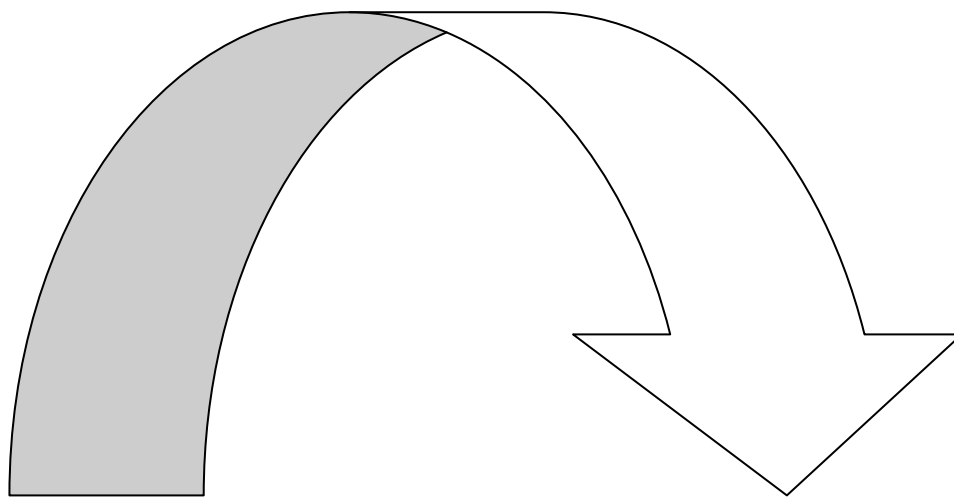


Basic Function Description

Open Access Protocol (OAP)

SE 99231 2010-01-19/ Ver. H



Basic Function Description

Open Access Protocol (OAP)

1 Introduction

The Open Access Protocol is used as an interface between external applications or systems and a Cordless Telephone System and/or System 900. The protocol enables exchange of data between the systems, for example messages.

Examples of applications are integration of Cordless Telephone System and System 900 services with a Nurse Call System. It can also be used to interface a building automation system or handle machine alarms in a production process etc.

1.1 Abbreviations

XML	Extensible Markup Language
LAN	Local Area Network
TCP	Transmission Control Protocol

1.2 Definitions

Request block	XML document sent between the OAP Server and client application
Response block	XML document sent as response to a previously sent request block.

2 Technical Solution

The Open Access Protocol can be used by a client application for communication with a Cordless Telephone System and System 900. The client communicates with an OAP Server. The protocol is XML based and is sent to the OAP Server over the LAN using a TCP connection.

2.1 System Outline

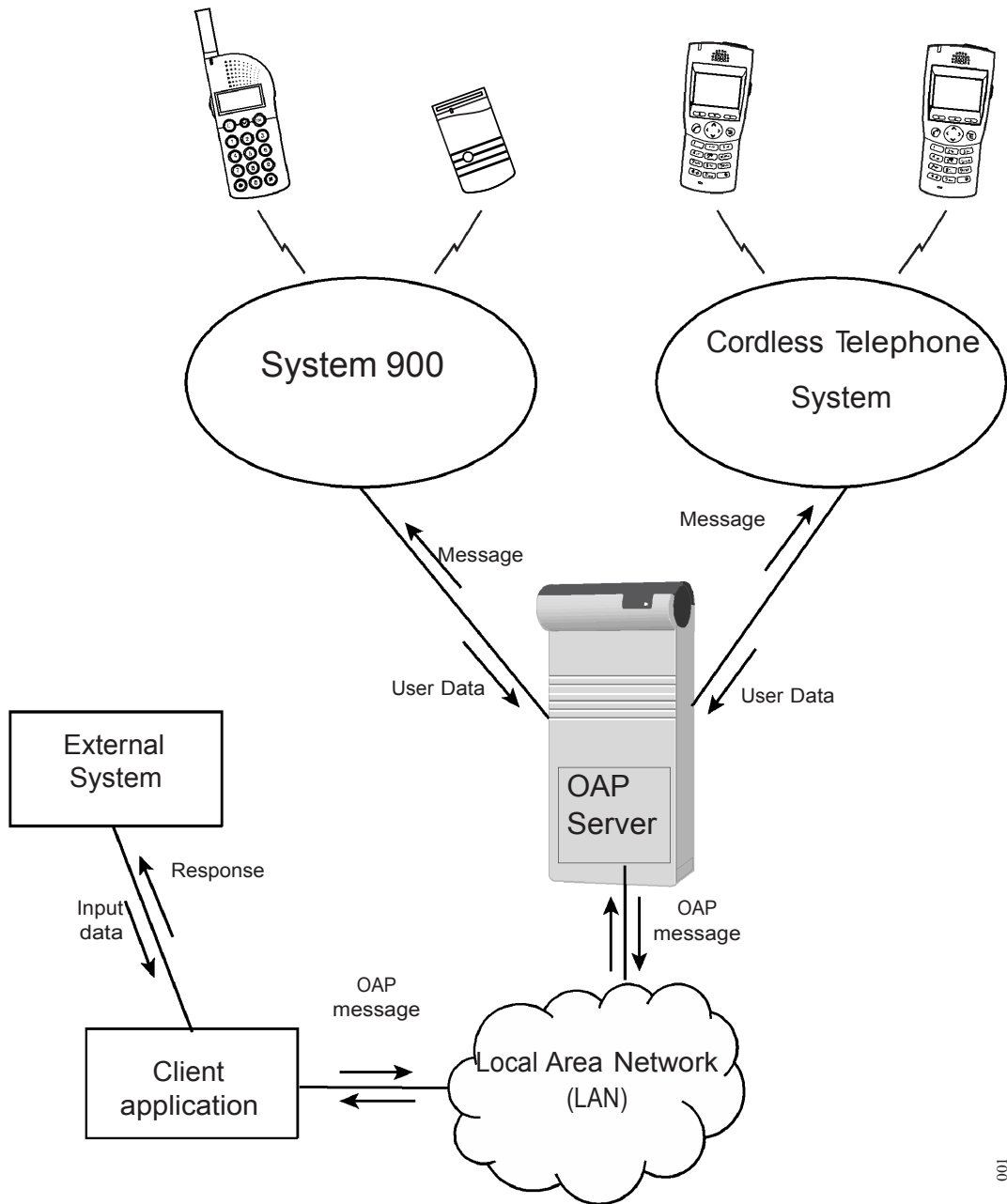


Figure 1. Receiving Portable Device user data and transmitting messages to Portable Devices.

2.2 Application Examples

The Cordless Handsets in the system have two preprogrammed Hot keys that are used to turn on and off the light. In addition, the Building Automation System can send Messages to the Cordless Handsets, and take actions according to the response that is sent from the handset.

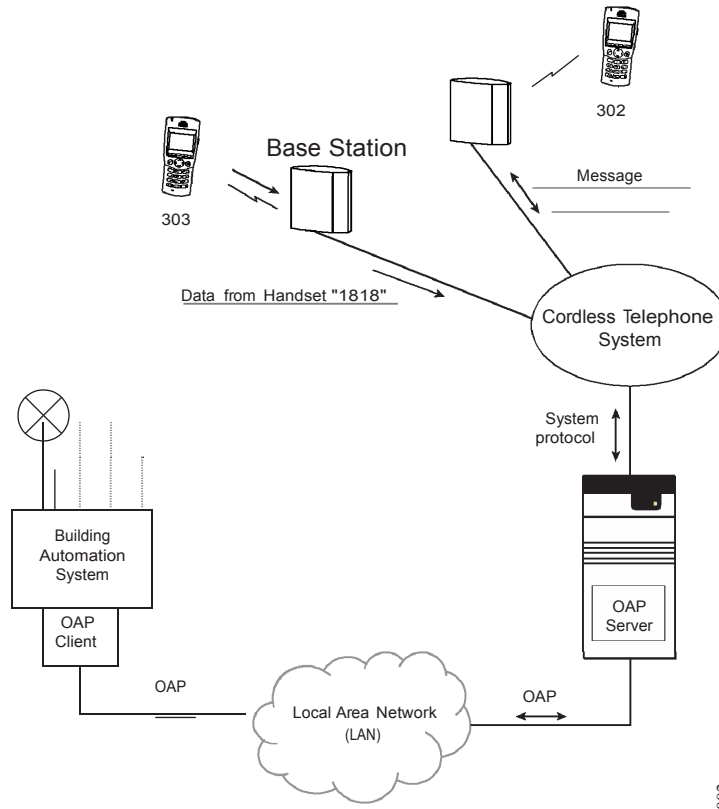


Figure 2. Controlling a Building Automation System from a Cordless Handset via OAP.

In this example, the Building Automation System has implemented the OAP protocol to be able to communicate with the Cordless Handsets in the Cordless Telephone System. This implementation will hereafter be called OAP Client. The unit that includes the OAP Server transforms the OAP message to the protocol used by the receiving system.

Protocol Communication for Light Control via User Data

Before the OAP Client can receive User Data from the Cordless Handset, it has to register in the OAP Server and subscribe for the information.

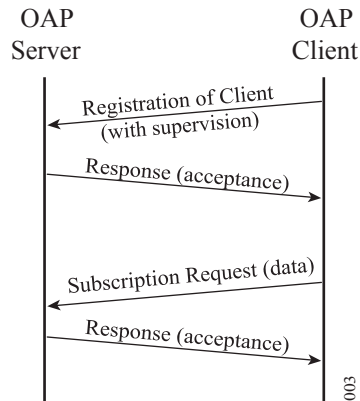


Figure 3. Registration of the Building Automation System and subscription for User Data from Cordless Handsets.

Registration and subscription for user has to be done once when communication with the server is established.

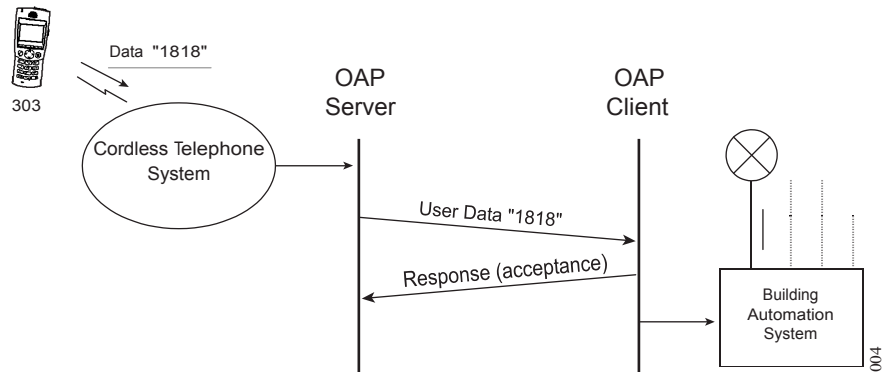


Figure 4. Using data from handset to control a Building Automation System.

When the handset transmits the data, it is sent to the OAP Server. The OAP Server then transmits the information to the OAP Client. When the OAP Client receives the information, it sends a response to the OAP Server that the OAP message has been received. It interprets the information in the OAP message and turns on the light.

Protocol Communication for Error Indication to Cordless Handsets via Messaging

When an error occurs in the Building Automation System, a Message is sent to a handset in the Cordless Telephone System. In the message there is an option for acknowledgement.

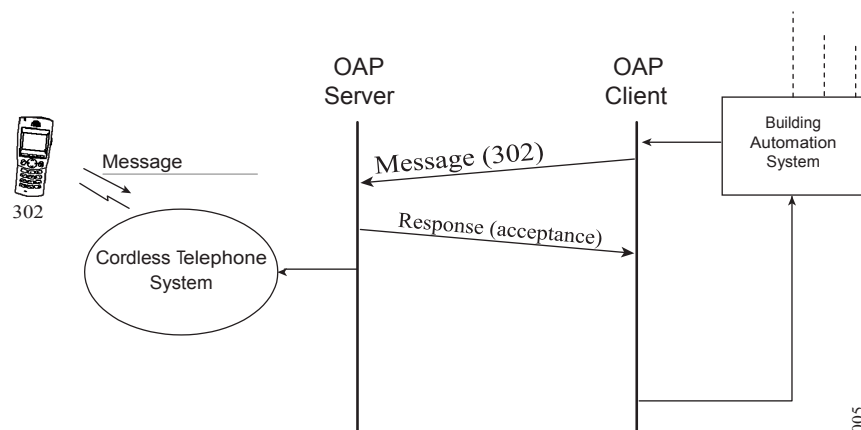


Figure 5. Error indication and control via Messaging.

When an error occurs the OAP Client sends a Message to the OAP Server in the Cordless Telephone System. The OAP Server sends a response to the OAP Client that the message has been received. It interprets the message and sends it to the addressed Cordless Handset.

When the handset sends an acknowledgement that should be handled by the Building Automation System, the response is sent from the OAP Server to the OAP Client. The OAP Client sends a confirmation to the OAP Server that the response has been received. It then interprets the response and the Building Automation System takes appropriate actions.

3 System Requirements

Up to 5 clients can connect to the same OAP server.

Portable Devices

The Portable Device has to have support for the OAP services that are to be used. See Data Sheets for each Portable Device for more information.

System 900

Transmitting and receiving equipment. See System Descriptions for On-site Paging System and Personal Security System for more information.

Cordless Telephone System

Equipment for message control. See documentation for the Cordless Telephone System for more information.

3.1 Licenses

There are different OAP licenses depending on which functionality that are required.

4 Protocol Description

This chapter describes the general structure of the Open Access Protocol, and also the transportation between the OAP Server and a client.

4.1 Introduction

The Open Access Protocol is a data transport protocol that uses XML documents as data carriers. The XML document will be called “request block” in this description. A response to a request block will be called “response block”.

4.1.1 Transport

The Local Area Network (LAN) is used for communication between the server and the client. The messages are sent with TCP to the OAP Server that listens to port 1321. The client application must submit the port number and IP address that the OAP Server should use for responses to the client. If there is an open TCP connection for this port and IP address, that connection is used else the OAP Server will use a temporary connection. An established TCP connection can be used for all messages or a new connection can be established for each message.

4.1.2 Protocol Version

The OAP version is included in all blocks that are sent between the OAP Server and the client. The major number in the OAP version is a compatibility number that indicates whether the OAP Server can handle the block from the client or not.

Example:

A block from the client with OAP version 2.10 will be handled if the OAP Server supports version 2.xy (xy is any value).

4.1.3 Character Encoding

XML element tag names

The element names used within the service protocol uses the characters 0x20 – 0x7F in US-ASCII (ISO 646) only.

XML data content

All characters within a block must use ISO 8859-1 encoding.

The data content between a start and end tag must be escaped according to XML standard.

Example:

- The character ‘&’ must be written ‘&’.

Any character can also be written with its ASCII code in hex, for example ‘’ for carriage return (ASCII character 013). This is normally not needed, but can be good to know to solve problems.

4.1.4 Parsing of Blocks in the OAP Server

The blocks that are transmitted to the OAP server have to be written as one long text string without any carriage returns. The code examples that are shown in this document are, however, written with carriage returns in order to make them easier to read.

4.1.5 Structure

The request block consists of two parts, header and body. The header contains address information and the body contains the data. The response block contains status information for a previously sent request block.

Message ID

All blocks include an ID. The ID is hexadecimal number between 1 and FFFFFFFF. The ID is used as a reference when sending a response to a previously sent request block.

Recommendation:

The 16 most significant bits should be a random number that is regenerated at every reboot. The 16 least significant bits is then a sequence number that is increased by one for each request block.

Request Block

The request block will look as follows:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-request version="3.0" id="xxx">
  <Header>
    Addressing information
  </Header>
  <Body service="service_name">
    Service data
  </Body>
</OAP-request>
```

Text that is written in italic is the data.

Response Block

The response block will look as follows:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-response version="3.0" id="xxx">
  <Status service="service_name">
    Response status
  </Status>
</OAP-response>
```

Text that is written in italic is the data. The first response block will have the status 'Acceptance' and is sent as soon as the receiving part has evaluated the content and checked that the request can be handled. The client should always wait for the first response block before terminating the connection to the OAP Server. If the client has not received a response within 15 seconds the connection can be terminated.

The response block is described further in 4.2.6 *Response from Server* and 4.3.6 *Service Status Response*.

4.1.6 Header Data

The header data contains addressing information that the receiver of a request block uses when sending a response block.

The header in the request block looks as follows:

```
<Header>
  <IP>Senders IP address</IP>
  <Port>Senders Port number</Port>
</Header>
```

Elements

IP (optional)	The senders IP address. 7-15 characters. The IP address in decimal representation (for example 100.10.10.5)
Port (optional)	The senders port number. 1-5 decimal characters

If any of these elements are missing or empty, 'Acceptance' status only will be sent as response.

4.1.7 Body Data

The body data is the information that is sent to an application or unit. There can only be one body in a request block. The body tag has an attribute that contains the service in the request, for example message. For more information about the look of the body and the elements, see 4.3 *Services*.

4.1.8 Response Data

The response data includes information about the process of the request block in the system.

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-response version="3.0" id="xxx">
  <Status service="service_name">
    <Type>Status Type</Type>
    <Code>Description code</Code>
    <Text>Descriptive text</Text>
    <TypeSpecific>Elements that are specific for the status type.</TypeSpecific>
  </Status>
</OAP-response>
```

Elements

Type	The type of the response. Range: 1-99 1 : Acceptance 2 : Availability 3 : Delivery 4 : Manual acknowledge
Code	Code that describes the status type. 3 decimal characters. The codes are described in connection with the service descriptions.
Text	Text that describes the status that has been received. 1-160 characters.
TypeSpecific	Elements that is dependent on the status type. The type specific elements are described in connection with the services.

4.2 System Specific Requests

The system specific requests can be used by the client to check the communication link to the OAP Server and also to subscribe for information that the OAP Server can send to the client, i.e. user data from Portable Devices.

4.2.1 Registration of Client

There are two reasons for a client to use registration:

- Supervision of the communication between client applications and the OAP Server. In case of a lost client, the system can take appropriate actions.
- Subscribe for information from the OAP Server to the client application.

It is not necessary to register the client if it only wants to send messages to the OAP server and supervision of lost clients is not required.

The format of the registration request:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-request version="3.0" id="xxx">
  <Header>
    <IP>Senders IP address</IP>
    <Port>Senders Port number</Port>
  </Header>

  <Body service="addClient">
    <UpdTime>time</UpdTime>
  </Body>
</OAP-request>
```

The client registers to the OAP Server by sending a request block with the service set to "addClient". When the client sends the registration request, all existing subscriptions that the client has will be deleted. This means that the client has to subscribe to the services that are to be used every time it is started.

The "UpdTime" sets the time limit for supervision requests. If the client has not sent a supervision request within the specified time limit, the OAP Server will consider the client disconnected and delete all existing subscriptions. This element can be left out if the client should not be supervised by the OAP Server.

If the client does not get a response from the OAP Server within 15 seconds it should send a new registration request.

Elements

UpdTime (optional)	This element tells the OAP Server that the client will send a supervision request within the specified time. 10-900 seconds.
-----------------------	---

4.2.2 Supervision Request

The supervision request is sent from the client to the OAP Server to check that the communication link is working and that the OAP Server is running. It is also the block that the client uses to tell the OAP Server that it is alive when the supervision time is set in the registration block.

The format of the supervision request:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-request version="3.0" id="xxx">
  <Header>
    <IP>Senders IP address</IP>
    <Port>Senders Port number</Port>
  </Header>

  <Body service="supervision">
  </Body>
</OAP-request>
```

The client sends a supervision request to the OAP Server by sending a request block with the service set to "supervision". If the client has not received a response from the OAP Server within 15 seconds it should start over with a new registration.

4.2.3 Disconnection Request

This request should be sent when the client wants to stop the connection to the OAP Server. The OAP Server will then delete all existing subscriptions for the client. The format of the disconnection request:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-request version="3.0" id="xxx">
  <Header>
    <IP>Senders IP address</IP>
    <Port>Senders Port number</Port>
  </Header>

  <Body service="removeClient">
  </Body>
</OAP-request>
```

The client sends a disconnection request to the OAP Server by sending a request block with the service set to "removeClient". The client must not disconnect until it has got a response from the OAP Server. If a response has not been received within 15 seconds (time-out) the client can disconnect.

4.2.4 Subscription Request

The client can subscribe for information from the OAP Server, provided that the client has registered with supervision. The subscription request will be denied if the client is not supervised by the OAP Server (i.e. the UpdTime has to be specified in the registration request).

The requested services will be sent to the IP address and port that is specified in the header of the subscription request. The client may subscribe for several services by sending multiple requests.

The format of the subscription request:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-request version="3.0" id="xxx">
  <Header>
    <IP>Senders IP address</IP>
    <Port>Senders Port number</Port>
  </Header>

  <Body service="subscriptionStart">
    <Service>Type of service</Service>
  </Body>
</OAP-request>
```

The client subscribes for services by sending a request block with the service set to "subscriptionStart" to the OAP Server. The services that are available for subscription are represented with a decimal number between 1 and 99.

Elements

Service	Decimal number that represents the requested service. Range: 1-99 1 : User Data
---------	---

4.2.5 End Subscription Request

The client can stop the subscription for a service by sending an end subscription request. The format of the end subscription request:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-request version="3.0" id="xxx">
  <Header>
    <IP>Senders IP address</IP>
    <Port>Senders Port number</Port>
  </Header>

  <Body service="subscriptionStop">
    <Service>Type of service</Service>
  </Body>
</OAP-request>
```

The client stops the subscription for a service by sending a request block with the service set to "subscriptionStop" to the OAP Server.

Elements

See 4.2.4 *Subscription Request* for more information about the elements.

4.2.6 Response from Server

For each of the requests from the client, the OAP Server will send a response with status 'Acceptance'. The reference ID and service name are identical to the ones in the request. For more information about the response block, see 4.1.8 *Response Data*

Acceptance

<i>Code</i>	Code that describes the status type Acceptance. 000–199 : Message not accepted 200–299 : Message accepted 200 : OK 300–399 : Try again 300 : Unknown error 320 : Congestion 400–999 : Message not accepted 400 : Unknown error 401 : Communication error 402 : Licence error 403 : Message not understood 404 : Address not understood 405 : Addressee unknown 406 : Not supported 407 : Client not registered 408 : OAP version mismatch
-------------	---

4.3 Services

This is the services that are implemented in the Open Access Protocol.

4.3.1 User Data

This service includes information about data that has been sent from a Portable Device within the system.

The block looks as follows:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-request version="3.0" id="xxx">
  <Header>
    <IP>Senders IP address</IP>
    <Port>Senders Port number</Port>
  </Header>

  <Body service="userData">
    <From>Portable Device address</From>
    <Data>Input data</Data>
  </Body>
</OAP-request>
```

The block is identified as user data as the service is set to "userData".

Elements

From	The address of the Portable Device that transmitted the user data. 1-100 characters.
Data	A data string received from the Portable Device. 1-255 characters.

4.3.2 Message

This service is used to send a message to a Portable Device within the system. The block looks as follows:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<OAP-request version="3.0" id="xxx">
  <Header>
    <IP>Senders IP address</IP>
    <Port>Senders Port number</Port>
  </Header>

  <Body service="message">
    <To>Portable Device address</To>
    <SubjectText>Subject for the message</SubjectText>
    <BodyText>Body for the message</BodyText>
    <Priority>Message priority</Priority>
    <BeepCode>Beep Code that is used for indication</BeepCode>

    <AvailabilityStatus/>
    <DeliveryStatus/>

    <ManualAckStatus>
      <Mode>Type of acknowledge</Mode>
    </ManualAckStatus>
  </Body>
</OAP-request>
```

The request block is identified as a message as the service is set to “message”. It is possible to request status information by including the elements “AvailabilityStatus” and “DeliveryStatus”. The availability status indicates if a Portable Device is placed in a Storage or Charging Rack. The delivery status is sent when the message has reached the Portable Device.

A manual acknowledge of the message can be requested by including the “ManualAckStatus” block. The acknowledge is sent as a response with status type ‘Acknowledge’. The “Mode” element indicates if the user has the option to reject the message or if accept is the only possible option.

Elements

To	The address of the receiver of the message. For example a Portable Device address. 1-100 characters.
SubjectText (optional)	The subject of the message, normally used for general Information about the message. 0-150 characters. The text in the subject and body elements will be concatenated before transmission to Portable Devices within System 900. If the text is too long, it will be truncated before transmission.
BodyText (optional)	Body of the message, normally used for the main content of the message. 0-500 characters. The text in the subject and body elements will be concatenated before transmission to Portable Devices within System 900. If the text is too long, it will be truncated before transmission.
Priority (optional)	Priority of the message. Range: 0-9 Default value: 6 1 : alarm priority (should be used with special care) 2-4 : high priority 5-7 : normal priority 8-9 : low priority
BeepCode (optional)	A value that determines the indication in the Portable Device. Range: 0-99 Default value: 2 0-9 used for System 900 backward compatibility. 10-99 reserved
AvailabilityStatus (optional)	Request for availability status for the Portable Device that is addressed in the "To" element. The OAP Server will send the information as soon as it has got it from the carrier system.
DeliveryStatus (optional)	Request for the status message 'Delivery'.

Acknowledge Elements

The acknowledge block is optional and is included when a response is requested.

Mode (optional)	Sets the types of acknowledge. Possible values: OnlyAccept - the user can only accept the message. AcceptAndReject - the user can accept or reject the message.
--------------------	--

4.3.3 Service Status Response

For all requests that are sent between the client application and the OAP Server a response block has to be sent. The reference ID and service name are identical to the ones in the request. Which types of statuses that can be sent for different services are described below. The response block is described in 4.1.8 *Response Data*.

User Data

When the client application has received an user data block, it should check the block and then send a response block with status 'Acceptance' to the OAP Server.

Acceptance

See 4.2.6 *Response from Server* for more information about the codes for the acceptance status.

Message

When a message request has been sent the OAP server will send a response with 'Acceptance'. Normally this is done within 15 seconds. Additionally response blocks with availability, delivery, and manual acknowledge status can be received if they have been requested.

Acceptance

See 4.2.6 *Response from Server* for more information about the elements in a response block with acceptance status.

Availability

The availability status will be sent when the receiving application has received the information. The codes that can be received is listed below. Note that several different codes for absent can occur in one status response.

Code	Code that describes the status type Availability.
	200–299 : User is present
	200 : Present
	400–499 : User is absent
	400 : General absent
	401 : Do not disturb
	402 : Manual absent
	403 : In meeting
	404 : In storage rack
	405 : Deprecated, no longer used

Delivery

The delivery status will be sent when the message has been delivered to the address in the "To" element, i.e. it does not guarantee that the user has read the message.

Manual Acknowledge

This message is sent when the user has accepted or rejected a message with request for acknowledge. If the original message was sent to a group number, more than one response can be sent depending on how many that has accepted or rejected.

Code	Code that describes the status type Manual Acknowledge. 200–299 : Message is accepted 200 : Accepted 400–499 : Message is not accepted 400 : Rejected
------	---

The address of the Portable Device that the response was sent from is included in the type specific element.

```
...
  <TypeSpecific>
    <From>Address of the sender of the acknowledge</From>
  </TypeSpecific>
</Status>
</OAP-request>
```

From	The address of the Portable Device that transmitted the acknowledge. 1-100 characters.
------	---