MapReduce
- Developed as a research project out of Google.
- OSDI’04: “MapReduce: Simplified Data Processing on Large Clusters”
- **Big Idea:** Create a framework for processing data based on functions that can be “automatically parallelized”.
  - Allows many nodes to contribute to processing the data without human design/programming.


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**Example #1: Word Count**

<table>
<thead>
<tr>
<th>The</th>
<th>quick</th>
<th>brown</th>
<th>fox</th>
<th>jumps</th>
<th>over</th>
<th>the</th>
<th>lazy</th>
<th>dog</th>
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**Map:**

**Reduce:**

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**Example #2: Mosaic Images**

In the “1989” Final Project, you are already working on the “Map” function to create individual summaries of mosaics:

**Map:**

Once you have many mosaics, how can you reduce them?

**Reduce:**
**Software as a Service (SaaS)**

Q: What makes SaaS different from just software?

(1):

(2):

(3):

Much like all of the other things talked about in the cloud, SaaS is a model of software that is independent of programming language and independent of architectural design.

Q: What features differentiate SaaS from PaaS?

(1):

(2):

(3):

Some software tools have characteristics of both SaaS and PaaS – these are general terms to understand the level of abstraction that you, as a developer, are working with or providing.

**Large Categories of SaaS Software**

- Human Resource Management (HRM)
- Customer Relationship Management (CRM)
- Enterprise Resource Planning (ERP)
- Content Management Systems (CMS)
- Billing Platforms
- Project Management
- Bookkeeping/Accounting
- Ecommerce
- Communication

**Examples of SaaS at Illinois**

**Advantages of SaaS**

1)

2)

3)

4)

**Legend:**

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<tr>
<th>IaaS</th>
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