SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF MCA

I YEAR II SEM

23CAE717 – Cloud Computing

UNIT IV – PROGRAMMING MODEL

Topic 25: Programming Support - Google App Engine
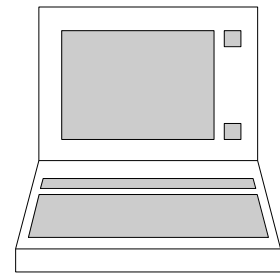
Introduction to Google App Engine

Google App Engine (GAE) is a service, offered by Google, that allows developers to build applications that can run on Google's infrastructure.
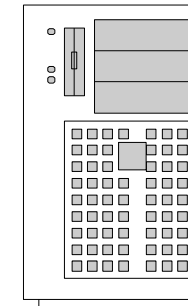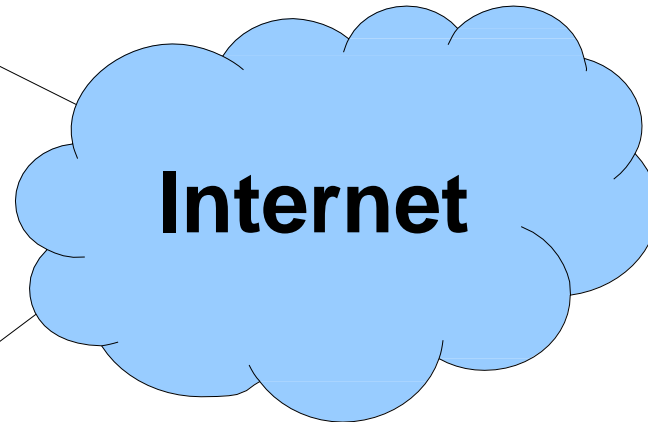
It is a form of Cloud Computing.

App Engine is a service and cloud computing platform employed for developing and hosting web applications.

Before Cloud computing

Client 1

Client N

Internet
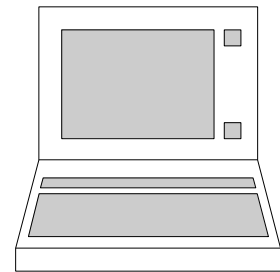
Server

Traditional client/server paradigm

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Engine/Dr.N.Nandhini/AP/MCA/SNSCT

Client 1

Server

Internet

Server

Server

Client N

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Cloud Computing 4
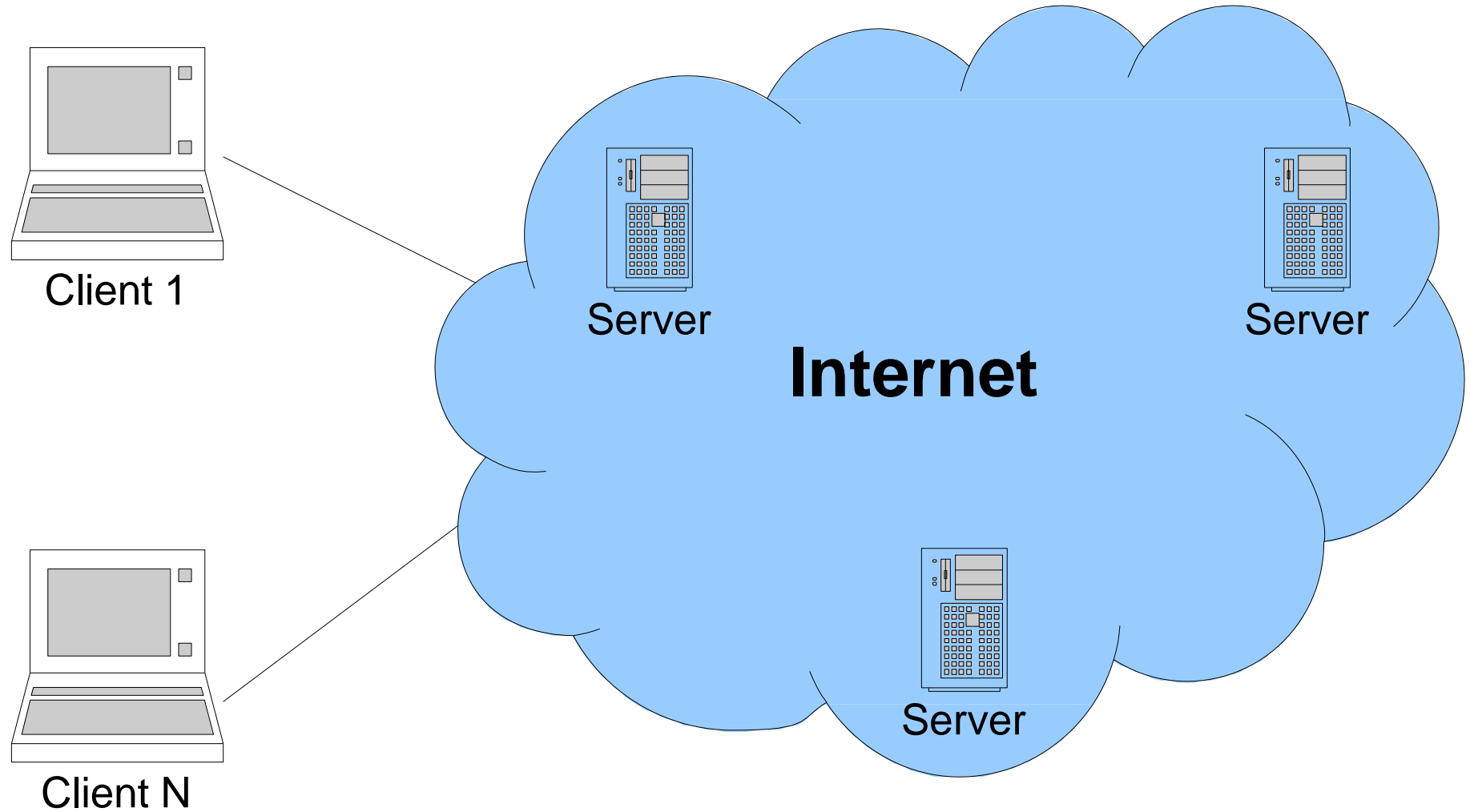
Cloud Players

IaaS → amazon web services | Google Compute Engine | IBMSmartCloud | DigitalOcean

PaaS → Google App Engine | Microsoft Azure | salesforce | amazon web services / Amazon Elastic Map Reduce (EMR)

SaaS → Gmail by Google | Google Docs | SharePoint

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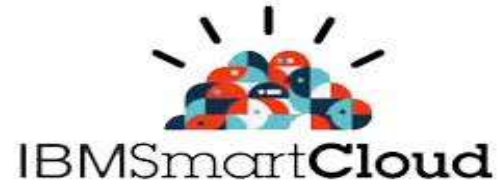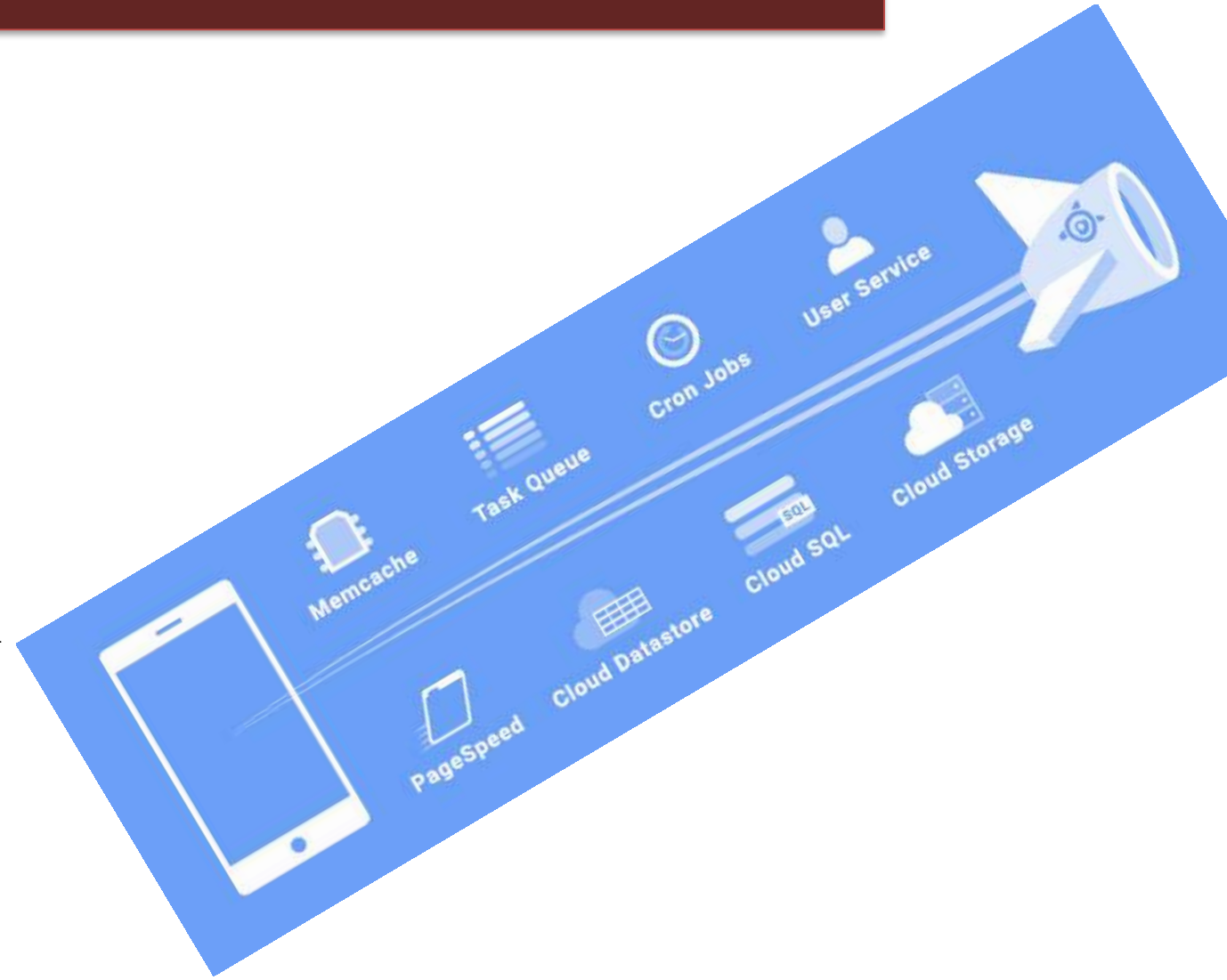
Some Prominent Features of Google App Engine

1. Runtimes & Languages

2. Ordinarily Accessible Features

   1. **Data storage, retrieval, and search**

   2. **Communications**

   3. **Process management**

   4. **Computation**

   5. **App management and configuration**

3. Multi-Task Manager

4. Bulk Downloading & Back-Up

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Platform Supports

It also supports other programming languages through custom runtimes. The App Engine serves minimum of 350 plus Billion requests per day.

1. Register an account at
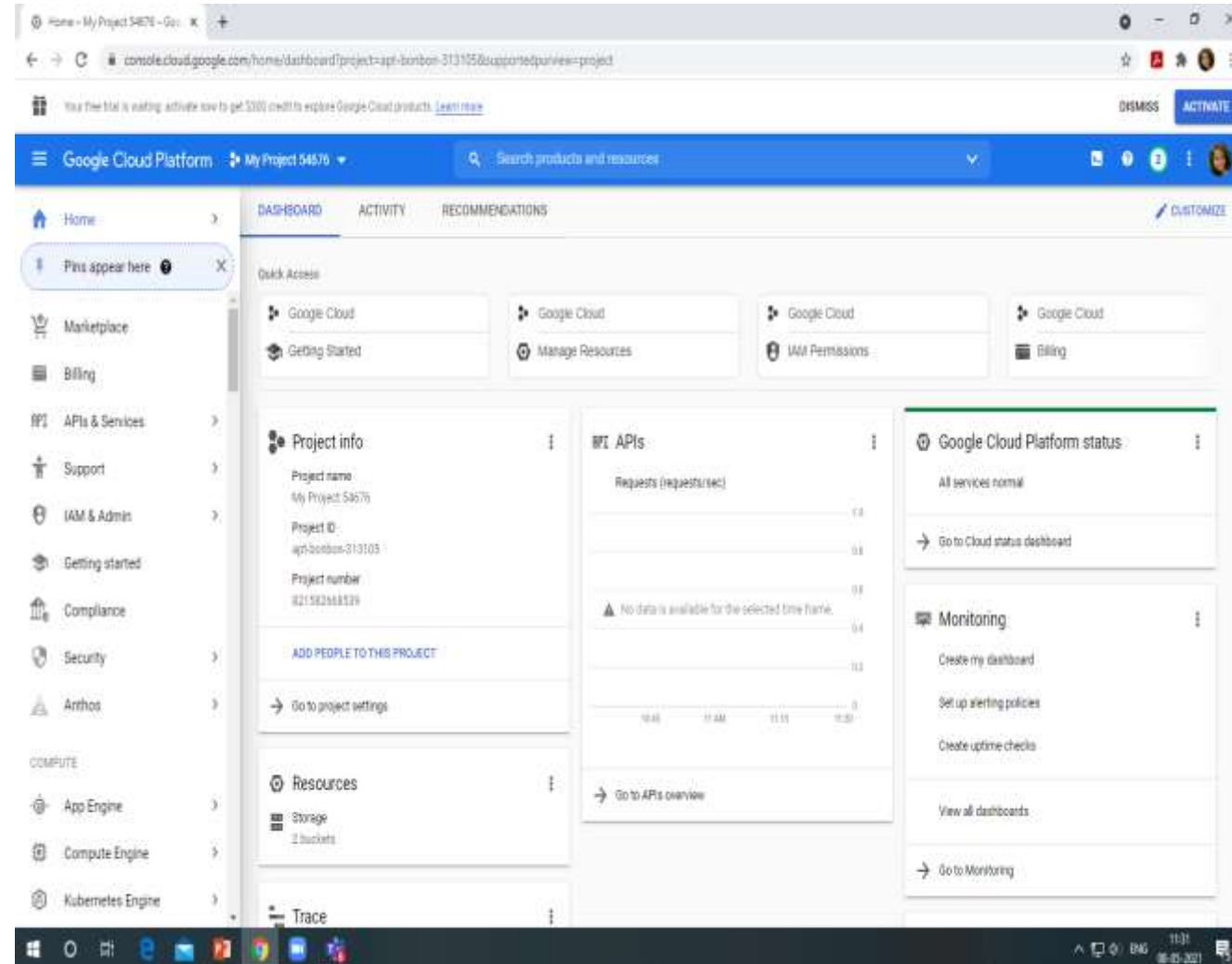   http://www.appspot.com

2. You will be able to
   create up to 10 GAE
   apps (each with its
   http://**app-**
   id.appspot.com URL)

3. Download the GAE SDK
   (Linux, MacOSX, Win)

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Who Utilized GAE?

Stack · YouTube · Bepro Company · The New York · Snapchat · HENNGE · Accenture

ABEJA, Inc ... · Khan Academy · commercetools · Soomgo · Infrastructure · JVM Stack · Buddy

Digital Servic ... · Vedantu · Practo · PartsAvatar · SocialDog · Feedly · Mintere

Programming Environment for GAE

❑ Web service for developing and hosting web applications in Google-managed data centers

❑ Part of Google cloud

❑ Cloud technology virtualizes applications across multiple servers

❑ Easy to build, maintain, Scale and load balance

❑ Transactional data model

❑ Programming languages support

❑ Use Eclipse plug-in for Java or GWT Google Web Toolkit for web application development

❑ Supports Webapp Python environment

Programming Environment for GAE

❑ Data store is a NOSQL schema-less object based data storage

❑ Java offers Java Data Object (JDO) and Java Persistence API (JPA) interfaces

❑ SQL-like query language called GQL for python

❑ Google added the blog store which is suitable for large files as its size limit is 2 GB

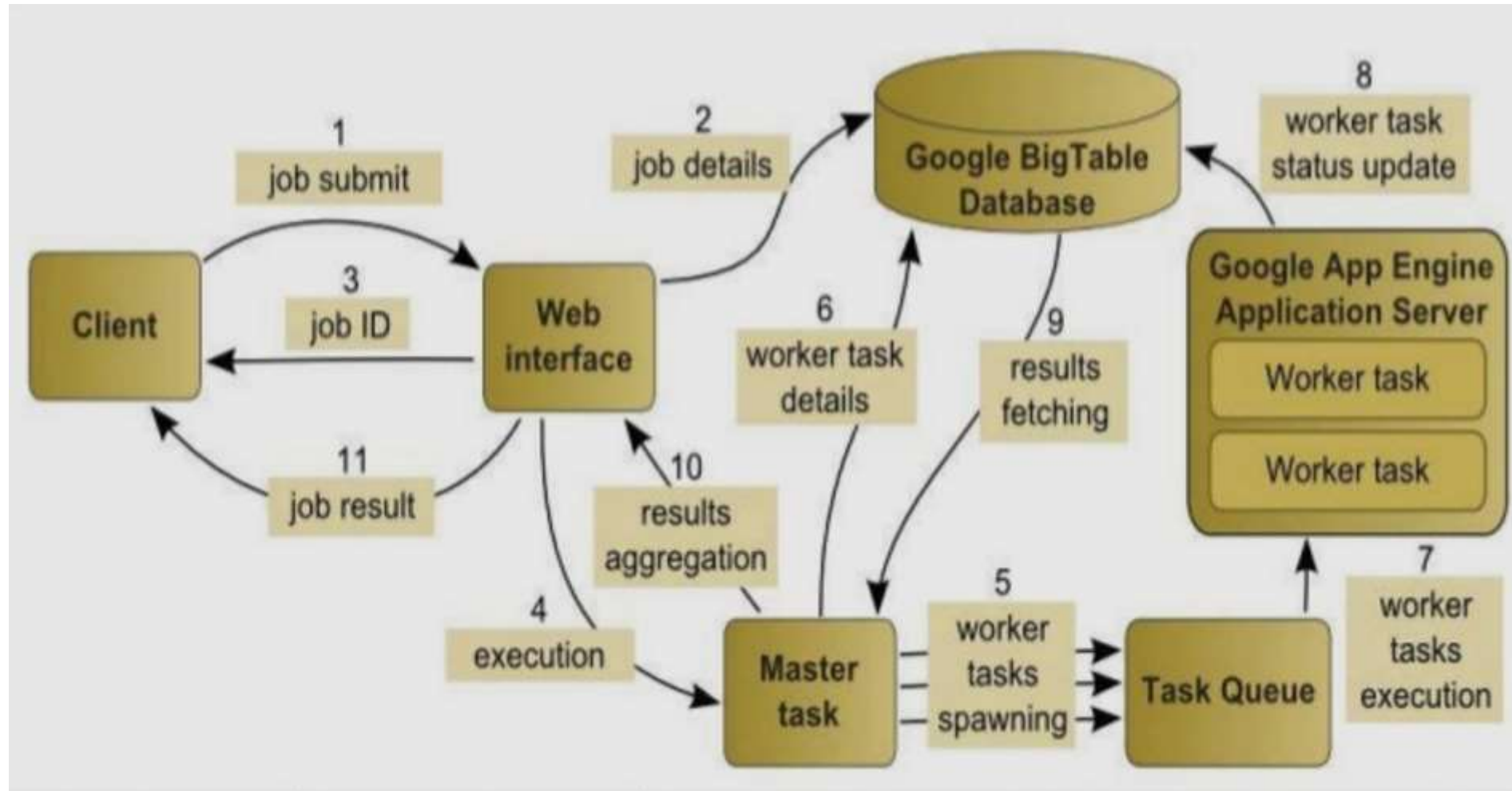❑ SDC (Secure Data Connection) can tunnel through the Internet and link intranet to an external GAE application

Programming Environment for GAE

❏ URL Fetch operation provides the ability for applications to fetch resources and communicate with other hosts over the Internet

❏ GAE provides the ability to manipulate image data using a dedicated Images service

❏ Google Data API handles maps, sites, groups, calendar, docs, and YouTube, among others
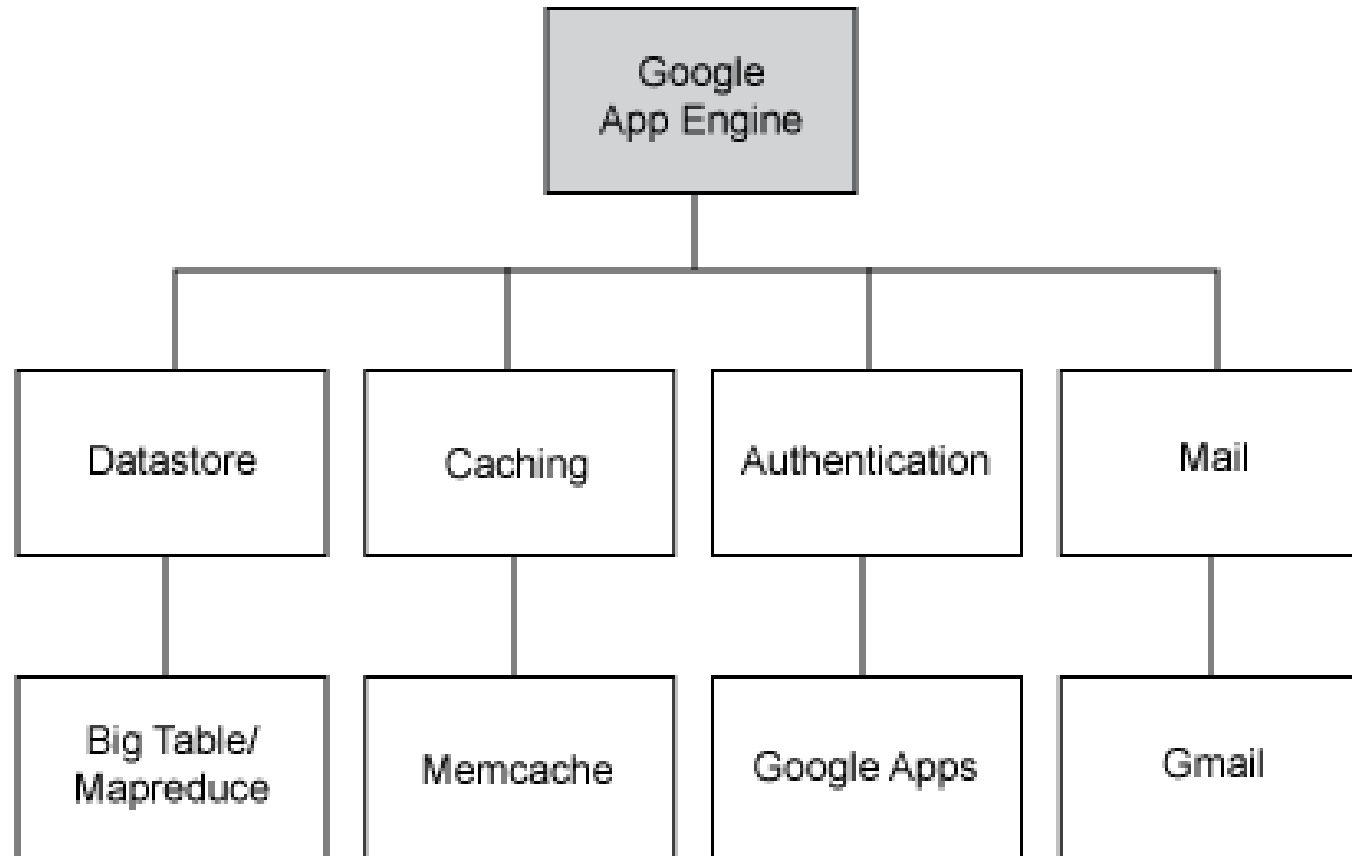
What GAE provides ?

Programming Environment for GAE
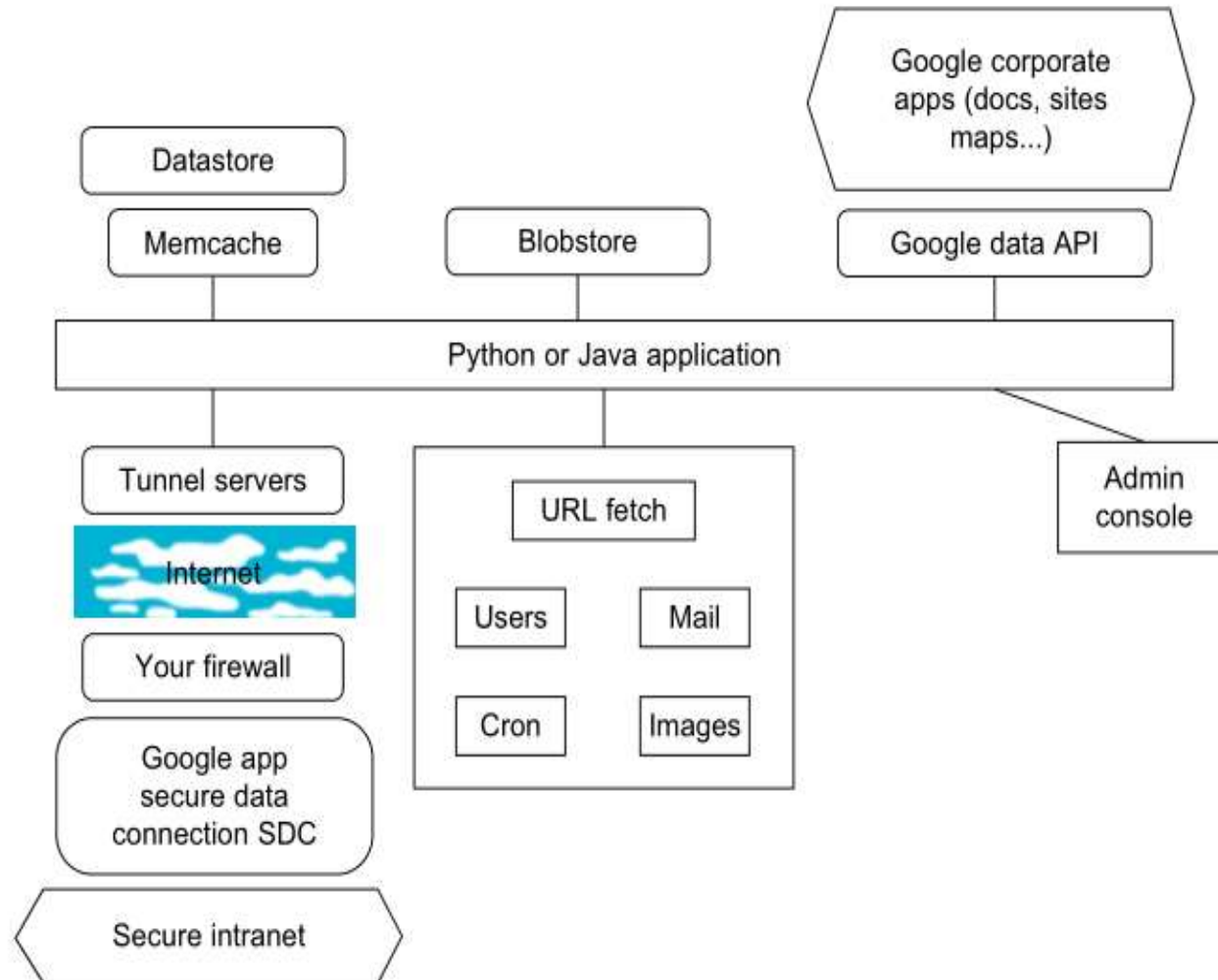
Services

- ❑ URL Fetch
- ❑ Mail
- ❑ Memcache
- ❑ Sandbox

Advantages

- ❑ Low cost
- ❑ Rich set of API
- ❑ Fully featured SDK
- ❑ Ease of deployment

Java on GAE

❑ Uses JAVA Servlet standard for web applications:

- WAR (Web Applications aRchive) directory structure.

- Servlet classes

- Java Server Pages (JSP)

- Static and data files

- Deployment descriptor (web.xml)

- Other configuration files

Google File System (GFS)

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Google File System (GFS)

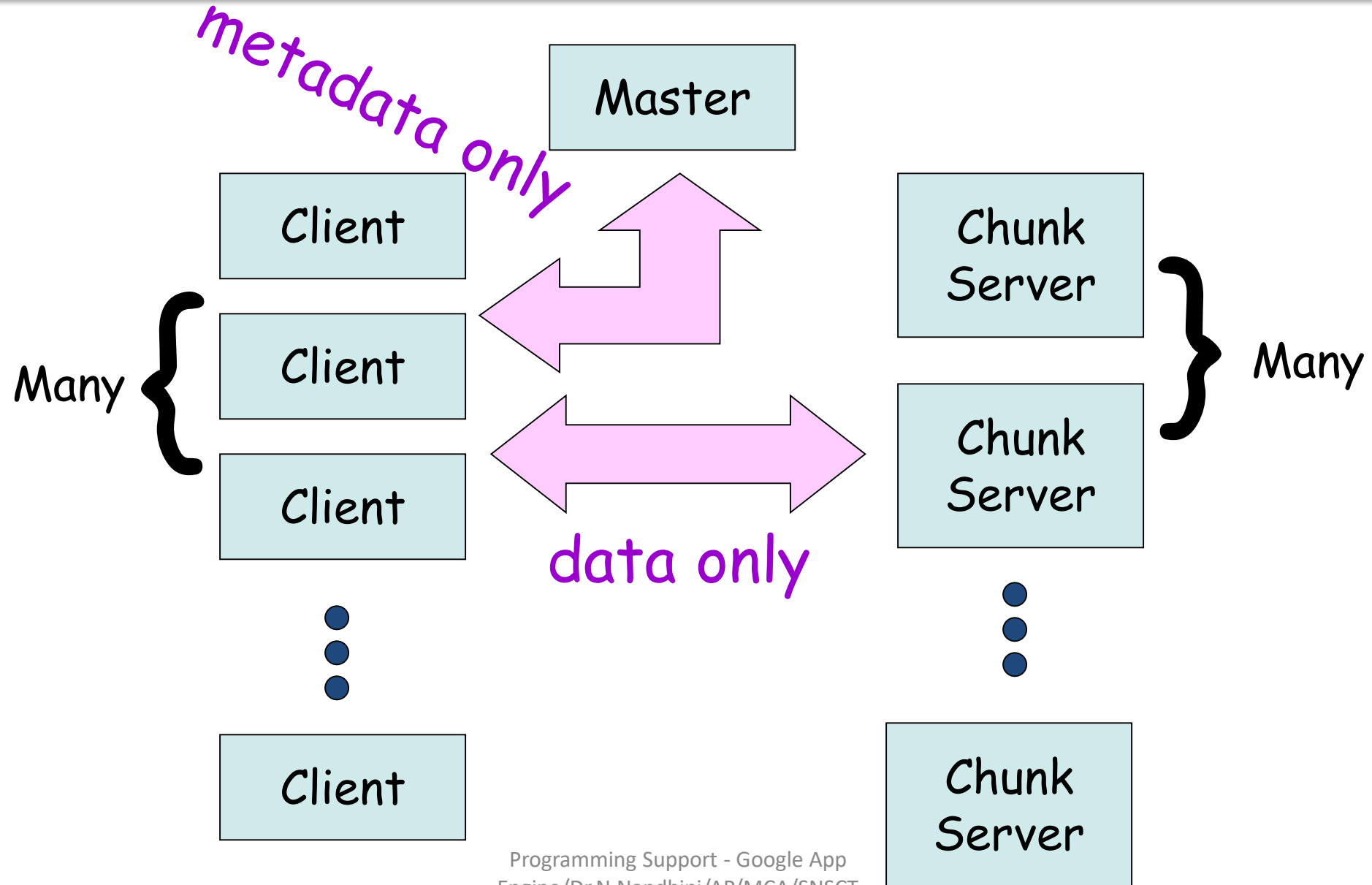❑ Started with Google search engine
❑ They provided new services
  ❑ Video
  ❑ Gmail
  ❑ Maps
  ❑ App engine
  ❑ ….
❑ Master and Chunk servers

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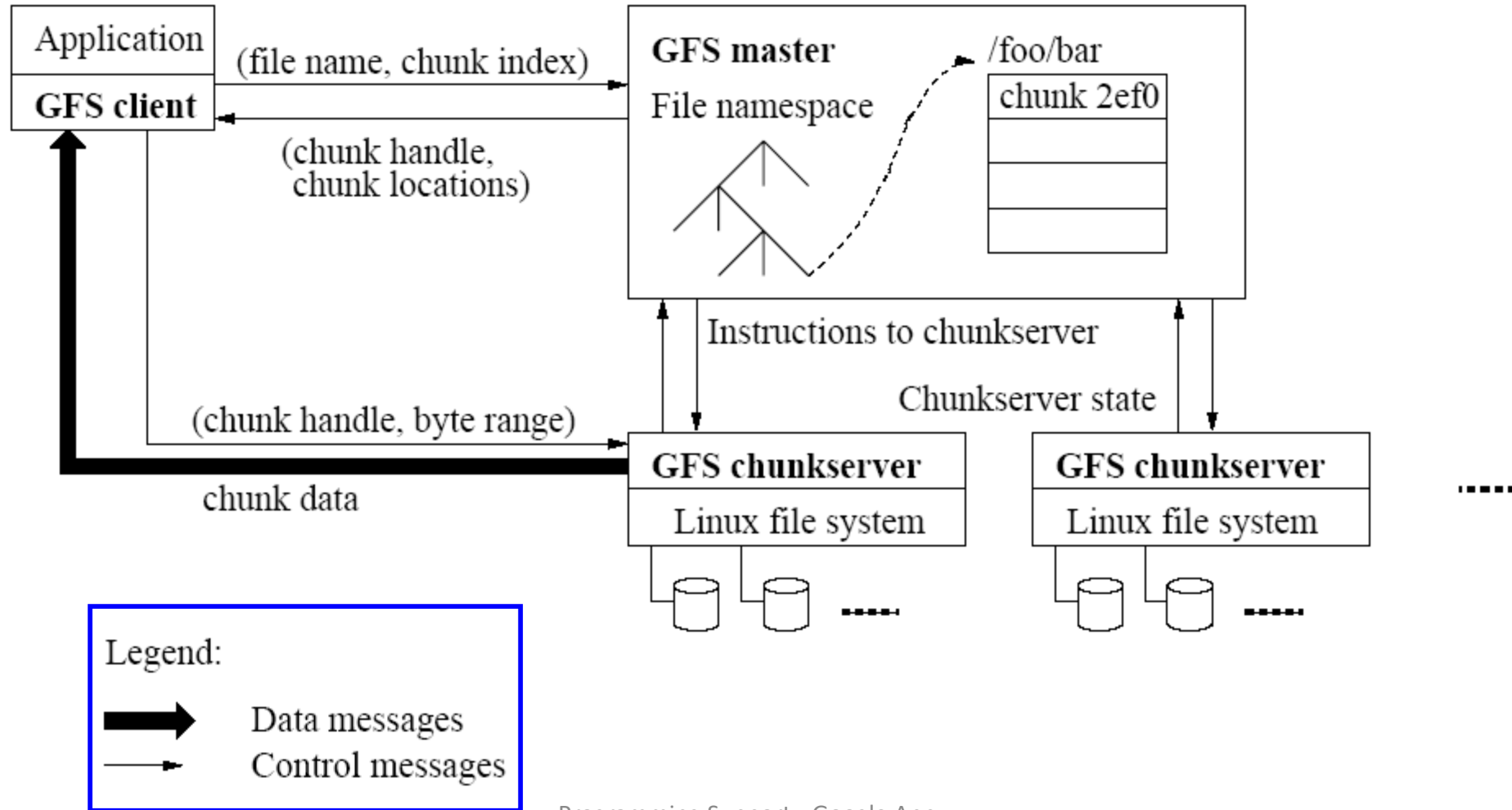
Using fixed chunk size, translate filename & byte offset to chunk index.
Send request to master

Application

GFS client

(file name, chunk index)

(chunk handle, chunk locations)

GFS master

File namespace

/foo/bar

chunk 2ef0

Instructions to chunkserver

Chunkserver state

(chunk handle, byte range)

GFS chunkserver

Linux file system

GFS chunkserver

Linux file system

chunk data

Legend:

→ Data messages
→ Control messages

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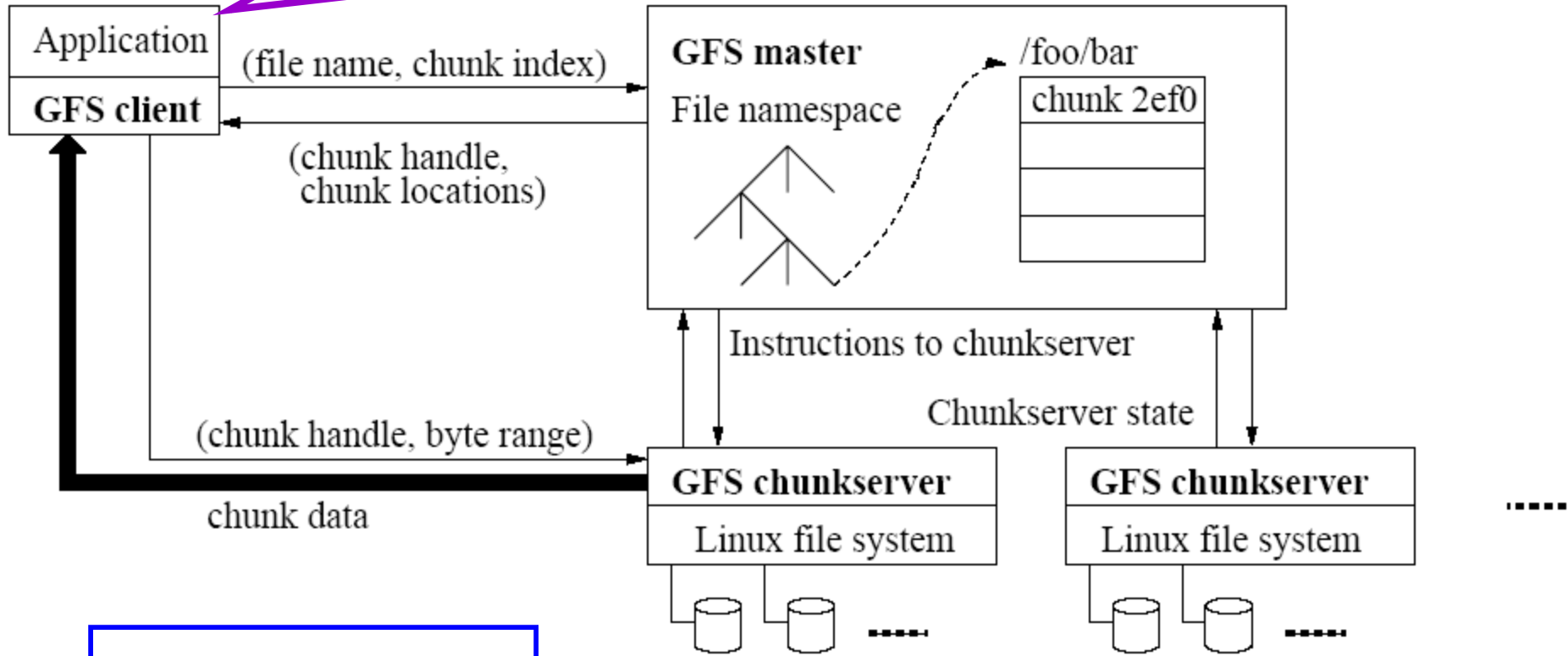
Replies with chunk handle & location of chunkserver replicas (including which is 'primary')

| Application | (file name, chunk index) | GFS master | /foo/bar |
| GFS client | | File namespace | chunk 2ef0 |

(chunk handle, chunk locations)

Instructions to chunkserver

Chunkserver state

(chunk handle, byte range)

chunk data

GFS chunkserver — Linux file system

GFS chunkserver — Linux file system

Legend:
→ Data messages
→ Control messages

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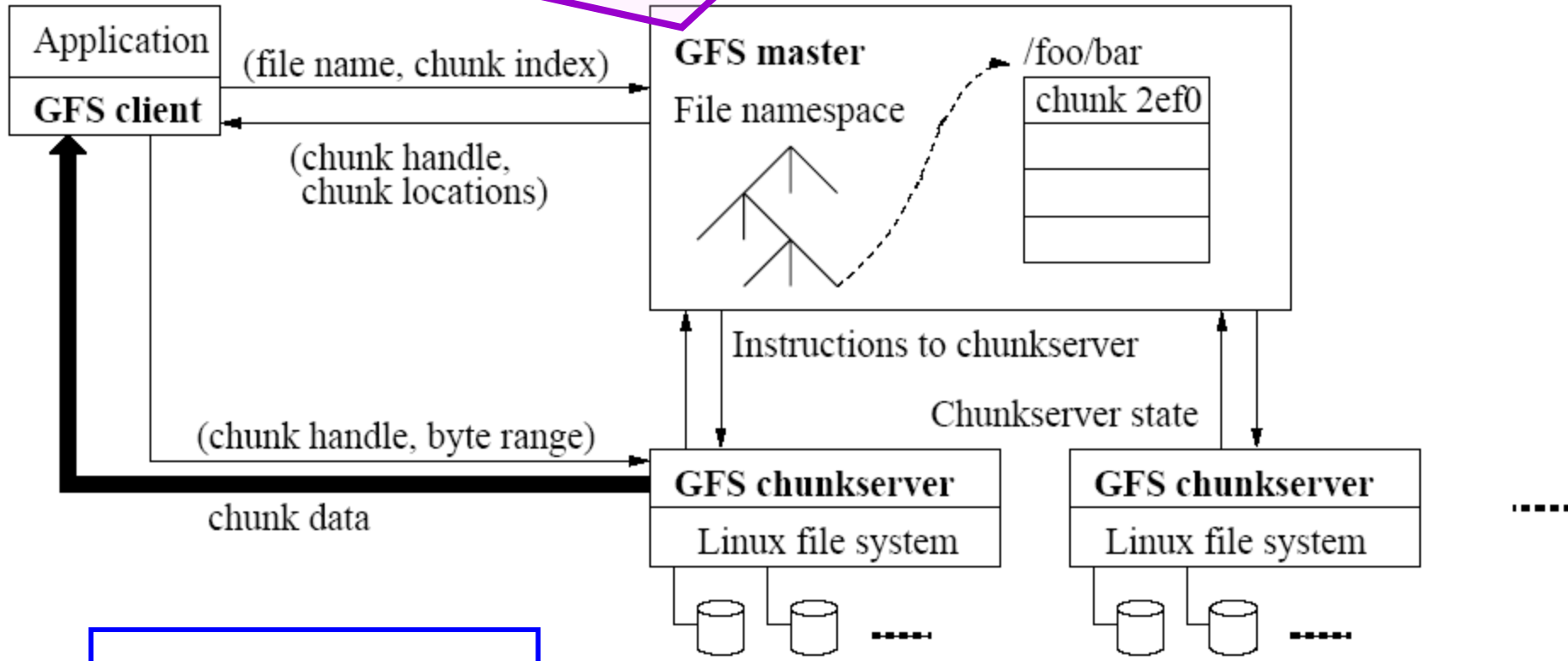
Cache info
using filename & chunk index as key

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Application

(file name, chunk index)

GFS master

/foo/bar

GFS client

File namespace

chunk 2ef0

(chunk handle,
chunk locations)

Instructions to chunkserver

Chunkserver state

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GFS chunkserver

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chunk data

Linux file system

Linux file system
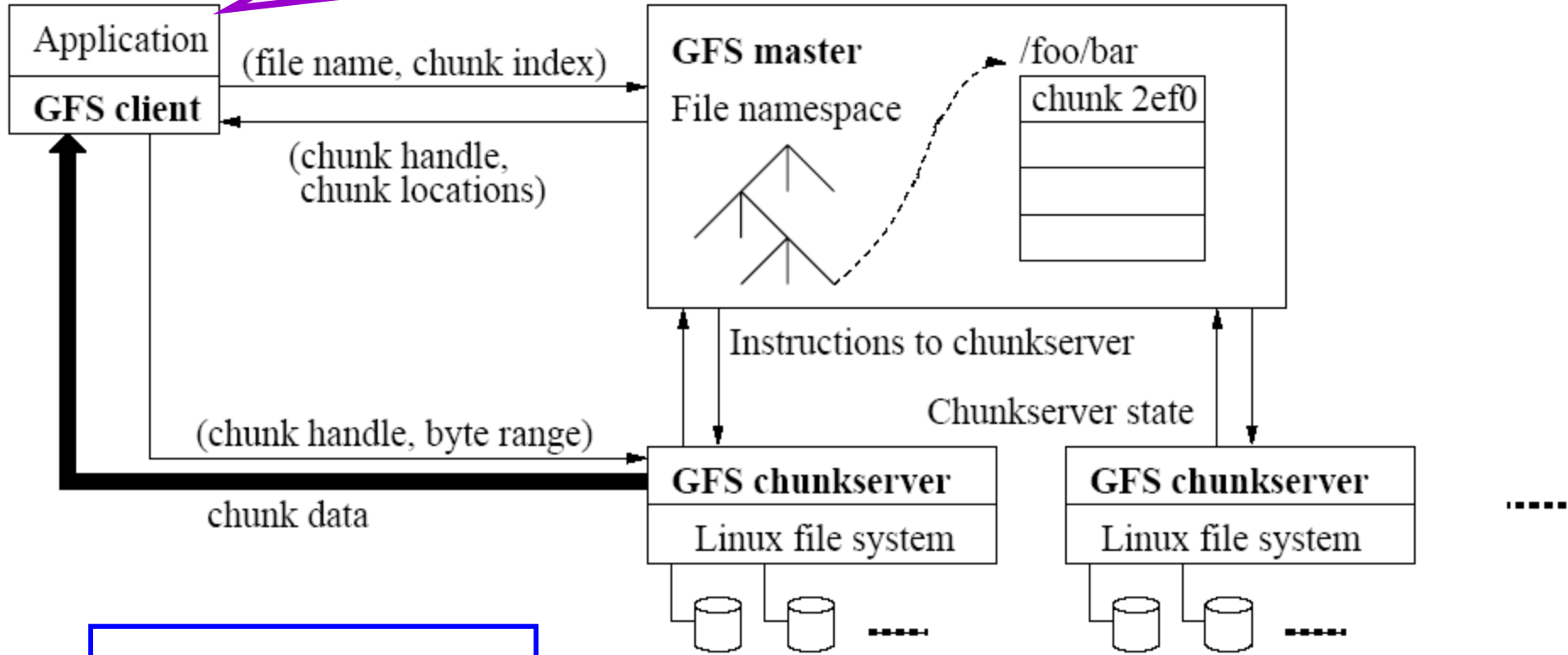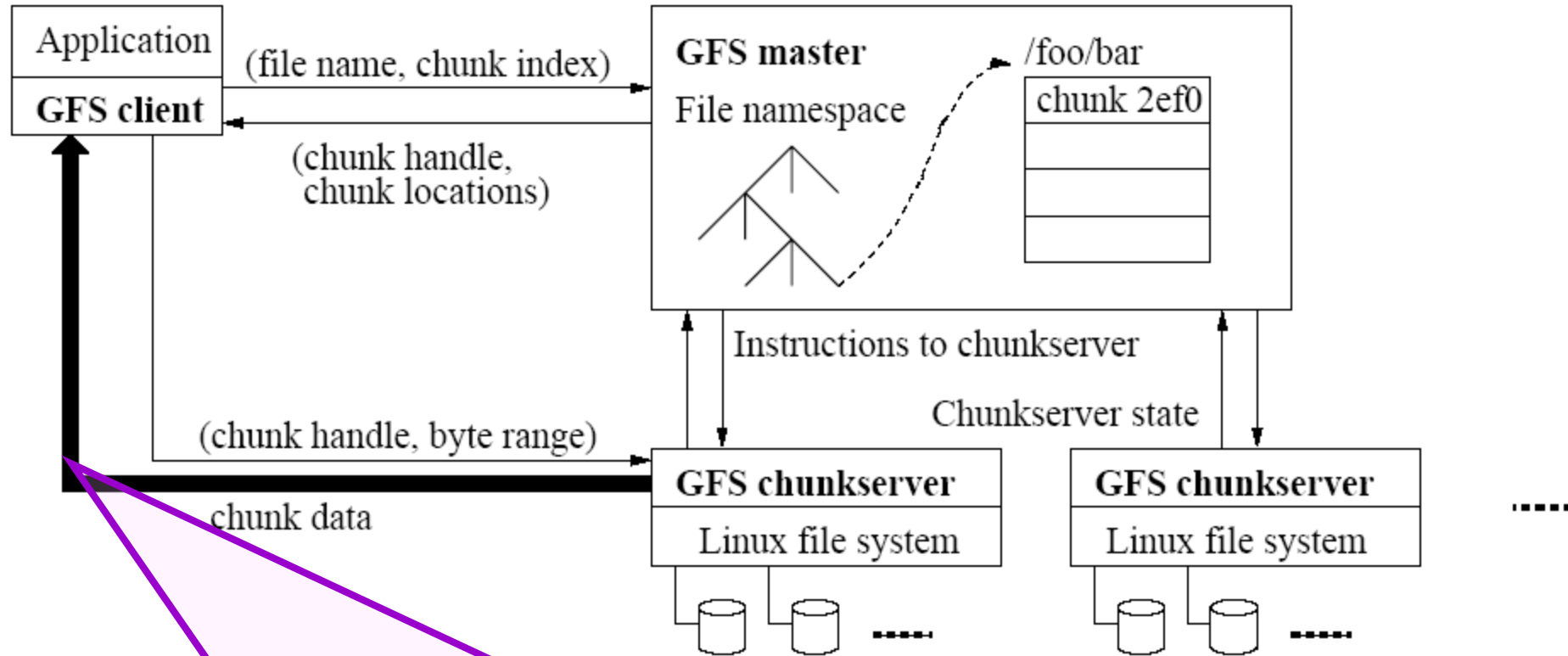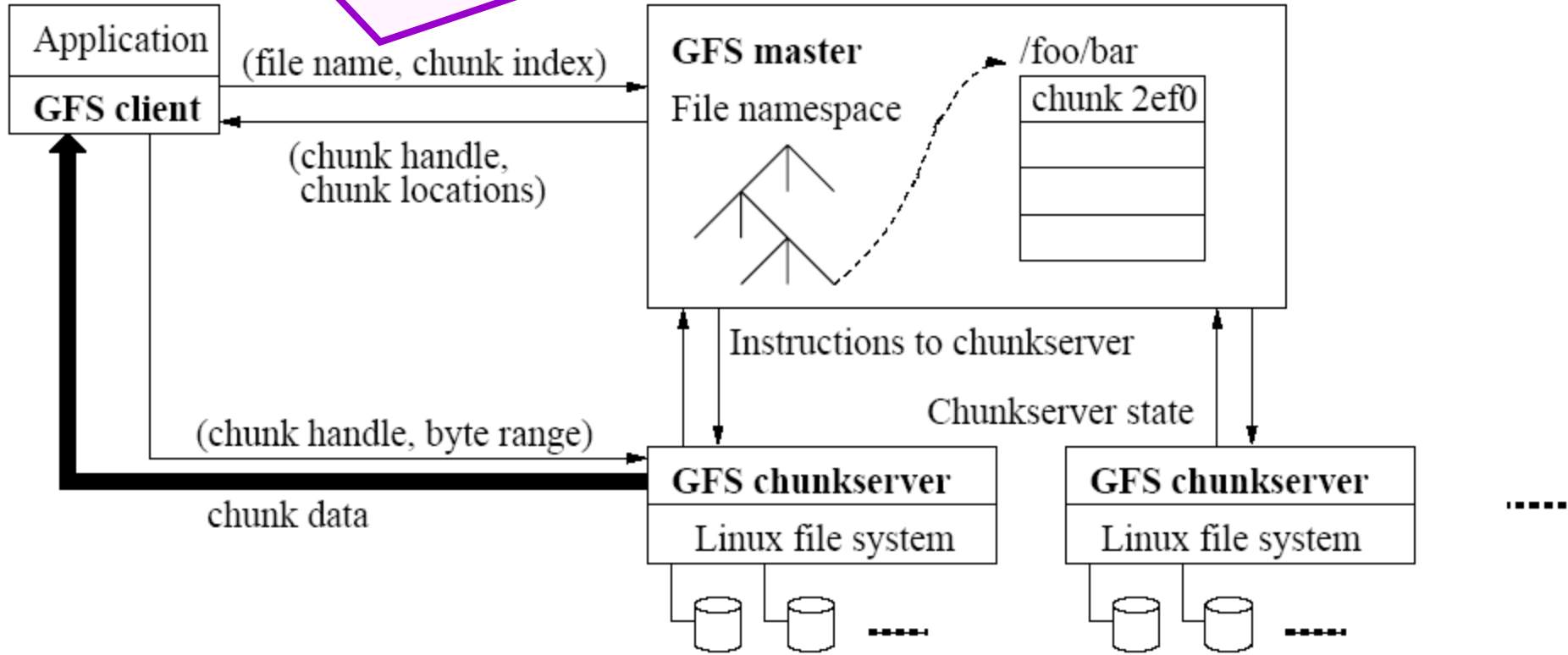
Request data from nearest chunkserver
"chunkhandle & index into chunk"

No need to talk more
About this 64MB chunk
Until cached info expires or file reopened

Application

GFS client

(file name, chunk index)

(chunk handle,
chunk locations)

GFS master

File namespace

/foo/bar

chunk 2ef0

Instructions to chunkserver

Chunkserver state

(chunk handle, byte range)

chunk data

GFS chunkserver

Linux file system

GFS chunkserver

Linux file system

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Often initial request asks about Sequence of chunks

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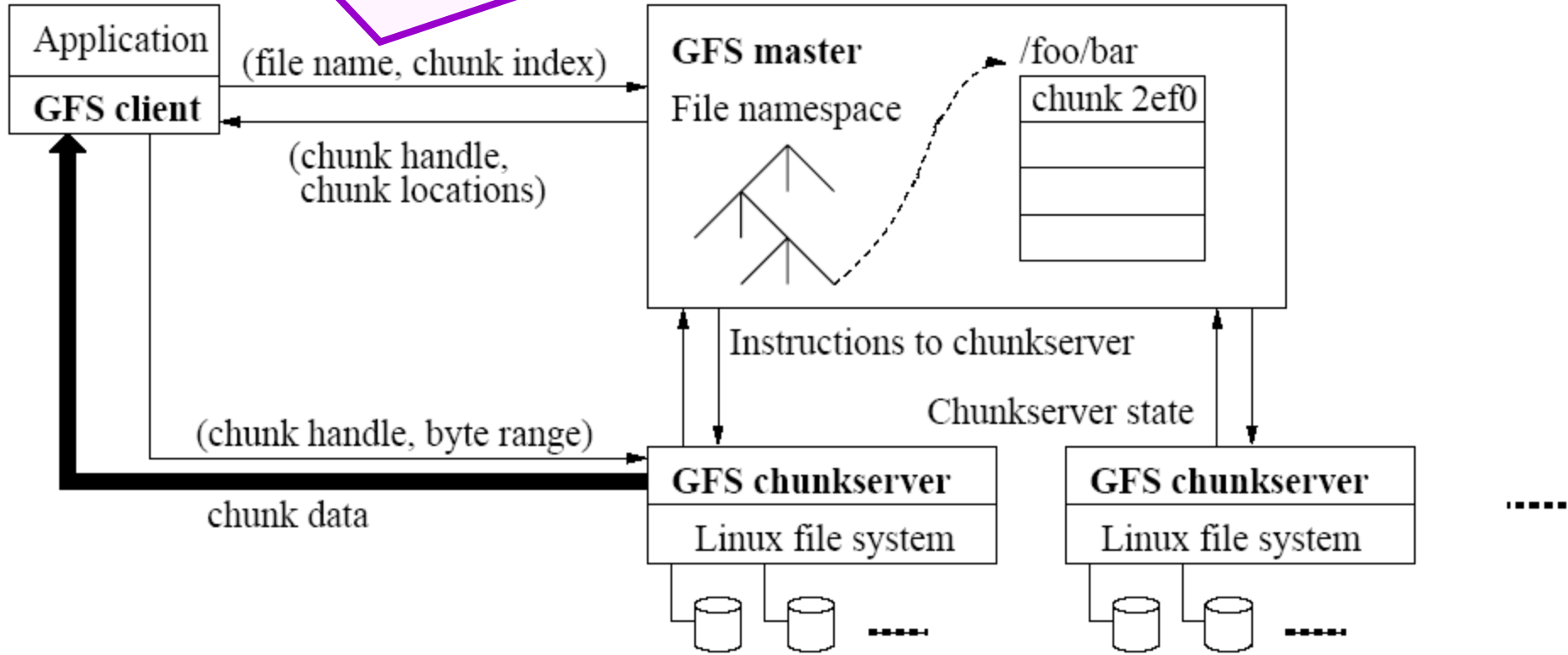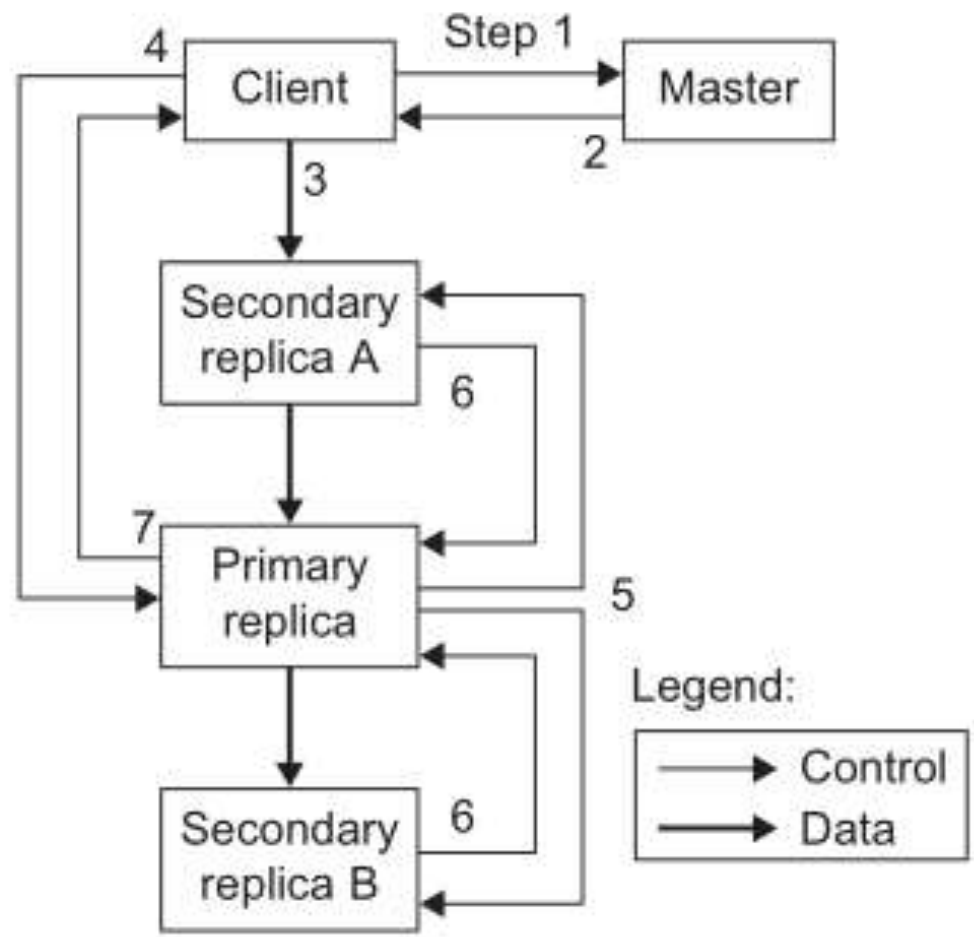
Google File System (GFS)

- All the Google applications run on GFS
- Characteristics
    - Runs on inexpensive commodity hardware infrastructure
    - File size: storages large number of huge size files (64 MB data block)
    - write operations are often the appending data blocks to the end of files concurrently
    - Reliability is achieved by using replications, data block of a file is replicated across more than three chunk servers

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- ❑ High fault tolerance
- ❑ Fast recovery capability
- ❑ Chunk is replicated in at least three places and
- ❑ Shadow master handles the failure of the GFS master
- ❑ GFS makes checksums on every 64 KB block in each chunk
- ❑ GFS can achieve the goals of high availability (HA), high performance, and large scale

Conclusion

App Engine applications are simple to develop, maintain, and also helps to scale your traffic and data storage needs.

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References

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.