

# Application Note



Akademie věd České republiky  
Ústav teorie informace a automatizace AV ČR, v.v.i.

## Adaptive Noise Canceller Migration Demo

Zdeněk Pohl  
[zdenek.pohl@utia.cz](mailto:zdenek.pohl@utia.cz)

### Contents

Description .....	2
Functional Description .....	2
Required Components .....	3
Running the Demo .....	3
Setting up the Demo.....	3
Setting up FFT Scope .....	3
Troubleshooting .....	5

### Revision history

Rev.	Date	Author	Description
0	18.3.2008	Z.P.	Initial version
1	3.12.2008	Z.P.	Actualization after including petalinux petalinux
2			

## Description

The *adaptive noise canceller (ANC) migration demo* presents the ability of the *least-square lattice (LSL) PCORE* accelerator and its API for Microblaze to perform migrations between software and hardware solution. Also the migration between different hardware configurations is demonstrated. During migrations the order (dimension) of the lattice filter can be increased and decreased.

The accelerator is used for noise cancellation in pre-recorded audio samples stored in the wave files. The result is sent to ac'97 compliant audio codec, thus the output of the noise cancellation filter can be observed on the audio line-out and headphones outputs.

## Functional Description

The demo components are displayed in Fig. 1

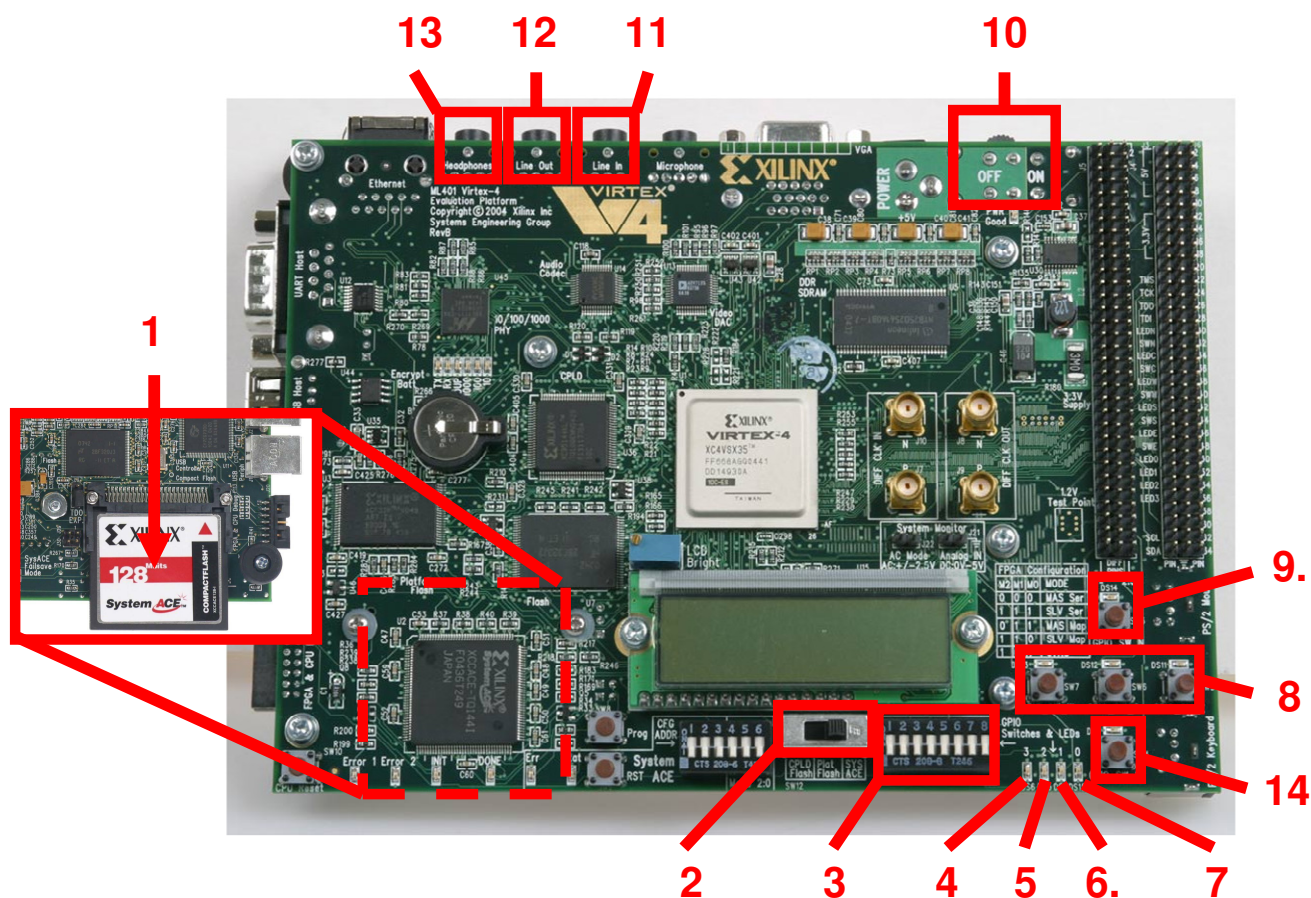


Fig. 1: Noise canceller migration demo controls

1. Compact Flash containing bitstream `pux_nc.ace`
2. Configuration switch in Sys ACE position
3. User DIP switches
4. Audio playback sync OK LED
5. Software configuration LED indicator
6. Hardware configuration LED indicator
7. Pipelined hardware configuration LED indicator

8. Switch to next configuration of the lattice filter (indicated by corresponding LEDs)
9. Turn off lattice filter button, output is then identical to input
10. Power switch
11. Audio data input from external source
12. Output to external device
13. Output to headphones
14. Turn off the running application

## Required Components

- ML402 board with boot manager identical to factory settings, 64 MB Compact Flash card
- Stereo audio cable for running the spectral scope
- Serial cable to run petalinux terminal or
- Ethernet cable to connect via telnet

## Running the Demo

The demo can be run standalone, using internally stored input sound waveforms. Optionally the spectral scope can be used for displaying of spectrograms.

## Setting up the Demo

1. Load the pux\_nc.ace to Compact Flash (CF) root directory, erase other files and directories\*
2. Turn off the ML402 board by power switch "10".
3. Insert CF into ML402 CF slot "1".
4. Switch configuration switch "2" into SYS ACE position.
5. Switch bit0 of user DIP switches "3" to high (it selects the source of input to wave stored within the CF)\*\*
6. Connect the speakers to line-out "12" or headphones to "13". It is possible to use both possibilities at the same time as well.
7. Connect the serial cable or Ethernet. The serial terminal parameters are: 115200 bps, 8bit, none, 1bit, none.
8. Turn the ML402 power on. The design is loaded when the LED near the CF slot start constantly lighting green.
9. Wait until petalinux will boot. It can be observed on serial terminal.
10. Log in via serial console. Login is "root" password is "root". Alternatively login via telnet to 192.168.0.8
11. type "run\_demo" and press enter
12. When the demo is running it is possible to use buttons: "8" and "9". Application can be terminated by pressing "14"

\*NOTE: The compact flash cards must have DOS format to work properly with ML402 bootloader. It may be necessary to use `mkdosfs` utility to create correct FAT filesystem on Windows XP/Vista

\*\*NOTE: Otherwise input is expected on ac'97 line-in input "11" in special format: left channel is reference noise, right channel is corrupted speech.

## Setting up FFT Scope

1. Run the demo
2. Connect audio cables from "12" to PCs line-in
3. Change directory to `gram50`

4. Setup volume for playback and recording as shown in Fig. 2

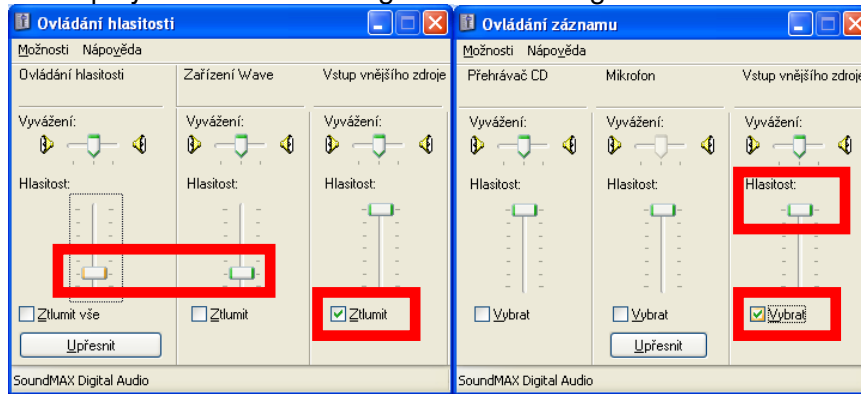


Fig. 2: Playback and record volume and source settings

5. Run `gram50.exe` and press OK when configuration appears.
6. See result in FFT scope window as illustrated in Fig. 3.

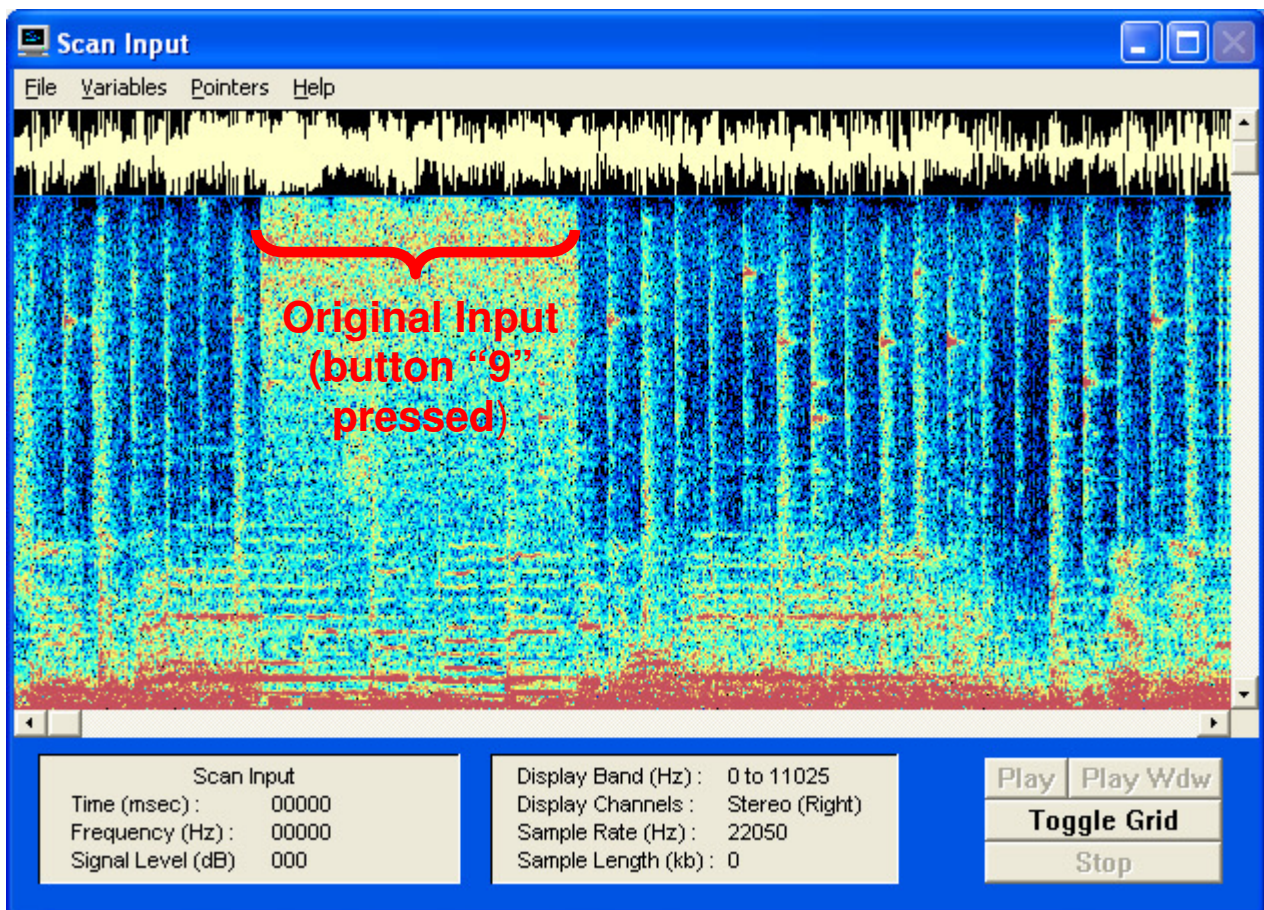


Fig. 3: FFT Scope output

## During the run of the demo it is possible

1. To initiate migration by pressing one of buttons "8".
2. To hear original input waveform by holding button "9" down.
3. To check correct audio synchronization by inspection of LED "4"

4. To see actual configuration indicated by LEDs “5, 6, 7”. The LED “5” stands for SW configuration with order 8. The LED “6” stands for hardware configuration with order 124. Finally the LED “7” indicates pipelined HW version of order 504.

## Troubleshooting

Telnet connection: If the connection cannot be established it is sometimes necessary to ping from ML402 to PC.

### 1. Package contents

<pre>    pux_nc.ace   └── Doc       anclsl_migdemo.pdf       anclsl_migdemo_short.pdf   └── gram50       gram.cnt       gram.exe       gram.hlp       gram.ini       origLong22050.wav</pre>	<p><b>Configuration bitstream for ML402 board</b></p> <p><b>This documentation Demo features overview</b></p> <p><b>FFT scope application</b></p> <p><b>Original “clear” sound</b></p>
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