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# NFC Extended OXE Mobility

## Chapter 1
NFC Extended OXE Mobility

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1.1 Introduction

The ALE NFC Extended OXE Mobility application allows users to activate OmniPCX Enterprise (OXE) telephone features by approaching a mobile phone to the NFC sticker of a desktop phone.

It is developed for Google Android environments and can be installed on Android mobile devices with NFC capabilities.

It offers the following features:
- Shifting an ongoing call from a user mobile device to a desktop phone or from a desktop phone to a user mobile device
- Setting or canceling immediate call forwardings of the user main desktop phone to any other set on the network
- Logging on and logging off from the user Desk Sharing User (DSU) extension

This application can be used alone. But to complete call shifting operations, it must be associated to a telephone application. Two kinds of applications are supported:
- Applications managed by the native Telephony Manager. This is possible provided the mobile phone is declared as remote extension in the OmniPCX Enterprise.
- Applications managed through CSTA and defined in the OmniPCX Enterprise as a type of user, such as IP Desktop Softphone

1.2 Technical description

1.2.1 User extensions

The services offered by the application mainly depend on the user extension configuration.

Three different combinations are supported:
- The mobile phone is declared in the OmniPCX Enterprise (as remote extension, or softphone) but no other user extension (main desk phone) is declared in the OmniPCX Enterprise or in the application’s settings

Operations involving the user main extension, such as remote call forwarding, or DSU in a Desk Sharing environment, cannot be offered. Shifting a call to and from a mobile phone remains possible.
- The user main desktop phone is declared, but the mobile phone is not declared in the OmniPCX Enterprise (no local number), or not declared in application settings.

Shifting a call from and to a mobile is not possible. The possible operations are: remote call forwarding of the main user extension and DSU applications in Desk Sharing environment.
- The user main desktop phone and mobile phone are declared in the OmniPCX Enterprise and declared in application settings.

This configuration, opening all of the application possibilities, demands that the two user extensions (mobile and desktop phone) are declared as twin sets in the OmniPCX Enterprise. Otherwise, shifting a call between a mobile phone and the user main extension cannot be
1.2.2 Approaching a mobile phone to the NFC tag

In standard operations, ALE NFC Extended OXE Mobility does not need to be launched, even in the background, because it relies on the Android System Tag Dispatch mechanism. When the mobile device is approached to an NFC tag, the Android System detects it, identifies its type and automatically starts the corresponding application.

The first operation of the application is to read and analyze the content of the NFC tag. The tag holds the following information:

- Extension number of the desktop phone bearing the NFC tag
- Role main addresses of the main and stand-by Communication Servers
- Port number for CSTA on these Communication Servers
- An optional flag indicating that the desktop phone is a Desk Sharing Set (DSS)

The information retrieved from the tag is used together with the application stored data to establish the list of extensions potentially concerned by the user action.

This list can contain up to four extensions:

- The mobile phone extension, if application settings define a mobile user number (softphone or remote extension)
- The user main desk phone extension if it is defined application settings
- A third party extension, if the mobile has been approached to a tag on a set that is not the user main desk phone
- The Desk Sharing Set on which the user is logged on, if configured as Desk Sharing User

Once the list established, the telephone state of each extension is analyzed to determine which operation to perform.

In most cases, state analysis is done by CSTA monitoring of the extension. There is one exception. When the mobile phone is declared as a standard remote extension, monitoring of this extension is done with the Android Telephony Manager.

For communication optimization, the application only opens the necessary CSTA server connections: a unique connection is established to a server managing several extensions. In the most complicated situations, a maximum of three simultaneous connections to the CSTA servers is necessary.

Connections to CSTA servers are done via the IP network: the Wi-Fi network or 3G/4G, which typically requires a VPN access.

1.2.3 Selection of operations

As described in the previous section, the mobile application interprets which action the user wishes to perform, considering the information of the NFC tag, the parameters in the memory and telephone states of the extensions involved.

Except in the last section, all the situations described here imply that the user mobile and main desktop phone are declared in the OmniPCX Enterprise as twin sets and declared in application settings.

1.2.3.1 The user main extension is declared as standard business profile (not a DSU)
The mobile device is approached to its primary twin set (main user extension)
- If the mobile device is engaged in a call
  • The main user extension is free: the call is shifted from the mobile device to the primary set
  • The primary set is engaged in a call: the application is closed
- If the mobile device is free
  • The primary set is engaged in a call: the call is shifted from the primary set to the mobile device.
  • The primary set is free and call forwarding is established on the primary set by the application: immediate call forwarding on the primary set is canceled.
  • In all other cases: the application is closed.

The mobile device is approached to a business set other than its primary set (third set)
- If the mobile device is engaged in a call
  • The third set is free: the call is shifted from the mobile device to the third set.
  • The third set is engaged in a call: the application is closed.
- If the mobile device is free
  • The third set is engaged in a call: the call is shifted from the third set to the mobile device.
  • The primary set is busy: the application is closed.
  • In other cases: if no call forwarding is established on the primary set by the application: immediate call forwarding is established from the primary set to the third set
  • When call forwarding is established on the primary set to this third set by the application: immediate call forwarding is canceled on the primary set.
  • When call forwarding is established on the primary set to another third set by the application: immediate call forwarding on the primary set is replaced by a new call forwarding to the third set.

The mobile device is approached to a DSS desktop phone
When a DSS is in service, it means that no DSU is logged on it.
- If the mobile device is engaged in a call
  • The DSS is out of service: the application is closed.
  • The DSS is in service and free: the call is shifted from the mobile device to the DSS.
  • The DSS is in service and busy: the application is closed.
- If the mobile device is free: the application is closed.
  • The DSS is out of service: the application is closed.
  • The DSS is in service and free: the application is closed.
  • The DSS is in service and busy: the call is shifted from the DSS to the mobile device.

Note:
No call forwarding is established from the user main desktop phone to a DSS.

1.2.3.2 The user main extension is declared as DSU

The mobile device is approached to a DSS desktop phone
The user DSU is out of service
If the DSU is out of service, it means that it is not logged on a DSS. In this case:
- When the DSS is in service, no DSU is logged on the DSS
- When the DSS is out of service, the DSS is used by another DSU
- **If the mobile device is engaged in a call**
  - The DSU is out of service: the application is closed.
  - The DSS is in service and free: the call is shifted from the mobile device to the DSS.
  - The DSS is in service and busy: the application is closed.
- **If the mobile device is free**
  - The DSU is out of service: the application is closed.
  - The DSS is in service and busy: the call is shifted from the DSS to the mobile device.
  - The DSS is in service and free: DSU log on to the DSS set.

The user DSU is in service

If the DSU is in service, it means that it is logged on a DSS. In this case:
- When the DSS is in service, no DSU is logged on the DSS.
- When the DSS is out of service and registered in the memory, the DSU is logged on the DSS.
- When the DSS is out of service and not registered in the memory, the DSS is used by another DSU.
- **If the mobile device is engaged in a call**
  - The DSS is in service and free: the call is shifted from the mobile device to the DSS.
  - The DSS is in service and busy: the application is closed.
  - The DSS is not in service but registered in the memory and the DSU is free: the call is shifted from the mobile device to the DSS.
  - The DSS is not in service but registered in the memory and the DSU is busy: the call is shifted from the mobile device to the DSS.
  - In all other cases: the application is closed.
- **If the mobile device is free**
  - The DSS is in service and free, the DSU is also free: DSU log on to the DSS set.
  - The DSS is in service and free, the DSU is busy: the application is closed.
  - The DSS is in service and busy, the DSU is free: call shift from DSS to mobile device.
  - The DSS is in service and busy, the DSU is busy: call shift from DSS to mobile device.
  - The DSS is not in service but registered in the memory and the DSU is free: DSU log off from the DSS.
  - The DSS is not in service but registered in the memory and the DSU is busy: the call is shifted from the DSS to the mobile device.
  - In all other cases: the application is closed.

The mobile device is approached to a standard business phone

The user DSU is out of service
- **If the mobile device is engaged in a call**
  - The third set is idle: the call is shifted from the mobile device to the third set.
  - The third set is engaged in a call: the application is closed.
If the mobile device is free
- The third set is engaged in a call: the call is shifted from the third set to the mobile device.
- The third set is free: the application is closed.

The user DSU is in service
- If the mobile device is engaged in a call
  - The third set is free: the call is shifted from the mobile device to the third set.
  - The third set is engaged in a call: the application is closed.

- If the mobile device is free
  - The third set is engaged in a call: the call is shifted from the third set to the mobile device.
  - If the DSU is engaged in a call: the application is closed.
  - In other cases, if the third set is free and no call forwarding is established on the DSU by the application: immediate call forwarding is established from the DSU to the third set.
  - If the third set is free and a call forwarding to this third set is established on the DSU by the application: immediate call forwarding of the DSU is canceled.
  - If the third set is free and call forwarding is established on the DSU to another third set by the application: immediate call forwarding of the DSU is replaced by a new call forwarding to the third set.

1.2.4 Desk Sharing considerations

When the user main extension is declared as Desk Sharing User, a few restrictions apply, because the mobile application cannot retrieve the physical link between the DSU and the DSS.

For instance, when a DSS is out of service, the application interprets this as a DSU being logged on this DSS, but cannot determine which DSU is logged.

In the same way, if the user extension is in service, for the application, this DSU is logged on a DSS, but the application cannot determine on which DSS it is logged.

Consequences:
- When a user logs on using the mobile application, the DSS on which logging on takes place is registered in the memory. This information is released when the user logs off, using the mobile application. But if the user logs on or logs off manually, using prefixes, synchronization of this information is lost. This can lead to malfunctions in logging on/logging off processes.
- Over logon (that is: logging on where there is already a user logged on) is impossible, because the logged on user identity cannot be retrieved.

In most cases, the loss of synchronization of login information can be detected and automatically corrected by the application.

1.2.5 Special cases

1.2.5.1 The mobile device is not defined
The main user extension is necessarily declared in the OmniPCX Enterprise and application settings.

When the mobile device is not declared in application settings, its state is not taken into account for operation selection.

The operations allowed are:
- Call forwarding establishment and cancelation of the user main extension to/from a third set.
- In a Desk Sharing environment (user main extension defined as DSU), logging on and logging off of the DSU on/from a DSS.

Call shifts are not possible in this situation.

1.2.5.2 The user main extension is not defined

The mobile device is necessarily declared in the OmniPCX Enterprise and application’s settings.

As in the previous case, when the user main extension is not declared in application settings, the state of this extension is not taken into account when selecting the operation to execute.

Only call shift operations from and to a mobile phone are possible.

1.2.5.3 Softphone case

This specific situation applies to configurations where the main user phone and the mobile phone are declared, but with the mobile phone declared as a softphone.

In standard operations, features are available according to the configuration.

But if the softphone application is not started, the application falls back to “mobile device not defined” mode, allowing the user to perform only call forwardings or logging on/logging off operations.

Call shifts are possible again as soon as the user starts the softphone client.

1.3 Features description

1.3.1 Call shift between mobile device and user main desktop set

Call shifting between the mobile device and the user main desktop phone relies on the Twinset Get Call feature, available as of OmniPCX Enterprise R11.1. The specified feature prefix is dialed on the idle phone of the twinsets.

If the idle phone is the desktop phone, prefix dialing is done using CSTA commands.

If the mobile device is the idle set, three situations are possible:
- The mobile device uses a non-native telephone client monitored with CSTA (softphone): the operation prefix is dialed on the mobile client, using the CSTA commands on the softphone termination in the OmniPCX Enterprise.
- The mobile device is declared as standard remote extension (using the mobile telephone application manageable through Android Telephony Manager): the application takes control of the native telephone application and dials the remote extension DISA number. Once connected to the OmniPCX Enterprise, the prefix is dialed using DTMF to achieve call shift.
The mobile device is declared as a remote extension with callback (using the mobile telephone application manageable through Android Telephony Manager): the prefix is dialed using CSTA on the remote extension termination declared in the OmniPCX Enterprise. A call is presented from the OmniPCX Enterprise to the mobile phone. The user must answer the call to shift the call.

Call shifting from mobile to desktop phone is only possible when the call is established through the OmniPCX Enterprise, especially if the set is used as remote extension. An independent call to the GSM number of the mobile cannot be shifted.

1.3.2 Call shifts between mobile device and any desktop set

This call shift with a deskphone set other than the user main extension is offered through the Get Call feature, available as of OmniPCX Enterprise R11.2.

The prefix dialing mechanism is identical as for the previous feature.

1.3.3 Immediate call forwarding establishment and cancellation

When the mobile device is approached to a desktop set other than the user main desktop set,
the extension number of this third set is compared to a static field of the application internal memory.

If this field is empty, the application deduces that no call forwarding was previously been established and that the user wants to forward his/her primary set to the third set.

If the field is not empty, it indicates that the primary set is forwarded to another extension:

- The number on which the primary set is forwarded is identical to the third set number: the user wants to cancel this call forwarding
- The numbers are different: the user wants to replace the existing call forwarding by a new call forwarding to the third set number

Establishment of immediate call forwarding is done through CSTA commands.

Once call forwarding is established, the application stores the number of the third set in its internal memory and creates an Android notification to indicate the forwarding status to the user. This notification can be used later to cancel call forwarding.

Cancellation of call forwarding is done in the same way, with CSTA commands.
Once call forwarding is canceled, the extension number is cleared from the internal memory and the call forwarding notification is deleted.

The user can cancel call forwarding in three ways:
1. Approach the mobile to the third set to which the primary set is forwarded.
2. Approach the mobile to the primary set.
3. Use the call forwarding notification, as seen above.

Note that the application cannot retrieve the real forwarding status of the primary set. The forwarding status used to determine if the user wants to start or cancel call forwarding is based on the application history only. If the user has manually started or canceled call forwarding on the primary set, the application cannot take this information into account.

At the end of the call forwarding or forwarding cancellation operation, a message is displayed to confirm the establishment or cancellation of the immediate call forwarding.

1.3.4 DSU log on and log off
These operations rely on the dedicated prefixes:

- Logging on is performed using CSTA commands on the DSS set, by dialing a prefix, followed by the DSU extension and user password.

- Logging off is executed on the DSU extension, always with CSTA commands. The log off prefix can be followed by the user password, if requested in configuration.

### 1.4 Configuration

#### 1.4.1 OmniPCX Enterprise prerequisites

- Call shifting between a mobile phone and user main extension is based on the Twinset Get Call feature. This feature is only available as of OmniPCX Enterprise R11.1.

- Call shifting between a mobile phone and any desktop phone is based on the (enhanced) Get Call feature, available as of OmniPCX Enterprise R11.2.

- Desk Sharing logging on and logging off are available only as of OmniPCX Enterprise R10.1.

- A direct IP connection with the OXE CSTA server is required. This connection can be offered through Wi-Fi or using the enterprise VPN.

- The application uses CSTA monitoring licenses. Depending on the situation, one to four licenses are used per OmniPCX Enterprise node involved, for the duration of the operation (a few seconds). CSTA monitoring licenses must be sized according to the number of mobile users.

- Call shifting features must be activated in OmniPCX Enterprise configuration: prefixes must be created and the user phone feature COS must give the right to use the features.

- If a mobile phone and user main desktop phone are declared, the two phones must be configured as twin sets.

- If a mobile device is used as standard remote extension, a remote extension DISA DDI number must be created for call shifting operations from the desktop phone to the mobile. This is not requested if the mobile is declared as remote extension with callback.

#### 1.4.2 Mobile application configuration

Configuration is done by manually starting the application. The configuration screen is automatically displayed.

To modify a parameter, touch its title. An input dialog box opens to enter the value. The keyboard offered to the user displays figures for a telephone number and alphanumeric characters for a server name.

To guide configuration, parameters are automatically enabled or disabled depending on the situation. For instance, if the mobile phone is not declared as standard remote extension, DISA configuration is not enabled, because it is not needed.
## 1.4.2.1 User extensions configuration parameters

- The **Local number of softphone/remote extension** is the local extension number of the telephone client in the OmniPCX Enterprise, or the OmniPCX Enterprise remote extension number (local OmniPCX Enterprise number) if no client is used. This number can be omitted if the mobile phone does not need to be declared.

- **Select mobile mode**
  
  This checkbox is used to declare the user mobile mode:
  
  - Standard remote extension: call establishments between the mobile and the OmniPCX Enterprise are done using the GSM network, with calls initiated from the mobile phone.
  - Remote extension with callback: calls are established through the GSM network and initiated from the OmniPCX Enterprise.
  - Softphone: the mobile uses a mobile client and calls are established through the IP network.
- The **Local number of your desktop set** is the user main extension number (local OmniPCX Enterprise number). This number can be omitted if only the mobile phone must be declared.

### 1.4.2.2 User Communication Server configuration parameters

- **Main Communication Server**
  In spatial redundancy, this parameter is the IP address (role main address) of the main Communication Server. In local redundancy, it is the role main address of the Communication Server. If no redundancy is configured, this parameter is the Communication Server address.

- **Standby Communication Server**
  In spatial redundancy this parameter is the IP address of the role main address of the stand- by Communication Server. It can be omitted in local redundancy or when redundancy is not configured.

- **CSTA server port**
  It is the connection port of the CSTA server of the OXE. Its default value is 2555.

### 1.4.2.3 Prefixes configuration parameters
- **Twinset Get Call prefix**
  This is the prefix declared in the OmniPCX Enterprise network for the Twinset Get Call feature.
  This parameter can only be used as of OmniPCX Enterprise R11.1, allowing call shifts between twin sets. It can be empty if the feature must not be used.

- **Enhanced Get Call prefix**
  This is the prefix declared in the OmniPCX Enterprise network for the (enhanced) Get Call feature.
  This parameter can only be used as of OmniPCX Enterprise R11.2, allowing call shifts between any sets. It can be empty if the feature must not be used.

### 1.4.2.4 Remote Extension DISA configuration parameters

These parameters are enabled only if the mobile extension is declared as standard remote extension.

- **Remote Extension DISA public number**
  This is the DDI number of the DISA remote extension prefix in the OmniPCX Enterprise network.

- **Timer before prefix dialing**
  This is a value, in seconds, defining the time to wait between dialing the DISA remote extension number and dialing the prefix. Its default value is 2 seconds.

- **Prefix dialing**
  This checkbox modifies the way prefixes are dialed over the DISA connection. They are usually dialed automatically after expiry of the timer defined above. With this option, once the DISA connection is established, the user is prompted before dialing the prefix.
  This solution can be used in case of a problem with the normal way of dialing prefixes, not activated in default settings.
1.4.2.5 Desk Sharing configuration parameters

- **Desk Sharing configuration**
  This checkbox is used to indicate if the user main extension is defined as a DSU.

- **Desk Sharing logon prefix**
  This is the prefix declared in the OmniPCX Enterprise network for Desk Sharing logging on.

- **Desk Sharing logoff prefix**
  This is the prefix defined in the OmniPCX Enterprise network for Desk Sharing logging off.

- **Desk Sharing password**
  This is the user password for Desk Sharing operations (logging on and logging off).

- **Logoff password requirement**
  This checkbox indicates if a password is required at logging off.
  This parameter must match the OmniPCX Enterprise system option “Activate logoff without pwd”.

1.4.2.6 Application Global Parameters configuration

- **Time-out for connections attempts**
This is the value of the time-out for socket establishment in milliseconds. Its default value is 3000. If redundancy is configured, this timer is applied to the two connection attempts.

- **Write NFC tag**
  If the user main extension number is declared and when Communication Server parameters are entered (at least the main Communication Server address and CSTA server port number) this parameter is activated to offer the possibility for the user to record information on the tag of the primary set.
  This option is never available for Desk Sharing configured application (user as a DSU).

### 1.4.3 Deployment

If the user clicks this option, a new screen appears, asking to approach the mobile to an empty tag.

Information written on the tag comes directly from application parameters. Only the user primary set tag can be recorded this way. Other sets, such as meeting room phones must have their tag recorded with ALE NFC Extended OXE Mobility.
Tag deployment is secured: users cannot write their tag information on another user tag.
The first time the user deploys a tag, the serial number of this tag is recorded in application parameters. The application only allows recording on the tag defined by this serial number or on a new, empty tag.