OpenSeesSP

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OpenSees Parallel Workshop
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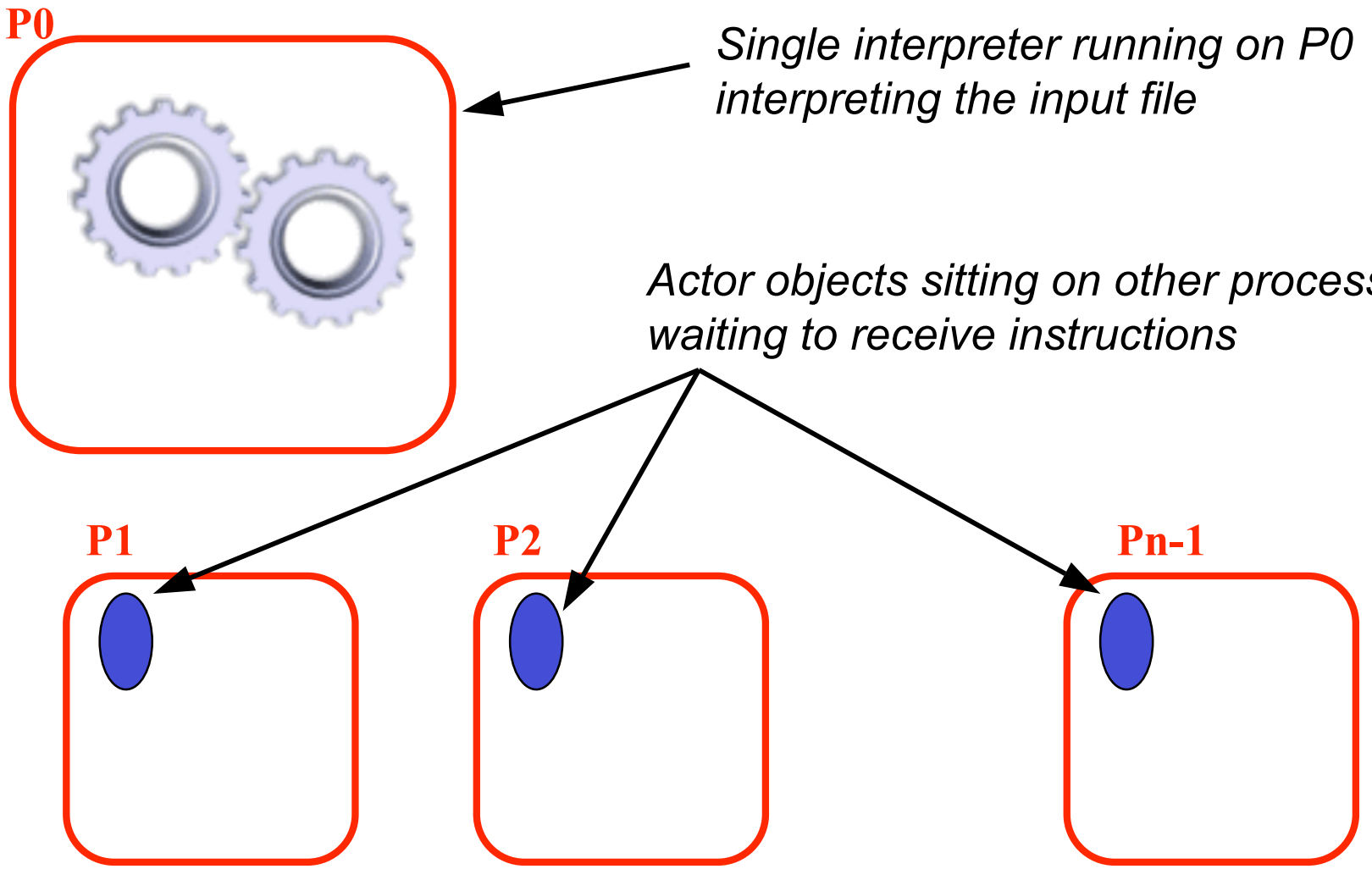
OpenSeesSP

- Two OpenSees Interpreters have been created for users:
  1. OpenSeesSP
  2. OpenSeesMP
- OpenSeesSP was created for analyzing large models on parallel machines.
- OpenSeesSP was created with the 2 goals in mind:
  1. Minimal changes to input scripts (0 if possible!)
  2. Minimizing the required knowledge of parallel processing

What is running on the processors in OpenSeesSP

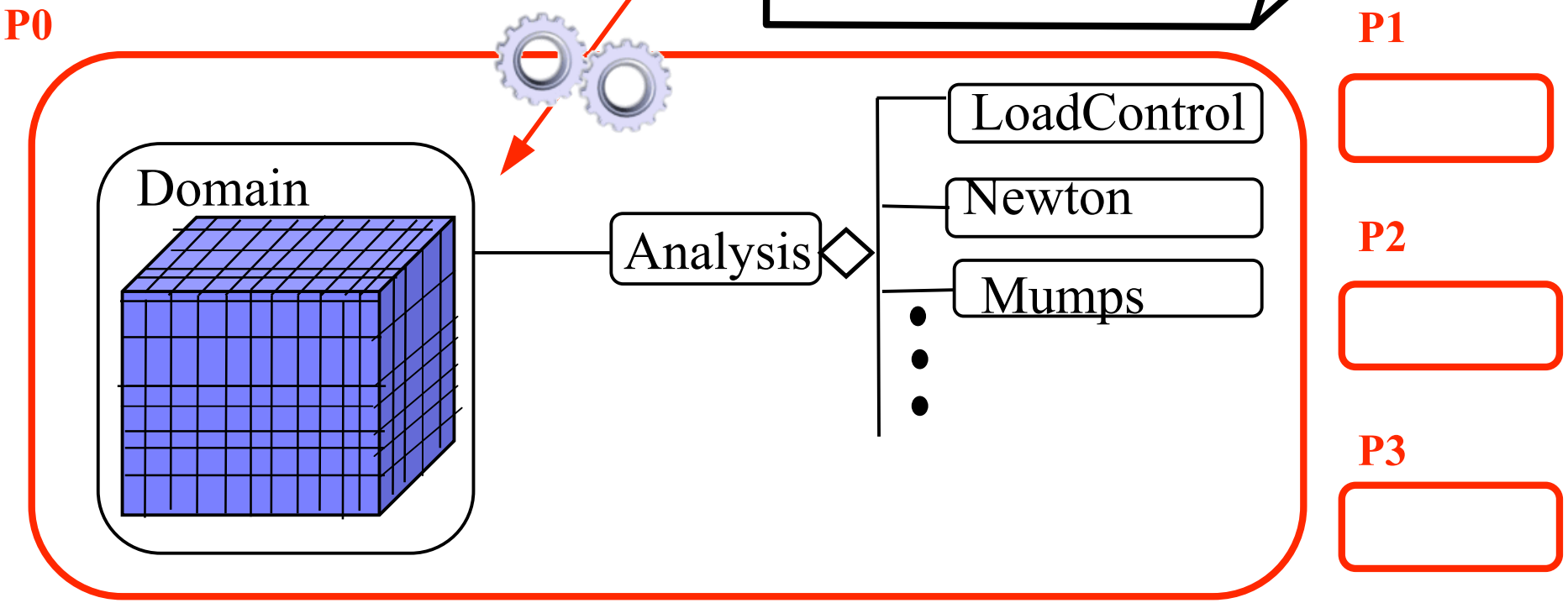


Model Built and Analysis Constructed in P0

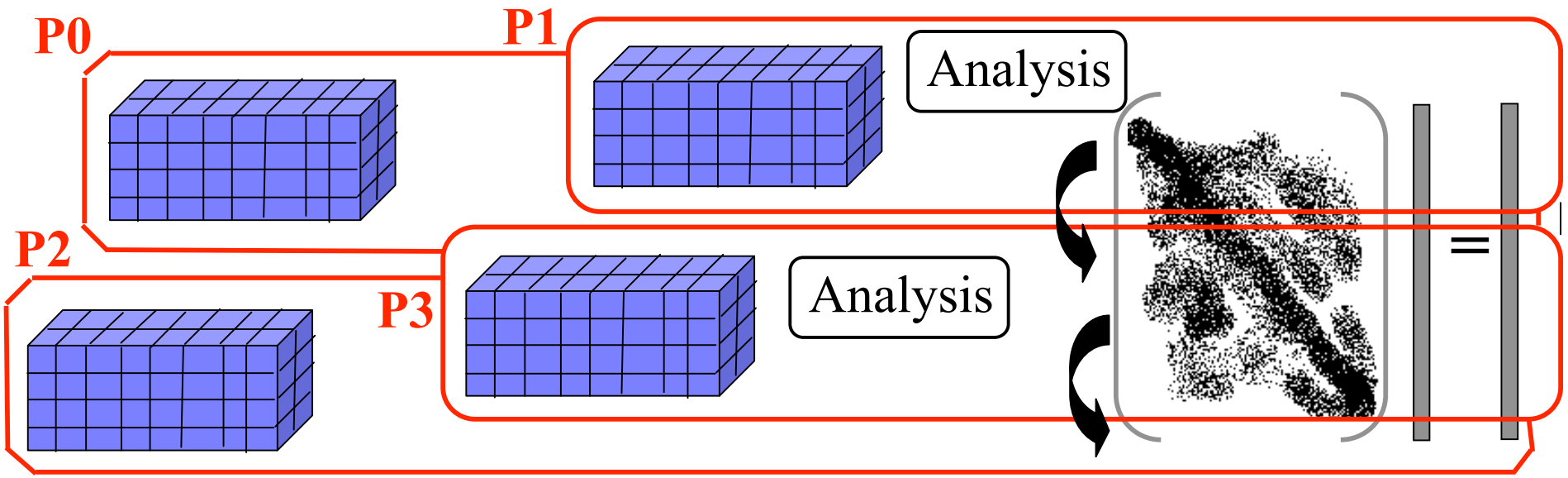
Single interpreter running on P0

Interpreting the input file

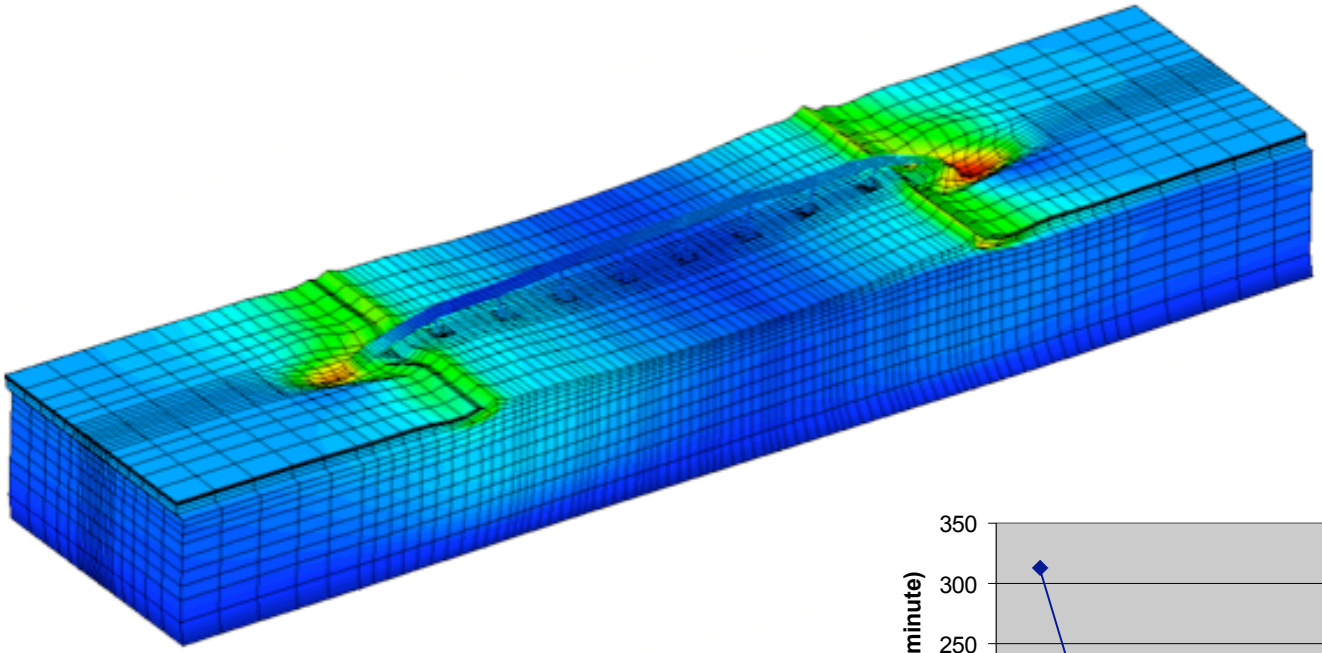
```
#build the model
source model.tcl
#build the analysis
system Mumps
constraints Transformation
numberer Plain
test NormDispIncr 1.0e-12 10 3
algorithm Newton
integrator LoadControl
analysis Static
```

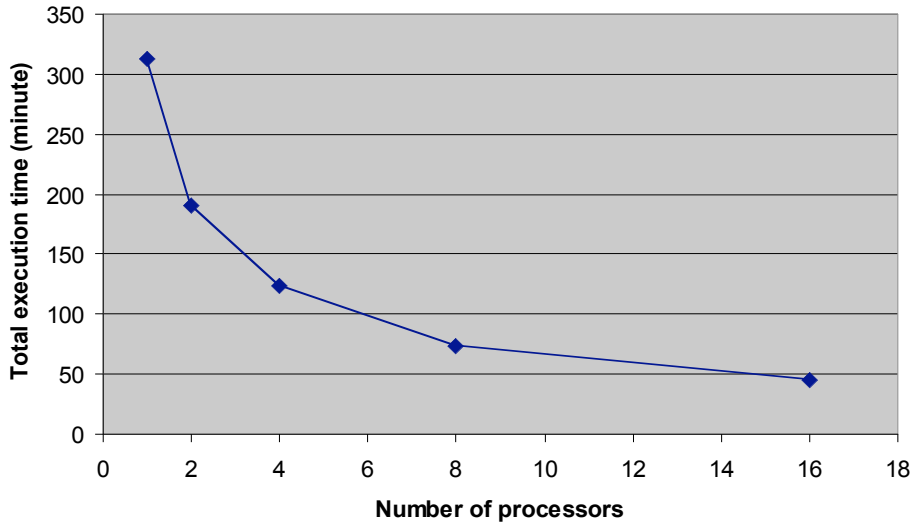


```
#build the model
source modelP.tcl
#build the analysis
system Mumps
constraints Transformation
numberer Plain
test NormDispIncr 1.0e-12 10 3
algorithm Newton
integrator LoadControl
analysis Static
analyze 10
```



Example Usage: Humboldt Bay Bridge Model





Modified Commands

- System command is modified to accept new parallel equation solvers

  system mumps

  system diagonal

WARNING The Output Files are Currently Different

- The output files generated by the recorders are different. The order of the data in the rows is not necessarily the same as that ouput from a sequential analysis
- Use the -xml flag instead of -file flag.

```
<?xml version="1.0" encoding="UTF-8"?>
 <OpenSees
  xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation = "http://OpenSees.berkeley.edu/xml-schema/xmlns/OpenSees.xsd">

    <OpenSeesOutput>
       <TimeOutput>
          <ResponseType>time</ResponseType>
       </TimeOutput>

       <NodeOutput nodeTag="3" coord1="20.000000" coord2="0.000000" coord3="0.000000">
          <ResponseType>D1</ResponseType>
       </NodeOutput>

       <TimeOutput>
          <ResponseType>time</ResponseType>
       </TimeOutput>

       <NodeOutput nodeTag="3" coord1="20.000000" coord2="0.000000" coord3="0.000000">
          <ResponseType>D1</ResponseType>
       </NodeOutput>

  <Data>
          1.000000 0.028159          1.000000 0.028159
          2.000000 0.056318          2.000000 0.056318
          3.000000 0.084477          3.000000 0.084477
          4.000000 0.122962          4.000000 0.122962
          5.000000 0.276897          5.000000 0.276897
          6.000000 0.440276          6.000000 0.440276
          7.000000 0.607783          7.000000 0.607783
          8.000000 0.794601          8.000000 0.794601
          9.000000 1.013698          9.000000 1.013698
          10.000000 1.268579           10.000000 1.268579
          11.000000 1.528590           11.000000 1.528590
          12.000000 1.790070           12.000000 1.790070
          13.000000 2.069066           13.000000 2.069066
          14.000000 2.350606           14.000000 2.350606
```

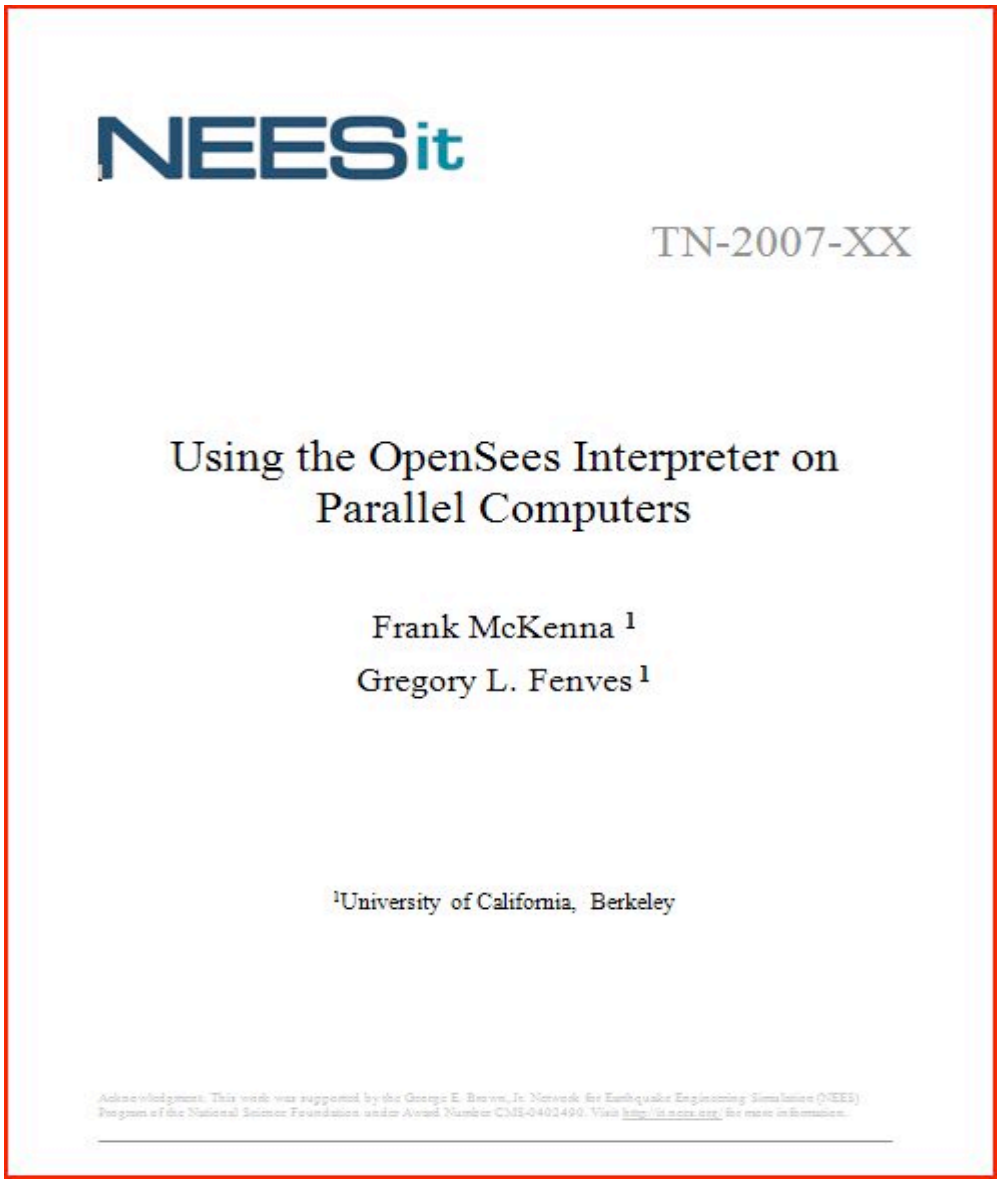
ERROR - The eigen command does not currently work.

- The eigen command does not work after the first analyze command has been issued.
- For large problems it might not work even then due to memory demands on the system.

Scalability Issues

- This application does not scale well. Creating all the elements and nodes in a single processes address space will limit the size of the problem that can be analyzed using this interpreter.
- The second interpreter does not have this problem.

Documentation



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Using the OpenSees Interpreter on Parallel Computers

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Any Questions?