

# Quick Guide: How to Setup Multi-cell in SME VoIP Network

# Adding Multiple Base Stations to Network (Multi-cell System)

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## Document History

Revision	Author	Issue Date	Comments
0.1	MYA	09-Jun-2010	Initial Version
0.2	MYA	10-Jun-2010	With inputs from LH, added Time Server requirements
0.3	MYA	07-Sep-2010	Update with new Base station features, new sections.
0.4	MYA	15-Sep-2010	With Inputs from IFJ, new section: Summary of Procedure
0.5	MYA	29-Oct-2010	Minor corrections, Practical configuration chapter introduced, adding extensions to network.

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## Introduction: Base station Installation

This document seeks to describe how to install, add and synchronize one or multiple base stations to the network. There are two main procedures involved:

- 1) Proper placement of the base stations (which is usually called network dimensioning). The present document does not address this issue. Please refer to accompanying document
- 2) Creating and adding base station profiles to the network via the SME Configuration Tool (to form a multi-cell system).

This document describes the second procedure.

**NOTE** This documentation is valid for Base station firmware version 00.49 and above.

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## Abbreviations

For the purpose of this document, the following abbreviations hold:

DHCP:	Dynamic Host Configuration Protocol
DNS:	Domain Name Server
HTTP:	Hyper Text Transfer Protocol
IOS:	Internetworking Operating System
NAT:	Network Address Translator
PCMA:	A-law Pulse Code Modulation
PCMU:	mu-law Pulse Code Modulation
SME:	Small and Medium scale Enterprise
STUN:	Session Traversal Utilities for NAT

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## References

- [1]: SME VoIP System Description – Installation & Configuration; Network Deployment, V1.1  
[2]: Bla Bla Bla

## Multi-cell System

A multi-cell system has a coordinated installation of intra-system synchronized base stations, which enables seamless inter-cell handover for moving handsets.

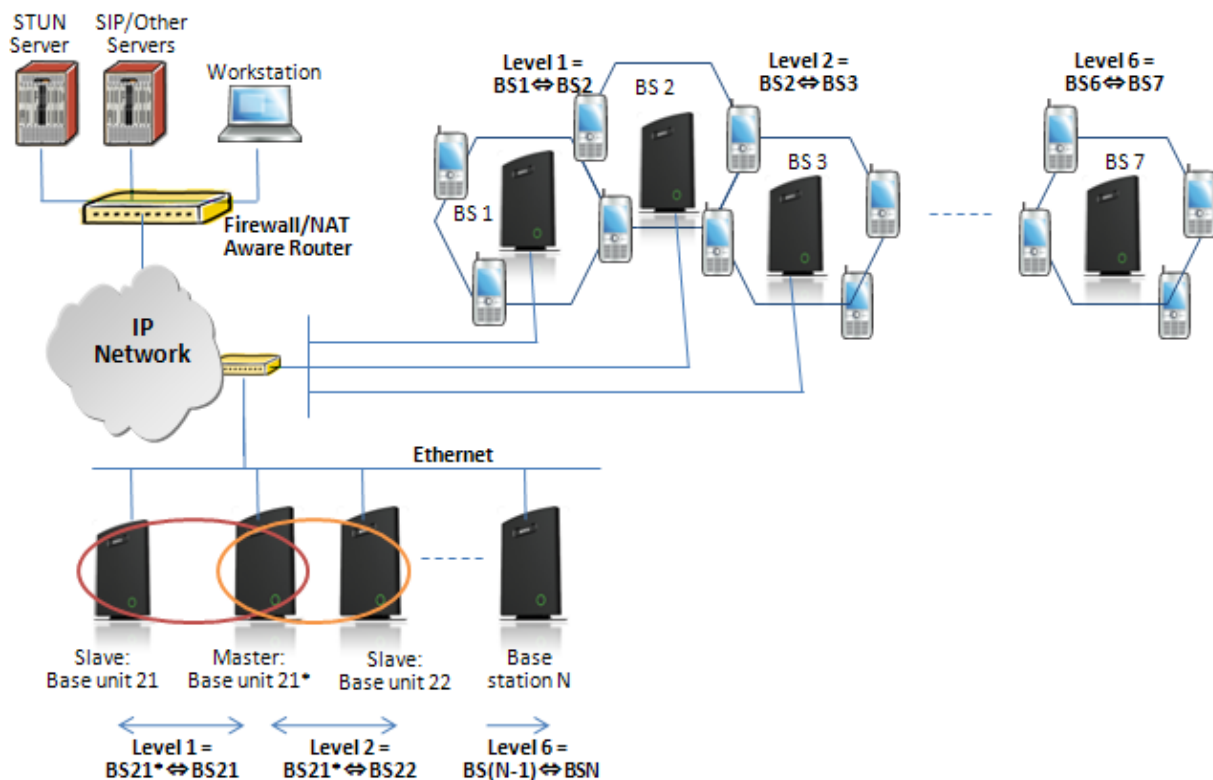
It provides increased mobility, higher total capacity and higher quality than a corresponding number of standalone base stations.

All handsets subscribed to a multi-cell system will benefit from high voice quality, and full coverage over the whole multi-cell system coverage area.

## Multi-cell Configuration

A total of 40 Base stations can be hosted in a typical SME multi-cell system. At each time, a maximum of 6 levels can be formed in a multi-cell chain.

Level 1 is when Base unit 1 synchronizes to Master Base unit, and Level 2 is when Base unit 2 uses Base unit 1 as its synchronization source, in that order. We can illustrate the configuration with the figure below (Refer to STEP 13 to STEP 15 for details on how to actually set it up via SME HTTP web interface):



## SME Configuration Interface

RTX have offered HTTP interface in base station that can be used as HTTP Web Server. The SME Configuration Interface can be retrieved from this HTTP Web Server in each Base station.

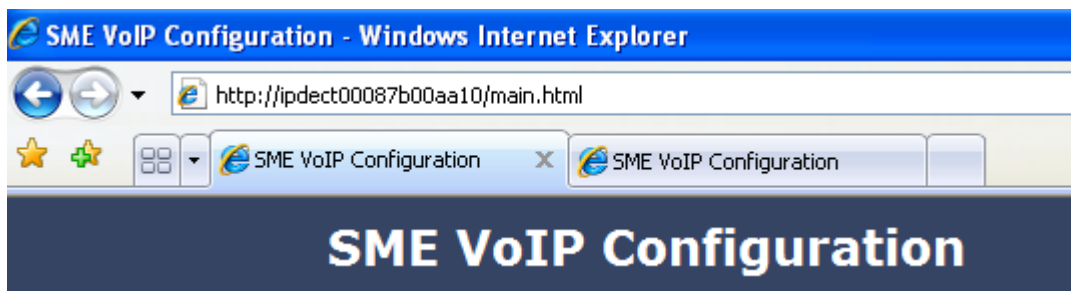
The HTTP Web Server is enabled in the base station by default.

**NOTE** This procedure is valid for Base station firmware version 00.49 and above. The system administrator must update the relevant Base station(s) to the latest firmware before proceeding to the next section. Refer to accompanied document [1]

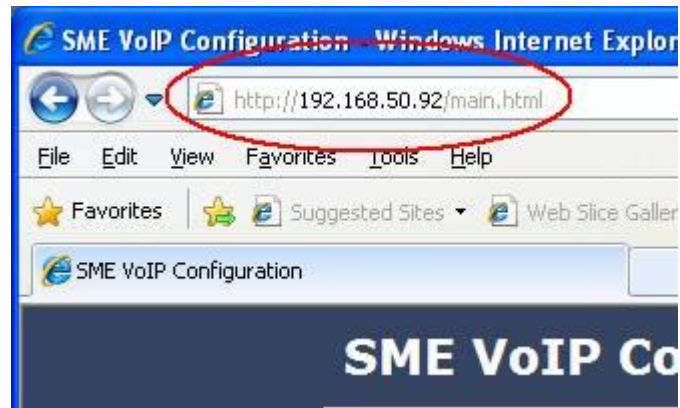
## Adding Base stations via SME Configuration Interface

Here are the recommended steps to add Base stations to network:

- STEP 1** Connect the Base station to a private network via standard Ethernet cable (CAT-5).
- STEP 2** Open any standard browser and enter the address:  
<http://ipdetect<MAC-Address-Base-Station>>  
for e.g. <http://ipdetect00087B00AA10>. This will retrieve the HTTP Web Server page from the base station with hardware address **00087B00AA10**.



- STEP 3** Skip this step if you were successful with STEP 2. If the **MAC-address** method as described above does not work, then use a standard network protocol analyzer (for e.g. **Wireshark**) to eavesdrop the IP address allocated to the base unit by the DHCP server. You can download Wireshark follow its documentation to know how it is done.  
Enter the IP address into the address bar of the browser to retrieve base station HTTP Web Server Page.



**STEP 4** On the Login page, enter your authenticating credentials (i.e. username and password is default “admin”). Click **OK** button.



**STEP 5** Once you have authenticated, the browser will display front end of the SME Configuration Interface. The front end will show relevant information of the base station (in this case MAC-Addr: **0087B00AA10** as highlighted in the snap-shot below).

## SME VoIP Configuration

- Home/Status
- Extensions
- Servers
- Network
- Management
- Firmware Update
- Time
- Country
- Security
- Contact List
- Multi cell
- Settings
- Debug Log
- SIP Log
- Logout

### Welcome

Please select a configuration page in the index pane on left.

**System Information:**

Phone Type:	IPDECT
Current local time:	08/Sep/2010 11:48:02
Operation time:	00:04:26 (H:M:S)
RFPI-Address:	116E604900; RPN:00
MAC-Address:	00087B00AA10
IP-Address:	192.168.50.71
Firmware-Version:	IPDECT/00.34//26-Aug-10 13:55
Firmware-URL:	ftp://192.168.50.3/FwuPath

**SIP Identity Status on this Base Station:**

Press button to reboot.

Reboot

## TIME SERVER SETUP

**STEP 6** Navigate to the Time settings and configure it. Scroll on the left column and click on **Time** url link to Open the **Time Settings** Page. Enter the relevant parameters on this page and press the **Save** button.  
 Make sure there is contact to the "Time server" otherwise the Multi-cell feature will not work.

Set this Time Settings to synchronise the base station(s) time to the NTP server time. Next Save the settings and reboot the base station.

Home/Status	<b>Time Settings</b>
Extensions	Time server: <input type="text" value="192.168.50.3"/>
Servers	Time server refresh interval: <input type="text" value="1"/>
Network	Timezone: <input type="text" value="+1:00"/>
Management	Daylight Saving Time (DST): <input type="text" value="Automatic"/>
Firmware Update	DST Fixed By Day: <input type="text" value="Use Month and Day of Week"/>
Time	DST Start Month: <input type="text" value="March"/>
Country	DST Start Date: <input type="text" value="1"/>
Security	DST Start Time: <input type="text" value="2"/>
Contact List	DST Start Day of Week: <input type="text" value="Sunday"/>
Multi cell	DST Start Day of Week Last in Month: <input type="text" value="Last In Month"/>
Settings	DST Stop Month: <input type="text" value="October"/>
Debug Log	DST Stop Date: <input type="text" value="1"/>
SIP Log	DST Stop Time: <input type="text" value="2"/>
	DST Stop Day of Week: <input type="text" value="Sunday"/>
	DST Stop Day of Week Last in Month: <input type="text" value="Last In Month"/>
	<input type="button" value="Save"/> <input type="button" value="Cancel"/>

A successful reboot will reset the time in the base station.

**Please select a configuration page in the index pane on left.**

<p><b>System Information:</b>          Phone Type:          System Type:          RF Band:          Current local time:          Operation time:</p>	<p><b>Multi Cell Disabled</b>          IPDECT HW ver 00          Generic SIP (RFC 3261)          EU  <span style="border: 1px solid red; border-radius: 50%; padding: 2px;">21/Oct/2010 11:07:24</span>          00:01:51 (H:M:S)</p>
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### SIP SERVER (OR PBX SERVER) SETUP

**STEP 7** Create the relevant SIP server (or PBX Server) information in the system. Each service provider/customer should refer SIP server vendor on how to setup SIP servers. Click the link **“Server”** at the left hand column of home page, you can add your SIP server for base station use. Next, from the Server page, click on the **Add Server** URL and enter the relevant SIP server information (an example is shown below). Choose **“No”** on NAT adaption parameter if NAT function of the SIP aware router is not enabled. Enter the relevant parameters based on the description in the table below. Select **Save** button.



Parameter	Description
<b>NAT Adaption</b>	To ensure all SIP messages goes directly to the NAT gateway in the SIP aware router. NAT Adaption option should be <b>“No”</b> or otherwise choose <b>“Yes”</b> <b>Possible value(s):</b> Yes, No
<b>Registrar</b>	SIP Server proxy DNS or IP address <b>Permitted value(s):</b> AAA.BBB.CCC.DDD:<Port-Number> <b>Note:</b> Specifying the Port Number is optional.
<b>Outbound Proxy</b>	This is usually Session Border Controller DNS or IP address (OR SIP server outbound proxy address) Set the Outbound proxy to the address and port of private NAT gateway so that SIP messages sent via the NAT gateway. <b>Permitted value(s):</b> AAA.BBB.CCC.DDD <b>Examples:</b> “192.168.0.1”, “192.168.0.1:5062”, “nat.company.com” and “sip:nat@company.com:5065”.
<b>Re-registration time</b>	The window period (in seconds) when base stations SIP registers with SIP server. <b>Permitted value(s):</b> Positive integer
<b>Keep Alive</b>	This directive defines the window period (usually 30 secs.) to re-open port of relevant NAT-aware router(s), etc. <b>Valid Input(s):</b> Enable, Disable
<b>DTMF Signalling</b>	Conversion of decimal digits (and '*' and '#') into sounds that share similar characteristics with voice to easily traverse networks designed for voice <b>Valid Option(s)</b> <b>In band:</b> Meta-data (for e.g.: tone digits) and control information sent in the same voice band, using the same VoIP codec as the human voice (for e.g. G.711, G.729, etc.) <b>SIP INFO:</b> Carries application level data along SIP signalling path (for e.g.: Carries DTMF digits generated during SIP session OR sending of DTMF tones via data packets in the <u>same</u> internet layer as the Voice Stream, etc.). <b>RFC 2833:</b> DTMF handling for gateways, end systems and RTP trunks (for e.g.: Sending DTMF tones via data packets in <u>different</u> internet layer as the voice stream) <b>Both:</b> Enables SIP INFO and RFC 2833 modes.
<b>Codec Priority</b>	Defines the codec priority that base stations uses for audio compression and transmission. <b>Possible Option(s):</b> PCMU, PCMA, iLBC, etc.

### Servers

**Server 1:**

Add server  
Remove server

NAT Adaption:

Registrar:

Outbound Proxy:

Re-registration time:

Keep Alive:

DTMF Signalling:

Codec Priority:

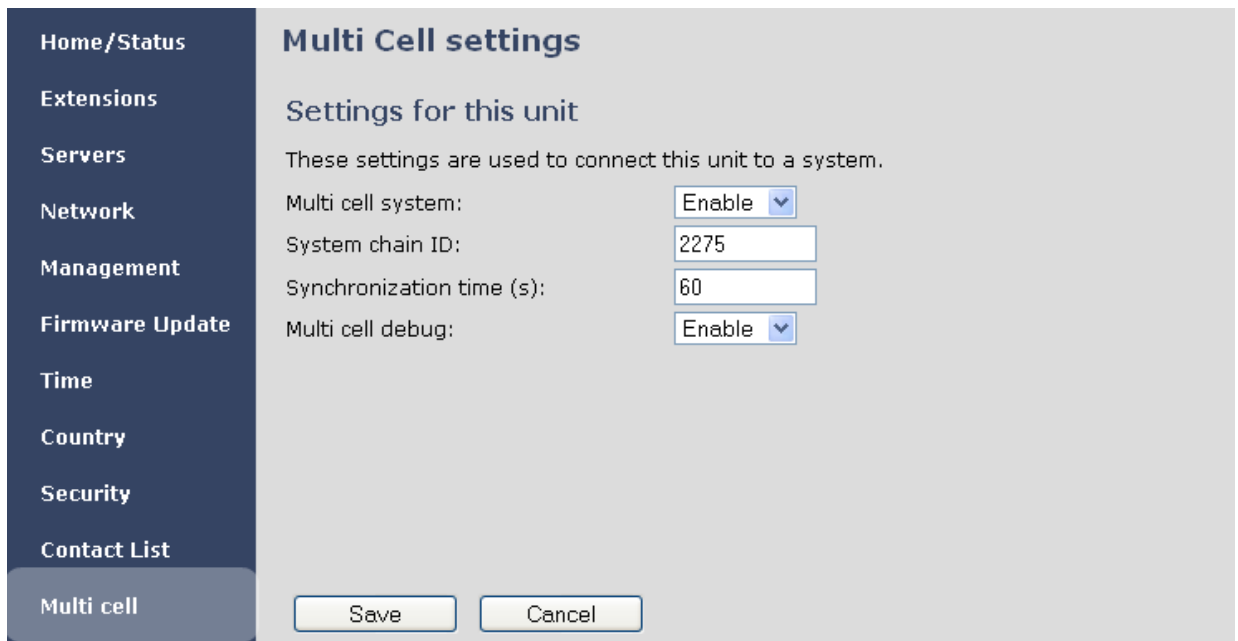
*Server 1 recently added, press save to save changes*

### MULTI-CELL SETUP

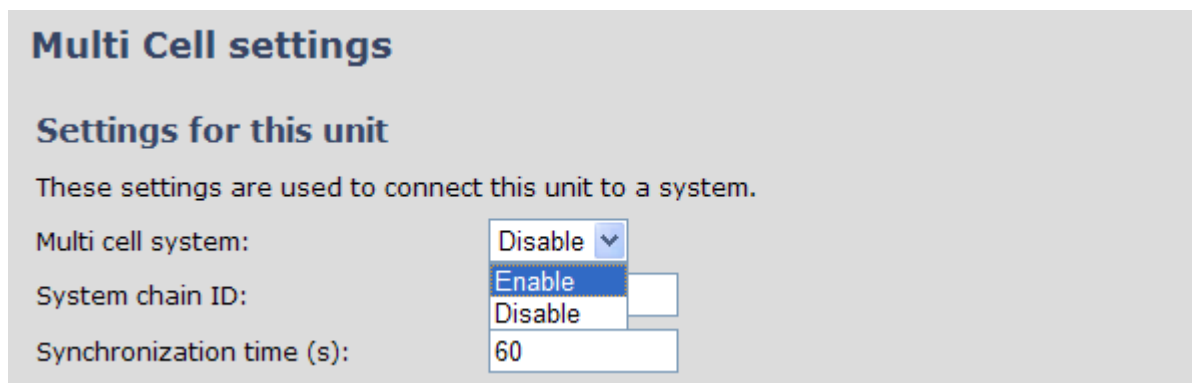
**STEP 8** Scroll down and Click on **Multi Cell** url link in the **SME VoIP Configuration** to view the current **Multi cell settings** status of the current base station. Normally, most brand new base stations have **Multi cell system** feature disabled by default.

Description of Settings for Specific Base units is as follows:

Parameter	Description
<b>Multi cell system</b>	Enable this option to allow the Base unit to be set in multi-cell mode (can be set as master or slave in the multi-cell chain system). <b>Valid Inputs:</b> Enable, Disable
<b>System chain ID</b>	This is an identifier (usually in string format for e.g. 2275) that is unique for a specific multi-cell system. <b>Note:</b> There can be several multi-cell systems in SME network. <b>Valid Input:</b> 8 bit String
<b>Synchronization time (s)</b>	This specifies the period or window in seconds elements/nodes (for e.g. Base units) in a specific Multi-cell should synchronise to each other.
<b>Multi cell debug</b>	Enable this feature, if you want the system to catalogue low level multi-cell debug information or traces.



**STEP 9** Next, the system administrator needs to create and Enable Multi Settings profile for the current base station. On the **Multi Cell settings** Page, choose **Enable** option from the drop down menu of the **Multi cell system** parameter. Enable the **Multi cell debug** option if the system administrator wants some Multi-cell related logs to be catalogued by the system.



**STEP 10** On the same **Multi Cell Settings** page > Enter the relevant values for **System chain ID** and **Synchronization time (s)** respectively. The **System chain ID** is a geographically unique DECT cell identity allocated to bridge several base stations together in a chain. An example is **2275**. The **Synchronization time (s)** parameter is defined as window/period of time in seconds a specific base station synchronises to the master base station unit (by default 60).

## Multi Cell settings

### Settings for this unit

These settings are used to connect this unit to a system.

Multi cell system:

System chain ID:

Synchronization time (s):

Multi cell debug:

Click on **Save** button to keep modified changes of multi cell settings into the base station.

**The parameters are successfully saved**

*You will be redirected after 3 seconds*

**NOTE** The Multi Cell data synchronization **ONLY** works when the relevant **Time Server** is set in the system before Server/Subscriber profile is added or created. Refer to **STEP 6**.

**IMPORTANT:**

Base stations must be rebooted after the time server has been set.

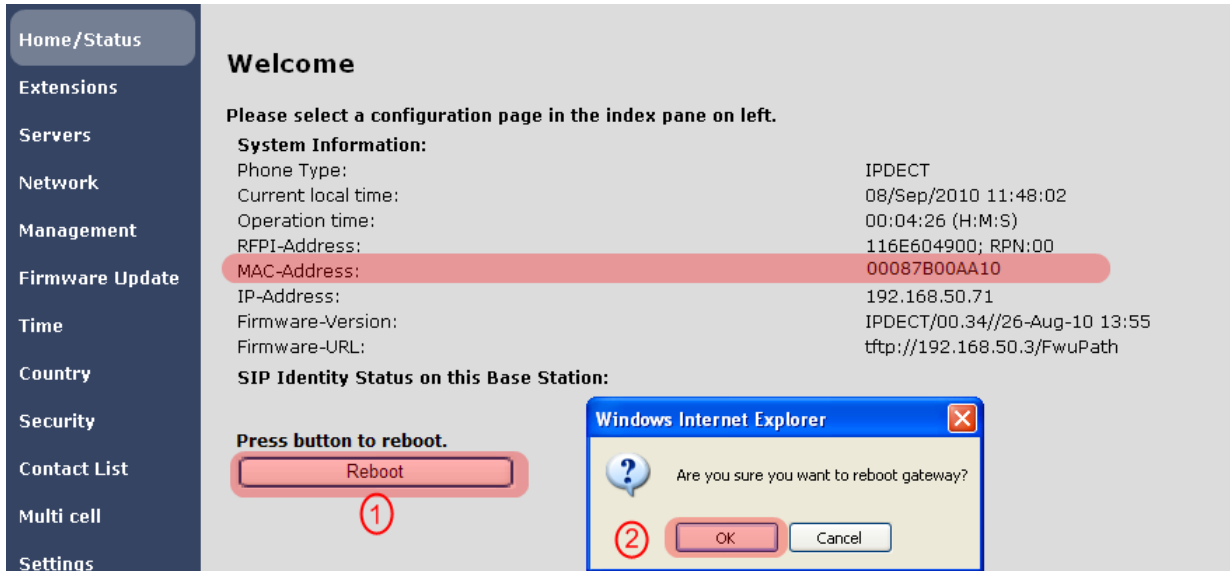
**STEP 11** Repeat **STEP 1-10** as explained above for N number of base stations.

**IMPORTANT:**

It takes up to 5 minutes (synchronization time) to add a new base station to a Multi Cell System.

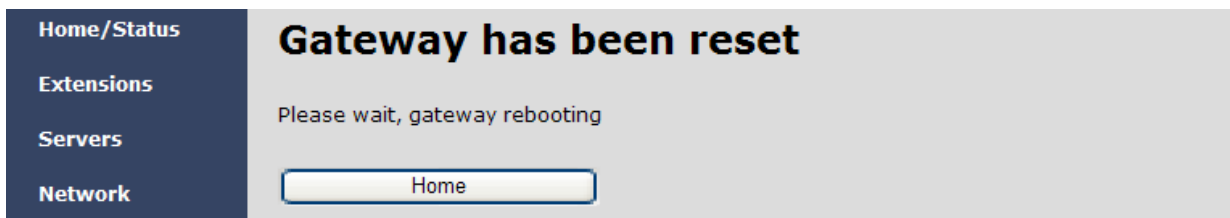
## Synchronizing the Base stations

**STEP 12** On each **SME VoIP Configuration** interface for the base station(s) navigate to the Home/Status page and Click the Reboot button.



The screenshot shows the 'Home/Status' page of the SME VoIP Configuration interface. The left sidebar contains navigation links: Home/Status, Extensions, Servers, Network, Management, Firmware Update, Time, Country, Security, Contact List, Multi cell, and Settings. The main content area displays system information and a 'Reboot' button. A 'Windows Internet Explorer' dialog box is open, asking for confirmation to reboot the gateway. The 'Reboot' button is marked with a red circle and the number 1, and the 'OK' button in the dialog box is marked with a red circle and the number 2.

This will trigger **Are you sure you want to reboot gateway?** window. Click **OK** button on this window. A successful restart of the base stations will lead to a display of the page: **Gateway has been reset**.



The screenshot shows the 'Gateway has been reset' page. The left sidebar contains navigation links: Home/Status, Extensions, Servers, and Network. The main content area displays the message 'Please wait, gateway rebooting' and a 'Home' button.

**STEP 13** Navigate back to the **Multi cell settings** page by clicking **Multi-cell** url link at the left column. The revised **Multi cell settings** page shows the relevant base stations synchronized together. By default, the system uses the first registered base station as the master base unit.

**Multi Cell settings**

Settings for this unit

These settings are used to connect this unit to a system.

Multi cell system:

System chain ID:

Synchronization time (s):

Multi cell debug:

**DECT system settings**

These settings are DECT settings for the system.

DECT system RFPI:

Auto configure DECT sync source tree

**SIP system settings**

These settings are SIP settings for the system.

Maximum number of SIP register per base station:

**MAC-units in chain**

ID	RPN	MAC address	IP address	Version	Status	DECT sync source	Property	Dect Property
<input type="checkbox"/>	0	00:08:7B:07:7C:BC	0.0.0.0	0	Connection lost!	1 - RPN: 04		Unknown!
<input type="checkbox"/>	1	00:08:7B:07:7C:F7	192.168.50.114	34	Connected	0 - RPN: 00		Unknown!

/   
 With selected:

**STEP 14** On the Multi-cell settings page, scroll to the **DECT system settings** and Enable or Disable the **“Auto configure DECT sync option source tree”** (See description in the table below). Usually the DECT system RFPI parameter is computed by the system (Its often greyed in a multi-cell system configuration).

Parameter	Description
<b>DECT system RFPI</b>	<p>This is a radio network identity accessed by all Base units in a specific multi-cell system. It composed of 5 octets. It is actually 5 different variables combined together.</p> <p><b>RFPI Format:</b> XX XX XX XX XX (where XX are HEX values)</p> <p><b>Access Rights Class (ARC):</b>            Defines network identity structure used by terminals especially in multi-cell environment.  <b>Fixed/default Value=1</b> (Private multi-cell system).  <b>RFPI:</b> 1X XX XX XX XX</p> <p><b>Equipment Installer's code (EIC):</b>            Code that allows terminals to distinguish between separate DECT networks.  <b>Min:</b> 0x0000, <b>Max:</b> 0xFFFF; <b>RTX_EIC:</b> 0x16E6 (May change)  <b>RFPI:</b> 11 6E 6X XX XX</p> <p><b>Fixed Part Number(FPN):</b>            Is a geographically unique identity transmitted to DECT networks to help PP distinguish between base station communications in different cells/multi-cell systems.  <b>Min:</b> 0x001, <b>Max:</b> 0xFFFF; <b>E.g. FPN:</b> 0x049  <b>RFPI:</b> 11 6E 60 49 XX</p> <p><b>Location Area Length (Lal):</b>            A unique code sent to the terminal during location registration to determine the size of the location or cell area.  <b>Type:</b> 8-bit value (from 0x00 to 0xFF). <b>E.g Lal=0x04</b>  <b>RFPI:</b> 11 6E 60 49 04</p>

<b>Auto configure DECT sync source tree</b>	Enable this to allow the network to automatically synchronise the multi-cell chain/tree <b>Permitted Inputs:</b> Enable, Disable Note: This parameter is not available to all base unit firmware
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### DECT system settings

These settings are DECT settings for the system.

DECT system RFPI:

Auto configure DECT sync source tree

**STEP 15** Scroll to the **SIP system settings** section, configure and save the parameter based on the description below:

Parameter	Description
<b>## of SIP accounts before distributed load</b>	The maximum number of handsets or SIP end nodes that are permitted to perform location registration on a specific Base unit before load is distributed to other base units. <b>Note:</b> A maximum of 8 simultaneous calls can be routed through each Base units in a multi-cell setup. <b>Permitted Input:</b> Positive Integers (for e.g. 30)
<b>SIP Support for multiple registrations per account</b>	Enable this option so it is possible to use same extension (i.e. SIP Account) on multiple phones (SIP end nodes). These phones will ring simultaneously for all incoming calls. When a phone (from a SIP account group) initiates a handover from Base X to Base Y, this phone will de-register from Base X, and register to Base Y automatically. <b>Note:</b> Choose <b>Yes</b> when the SIP server supports this feature otherwise choose <b>No</b> for the Sip server does not support this feature. <b>Permitted Input:</b> Yes, No

### SIP system settings

These settings are SIP settings for the system.

Number of SIP accounts before distributed load:

SIP Server support for multiple registrations per account:  (used for roaming signalling)

**STEP 16** Next, on the **MAC-units in chains** section, you can manually configure the synchronisation source tree of the multi-cell system. Multi-cell settings page, scroll to the DECT system settings and Enable or Disable the “**Auto configure DECT sync option source tree**” (See description in the table below). Usually the DECT system RFPI parameter is computed by the system (Its often grayed in a multi-cell system)

Parameters	Description
<b>ID</b>	Base unit identity in the chained network. <b>Permitted Output:</b> Positive Integers
<b>RPN</b>	The Radio Fixed Part Number, is an 8-bit DECT cell identity allocated by the installer. The allocated RPN within the SME must be geographically unique. Base stations’ and repeater’s RPN must only differ on least significant bits that are masked out by the handover mask.

	<b>Permitted Output:</b> 0 to 255 (DEC) <b>OR</b> 0x00 to 0xFF (HEX)
<b>MAC Address</b>	Contains the hardware Ethernet MAC address on the base station. It varies from Base station to Base stations. <b>Min. Value:</b> 0 ( i.e. last 4 HEX digits of 0x00087B070000, may change in the future) <b>Max. value:</b> 65535 ( i.e. last 4 HEX digits of 0x00087B07FFFF, may change in the future)
<b>Version</b>	Base station current firmware version. <b>Permitted Output:</b> positive Integers (for e.g. 34)
<b>Status</b>	Current Base station behaviour in the SME network. <b>Possible Outputs</b> <b>Connected:</b> The relevant Base station(s) is online in the network <b>Connection Loss:</b> Base station unexpectedly lost connection to network <b>This Unit:</b> Current Base station whose http Web Interface is currently being accessed
<b>DECT Sync source</b>	The administrator should choose the relevant “multi cell chain” level its wants a specific Base unit be placed. Maximum number of “multi-cell chain” levels is 6.
<b>Dect Property</b>	Base station characteristics in connection to the current multi cell network. <b>Possible Output(s)</b> <b>Master:</b> Main Base station unto which all other nodes in the chain synchronises to. <b>Locked:</b> The Base unit is currently synchronized and locked to the master Base unit. <b>Searching:</b> Base unit in the process of locating to a Master/slave as specified in Dect sync source <b>Free Running:</b> A locked Base unit that suddenly lost synchronisation to the Master. <b>Unknown:</b> No current connection information from specific Base unit

#### MAC-units in chain

ID	RPN	MAC address	IP address	Version	Status	DECT sync source	Dect Property	
<input type="checkbox"/>	0	00	00:08:7B:07:7C:BC	<a href="#">192.168.50.71</a>	34	Connected	0 - RPN: 00 ▼	Master
<input type="checkbox"/>	1	04	00:08:7B:07:7C:F7	<a href="#">192.168.50.114</a>	34	Connected	0 - RPN: 00 ▼	Unknown!

[Check All](#) / [Uncheck All](#)

*With selected:* [Remove from chain](#)

Save



## Summary of Procedure – Creating a Chain

We enumerate the short version of how to add 3 base stations units in a multi-cell setup. This can be applied for up to N number of base units. The procedure below is valid ONLY for base station firmware version 00.36 and above.

This procedure is divided into four (4) main stages. Apply this procedure if all base unit are straight from production.

### Stage 1

Skip this stage if relevant base stations are already in the network.

- a) Add 3 base stations i.e. RFP1, RFP2, RFP3 > Disable the “Multi cell system” option and “Save”
- b) RFP1, RFP2, RFP3: Reboot from the HTTP SME Configuration Main Page
- c) RFP1, RFP2, RFP3: Default by pressing reset button 12-sec.

### Stage 2

Choosing 1<sup>st</sup> base unit i.e. RFP1 as Master

- a) RFP1: Define Time server and “Save” from the **Time** page
- b) RFP1: Reboot
- c) RFP1: Press “Add server” and define SIP server IP and “Save” from the **Servers** page
- d) RFP1: Multi cell system = enable and “Save” from the **Multi-cell** page
- e) RFP1: Reboot (Verify from Debug log “**SYNCMGR: This base is ready to be master in a Chain**”)

### Stage 3

Choose another base unit, RFP2 as Slave1

- a) RFP2: Multi cell system = enable and “Save”
- b) RFP2: Reboot (Verify from Debug log “**SYNCMGR: This base is ready to join into another Chain**”)
- c) RFP1, RFP2: Wait 2min for stable Master-Slave chain (check for the message: **SYNCMGR: Socket#10 creation success**)

### Stage 4

Choose the 3<sup>rd</sup> base unit, RFP3 as Slave2

- d) RFP3: Multi cell system = enable and “Save”
- e) RFP3: Reboot (Verify Debug log “**SYNCMGR: This base is ready to join into another Chain**”)
- f) RFP1, RFP3: Wait 2min for stable Master-Slave chain (SYNCMGR: Socket#10 creation success)
- g) RFP3: Check mark ID2/RPN08 and select dropdown “1 – RPN: 04” and “Save”
- h) RFP3: Reboot (**SYNCMGR: Socket#8 creation success**)

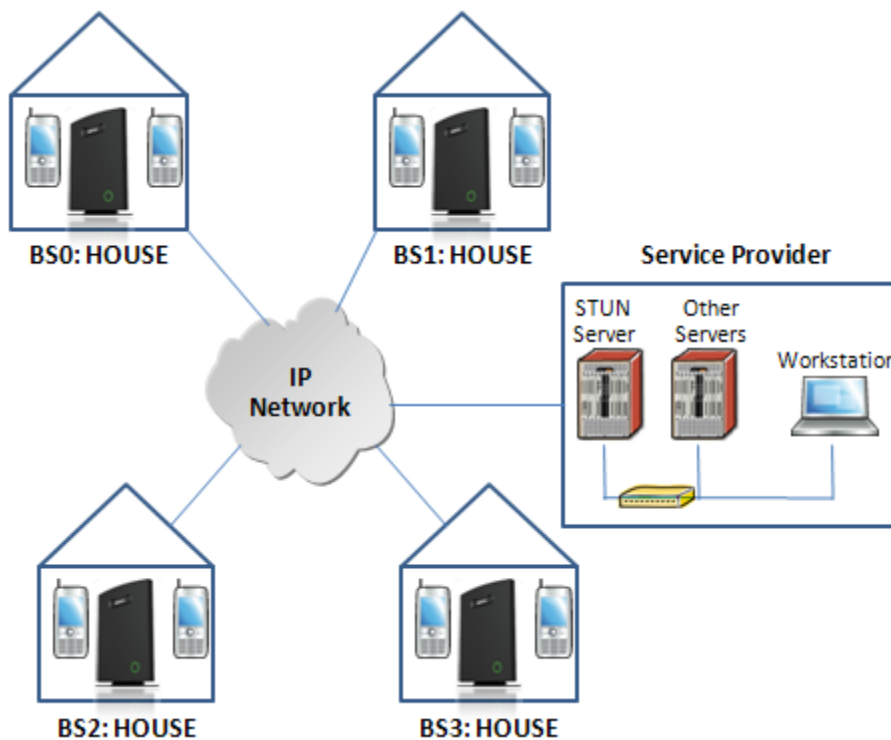
Multi-cell chain of 3 base stations have been created successfully. Next step involves adding extensions to the system.

# Practical Configuration of Multi-Cell System

## Case ##1: Isolated Buildings

Example includes Branch or small office, Retail outlet or store, etc.

The optimal configuration for isolated buildings is standalone base stations setting. In this setting, you must disable the Multi-cell parameter of each base station.



### Disable Multi Cell option of Base Stations

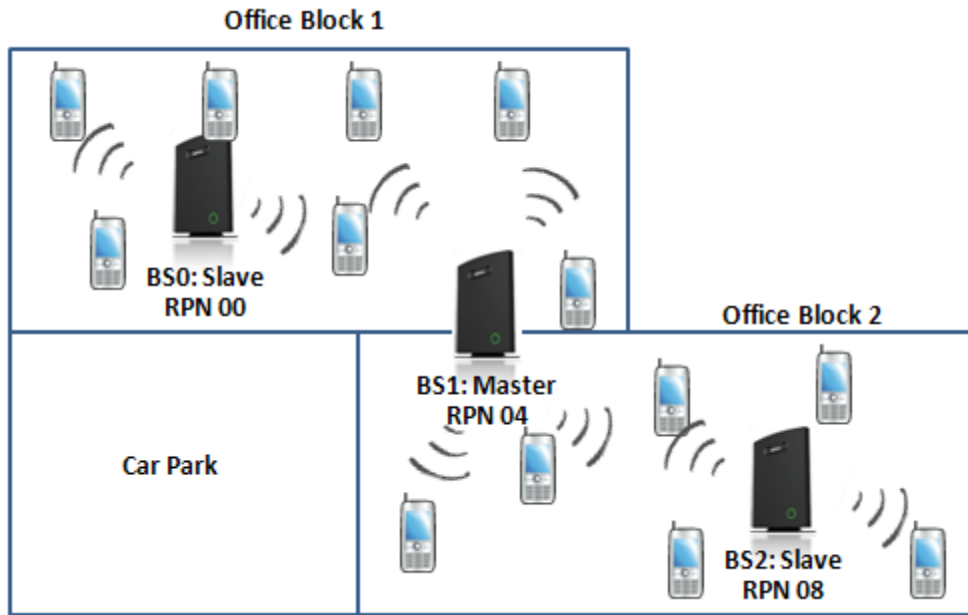
#### Settings for this unit

These settings are used to connect this unit to a system.

Multi cell system:	<input type="text" value="Disable"/>
System chain ID:	<input type="text" value="2275"/>
Synchronization time (s):	<input type="text" value="60"/>
Multi cell debug:	<input type="text" value="Disable"/>

## Case ##2: Location with co-located partners

Example includes Department shops, Retail location with co-located photo kiosk or pharmacy, etc. Here is diagram to illustrate Case ##2.



### Multi Cell Page of Base Stations

Recommended settings of MAC-units in Chain section of page (Other different settings exist):

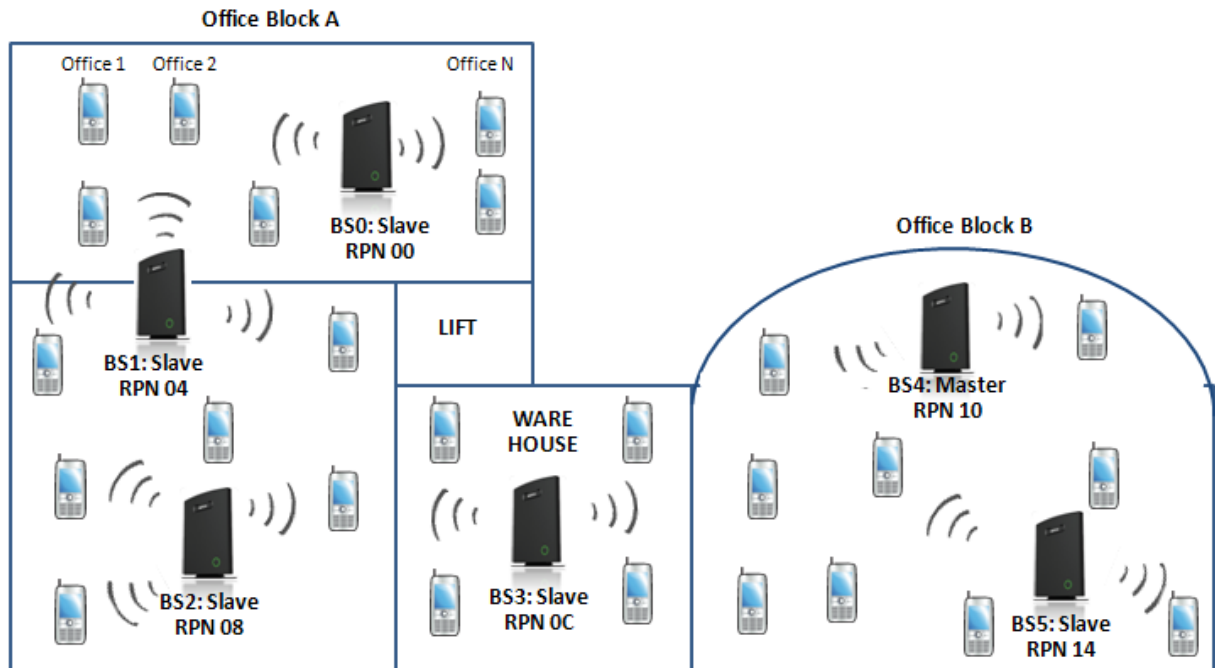
RPN	Ver	MAC Addr	IP Addr	IP Status	DECT sync source	DECT Property
00	XX	XX:XX:XX...	XXX.XXX...	Connected	1: RPN:04	
04	XX	XX:XX:XX...	XXX.XXX...	Connected	1: RPN:04	Master
08	XX	XX:XX:XX...	XXX.XXX...	Connected	1: RPN:04	

#### Note:

It is not necessary to deploy a dedicated Base unit at the car park area because it is likely no telephony traffic or call will be placed at the area.

### Case ##3: Large to Medium Sized Enterprises

Example: Corporate headquarters, Harbor areas, Campus



### Multi Cell Page of Base Stations

Recommended settings of MAC-units in Chain section of page (Other valid setting exists):

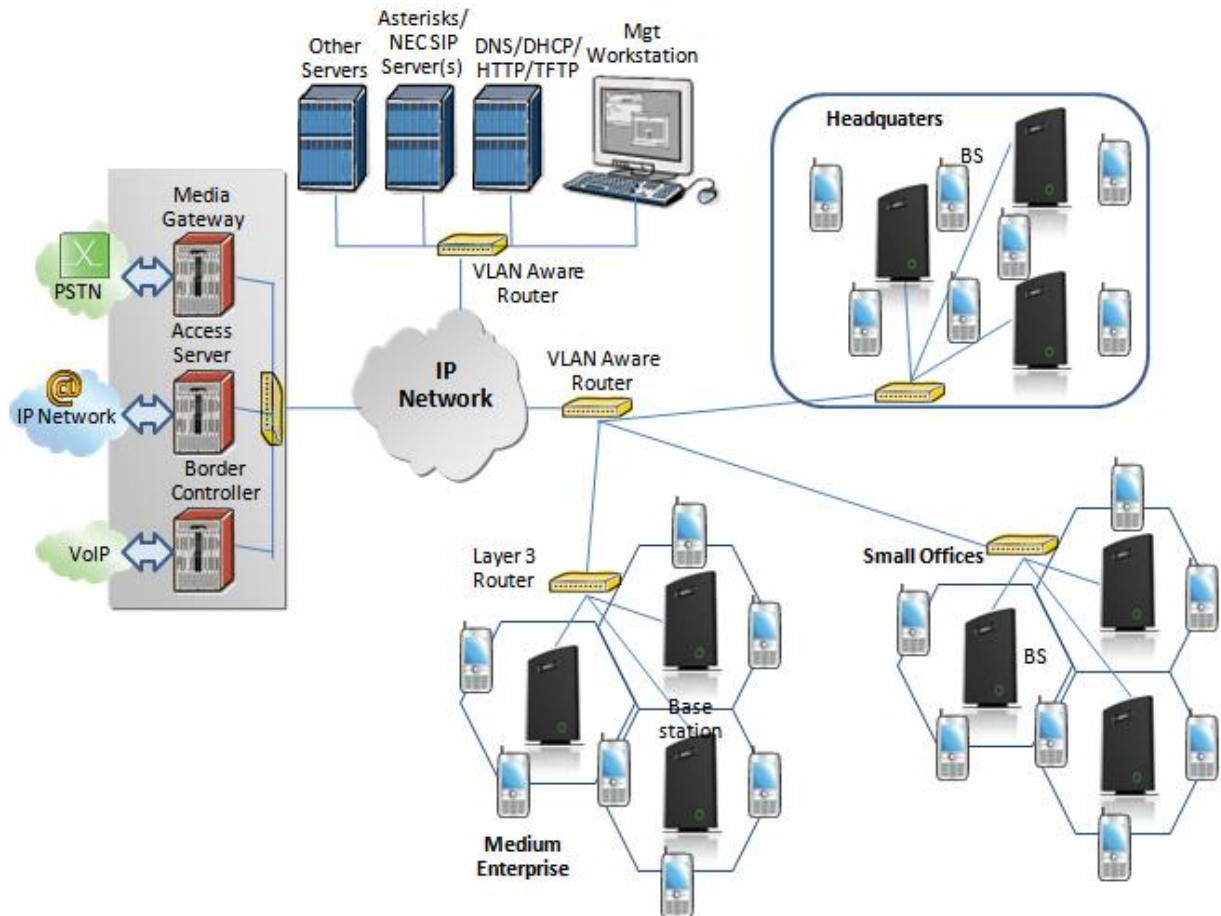
RPN	Ver	MAC Addr	IP Addr	IP Status	DECT sync source	DECT Property
00	XX	XX:XX:XX...	XXX.XXX...	Connected	1: RPN:04	
04	XX	XX:XX:XX...	XXX.XXX...	Connected	2: RPN:08	
08	XX	XX:XX:XX...	XXX.XXX...	Connected	3: RPN:0C	
0C	XX	XX:XX:XX...	XXX.XXX...	Connected	4: RPN:10	
10	XX	XX:XX:XX...	XXX.XXX...	Connected	4: RPN:10	Master
14	XX	XX:XX:XX...	XXX.XXX...	Connected	4: RPN:10	

**Note:**

The number of chains cannot exceed 7 levels.

### Case ##4: Large Enterprises at Different Locations

Government departments/agencies geographically separated from each other, University campus, Hospital etc.



### Multi Cell Page of Base Stations

Recommended settings of MAC-units in Chain section of page (Other valid setting exists):

RPN	Ver	MAC Addr	IP Addr	IP Status	DECT sync source	DECT Property
00	XX	XX:XX:XX...	XXX.XXX...	Connected	0: RPN:00	Master for HQ
04	XX	XX:XX:XX...	XXX.XXX...	Connected	0: RPN:00	
08	XX	XX:XX:XX...	XXX.XXX...	Connected	1: RPN:04	
0C	XX	XX:XX:XX...	XXX.XXX...	Connected	3: RPN:0C	Master for Offices
10	XX	XX:XX:XX...	XXX.XXX...	Connected	3: RPN:0C	
14	XX	XX:XX:XX...	XXX.XXX...	Connected	4: RPN:10	
18	XX	XX:XX:XX...	XXX.XXX...	Connected	6: RPN:18	Master for Enterprises
1C	XX	XX:XX:XX...	XXX.XXX...	Connected	6: RPN:18	
20	XX	XX:XX:XX...	XXX.XXX...	Connected	7: RPN:1C	

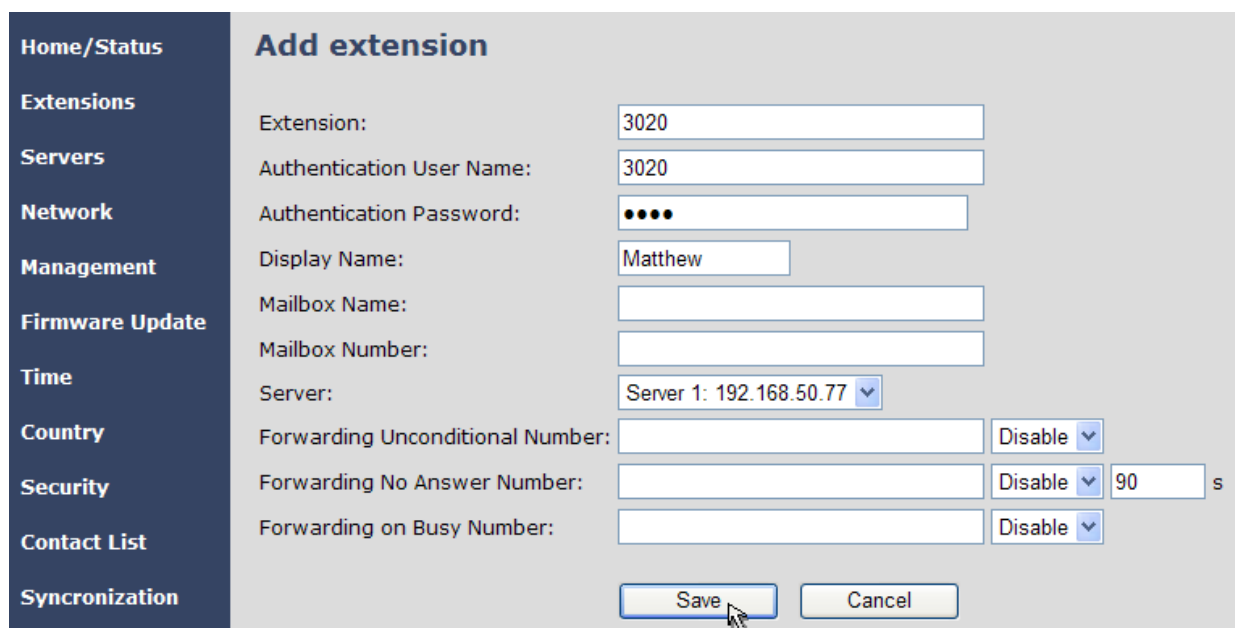
## Adding Extension/Handset Registration

Here is the recommended procedure of adding extension(s) and registering one or more handsets to the Multi-cell system which was just created.

### ADDING EXTENSIONS TO SYSTEM

**STEP 17** Choose the “**Extensions**” URL at the left hand column of home page.

**STEP 18** Select the **Add Extension** URL and enter the relevant entries (an example is shown below with 3020 as the extension). Click on the **Save** button.



The screenshot shows the 'Add extension' form with the following fields:

- Extension: 3020
- Authentication User Name: 3020
- Authentication Password: ••••
- Display Name: Matthew
- Mailbox Name: (empty)
- Mailbox Number: (empty)
- Server: Server 1: 192.168.50.77
- Forwarding Unconditional Number: (empty) Disable
- Forwarding No Answer Number: (empty) Disable 90 s
- Forwarding on Busy Number: (empty) Disable

Buttons: Save, Cancel

### HANDSET REGISTRATION

**STEP 19** The extension page will show the figure below, if you save successfully the entries safely. Enable the check option and choose the option “**Register Handset**” URL.



The screenshot shows the 'Extensions' page with the following table:

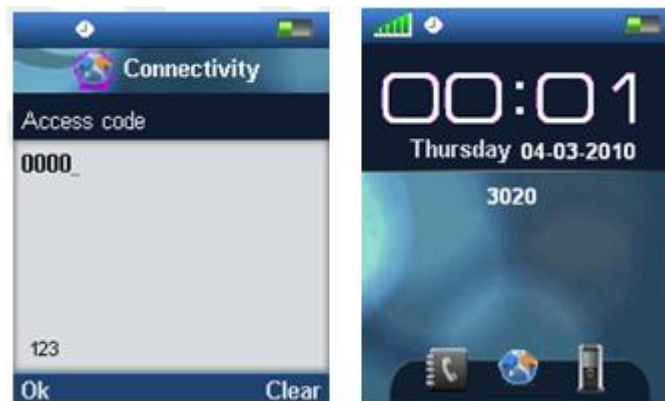
Server 1: 192.168.50.77				
	Idx	Extension	Display Name	IPEI
<input checked="" type="checkbox"/>	0	3020	Matthew	FF:FF:FF:FF:FF

Check All / Uncheck All  
With selected: [Delete extension\(s\)](#), [Register Handset\(s\)](#), [Deregister Handset\(s\)](#)

**STEP 20** Next, take the handset you will like to register > power it up > In the idle mode navigate to the Menu > Choose **Connectivity** > Select **Register**.



**STEP 21** On the Connectivity dialog and after choosing Register option > Enter the **Access code** (by default is 0000) > Press **OK** > Successful registration displays Extension(s) registered.



**STEP 22** Open the HTTP interface of relevant base unit > On the **Home/Status** page, you can check the current status of the SIP end node (which is the same as the handset). (In the example below you can check the status of an extension 8000)

## SME VoIP Configuration

<ul style="list-style-type: none"> <li>Home/Status</li> <li>Extensions</li> <li>Servers</li> <li>Network</li> <li>Management</li> <li>Firmware Update</li> <li>Time</li> <li>Country</li> <li>Security</li> <li>Contact List</li> <li>Multi cell</li> <li>Settings</li> </ul>	<div style="background-color: #f0f0f0; padding: 10px;"> <h3>Welcome</h3> <p>Please select a configuration page in the index pane on left.</p> <p><b>System Information:</b>            Phone Type:            System Type:            RF Band:            Current local time:            Operation time:            RFPI-Address:            MAC-Address:            IP-Address:            Firmware-Version:            Firmware-URL:</p> <p><b>SIP Identity Status on this Base Station:</b>  <span style="border: 1px solid red; border-radius: 50%; padding: 2px;">Demonstration 8000@192.168.50.57</span></p> <p>Press button to reboot.  <input type="button" value="Reboot"/></p> </div> <div style="margin-top: 10px;"> <p><b>Multi Cell Disabled</b>            IPDECT HW ver 00            Generic SIP (RFC 3261)            EU            21/Oct/2010 11:34:13            00:28:40 (H:M:S)            116E60F700; RPN:00            00087bd79156            192.168.50.92            IPDECT/00.44//01-Oct-10 14:47            tftp://</p> <p>Identity 1 Status: <span style="border: 1px solid red; border-radius: 50%; padding: 2px;">OK</span></p> </div>
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## Example: Creating Multi-Cell Using 2 Bases/Handsets

In this chapter, we assume a user have single functioning standalone Base unit and will like to add another base unit. Here is the procedure:

The multi-cell system contains one Master and can have more than one Slave. Slave will have the information synchronized with Master.

### BEFORE CONFIGURING THE BASE STATIONS

**STEP 1** Reset the relevant bases (BS1 and BS2) to the default state.

**STEP 2** Take each base station and long press on the side a small button (after the bases restart or powers up) until the LED in front lit **RED** for 5 sec (continue pressing even when you see **ORANGE**):



-> Long press reset button ->



-> Wait until LED stay



to **RED** for 5 secs (no flashing) -> finish.

-> Power down and up the BS again to

### CONFIGURATION OF BASE STATIONS

**STEP 3** For each base station [BS 1 and BS 2] navigate to multi-cell configuration page by clicking "**Multi-cell**" > On this page select the "**Enable**" option for Multi cell system parameter and fill in a number for System chain ID, press Save. Press reboot button on the "Home" page to reboot BS 1 and BS 2 and wait for 1 to 3 mins



**Multi Cell settings**

Settings for this unit

These settings are used to connect this unit to a system.

Multi cell system:

System chain ID:

Synchronization time (s):

Multi cell debug:

**Multi cell**

**STEP 4** After a successful restart, on each base [BS 1 and BS 2] Multi-cell page you will find the other base connected and synchronized (the IP status shows **This Unit** or **Connected**) to the system as illustrated below.

**DECT system settings**

These settings are DECT settings for the system.

DECT system RFPI:

**SIP system settings**

These settings are SIP settings for the system.

Number of SIP accounts before distributed load:

SIP Server support for multiple registrations per account:  (used for roaming signalling)

**MAC-units in chain**

	ID	RPN	Version	MAC address	IP address	IP Status	DECT sync source	DECT Property
<input type="checkbox"/>	0	00	44	00:08:7B:D7:91:5C	192.168.50.96	This unit	0 - RPN: 00	Master
<input type="checkbox"/>	1	04	44	00:08:7B:D7:91:58	192.168.50.78	Connected	0 - RPN: 00	Locked

[Check All](#) / [Uncheck All](#)

**STEP 5** For [BS 1] Add server and extension to BS 1 similar to earlier sections.

**STEP 6** [BS 1] Register HS to the extension and verify whether its successful from the “Home” page and Handset UI

## Welcome

Please select a configuration page in the index pane on left.

### System Information:

Phone Type:	IPDECT HW ver 00
System Type:	Generic SIP (RFC 3261)
RF Band:	EU
Current local time:	01/Jan/1970 00:10:15
Operation time:	00:10:10 (H:M:S)
RFPI-Address:	116E60FD00; RPN:00
MAC-Address:	00087bd7915c
IP-Address:	192.168.50.96
Firmware-Version:	IPDECT/00.44//01-Oct-10 14:47
Firmware-URL:	tftp://

### Multi Cell Ready(Keep-alive) Master

### SIP Identity Status on this Base Station:

4001 4001@192.168.50.95	Identity 1 Status:	OK
4002 4002@192.168.50.95	Identity 2 Status:	OK