Intermediate HTCondor: More Workflows

Monday pm

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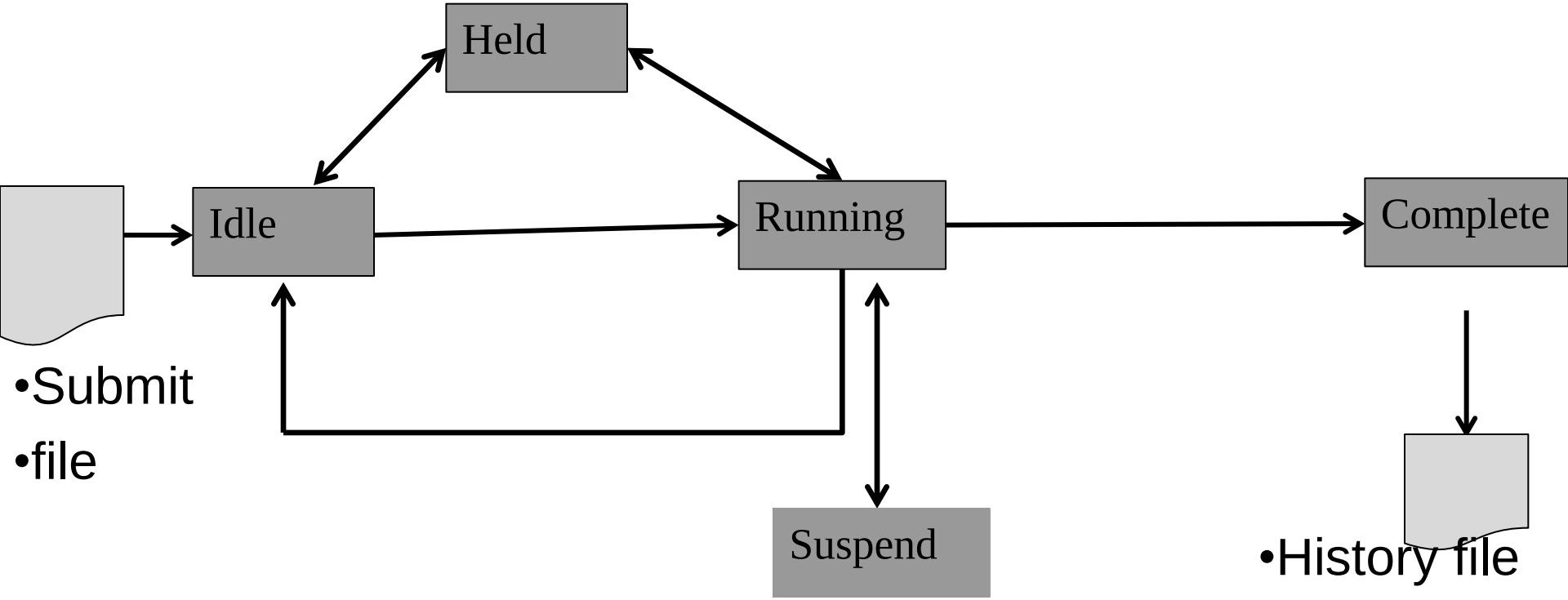
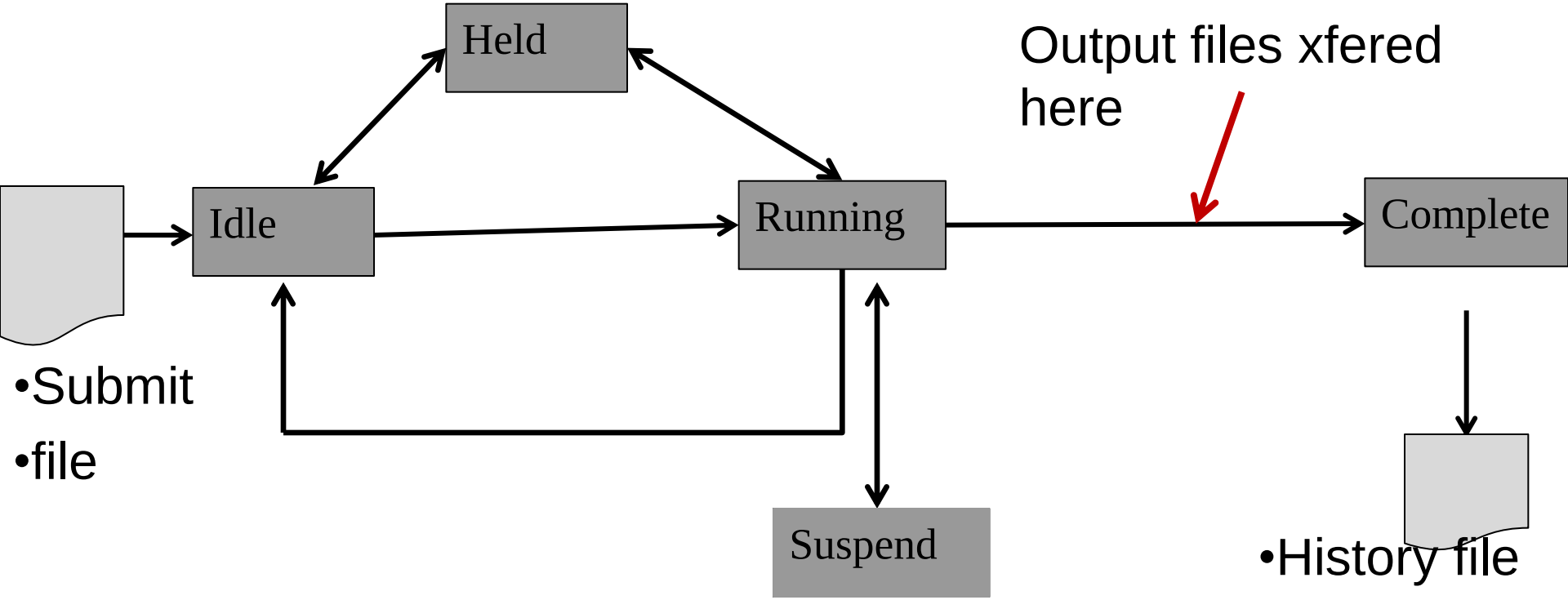
Before we begin…

- Any questions on the lectures or exercises up to this point?

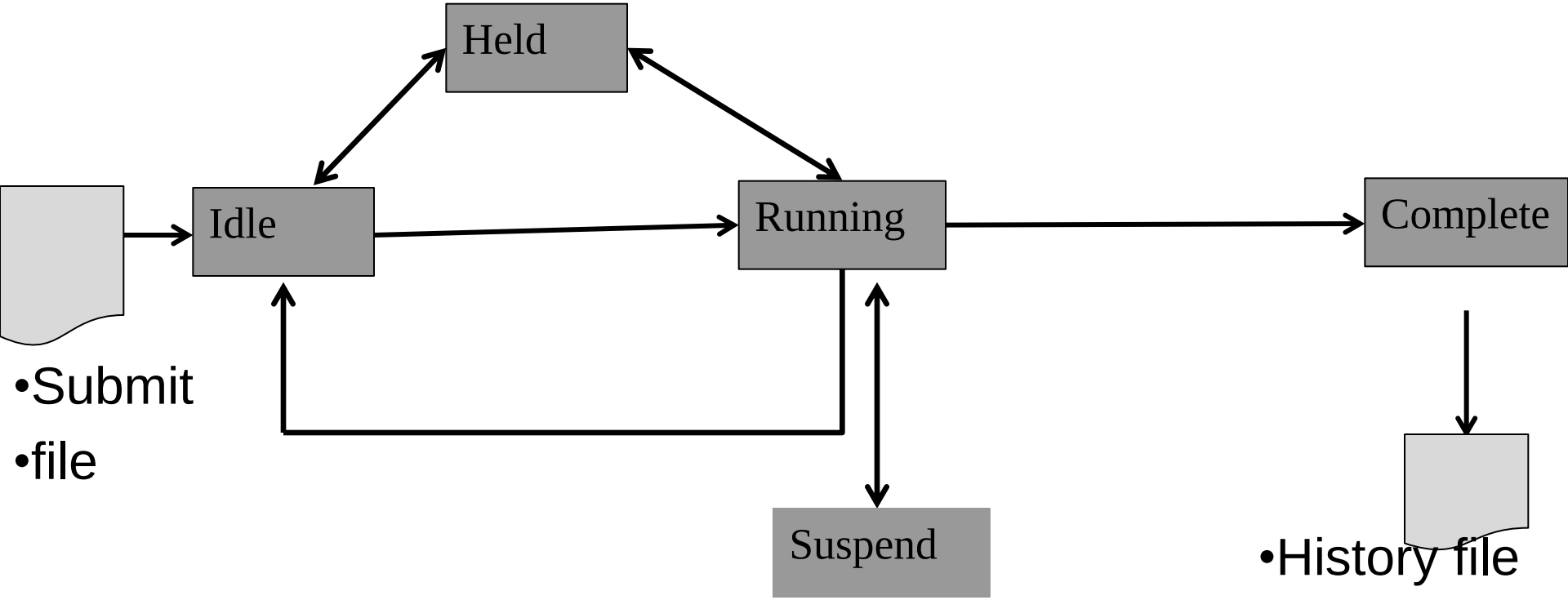
Life cycle of HTCondor Job



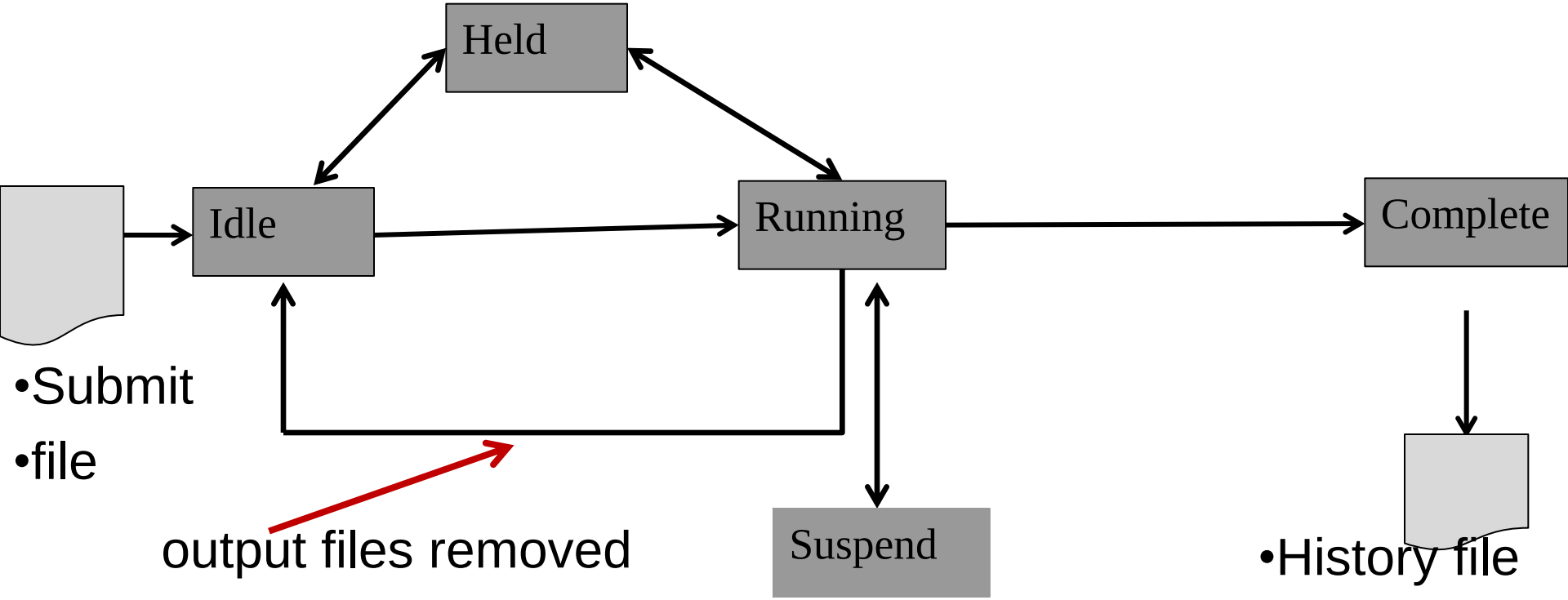
Life cycle of HTCondor Job



What about long running job?



What about long running job?



WHEN_TO_TRANSFER_OUTPUT

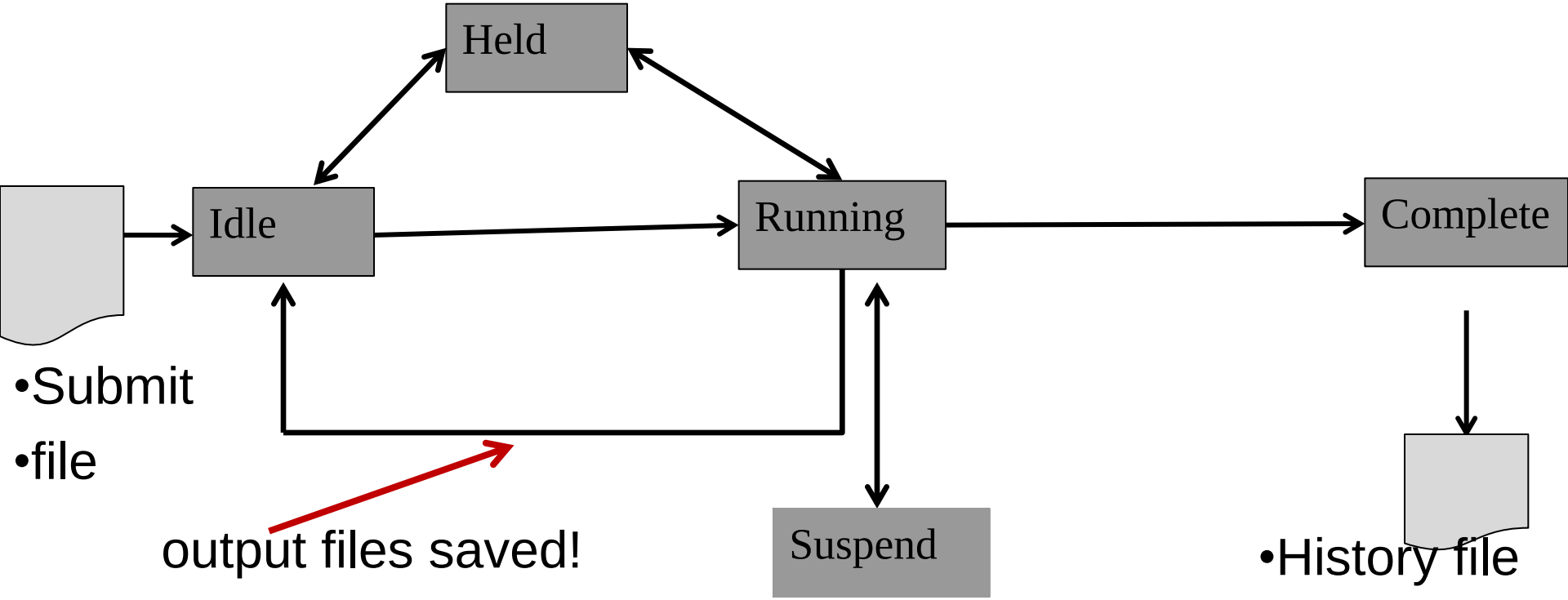
```
Universe = vanilla
Executable = gronk

should_transfers_files = yes
WHEN_TO_TRANSFER_OUTPUT = ON_EXIT_OR_EVICT

Arguments = $(OUTPUT)

queue
```

ON_EXIT_OR_EVICT



Advanced DAGMan Tricks

- DAGMan Variables
- DAGs without dependencies
- Throttles
- Sub-DAGs
- Retries
- Pre and Post scripts: editing your DAG
- SPLICEs: DAGs as subroutines

Throttles

- Throttles to control job submissions
  - Max jobs idle
    - `condor_submit_dag -maxidle XX work.dag`
  - `Max_jobs_submitted`
  - Max scripts running
    - `condor_submit_dag -maxpre XX -maxpost XX`
- Useful for “big bag of tasks”
  - Schedd holds everything in memory

DAGMan variables

```
# Diamond dag
Job A a.sub
Job B b.sub
Job C c.sub
Job D d.sub

Parent A Child B C
Parent B C Child D
```

DAGMan variables (Cont)

```
# Diamond dag
Job A a.sub
Job B a.sub
Job C a.sub
Job D a.sub

VARS A OUTPUT="A.out"
VARS B OUTPUT="B.out"
VARS C OUTPUT="C.out"
VARS D OUTPUt="D.out"

Parent A Child B C
Parent B C Child D
```

DAGMan variables (cont)

```
# a.sub
Universe = vanilla
Executable = gronk

Arguments = $(OUTPUT)

queue
```

Retries

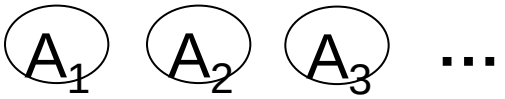
Failed nodes can be automatically retried a configurable number of times

- Helps when jobs randomly crash

```
Job A a.sub
Job B b.sub
Job C c.sub
Job D d.sub
RETRY D 5
Parent A Child B C
Parent B C Child D
```

DAGs without dependencies

- Submit DAG with:
  - 200,000 nodes
  - No dependencies



- Use DAGMan to throttle the job submissions:
  - HTCondor is scalable, but it will have problems if you submit 200,000 jobs simultaneously

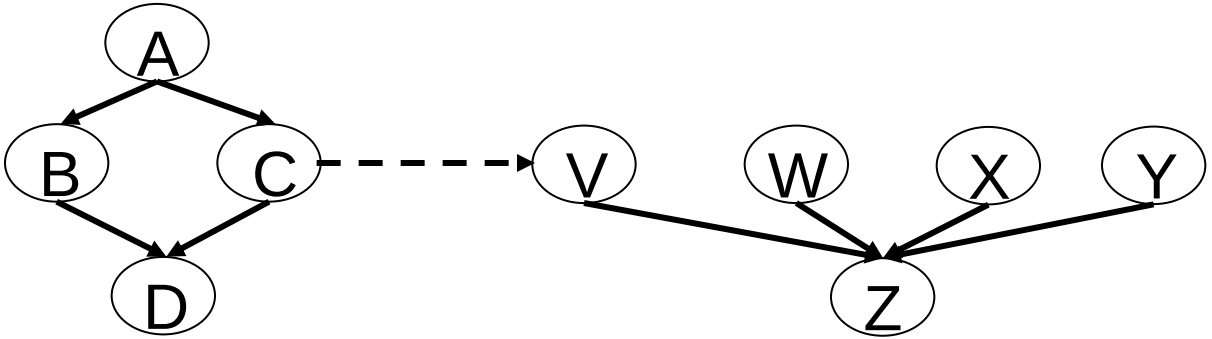
Shishkabob DAG

- Used for breaking long jobs into short
- Easier for scheduling

Sub-DAG

- Idea: any given DAG node can be another DAG
  - SUBDAG External Name DAG-file
- DAG node will not complete until sub-dag finishes
- Interesting idea: A previous node could *generate* this DAG node
  - Simpler DAG structure
  - Implement a fixed-length loop
  - Modify behavior on the fly

Sub-DAG



DAGMan scripts

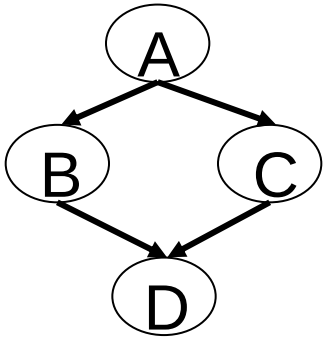
- DAGMan allows pre & post scripts
  - Run before (pre) or after (post) job
  - Run on the same computer you submitted from
  - Don’t have to be scripts: any executable
- Syntax:

```
JOB A a.sub
SCRIPT PRE A before-script $JOB
SCRIPT POST A after-script $JOB $RETURN
```

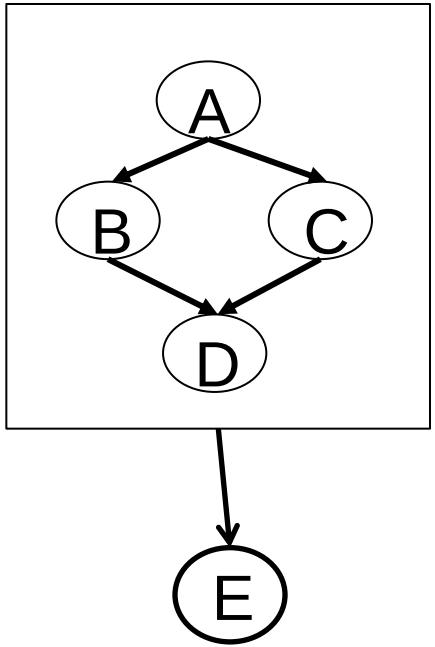
So What?

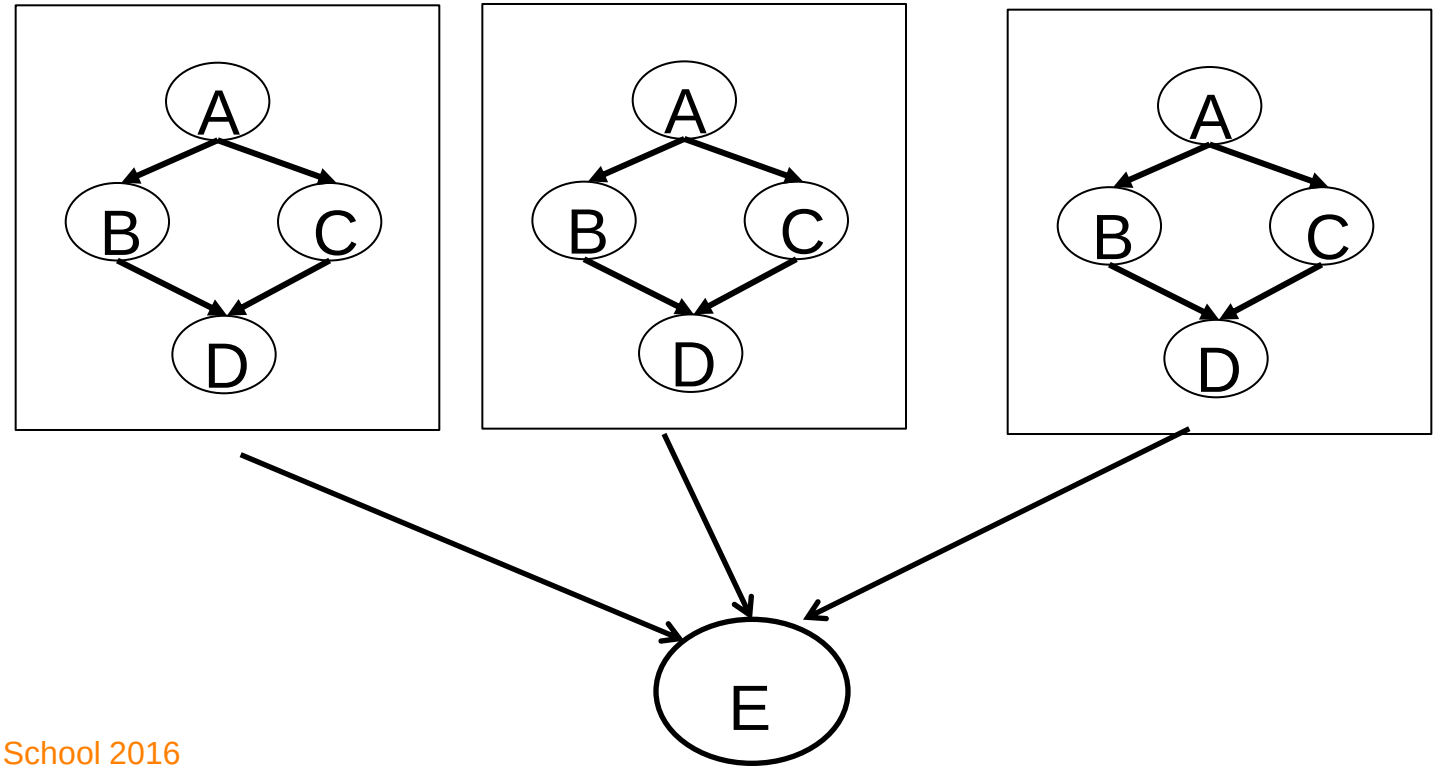
- Pre script can make decisions
  - Where should my job run? (Particularly useful to make job run in same place as last job.)
  - What should my job do?
  - Generate Sub-DAG
- Post script can change return value
  - DAGMan decides job failed in non-zero return value
  - Post-script can look at {error code, output files, etc} and return zero or non-zero based on deeper knowledge.

SPLICEs: DAGs as subroutines



SPLICEs: DAGs as subroutines




A
B
C
D
A
B
C
D
A
B
C
D
E

SPLICE Syntax

```
SPLICE name dagfile.dag
```

Creates new node with dag as node

CHILD / PARENT / etc all work on ndoes

Example

```
JOB E E.submit
SPLICE DIAMOND diamond.dag
PARENT DIAMOND CHILD E
```

Let’s try it out!

- Exercises with DAGMan.

Questions?

- Questions? Comments?
- Feel free to ask me questions later: