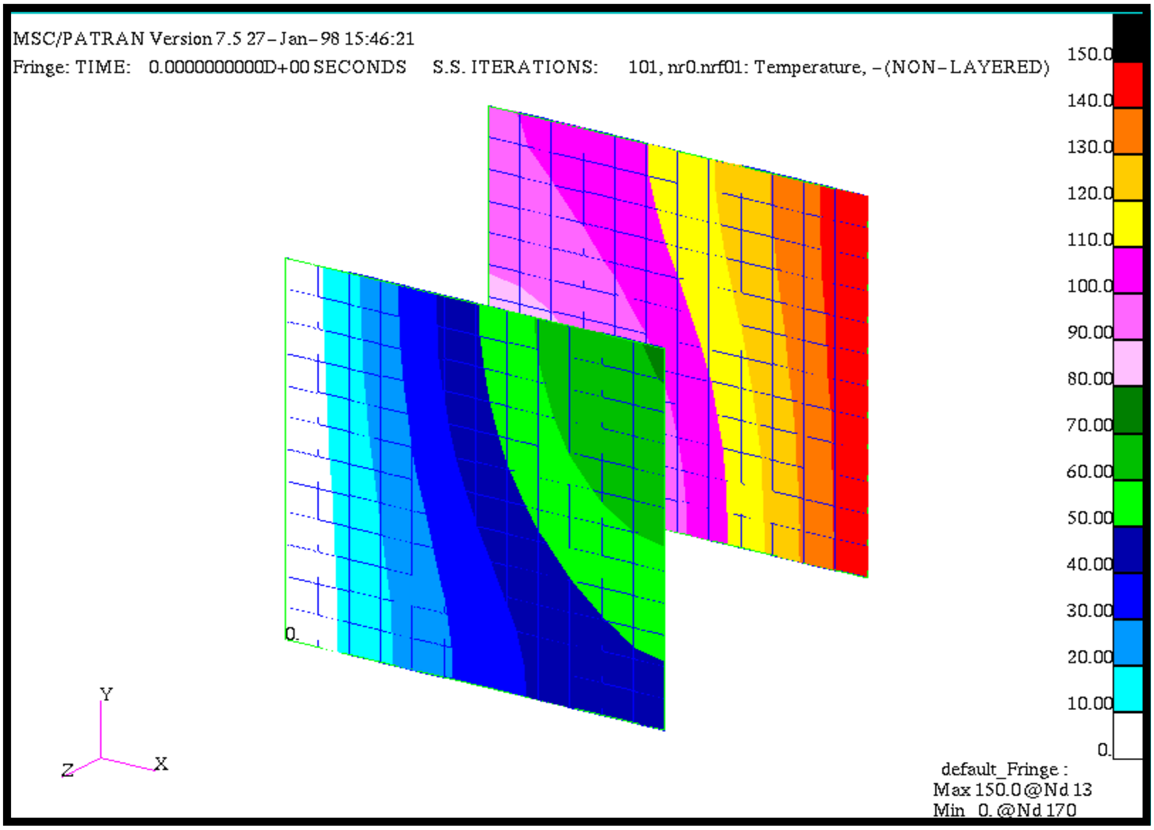
Exercise 21

Optimizing Performance of Radiation Interchange Analysis



Objective:

- Modify the database of exercise_14 and the template.dat.apnd file in order to increase analysis speed and reduce file size
- Rerun and monitor the analysis and compare CPU time of the run and file size to those of Exercise 14

Model Description:

In this Exercise we will reopen the database created in Exercise 14 and modify some LBC's and the template.dat.apnd file. These modifications will significantly reduce the execution time of both the radiation interchange calculations as well as the thermal analysis network run. Also, the size of several of the files will be significantly reduced.

Any analyst who uses the radiation interchange capability of MSC/Thermal should become practiced in using the available flags and settings which will increase execution speed and reduce storage demands.

Exercise Overview:

- Open the existing database named **exercise_14.db.**
- Use **Load/BCs/Modify/Radiation** to modify the existing radiation boundary conditions.
- Create a new radiation Load/BC for Surface 2.
- Change the Job Name in the Analysis form to **exercise_21.**
- Modify the **template.dat.apnd** file to include a collapse flag.
- Submit the model for analysis and use the commands described to monitor its progress.
- Debug, if necessary and resubmit after deleting all the files in the jobnamed subdirectory.
- Read in results file and plot results.
- Compare CPU times and File sizes.
- **Quit** MSC/PATRAN.

Exercise Procedure:

Open an existing database

1. Open the existing database named **exercise_14.db**.

Within your window environment change directories to the microcircuit.db working directory. Run MSC/PATRAN by typing **p3** in your xterm window.

Next, select **File** from the *Menu Bar* and open the existing microcircuit database.

File	
Open	
Database List	**exercise_14.db**
OK	

MSC/PATRAN will open a Viewport and change various *Control Panel* selections from a ghosted appearance to a bold format.

Use Load/BC Modify

2. Use **Load/BCs/Modify/Radiation** to modify the existing radiation boundary conditions.

In order to give a different Convex Surface ID flag to each surface it is necessary to modify the Input Data Form of the existing Load/BC for radiation.

◆ Load/BC	
Modify/Radiation	
Select Set to Modify	**<your set name>**
Modify Data...	
Convex Surface ID	**1**
Obstr Flag (0=Obst, 1=No-Obst)	**1**
OK	
Modify Application Region...	
Application Region	**Surface 1 (delete Surface 2)**
OK	
Apply	

3. Create a new radiation Load/BC for Surface 2.

Create a new Load/BC

By limiting the application region of the previous Load/BC to Surface 1, it is necessary to create a second Load/BC for Surface 2. Obviously the Application Region will be Surface 2. The Input Data Form will be the same as the last Load/BC but will have a different Convex Surface ID flag.

◆ **Load/BC**

Create/Radiation/Element Uniform

New Set Name	**Rad2**
Target Element Type	**2D**

Input Data...

Vfac Template ID	**200**
Convex Surface ID	**2**
Obstu Flagg (0= Obst, 1= non-Obst)	**1**
Enclosure ID	**1**

OK

Select Application Region — **<select Surface 2>**

ADD

OK

Apply

4. Change the Job Name in the Analysis form to **exercise_21**.

Change Job Name

On the Analysis Form change the *Job Name* to **exercise_21**. This will create a new subdirectory of files for this analysis which will facilitate comparing data between the two runs, **exercise_14** and **exercise_21**.

◆ **Analysis**

Job Name	**exercise_21**

Modify template

5. Modify the **template.dat.apnd** file to include a collapse flag.

Open a Unix shell and edit the **template.dat.apnd** file associated with **exercise_14**. If necessary make any existing **template.dat.apnd** file out of the way and reinstate the **template.dat.apnd** file associated with **exercise_14**. Edit the **tempalte.dat.apnd** file to include a collapse flag.

```
*============================
VFAC 100
0.1 1.0 0 0 0.0 0.0 0 100
VFAC 200
0.1 1.0 0 0 0.0 0.0 0 200
*============================
```

The main advantage of using COLLAPSE to collapse radiosity nodes is that this will result in a much smaller number of radiation resistors in the model. A smaller number of resistors usually means that the thermal analysis will proceed faster. In the best cases, the number of radiation resistors may be reduced by about a factor of four for 2D Cartesian or axisymmetric models and by about a factor of 16 for 3D models**.**

Submit the model

6. Submit the model for analysis and use the commands described to monitor its progress.

Return to the open Analysis Form and check **Apply.** After the Command Line History Window stops scrolling, change focus to the UNIX window and affect the **cd exercise_21** command with a carriage return. Repeated execution of **ls** within the jobname subdirectory will show you the progress of your analysis: Once the file **vf.msg.01** appears, type:

$ tail -f vf.msg.01 <CR>

This will provide a continuous status of the viewfactor run.

When viewfactor is complete it will end the status with a message, Successful Execution Completed.

Use the *<Ctrl>c key* combination to terminate the tail function.

Again input a sequence of ls commands until a stat.bin file appears in the directory list. Once you the see the stat.bin file type:

$ qstat c

to monitor the progress of the network analysis. This command will self terminate after 20 repetitions or upon job completion. Monitor the data from the qstat command to determine the numerical status of the analysis.

Check for the existence of an nr0.nrf.01 results file. If it exists the numerical analysis is complete and successful.

Debug

7. Debug, if necessary, and resubmit after deleting all the files in the jobnamed subdirectory.

If Step 5 does not yield a results file then determine what went wrong.

Is there a patqb.log file?

If so, then is there a patq.msg file? If there is no patqb.log file then look in the MSC/PATRAN Command Line History Window or in the PATRAN interface for any error messages.

If there is a patqb.log file and no patq.msg file then look for error messages in patqb.log.

If there is a patq.msg file then look for error messages in it.

If there are no error messages in the patq.msg file but this analysis requests that a viewfactor run be made then is there a vf.msg file?

If there is a vf.msg file then look for error messages in it.

For this analysis answering the above questions should provide a clue to the problem.

Once the error is found and resolved Repeat Steps 4 and 5. Remember that now many of the files will have an extension index which has been incremented by 1, e.g., vf.msg.01 to vf.msg.02. If it is convenient you may delete all the files from the exercise_21 Job Named subdirectory prior to resubmitting the analysis.

8. Read in results file and plot results.

Read and plot results

From within MCS/PATRAN the only indication that the analysis has successfully finished is the existence of an nrX.nrf.01 results file in a subdirectory one level below your working directory.

Recall that p3 was initiated from a working directory which contained the microcircuit.db database file. The analysis, initiated from within MSC/PATRAN, created a new subdirectory with the same name as the *Job Name*; it should be named exercise_21/. By using **Read Result** in the Analysis form and **Selecting Results File...** you can filter down to the *Job Name* subdirectory and check for the existence of the results file.

◆ Analysis

Read Results/Result Entities

Select Results File...

Directories **<path>/exercise_21**

Filter

Available Files **nr0.nrf.01**

OK

Select Rslt Template File...

Files **pthermal_1_nodal.res_tmpl**

OK

Apply

To plot the results to posted FEM use the **Results** *Application radio button*.

◆ Results

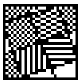
Create/Quick Plot

Select Result Cases <select the second> **TIME: 0.0000000000D+00 S...**

Select Fringe Result **Temperature,**

Apply

Select the *Fringe Attributes* icon.



Display:	**Element Edges**
Label Style...	
Label Format:	**Fixed**
Significant figures	**4 <use slider bar>**
OK	
Apply	

9. Compare CPU times and File sizes.

Compare files

Use the **qstat** command in each of the Job Name subdirectories to find the **CPU Time** data and record it in the following table.

Use the **ls -al v*** command in each Job Name subdirectory to record the size of the **vfnode.dat, vfraw.dat,** and **vfres.dat** files in the following table.

Subdirectories	Exercise_14	Exercise_21
CPU Time (sec.)		
Vfnode.dat (bytes)		
Vfraw.dat (bytes)		
Vfres.dat (bytes)		

The size and speed improvement are significant.

10. **Quit** MSC/PATRAN.

Quit MSC/ Patran

To stop MSC/PATRAN select **File** on the *Menu Bar* and select **Quit** from the drop-down menu.