

Programming Assignment 2

Due October 31 at 11:55 PM

You still work for XYZ Inc. XYZ Inc. has decided to move to C++ as their primary programming language. You will be porting your utility from Programming Assignment 1. This program should no longer use C structures and functions that have a clear C++ replacement, for example the C++ string class should be used instead of char *. You will also need to expand the utility to incorporate the following functionality. Some source files have been provided for you and can be downloaded from <http://wwwcsif.cs.ucdavis.edu/~hsuf/ecs40/pa2/pa2.tar.gz>

The utility will need to access the library of footprint files. The directory of footprint files will be specified by the environment variable XYZ_FOOTPRINT_DIR. If the environment variable does not exist then it is assumed that the footprint directory is the current working directory. The footprint directory will have a .manifest file and the footprint files. The file formats for both the .manifest file and the footprint files are described later in this document.

All of the options available in the previous programming assignment will need to be available in this assignment.

-d (quick display option)

Component count: **<component count>**

Footprint count: **<footprint count>**

Unique component count: **<unique component count>**

Net count: **<net count>**

Largest net: **<net name>** with **<net connections>** connections

-n (no connection option)

Component **<designation>** is not connected on pin(s) **<pin number>**

-s (net shorted list)

Net **<net name>** and **<net name>** are shorted through component

<designation> on pin **<pin number>**

-c (component assembly info)

<count> of component **<label>** in **<footprint name>** footprint.

...

-v (verify netlist)

Net **<net name>** and **<net name>** are shorted through component **<designation>** on pin **<pin number>**.

Component **<designation>** in net **<net name>** does not exist.

Pin **<pin number>** does not exist on component **<designation>**.

...

-C (convert netlist)

Netlist **<file name>** converted to XML and saved in **<output file name>**. Add a **-v** option such that it verifies that the netlist has no obvious errors. Errors that it should report are shorted pads, same as **-s** option from Programming Assignment 1. Also it should report that a connection is not valid. One possible invalid connection is if the component designation for the connection in the net does not exist. Another possible invalid connection is if the pin number is greater than the number of pins in the footprint. Shorted net errors should not be duplicated, i.e. if Net1 and Net2 are shorted together through a component, the error should only be displayed once. The convention for displaying such an error should be first net name to appear in file followed by second net name to appear in file. The errors should be in the following format:
Net **<net name>** and **<net name>** are shorted through component **<designation>** on pin **<pin number>**.
Component **<designation>** in net **<net name>** does not exist.
Pin **<pin number>** does not exist on component **<designation>**.

The **-n** option will do the same as from Programming Assignment 1, but it will use the actual footprint information described in the footprint file.

Add a **-C** option that converts the netlist files from the existing format to an XML netlist version. The output file name will have the same name as the original netlist file except that it will have an **.xml** extension instead of a **.net** extension. The XML version will be described later in this document.

.manifest File Format

The .manifest file has pairs of footprint name with footprint filename. The footprint filenames are relative to the path of the .manifest file. The footprint name is the same name that exists in the netlist files.

```
{  
Footprint1 name  
Footprint1 filename  
}  
{  
Footprint2 name  
Footprint2 filename  
}  
...
```

Footprint File Format

The footprint file may have information for multiple footprints, or possibly only a single footprint. Each footprint description has the footprint name, followed by the pin count, and then the pin locations in X, Y format. The footprint name is a string of the same format as those seen in the component section of the netlist files. The footprint pin count is an integer value. The locations will be floating point numbers.

```
{  
Footprint Name  
Footprint Pin Count  
Pin1 X Pos, Pin1 Y Pos  
Pin2 X Pos, Pin2 Y Pos  
...  
}
```

XML Netlist File Format

The XML Netlist files have a NETLIST element at the highest level. The NETLIST elements can have COMPONENT and NET subelements. The COMPONENT elements have DESIGNATION, FOOTPRINT, and LABEL attributes. The NET elements have a single attribute: NAME. The NET elements have CONNECTION subelements. The CONNECTION elements have a single attribute: COMPONENT, and PIN subelements. The PIN elements have no attributes and the text is the pin number. See the example below. Component designations may not be listed more than once in the net.

```
<NETLIST>
  <COMPONENT DESIGNATION="COMPONENT DESIGNATION"
    FOOTPRINT="FOOTPRINT" LABEL="LABEL"/>
  ...
  <NET NAME="NET NAME">
    <CONNECTION COMPONENT="COMPONENT DESIGNATION">
      <PIN>PinNumber1</PIN>
      <PIN>PinNumber2</PIN>
      ...
    </CONNECTION>
  </NET>
  ...
</NETLIST>
```