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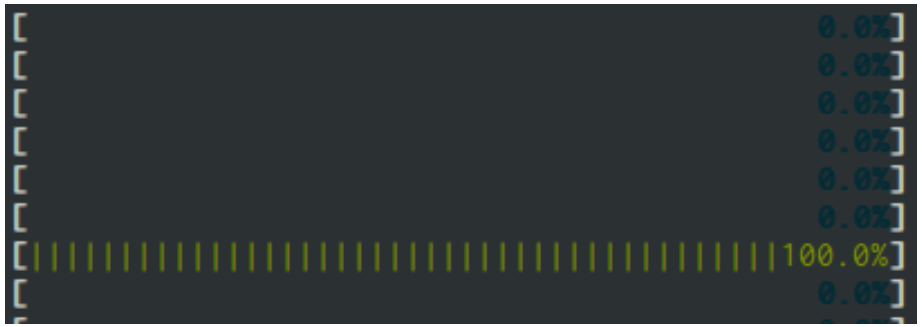

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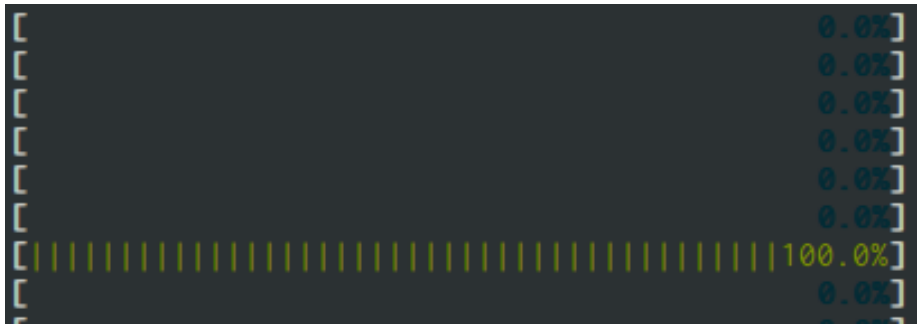

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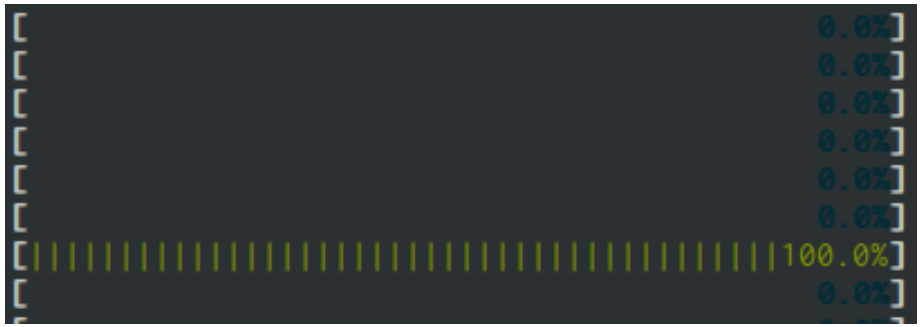

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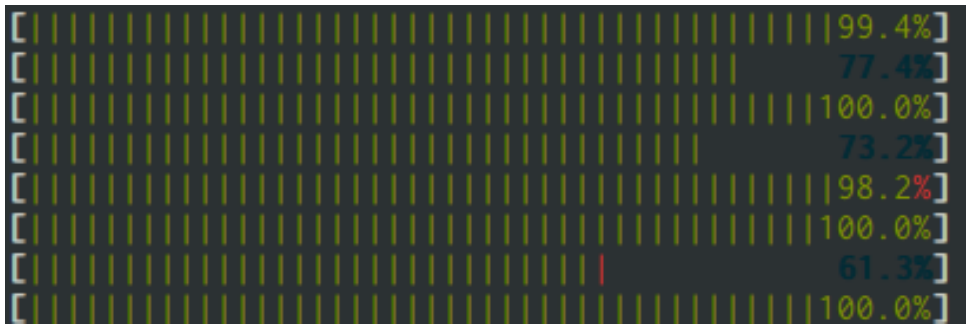

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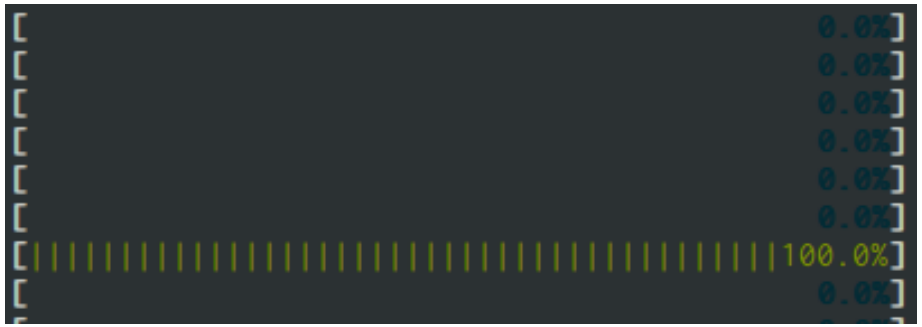

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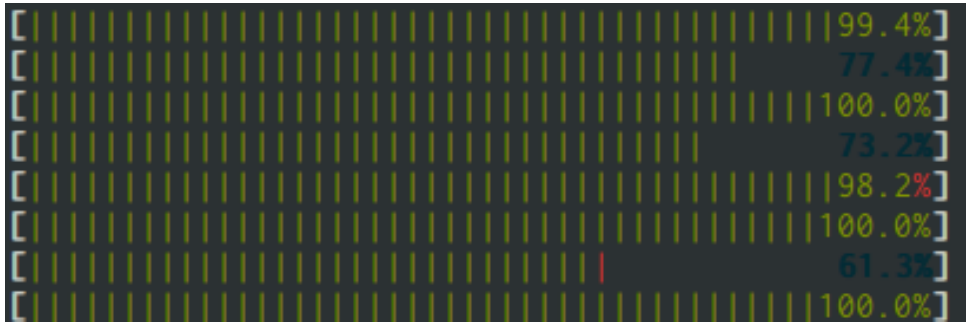

Joint work with:

And many others (in alphabetical order):

Nikos Vasilakis

Achilles Benetopoulos

Lazar Cvetkovic

Thurston Dang

Michael Greenberg

Shivam Handa

Konstantinos Mamouras

Martin Rinard

Used by everyone!

- Orchestration
  - Kubernetes deployment
  - Docket containers …
- Data processing:
  - Downloading
  - Extracting
  - Preprocessing
  - Querying
- Automation Tasks
  - Configuration
  - Installation

```
# Check all possible clusters, as your .KUBECONFIG may have multiple contexts:
kubectl config view -
o jsonpath='{"Cluster name\tServer\n"}{range .clusters[*]}{.name}{"\t"}{.cluster.server}{"\n"}{end}'

# Select name of cluster you want to interact with from above output:
export CLUSTER_NAME="some_server_name"

# Point to the API server referring the cluster name
APISERVER=$(kubectl config view -o jsonpath="{.clusters[?(@.name==\"$CLUSTER_NAME\")].cluster.server}")

# Gets the token value
TOKEN=$(kubectl get secrets -o jsonpath="{.items[?(@.metadata.annotations['kubernetes\.io/service-
account\.name']=='default')].data.token}"|base64 --decode)

# Explore the API with TOKEN
curl -X GET $APISERVER/api --header "Authorization: Bearer $TOKEN" --insecure
```

```
base="ftp://ftp.ncdc.noaa.gov/pub/data/noaa";
for y in {2015..2019}; do
 curl $base/$y | grep gz | tr -s" " | cut -d" " -f9 |
 sed "s;^;$base/$y/;" | xargs -n 1 curl -s | gunzip |
 cut -c 89-92 | grep -iv 999 | sort -rn | head -n 1 |
 sed "s/^/Maximum temperature for $y is: /"
done
```

```
echo "Building parser..."
eval $(opam config env)
cd compiler/parser
echo "|-- installing opam dependencies..."
make opam-dependencies
echo "|-- making libdash..."
make libdash
echo "|-- making parser..."
make
cd ../../
echo "Building runtime..."
cd runtime/ ; make ; cd ../
```

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- Using semi-automatic restricted parallelization tools (e.g., GNU parallel)
- Manually parallelizing using the background (&) operator
- Manually parallelizing by rewriting parts of a script in parallel frameworks (e.g., MR)

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   - This makes an automated command analysis infeasible and a one-time manual analysis useless

PaSh

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A tool that:

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- exposes latent data parallelism in shell scripts
- is a lightweight layer on top of bash

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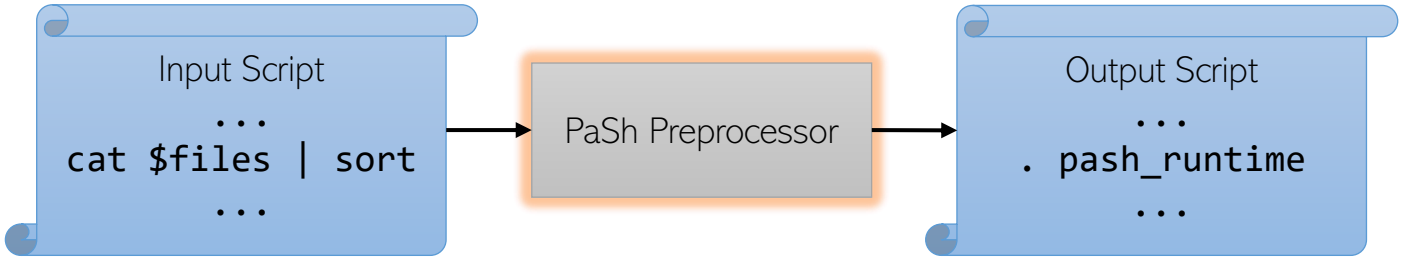
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cat $files | sort
...
PaSh Preprocessor
Output Script
...
. pash_runtime
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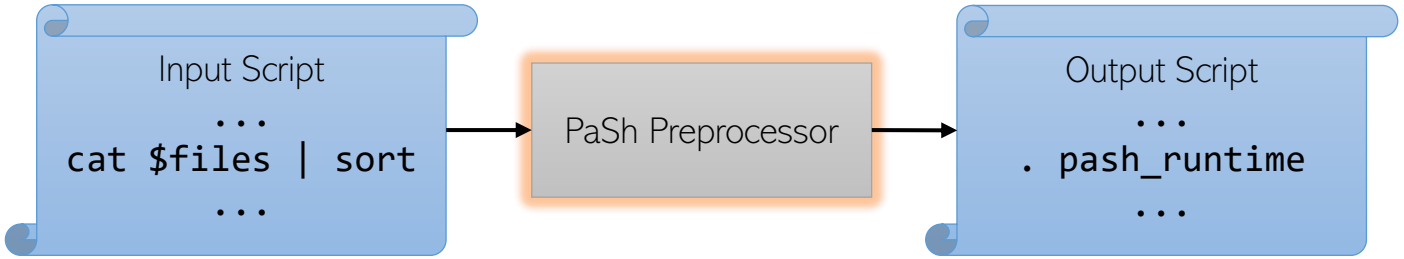
PaSh



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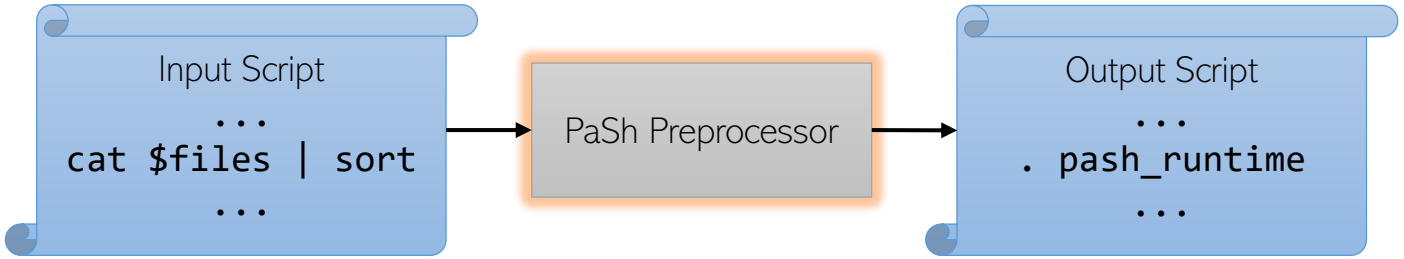

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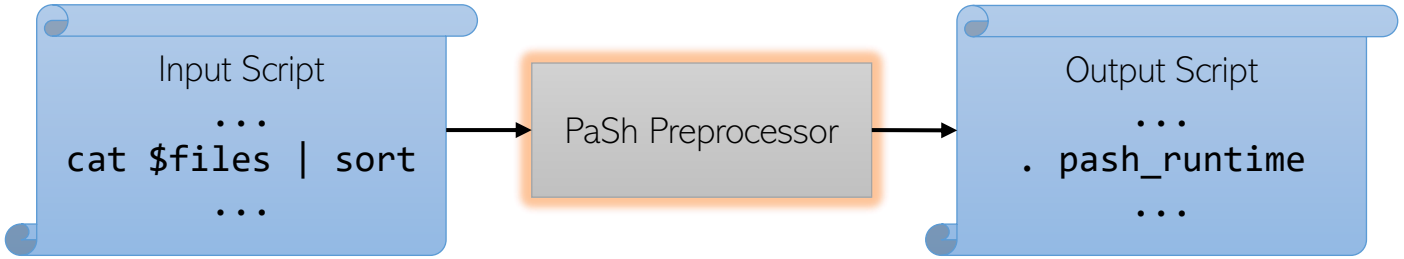

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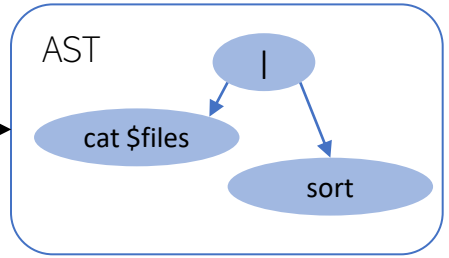

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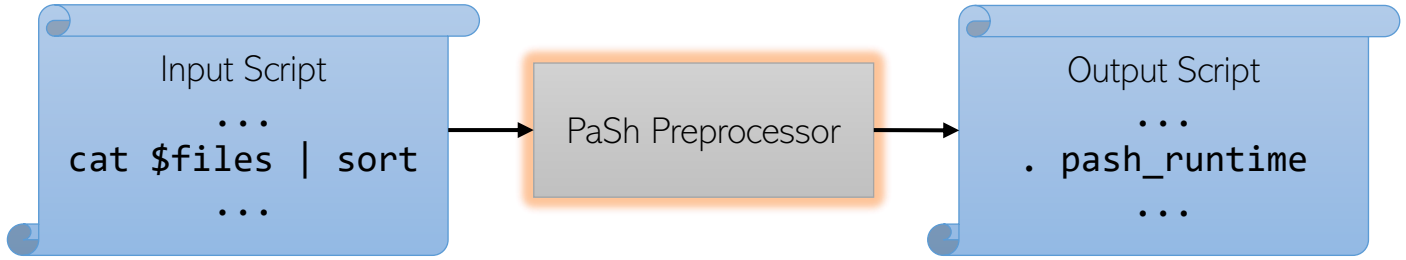
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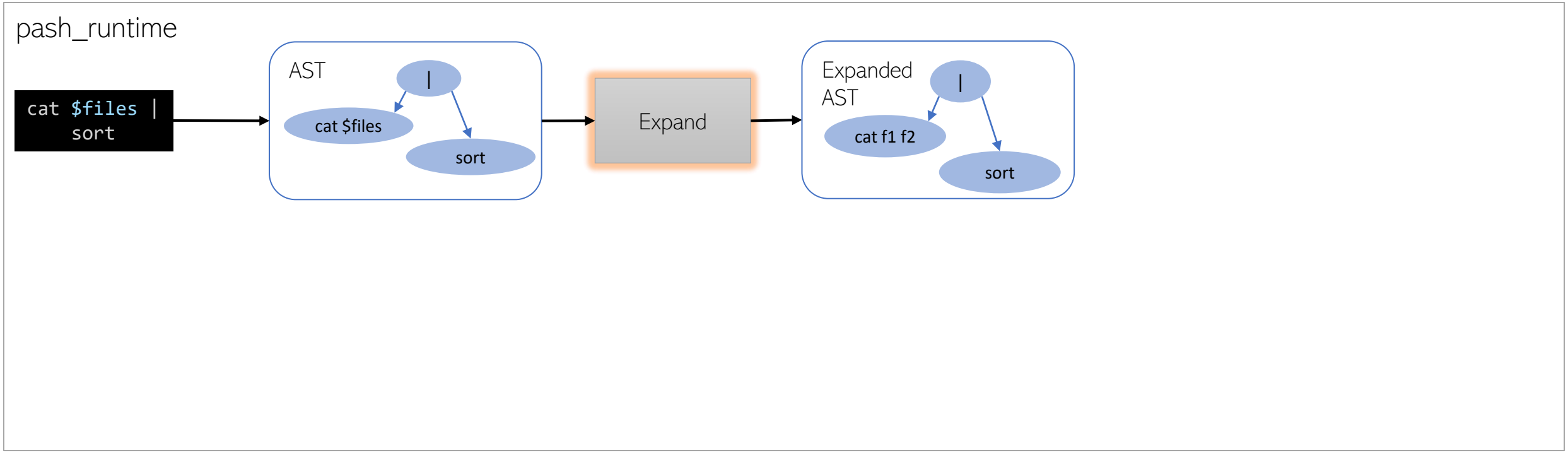
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Expand
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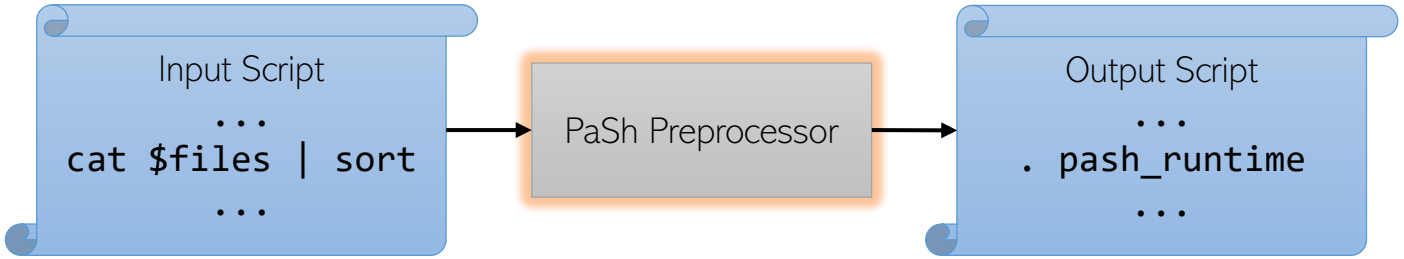
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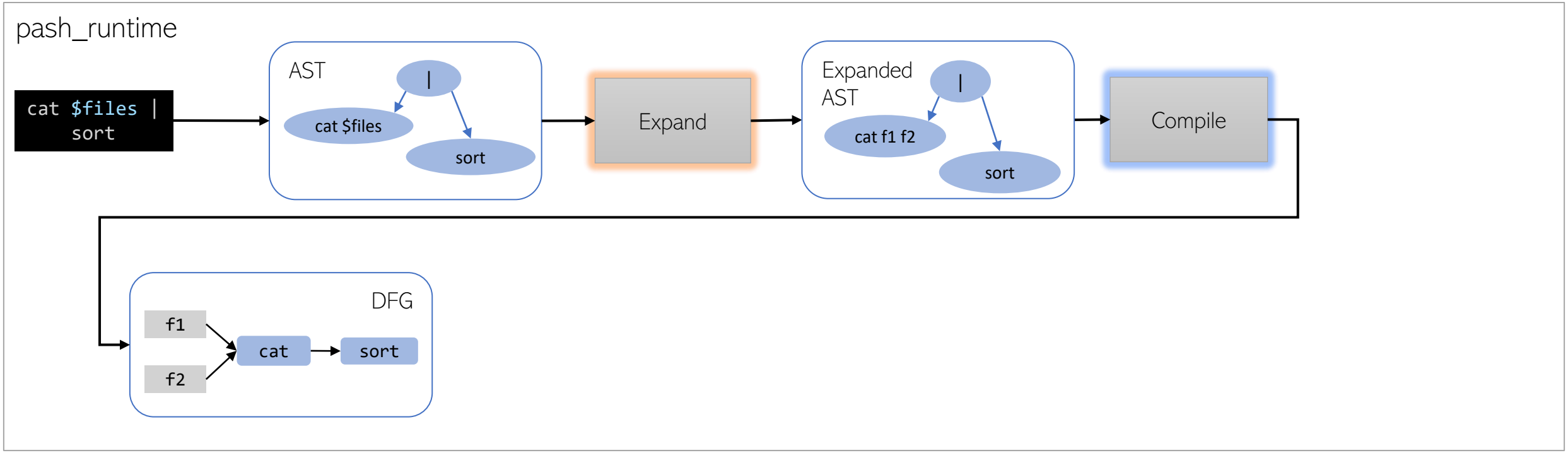
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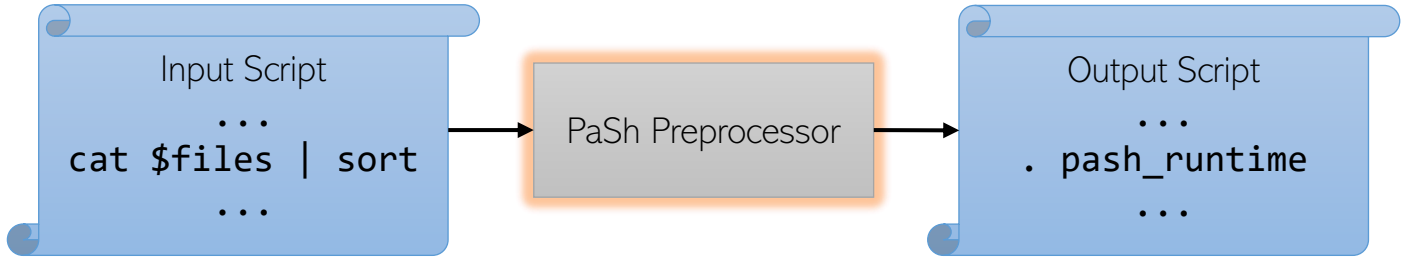
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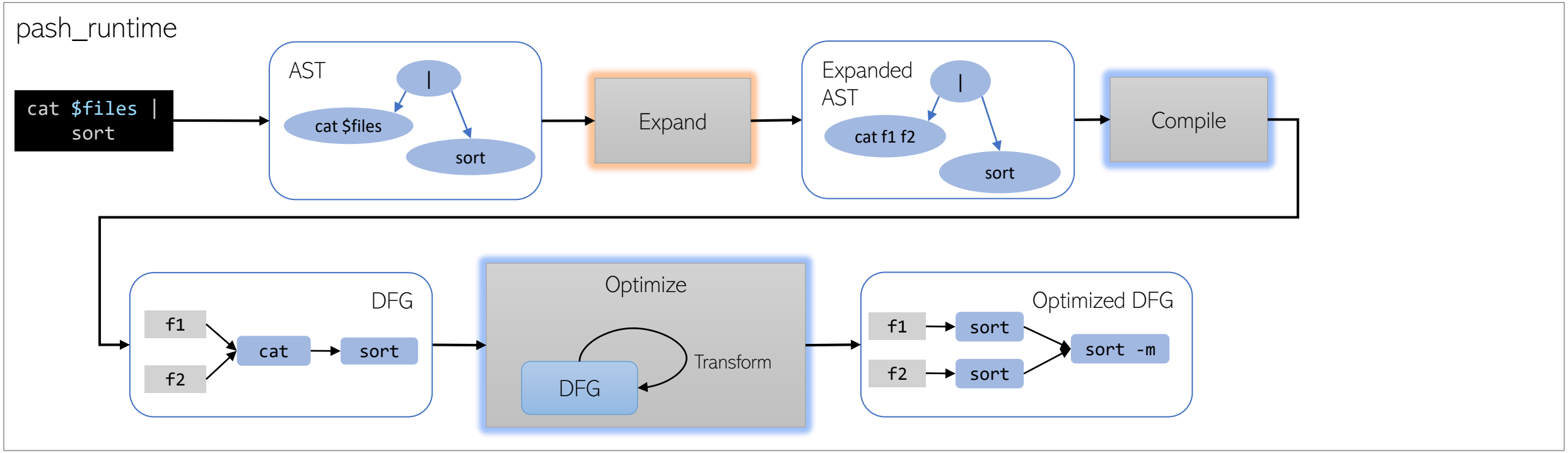
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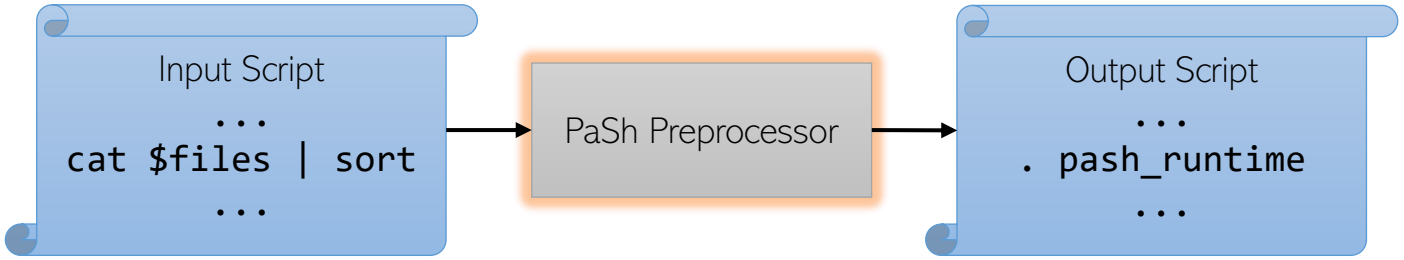
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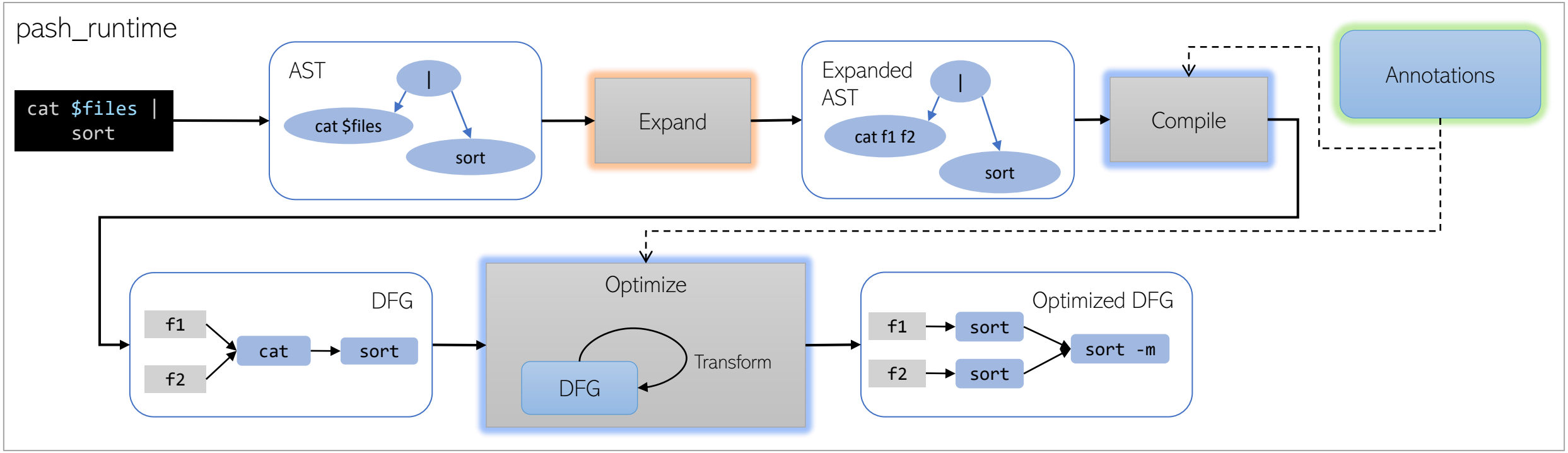
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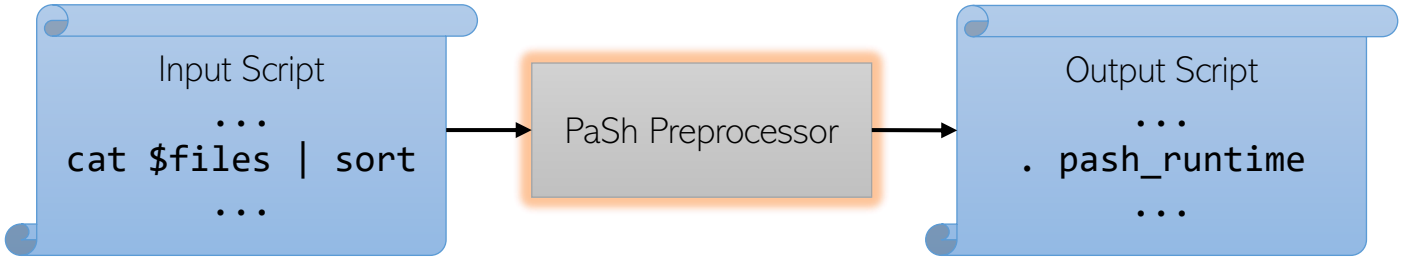
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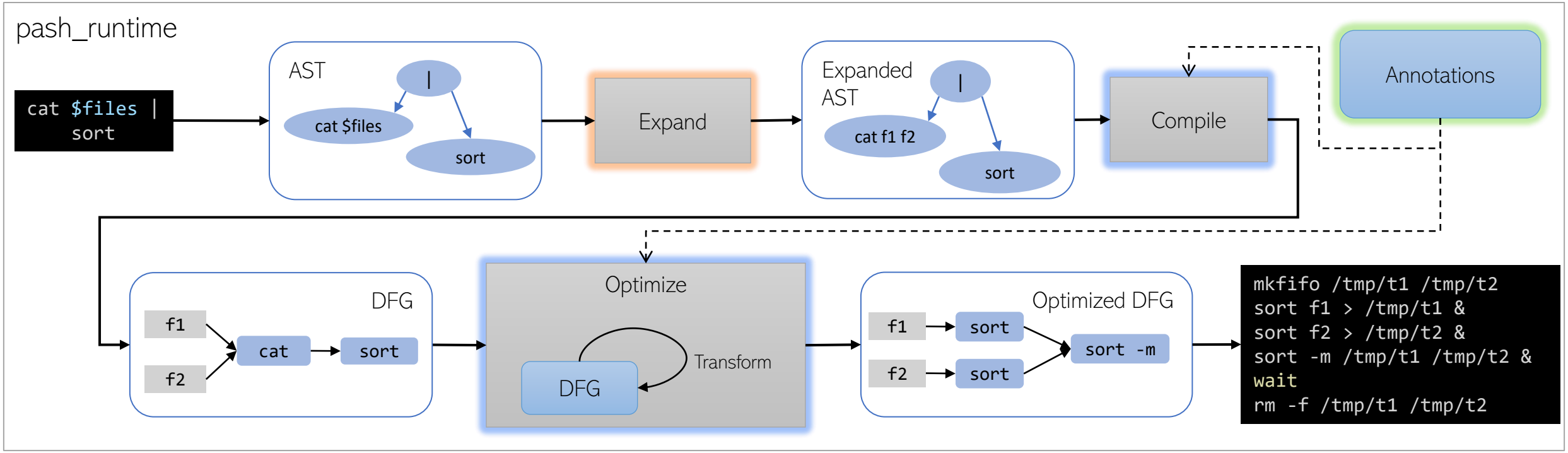
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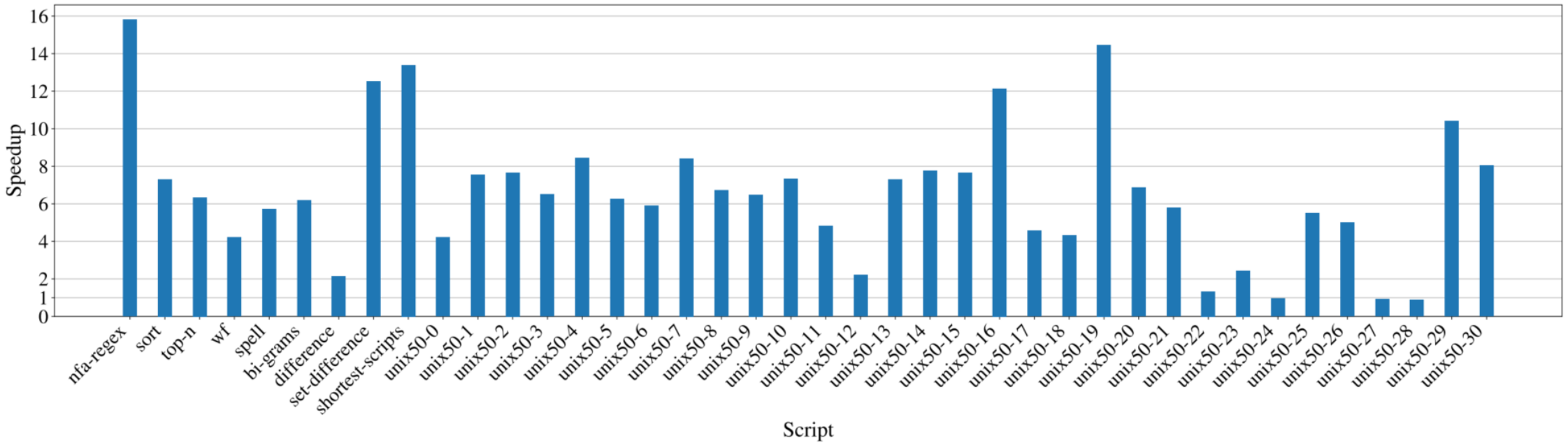
sort -m
mkfifo /tmp/t1 /tmp/t2
sort f1 > /tmp/t1 &
sort f2 > /tmp/t2 &
sort -m /tmp/t1 /tmp/t2 &
wait
rm -f /tmp/t1 /tmp/t2

High speedups!!!



Average: 6.56x, Maximum: 15.81x, Minimum: 0.89x

Come chat ☺

- If you want to learn more
- If you are interested in trying out PaSh
- If you have long running scripts that might benefit from parallelism
- If you would like to collaborate

Come and chat in the poster session ☺