs:string | 1 | CU | Metering point identifier |
| EndDevice | | 0..1 | CU | Device to which the work is related / current known device in the metering point |

| | | | | |
|---|---|---|---|---|
| EndDevice/mRID | xs:string | 1 | CU | Device identifier |
| createdBy | xs:string | 0..1 | CU | User name of the user who created the work order |
| performerUnit | xs:string | 0..1 | CU | Organization, unit or other entity performing the actual work |
| fieldEngineer | xs:string | 0..1 | CU | Field engineer or responsible party to execute the work order |
| connectionStatus | xs:string | 0..1 | CU | Status of the end device connection.<br>Possible values:<br>- burnedDown<br>- connected<br>- connecting<br>- demolished<br>- logicallyDisconnected<br>- merged<br>- physicallyDisconnected |
| placementDetails | xs:string | 0..1 | CU | Description of the meter placement |
| voltage | xs:int | 0..1 | CU | Voltage on the metering point.<br>Possible values:<br>- 230<br>- 400 |
| ratedCurrent | xs:int | 0..1 | CU | Fuse size |
| phaseCode | | 0..1 | CU | Phase code that defines number of phases. |
| phaseCode/@ref | | 0..1 | CU | Possible values:<br>- A<br>- ABC |
| deviationKind | xs:string | 0..1 | U | Possible deviation from normal work order execution |
| antennaType | xs:string | 0..1 | CU | Installed antenna type(s) |
| completionDetails | xs:string | 0..1 | U | Optional information or comment about the completion of the work order |
| ActivityRecords/ActivityRecord | xs:string | 0..n | U | |
| ./Documents/Document | | 1..n | U | |
| ./mRID | xs:string | 1..1 | U | |
| ./createdDateTime | xs:dateTime | 1..1 | U | |
| ./title | xs:string | 1..1 | U | Name of the document |
| ./ElectronicAddress/web | xs:string | 1..1 | U | URL where the document is available |
| Readings/Reading | | 0..n | U | Meter readings for the current device in the metering point |

| | | | | |
|---|---|---|---|---|
| ./timestamp | xs:dateTime | 1..1 | U | Timestamp of the reading value |
| ./value | xs:decimal | 1..1 | | |
| ./ReadingType/@ref | xs:string | 1..1 | U | Meter reading type. Possible values are listed in the table below. |
| OldAsset | | 0..1 | U | Container for old or replaced device |
| ./EndDevice | | 1 | U | |
| ./EndDevice/mRID | | 1 | U | Device identifier |
| ./Readings | | 0..1 | U | Meter readings for the old device |
| ./Readings/Reading | | 0..n | U | |
| ./timestamp | xs:dateTime | 1..1 | U | Timestamp of the reading value |
| ./value | xs:decimal | 1..1 | U | |
| ./ReadingType/@ref | xs:string | 1..1 | U | Meter reading type. Possible values are described in Interface Specification - Linkware IEC 61968 Common v2 (draft).docx. |
| NewAsset | | 0..1 | U | Container for new device |
| ./EndDevice | | 1 | U | |
| ./EndDevice/mRID | | 1 | U | Device identifier |
| ./Readings | | 0..1 | U | Meter readings for the new device |
| ./Readings/Reading | | 0..n | U | |
| ./timestamp | xs:dateTime | 1..1 | U | Timestamp of the reading value |
| ./value | xs:decimal | 1..1 | U | |
| ./ReadingType/@ref | xs:string | 1..1 | U | Meter reading type. Possible values are described in Interface Specification - Linkware IEC 61968 Common v2 (draft).docx. |

*CRU = Is element available in Create, Read and Update (Change) operations. Currently only create and update is supported.

**Possible meter reading values**

| ReadingType | Description | Unit |
|---|---|---|
| 0.0.0.1.1.1.12.0.0.0.0.0.0.0.0.3.72.0 | Active positive (forward) register (A+). | kWh |
| 0.0.0.1.19.1.12.0.0.0.0.0.0.0.0.3.72.0 | Active negative (reverse) register (A-). | kWh |
| 0.0.0.1.1.1.12.0.0.0.0.0.0.0.0.3.73.0 | Reactive positive (forward) register (R+). | kVArh |
| 0.0.0.1.19.1.12.0.0.0.0.0.0.0.0.3.73.0 | Reactive negative (reverse) register (R-). | kVArh |
| 0.0.0.1.1.1.12.0.0.0.0.1.0.0.0.3.72.0 | Tariff register 1 (T1), A+. | kWh |

| | | |
|---|---|---|
| 0.0.0.1.1.1.12.0.0.0.0.2.0.0.0.3.72.0 | Tariff register 2 (T2), A+. | kWh |
| 0.0.0.1.1.1.12.0.0.0.0.3.0.0.0.3.72.0 | Tariff register 3 (T3), A+. | kWh |
| 0.0.0.1.1.1.12.0.0.0.0.4.0.0.0.3.72.0 | Tariff register 4 (T4), A+. | kWh |

### 2.3.2 CreateWorkOrder

CreateWorkOrder is used to create a work order.

Common principles to create or change data in Aidon systems is described in Interface Specification – Linkware IEC 61968 Common.

#### 2.3.2.1 Request

| Element | Data type | Cardinality | Description and usage |
|---|---|---|---|
| Header | | 1 | The header that contains information about the message. See Interface Specification – Linkware IEC 61968 Common for generic Header elements. |
| Header/Verb | xs:string | 1 | Possible values:<br>"create": create work order |
| Header/Noun | xs:string | 1 | Static "Work" |
| Payload | | 1 | |
| Payload/Work | m:Work | 1 | Work order to be created. Only elements that are defined with "C" in CRU column of the UsagePoint message will be available in create. |

#### 2.3.2.2 Response

| Element | Data type | Cardinality | Description and usage |
|---|---|---|---|
| Header | | 1 | The header that contains information about the message. See Interface Specification – Linkware IEC 61968 Common for generic Header elements. |
| Header/Verb | xs:string | 1 | Static "reply" |
| Header/Noun | xs:string | 1 | Static "Work" |
| Reply | | 1 | |
| Reply/Result | | 1 | OK, FAILED |
| Reply/Error | | 0..1 | Returned if Result=Failed |
| ./code | xs:string | 1 | Error code, see table below |
| ./level | xs:string | 1 | |
| ./reason | xs:string | 0..1 | Description of the error |
| Payload | | 1 | |
| Payload/Work | | 1 | Updated work order. Only elements that are defined with |

| | | | |
|---|---|---|---|
| | | | "U" in CRU column of the Work message will be available in response. Cardinality for the all elements is 0..1. |

### 2.3.2.3 Result codes

| Code | Description | Error level |
|---|---|---|
| 0.0 | Ok | |
| 1.0 | Request message is invalid or incomplete. This code is used when the request is invalid i.e. some required element is missing or invalid. For example when ChangeEndDevices message header's verb is not change or header's correlation id is missing. | FATAL |
| 1.1 | The message contains incorrect time specification. Only UTC times are supported. | FATAL |
| 2.1 | Usage point not found. | FATAL |
| 2.2 | Device not found. | FATAL |
| 2.38 | Work order already exists | FATAL |
| 5.0 | Operation failed. This code is used when the request cannot be completed because an exception has occurred. | FATAL |

This table describes result codes that are possibly returned from the described service. Result codes are listed and maintained in the document Interface Specification – Linkware IEC 61968 Common.

### 2.3.2.4 Examples

**Request**

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
                  xmlns:work="http://aidon.com/IEC/WorkOrder/v1/WorkMessage"
                  xmlns:mes="http://iec.ch/TC57/2011/schema/message"
                  xmlns:work1="http://iec.ch/TC57/2007/Work#">
  <soapenv:Header />
  <soapenv:Body>
    <work:CreateWorkOrderRequest>
      <work:Header>
        <mes:Verb>create</mes:Verb>
        <mes:Noun>Work</mes:Noun>
        <mes:Timestamp>2016-02-01T12:15:00Z</mes:Timestamp>
        <mes:Source>Client System</mes:Source>
        <mes:MessageID>795931F9-3DF3-4D2C-A743-AF139041E3FE</mes:MessageID>
        <mes:CorrelationID>6E4496DD-E2F8-4775-A332-
D3DE25B961E9</mes:CorrelationID>
      </work:Header>
      <work:Payload>
        <work:Work>
          <work1:mRID>7dc53df5-703e-56b3-86ff-b1a418f22fe1</work1:mRID>
          <work1:referenceId>10011</work1:referenceId>
          <work1:errandId>1234567</work1:errandId>
          <work1:errandStatusKind>Open</work1:errandStatusKind>
          <work1:kind>service</work1:kind>
          <work1:requestDateTime>2016-02-01T12:14:58Z</work1:requestDateTime>
          <work1:targetDateTime>2016-02-14T00:00:00Z</work1:targetDateTime>
          <work1:statusKind>waitingToBeScheduled</work1:statusKind>
```

```
          <work1:orderDetails>Poor RF signal, probably requires an
antenna</work1:orderDetails>
          <work1:UsagePoint>
            <work1:mRID>123456789</work1:mRID>
          </work1:UsagePoint>
          <work1:EndDevice>
            <work1:mRID>700123456</work1:mRID>
          </work1:EndDevice>
          <work1:createdBy>ext-user1</work1:createdBy>
          <work1:performerUnit>Network Installers Ltd</work1:performerUnit>
          <work1:fieldEngineer>John Doe</work1:fieldEngineer>
          <work1:connectionStatus>Disconnected</work1:connectionStatus>
          <work1:placementDetails>Keycode is 1234</work1:placementDetails>
          <work1:voltage>230</work1:voltage>
          <work1:ratedCurrent>50.0</work1:ratedCurrent>
          <work1:phaseCode ref="ABC" />
          <work1:antennaType>None</work1:antennaType>
        </work:Work>
      </work:Payload>
    </work:CreateWorkOrderRequest>
  </soapenv:Body>
</soapenv:Envelope>
```

**Response**

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
                  xmlns:work="http://aidon.com/IEC/WorkOrder/v1/WorkMessage"
                  xmlns:mes="http://iec.ch/TC57/2011/schema/message"
                  xmlns:work1="http://iec.ch/TC57/2007/Work#">
  <soapenv:Header />
  <soapenv:Body>
    <work:CreateWorkOrderResponse>
      <work:Header>
        <mes:Verb>reply</mes:Verb>
        <mes:Noun>Work</mes:Noun>
        <mes:Timestamp>2016-02-01T12:15:02Z</mes:Timestamp>
        <mes:Source>Aidon Linkware</mes:Source>
        <mes:MessageID>795931F9-3DF3-4D2C-A743-AF139041E3FE</mes:MessageID>
        <mes:CorrelationID>6E4496DD-E2F8-4775-A332-
D3DE25B961E9</mes:CorrelationID>
      </work:Header>
      <work:Payload>
        <work:Work>
          <work1:mRID>7dc53df5-703e-56b3-86ff-b1a418f22fe1</work1:mRID>
          <work1:referenceId>10011</work1:referenceId>
          <work1:errandId>1234567</work1:errandId>
        </work:Work>
      </work:Payload>
    </work:CreateWorkOrderResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

### 2.3.3 ChangeWorkOrder

ChangeWorkOrder is used to update an existing work order.

Common principles to create or change data in Aidon systems is described in Interface Specification – Linkware IEC 61968 Common.

#### 2.3.3.1 Request

| Element | Data type | Cardinality | Description and usage |
|---|---|---|---|
| Header | | 1 | The header that contains information about the message. See Interface Specification – Linkware IEC 61968 Common for generic Header elements. |
| Header/Verb | xs:string | 1 | Possible values:<br>"change": create work order |
| Header/Noun | xs:string | 1 | Static "Work" |
| Payload | | 1 | |
| Payload/Work | m:Work | 1 | Work order to be created. Only elements that are defined with "U" in CRU column of the UsagePoint message will be available in create. |

#### 2.3.3.2 Response

| Element | Data type | Cardinality | Description and usage |
|---|---|---|---|
| Header | | 1 | The header that contains information about the message. See Interface Specification – Linkware IEC 61968 Common for generic Header elements. |
| Header/Verb | xs:string | 1 | Static "reply" |
| Header/Noun | xs:string | 1 | Static "Work" |
| Reply | | 1 | |
| Reply/Result | | 1 | OK, FAILED |
| Reply/Error | | 0..1 | Returned if Result=Failed |
| ./code | xs:string | 1 | Error code, see table below |
| ./level | xs:string | 1 | |
| ./reason | xs:string | 0..1 | Description of the error |

#### 2.3.3.3 Result codes

| Code | Description | Error level |
|---|---|---|
| 0.0 | Ok | |
| 1.0 | Request message is invalid or incomplete. This code is used when the request is invalid i.e. some required element is missing or invalid. For example when ChangeEndDevices message header's verb is not change or header's correlation id is missing. | FATAL |
| 1.1 | The message contains incorrect time specification. Only UTC times are supported. | FATAL |
| 5.0 | Operation failed. This code is used when the request cannot be completed because an exception has occurred. | FATAL |

This table describes result codes that are possibly returned from the described service. Result codes are listed and maintained in the document Interface Specification – Linkware IEC 61968 Common.

### 2.3.3.4 Examples

**Request**

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
                  xmlns:work="http://aidon.com/IEC/WorkOrder/v1/WorkMessage"
                  xmlns:mes="http://iec.ch/TC57/2011/schema/message"
                  xmlns:work1="http://iec.ch/TC57/2007/Work#">
  <soapenv:Header />
  <soapenv:Body>
    <work:ChangeWorkOrderRequest>
      <work:Header>
        <mes:Verb>change</mes:Verb>
        <mes:Noun>Work</mes:Noun>
        <mes:Timestamp>2016-02-01T12:15:00Z</mes:Timestamp>
        <mes:Source>Client System</mes:Source>
        <mes:MessageID>795931F9-3DF3-4D2C-A743-AF139041E3FE</mes:MessageID>
        <mes:CorrelationID>6E4496DD-E2F8-4775-A332-
D3DE25B961E9</mes:CorrelationID>
      </work:Header>
      <work:Payload>
        <work:Work>
          <work1:mRID>7dc53df5-703e-56b3-86ff-b1a418f22fe1</work1:mRID>
          <work1:referenceId>10011</work1:referenceId>
          <work1:errandId>1234567</work1:errandId>
          <work1:errandStatusKind>Finished</work1:errandStatusKind>
          <work1:kind>service</work1:kind>
          <work1:actualDateTime>2016-02-10T10:02:00Z</work1:actualDateTime>
          <work1:statusKind>completed</work1:statusKind>
          <work1:orderDetails>Poor RF signal, probably requires an
antenna</work1:orderDetails>
          <work1:UsagePoint>
            <work1:mRID>123456789</work1:mRID>
          </work1:UsagePoint>
          <work1:EndDevice>
            <work1:mRID>700445678</work1:mRID>
          </work1:EndDevice>
          <work1:performerUnit>Network Installers Ltd</work1:performerUnit>
          <work1:fieldEngineer>John Doe</work1:fieldEngineer>
          <work1:connectionStatus>Connected</work1:connectionStatus>
          <work1:placementDetails>Keycode is 1234</work1:placementDetails>
          <work1:voltage>230</work1:voltage>
          <work1:ratedCurrent>63.0</work1:ratedCurrent>
          <work1:phaseCode ref="ABC" />
          <work1:deviationKind>The meter seemed to be
broken</work1:deviationKind>
          <work1:antennaType>None</work1:antennaType>
          <work1:ActivityRecords>
            <work1:ActivityRecord>
              <work1:Documents>
                <work1:Document>
                  <work1:createdDateTime>2016-02-
10T09:37:12Z</work1:createdDateTime>
                  <work1:title>IMG_10102.JPG</work1:title>
                  <work1:ElectronicAddress>
```

```
<work1:web>http://fileserver01/10011/IMG_10102.JPG</work1:web>
                  </work1:ElectronicAddress>
                </work1:Document>
              </work1:Documents>
            </work1:ActivityRecord>
          </work1:ActivityRecords>
          <work1:Readings>
            <work1:Reading>
              <work1:timestamp>2016-02-10T09:58:00Z</work1:timestamp>
              <work1:value>0.0</work1:value>
              <work1:ReadingType ref="0.0.0.1.1.1.12.0.0.0.0.0.0.0.3.72.0" />
            </work1:Reading>
          </work1:Readings>
          <work1:OldAsset>
            <work1:EndDevice>
              <work1:mRID>700123456</work1:mRID>
            </work1:EndDevice>
            <work1:Readings>
              <work1:Reading>
                <work1:timestamp>2016-02-10T09:39:00Z</work1:timestamp>
                <work1:value>4321.0</work1:value>
                <work1:ReadingType ref="0.0.0.1.1.1.12.0.0.0.0.0.0.0.3.72.0"
/>
              </work1:Reading>
            </work1:Readings>
          </work1:OldAsset>
        </work:Work>
      </work:Payload>
    </work:ChangeWorkOrderRequest>
  </soapenv:Body>
</soapenv:Envelope>
```

**Response**

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
                  xmlns:work="http://aidon.com/IEC/WorkOrder/v1/WorkMessage"
                  xmlns:mes="http://iec.ch/TC57/2011/schema/message"
                  xmlns:work1="http://iec.ch/TC57/2007/Work#">
  <soapenv:Header />
  <soapenv:Body>
    <work:ChangeWorkOrderResponse>
      <work:Header>
        <mes:Verb>reply</mes:Verb>
        <mes:Noun>Work</mes:Noun>
        <mes:Timestamp>2016-02-01T12:15:02Z</mes:Timestamp>
        <mes:Source>Aidon Linkware</mes:Source>
        <mes:MessageID>795931F9-3DF3-4D2C-A743-AF139041E3FE</mes:MessageID>
        <mes:CorrelationID>6E4496DD-E2F8-4775-A332-
D3DE25B961E9</mes:CorrelationID>
      </work:Header>
      <work:Payload>
        <work:Work>
          <work1:mRID>7dc53df5-703e-56b3-86ff-b1a418f22fe1</work1:mRID>
          <work1:referenceId>10011</work1:referenceId>
          <work1:errandId>1234567</work1:errandId>
        </work:Work>
      </work:Payload>
    </work:ChangeWorkOrderResponse>
  </soapenv:Body>
```

```
</soapenv:Envelope>
```

# 3 Appendix: Change history

| Version | Author | Date | Changes |
|---|---|---|---|
| 1.00D | HKl | 4.2.2016 | Initial draft |
| 1.01D | HKl | 4.2.2016 | Fixes based on internal review comments |
| 1.02D | HKl | 5.2.2016 | Added example messages |
| 1.03D | HKl | 13.4.2016 | Added result code 1.1 to CreateWorkOrder |
| 1.04D | HKl | 26.4.2016 | Added referenceId and errandId to Work message, changed kind element as free text and added possibility to return updated work order data in CreateWorkOrder response |
| 1.05D | HKl | 2.6.2016 | Added targetDateTime, performerUnit and createdBy elements to Work message |
| 1.06D | HKl | 8.8.2016 | Added a draft for ChangeWorkOrder operation |
| 1.07D | HKl | 16.9.2016 | Updated draft for ChangeWorkOrder based on review comments |
| 1.08D | HKl | 29.9.2016 | Fixed cardinalities in Work message and added some elements to be available for Create operation too |
| 1.09D | HKl | 3.10.2016 | Fixed timestamps in example messages and added more additional fields to examples |
| 1.10D | HKl | 17.10.2016 | Fixed note about CRU column in Work message. |
| 1.11D | PVA | 24.10.2016 | Added possible values for connectionStatus field |
| 1.12D | PVA | 04.11.2016 | Added mRID for ActivityRecord Document |
| 1.13 | TPa | 15.11.2016 | Published Linkware 1.10 release version |
| 1.14D | PVa | 30.12.2016 | Added NewAsset tag to Work |
| 1.15 | PVa | 11.5.2017 | Published Linkware 1.11 release version |