Advanced Computer Architecture:

A Google Search Engine

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Course Details

- Course title: Advanced Computer Architecture
- Course code: 332
- Syllabus
  - Basic cluster performance analysis; PageRank algorithm
- Learning Objectives
  - be able to perform high-level mean performance analysis of a cluster
  - understand how PageRank algorithm measures a website's popularity
  - know how to perform an eigenvalue calculation to calculate a PageRank value

Books

- Computer Architecture: A Quantitative Approach. Hennessy and Patterson. 3rd Edition. Morgan Kaufmann 2003.
- Probability and Statistics with Reliability, Queuing and Computer Science Applications. K.Trivedi. 1st/2nd Edition. Wiley 1980/2002.

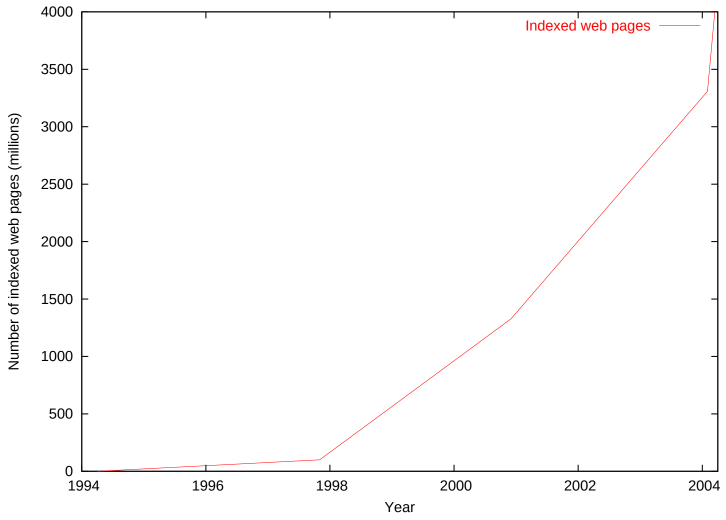
Challenges for Google

- Google (or any mainstream internet search engine) has to cope with three major problems:
  - phenominal internet growth rate
  - unstructured information storage
  - no quality guarantees on web-published data
- Solves these with:
  - several enormous cluster computers
  - the PageRank algorithm

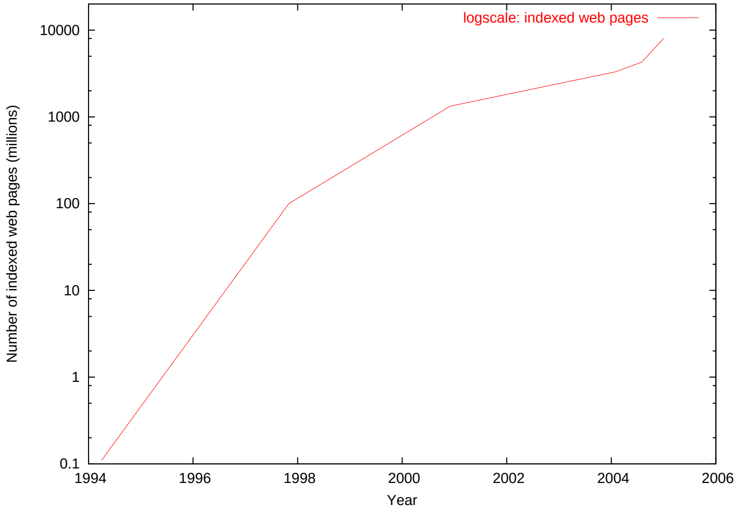
Growth Rate

- The web is big... very big
- Probably 5×10^9 to 6×10^9 pages (2003)
- ...and still growing at conservatively > 10% per year
- Sedate compared 1994–98 500% annual growth rate

Internet Growth



Internet Growth



Information storage

- In contrast to information stored in a traditional database, the internet stores information with:
  - Ad-hoc data publishing
  - Semi-random underlying graph structure
  - Heterogeneous data types
  - No authoritative index or design