MOVES Batch Computing using Workers on a Network

Setting up and running groups of related MOVES run specifications

EPA Office of Transportation and Air Quality
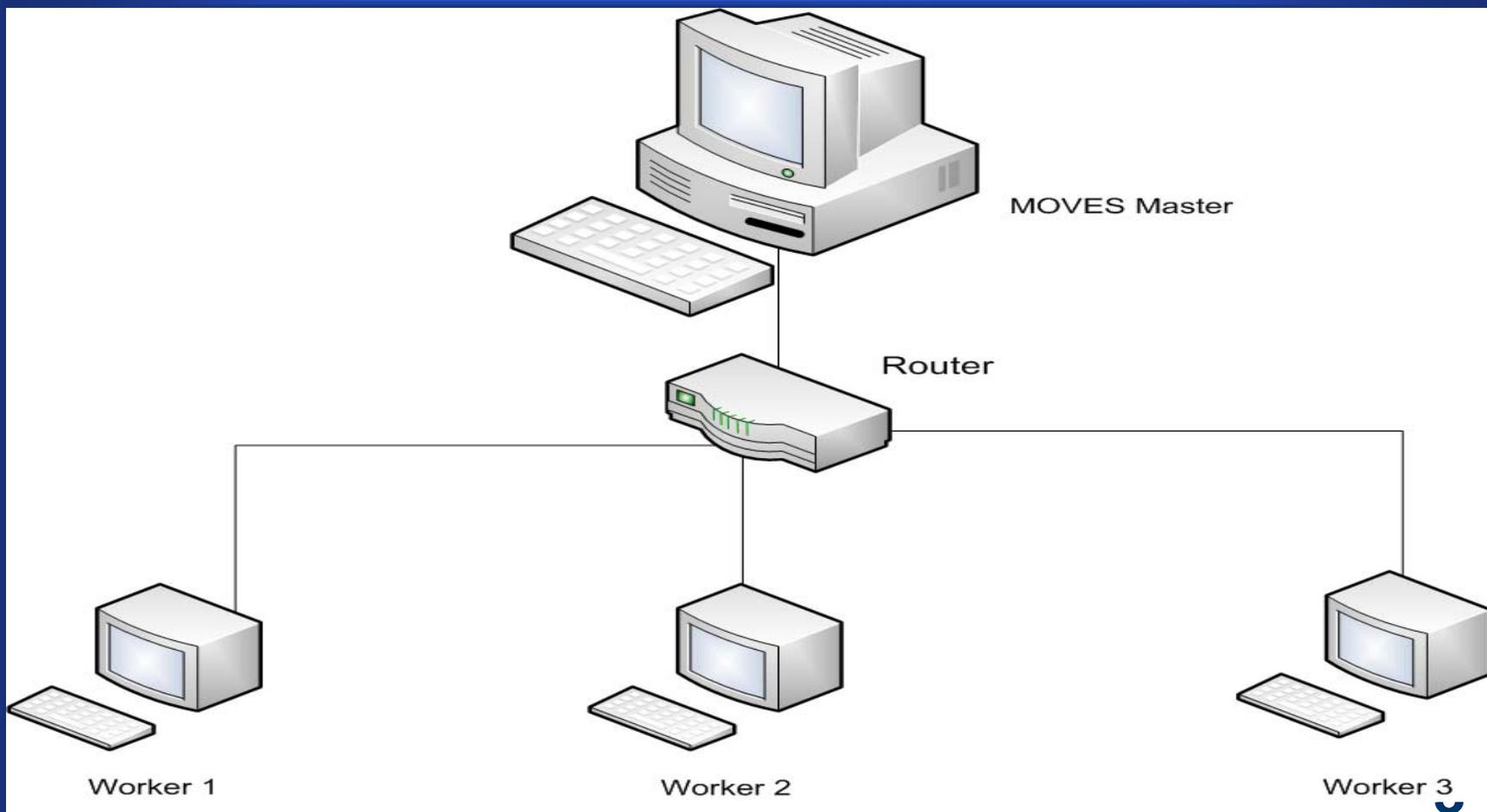
June 15, 2011

MOVES Info

http://www.epa.gov/otaq/models/moves/index.htm

Email: mobile@epa.gov

A Small Grid Configuration

MOVES Master

Router

Worker 1

Worker 2

Worker 3

NEI runtimes with multiple workers

Number of Workers	Total Run Time (hrs)
1	17.5
2	10.8
3	9.6
4	9.5
5	10.0

Why use the command line?

- **Numerous Runs to Complete.**

- **Verbose Output Logging**

- **Repeatability**

- **Network or Power Outages**

What you should already know:

- **Experience using MOVES to set up and execute single runs before doing Grid Computing**

- **Familiarity with command line interface**
  - (cd, md, rd, dir(/b), xcopy /E /I /Y, help myCommand, etc.,)
  - You have a favorite editor….VIM, UE, NotePad++, GNUEmacs, Crimson, Komodo, jEdit, Excel, …

- **Comfortable creating DOS batch files or using Perl**

Presentation Overview

- **Best Practices**
- **XML File**
- **System Requirements**
- **Many Runs vs. One Run**
- **Setenv.bat**
- **Batch File**
- **Editing MOVESConfiguration.txt**
- **Editing WorkerConfiguration.txt**

Best Practices (review)

- Use a naming convention that specifies what the run is about.
- County_Year_Emission/SCC/Process/Domain/etc.
- MOVES RunSpecs end in ".mrs".
- MOVES output files end in "_MO".
- MOVES input files end in "_IN".

- Perform many small runs, not one large run

MOVES XML Runspec Example

```xml
<runspec>
    <description><![CDATA[Baltimore City - VMT - Monthly
    2008]]></description>
    <modelscale value="MACRO"/>
    <modeldomain value="NATIONAL"/>
    <geographicselections>
     <geographicselection type="COUNTY" key="24510"
    description="MARYLAND - Baltimore city"/>
    </geographicselections>
    <timespan>
     <year key="2008"/>
    <month key="0"/>
    <month key="1"/>
    <month key="2"/>
```

System Requirements (for batch runs)

- **Access to the Command Prompt**
- **Access to Note Pad or some other editing program**
- **Ability to run batch files**

Sometimes these capabilities are turned off for security reasons.

If you are not sure if you have these capabilities on your computer, ask your local information technology support staff.

Splitting Runs to Speed Up MOVES

- **Separate runs by calendar year**
  - Multi-year runs can be much slower than a series of single-year runs

- **Separate evaporative emissions if you can do temporal pre-aggregation for other processes**
  - Evaporative emissions must be run by hour
  - Other processes can be run for longer times
    - Choice depends on precision desired
    - See MOVES Technical Guidance for EPA requirements

How to Make a Desk Top Icon

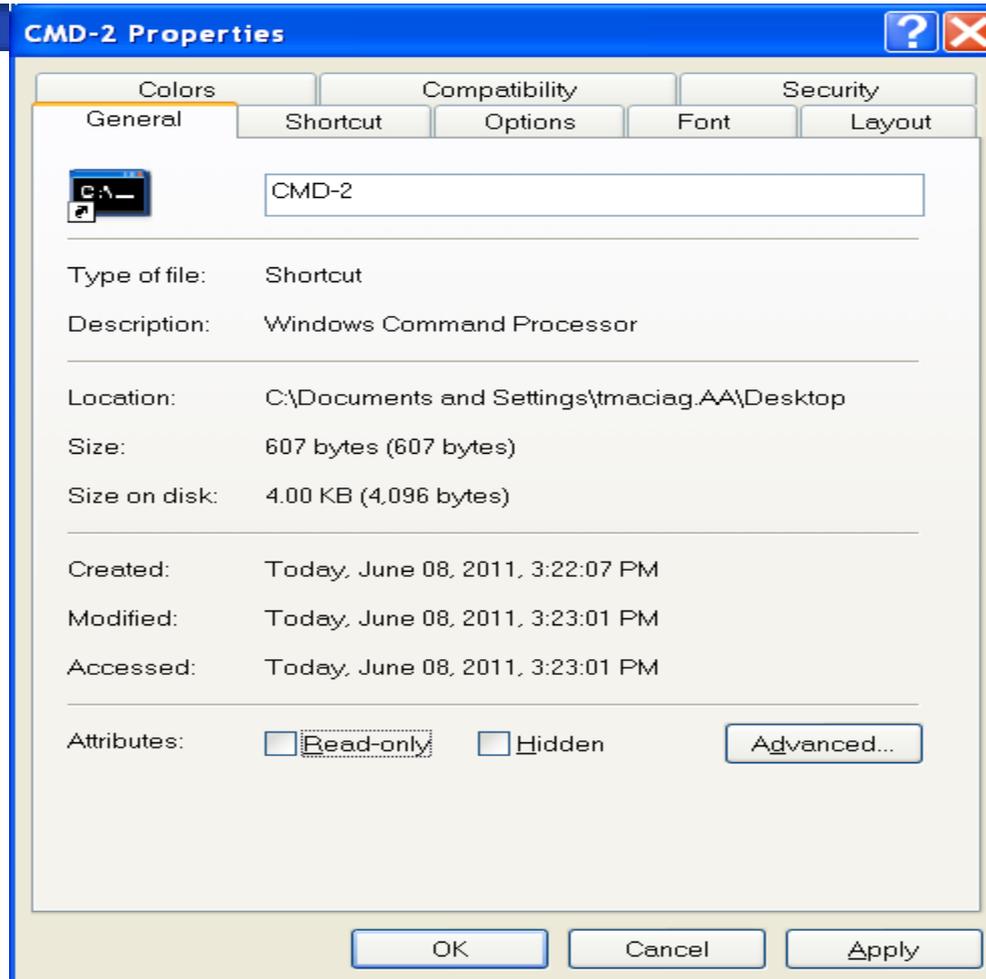- **On the desktop…**
  -
  - right click
  - New ->Shortcut->C:\windows\system32\cmd.exe
  - Name: CMD
  - Right Click->Properties->Start in:
  - You favorite working DIR here.
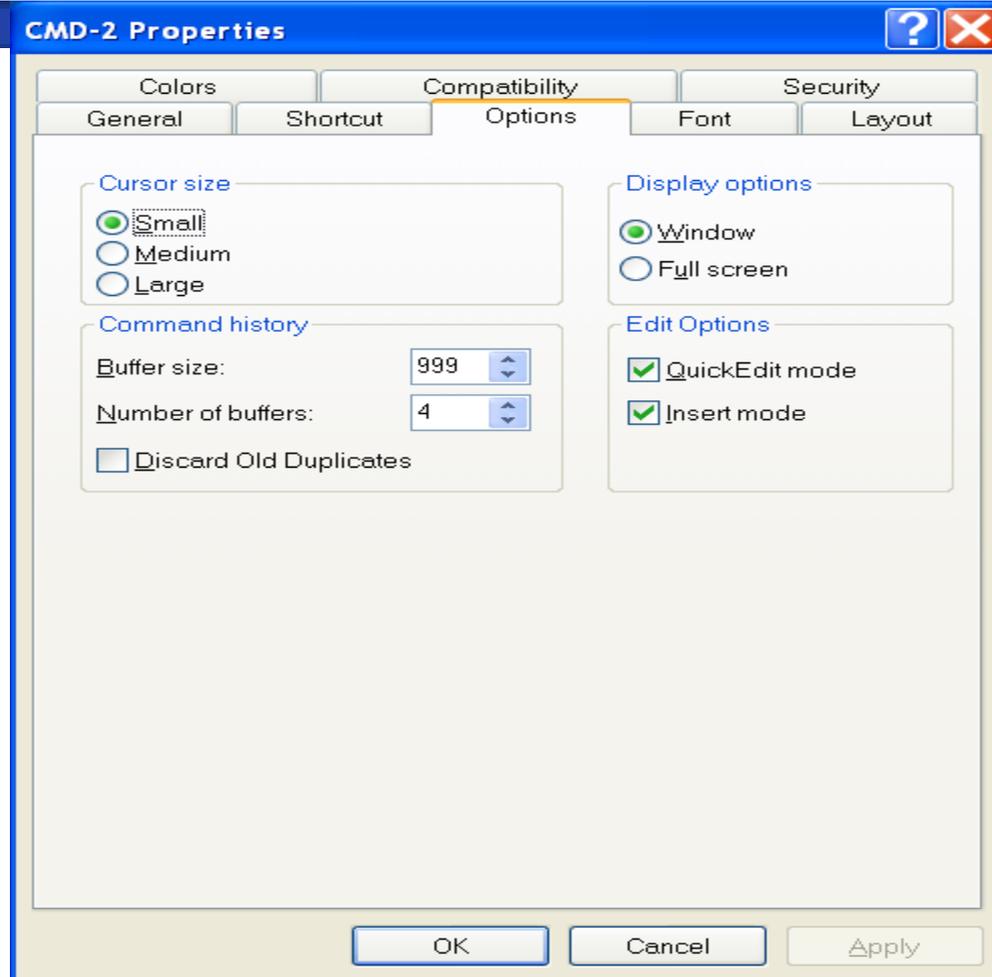
CMD Properties Overview

- **Properties**
  - Options -> Command History, 999, Quick Edit, Insert Mode
  - Layout -> Screen Buff Size, 9999
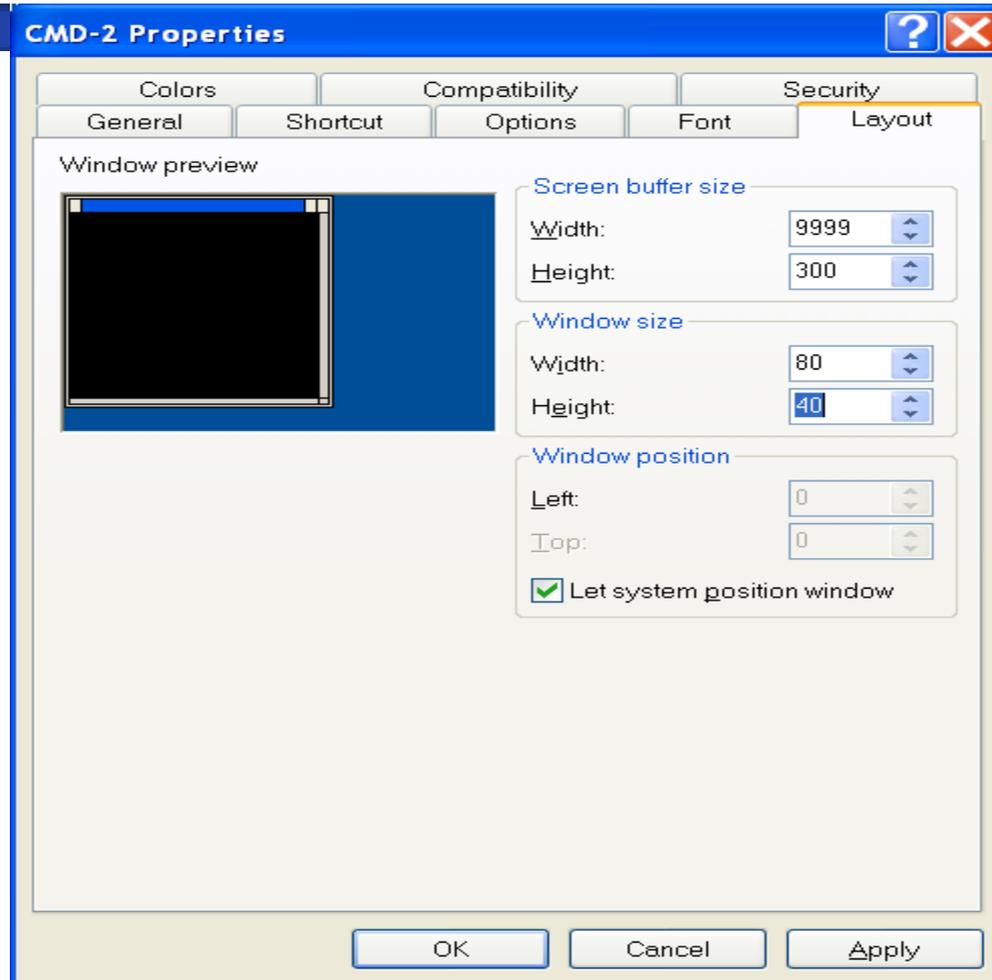 - Colors -> Select what you like.

CMD Properties - General

CMD Properties - Options

CMD Properties - Layout

Overview of the Batch Process (1 of 2)

1. **Create an initial Run Spec using MOVES graphical user interface (GUI).**
2. **Use this as a template to create a group of related Run Specs (using RunSpec Creator)**
   1. Most of the elements are the same, but a few vary
   2. Since Run Specs are XML files, you can make the changes with an editor, a script or macro, or MOVES' "Multi Run Spec Creator"

Overview of the Batch Process (2 of 2)

3. **For each Run Spec, create the required input database(s)**

    1. You can do this with MySQL commands, scripts or the MOVES "Importer XML" tool

4. **Use a text editor or tool to create a *.bat file that lists the Run Specs you want to run as a "batch"**

5. **Run this "Batch file" from the command line (or with another computer program or script).**
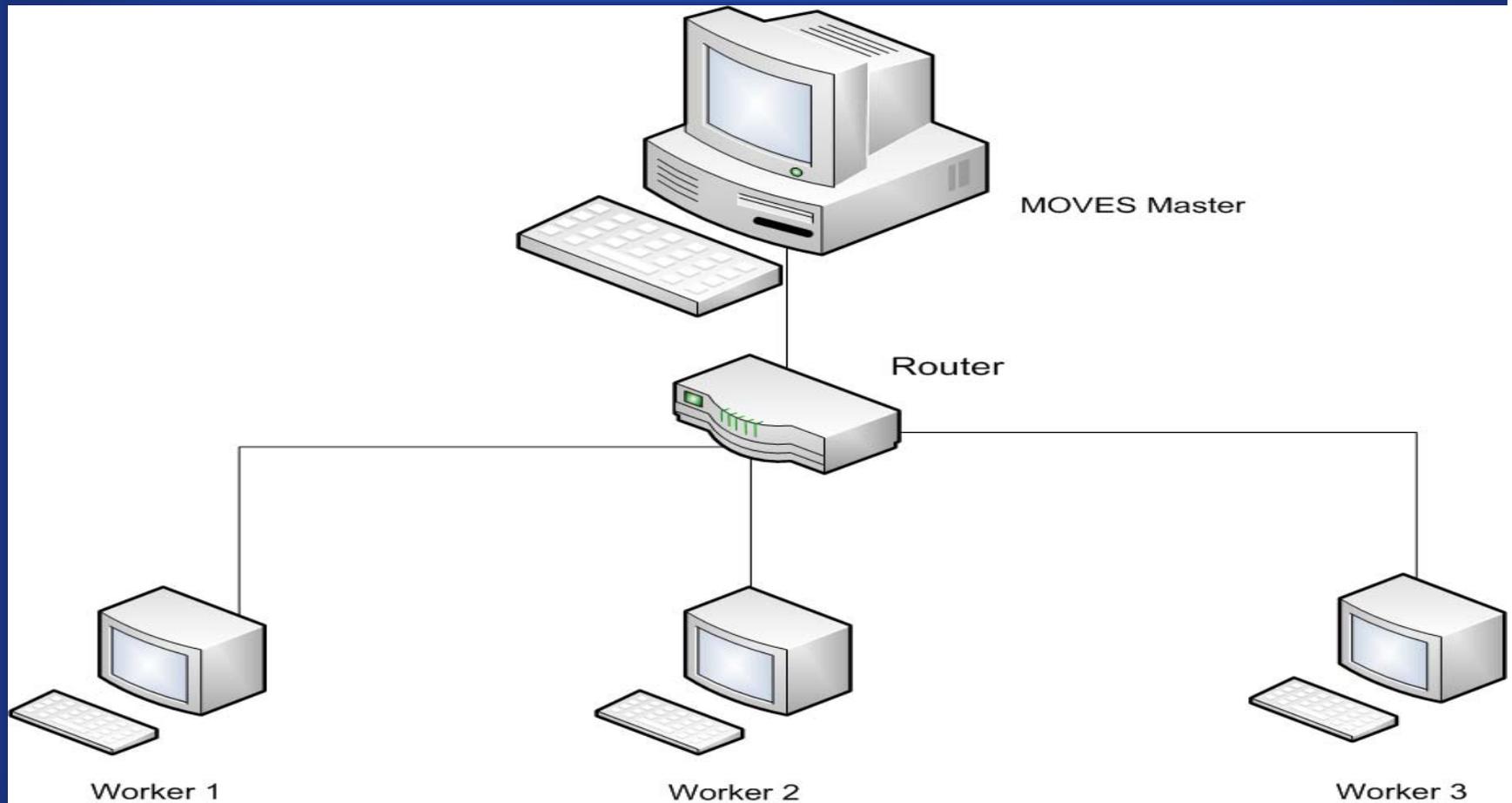
NEI runtimes with multiple workers

Number of Workers	Total Run Time
1	1044
2	645
3	578
4	569
5	600

Shared Work Folder

- **Create a shared work space**
  - Enlist the help of your Network Administrator
- **Edit the WorkerConfiguration.txt file**
  - Change the sharedDistributedFolderPath parameter
- **Edit the MOVESConfiguartion.txt**
  - Change the sharedDistributedFolderPath parameter

Shared Work Space

MOVES Master

Router

Worker 1   Worker 2   Worker 3

Edit MOVESConfiguration.txt

- outputUserName =

- outputPassword =

- sharedDistributedFolderPath = C:\EPA\MOVES\MOVES20100826\SharedWork

- computerIDPath =

- masterFolderPath = C:\EPA\MOVES\MOVES20100826
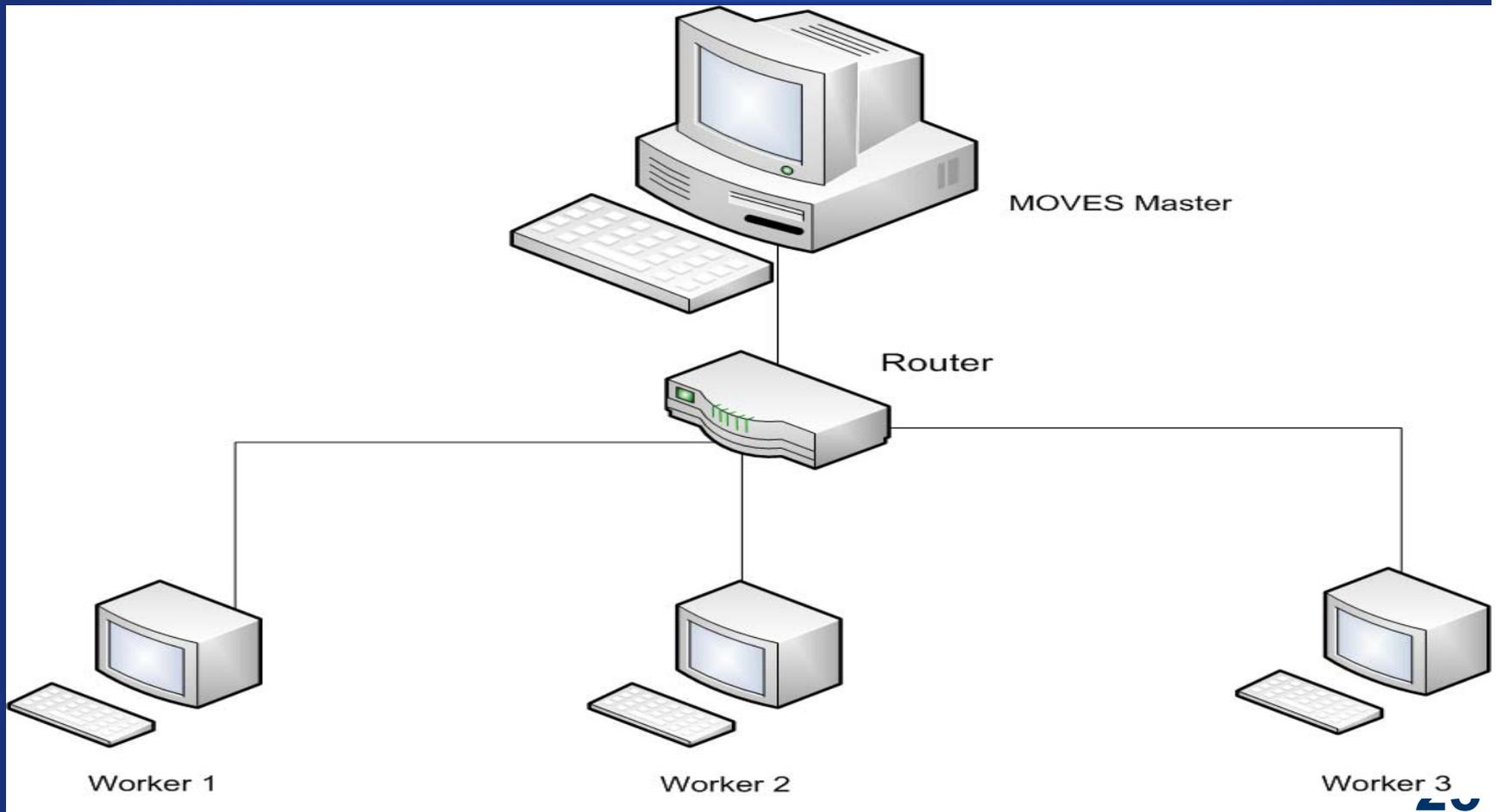
- saveTODOPath =

Edit WorkerConfiguration.txt

- sharedDistributedFolderPath = C:\EPA\MOVES\MOVES20100826\SharedWork

- workFolderPath = C:\EPA\MOVES\MOVES20100826\WorkerFolder

- workerDatabaseName = MOVESWorker

- computerIDPath =

MOVES Software Configuration

- **MOVES Master**

  - Java SDK (Software Development Kit 1.6_12)

  - MOVES Software 20118026

  - MySQL 5.1.32

  - Movesdb20110830

- **MOVES Worker**

  - Java SDK (Software Development Kit 1.6_12)

  - MOVES Software 20118026

  - MySQL 5.1.32

A Small Grid Configuration

MOVES Master

Router

Worker 1

Worker 2

Worker 3

THANK YOU!

Questions?