Leveraging the MapReduce Application Model to Run Text Analytics in HPC Clusters

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Overview

1. **Text Analytics with Voyeur Tools**
2. HPC burst computing
3. MapReduce
4. Challenges

Text analytics with Voyeur Tools

Voyeur Tools

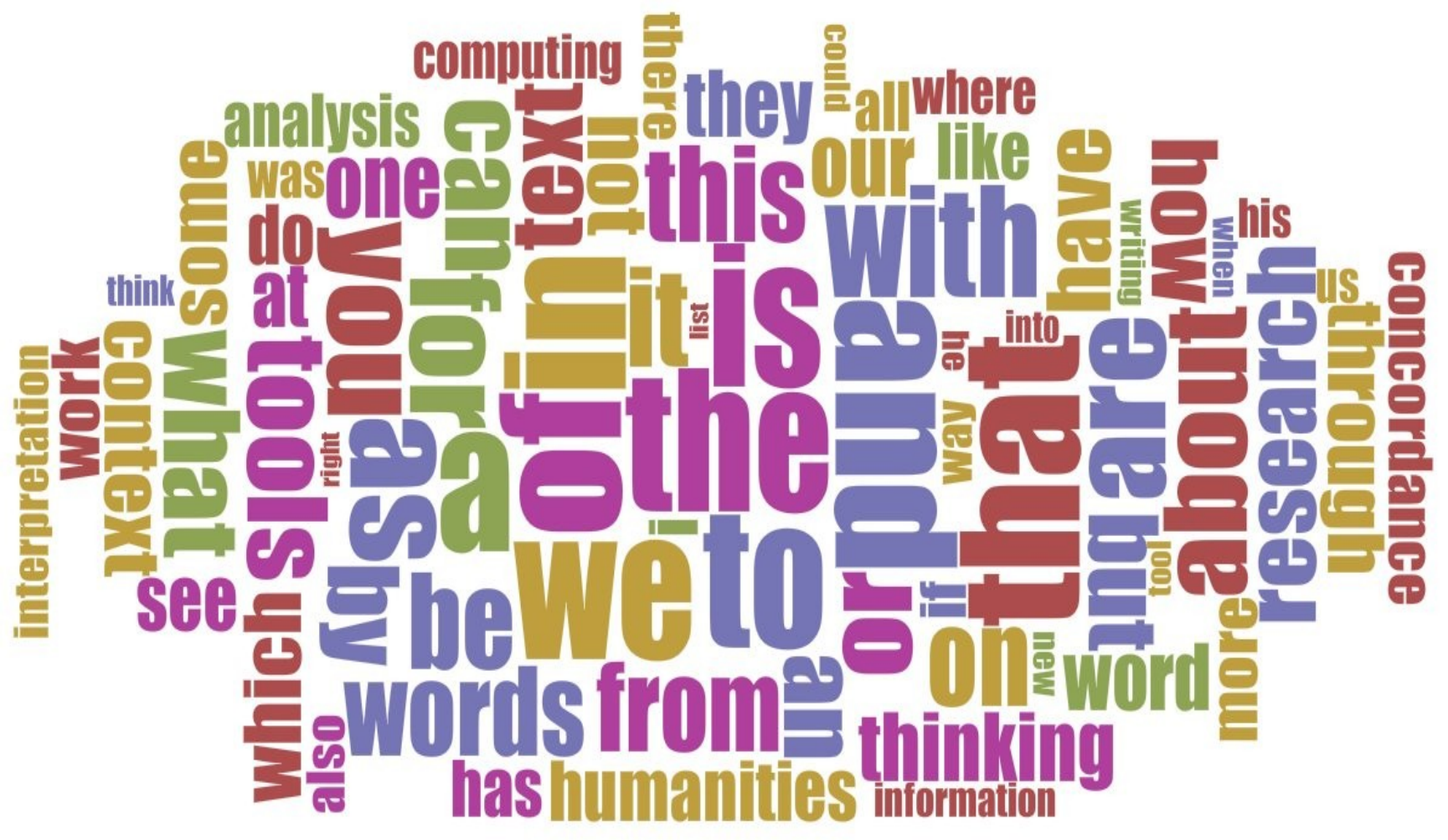
* **interactive web app**

* toolbox (word **frequencies**, **collocates**, **concordances, ...**)

* for **text corpora** (primary scope: **Digital Humanities**)

http://voyeurtools.org (you can try now)

Text analytics with Voyeur Tools



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HPC burst computing

* next generation of Voyeur Tools:
  scale to process large text corpora upon user request,
  so-called “burst computing”

* use of **HPC resources** to process **bursts of user requests**
  so that interactive web app remains **responsive**

* **SHARCNET-sponsored** project & Postdoctoral Fellowship
  (started: January 2010)

Burst computing opportunities

3 opportunities to use HPC resources in Voyeur Tools:

* initial data **importing**

* data **indexing**

* data **analysis**

=> multithreading “OK”, but limited data parallelism

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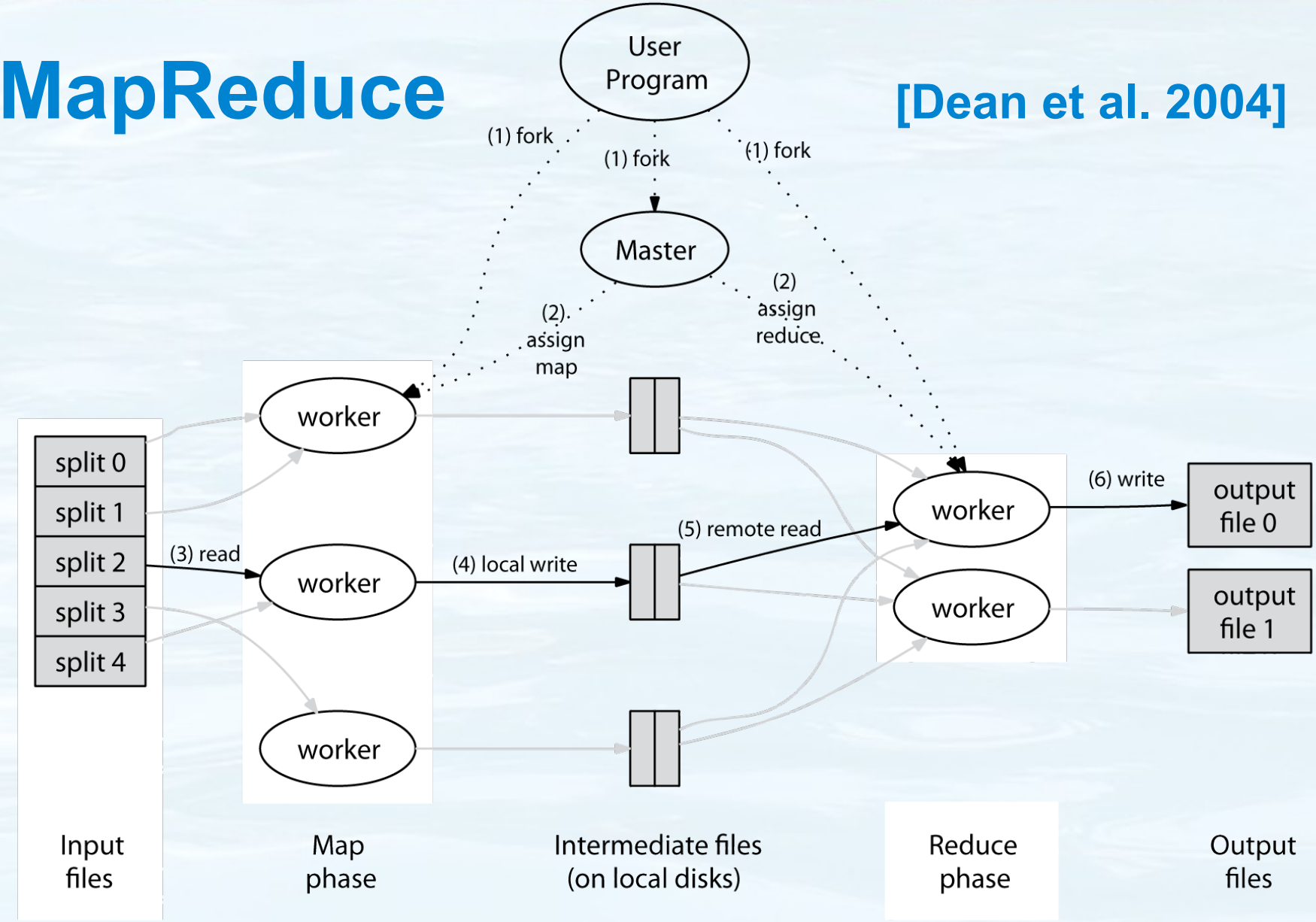
MapReduce

[Dean et al. 2004]



MapReduce features [Dean et al. 2004]

* automatic **parallelization** and distribution

* **I/O scheduling** (+ **data-aware scheduling**)

* **fault-tolerance**

* status and monitoring

Using MapReduce in Voyeur Tools

* initial data importing:

  import text corpora **into MapReduce filesystem**

* data indexing: **online or** (preferably) **batch indexing jobs**

* data analysis: **online analysis jobs**

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Challenge: data model

impact of **data model**

* current Voyeur Tools: **file**-based
  (O.S.-level, **“local” filesystem**)

vs.

* MapReduce: **record**-based
  (application-level, **“distributed” filesystem**)

Challenge: computation model

impact of **computation model**

* current Voyeur Tools: multiple **nested loops**

vs.

* MapReduce: **2-phase record-based processing**

Challenge: cluster job queue

impact of **cluster job queue**

* middleware **daemons** (for data distribution, computation) should ideally be **always-on** (to reduce web app latency)

* application **malleability** (to **# available cores**): supplementary challenge...

Challenge: global filesystem

impact of **cluster-level global filesystem**

* very **convenient** for many applications...

  but we'd rather **preposition data to local disks**,

  in order to maximize parallelism of data access

Challenge: firewalls

impact of **firewalls**

* can communicate <===> SHARCNET nodes, clusters

* **cannot download data from the web**

  (= limited parallelism of initial data import from web servers)

Challenge: public web front-end

requirement for public **web front-end**

* scalable **servlet** container

* **DNS** entry

Conclusion

* project **getting started**

* will rely on Open Source software:

  . Apache **Hadoop**

  . Apache Tomcat (maybe Eclipse Jetty)

  . and of course Voyeur Tools

* importance of **flexible data model**

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