Guidelines on how to Configure Integrated DECT in MiVoice MX-ONE

INFORMATION

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TRADEMARKS

CONTENTS

1 SCOPE

The purpose of this document is to gather important and strongly recommended actions which are essential to follow in order to get a well working DECT system, into one and the same document.

More extensive information how to configure and deploy MiVoice MX-ONE integrated DECT solution is available in MX-ONE O&M Library under Cordless Telephony. Always follow the CPI documentation referred to in section 3.3 when it comes to planning, deploying, changing and upgrading the Integrated DECT system.

2 GENERAL

Problems with integrated DECT like distortion, crackling noise, one-way-speech, cut calls, PP not reachable and handover problems can in most cases be related to the fact that the system experience different types of synchronization problems. This can be due to many things like e.g. poor external sync source (for the system clock), old HW revisions on boards vital to the overall synchronization of the system, poor distribution of the DECT sync on the DECT ring, as well as how all the GW's which are housing DECT components are synchronized to each other. If the rules in this document are followed it will significantly reduce the number of problems for the customer and the end-users.

2.1 NAMING CLARIFICATIONS TO DIFFERENT MX-ONE PRODUCTS

MX-ONE Classic

Refers to Media Gateway in a 19" (7U) Sub-rack containing one MGU.

3 PRE-REQUISITES

3.1 PRE-REQUISITES FOR THE SYNC SOURCE

For media gateways which are containing integrated DECT the sync is of critical importance, both for the DECT side and for the systems side.

Historically, the system sync signal has been derived from an external source via an ISDN (E1/T1) trunk into the system where it has been defined as system sync master. With the enhanced clock on the MGU board (ROF.../n), the MGU board can now be used as sync master for the whole system. Using this (MGU board) is a benefit and necessity when the media gateway gets no external synchronization source (PRI/BRI) and it is servicing Integrated DECT infrastructure and when remote sites are connected via IP/WAN connections.

The “DECT sync signal” is then created from the system clock on the Ring Master board. Below are some pre-requisites that must be fulfilled to secure a proper operation when using external sync source:

- Traditionally MX-ONE media gateways are connected to PSTN network interface, normally a primary rate interface (2048 Kbit/s for E1 or 1544 Kbit/s for T1) which provides a reference timing to MX-ONE systems. This external timing source must comply with the timing accuracy and stability required for Stratum 3 timing (see note 1).
- The system clock synchronization is more crucial when integrated DECT is deployed in MX-ONE systems and more careful synchronization and timing planning must be considered.
- Additional CPE network termination units placed between MX-ONE and the network interface such as multiplexor, repeater or converters, must preserve a traceable timing to the reference source even in the presence of wander/jitter in the incoming bit rate as per ITU-T recommendation or equivalent ETSI specifications (see note 2).
- Any equipment that degrades the timing characteristics shall only be used with certain restrictions. Refer to reference specification (note 3) for timing accuracy requirements and comments in following slides.
- To avoid the risk of having deviating sync sources to the different GW’s containing DECT boards it is strongly recommended to use only one external sync source and to distribute the system sync from this GW to the other DECT GW’s.

Note 1: Characteristics of Stratum 3 timing reference (see standards in Note 2):

- Accuracy 4,6 ppm
- Stability 0,37 ppm/24 hours

Note 2: Characteristics of network interfaces, bit rate and timing are specified in:

- ITU-T Recommendation G.823 (or equivalent ETSI EN 302 084), "The control of jitter and wander within digital networks which are based on the 2,048 kbit/s hierarchy”
- ITU-T Recommendation G.824 (or equivalent ETSI EN 302 084), “The control of jitter and wander within digital networks which are based on the 1,544 kbit/s hierarchy”

Note 3: Relevant DECT standard reference:

- ETSI EN 300 175-2 V2.3.1 (2010-06) Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical Layer (PHL)

3.2 ACTIONS TO BE TAKEN TO AVOID GENERAL DECT PROBLEMS

Note that an ELU31/4 board operating in /3-mode is compatible to an ELU31/3 board with latest FW except that ELU31/4 has a new board id and a new 'board mode switch'. The new board id is supported by all releases in active sustaining.

With the release of MX-ONE 5.0 SP5 the ELU31/4 board can now also be operated in /4-mode.

The /4-mode offers two new main features:

- Distribution of the system timing on top of the DECT sync over the RS.422 DECT sync cable running between the sync-ring boards.
- Changed detection of sync pulses for improved delay measurement and sync accuracy, plus enhanced diagnostics.

Use ELU31/4 in /4-mode

The general recommendation is to use ELU31/4 in /4-mode for the synchronization ring. This configuration requires all ring-boards to be ELU31/4 boards. (See Note 4).
(The functionality for distribution of system synchronization provided by the /4-mode is not supported within the TSW system. ELU31/4 used in TSW systems can however be used in /4-mode as long as all ring boards are running in /4-mode).

Always upgrade to latest HW and SW revisions

Make sure that all relevant system HW and SW components (including base stations and portables) are upgraded to approved and supported revisions (see Knowledge Base).

Note 4: In /4-mode the **technical** handling of the sync pulses on the sync cable has been changed in order to take full advantage of the hardware capabilities on the ELU31/4 board.
Be aware that ELU31/4 boards in /4-mode are NOT compatible with older boards or with ELU31/4 boards running in /3-mode as ring master or ring member.

Regarding ACDM

It is recommended to always use ACDM.

This has shown to improve the cable delay compensation significantly, hence the system performance improves, concerning all synchronization related problems like PP not reachable, noise during speech with PP or one way speech to PP as well as 348 alarms indicating ring problems.

All wire pairs of the synchronization ring must follow the same cable path (e.g. same length). For new established sync rings it may be obvious, but this has particularly to be considered when the sync ring is modified from an old sync ring (ELU31/1 without ACDM) to a new one with ACDM.

CPE timing accuracy and stability deviation

In case non-conforming CPE equipment must be used for practical reasons, the timing accuracy of this equipment must be better than +/-25 ppm, which is the critical factor for disturbance free operation of DECT portables according to ETSI EN 300 175-2 V2.3.1.
The stricter requirement i.e. max +/-5 ppm deviation between RFP's, is guaranteed by MX-ONE's integrated DECT solution.

Regarding long cables and/or many ring members

If the accumulated ring cable length is long, or if the number of ring-boards is large the automatic delay measurements and compensation can be challenging. Therefore such installations shall always be monitored using the ELU31/4 on-board diagnostics.

Regarding ELU31/1 and ELU31/2

These boards are service stopped. It is strongly recommended to not use ELU31/1 and or ELU31/2 boards in systems which are having general DECT problems**.** ELU31/1 has less capacity and performance compared to ELU31/4 and ELU31/3.

Review of existing site survey at upgrades from ELU31/1 to ELU31/3 or ELU31/4

It is essential to do a review of existing site survey when changing existing DECT radio base station configuration e.g. when moving to ELU31/4 or ELU31/3, or at upgrade from TSW to MiVoice MX-ONE. ELU31/4 and ELU31/3 can support 32 speech channels compared to only 16 with ELU31/1. When changing the configuration, the balance between base station coverage and traffic capacity per board may change, therefore a new site survey should be considered.

Regarding layer 1 synchronization on ISDN

The VARO parameter used with ISDN trunk setup is of particular importance in combination with Integrated DECT, more specifically it is the D3 value [Priority for layer 1] that is most critical. This parameter is crucial and must be setup in a correct manner for ISDN lines providing sync or else the sync will be lost even if commands SCEXI & SCICI (trsp_synchronization & pcm_synchronization) are setup correctly. So in practice, for the sync receiving side of the ISDN interface where the SCEXI (trsp_synchronization) is setup to receive sync the route must also be set to have [no Priority] = slave, on at least layer 1.

Regarding receiving synchronization from one single source when using multiple ISDN trunks

If system has multiple gateways/LIMs with multiple ISDN trunk lines connected to public PSTN but only one common ELU31 ring then it is important to only setup the system to receive synchronization from one of the public ISDN trunk lines and to distribute this synchronization source to all other gateways/LIMs internally within the system. The reason for this is that it is critical for Integrated DECT to have all gateways/LIMs on the same sync level (see examples in §4).

Regarding dropped calls or PP not reachable

When removing an extension by CXAKE/commands, remember that the subscription must be removed in the portable as well. If this is not done and if you initiate the same extension number on another PP you end up in having two PP’s with the same number. This will/may cause issues such as 'dropped calls' and PP not reachable.

If the subscription is removed from the system, but not from the portable, the portable will automatically and continuously try to re-connect to the system causing extra load on the system.

BRI (2B+D) trunks (TLU79) as timing (sync) reference

The experience is that the stability of the sync from 2B+D lines is not as accurate and good as from ISDN (30B+D) lines. A disturbance of the sync on the 2B+D can sometimes propagate through the TLU79 and in combination with MGU cause a disturbance on the DECT frame sync which can result in Base Station restarts.

Crosstalk or one way speech after upgrade or data reload

After an upgrade or data reload of MX-ONE Service Node there is a risk, not very common though, that gateways containing ELU31 boards can have crosstalk or one way speech problems. This problem remains until the ELU31 board, having the problem, is restarted.
It is therefore, as a precaution, recommended that the service technician always makes test calls on every ELU31 board after a SW upgrade or data reload or alternatively do a restart of all ELU31 boards belonging to the SN which has been reloaded.

3.3 DOCUMENT REFERENCES

5/1531-ANF 901 14 – Cordless Phone Installation Planning

6/1531-ANF 901 14 – Cordless Phone Installation Instruction

127/154 31-ANF 901 14 – Cordless Extension Operation Directions

4 SYSTEM CLOCK SYNCHRONIZATION FOR INTEGRATED DECT

4.1 CASE #1 – MX-ONE CLASSIC (NO GS)

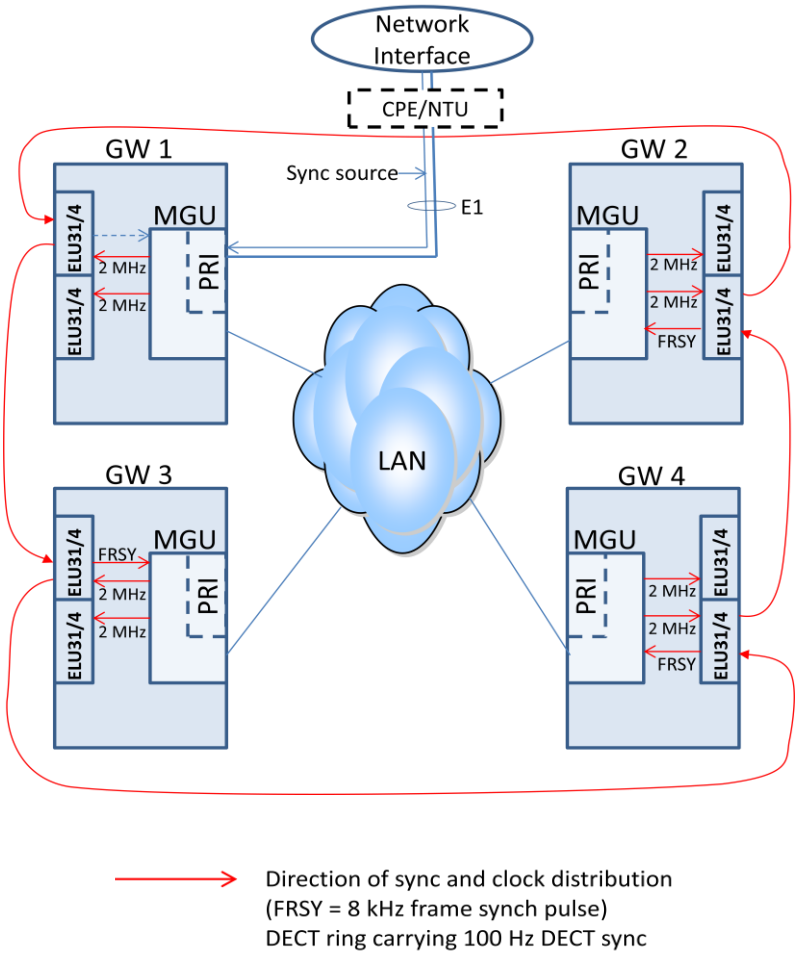

Figure 1

This case describes how the synchronization shall be done for a MX-ONE Classic system having 4 Media GW's and "IP backbone":

- It is important to configure the System sync master and the DECT ring master to be in the same GW, the GW where the external sync source is connected i.e. in this case GW1/MGU.
- Synchronizing MX-ONE Classic gateways using ELU31/4 in /4-mode is the new way to configure the system. This deployment fit specifically well in IP-centric environments.
- In figure 1 the boards in GW1 can receive the reference timing from the MGU clock or the PRI trunk in GW1. However, if you have a PRI/BRI clock source with good quality it shall be used as reference timing source in first hand. The ELU31/4 board in GW 1 is configured to distribute both System sync and DECT sync to next GW (GW 2). The ELU31/4 DECT ring board in GW 2 is configured to connect System sync and DECT sync to GW 2 and distribute System sync and DECT sync to next GW (GW 3) etc. The other GWs (2 – 4) are synchronized to MGW 1 via the RS.422 DECT synchronization cable and the ELU31/4 boards.
- For redundancy other MGU's in the system can act as the System synch master.
- You may have ISDN or E1/T1 trunks connected to any GW in the system as long as ONE of the trunks is used as system synch source.

4.2 CASE #1, ALT 2 – MX-ONE CLASSIC (NO GS)

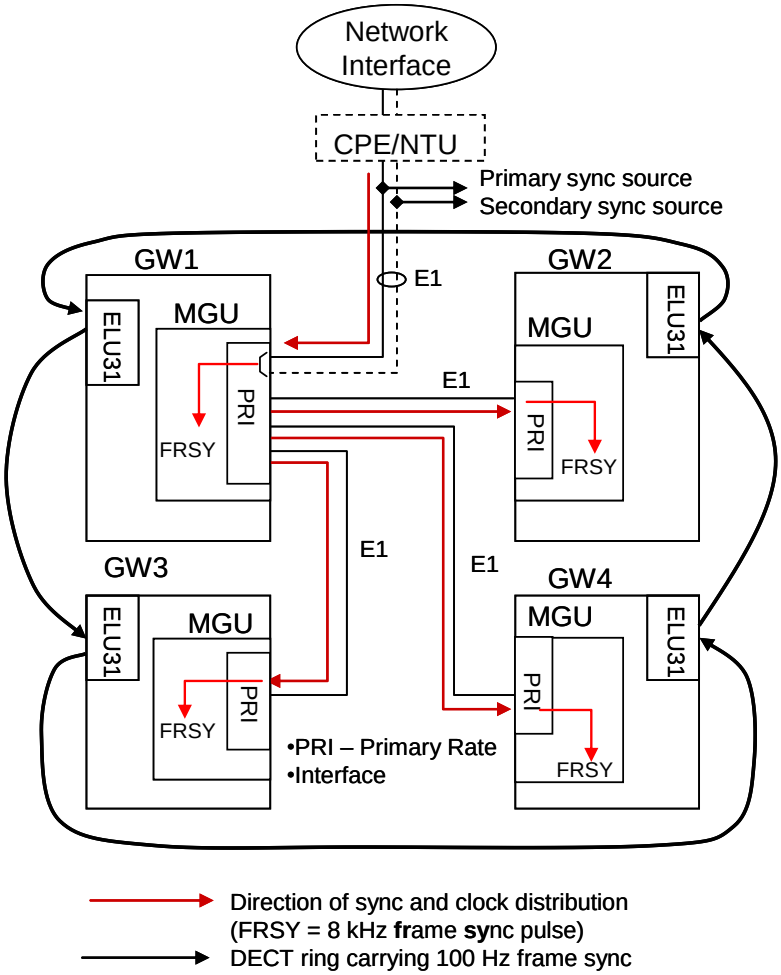

Figure 2

This case describes how the synchronization shall be done for a MX-ONE Classic system having 4 DECT Media GW's and "IP backbone":

- In figure 2 the GW1 is connected to the reference timing (via CPE/NTU if used) and receives the network timing. The other GWs (2 – 4) get system synch from MGW 1 via E1 tie-lines. (Each MGU has 8 E1 ports).

  The DECT sync is distributed via the DECT ring.

- If redundant system sync mechanism is required, a second PRI link is connected to another E1 of MGU (dashed line) and designated as the secondary sync source.
  Note 5: The secondary E1 port must be selected from the same gateway (i.e. MGU in GW1).
- When CPE equipment is placed between network interface and MX-ONE system, the clock provided by CPE equipments must be traceable to the network timing source (see 3.1 - "Pre-requisites external sync source").

4.3 CASE #2, ALT 2 – MX-ONE CLASSIC WITH MANY GW'S CONTAINING DECT

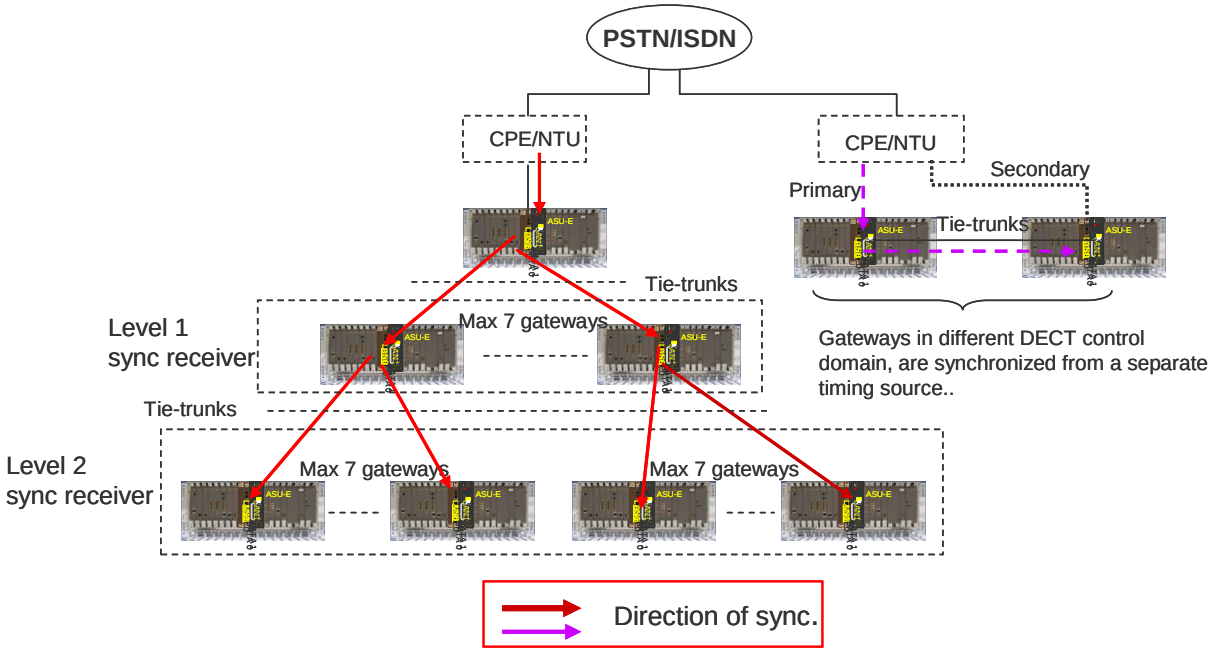

Figure 3

This case describes how the system synchronization shall be done for a large MX-ONE Classic system having many GW's with Integrated DECT (/3-mode synchronization):

- Even with 8 E1 ports in each MGU, maybe it is not sufficient to build a large DECT system (single hand-over domain).
- In this case, the system synchronization hierarchy can be built in several hierarchy levels as shown figure 4 above. The DECT sync is distributed via the DECT ring.
- It is recommended that the system sync chain consist of no more than 2 levels (which set limit of max number of gateways to 57 (= 1 + 7 + 49).
- Timing requirement of the reference source and CPE equipment are same as previous case.
- If redundant system sync source needs to be designated, it must reside in the same gateway connected to the PSTN (see cases in section 4.2 and 4.4).
- It is good practice to design the sync ring such that it avoids jumping between different sync levels, or branches, more than necessary.

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