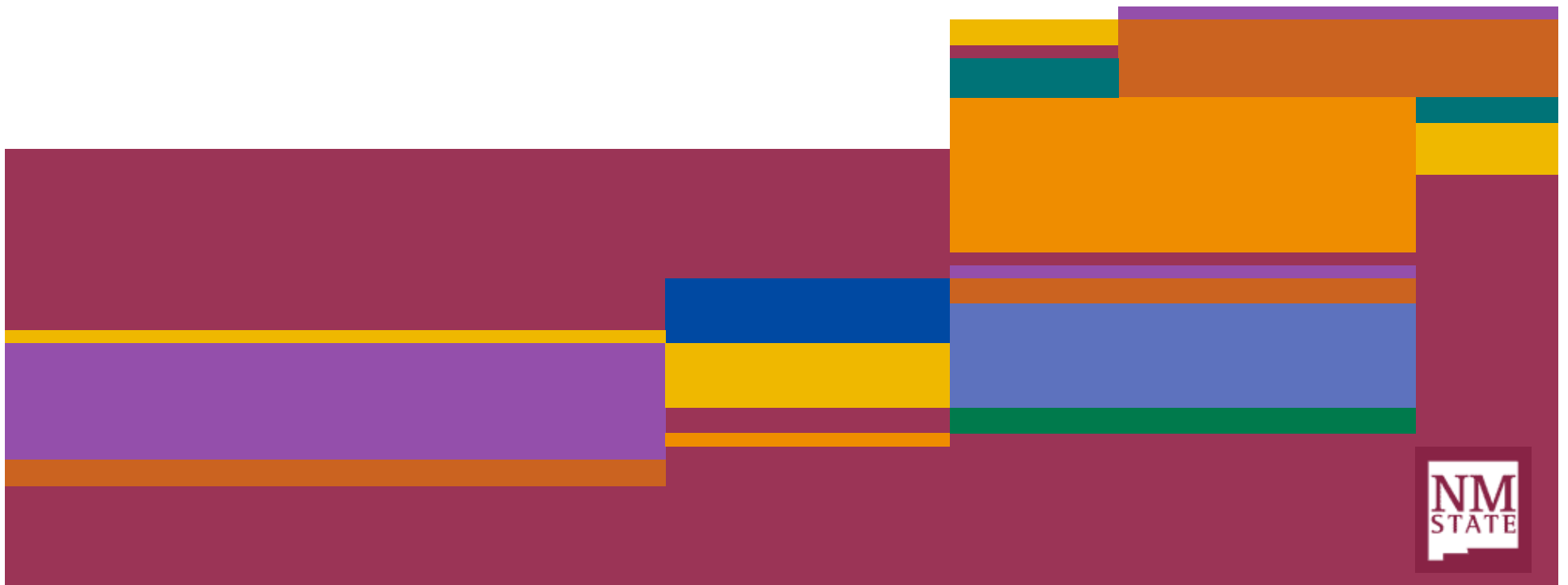


Generalized Extension Language (GEL) and Applications



References

- More detailed information on GEL can be found in Chapter 12 of the Code Composer Studio (CCS) User's Guide, application note **SPRU328B.pdf** (see course webpage)
- Additional information can be found in CCS's help system
 - Help → Contents → Creating Code and Building Your Project → Automating Tasks with the General Extension Language

Introduction

- General Extension Language (GEL) is an interpretive language similar to C that lets you create functions to extend CCS' s capabilities
 - Functions are created using GEL syntax and separately loaded into CCS
- With GEL, we can create a Graphical User Interface (GUI) that can displays a window on the host PC
 - GUI: sliders, dialog boxes, menu actions, output windows
 - Memory can be accessed in real-time using GEL
- Actions to the GUI can be used to control the DSK

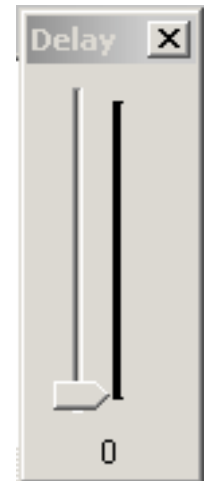
Example: Real-Time Echo with Selectable Delay

- As a simple example on the use of GEL for creating a GUI, consider the following difference equation

$$y[n] = 0.5x[n] + 0.5x[n-D]$$

which implements an echo

- We would like to make the echo delay, D a variable and control it (real-time) using a GUI slider
 - We also assume that $0 \leq D \leq \text{MAX_DELAY}$



user_data.h

<SNIP>

```
/* Global variables here as extern, initializations in  
initialize_program.c */
```

```
#define MAX_DELAY 32767 /* buffer length, max should be 32767 */  
extern short buffer[]; /* buffer to store samples */  
extern short *OldestSamplePtr; /* ptr to oldest sample */  
extern short delay; /* desired echo delay */
```

```
#include "DSPFunctionsFixedPoint/util.h"
```

<SNIP>

initialize_program.c

```
short buffer[MAX_DELAY]; /* buffer to store samples */
short *OldestSamplePtr; /* ptr to oldest sample in buffer */
short delay; /* echo delay */

void initialize_program()
{
    short i;

    delay = 0; /* initial echo delay in samples*/
    OldestSamplePtr = buffer; /* setup ptr clear buffer out */
    for(i=0;i<MAX_DELAY;i++)
        buffer[i] = 0;
}
```

process_signal.c

```
void process_signal(short inputRight, short inputLeft, short
*outputRight, short *outputLeft)
{
    short delay_sample;

    // Process right channel sample
    *OldestSamplePtr = inputRight;

    delay_sample=tap((MAX_DELAY-1),buffer,OldestSamplePtr,delay);

    *outputRight = inputRight/2 + delay_sample/2;

    cdelay((MAX_DELAY-1), buffer, &OldestSamplePtr);

    // Process left channel sample
    *outputLeft = inputLeft;
}
```

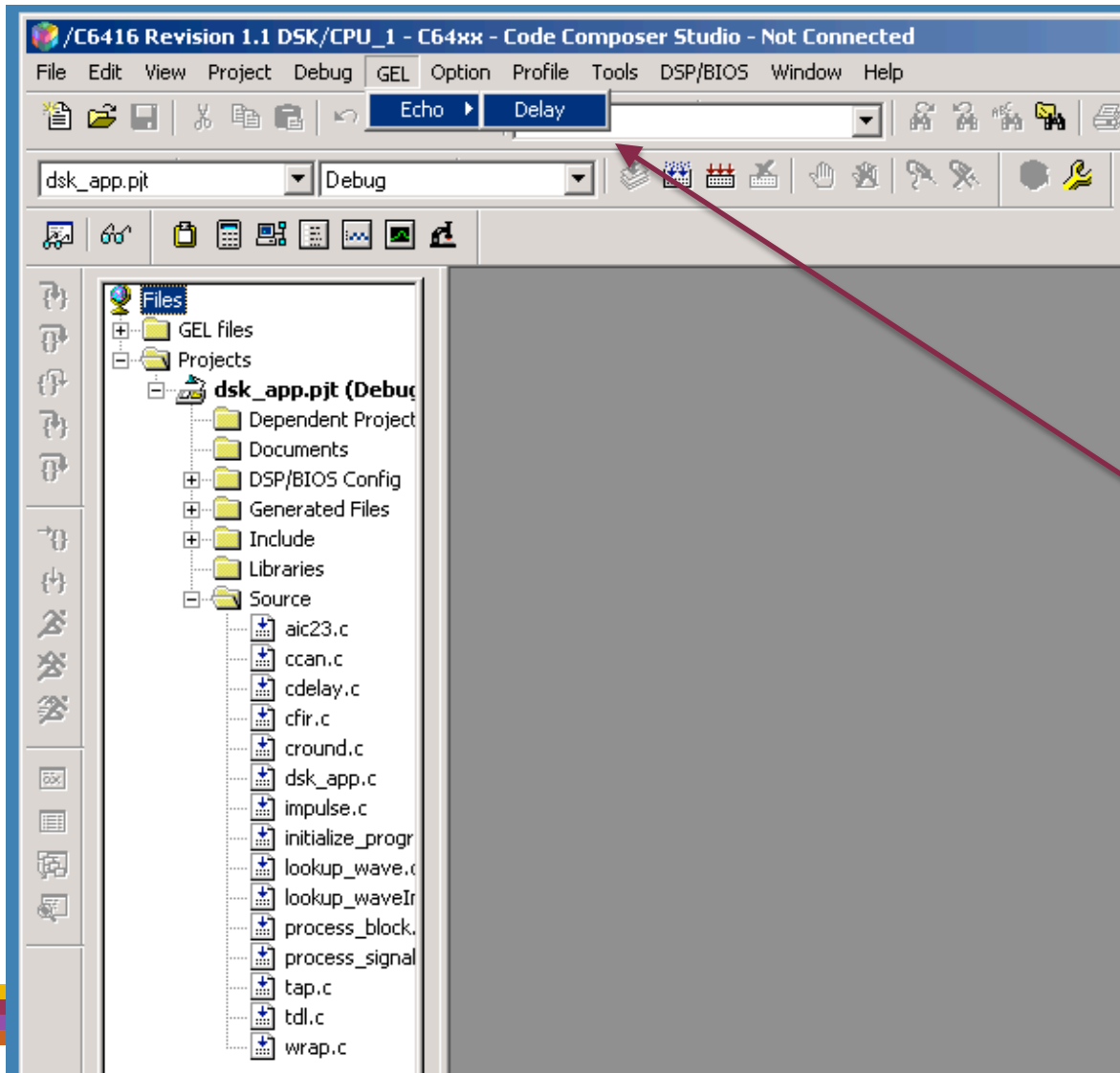
echo.gel

```
menuitem "Echo"; // GEL menu item called Echo
// min, max, increment, skip, variable name
slider Delay(0, 32766, 100, 1000, d)
{
    // delay is a global variable
    delay = d;
}
```

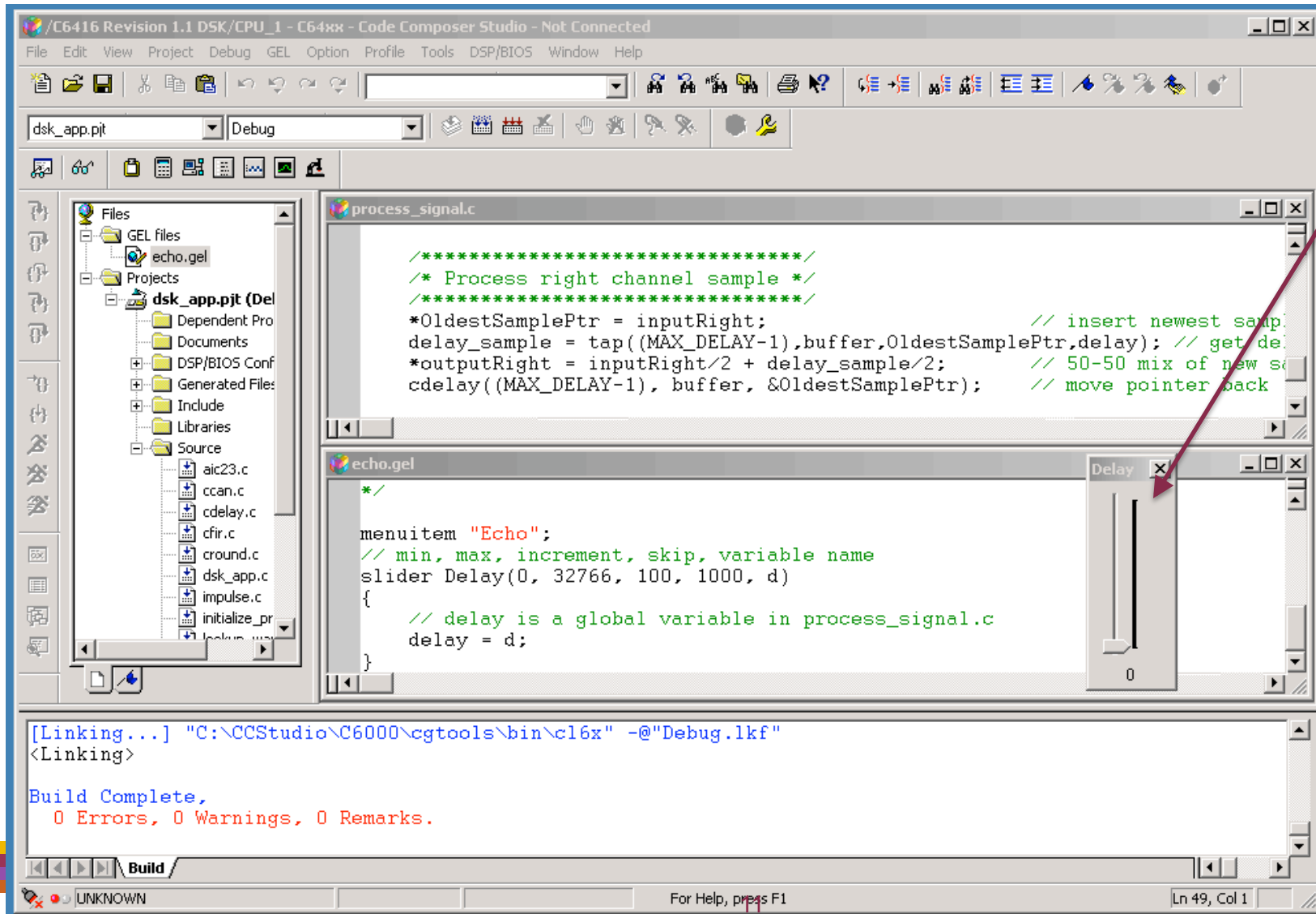
Steps

- 1) Build the project as usual and download to target H/W
- 2) Load the GEL file (File -> Load GEL...)
- 3) Display the slider (GEL -> Echo -> Delay)
- 4) Run the program

Displaying the Delay Slider



Delay Slider



The screenshot displays the Code Composer Studio interface for a project named 'dsk_app.pjt'. The main window shows the source code for 'process_signal.c' and 'echo.gel'. The 'echo.gel' window includes a menu item 'Echo' and a slider control for 'Delay'. The slider is currently set to 0. A red arrow points to the slider. The bottom status bar shows 'Build Complete, 0 Errors, 0 Warnings, 0 Remarks.' and 'Ln 49, Col 1'.

```
process_signal.c
/*****
 * Process right channel sample */
*****/
*OldestSamplePtr = inputRight; // insert newest sample
delay_sample = tap((MAX_DELAY-1),buffer,OldestSamplePtr,delay); // get delay sample
*outputRight = inputRight/2 + delay_sample/2; // 50-50 mix of new sample and delay sample
cdelay((MAX_DELAY-1), buffer, &OldestSamplePtr); // move pointer back

echo.gel
*/
menuitem "Echo";
// min, max, increment, skip, variable name
slider Delay(0, 32766, 100, 1000, d)
{
    // delay is a global variable in process_signal.c
    delay = d;
}
```

[Linking...] "C:\CCStudio\C6000\cgttools\bin\cl6x" -@"Debug.lkf"
<Linking>
Build Complete,
0 Errors, 0 Warnings, 0 Remarks.
Build

UNKNOWN For Help, press F1 Ln 49, Col 1