INTRO TO LINUX SERVER & CCR

SESSION 03

By: Ningji Wei

October 23, 2018

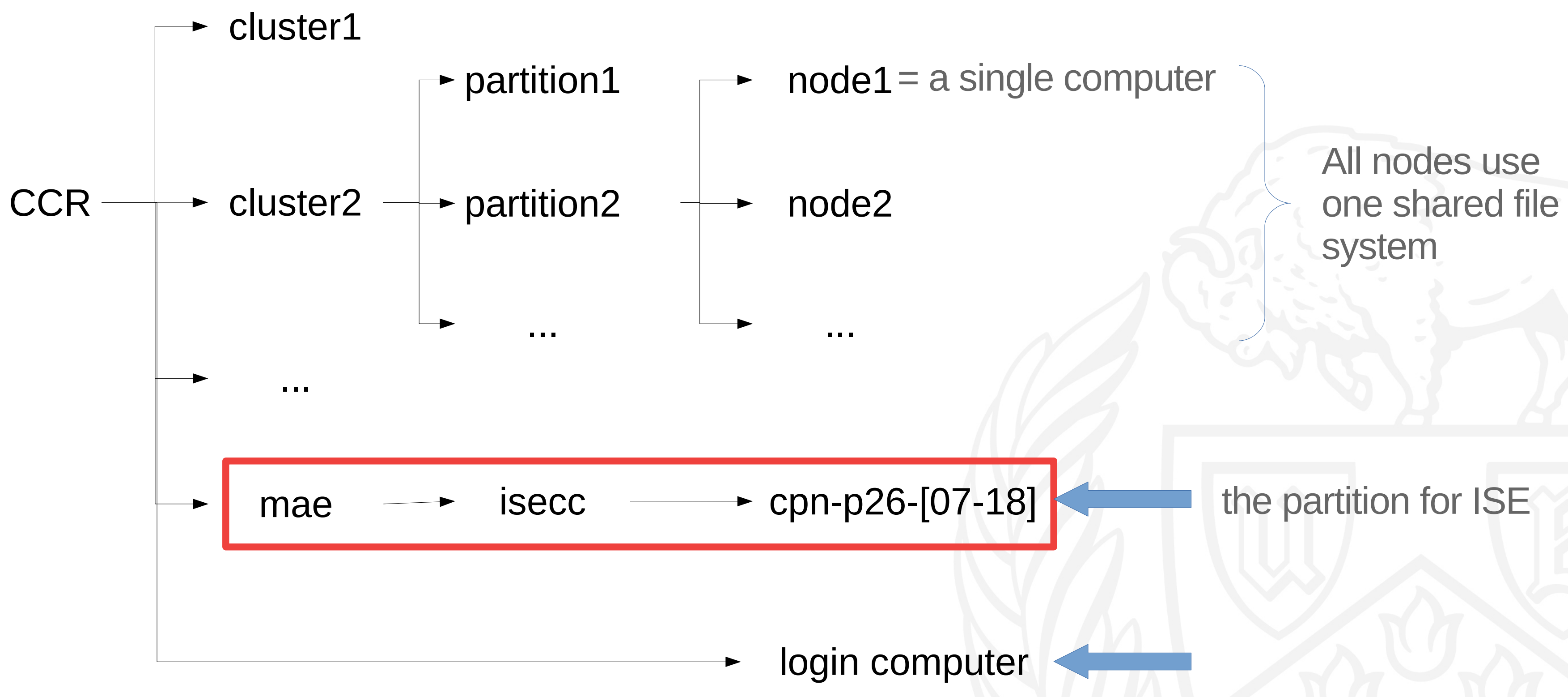
University at Buffalo The State University of New York

Well Done!

Basics:
know how to finish common tasks in CCR

- ✓ Connect to CCR
- ✓ Filesystem Operations
- ☐ CCR Operations
- ☐ File Transfer

Logic Structure of CCR



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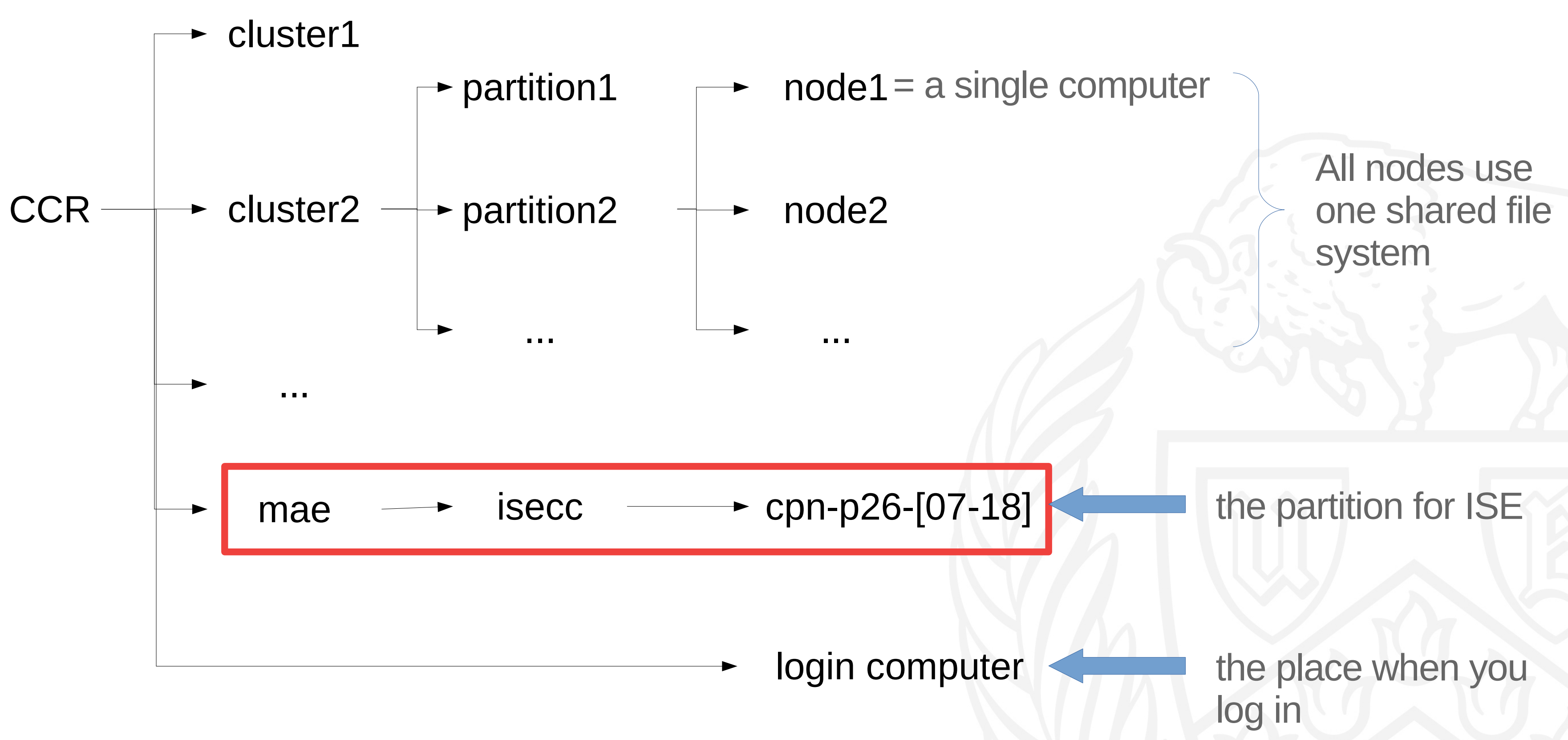
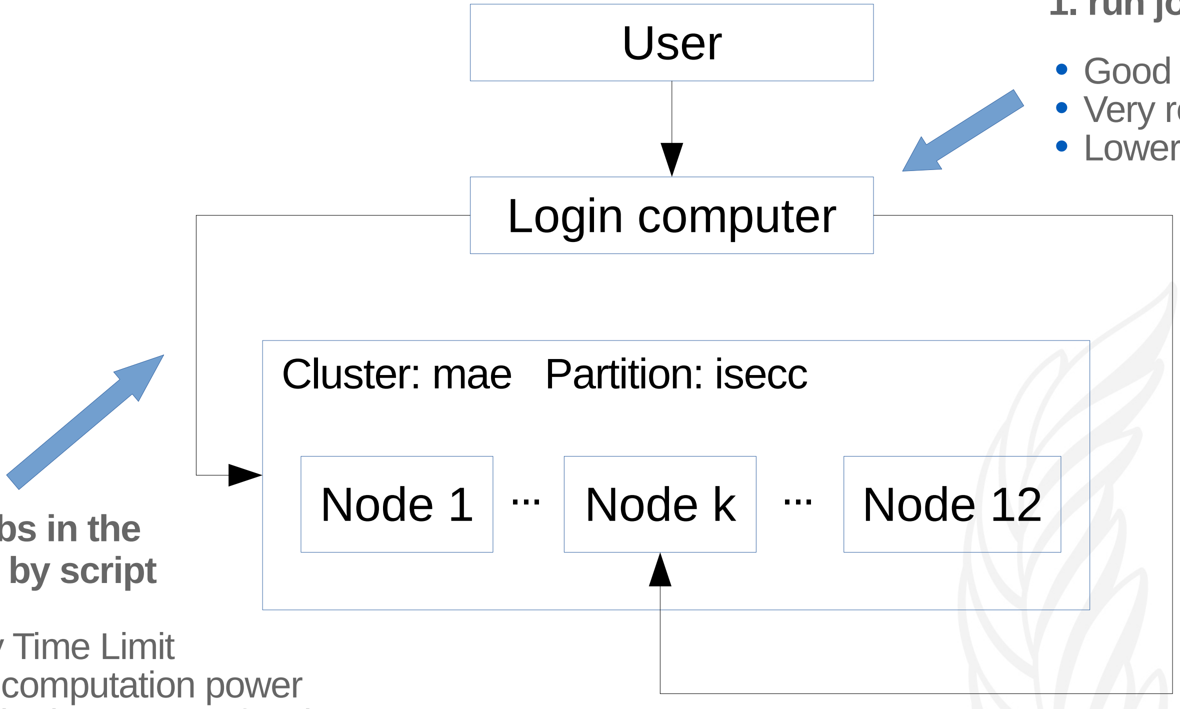


Different Ways of Running Jobs in CCR



1. run jobs in the login computer

- Good testing environment
- Very restrictive time limit
- Lower computation power

2. run jobs in a node interactively

- Specify time limit
- Higher computation power
- Run single script a time
- Cancel job when disconnected
- Special testing environment

3. run jobs in the partition by script

- Specify Time Limit
- Higher computation power
- Can submit an array of script
- Unaffected by the connection
- Good running environment
- No interactive environment

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Step 1: jump to a computation node (computer):

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Step 1: create a batch script: task.bat
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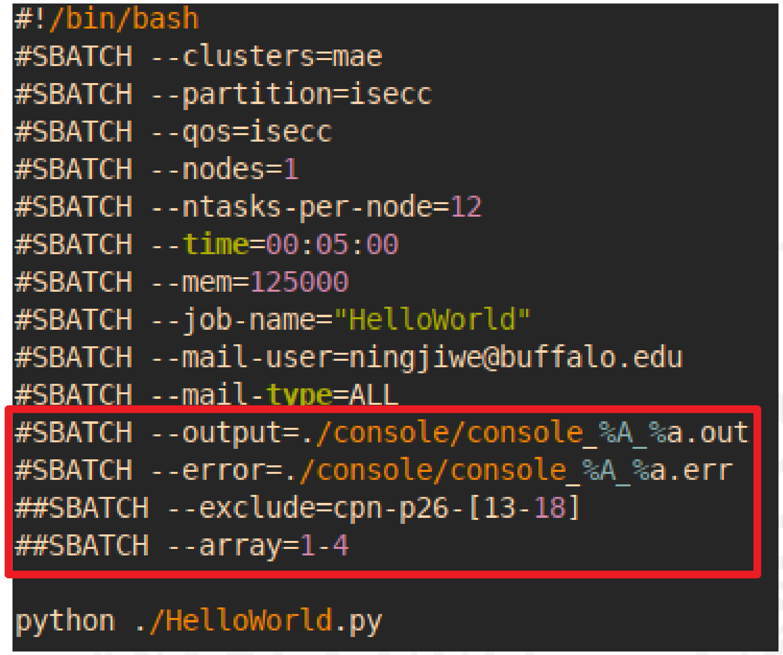

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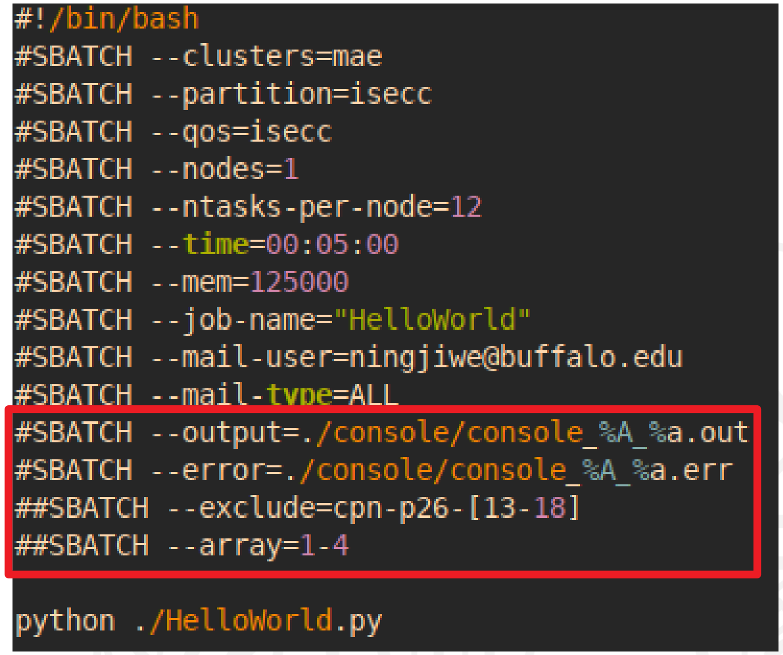

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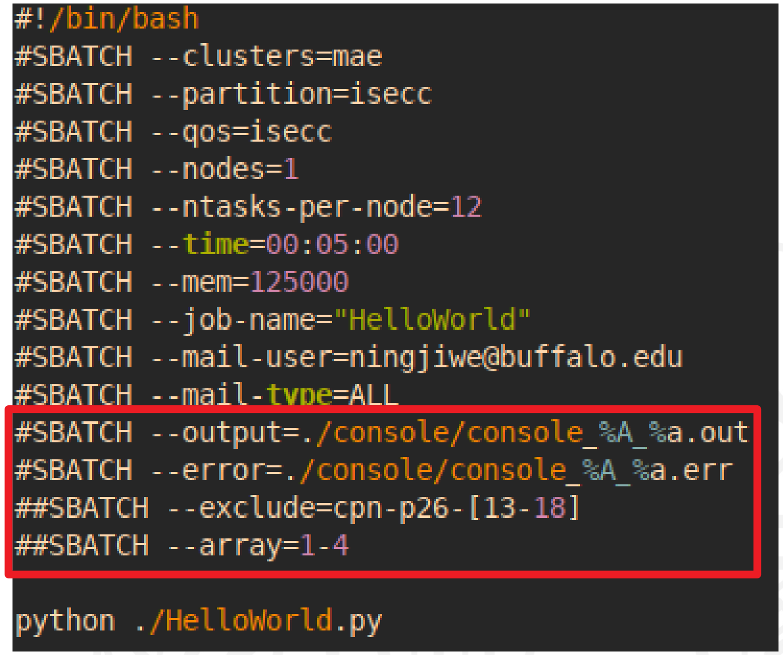

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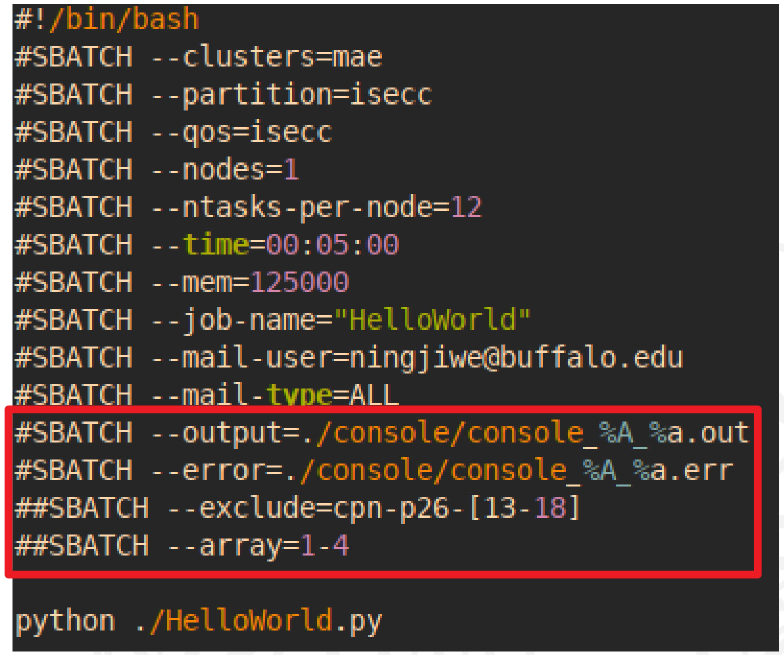

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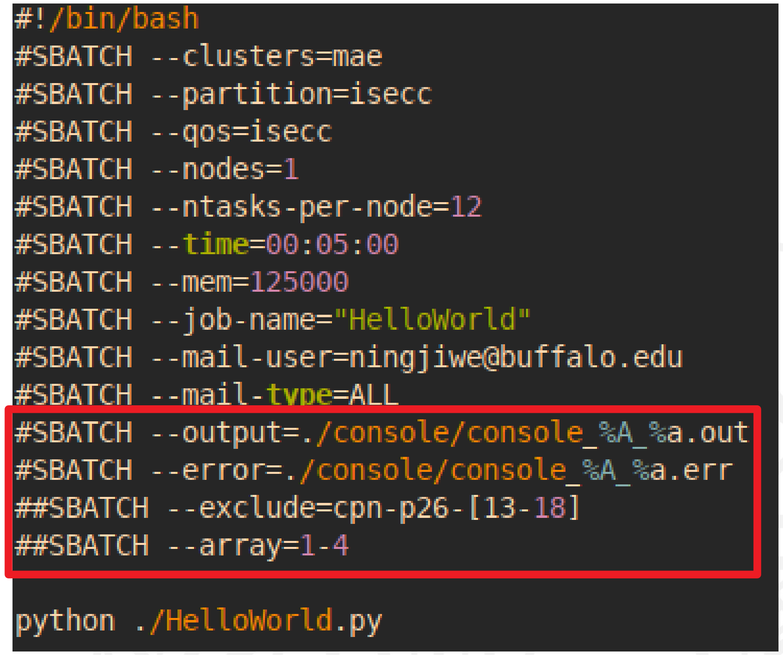

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Using Array in Script

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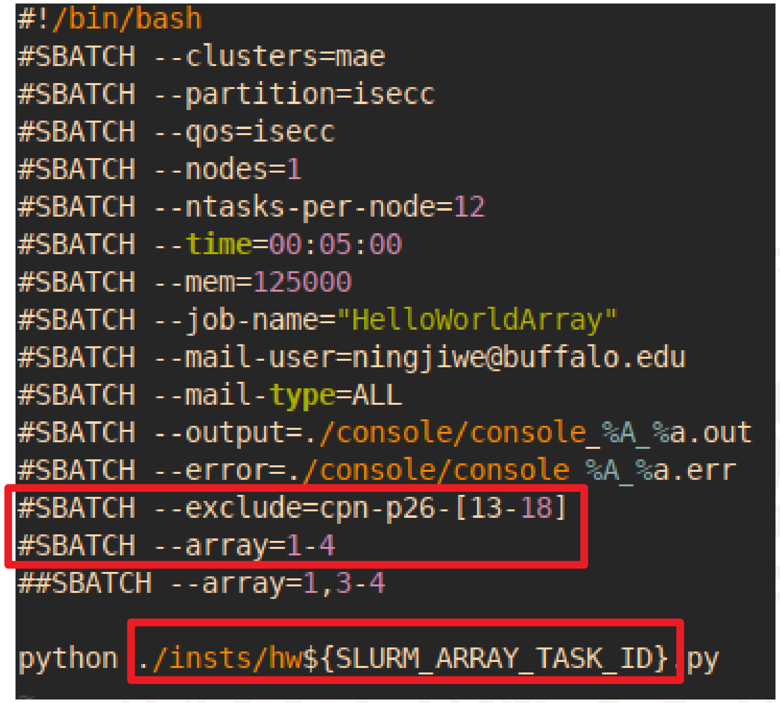

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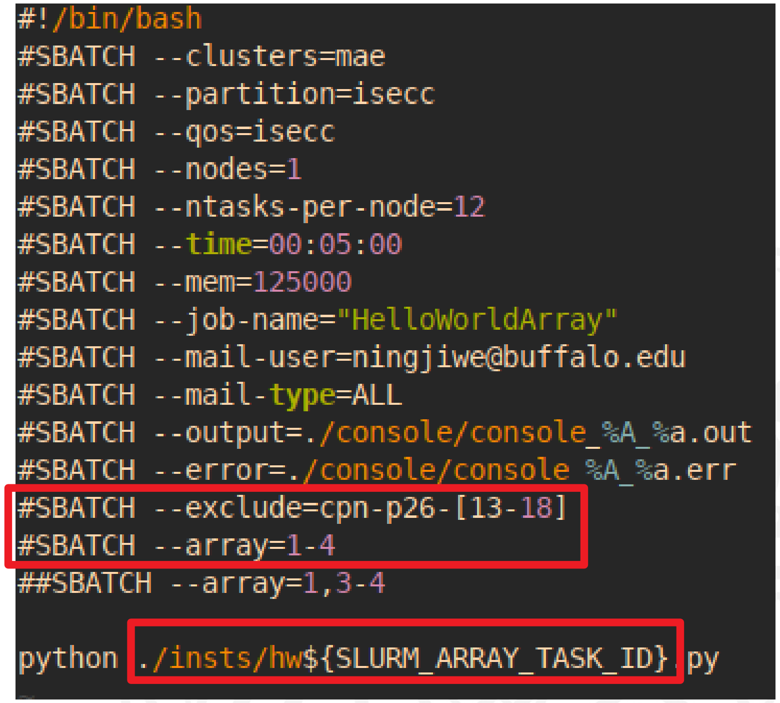

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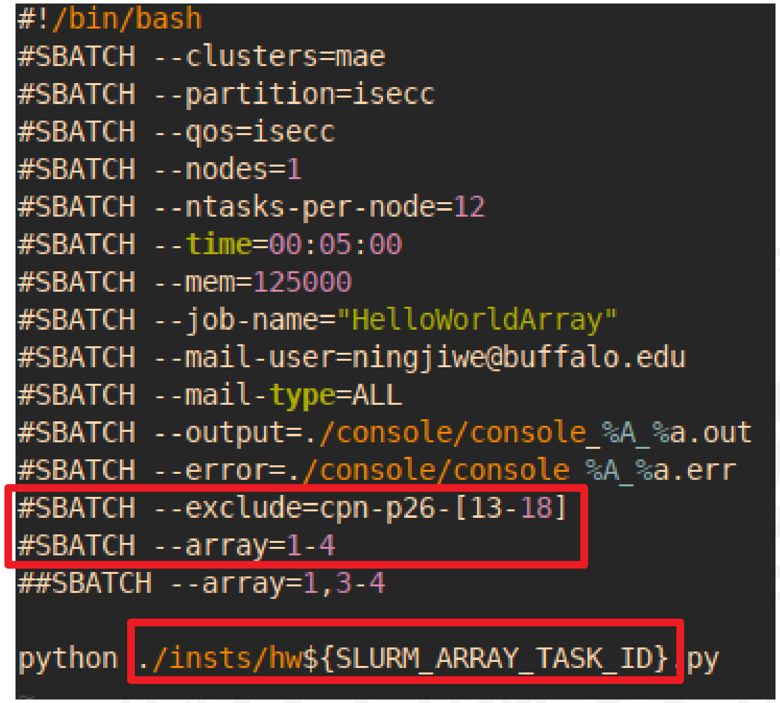

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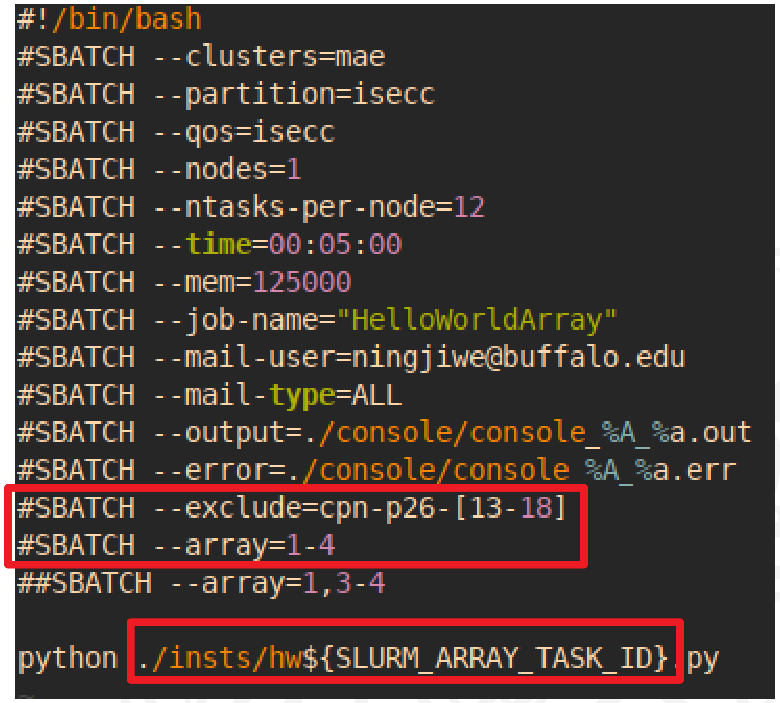

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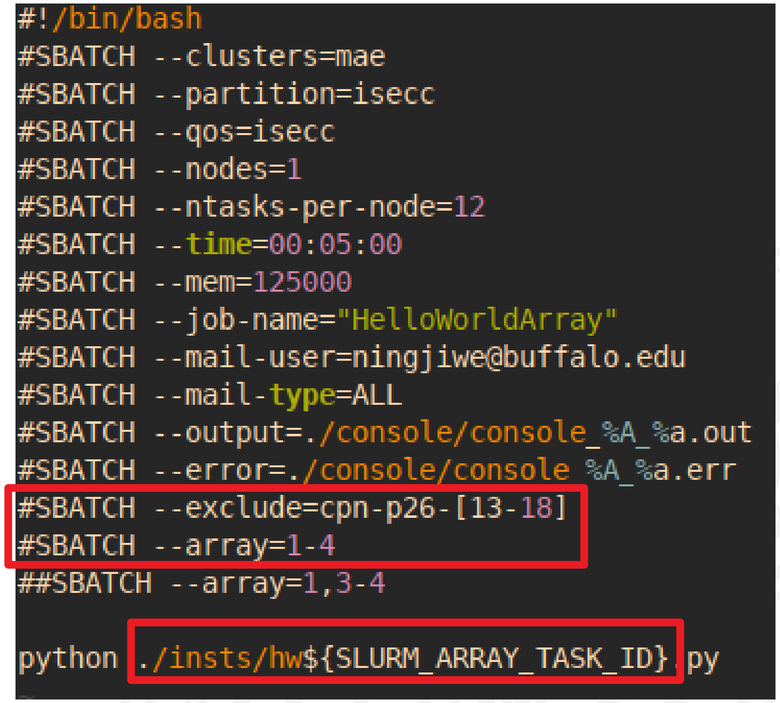

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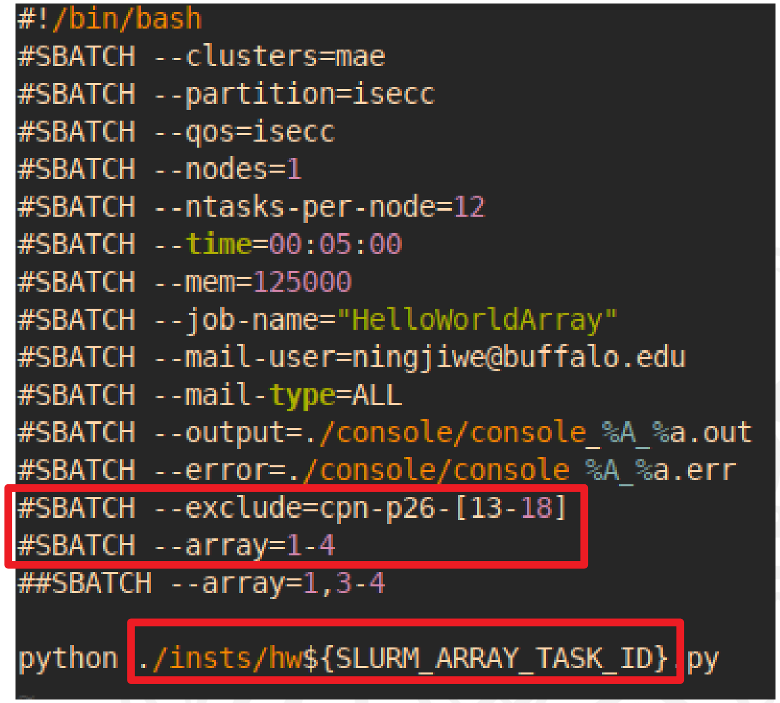

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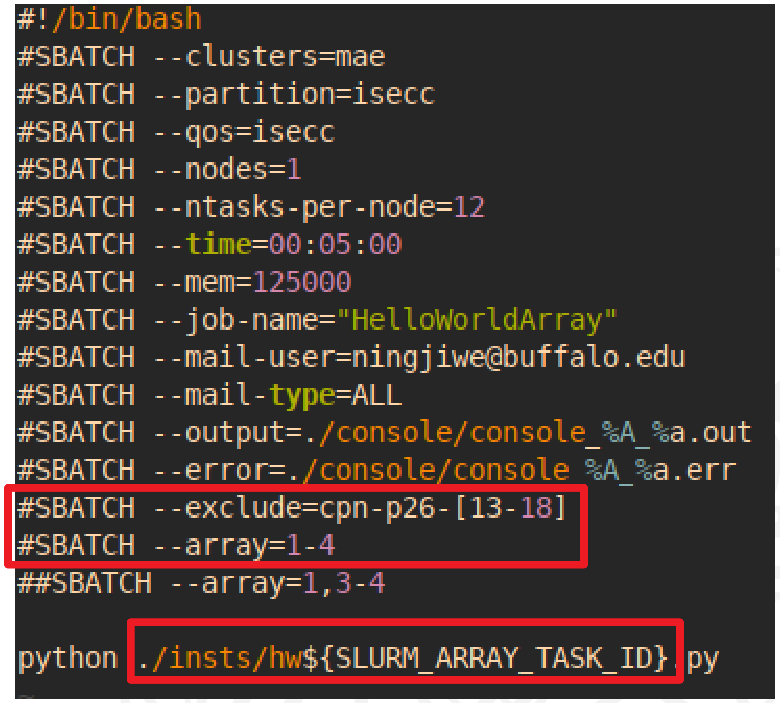

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- array representation example:
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- may occupy all 12 nodes
- use --exclude to specify nodes that **DON'T** use

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- Example: use python3 to run HelloWorld.py:

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- Example: use python3 to run HelloWorld.py:

  step1: search python related modules

Load Necessary Modules

- Some commands are not in the environment when we log in.
- We need to load the corresponding modules first.
- Some module commands:

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$ module avail              # show all available modules
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$ module load NAME          # load module NAME
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$ module unload NAME        # unload module NAME
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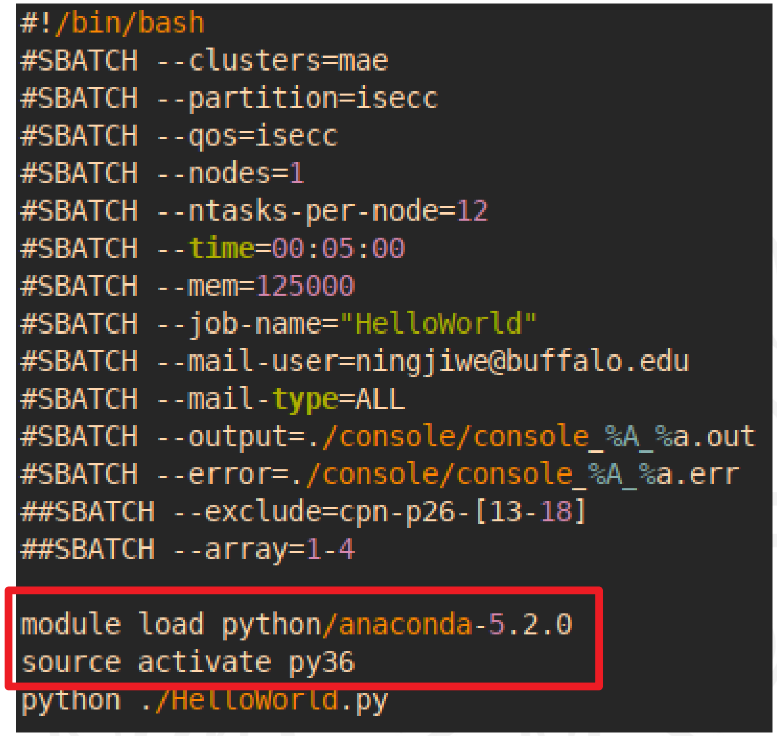

```
#!/bin/bash
#SBATCH --clusters=mae
#SBATCH --partition=isecc
#SBATCH --qos=isecc
#SBATCH --nodes=1
#SBATCH --ntasks-per-node=12
#SBATCH --time=00:05:00
#SBATCH --mem=125000
#SBATCH --job-name="HelloWorld"
#SBATCH --mail-user=ningjiwe@buffalo.edu
#SBATCH --mail-type=ALL
#SBATCH --output=./console/console_%A_%a.out
#SBATCH --error=./console/console_%A_%a.err
##SBATCH --exclude=cpn-p26-[13-18]
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module load python/anaconda-5.2.0
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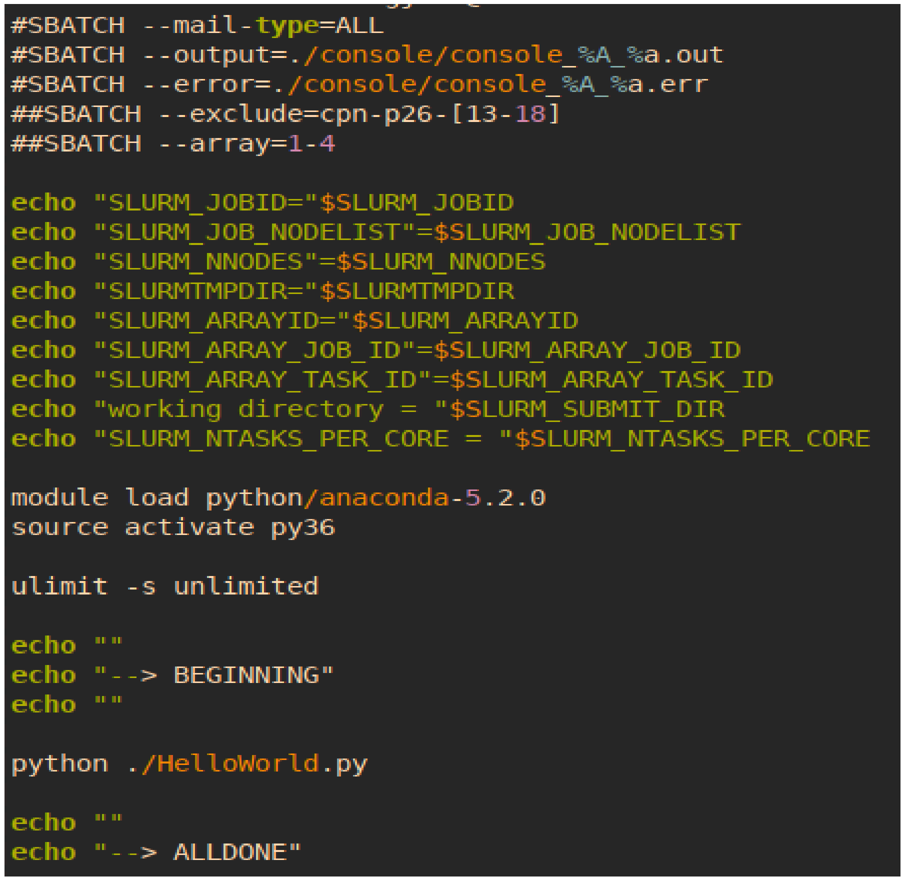

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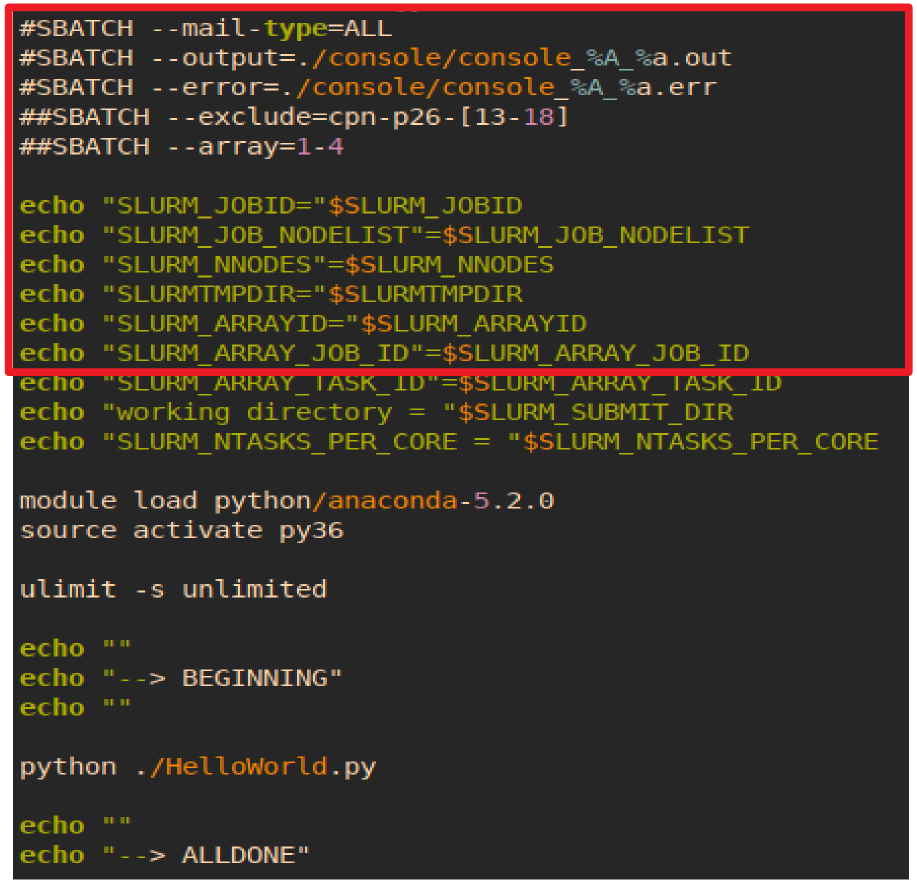

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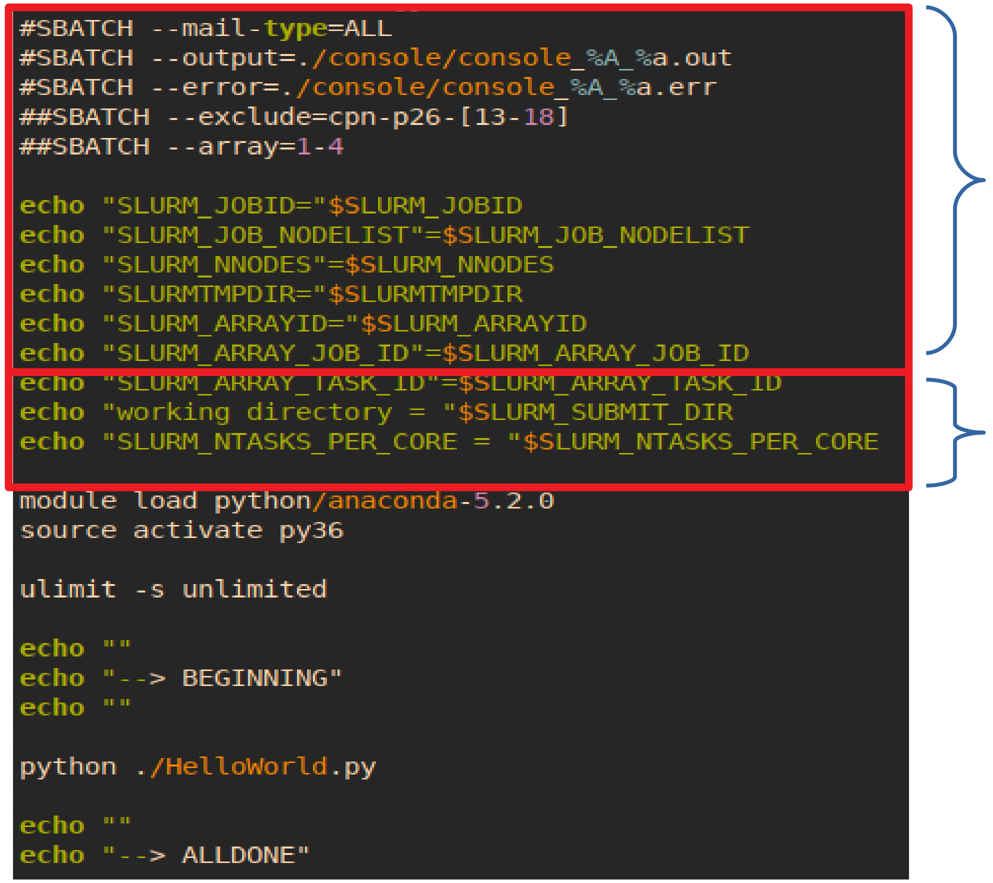

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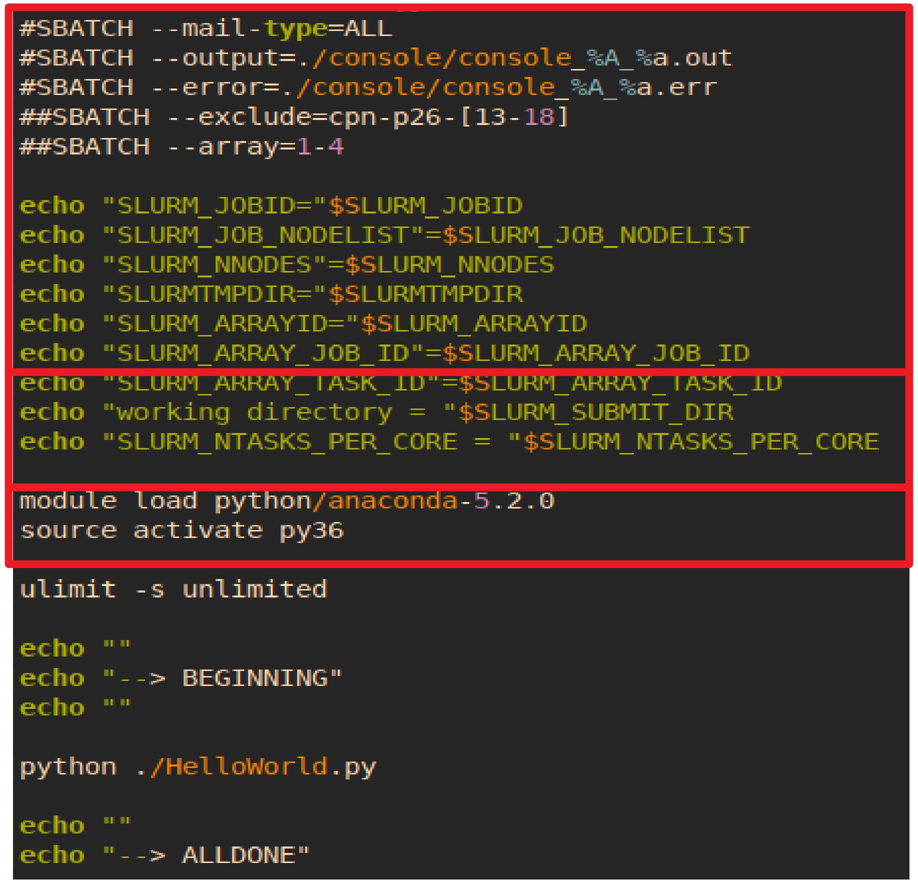

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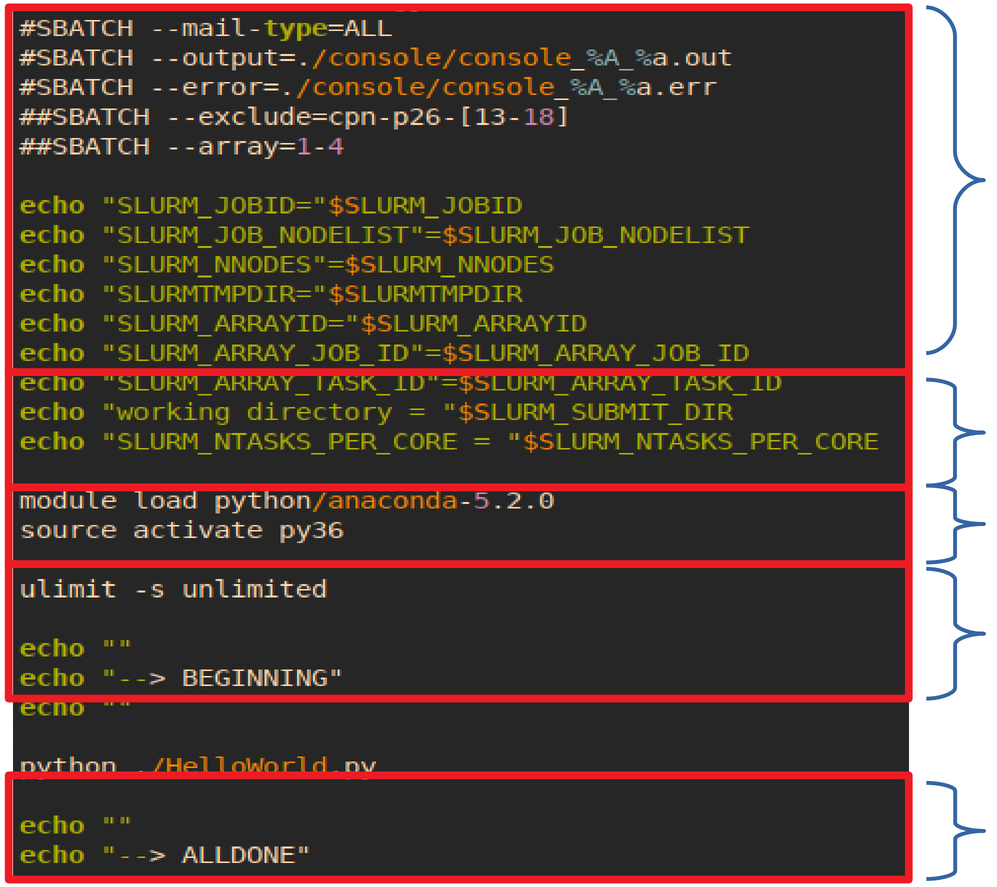

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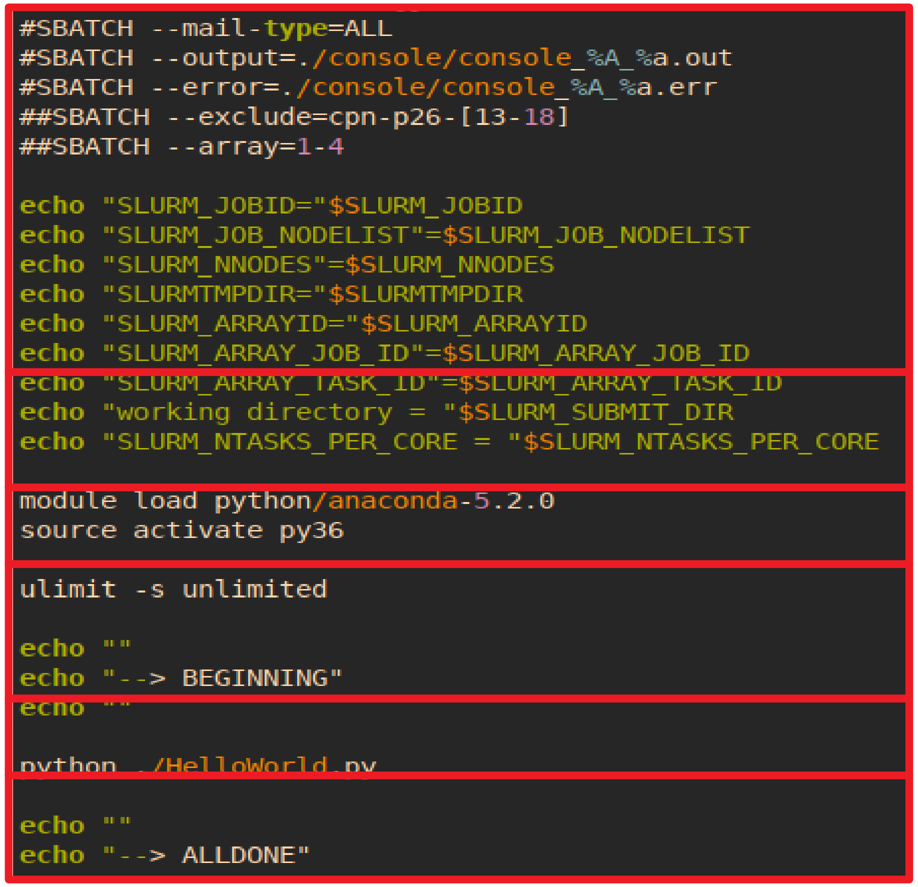

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CCR Commands Summary

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Start script job	$ sbatch SCRIPT
Start interactive job	$ fisbatch OPTIONS...
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- Help monitoring running jobs:
  watch squeue -M mae -p isecc

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Well Done!

Basics:
know how to finish common tasks in CCR

- ✓ Connect to CCR
- ✓ Filesystem Operations
- ☐ CCR Operations
- ☐ File Transfer

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Transfer Files

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GUI Method:

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Problems:
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Sync Files (Git and Github)

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Contents:

1. Introduction to Linux Server & CCR
2. Linux Basics (Commands & Tricks)
3. Run Jobs in CCR
4. Intro to Advanced Session
5. Advanced Tools

Linux:

Linux:

Is About Free and Open

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$\xrightarrow{\text{transition of mentality}}$

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How can I learn stuff to use certain interface / application / workflow?

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- Practice it on your own!

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- Connect to CCR with one simple command: $ ccr
- No need to input password, but also keep the communication safe

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- Add the folder to path: $ export PATH=$PATH:~/bin # Environment Variables
- ** Use ssh-key to generate key pairs, for safe but easy login (https://www.debian.org/devel/passwordlessssh) # Asymmetric cryptography

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Contents:

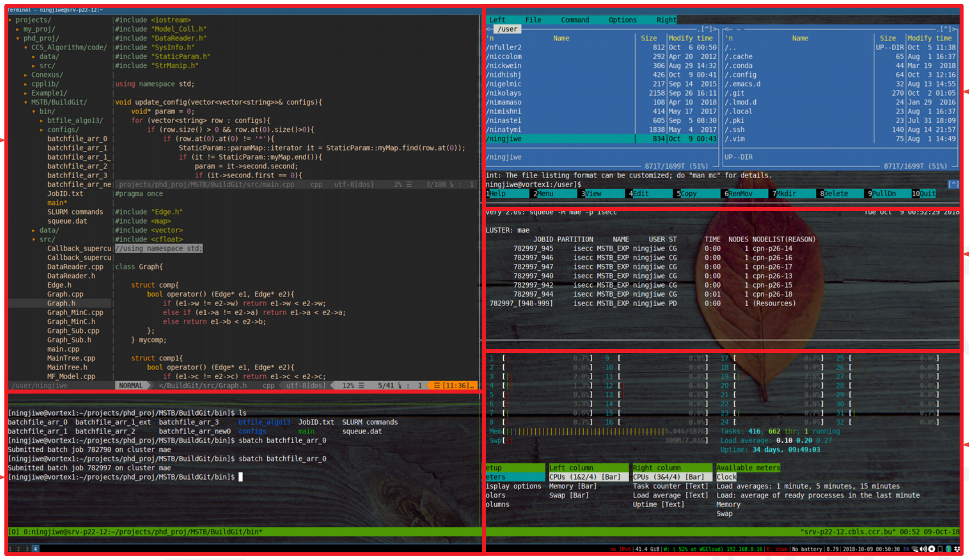
1. Introduction to Linux Server & CCR
2. Linux Basics (Commands & Tricks)
3. Run Jobs in CCR
4. Intro to Advanced Session
5. Advanced Tools

University at Buffalo The State University of New York

Remember Our Goal

Remember Our Goal

After the workshop



```
Terminal - ningjiwe@srv-p22-12:~
▾ projects/                  |#include <iostream>
  ▸ my_proj/                 |#include "Model_Coll.h"
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```

```
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ ls
batchfile_arr_0  batchfile_arr_1_ext  batchfile_arr_3     btfile_algo13  JobID.txt  SLURM commands
batchfile_arr_1  batchfile_arr_2      batchfile_arr_new0  configs        main       squeue.dat
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782790 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782997 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ █

[0] 0:ningjiwe@srv-p22-12:~/projects/phd_proj/MSTB/BuildGit/bin*
1 2 3 4
```

```
 Left     File     Command     Options     Right
<- /user ----------------------------.[^]>  <- ~ ------------------------------.[^]>
'n               Name          Size |Modify time  'n             Name           Size |Modify time
/nfuller2                       812 |Oct  6 00:50  /..                        UP--DIR|Oct  5 11:38
/niccolom                       292 |Apr 20  2012  /.cache                         65|Aug  1 16:37
/nickwein                       306 |Aug 29 14:32  /.conda                         44|Mar 19  2018
/nidhishj                       426 |Oct  9 00:41  /.config                        64|Oct  3 12:16
/nigelmic                       217 |Sep 14  2015  /.emacs.d                       32|Aug 13 14:55
/nikolays                      2158 |Sep 26 16:11  /.git                          270|Oct  2 01:05
/nimamaso                       108 |Apr 10  2018  /.lmod.d                        24|Jan 29  2016
/nimishni                       414 |May 17  2017  /.local                         23|Aug  1 16:37
/ninastei                       605 |Sep  5 08:30  /.pki                           23|Jul 31 18:09
/ninatymi                      1838 |May  4  2017  /.ssh                          140|Aug 14 21:57
/ningjiwe                       834 |Oct  9 00:43  /.vim                           75|Aug  1 14:49

/ningjiwe                                          UP--DIR
                         871T/1699T (51%)                               871T/1699T (51%)
int: The file listing format can be customized; do "man mc" for details.
ningjiwe@vortex1:/user]$                                                             [^]
1Help  2Menu  3View  4Edit  5Copy  6RenMov  7Mkdir  8Delete  9PullDn  10Quit
```

```
very 2.0s: squeue -M mae -p isecc                                    Tue Oct  9 00:52:29 2018

LUSTER: mae
         JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
    782997_945     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-14
    782997_946     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-16
    782997_947     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-17
    782997_940     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-13
    782997_942     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-15
    782997_944     isecc MSTB_EXP ningjiwe CG       0:01      1 cpn-p26-18
 782997_[948-999]  isecc MSTB_EXP ningjiwe PD       0:00      1 (Resources)
```

```
  1  [|           0.7%]   9  [            0.0%]   17 [|           0.7%]   25 [            0.0%]
  2  [            0.0%]   10 [            0.0%]   18 [            0.0%]   26 [            0.0%]
  3  [||          2.0%]   11 [            0.0%]   19 [||          2.6%]   27 [            0.0%]
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  8  [|           0.7%]   16 [            0.0%]   24 [            0.0%]   32 [            0.0%]
  Mem[|||||||||||||||||||||||||||||||||||||5.84G/187G]   Tasks: 416, 662 thr; 1 running
  Swp[||                               309M/7.81G]   Load average: 0.10 0.20 0.27
                                                     Uptime: 34 days, 09:49:03

etup            Left column            Right column            Available meters
eters           CPUs (1&2/4) [Bar]     CPUs (3&4/4) [Bar]      Clock
isplay options  Memory [Bar]           Task counter [Text]     Load averages: 1 minute, 5 minutes, 15 minutes
olors           Swap [Bar]             Load average [Text]     Load: average of ready processes in the last minute
olumns                                 Uptime [Text]           Memory
                                                               Swap

                                                        "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
no IPv6 | 41.4 GiB | W: ( 52% at WGCloud) 192.168.0.16 | E: down | No battery | 0.79 | 2018-10-09 00:50:30 EN
```

call me Linux server ninja warrior

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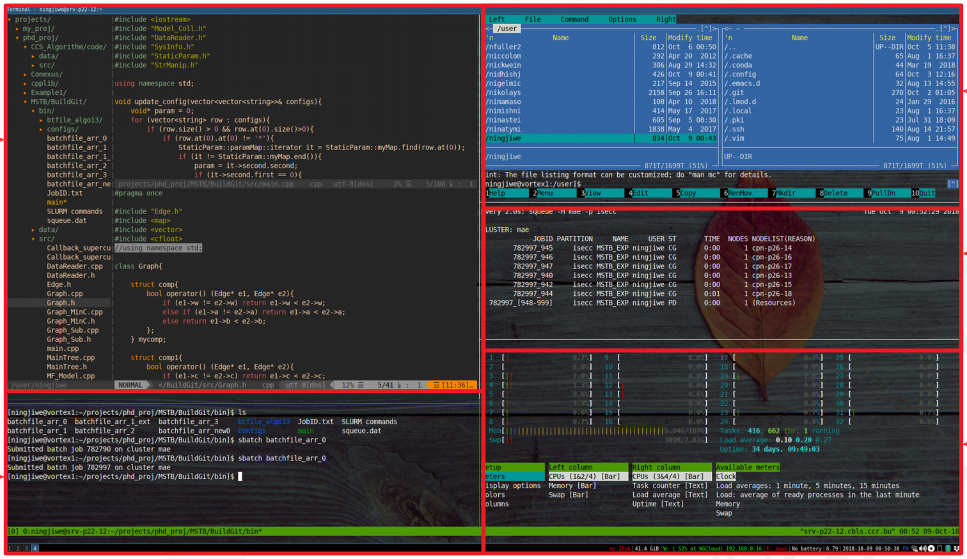

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Toolset:

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After the workshop

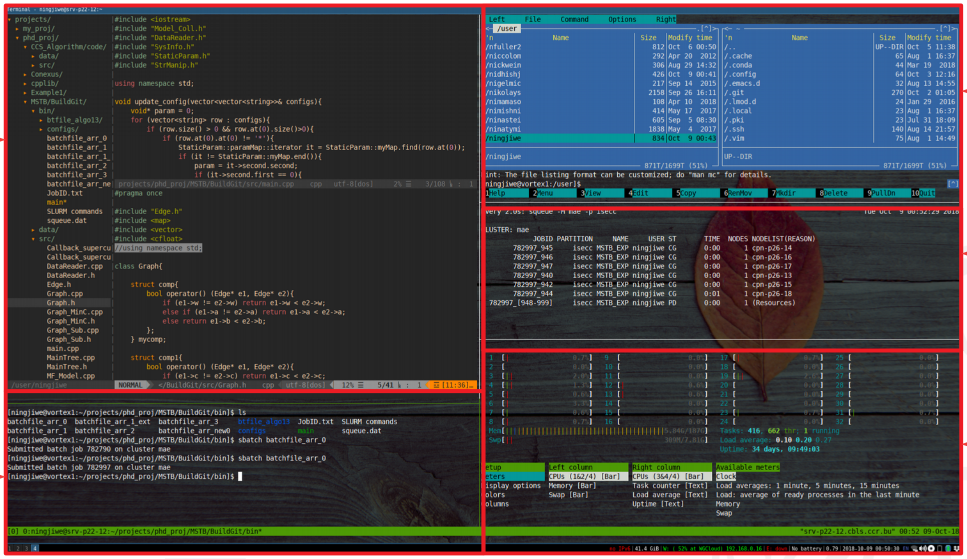
Coding IDE

File manager

Job monitor

Debug

Resources monitor



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[0] 0:ningjiwe@srv-p22-12:~/projects/phd_proj/MSTB/BuildGit/bin*
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```
 Left     File     Command     Options     Right
<─ /user ───────────────────────.[^]>┐<─ ~ ─────────────────────────.[^]>
'n          Name         Size |Modify time  'n          Name          Size |Modify time
/nfuller2                 812 |Oct  6 00:50 /..                     UP--DIR|Oct  5 11:38
/niccolom                 292 |Apr 20  2012 /.cache                      65|Aug  1 16:37
/nickwein                 306 |Aug 29 14:32 /.conda                      44|Mar 19  2018
/nidhishj                 426 |Oct  9 00:41 /.config                     64|Oct  3 12:16
/nigelmic                 217 |Sep 14  2015 /.emacs.d                    32|Aug 13 14:55
/nikolays                2158 |Sep 26 16:11 /.git                       270|Oct  2 01:05
/nimamaso                 108 |Apr 10  2018 /.lmod.d                     24|Jan 29  2016
/nimishni                 414 |May 17  2017 /.local                      23|Aug  1 16:37
/ninastei                 605 |Sep  5 08:30 /.pki                        23|Jul 31 18:09
/ninatymi                1838 |May  4  2017 /.ssh                       140|Aug 14 21:57
/ningjiwe                 834 |Oct  9 00:43 /.vim                        75|Aug  1 14:49

/ningjiwe                                   UP--DIR
              871T/1699T (51%)                           871T/1699T (51%)
int: The file listing format can be customized; do "man mc" for details.
ningjiwe@vortex1:/user]$                                                        [^]
1Help  2Menu  3View  4Edit  5Copy  6RenMov  7Mkdir  8Delete  9PullDn  10Quit
```

```
very 2.0s: squeue -M mae -p isecc                              Tue Oct  9 00:52:29 2018

LUSTER: mae
          JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
      782997_945     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-14
      782997_946     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-16
      782997_947     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-17
      782997_940     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-13
      782997_942     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-15
      782997_944     isecc MSTB_EXP ningjiwe CG       0:01      1 cpn-p26-18
 782997_[948-999]     isecc MSTB_EXP ningjiwe PD       0:00      1 (Resources)
```

```
  1  [|          0.7%]   9  [          0.0%]   17 [|          0.7%]   25 [          0.0%]
  2  [           0.0%]   10 [          0.0%]   18 [           0.0%]   26 [          0.0%]
  3  [||         2.0%]   11 [          0.0%]   19 [||         2.6%]   27 [          0.0%]
  4  [||         1.3%]   12 [|         0.6%]   20 [           0.0%]   28 [          0.0%]
  5  [|          0.6%]   13 [|         0.6%]   21 [           0.0%]   29 [          0.0%]
  6  [|          3.3%]   14 [          0.0%]   22 [           0.0%]   30 [          0.0%]
  7  [|          0.6%]   15 [          0.0%]   23 [|          0.7%]   31 [|         0.7%]
  8  [|          0.7%]   16 [          0.0%]   24 [           0.0%]   32 [          0.0%]
  Mem[||||||||||||||||||||||||||||||||5.84G/187G]   Tasks: 416, 662 thr; 1 running
  Swp[||                          309M/7.81G]   Load average: 0.10 0.20 0.27
                                                Uptime: 34 days, 09:49:03

etup            Left column          Right column          Available meters
eters           CPUs (1&2/4) [Bar]   CPUs (3&4/4) [Bar]    Clock
isplay options  Memory [Bar]         Task counter [Text]   Load averages: 1 minute, 5 minutes, 15 minutes
olors           Swap [Bar]           Load average [Text]   Load: average of ready processes in the last minute
olumns                               Uptime [Text]         Memory
                                                           Swap

                                                 "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
no IPv6 | 41.4 GiB | W: ( 52% at WGCloud) 192.168.0.16 | E: down | No battery | 0.79 | 2018-10-09 00:50:30 EN
```

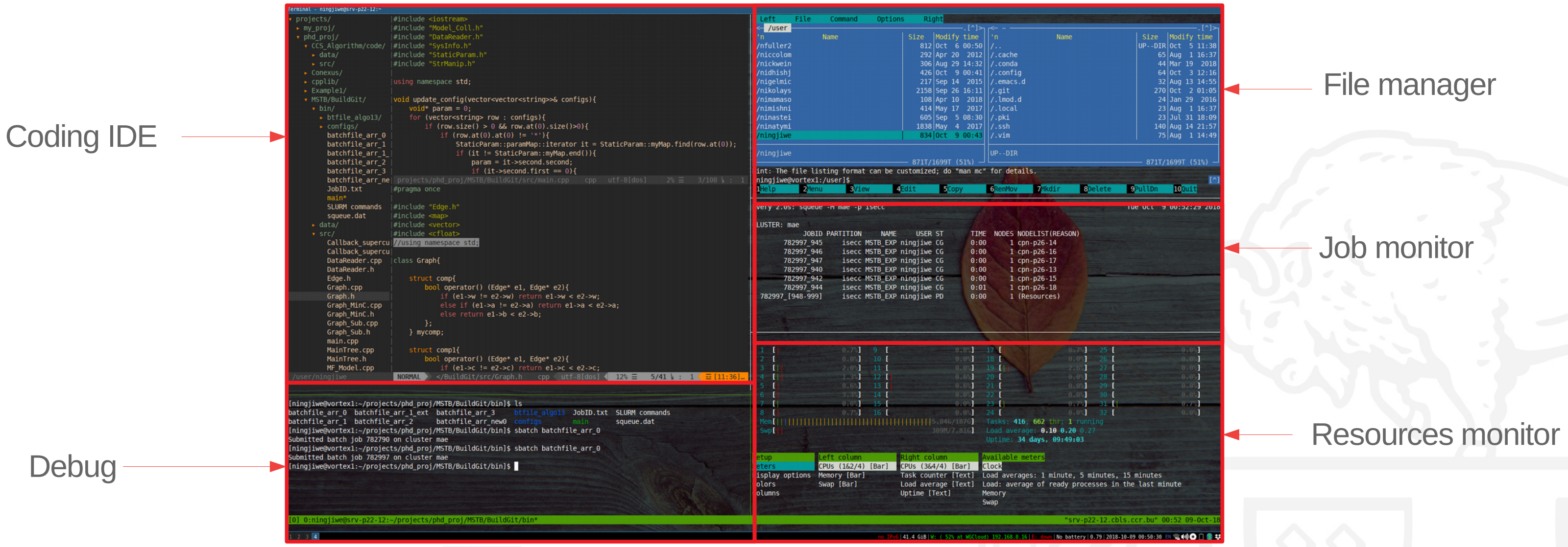
call me Linux server ninja warrior

Toolset:

- Text Editor: Vim

Remember Our Goal

After the workshop



```
Terminal - ningjiwe@srv-p22-12:~
▾ projects/                 |#include <iostream>
  ▸ my_proj/                |#include "Model_Coll.h"
  ▾ phd_proj/               |#include "DataReader.h"
    ▾ CCS_Algorithm/code/   |#include "SysInfo.h"
      ▸ data/               |#include "StaticParam.h"
      ▸ src/                |#include "StrManip.h"
    ▸ Conexus/              |
    ▸ cpplib/               |using namespace std;
    ▸ Example1/             |
    ▾ MSTB/BuildGit/        |void update_config(vector<vector<string>>& configs){
      ▾ bin/                |    void* param = 0;
        ▸ btfile_algo13/    |    for (vector<string> row : configs){
        ▸ configs/          |        if (row.size() > 0 && row.at(0).size()>0){
          batchfile_arr_0   |            if (row.at(0).at(0) != '*'){
          batchfile_arr_1   |                StaticParam::paramMap::iterator it = StaticParam::myMap.find(row.at(0));
          batchfile_arr_1_  |                if (it != StaticParam::myMap.end()){
          batchfile_arr_2   |                    param = it->second.second;
          batchfile_arr_3   |                    if (it->second.first == 0){
          batchfile_arr_ne  | projects/phd_proj/MSTB/BuildGit/src/main.cpp   cpp   utf-8[dos]   2% ☰   3/108 ㏑ :  1
          JobID.txt         |#pragma once
          main*             |
          SLURM commands    |#include "Edge.h"
          squeue.dat        |#include <map>
      ▸ data/               |#include <vector>
      ▾ src/                |#include <cfloat>
          Callback_supercu  |//using namespace std;
          Callback_supercu  |
          DataReader.cpp    |class Graph{
          DataReader.h      |
          Edge.h            |    struct comp{
          Graph.cpp         |        bool operator() (Edge* e1, Edge* e2){
          Graph.h           |            if (e1->w != e2->w) return e1->w < e2->w;
          Graph_MinC.cpp    |            else if (e1->a != e2->a) return e1->a < e2->a;
          Graph_MinC.h      |            else return e1->b < e2->b;
          Graph_Sub.cpp     |        };
          Graph_Sub.h       |    } mycomp;
          main.cpp          |
          MainTree.cpp      |    struct comp1{
          MainTree.h        |        bool operator() (Edge* e1, Edge* e2){
          MF_Model.cpp      |            if (e1->c != e2->c) return e1->c < e2->c;
 /user/ningjiwe              NORMAL  </BuildGit/src/Graph.h   cpp  utf-8[dos]  12% ☰   5/41 ㏑ :  1  ☲ [11:36]…
```

```
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ ls
batchfile_arr_0  batchfile_arr_1_ext  batchfile_arr_3     btfile_algo13  JobID.txt  SLURM commands
batchfile_arr_1  batchfile_arr_2      batchfile_arr_new0  configs        main       squeue.dat
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782790 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782997 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ █

[0] 0:ningjiwe@srv-p22-12:~/projects/phd_proj/MSTB/BuildGit/bin*
1 2 3 4
```

```
 Left     File     Command     Options     Right
<- /user ---------------------------.[^]>  <- ~ --------------------------------.[^]>
'n            Name        | Size |Modify time   'n            Name        | Size  |Modify time
/nfuller2                 |  812 |Oct  6 00:50  /..                       |UP--DIR|Oct  5 11:38
/niccolom                 |  292 |Apr 20  2012  /.cache                   |    65 |Aug  1 16:37
/nickwein                 |  306 |Aug 29 14:32  /.conda                   |    44 |Mar 19  2018
/nidhishj                 |  426 |Oct  9 00:41  /.config                  |    64 |Oct  3 12:16
/nigelmic                 |  217 |Sep 14  2015  /.emacs.d                 |    32 |Aug 13 14:55
/nikolays                 | 2158 |Sep 26 16:11  /.git                     |   270 |Oct  2 01:05
/nimamaso                 |  108 |Apr 10  2018  /.lmod.d                  |    24 |Jan 29  2016
/nimishni                 |  414 |May 17  2017  /.local                   |    23 |Aug  1 16:37
/ninastei                 |  605 |Sep  5 08:30  /.pki                     |    23 |Jul 31 18:09
/ninatymi                 | 1838 |May  4  2017  /.ssh                     |   140 |Aug 14 21:57
/ningjiwe                 |  834 |Oct  9 00:43  /.vim                     |    75 |Aug  1 14:49

/ningjiwe                                      UP--DIR
                        871T/1699T (51%)                              871T/1699T (51%)
int: The file listing format can be customized; do "man mc" for details.
ningjiwe@vortex1:/user]$                                                              [^]
1Help  2Menu  3View  4Edit  5Copy  6RenMov  7Mkdir  8Delete  9PullDn  10Quit
```

```
very 2.0s: squeue -M mae -p isecc                                   Tue Oct  9 00:52:29 2018

LUSTER: mae
          JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
     782997_945     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-14
     782997_946     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-16
     782997_947     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-17
     782997_940     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-13
     782997_942     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-15
     782997_944     isecc MSTB_EXP ningjiwe CG       0:01      1 cpn-p26-18
 782997_[948-999]   isecc MSTB_EXP ningjiwe PD       0:00      1 (Resources)
```

```
  1  [|          0.7%]   9  [          0.0%]   17 [|          0.7%]   25 [          0.0%]
  2  [           0.0%]   10 [          0.0%]   18 [           0.0%]   26 [          0.0%]
  3  [||         2.0%]   11 [          0.0%]   19 [||         2.6%]   27 [          0.0%]
  4  [||         1.3%]   12 [|         0.6%]   20 [           0.0%]   28 [          0.0%]
  5  [|          0.6%]   13 [|         0.6%]   21 [           0.0%]   29 [          0.0%]
  6  [|          3.3%]   14 [          0.0%]   22 [           0.0%]   30 [          0.0%]
  7  [|          0.6%]   15 [          0.0%]   23 [|          0.7%]   31 [|         0.7%]
  8  [|          0.7%]   16 [          0.0%]   24 [           0.0%]   32 [          0.0%]
  Mem[|||||||||||||||||||||||||||||||||||5.84G/187G]   Tasks: 416, 662 thr; 1 running
  Swp[||                              309M/7.81G]   Load average: 0.10 0.20 0.27
                                                     Uptime: 34 days, 09:49:03

etup             Left column          Right column          Available meters
eters            CPUs (1&2/4) [Bar]   CPUs (3&4/4) [Bar]    Clock
isplay options   Memory [Bar]         Task counter [Text]   Load averages: 1 minute, 5 minutes, 15 minutes
olors            Swap [Bar]           Load average [Text]   Load: average of ready processes in the last minute
olumns                                Uptime [Text]         Memory
                                                            Swap

                                                "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
no IPv6 | 41.4 GiB | W: ( 52% at WGCloud) 192.168.0.16 | E: down | No battery | 0.79 | 2018-10-09 00:50:30 EN
```

call me Linux server ninja warrior

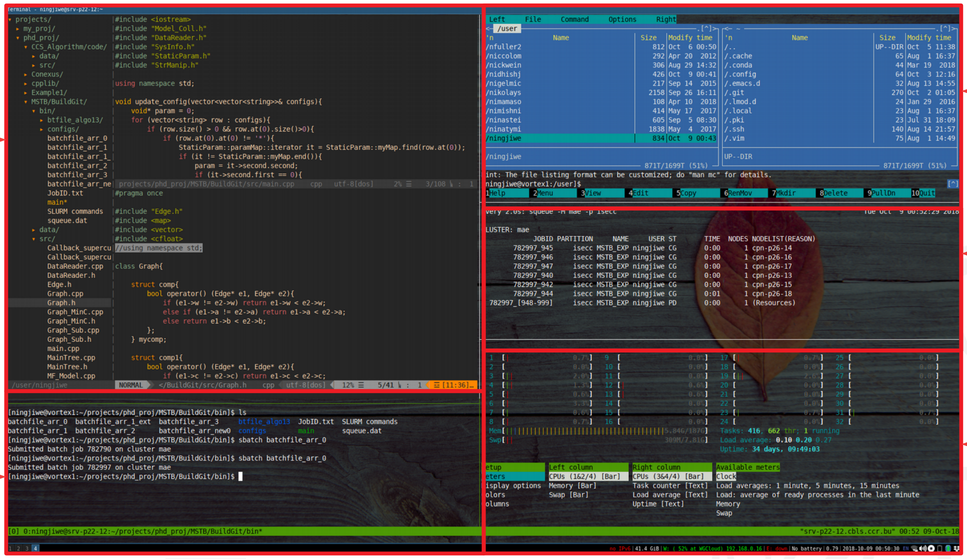
Toolset:

- Text Editor: Vim
- File Manger: Midnight Commander

University at Buffalo The State University of New York

Remember Our Goal

After the workshop



```
Terminal - ningjiwe@srv-p22-12:~
▾ projects/                  |#include <iostream>
  ▸ my_proj/                 |#include "Model_Coll.h"
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      ▸ src/                 |#include "StrManip.h"
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    ▸ cpplib/                |using namespace std;
    ▸ Example1/              |
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          batchfile_arr_ne   | projects/phd_proj/MSTB/BuildGit/src/main.cpp   cpp   utf-8[dos]   2% ☰   3/108 ㏑ :  1
          JobID.txt          |#pragma once
          main*              |
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          squeue.dat         |#include <map>
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          Callback_supercu   |//using namespace std;
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          DataReader.cpp     |class Graph{
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```
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1 2 3 4
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```
 Left     File     Command     Options     Right
<─ /user ──────────────────────.[^]>┐┌<─ ~ ─────────────────────────.[^]>
'n          Name         Size │Modify time ││'n          Name         Size │Modify time
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/nickwein                 306│Aug 29 14:32││/.conda                     44│Mar 19  2018
/nidhishj                 426│Oct  9 00:41││/.config                    64│Oct  3 12:16
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/nikolays                2158│Sep 26 16:11││/.git                      270│Oct  2 01:05
/nimamaso                 108│Apr 10  2018││/.lmod.d                    24│Jan 29  2016
/nimishni                 414│May 17  2017││/.local                     23│Aug  1 16:37
/ninastei                 605│Sep  5 08:30││/.pki                       23│Jul 31 18:09
/ninatymi                1838│May  4  2017││/.ssh                      140│Aug 14 21:57
/ningjiwe                 834│Oct  9 00:43││/.vim                       75│Aug  1 14:49

/ningjiwe                                   UP--DIR
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```

```
1  [|          0.7%]  9  [           0.0%]  17 [|          0.7%]  25 [           0.0%]
2  [           0.0%]  10 [           0.0%]  18 [           0.0%]  26 [           0.0%]
3  [||         2.0%]  11 [           0.0%]  19 [||         2.6%]  27 [           0.0%]
4  [||         1.3%]  12 [|          0.6%]  20 [           0.0%]  28 [           0.0%]
5  [|          0.6%]  13 [|          0.6%]  21 [           0.0%]  29 [           0.0%]
6  [|          3.3%]  14 [           0.0%]  22 [           0.0%]  30 [           0.0%]
7  [|          0.6%]  15 [           0.0%]  23 [|          0.7%]  31 [|          0.7%]
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Mem[||||||||||||||||||||||||||||||||||||||5.84G/187G]  Tasks: 416, 662 thr; 1 running
Swp[||                              309M/7.81G]  Load average: 0.10 0.20 0.27
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olumns                                   Uptime [Text]           Memory
                                                                 Swap

                                                   "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
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```

call me Linux server ninja warrior

Toolset:

- Text Editor: Vim
- File Manger: Midnight Commander
- Resources monitor: Htop

Remember Our Goal

After the workshop

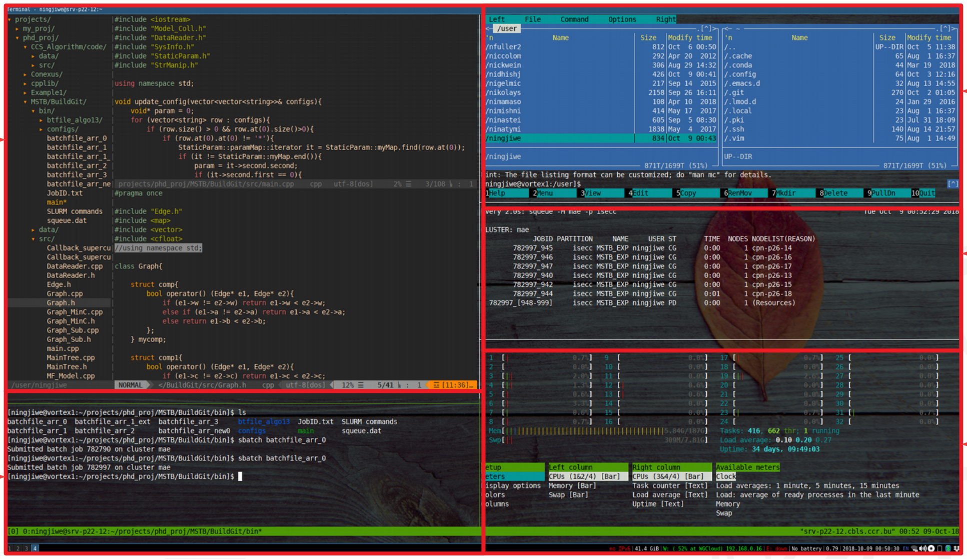
Coding IDE

File manager

Job monitor

Resources monitor

Debug



```
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      ▸ data/                 |#include "StaticParam.h"
      ▸ src/                  |#include "StrManip.h"
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    ▸ cpplib/                 |using namespace std;
    ▸ Example1/               |
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          JobID.txt           |#pragma once
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          SLURM commands      |#include "Edge.h"
          squeue.dat          |#include <map>
      ▸ data/                 |#include <vector>
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          Callback_supercu    |//using namespace std;
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          Graph_Sub.cpp       |        };
          Graph_Sub.h         |    } mycomp;
          main.cpp            |
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          MainTree.h          |        bool operator() (Edge* e1, Edge* e2){
          MF_Model.cpp        |            if (e1->c != e2->c) return e1->c < e2->c;
 /user/ningjiwe      NORMAL > </BuildGit/src/Graph.h   cpp < utf-8[dos] < 12% ☰   5/41 ㏑ :  1 < ☲ [11:36]…
```

```
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ ls
batchfile_arr_0  batchfile_arr_1_ext  batchfile_arr_3     btfile_algo13  JobID.txt  SLURM commands
batchfile_arr_1  batchfile_arr_2      batchfile_arr_new0  configs        main       squeue.dat
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782790 on cluster mae
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Submitted batch job 782997 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ █

[0] 0:ningjiwe@srv-p22-12:~/projects/phd_proj/MSTB/BuildGit/bin*
1 2 3 4
```

```
 Left     File     Command     Options     Right
<- /user ─────────────────────.[^]>┐<- ~ ────────────────────────────.[^]>┐
'n           Name          Size |Modify time |'n           Name          Size |Modify time
/nfuller2                   812 |Oct  6 00:50 |/..                     UP--DIR|Oct  5 11:38
/niccolom                   292 |Apr 20  2012 |/.cache                     65 |Aug  1 16:37
/nickwein                   306 |Aug 29 14:32 |/.conda                     44 |Mar 19  2018
/nidhishj                   426 |Oct  9 00:41 |/.config                    64 |Oct  3 12:16
/nigelmic                   217 |Sep 14  2015 |/.emacs.d                   32 |Aug 13 14:55
/nikolays                  2158 |Sep 26 16:11 |/.git                      270 |Oct  2 01:05
/nimamaso                   108 |Apr 10  2018 |/.lmod.d                    24 |Jan 29  2016
/nimishni                   414 |May 17  2017 |/.local                     23 |Aug  1 16:37
/ninastei                   605 |Sep  5 08:30 |/.pki                       23 |Jul 31 18:09
/ninatymi                  1838 |May  4  2017 |/.ssh                      140 |Aug 14 21:57
/ningjiwe                   834 |Oct  9 00:43 |/.vim                       75 |Aug  1 14:49

/ningjiwe                                      |UP--DIR
──────────────────── 871T/1699T (51%) ─        ──────────────────── 871T/1699T (51%) ─
int: The file listing format can be customized; do "man mc" for details.
ningjiwe@vortex1:/user]$                                                          [^]
1Help  2Menu  3View  4Edit  5Copy  6RenMov  7Mkdir  8Delete  9PullDn  10Quit
```

```
very 2.0s: squeue -M mae -p isecc                                    Tue Oct  9 00:52:29 2018

LUSTER: mae
          JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
     782997_945     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-14
     782997_946     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-16
     782997_947     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-17
     782997_940     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-13
     782997_942     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-15
     782997_944     isecc MSTB_EXP ningjiwe CG       0:01      1 cpn-p26-18
 782997_[948-999]   isecc MSTB_EXP ningjiwe PD       0:00      1 (Resources)
```

```
  1  [|          0.7%]   9  [          0.0%]   17 [|          0.7%]   25 [          0.0%]
  2  [           0.0%]   10 [          0.0%]   18 [           0.0%]   26 [          0.0%]
  3  [||         2.0%]   11 [          0.0%]   19 [||         2.6%]   27 [          0.0%]
  4  [||         1.3%]   12 [|         0.6%]   20 [           0.0%]   28 [          0.0%]
  5  [|          0.6%]   13 [|         0.6%]   21 [           0.0%]   29 [          0.0%]
  6  [|          3.3%]   14 [          0.0%]   22 [           0.0%]   30 [          0.0%]
  7  [|          0.6%]   15 [          0.0%]   23 [|          0.7%]   31 [|         0.7%]
  8  [|          0.7%]   16 [          0.0%]   24 [           0.0%]   32 [          0.0%]
  Mem[||||||||||||||||||||||||||||||||||||||5.84G/187G]   Tasks: 416, 662 thr; 1 running
  Swp[||                              309M/7.81G]   Load average: 0.10 0.20 0.27
                                                    Uptime: 34 days, 09:49:03

etup             Left column         Right column          Available meters
eters            CPUs (1&2/4) [Bar]  CPUs (3&4/4) [Bar]    Clock
isplay options   Memory [Bar]        Task counter [Text]   Load averages: 1 minute, 5 minutes, 15 minutes
olors            Swap [Bar]          Load average [Text]   Load: average of ready processes in the last minute
olumns                               Uptime [Text]         Memory
                                                           Swap

                                                     "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
no IPv6 | 41.4 GiB | W: ( 52% at WGCloud) 192.168.0.16 | E: down | No battery | 0.79 | 2018-10-09 00:50:30 EN
```

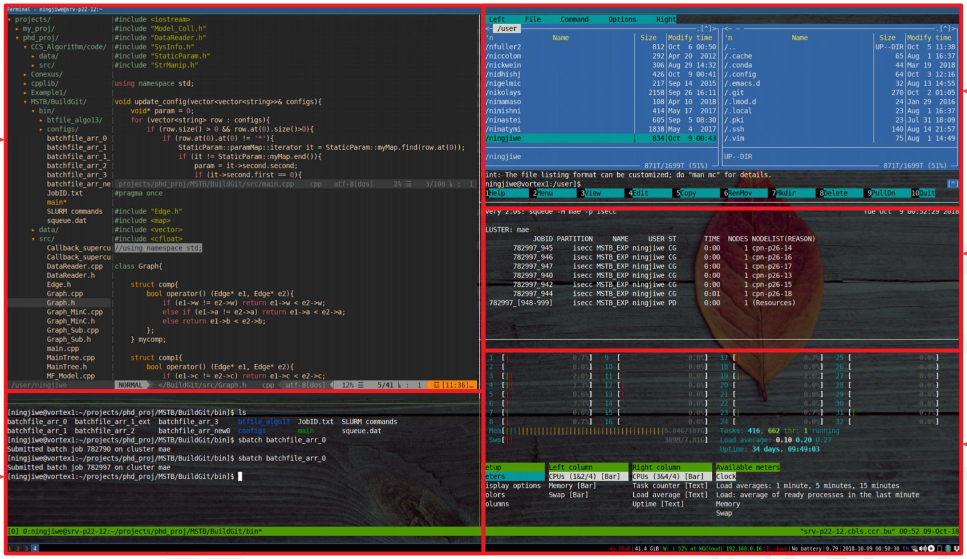
call me Linux server ninja warrior

Toolset:

- Text Editor: Vim
- File Manger: Midnight Commander
- Resources monitor: Htop
- Console Debugger: gdb, jdb, pdb ...

Remember Our Goal

After the workshop



```
Terminal - ningjiwe@srv-p22-12:~
▾ projects/                 |#include <iostream>
  ▸ my_proj/                |#include "Model_Coll.h"
  ▾ phd_proj/               |#include "DataReader.h"
    ▾ CCS_Algorithm/code/   |#include "SysInfo.h"
      ▸ data/               |#include "StaticParam.h"
      ▸ src/                |#include "StrManip.h"
    ▸ Conexus/              |
    ▸ cpplib/               |using namespace std;
    ▸ Example1/             |
    ▾ MSTB/BuildGit/        |void update_config(vector<vector<string>>& configs){
      ▾ bin/                |    void* param = 0;
        ▸ btfile_algo13/    |    for (vector<string> row : configs){
        ▸ configs/          |        if (row.size() > 0 && row.at(0).size()>0){
          batchfile_arr_0   |            if (row.at(0).at(0) != '*'){
          batchfile_arr_1   |                StaticParam::paramMap::iterator it = StaticParam::myMap.find(row.at(0));
          batchfile_arr_1_  |                if (it != StaticParam::myMap.end()){
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          batchfile_arr_ne  | projects/phd_proj/MSTB/BuildGit/src/main.cpp    cpp   utf-8[dos]    2% ☰   3/108 ㏑ :  1
          JobID.txt         |#pragma once
          main*             |
          SLURM commands    |#include "Edge.h"
          squeue.dat        |#include <map>
      ▸ data/               |#include <vector>
      ▾ src/                |#include <cfloat>
          Callback_supercu  |//using namespace std;
          Callback_supercu  |
          DataReader.cpp    |class Graph{
          DataReader.h      |
          Edge.h            |    struct comp{
          Graph.cpp         |        bool operator() (Edge* e1, Edge* e2){
          Graph.h           |            if (e1->w != e2->w) return e1->w < e2->w;
          Graph_MinC.cpp    |            else if (e1->a != e2->a) return e1->a < e2->a;
          Graph_MinC.h      |            else return e1->b < e2->b;
          Graph_Sub.cpp     |        };
          Graph_Sub.h       |    } mycomp;
          main.cpp          |
          MainTree.cpp      |    struct comp1{
          MainTree.h        |        bool operator() (Edge* e1, Edge* e2){
          MF_Model.cpp      |            if (e1->c != e2->c) return e1->c < e2->c;
 /user/ningjiwe              NORMAL  </BuildGit/src/Graph.h   cpp  utf-8[dos]   12% ☰   5/41 ㏑ :  1  ☲ [11:36]…
```

```
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ ls
batchfile_arr_0  batchfile_arr_1_ext  batchfile_arr_3     btfile_algo13  JobID.txt  SLURM commands
batchfile_arr_1  batchfile_arr_2      batchfile_arr_new0  configs        main       squeue.dat
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782790 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782997 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ █

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1 2 3 4
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/nikolays                   | 2158 |Sep 26 16:11  /.git                       |    270|Oct  2 01:05
/nimamaso                   |  108 |Apr 10  2018  /.lmod.d                    |     24|Jan 29  2016
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/ninastei                   |  605 |Sep  5 08:30  /.pki                       |     23|Jul 31 18:09
/ninatymi                   | 1838 |May  4  2017  /.ssh                       |    140|Aug 14 21:57
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/ningjiwe                                         UP--DIR
                      871T/1699T (51%)                                  871T/1699T (51%)
int: The file listing format can be customized; do "man mc" for details.
ningjiwe@vortex1:/user]$                                                                    [^]
1Help  2Menu  3View  4Edit  5Copy  6RenMov  7Mkdir  8Delete  9PullDn  10Quit
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LUSTER: mae
          JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
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```
  1  [|           0.7%]   9  [            0.0%]   17 [|           0.7%]   25 [            0.0%]
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                                                            Swap

                                                   "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
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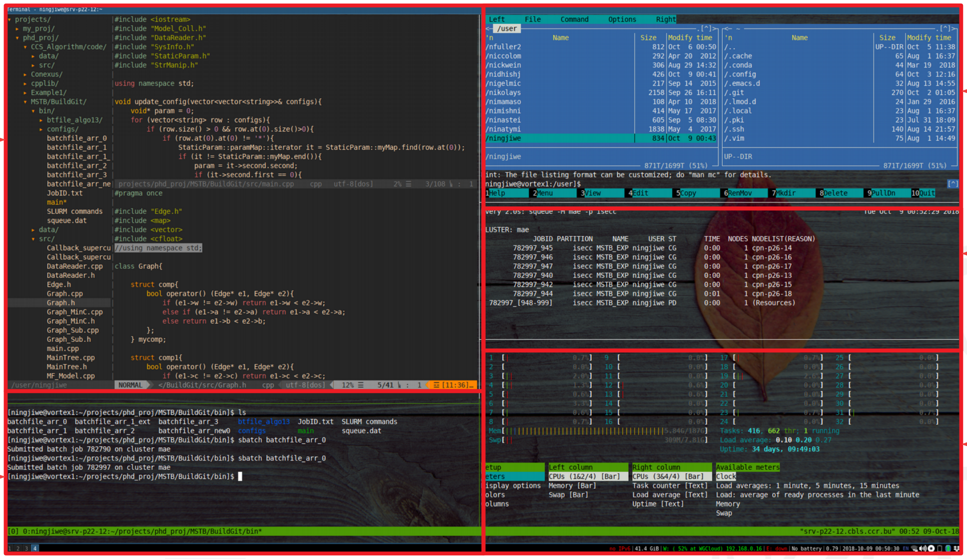

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The flow:

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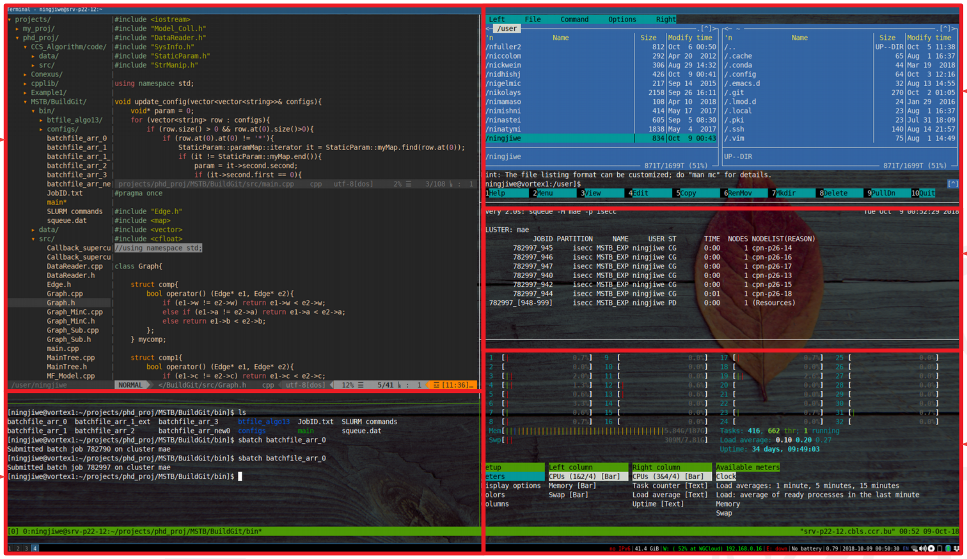

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[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782790 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782997 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ 

[0] 0:ningjiwe@srv-p22-12:~/projects/phd_proj/MSTB/BuildGit/bin*
1 2 3 4
```

```
 Left     File     Command     Options     Right
<- /user ─────────────────────.[^]>┐<- ~ ──────────────────────────.[^]>
'n            Name       | Size |Modify time  |'n            Name       | Size |Modify time
/nfuller2                |   812|Oct  6 00:50  |/..                      |UP--DIR|Oct  5 11:38
/niccolom                |   292|Apr 20  2012  |/.cache                  |    65|Aug  1 16:37
/nickwein                |   306|Aug 29 14:32  |/.conda                  |    44|Mar 19  2018
/nidhishj                |   426|Oct  9 00:41  |/.config                 |    64|Oct  3 12:16
/nigelmic                |   217|Sep 14  2015  |/.emacs.d                |    32|Aug 13 14:55
/nikolays                |  2158|Sep 26 16:11  |/.git                    |   270|Oct  2 01:05
/nimamaso                |   108|Apr 10  2018  |/.lmod.d                 |    24|Jan 29  2016
/nimishni                |   414|May 17  2017  |/.local                  |    23|Aug  1 16:37
/ninastei                |   605|Sep  5 08:30  |/.pki                    |    23|Jul 31 18:09
/ninatymi                |  1838|May  4  2017  |/.ssh                    |   140|Aug 14 21:57
/ningjiwe                |   834|Oct  9 00:43  |/.vim                    |    75|Aug  1 14:49

/ningjiwe                                      |UP--DIR
                       871T/1699T (51%)        |                  871T/1699T (51%)
int: The file listing format can be customized; do "man mc" for details.
ningjiwe@vortex1:/user]$                                                          [^]
1Help  2Menu  3View  4Edit  5Copy  6RenMov  7Mkdir  8Delete  9PullDn  10Quit
```

```
very 2.0s: squeue -M mae -p isecc                                Tue Oct  9 00:52:29 2018

LUSTER: mae
           JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
      782997_945     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-14
      782997_946     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-16
      782997_947     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-17
      782997_940     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-13
      782997_942     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-15
      782997_944     isecc MSTB_EXP ningjiwe CG       0:01      1 cpn-p26-18
 782997_[948-999]    isecc MSTB_EXP ningjiwe PD       0:00      1 (Resources)
```

```
  1  [|          0.7%]   9  [          0.0%]  17  [|          0.7%]  25  [          0.0%]
  2  [           0.0%]  10  [          0.0%]  18  [           0.0%]  26  [          0.0%]
  3  [||         2.0%]  11  [          0.0%]  19  [||         2.6%]  27  [          0.0%]
  4  [||         1.3%]  12  [|         0.6%]  20  [           0.0%]  28  [          0.0%]
  5  [|          0.6%]  13  [|         0.6%]  21  [           0.0%]  29  [          0.0%]
  6  [|          3.3%]  14  [          0.0%]  22  [           0.0%]  30  [          0.0%]
  7  [|          0.6%]  15  [          0.0%]  23  [|          0.7%]  31  [|         0.7%]
  8  [|          0.7%]  16  [          0.0%]  24  [           0.0%]  32  [          0.0%]
  Mem[||||||||||||||||||||||||||||||||||5.84G/187G]  Tasks: 416, 662 thr; 1 running
  Swp[||                             309M/7.81G]    Load average: 0.10 0.20 0.27
                                                    Uptime: 34 days, 09:49:03

etup            Left column          Right column          Available meters
eters           CPUs (1&2/4) [Bar]   CPUs (3&4/4) [Bar]    Clock
isplay options  Memory [Bar]         Task counter [Text]   Load averages: 1 minute, 5 minutes, 15 minutes
olors           Swap [Bar]           Load average [Text]   Load: average of ready processes in the last minute
olumns                               Uptime [Text]         Memory
                                                           Swap

                                                  "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
no IPv6 | 41.4 GiB | W: ( 52% at WGCloud) 192.168.0.16 | E: down | No battery | 0.79 | 2018-10-09 00:50:30 EN
```

💪 call me Linux server ninja warrior

Toolset:

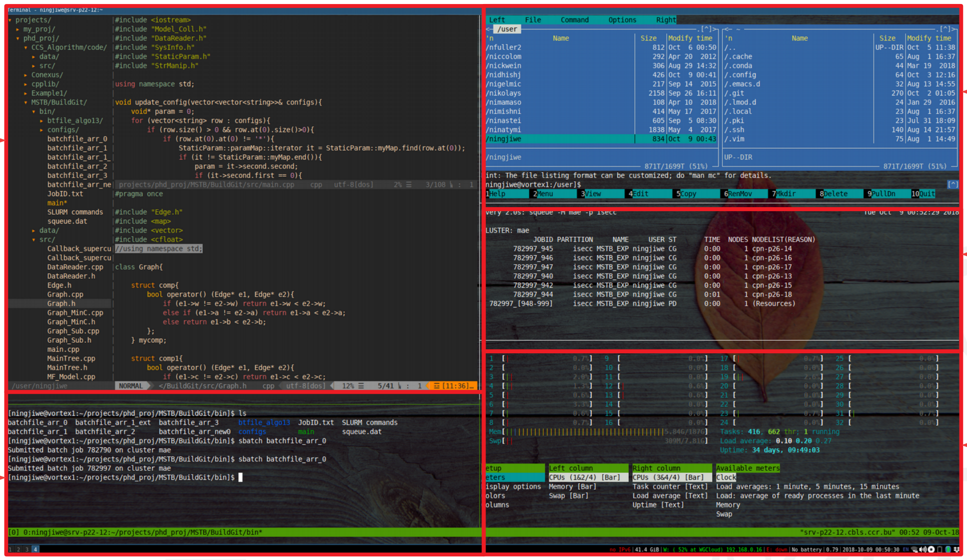
- Text Editor: Vim
- File Manger: Midnight Commander
- Resources monitor: Htop
- Console Debugger: gdb, jdb, pdb ...
- Many other tools...

The flow:

- Introduce basic functionality

Remember Our Goal

After the workshop



```
Terminal - ningjiwe@srv-p22-12:~
▾ projects/                   |#include <iostream>
  ▸ my_proj/                  |#include "Model_Coll.h"
  ▾ phd_proj/                 |#include "DataReader.h"
    ▾ CCS_Algorithm/code/     |#include "SysInfo.h"
      ▸ data/                 |#include "StaticParam.h"
      ▸ src/                  |#include "StrManip.h"
    ▸ Conexus/                |
    ▸ cpplib/                 |using namespace std;
    ▸ Example1/               |
    ▾ MSTB/BuildGit/          |void update_config(vector<vector<string>>& configs){
      ▾ bin/                  |    void* param = 0;
        ▸ btfile_algo13/      |    for (vector<string> row : configs){
        ▸ configs/            |        if (row.size() > 0 && row.at(0).size()>0){
          batchfile_arr_0     |            if (row.at(0).at(0) != '*'){
          batchfile_arr_1     |                StaticParam::paramMap::iterator it = StaticParam::myMap.find(row.at(0));
          batchfile_arr_1_    |                if (it != StaticParam::myMap.end()){
          batchfile_arr_2     |                    param = it->second.second;
          batchfile_arr_3     |                    if (it->second.first == 0){
          batchfile_arr_ne    | projects/phd_proj/MSTB/BuildGit/src/main.cpp   cpp   utf-8[dos]   2% ☰   3/108 ㏑ :  1
          JobID.txt           |#pragma once
          main*               |
          SLURM commands      |#include "Edge.h"
          squeue.dat          |#include <map>
      ▸ data/                 |#include <vector>
      ▾ src/                  |#include <cfloat>
          Callback_supercu    |//using namespace std;
          Callback_supercu    |
          DataReader.cpp      |class Graph{
          DataReader.h        |
          Edge.h              |    struct comp{
          Graph.cpp           |        bool operator() (Edge* e1, Edge* e2){
          Graph.h             |            if (e1->w != e2->w) return e1->w < e2->w;
          Graph_MinC.cpp      |            else if (e1->a != e2->a) return e1->a < e2->a;
          Graph_MinC.h        |            else return e1->b < e2->b;
          Graph_Sub.cpp       |        };
          Graph_Sub.h         |    } mycomp;
          main.cpp            |
          MainTree.cpp        |    struct comp1{
          MainTree.h          |        bool operator() (Edge* e1, Edge* e2){
          MF_Model.cpp        |            if (e1->c != e2->c) return e1->c < e2->c;
 /user/ningjiwe                 NORMAL  </BuildGit/src/Graph.h   cpp  utf-8[dos]  12% ☰   5/41 ㏑ :  1  ☲ [11:36]…
```

```
 Left     File     Command     Options     Right
<- /user ----------------------------------.[^]>  <- ~ ------------------------------------.[^]>
'n              Name             Size |Modify time  'n              Name            Size |Modify time
/nfuller2                         812 |Oct  6 00:50 /..                           UP--DIR|Oct  5 11:38
/niccolom                         292 |Apr 20  2012 /.cache                            65|Aug  1 16:37
/nickwein                         306 |Aug 29 14:32 /.conda                            44|Mar 19  2018
/nidhishj                         426 |Oct  9 00:41 /.config                           64|Oct  3 12:16
/nigelmic                         217 |Sep 14  2015 /.emacs.d                          32|Aug 13 14:55
/nikolays                        2158 |Sep 26 16:11 /.git                             270|Oct  2 01:05
/nimamaso                         108 |Apr 10  2018 /.lmod.d                           24|Jan 29  2016
/nimishni                         414 |May 17  2017 /.local                            23|Aug  1 16:37
/ninastei                         605 |Sep  5 08:30 /.pki                              23|Jul 31 18:09
/ninatymi                        1838 |May  4  2017 /.ssh                             140|Aug 14 21:57
/ningjiwe                         834 |Oct  9 00:43 /.vim                              75|Aug  1 14:49

/ningjiwe                                           UP--DIR
                        871T/1699T (51%)                                  871T/1699T (51%)
int: The file listing format can be customized; do "man mc" for details.
ningjiwe@vortex1:/user]$                                                                    [^]
1Help   2Menu   3View   4Edit   5Copy   6RenMov   7Mkdir   8Delete   9PullDn   10Quit
```

```
very 2.0s: squeue -M mae -p isecc                                          Tue Oct  9 00:52:29 2018

LUSTER: mae
          JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
     782997_945     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-14
     782997_946     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-16
     782997_947     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-17
     782997_940     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-13
     782997_942     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-15
     782997_944     isecc MSTB_EXP ningjiwe CG       0:01      1 cpn-p26-18
 782997_[948-999]   isecc MSTB_EXP ningjiwe PD       0:00      1 (Resources)
```

```
  1  [|          0.7%]   9  [          0.0%]   17 [|          0.7%]   25 [          0.0%]
  2  [           0.0%]   10 [          0.0%]   18 [           0.0%]   26 [          0.0%]
  3  [||         2.0%]   11 [          0.0%]   19 [||         2.6%]   27 [          0.0%]
  4  [||         1.3%]   12 [|         0.6%]   20 [           0.0%]   28 [          0.0%]
  5  [|          0.6%]   13 [|         0.6%]   21 [           0.0%]   29 [          0.0%]
  6  [|          3.3%]   14 [          0.0%]   22 [           0.0%]   30 [          0.0%]
  7  [|          0.6%]   15 [          0.0%]   23 [|          0.7%]   31 [|         0.7%]
  8  [|          0.7%]   16 [          0.0%]   24 [           0.0%]   32 [          0.0%]
  Mem[||||||||||||||||||||||||||||||||||||||5.84G/187G]   Tasks: 416, 662 thr; 1 running
  Swp[||                                 309M/7.81G]   Load average: 0.10 0.20 0.27
                                                       Uptime: 34 days, 09:49:03

etup             Left column            Right column            Available meters
eters            CPUs (1&2/4) [Bar]     CPUs (3&4/4) [Bar]      Clock
isplay options   Memory [Bar]           Task counter [Text]     Load averages: 1 minute, 5 minutes, 15 minutes
olors            Swap [Bar]             Load average [Text]     Load: average of ready processes in the last minute
olumns                                  Uptime [Text]           Memory
                                                                Swap
```

```
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ ls
batchfile_arr_0  batchfile_arr_1_ext  batchfile_arr_3     btfile_algo13  JobID.txt  SLURM commands
batchfile_arr_1  batchfile_arr_2      batchfile_arr_new0  configs        main       squeue.dat
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782790 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ sbatch batchfile_arr_0
Submitted batch job 782997 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ █

[0] 0:ningjiwe@srv-p22-12:~/projects/phd_proj/MSTB/BuildGit/bin*            "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
1 2 3 4      no IPv6 | 41.4 GiB | W: ( 52% at WGCloud) 192.168.0.16 | E: down | No battery | 0.79 | 2018-10-09 00:50:30 EN
```

call me Linux server ninja warrior

Toolset:

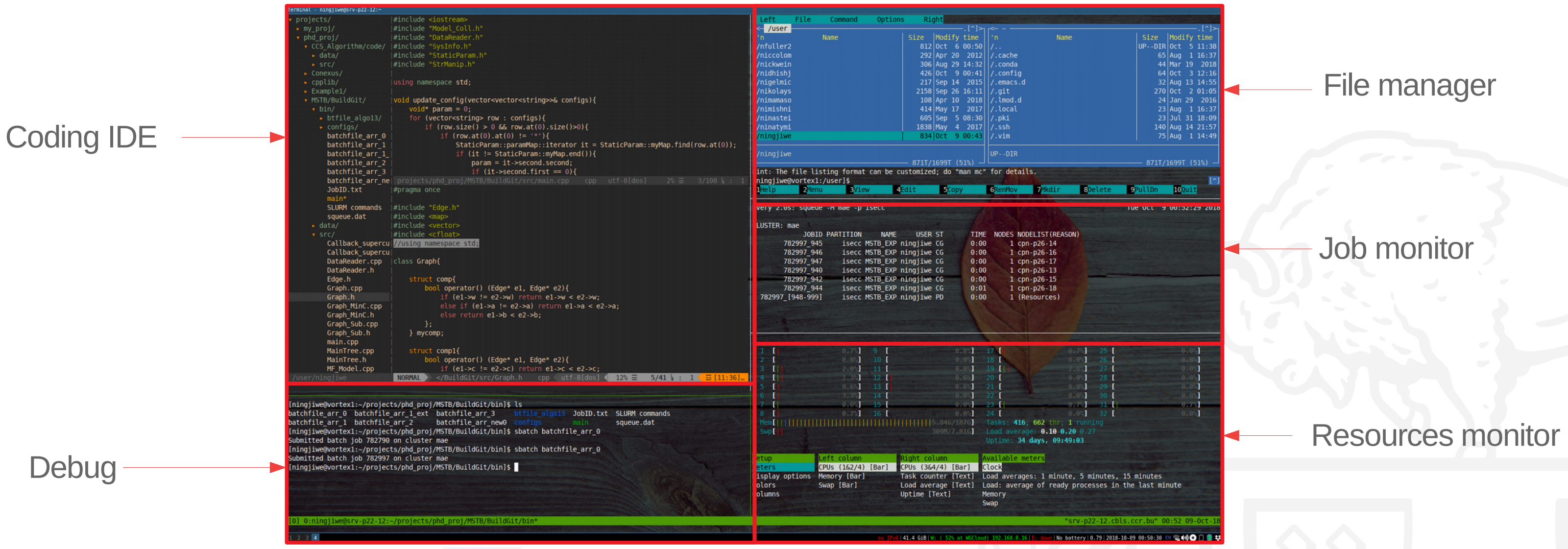
- Text Editor: Vim
- File Manger: Midnight Commander
- Resources monitor: Htop
- Console Debugger: gdb, jdb, pdb ...
- Many other tools...

The flow:

- Introduce basic functionality
- Demonstrate the potential

Remember Our Goal

After the workshop



```
Terminal - ningjiwe@srv-p22-12:~
▾ projects/                  |#include <iostream>
  ▸ my_proj/                 |#include "Model_Coll.h"
  ▾ phd_proj/                |#include "DataReader.h"
    ▾ CCS_Algorithm/code/    |#include "SysInfo.h"
      ▸ data/                |#include "StaticParam.h"
      ▸ src/                 |#include "StrManip.h"
    ▸ Conexus/               |
    ▸ cpplib/                |using namespace std;
    ▸ Example1/              |
    ▾ MSTB/BuildGit/         |void update_config(vector<vector<string>>& configs){
      ▾ bin/                 |    void* param = 0;
        ▸ btfile_algo13/     |    for (vector<string> row : configs){
        ▸ configs/           |        if (row.size() > 0 && row.at(0).size()>0){
          batchfile_arr_0    |            if (row.at(0).at(0) != '*'){
          batchfile_arr_1    |                StaticParam::paramMap::iterator it = StaticParam::myMap.find(row.at(0));
          batchfile_arr_1_   |                if (it != StaticParam::myMap.end()){
          batchfile_arr_2    |                    param = it->second.second;
          batchfile_arr_3    |                    if (it->second.first == 0){
          batchfile_arr_ne   | projects/phd_proj/MSTB/BuildGit/src/main.cpp   cpp   utf-8[dos]    2% ☰   3/108 ㏑ :  1
          JobID.txt          |#pragma once
          main*              |
          SLURM commands     |#include "Edge.h"
          squeue.dat         |#include <map>
      ▸ data/                |#include <vector>
      ▾ src/                 |#include <cfloat>
          Callback_supercu   |//using namespace std;
          Callback_supercu   |
          DataReader.cpp     |class Graph{
          DataReader.h       |
          Edge.h             |    struct comp{
          Graph.cpp          |        bool operator() (Edge* e1, Edge* e2){
          Graph.h            |            if (e1->w != e2->w) return e1->w < e2->w;
          Graph_MinC.cpp     |            else if (e1->a != e2->a) return e1->a < e2->a;
          Graph_MinC.h       |            else return e1->b < e2->b;
          Graph_Sub.cpp      |        };
          Graph_Sub.h        |    } mycomp;
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 /user/ningjiwe               NORMAL > </BuildGit/src/Graph.h   cpp < utf-8[dos] < 12% ☰   5/41 ㏑ :  1 < ☲ [11:36]…
```

```
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ ls
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Submitted batch job 782997 on cluster mae
[ningjiwe@vortex1:~/projects/phd_proj/MSTB/BuildGit/bin]$ █

[0] 0:ningjiwe@srv-p22-12:~/projects/phd_proj/MSTB/BuildGit/bin*
1 2 3 4
```

```
 Left     File     Command     Options     Right
<- /user ─────────────────────────.[^]>┐<- ~ ──────────────────────────.[^]>
'n           Name        │ Size │Modify time  'n           Name       │  Size │Modify time
/nfuller2                │  812 │Oct  6 00:50 /..                     │UP--DIR│Oct  5 11:38
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/nickwein                │  306 │Aug 29 14:32 /.conda                 │    44 │Mar 19  2018
/nidhishj                │  426 │Oct  9 00:41 /.config                │    64 │Oct  3 12:16
/nigelmic                │  217 │Sep 14  2015 /.emacs.d               │    32 │Aug 13 14:55
/nikolays                │ 2158 │Sep 26 16:11 /.git                   │   270 │Oct  2 01:05
/nimamaso                │  108 │Apr 10  2018 /.lmod.d                │    24 │Jan 29  2016
/nimishni                │  414 │May 17  2017 /.local                 │    23 │Aug  1 16:37
/ninastei                │  605 │Sep  5 08:30 /.pki                   │    23 │Jul 31 18:09
/ninatymi                │ 1838 │May  4  2017 /.ssh                   │   140 │Aug 14 21:57
/ningjiwe                │  834 │Oct  9 00:43 /.vim                   │    75 │Aug  1 14:49

/ningjiwe                                     UP--DIR
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```
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   782997_946     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-16
   782997_947     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-17
   782997_940     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-13
   782997_942     isecc MSTB_EXP ningjiwe CG       0:00      1 cpn-p26-15
   782997_944     isecc MSTB_EXP ningjiwe CG       0:01      1 cpn-p26-18
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```

```
  1  [|          0.7%]   9  [           0.0%]   17  [|          0.7%]   25  [           0.0%]
  2  [           0.0%]   10 [           0.0%]   18  [           0.0%]   26  [           0.0%]
  3  [||         2.0%]   11 [           0.0%]   19  [||         2.6%]   27  [           0.0%]
  4  [||         1.3%]   12 [|          0.6%]   20  [           0.0%]   28  [           0.0%]
  5  [|          0.6%]   13 [|          0.6%]   21  [           0.0%]   29  [           0.0%]
  6  [|          3.3%]   14 [           0.0%]   22  [           0.0%]   30  [           0.0%]
  7  [|          0.6%]   15 [           0.0%]   23  [|          0.7%]   31  [|          0.7%]
  8  [|          0.7%]   16 [           0.0%]   24  [           0.0%]   32  [           0.0%]
  Mem[||||||||||||||||||||||||||||||||||||||||5.84G/187G]   Tasks: 416, 662 thr; 1 running
  Swp[||                                      309M/7.81G]   Load average: 0.10 0.20 0.27
                                                            Uptime: 34 days, 09:49:03

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olors           Swap [Bar]              Load average [Text]   Load: average of ready processes in the last minute
olumns                                  Uptime [Text]         Memory
                                                              Swap

                                                   "srv-p22-12.cbls.ccr.bu" 00:52 09-Oct-18
no IPv6 | 41.4 GiB | W: ( 52% at WGCloud) 192.168.0.16 | E: down | No battery | 0.79 | 2018-10-09 00:50:30 EN
```

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- Demonstrate the potential
- Given the link for full introduction