HDFS

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Basics – *optional*

- Program
  - sequence of instructions written to perform a specified task with a computer
  - or a piece of code
- Process
  - an instance of a computer program that is being executed.
  - or a execution of a program
- Daemon Process
  - process which runs in background and has no controlling terminal.
- JVM – Java Virtual Machine
  - program which executes certain programs, namely those containing Java bytecode instructions

Basics – *optional*

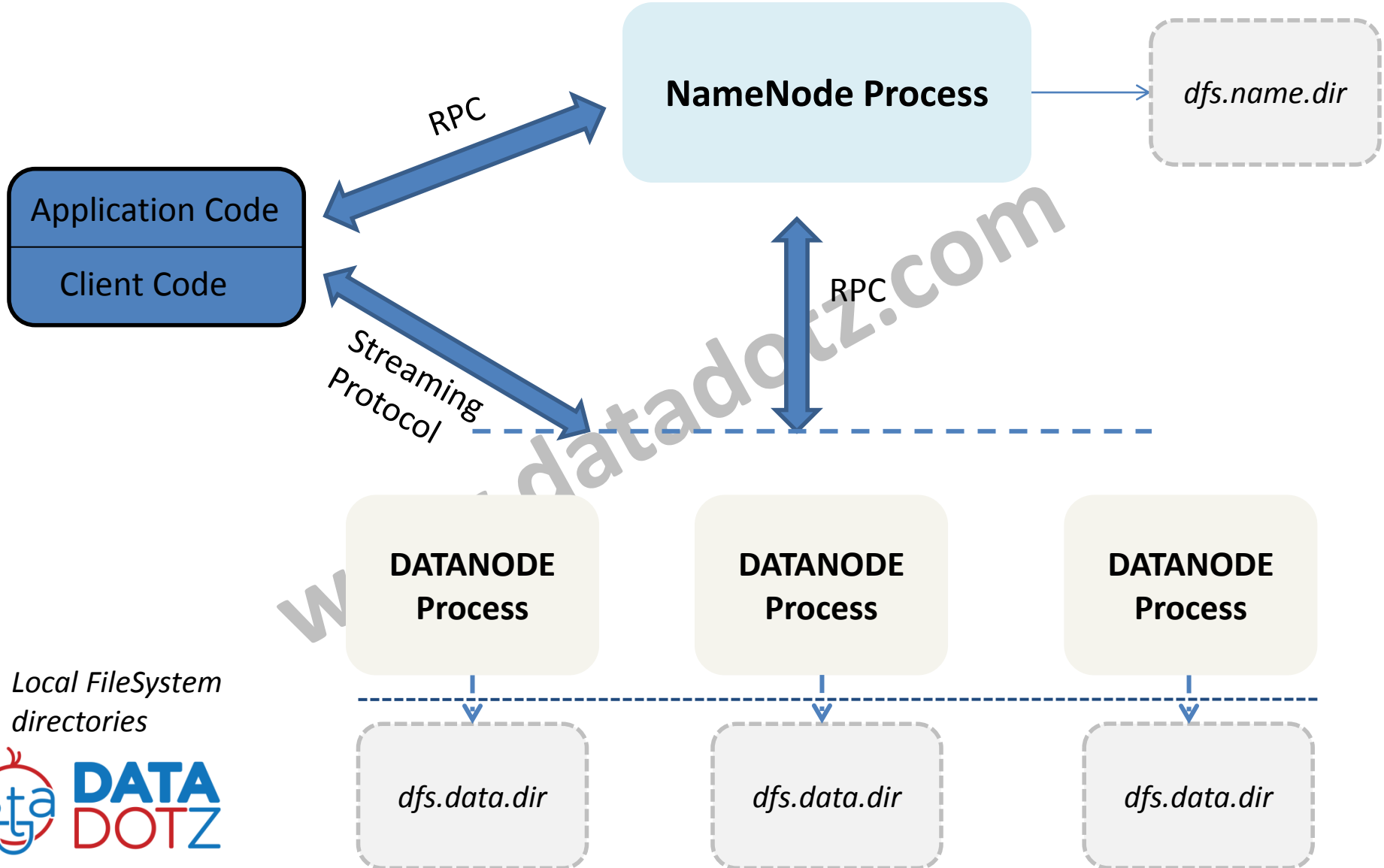
- Client-server Concept
  - Client sends requests to one or more servers which in turn accepts, processes them and return the requested information to the client.
  - A server might run a software which listens on particular ip and port number for requests
  - Examples:
    - Server - web server
    - Client – web browser

Introduction

- A distributed File System - **STORAGE**
  - A File System on multiple machines which sits on native filesystem
    - ext4,ext3
- Hardware Failure
  - Due to usage of Commodity machines, failure is a common phenomenon
  - Designed for failure
- Large Data Sets
  - Small Files Problem Due to NameNode
- Simple Coherency Model
  - Write Once , Read Many Times
- Streaming Data Access
  - High Throughput instead of low latency access

- ext3? ext4?

Continued...



Daemons in Hadoop Core

- NameNode
- DataNode
- Secondary NameNode*

} HDFS

- JobTracker*
- TaskTracker*

} MR

* - will be seen later

Block Concept

TestFile1.txt -> 1GB
Block Size -> 64 MB

No of Blocks = 1GB / 64MB = 16 blocks
Blocks are B1,B2,…..B16

Files are splitted into number of chunks(Blocks) of pre-defined size

DataNode	DataNode	DataNode	DataNode
B1	B3	B4	B2
B8	B7	B5	B6
B10	B12	B11	B9
B13	B16	B14	B15

Block Concept

TestFile1.txt -> 1GB
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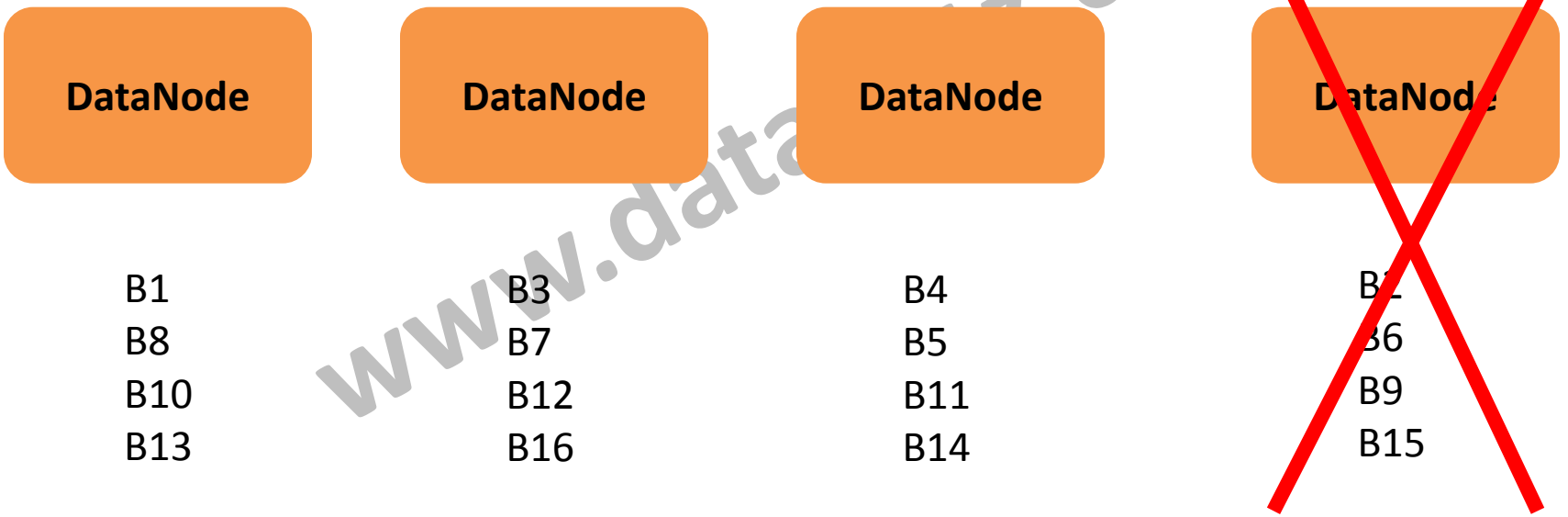
What happens to my data if node 4 goes down??



Fault Tolerant in HDFS

TestFile1.txt -> 1GB
Block Size -> 64 MB

No of Blocks = 1GB / 64MB = 16 blocks
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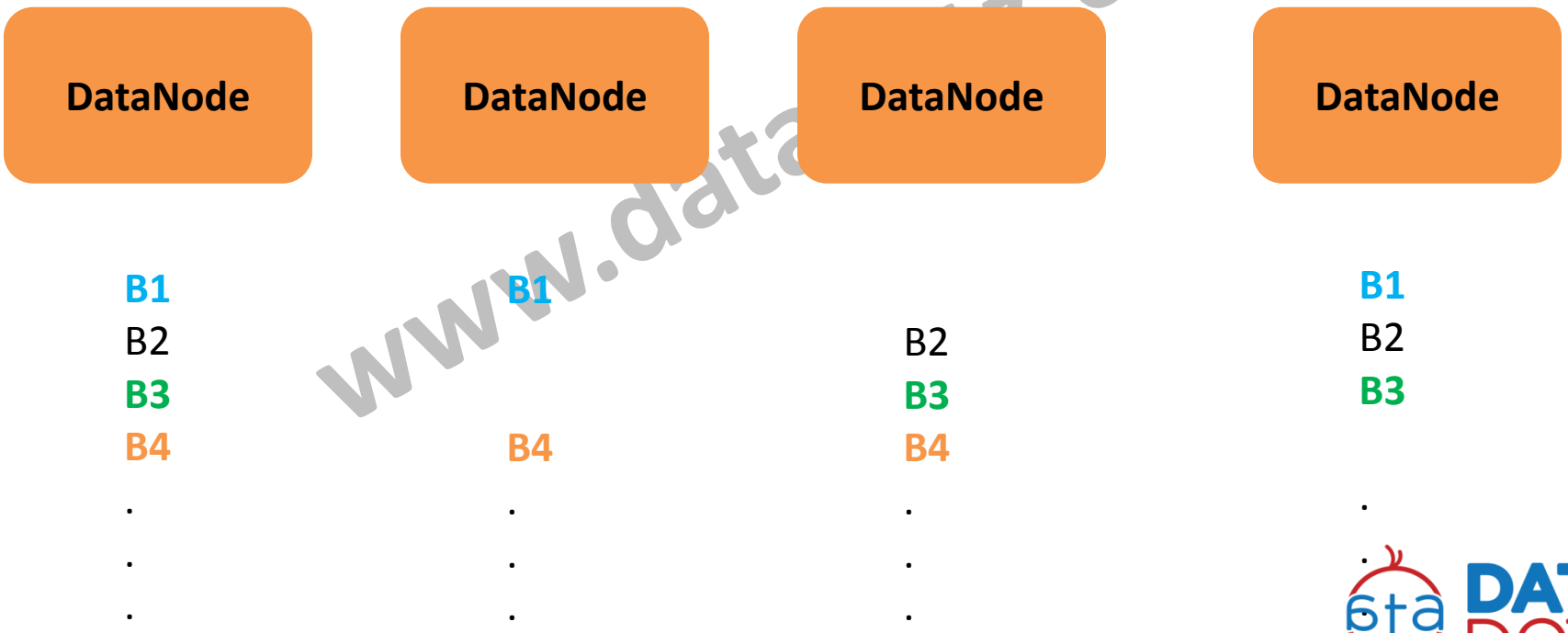
HDFS provides fault tolerant by replication of each block by 3



Data Pipelining

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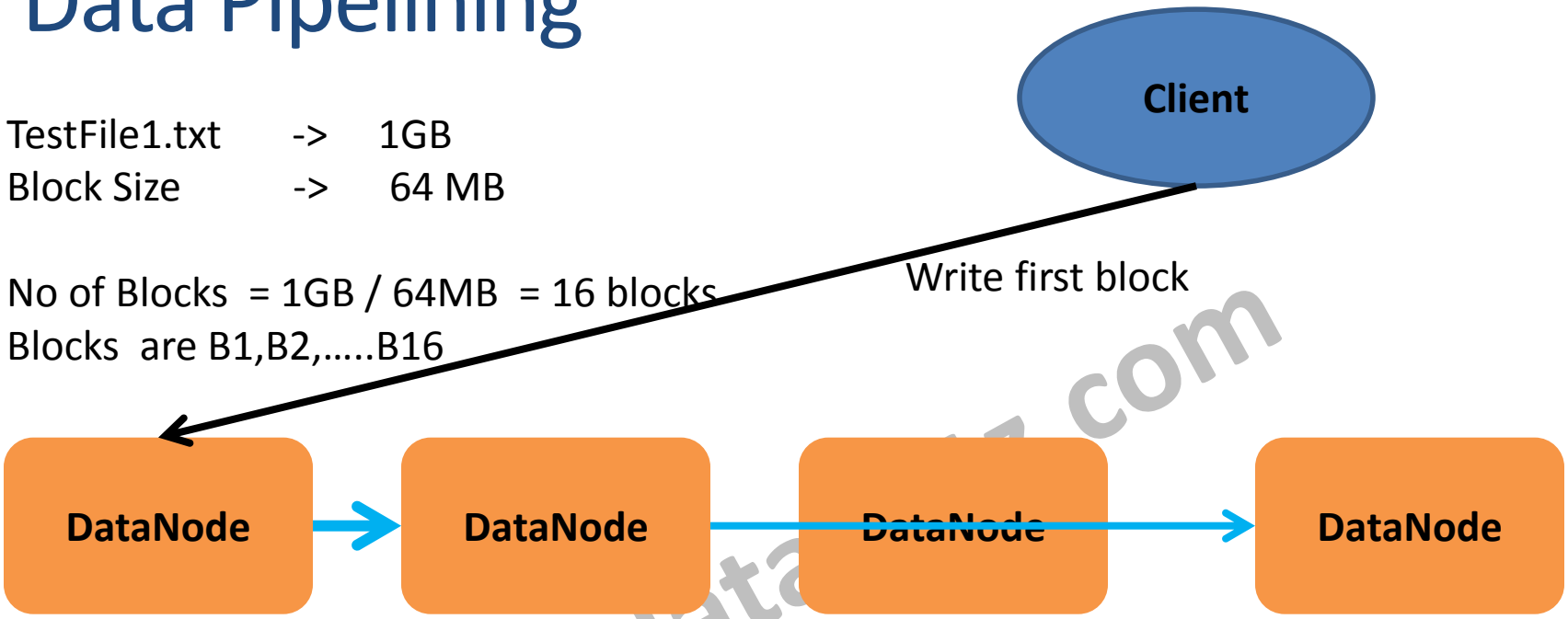
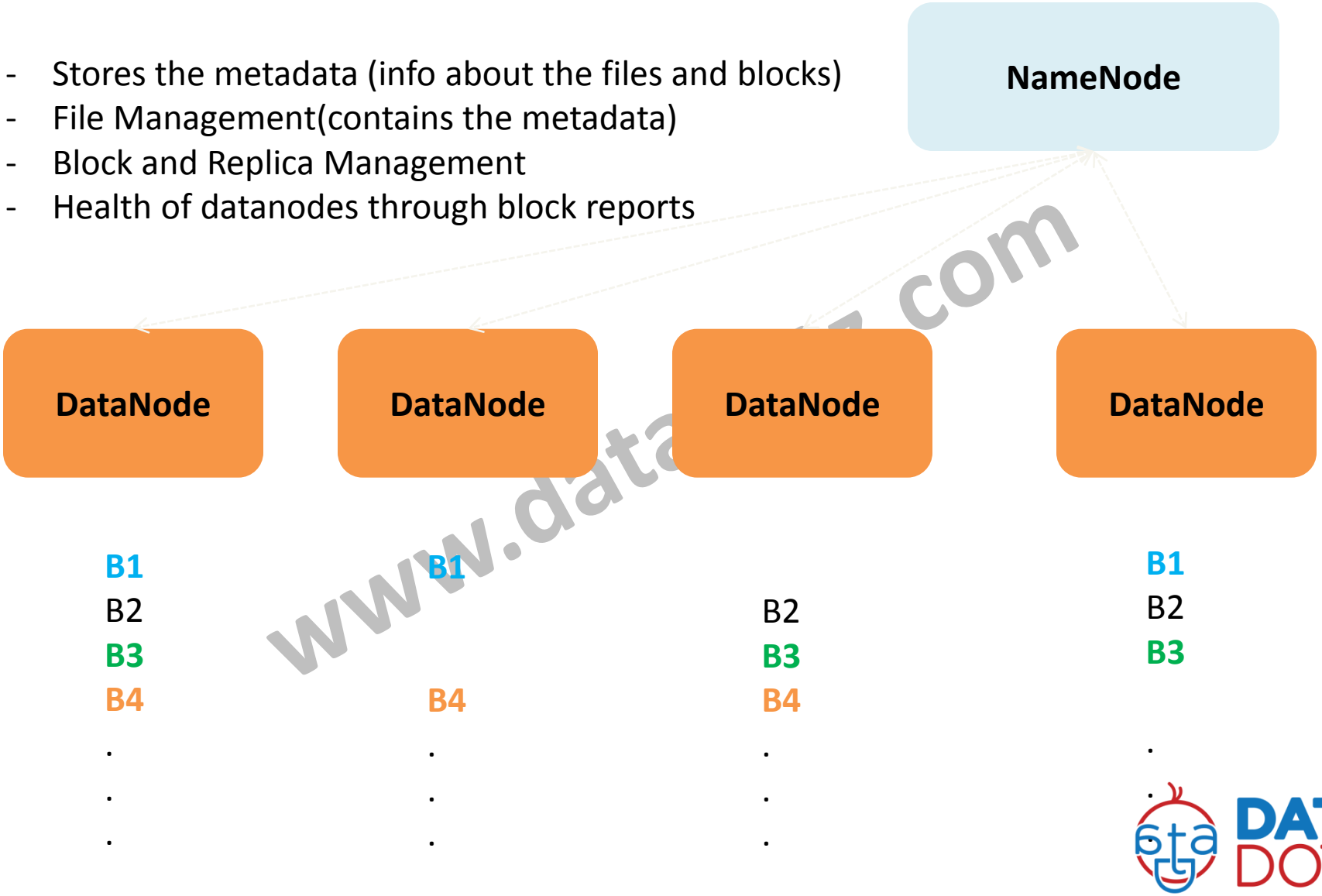


Role of NameNode

- Stores the metadata (info about the files and blocks)
- File Management(contains the metadata)
- Block and Replica Management
- Health of datanodes through block reports



Execution Modes &Installation

- Modes
  - Single Stand Alone
    - All Process runs in a single jvm
    - Does not use HDFS
  - Pseudo Distributed Mode **- for our training**
    - All daemon process runs in separate jvm in a single local machine
    - Used for development and testing
    - Uses HDFS to store data
  - Distributed Mode
    - A cluster of nodes more than 1
    - Each Process may run in different nodes
- Please follow instructor and doc provided

Installation

- Please follow the steps in the document given

Ports used by Hadoop Daemons

Daemon	RPC	WEB
NameNode	8020 (50000*)	50070
SecondaryNameNode		50090
JobTracker	8021(50001*)	50030
TaskTracker	50020	50060
DataNode	50010	50075

After installation

- jps
  - JPS - JVM profiling status tool
- Web UI
  - NameNode - http://localhost:50070
  - JobTracker – http://localhost:50030

Accessing HDFS

- Command line
  - Usage: *hadoop dfs <command>*
- JAVA API
- webHDFS

HDFS commands

- *hadoop dfs -copyFromLocal <srcLOCALfile> <destHDFSfile>*
- *hadoop dfs -ls /*
- *hadoop dfs -cat /<destHDFSfile>*
- *hadoop dfs -copyToLocal <srcHDFSfile> <destLOCALfile>*
- *hadoop dfs -mkdir /test*
- *hadoop dfs –rmr /test*

- *Please follow the document given*

JAVA API

- Most Packages Used
  - *org.apache.hadoop.conf.Configuration*
  - *org.apache.hadoop.fs.BlockLocation*
  - *org.apache.hadoop.fs.FSDataInputStream*
  - *org.apache.hadoop.fs.FSDataOutputStream*
  - *org.apache.hadoop.fs.FileStatus*
  - *org.apache.hadoop.fs.FileSystem*
  - *org.apache.hadoop.fs.Path*
  - *org.apache.hadoop.hdfs.DistributedFileSystem*
  - *org.apache.hadoop.hdfs.protocol.DatanodeInfo*

Please see and execute the example code provided

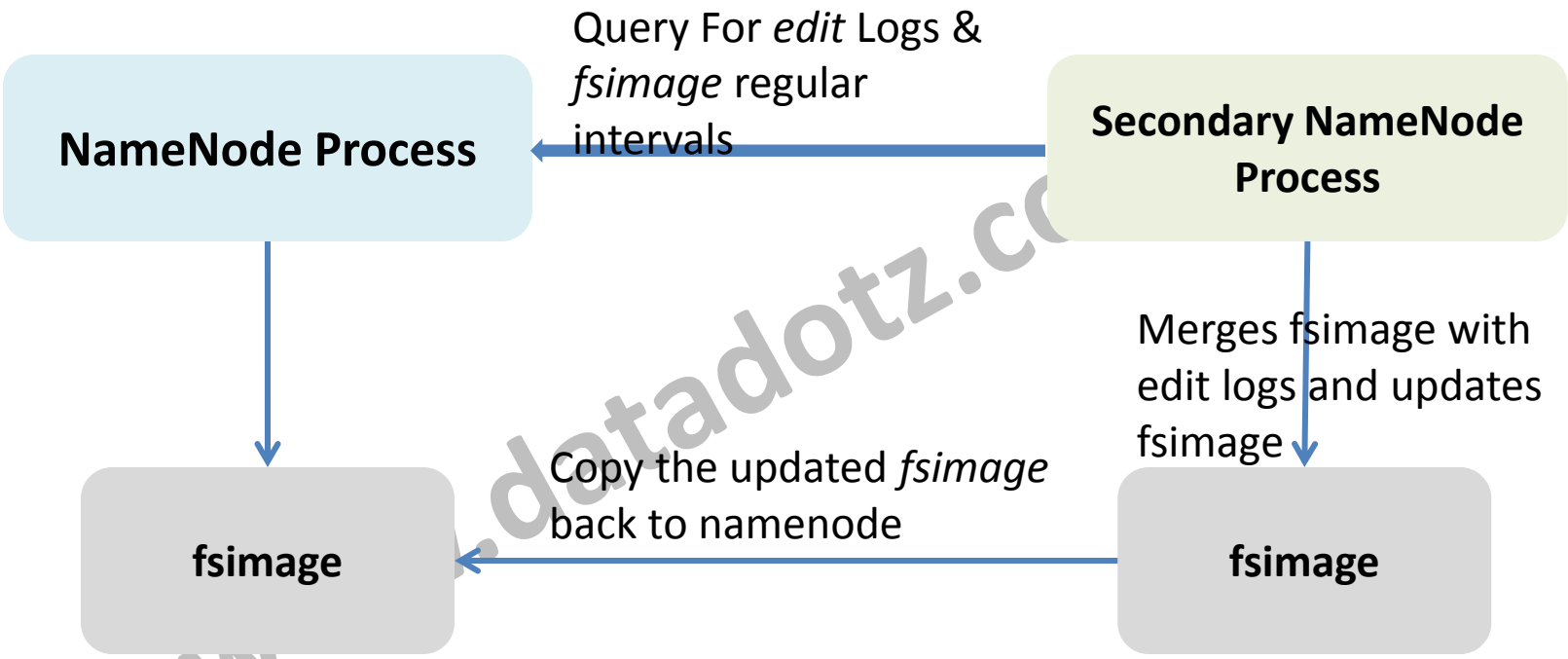
FileSystem API methods

- append()
- copyFromLocalFile()
- create()
- delete()
- mkdirs()
- open()

Secondary NameNode*

- A helper node for NameNode
- performs memory-intensive administrative functions for the
- NameNode
- Have a checkpoint for the file system (HDFS)
- Not a Backup Node

Role of Secondary NameNode



Thank you