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COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Using SystemACE

Overview

SystemACE is a flexible efficient way to configure Xilinx FPGAs without the use of a host computer and programming cable. As you can imagine, finished designs with FPGAs cannot afford to be programmed by computer, they must be able to simply remember their configuration information.

The CaLinX2 boards have been equipped with a SystemACE CF (Compact Flash) controller and Compact Flash Type II slots to allow you to program a flash card or IBM Microdrive with up to 8 FPGA configurations, one of which you will select using SW11 to load into the XCV2000E FPGA.

There are five main steps to using SystemACE

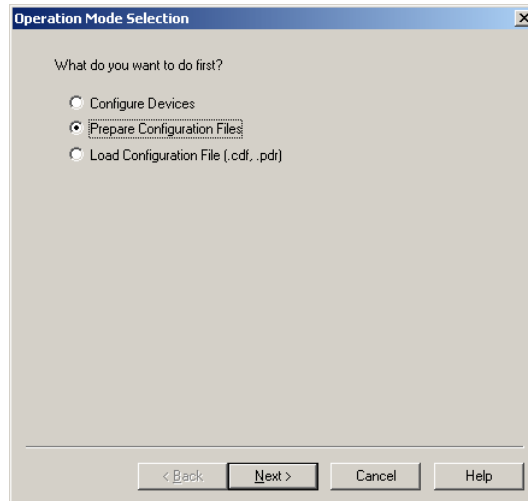
1. Generate the *.BIT files
2. Create a SystemACE Collection
3. Format a CF Card
4. Copy the Collection to your CF Card
5. Use the CF Card to Program a Board

Detailed Instructions: Step 1 – Create the *.BIT files

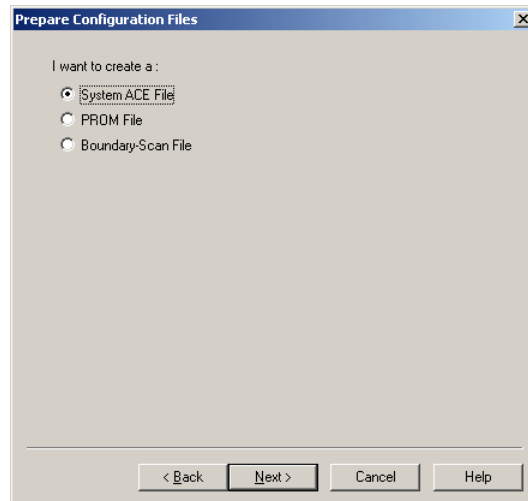
1. Before you can use SystemACE you must have a fully synthesized, placed and routed design ready.
 - a. For information about synthesizing your Verilog please see the Using Project Navigator tutorial.
 - b. <http://www-inst.eecs.berkeley.edu/~cs150/fa04/Documents.htm#Tutorials>

Detailed Instructions: Step 2 – Create a SystemACE Collection

1. Launch iMPACT
 - a. Xilinx iMPACT, the tool used to program the board, is also the tool for creating and working with SystemACE collections.
 - b. Note that **if** you launch iMPACT from **Project Navigator**, be sure to **double-click Generate PROM, ACE or JTAG file** in the **Processes for Current Source** box.
 - i. If you run **Configure Device (iMPACT)** you will not be given the option to create a SystemACE collection.
2. Select **Prepare Configuration Files**

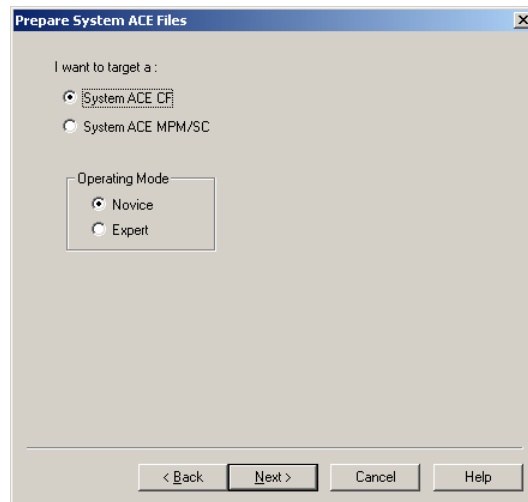


3. Select **System ACE File**

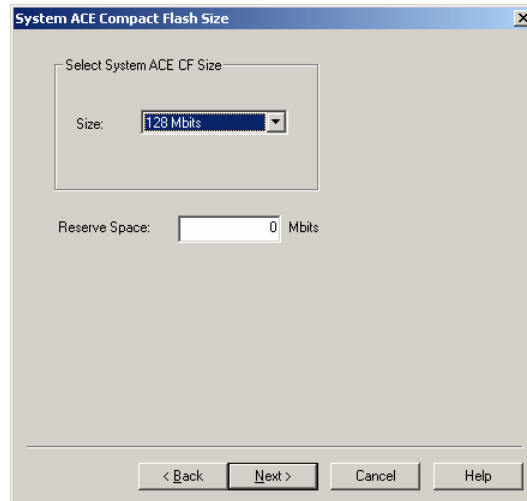


4. Select **System ACE CF** and **Novice** mode

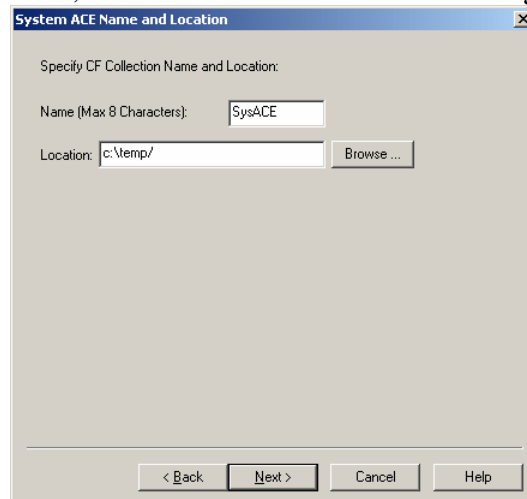
- a. Expert mode is not useful with the CaLinx boards



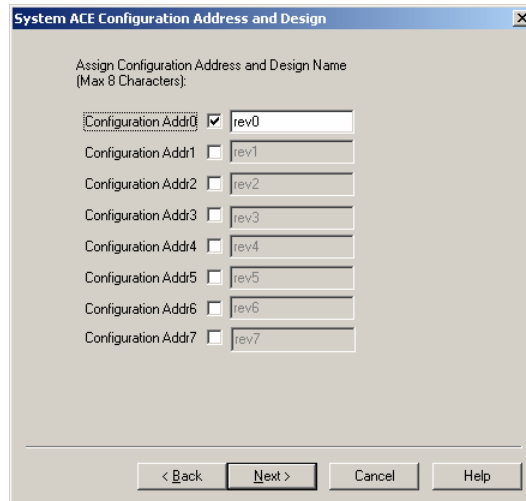
5. Select size **Generic**



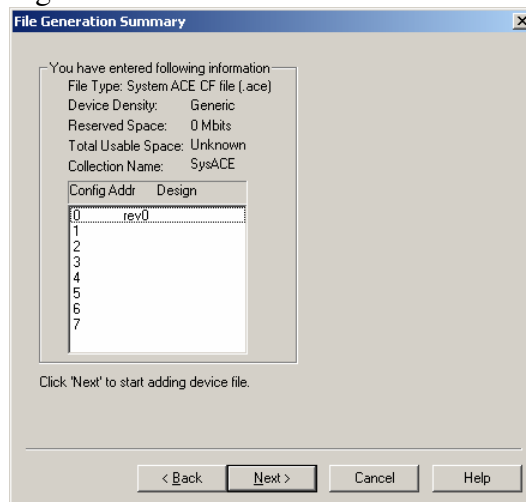
- a. If you are using a 128MB or 256MB flash card you may select the actual size.
 - b. For more information about reserving space, please read the SystemACE documentation.
6. Name your collection, and select a location for all of the generated files.



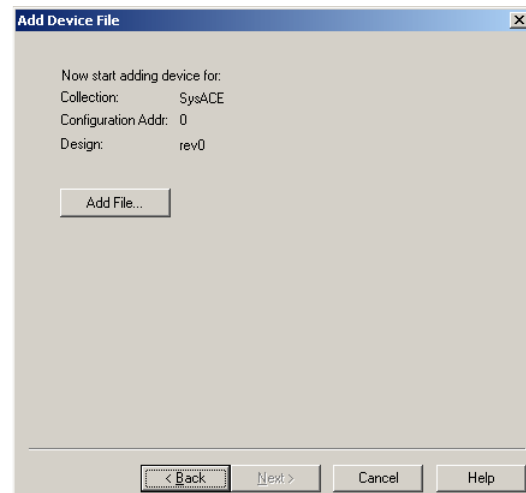
- a. The **collection name** is merely for your convenience, it makes no difference on the CaLinux board.
 - b. The **location cannot contain spaces in the path**
7. Select which configuration addresses will be used and name them.



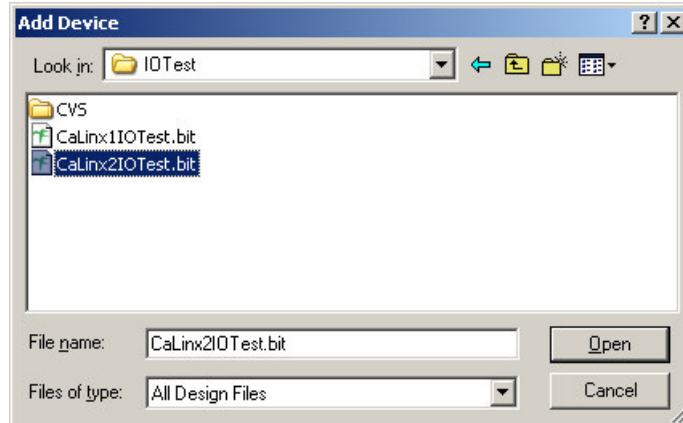
- a. SystemACE will allow you to store up to 8 configurations on one CF card.
 - b. You can select which configuration to load using SW11
 - c. The names are for your convenience only.
8. Review your settings and **Click Next**



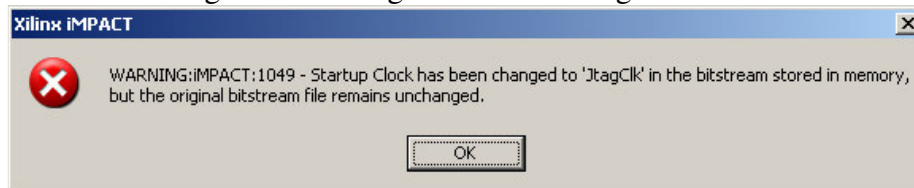
9. **Click Add File** to add a *.BIT file to configuration 0 (named rev0 in this example)



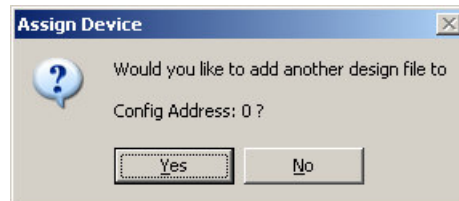
10. Navigate to, and then open the *.BIT file you wish to use in this configuration.
 a. In this case **rev0** will be the **CaLinx2 IO Test bitfile**.



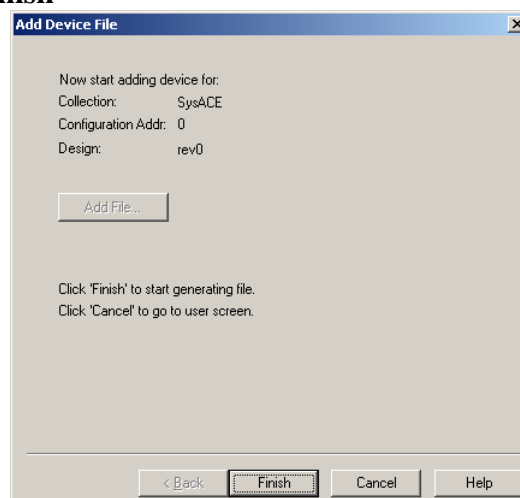
- b. After opening the file, iMPACT will take a minute to process it.
 c. You will get the warning shown below. Ignore it and **Click OK**



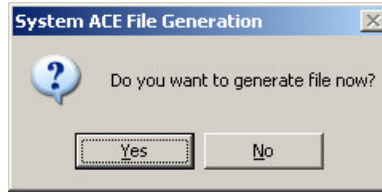
11. Since there is only **one FPGA on the CaLinx board** you do **NOT** want to add a second file to any of the configurations.
 a. **Click No**



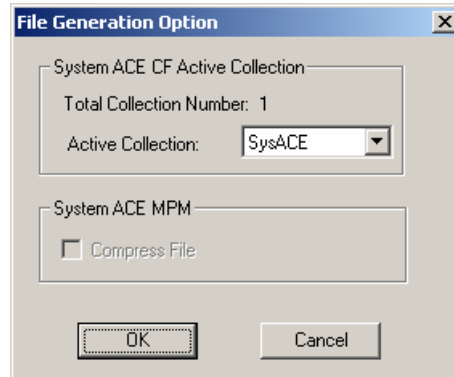
12. If you activated multiple configurations you will now get a chance to add files to the others. In this example, we only used one configuration, 0, so we are done.
 a. **Click Finish**



13. You will now need to generate the programming files. **Click Yes**



14. Click OK



15. Wait for iMPACT to finish generating files. **This may take a few minutes.**

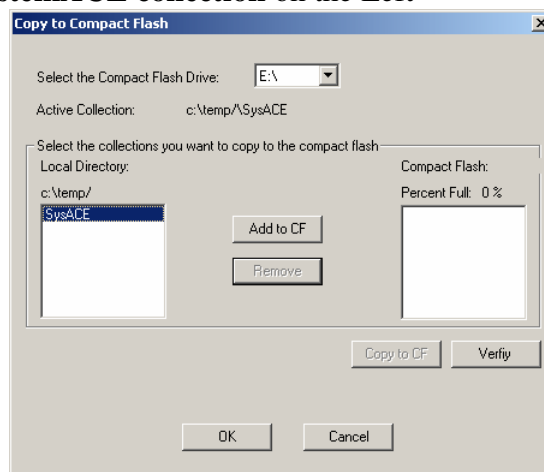
Detailed Instructions: Step 3 – Format a CF Card

1. In order to use a CF card with SystemACE it must be formatted with a FAT12 or FAT16 filesystem.
 - a. You cannot use NTFS
 - b. You cannot use FAT32
 - c. It must have been formatted using the older FAT16/FAT12 rules; it cannot have been formatted on a Windows XP or newer operating system.
2. **Check the filesystems of your CF card**
 - a. **Insert the CF card into a reader** on any Microsoft Windows computer
 - b. Go to **My Computer**
 - c. **Right-Click** on the CF drive
 - d. **Select Properties** from the drop down menu
 - e. On the **General** tab there should be a line that says **File system: xxxx**
 - i. If it says **FAT**, the card is probably useable
 - ii. If it says **NTFS, FAT32 or anything else you MUST format it**
3. If you do not need to format your CF card, **proceed to Step 4 – Copy the Collection to your CF Card**
4. If you have access to a Windows 98/NT/2000 computer it is **STRONGLY RECOMMENDED THAT YOU USE IT**
 - a. Put your CF card or IBM Microdrive into a CF reader
 - b. You will need to **BACKUP ALL YOUR DATA ON THE CF CARD**
 - c. Go to **My Computer**
 - d. **Right-Click** on the CF drive
 - e. **Select Format**
 - i. You need to use the **FAT12, FAT16 or FAT** file system
 - ii. **Do not use FAT32**

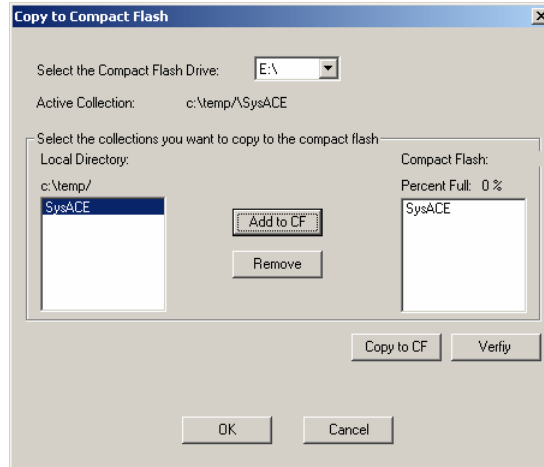
- iii. If you are given the option set the **Allocation unit size** to **1024 or greater**
 - iv. We recommend **Quick Format** since it is much faster.
 - v. **MAKE SURE YOU HAVE SAVED ANY DATA FROM THE CF CARD!**
 - vi. **Click Start**
5. If you have Windows XP you will need to use the **mkdosfs** utility
- a. **mkdosfs** is a Linux utility and you can easily perform this format on a Linux system.
 - b. You can download a windows version of the mkdosfs utility from <http://www-inst.eecs.berkeley.edu/~cs150/Documents/mkdosfs.zip>
 - c. The original webpage for the windows version of mkdosfs can be found here: <http://www.mager.org/mkdosfs/>
 - d. Put your CF card or IBM Microdrive into a CF reader
 - e. You will need to **BACKUP ALL YOUR DATA ON THE CF CARD**
 - f. **Click Start -> Run**
 - g. Enter **cmd** and click **Run**
 - i. **cd** to the directory where you **extracted mkdosfs.exe**
 - h. **MAKE SURE YOU HAVE SAVED ANY DATA FROM THE CF CARD!**
 - i. You will need to know the **drive letter of your CF reader**
 - j. Type **mkdosfs -s 64 -F 16 -R 1 f:**
 - i. Notice that **f:** should be replaced by the drive letter of your CF reader followed by a colon.
 - ii. These options will work for an IBM Microdrive, for a smaller flash card, consult the **mkdosfs** documentation or an EECS150 TA.

Detailed Instructions: Step 4 – Copy the Collection to your CF Card

1. Once you have a properly formatted CF card or ICM Microdrive, you must copy the SystemACE data to it.
2. In **iMPACT** Navigate to the **Operations -> Copy to Compact Flash** menu.
3. **Select your SystemACE collection** on the Left



4. **Click Add to CF**



5. **Click Copy to CF**
 - a. Make sure that the correct **Compact Flash Drive** is selected.
6. Make sure to **Eject the CF card properly**

Detailed Instructions: Step 5 – Copy the Collection to your CF Card

1. Make sure the CaLinX board is **powered on**
2. **Select the configuration address** you wish to use
 - a. You can select which of the 8 SystemACE addresses should be loaded using the rightmost three switches of **SW11**
 - b. Notice that **AD0** is on the left
3. **Insert the CF card** into the reader
 - a. The **STAT LED** should blink **green** while the configuration is loading
 - b. When the device is fully configured the **DONE** and **STATLED** LEDs will light **solid green**
 - c. If the **ERRLED** comes on **red** this most likely means that you need to reformat the CF card and copy the SystemACE files to it again. Repeat steps 3 and 4 above.

RevB - 7/19/2004	Greg Gibeling	Fully Documented (Original was incomplete) Added section on formatting with Windows XP
RevA	Greg Gibeling	Original