

ZSIM TUTORIAL

Configuration and Stats

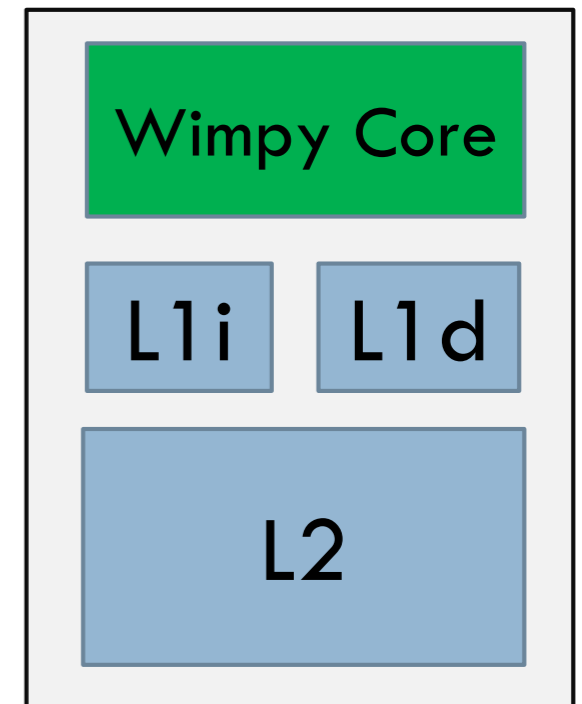
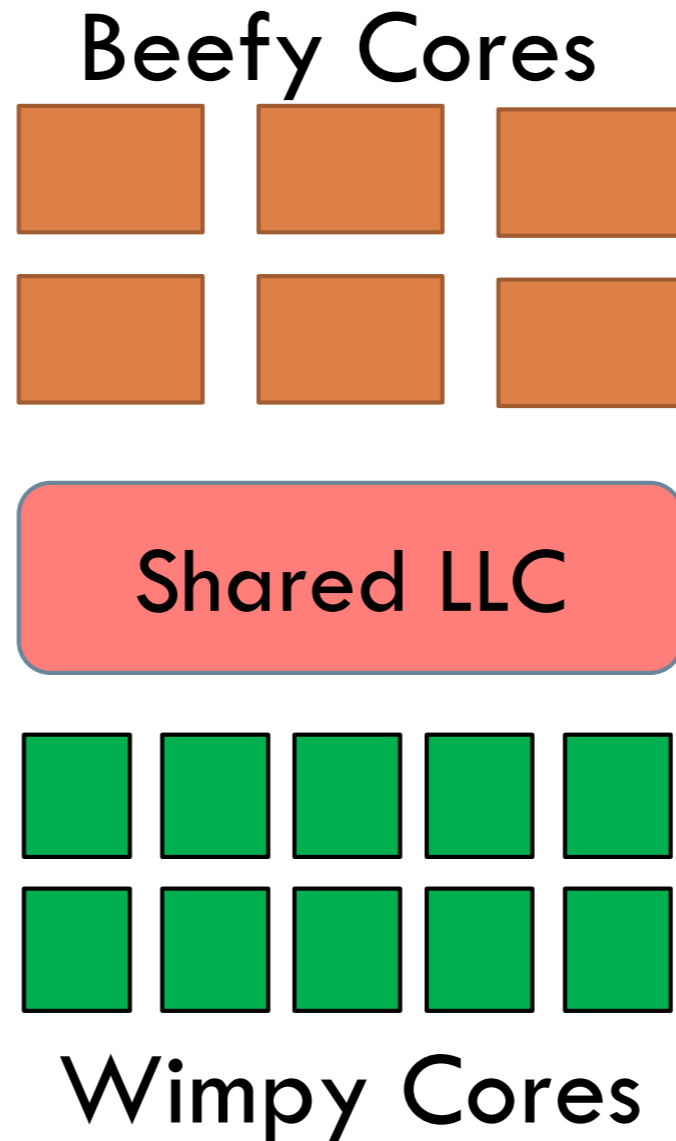
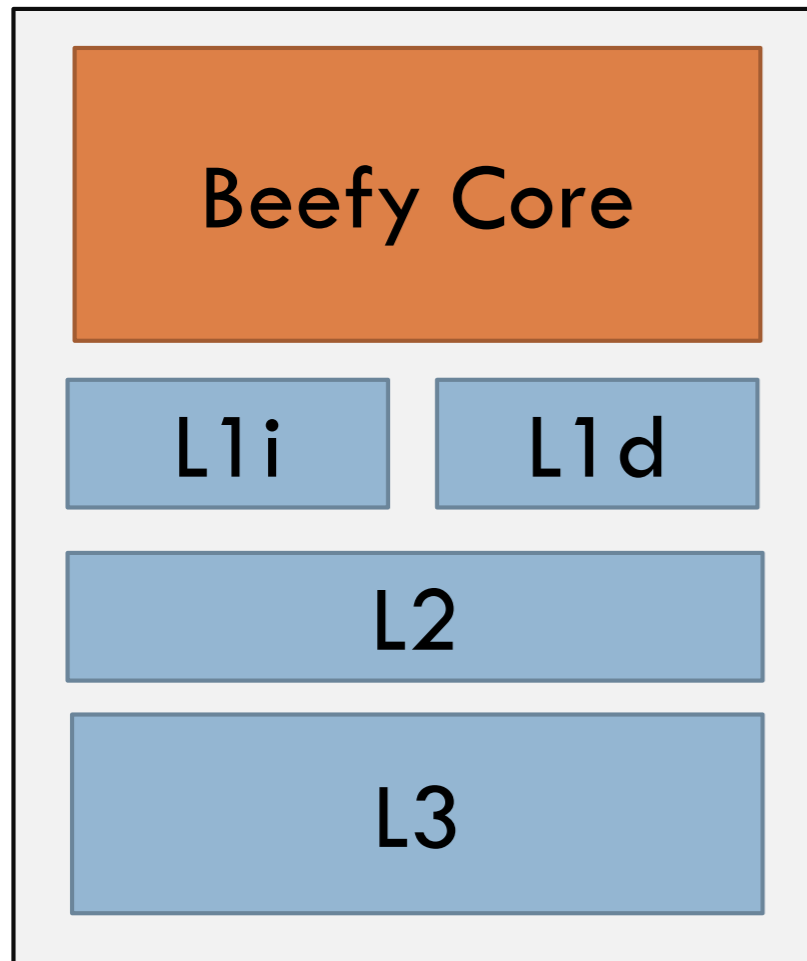


**Massachusetts
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Configuration

- What system configuration does zsim simulate?
- Type and number of cores, caches, how different components are connected to each other.



Configuration files

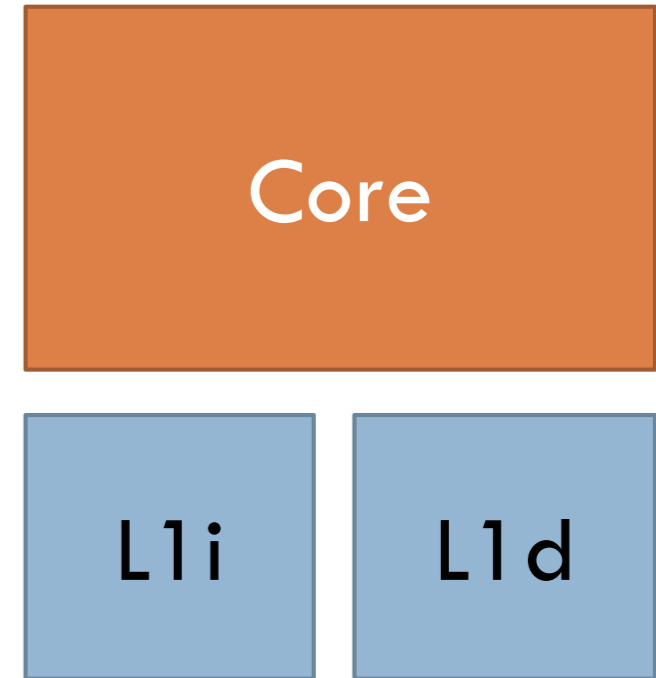
Configuration files use XML like syntax, but much simpler

3 Main components

- **System** - Cores, caches and main memory
- **Processes** - Applications to simulate
- **Simulation** - Miscellaneous simulator knobs
 - Ex. Stats, logging

System Config: Cores

```
cores = {  
    simpleCore = {  
        cores = 1;  
        type = "Simple";  
        icache = "l1i";  
        dcache = "l1d";  
    };  
};
```



Caches And Memory

```
 caches = {
     l1i = {
         size = 32768;
     };
     l1d = {
         size = 65536;
     };
     l2 = {
         size = 2097152;
         children = "l1i | l1d"; # Connect l2 to l1i and lid
     };
 };
 mem = {
     type= "DDR";
 };
```



Process Config

```
process0 = {  
    command = "./helloworld";  
    env = "PATH=/home/usr/bin/";  
    startFastForwarded = True;  
    ffiPoints = "10000000 20000000";  
};
```

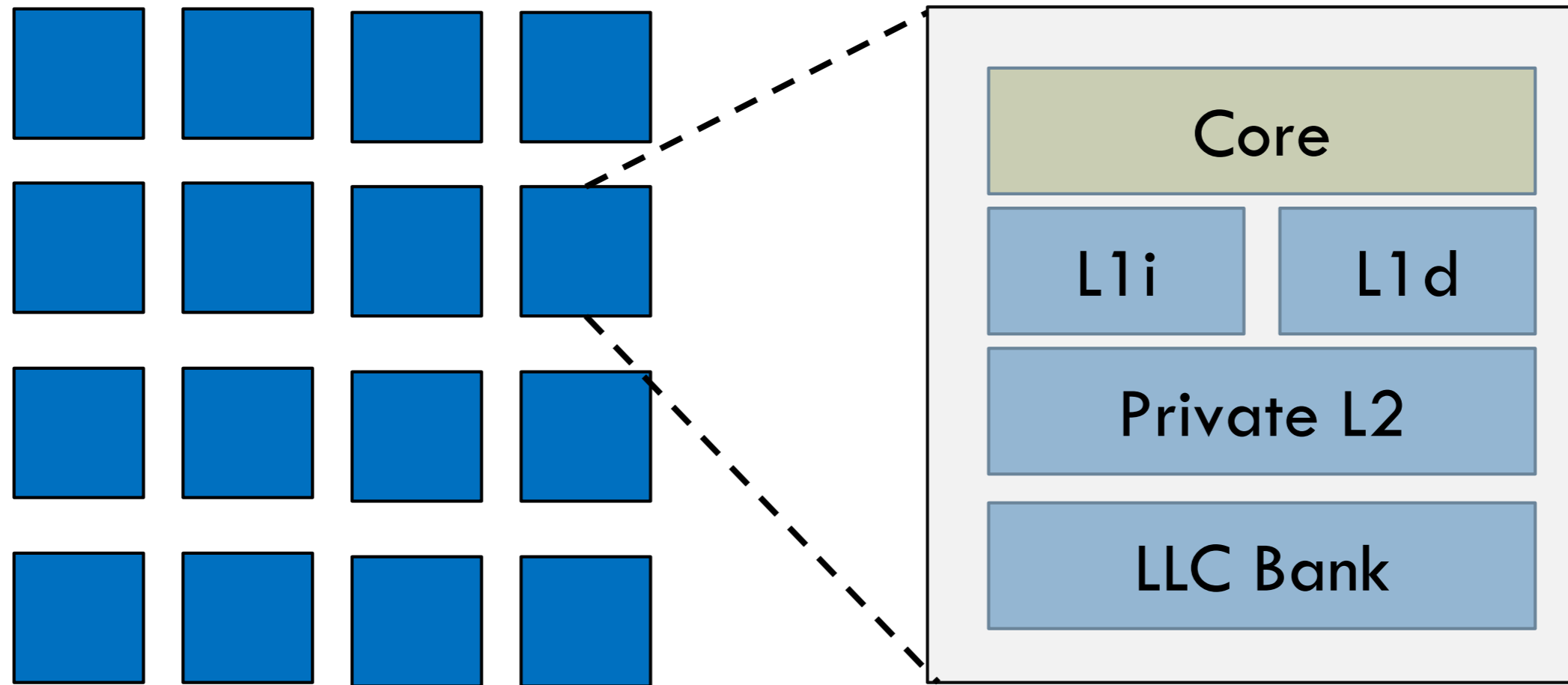
```
process1 {  
    .....  
};
```

```
process2 {  
    .....  
};
```

Simulation Config

```
sim = {  
    phaseLength = 10000; # Cycles  
    maxTotalInstrs = 100000000000;  
    logToFile = True;  
}
```

16 Core Tiled Processor



Changes To Single Core Config

9

- Change no. of instances of core and private caches.
- Other parameters remain the same.

```
simpleCore = {  
    cores = 16;  
    type = "Simple";  
    icache = "icache";  
    dcache = "dcache";  
}
```

```
l1i = {  
    caches = 16;  
    size = 32768;  
}
```

Similarly for l1d and l2

Add Banked L3

```
l3 = {  
    caches = 1;  
    banks = 16;  
    children = "l2";  
    size = 8386608; # 8MB total across all banks  
    nuca = {  
        type = "Static";  
    };  
};  
networkFile = "net-16-4x4-tiles.txt"
```

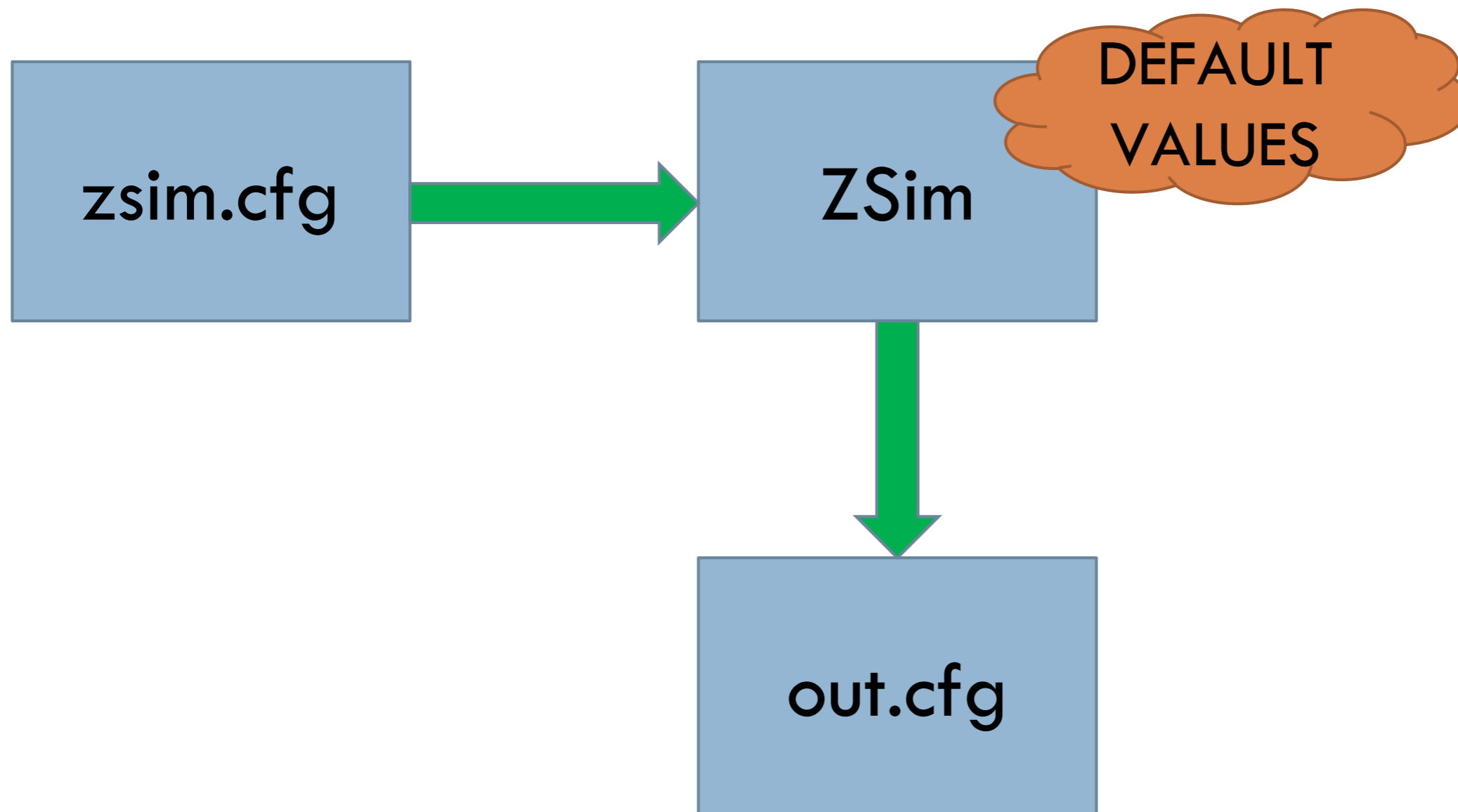
- ▣ Network file lists on-chip latency between tiles

tile0 tile7 10

tile0 tile10 13

Debugging

- All configuration variables needed by ZSim have default values.
- The values for all variables used by ZSim in a given simulation(including default values) are dumped to **out.cfg**

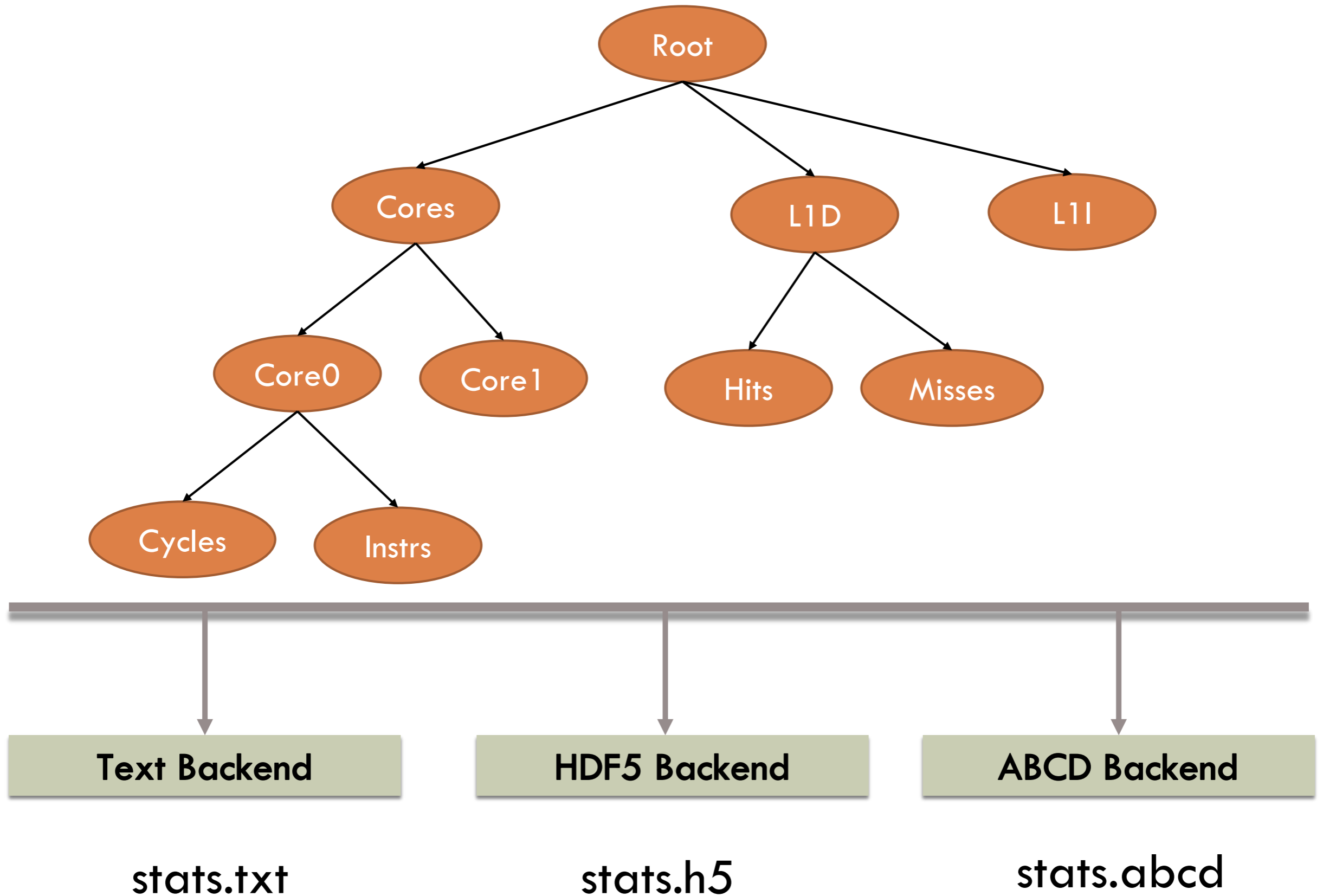


- Stats organization
- Analyzing stats
- Adding new stats

- Decouple stats collection and stats output.
- Create all stats objects during initialization.
- Use different backends to output these stats in desired formats.

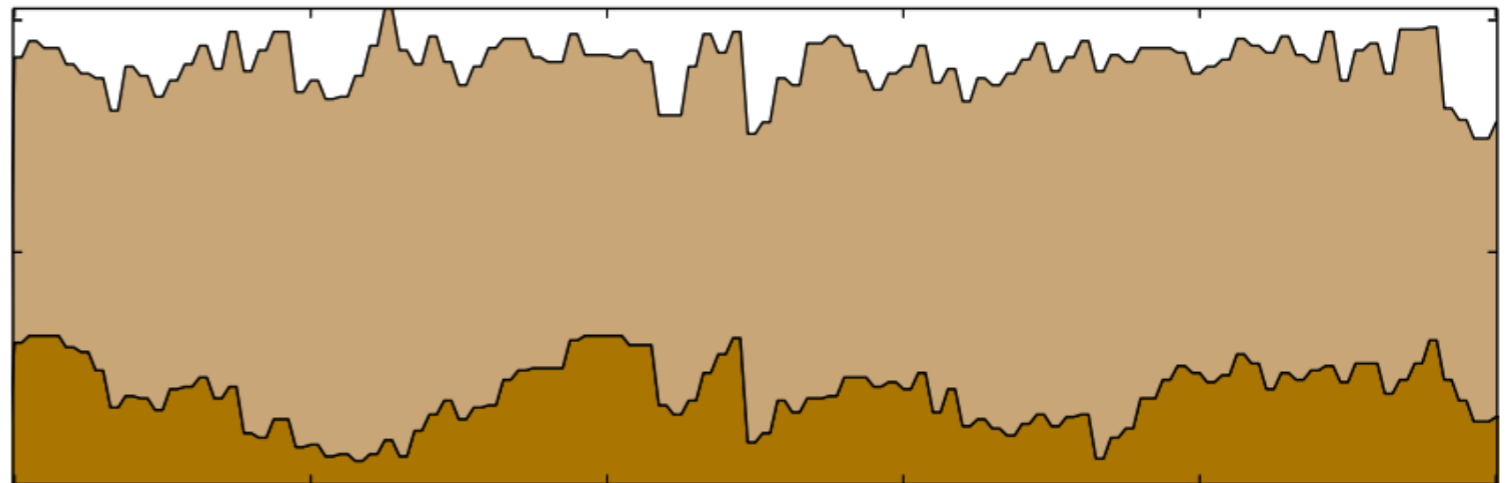
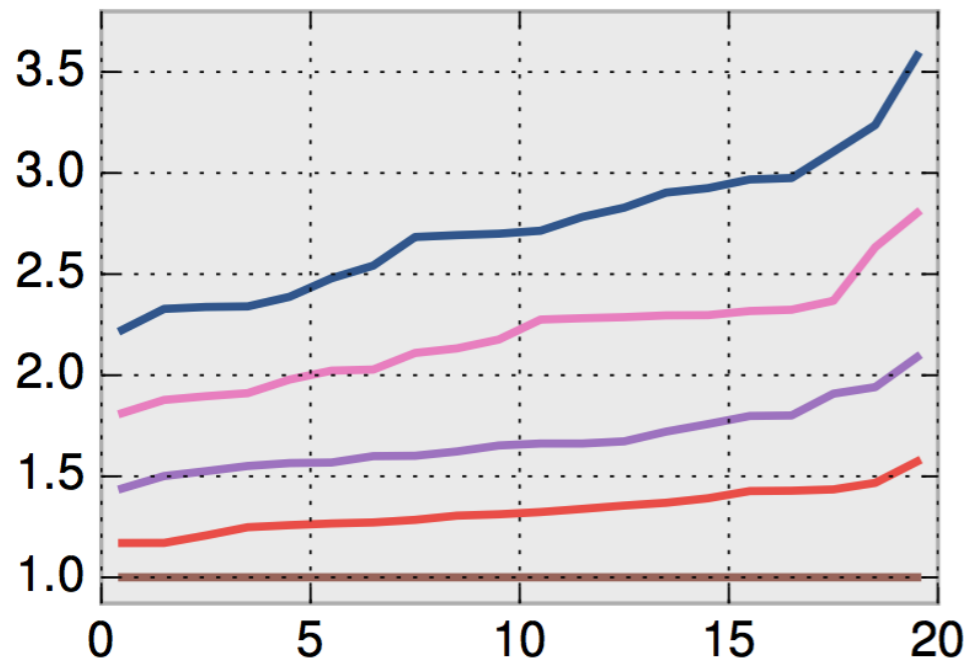
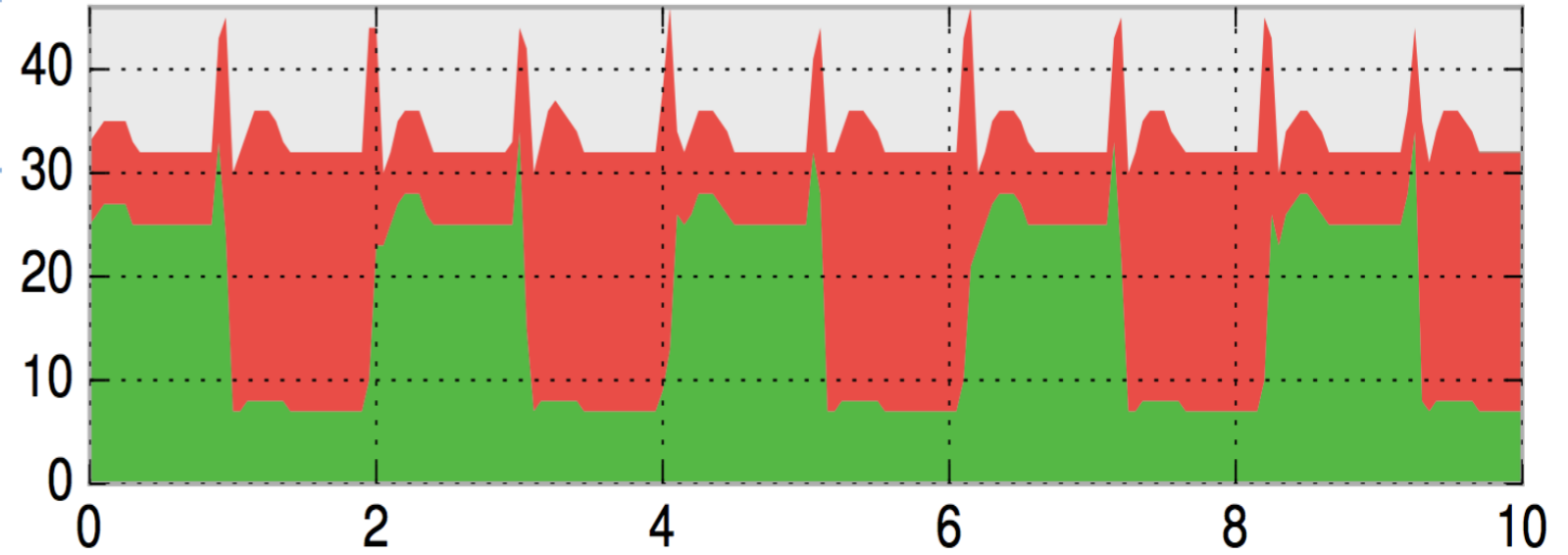
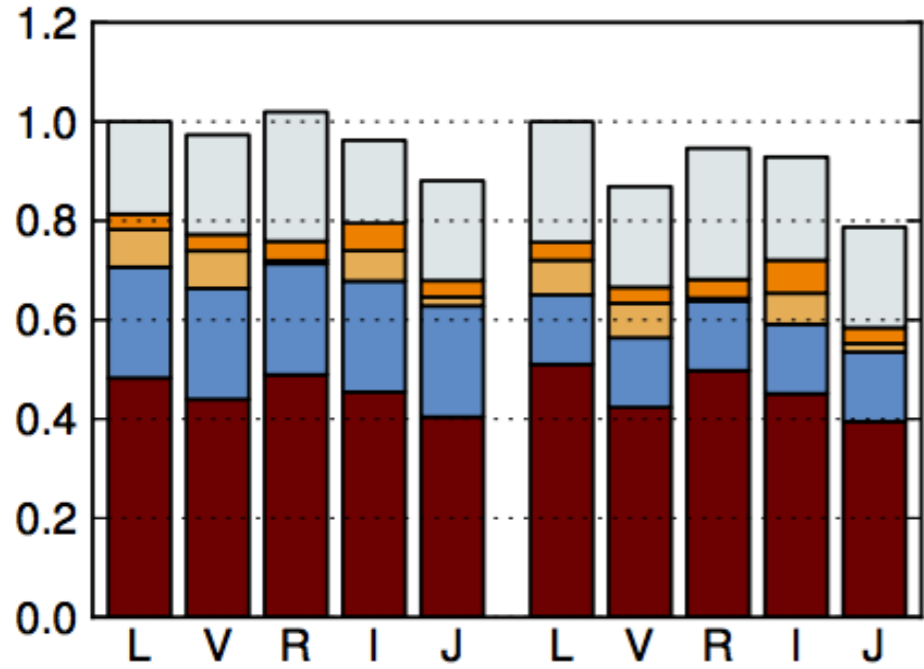
- Fixed sized stats output
 - ▣ All the supported stats types are fixed size.
 - ▣ New stats cannot be added after initialization.

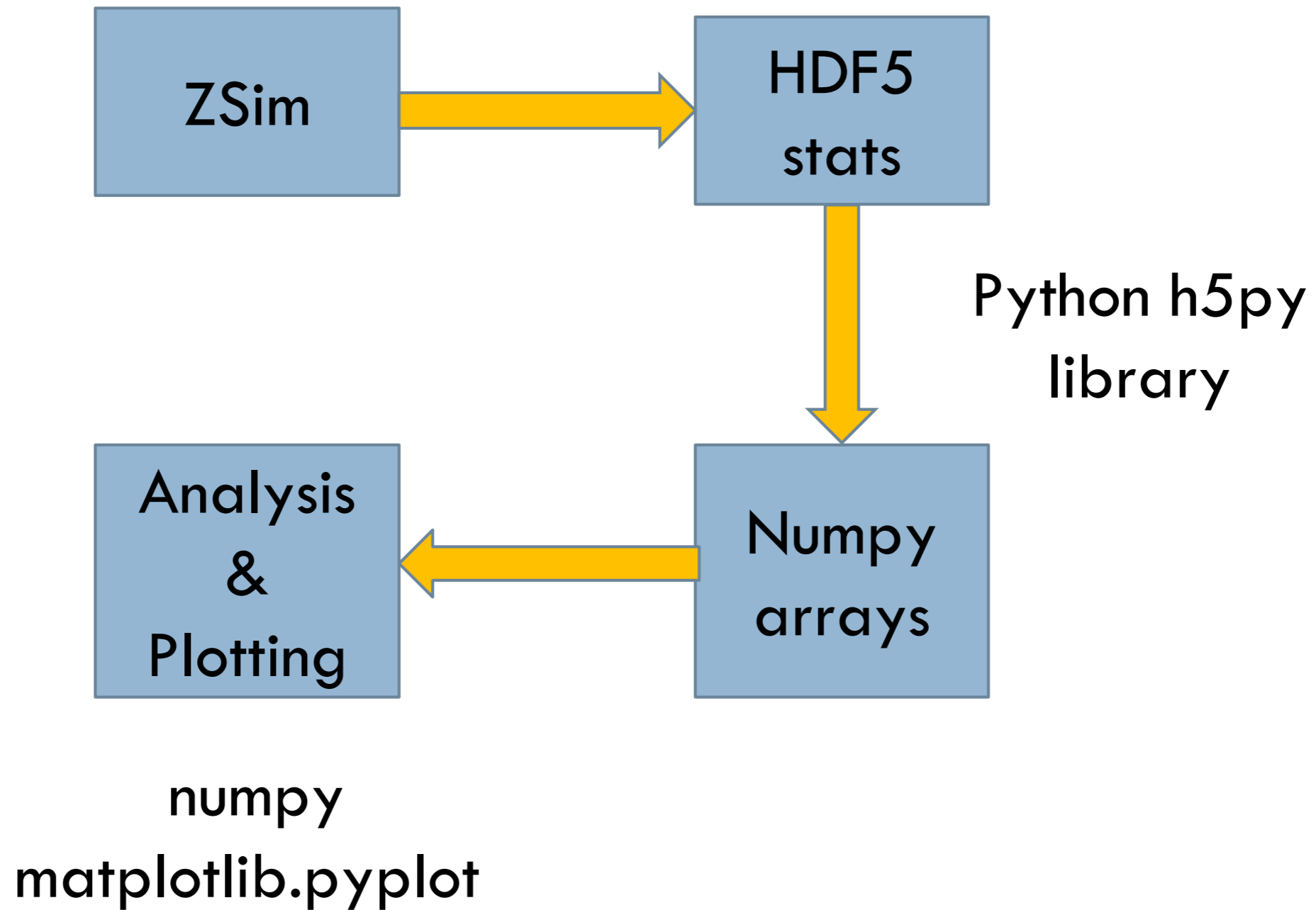
Stats organization



- We support multiple backends that traverse the stats tree and dump the output.
- ZSim has two kinds of backends.
 - ▣ Text backend: Prints out a hierarchical listing of all simulator stats.
 - zsim.out
 - ▣ Hdf5 backend: Dumps stats in hdf5 file format.
 - zsim-ev.h5: Eventual stats
 - zsim.h5: Periodic stats

Stats and Plots





Basic Stats

```
import h5py
import numpy as np

f = h5py.File('zsim-ev.h5', 'r')

dset = f["stats"]["root"]

stats = dset[-1]

phases = stats['phase']

coreStats = stats['core']
totalInstrs = coreStats['instrs']
totalCycles = coreStats['cycles']

ipc= (1. * totalInstrs)/totalCycles
```

ZSim dumps stats periodically in zsim.h5.

Example 1: L2 hits at the end of 200th stats dump

```
sample = dset[200]
```

```
L2Hits = sample['L2']['hGETS'] + sample['L2']['hGETX']
```

Example 2: Average IPC between 100th and 200th stats dump

```
instrs = dset[200]['core']['instrs'] - dset[100]['core']['instrs']
```

```
cycles = dset[100]['core']['cycles'] - dset[100]['core']['cycles']
```

```
ipc = (1. * instrs)/cycles
```

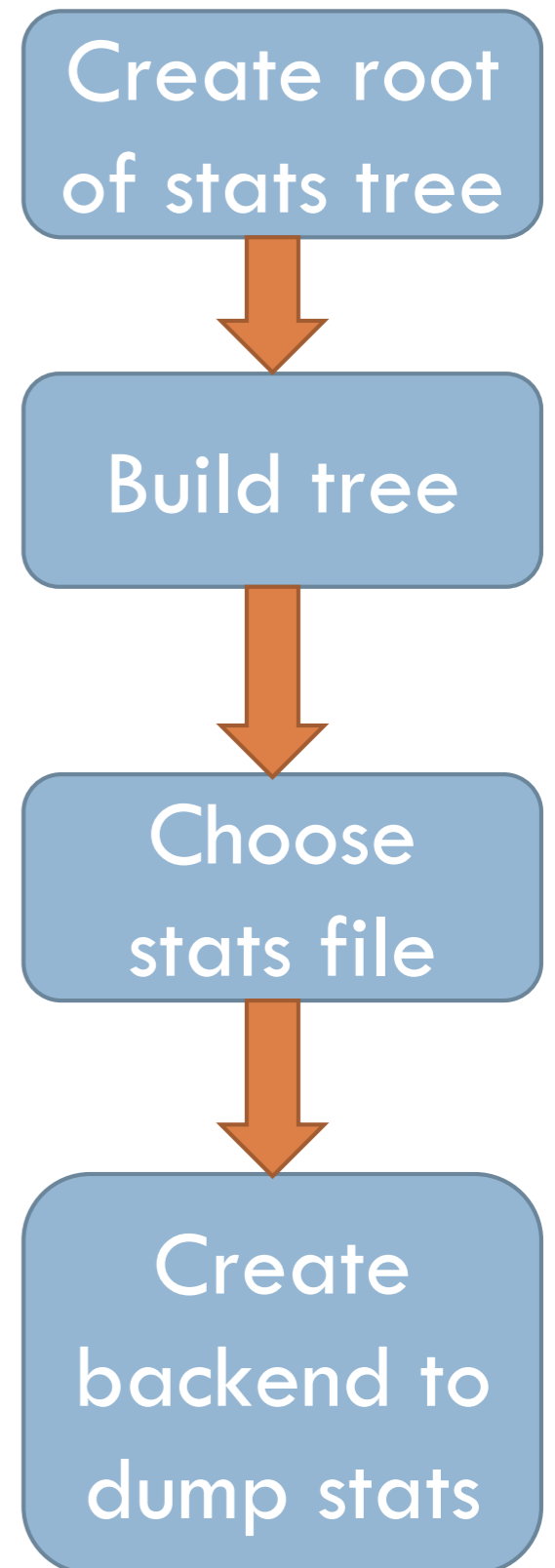
Adding new stats

```
AggregateStat* rootStat = new AggregateStat();  
rootStat->init("root", "my stats");
```

```
ProxyStat* phaseStat = new ProxyStat();  
phaseStat->init("phase", "Phase", &zinfo->numPhases);  
rootStat->append(phaseStat);
```

```
std::string statsFile = zinfo->outputDir;  
statsFile += "/mystats.h5";
```

```
stats = new HDF5Backend(gm_strdup(statsFile.c_str()),  
                        rootStat, 1<<17, false, false);  
zinfo->statsBackends->push_back(stats);
```



DEMO

THANK YOU
QUESTIONS?