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The Distributed Server System

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The Distributed Server System

ABSTRACT

This paper describes a method to provide content to end users in a distributed manner. A large group of geographically distributed, physically separated server computers holds image files in a distributed manner. That is each image file is partitioned into a large number of small byte partitions and each partition is stored on a separate server computer in the group. Whenever there is a need to provide an image file to the client computer all the server computers in the large server group simultaneously provide all the small partitions of the same image file to the client computer. When the client computer needs to upload an image file to this server computer system, it will also partition the image file into a large number of equal sized small byte partitions and will send all those byte partitions simultaneously to the server computer group. In this operation, each server computer will receive only one of those byte partitions that was sent by the client computer.

BACKGROUND

Nowadays, computer networks provide opportunity to exchange information in an interconnected world. Every time instance, a large number of users upload and download large amounts of information to server computers. This trend will only seem to increase day by day. It's challenging yet highly desirable to have a network infrastructure that could provide services to a large number of client computers seeking to upload and download large amounts of information.

KEYWORDS

- Server computer
- Client computer

DESCRIPTION

This paper describes a method to provide content to end users in a distributed manner. A large group of geographically distributed, physically separated server computers holds image files in a distributed manner. That is each image file is partitioned into a large number of small byte partitions and each partition is stored on a separate server computer in the group. Whenever there is a need to provide an image file to the client computer all the server computers in the large server group simultaneously provide all the small partitions of the same image file to the client computer. When the client computer needs to upload an image file to this server computer system, it will also partition the image file into a large number of equal sized small byte partitions and will send all those byte partitions simultaneously to the server computer group. In this operation, each server computer will receive only one of those byte partitions that was send by the client computer.

- The structure and functions of this total system with example scenarios are given below.

1. The description of the total system - the group of geographically distributed, physically separated server computers holding image files in a distributed manner. And the client computer.

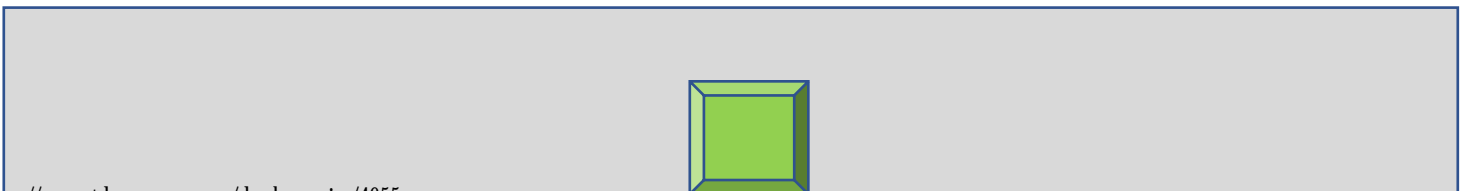
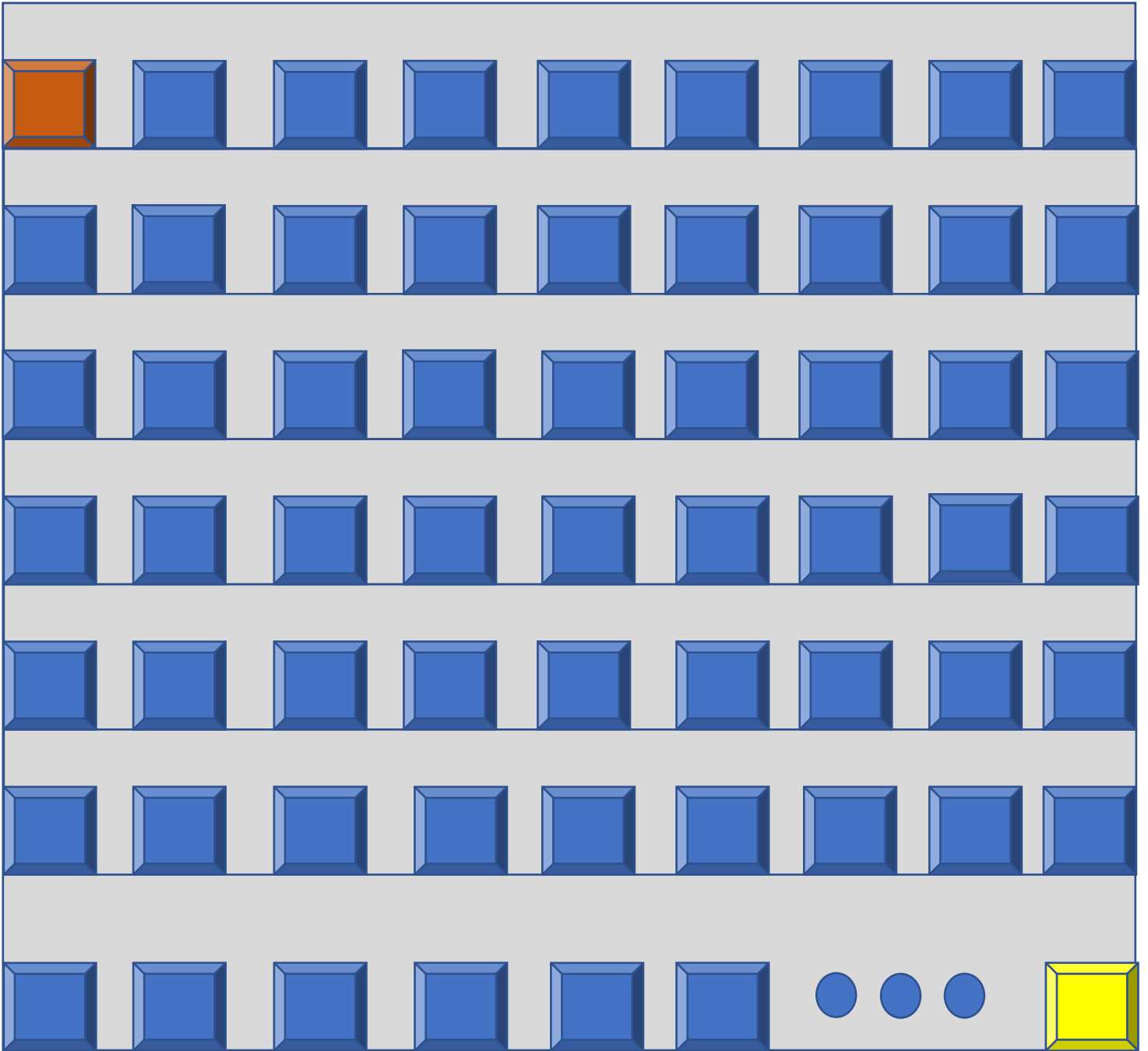
The total system consists of a collection of geographically distributed server computers. The server computers are physically separately located from each other. They all have equivalent network bandwidth capacity and storage capacity dedicated for image files. Also, there is a client computer who can access all the server computers in this total system.

- The example

A total collection of 100 000 server computers is present in this total system. They are all located at different physical locations from each other. All of the server computers have the equivalent network bandwidth of at least 100 megabits per second on each of them. All the server computers also have the same storage capacity of one terabyte dedicated for image files. The client computer who can access all of the server computers also has the network bandwidth of at least 100 megabits per second. All the server computers have the IP address of the client computer and in turn the client computer has all the IP addresses of all the server computers.

This scenario is given by the below diagram.

The brown shape represents the first server computer and the yellow shape represents the 100 000th server computer. The blue shapes represent all the other server computers. The green shape represents the client computer.

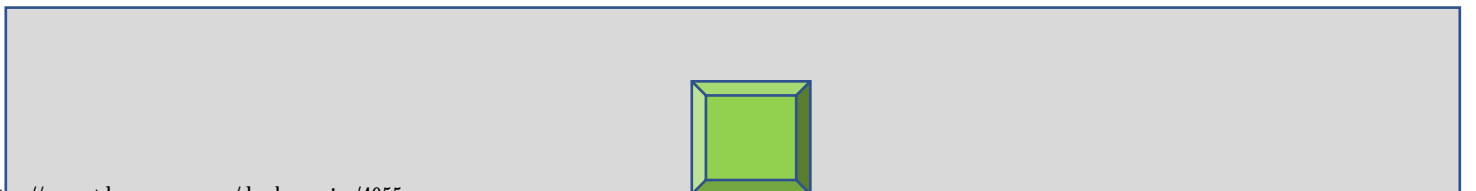
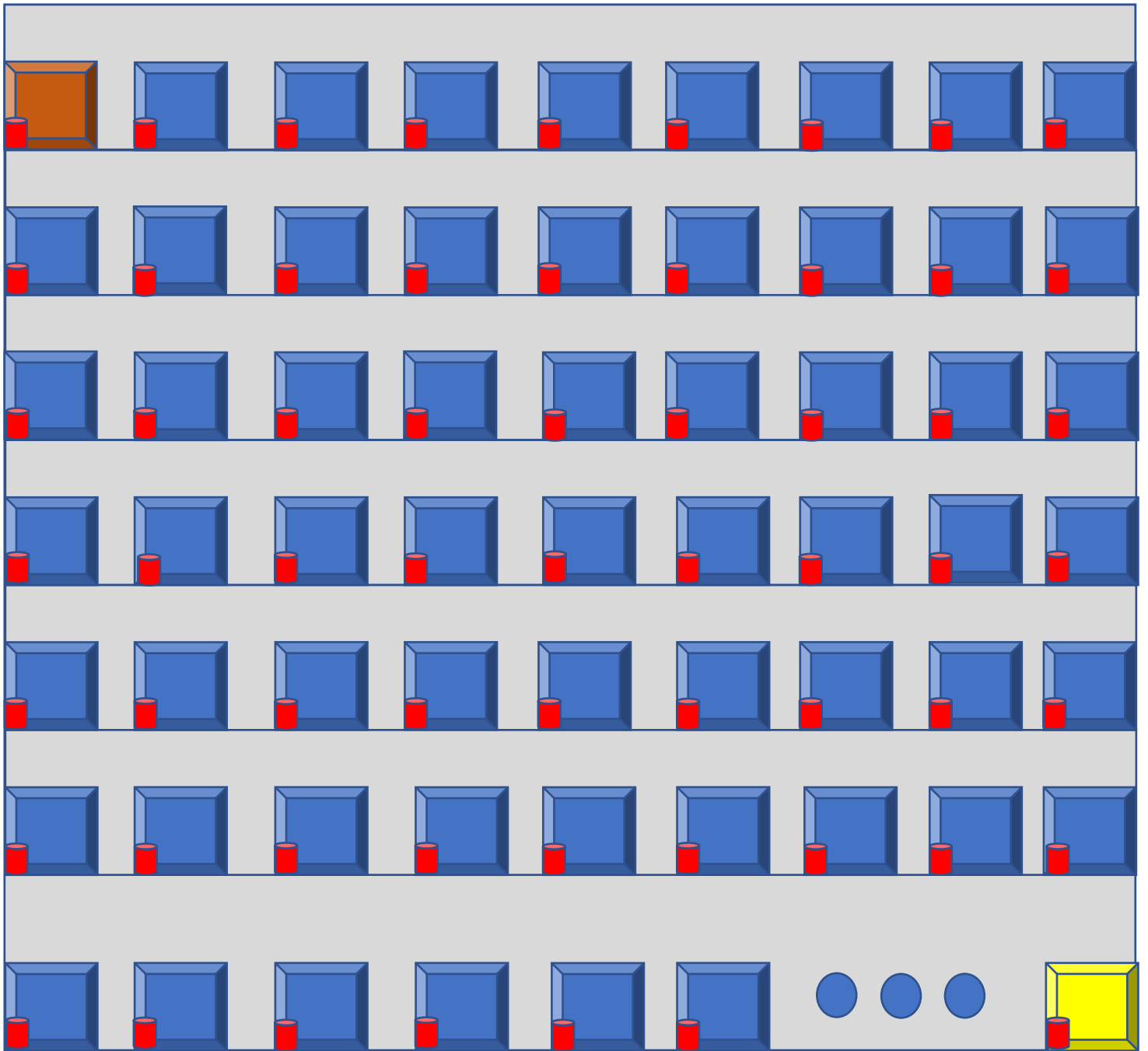


2. The description of how the image file is stored in this system.

The image file in this system is partitioned into a large collection of equal sized byte partitions and are stored across all the server computers in a distributed manner.

- The example

The image file is of size one megabyte. This image file could contain a part of an image, an image, several images or several images and part of an image. This image file of one megabyte is partitioned into 100 000 parts of equivalent size. One such part will be of size of ten bytes. All these ten-byte partitions are stored across all the server computers in a distributed manner. That is each server computer will hold a partition of ten bytes of the total image file of one megabyte. This is given by the diagram below. The red shapes represent the ten-byte sized partitions of the image file. The ten-byte sized partitions are each stored with additional information such as the name of the image of the partition, the number of the image of the partition and the sequence number of the partition of the particular image file.



3. The description of how the collection of servers holds multiple image files.

Each server computer can hold more than one ten-byte partition of an image. That is one server computer could hold multiple ten-byte partitions of different image files.

- The example

Each server in the system could in its storage of one terabyte dedicated for image file storage, could store multiple amounts of ten-byte sized partitions of multiple different images.

4. The description of how the client computer sends requests to all the server computers simultaneously to download an image.

The client computer simultaneously sends request messages to all the server computers requesting to download the required image file. The client computer in a database, stores all the names of the images all the server computers hold with the information about where are all the partitions of a particular image file are located. (On which server computer each partition of a particular image is located). The client computer will send all the server computers which has the image file distributed across them the request messages to download the image file.

- The example

The client computer wants to download the image named I_IMAGE. The client computer examines the data base to find out where all the ten-byte sized partitions of the image file I_IMAGE is located. That is on which servers each partition of the image file is located. After this examination process, the client computer will simultaneously send request messages to all the servers which contains the image file I_IMAGE in a distributed manner across them. In this scenario the client computer will send simultaneous request messages to all the 100 000 server computers in this system.

5. The description of how all the server computers send the required image file as a collection of small partitions to the client computer simultaneously.

All the server computers in this system, upon receiving the simultaneously send requests from the client computer, will reply back to the client computer by providing it with the image file. This is achieved by each server computer sending their stored corresponding image partition along with the metadata to the client computer also simultaneously.

- The example

All the 100 000 server computers in this system will send the image file I_IMAGE as a set of 100 000 partitions with their metadata in a distributed manner to the client computer.

- The client computer upon receiving all the image partitions with their corresponding metadata will assemble the image file in the correct order.

6. The description of how the client computer will upload an image file to the server computer system.

The client computer will select the image file it wants to upload into the server system which is also equivalent to the size of one megabyte. After the selection process, the client computer will partition the image file into a collection of equal sized 100 000 ten-byte block partitions with metadata added onto each partition. These metadata are the same as for the metadata used for the partitioning process in the server computers. They are metadata such as the name of the image of the partition, the number of the image of the partition and the sequence number of the partition of the particular image file. After preparing the 100 000 partitions of the image file, the client computer will determine to which server computer each partition should be sent. After this decision process, the client computer will simultaneously send all the partitions of the image file to all the 100 000 server computers in the system. (The sending process is executed in a manner where each server computer will get only one of the 100 000 image partitions)

APPLICATION

This method of sending image files to the client computer could be utilized in a scenario where multiple client computers will perform either download or upload procedures on the server system. By partitioning the image files into a large number of smaller parts and storing them across the servers in a distributed manner, the system will enable a particular server computer to handle more download and upload procedures at a given instance. This is due to the fact that instead of having to handle one image file of one megabyte download or upload procedure for a one single client computer at a given instance, now one server computer will need to only handle a data partition of a fraction of a size from the original image file size.