

Increasing Website Bandwidth Using Cloud Services

BRUCE MOMJIAN

This talk shows how you can use cloud storage for these files to greatly increase your website's bandwidth and responsiveness.

<https://momjian.us/presentations>



Creative Commons Attribution License

Last updated: November 2021

Network Bandwidth

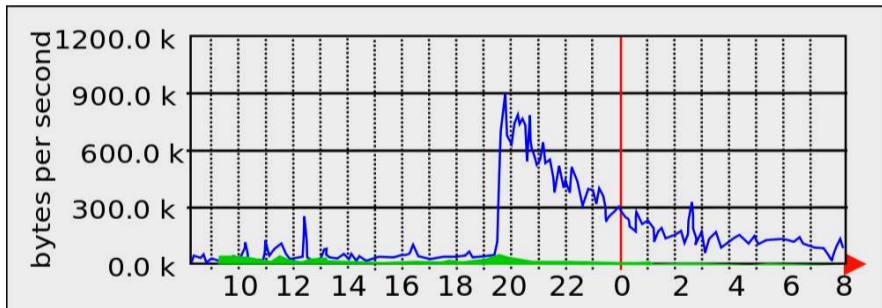
- Symetric or different up/down speeds
- Consistent or uneven
- Always available or sometimes offline

My Setup

- 50 megabits per second (Mbs) down and up
- Sometimes offline due to upgrades, power failure
- Occasional heavy demand

Managing Heavy Demand

The “Slashdot” Effect, https://en.wikipedia.org/wiki/Slashdot_effect



<https://commons.wikimedia.org/wiki/File:SlashdotEffectGraph.svg>

You Need a Spillway



https://commons.wikimedia.org/wiki/File:Hoover_Dam_and_Arizona_Spillway,_1983.jpg

Increasing Bandwidth

- Dynamically increasing bandwidth is usually difficult
- You need to repoint your content to another location that always has more bandwidth
- Cloud providers usually have high bandwidth

Some Terms

- Subdomains
 - `www.momjian.us` is a subdomain of `momjian.us`
 - `pickle.momjian.us` is a subdomain of `momjian.us`
- DNS (domain name service) maps domain names to IP addresses
 - `momjian.us` maps to IP address `72.94.173.45`
 - a CNAME record maps one hostname to another
- Apache is a daemon that serves web pages

Let's Use Amazon Web Services (AWS)

- Lots of acronyms
- Simple Storage Service (S3)
- CloudFront
- ~~EC2~~
- ~~EBS~~


How Do We Reroute Our Content?

- Create an Amazon S3 bucket
- Create a subdomain for the content
- Copy our content to the S3 bucket
- Setup disabled webserver rules to reroute subdomain requests to S3
- Setup disabled DNS rules to reroute subdomain content to S3

Hostnames






- external.momjian.us
- external.momjian.us.s3.amazonaws.com
- download.momjian.us
- d2mt7vdv560udp.cloudfront.net

AWS Services





 **Services** ▼ Edit ▼ Christine Momjian ▼ Global ▼ Help ▼

Amazon Web Services





Compute & Networking

-  **Direct Connect**
Dedicated Network Connection to AWS
-  **EC2**
Virtual Servers in the Cloud
-  **Elastic MapReduce**
Managed Hadoop Framework
-  **Route 53**
Scalable Domain Name System
-  **VPC**
Isolated Cloud Resources







Storage & Content Delivery

-  **CloudFront**
Global Content Delivery Network
-  **Glacier**
Archive Storage in the Cloud
-  **S3**
Scalable Storage in the Cloud
-  **Storage Gateway**
Integrates On-Premises IT Environments with Cloud Storage







Database

-  **DynamoDB**
Predictable and Scalable NoSQL Data Store
-  **ElastiCache**
In-Memory Cache
-  **RDS**
Managed Relational Database Service
-  **Redshift** NEW
Managed Petabyte-Scale Data Warehouse Service

Deployment & Management

-  **CloudFormation**
Templated AWS Resource Creation
-  **CloudWatch**
Resource and Application Monitoring
-  **Data Pipeline**
Orchestration for Data-Driven Workflows
-  **Elastic Beanstalk**
AWS Application Container
-  **IAM**
Secure AWS Access Control
-  **OpsWorks** NEW
Dev-Ops Application Management Service

App Services


-  **CloudSearch**
Managed Search Service
-  **Elastic Transcoder** NEW
Easy-to-use Scalable Media Transcoding
-  **SES**
Email Sending Service
-  **SNS**
Push Notification Service
-  **SQS**
Message Queue Service
-  **SWF**
Workflow Service for Coordinating Application Components

Additional Resources

Getting Started
See our documentation to get started and learn more about how to use our services.

Trusted Advisor
Best practice recommendations to save money, improve fault tolerance, increase performance, and close security gaps.


Service Health

 All services operating normally.

Updated: Jun 25 2013 11:21:00 GMT-0400

[Service Health Dashboard](#)

Set Start Page

 **AWS Marketplace**
Find & buy software, launch with 1-Click and pay by the hour.

© 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. [Privacy Policy](#) [Terms of Use](#)

[Feedback](#)

11 / 37

Example

```

```

```

```

Local Flowers Only



Local



S3

Create Bucket



Services ▾

Edit ▾

Christine Momjian ▾

Global ▾

Help ▾

Welcome to Amazon Simple Storage Service

Amazon S3 is storage for the Internet. It is designed to make web-scale computing easier for developers.

Amazon S3 provides a simple web services interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web. It gives any developer access to the same highly scalable, reliable, secure, fast, inexpensive infrastructure that Amazon uses to run its own global network of web sites. The service aims to maximize benefits of scale and to pass those benefits on to developers.

You can read, write, and delete objects ranging in size from 1 byte to 5 terabytes each. The number of objects you can store is unlimited. Each object is stored in a bucket with a unique key that you assign.

Get started by simply creating a bucket and uploading a test object, for example a photo or .txt file.

[Create Bucket](#)

Additional Information

[Getting Started Guide](#)

[Documentation](#)

[All S3 Resources](#)

[Forums](#)

S3 at a glance

Create



Add



Manage



© 2006 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved.

[Privacy Policy](#)

[Terms of Use](#)

[Feedback](#)

Bucket Name

The screenshot shows the Amazon S3 console interface. At the top, there is a navigation bar with 'Services' and 'Edit' dropdown menus, and user information for 'Christine Momjian' with 'Global' and 'Help' dropdowns. The main heading is 'Welcome to Amazon Simple Storage Service'. Below this, there is introductory text about Amazon S3 and links for 'Additional Information', 'Getting Started Guide', and 'Documentation'. A 'Create Bucket' button is visible on the left. A modal dialog box titled 'Create a Bucket - Select a Bucket Name and Region' is open in the center. The dialog contains a text input field for 'Bucket Name' with the value 'external.momjian.us' and a dropdown menu for 'Region' set to 'US Standard'. At the bottom of the dialog are buttons for 'Set Up Logging >', 'Create', and 'Cancel'. The background of the console is dimmed. At the bottom of the page, there is a footer with copyright information, 'Privacy Policy', 'Terms of Use', and a 'Feedback' button.

Services Edit Christine Momjian Global Help

Welcome to Amazon Simple Storage Service

Additional Information

Amazon S3 is storage for the Internet. It is designed to make web-scale computing easier for developers.

[Getting Started Guide](#)

Amazon S3 provides a simple web services interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web.

[Documentation](#)

that Amazon uses to re

benefits on to develop

You can read, write, and

unlimited. Each object

Get started by simply c

Create Bucket

S3 at a glance

Create

© 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. [Privacy Policy](#) [Terms of Use](#) [Feedback](#)

Create a Bucket - Select a Bucket Name and Region Cancel X

A bucket is a container for objects stored in Amazon S3. When creating a bucket, you can choose a Region to optimize for latency, minimize costs, or address regulatory requirements. For more information regarding bucket naming conventions, please visit the [Amazon S3 documentation](#).

Bucket Name:

Region:

[Set Up Logging >](#) [Create](#) [Cancel](#)

Bucket Properties

The screenshot displays the Amazon S3 console interface. At the top, there is a navigation bar with a logo, 'Services' and 'Edit' dropdown menus, and user information for 'Christine Momjian' with 'Global' and 'Help' dropdown menus. Below this, a 'Create Bucket' button and an 'Actions' dropdown menu are visible. On the right, there are tabs for 'None', 'Properties', and 'Transfers', along with refresh and help icons. The main content area is titled 'All Buckets' and contains a table with a header 'Name'. A single bucket named 'external.monjia.us' is listed and highlighted in blue. A context menu is open over this bucket, showing options: 'Create Bucket...', 'Delete', 'Paste Into', and 'Properties'. The footer contains copyright information for Amazon Web Services, Inc. (2006-2013), links for 'Privacy Policy' and 'Terms of Use', and a 'Feedback' button.

Services ▾ Edit ▾ Christine Momjian ▾ Global ▾ Help ▾

Create Bucket Actions ▾ None Properties Transfers ↻ ?

All Buckets

Name
external.monjia.us

- Create Bucket...
- Delete
- Paste Into
- Properties

© 2006 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. [Privacy Policy](#) [Terms of Use](#) [Feedback](#)

Bucket Created

The screenshot displays the Amazon S3 console interface. At the top, there is a navigation bar with the Amazon logo, 'Services' and 'Edit' dropdown menus, and user information for 'Christine Momjian' with 'Global' and 'Help' dropdowns. Below this, a 'Create Bucket' button and an 'Actions' dropdown are visible. A secondary navigation bar shows 'None Properties Transfers' tabs and refresh/help icons. The main content area is split into two panes. The left pane, titled 'All Buckets', contains a table with one entry: 'external.momjian.us'. The right pane, titled 'Bucket: external.momjian.us', displays the bucket's configuration details: 'Bucket: external.momjian.us', 'Region: US Standard', 'Creation Date: Tue Jun 25 12:04:51 GMT-00:00 2013', and 'Owner: Me'. Below these details is a list of expandable sections: 'Permissions', 'Static Website Hosting', 'Logging', 'Notifications', 'Lifecycle', 'Tags', and 'Requester Pays'. At the bottom of the console, there is a footer with copyright information, links for 'Privacy Policy' and 'Terms of Use', and a 'Feedback' button.

Services ▾ Edit ▾

Christine Momjian ▾ Global ▾ Help ▾

Create Bucket Actions ▾

None Properties Transfers

All Buckets

Name
external.momjian.us

Bucket: external.momjian.us

Bucket: external.momjian.us
Region: US Standard
Creation Date: Tue Jun 25 12:04:51 GMT-00:00 2013
Owner: Me

- ▶ Permissions
- ▶ Static Website Hosting
- ▶ Logging
- ▶ Notifications
- ▶ Lifecycle
- ▶ Tags
- ▶ Requester Pays

© 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. [Privacy Policy](#) [Terms of Use](#) [Feedback](#)

DNS for S3

```
external      IN      CNAME  external.momjian.us.s3.amazonaws.com.
```

S3 Permission Failure

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
- <Error>
  <Code>AccessDenied</Code>
  <Message>Access Denied</Message>
  <RequestId>41F9EEB772A6A0F4</RequestId>
- <HostId>
  3MLjMX9ojZL9PrasHy2aKS8iLKDJ3xc64CrGVaSKiATvTJmjiZVQPUOmr5Xo6FL
  </HostId>
</Error>
```

Bucket List Permission

The screenshot displays the Amazon S3 console interface. At the top, there is a navigation bar with 'Services' and 'Edit' dropdown menus, and a user profile for 'Christine Momjian' with 'Global' and 'Help' dropdowns. Below the navigation bar, there are buttons for 'Create Bucket' and 'Actions', and tabs for 'None', 'Properties', and 'Transfers'. The main content area is titled 'All Buckets' and shows a table with one bucket named 'external.monjiam.us'. To the right of the bucket list is a 'Permissions' panel. This panel contains two permission entries. The first entry is for the grantee 'cnmomjian' with checked permissions for 'List', 'Upload/Delete', 'View Permissions', and 'Edit Permissions'. The second entry is for the grantee 'Everyone' with checked 'List' and unchecked 'Upload/Delete', 'View Permissions', and 'Edit Permissions' permissions. Below the permission entries are buttons for 'Add more permissions', 'Add bucket policy', and 'Add CORS Configuration'. At the bottom of the panel are 'Save' and 'Cancel' buttons. A 'Static Website Hosting' section is partially visible at the bottom of the panel. The footer of the page contains copyright information for Amazon Web Services, Inc. (2008-2013), links for 'Privacy Policy' and 'Terms of Use', and a 'Feedback' button.

Services ▾ Edit ▾ Christine Momjian ▾ Global ▾ Help ▾

Create Bucket Actions ▾ None Properties Transfers ↻ ?

All Buckets

Name
external.monjiam.us

Permissions

Grantee: cnmomjian List Upload/Delete x

View Permissions Edit Permissions

Grantee: Everyone ▾ List Upload/Delete x

View Permissions Edit Permissions

[Add more permissions](#) [Add bucket policy](#)

[Add CORS Configuration](#)

[Save](#) [Cancel](#)

Static Website Hosting

© 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. [Privacy Policy](#) [Terms of Use](#) [Feedback](#)

S3 Permission Success

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
- <ListBucketResult>  
  <Name>external.momjian.us</Name>  
  <Prefix/>  
  <Marker/>  
  <MaxKeys>1000</MaxKeys>  
  <IsTruncated>>false</IsTruncated>  
</ListBucketResult>
```

Copy Image File to S3

```
$ s3cmd --acl-public put flower.jpg s3://external.momjian.us  
flower.jpg -> s3://external.momjian.us/flower.jpg [1 of 1]  
3342844 of 3342844 100% in 3s 903.64 kB/s done  
Public URL of the object is: http://external.momjian.us.s3.amazonaws.com/flower.jpg
```

Bucket Contents

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
- <ListBucketResult>
  <Name>external.momjian.us</Name>
  <Prefix/>
  <Marker/>
  <MaxKeys>1000</MaxKeys>
  <IsTruncated>>false</IsTruncated>
  - <Contents>
    <Key>flower.jpg</Key>
    <LastModified>2013-06-25T16:55:35.000Z</LastModified>
    <ETag>"5543cdef6dbb1e5b0895a8481ce89f56"</ETag>
    <Size>3342844</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
</ListBucketResult>
```

Local and S3 Flowers



Local



S3

Webpage URLs


General Media Permissions Security

Address	Type
http://momjian.us/flower/flower.jpg	Image
http://external.momjian.us/flower.jpg	Image

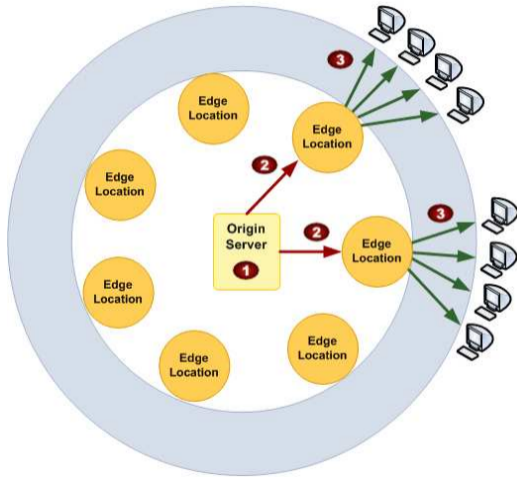
Location: <http://momjian.us/flower/flower.jpg>
Type: JPEG Image
Size: 3,264.5 KB (3,342,844 bytes)
Dimensions: 2,800px × 2,052px (scaled to 252px × 185px)

Block Images from momjian.us

Media Preview: Save As...



Content Delivery Network (CDN)



<http://docs.aws.amazon.com/AmazonCloudFront/latest/DeveloperGuide/Paying.html>

Create Cloudfront Distribution

The screenshot shows the Amazon CloudFront console interface. At the top, there is a dark navigation bar with the AWS logo, 'Services' and 'Edit' dropdown menus, and user information for 'Christine Momjian' with 'Global' and 'Help' dropdown menus. On the left, a 'Navigation' sidebar lists 'Distribution' (highlighted), 'Private Content', 'How-To Guide', and 'Origin Access Identity'. The main content area is titled 'CloudFront: Distributions' and features a toolbar with buttons for 'Create Distribution', 'Distribution Settings', 'Delete', 'Enable', 'Disable', 'Show/Hide', 'Refresh', and 'Help'. Below the toolbar is a yellow message box with the heading 'Amazon CloudFront Getting Started'. The message text reads: 'Either your search returned no results, or you do not have any distributions. Click the button below to create a new CloudFront distribution. A distribution allows you to distribute content using a worldwide network of edge locations that provide low latency and high data transfer speeds ([learn more](#))'. A 'Create Distribution' button is centered below the message. At the bottom of the page, there is a footer with copyright information '© 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved.', links for 'Privacy Policy' and 'Terms of Use', and a 'Feedback' button.

Services ▾ Edit ▾ Christine Momjian ▾ Global ▾ Help ▾

Navigation

- > **Distribution**
- Private Content
 - How-To Guide
 - Origin Access Identity

CloudFront: Distributions

Create Distribution Distribution Settings Delete Enable Disable Show/Hide Refresh Help

Amazon CloudFront Getting Started

Either your search returned no results, or you do not have any distributions. Click the button below to create a new CloudFront distribution. A distribution allows you to distribute content using a worldwide network of edge locations that provide low latency and high data transfer speeds ([learn more](#))

Create Distribution

© 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use Feedback

Distribution Settings

Services ▾ Edit ▾ Christine Momjian ▾ Global ▾ Help ▾

CloudFront > Create Distribution

Step 1: Select delivery method
[Step 2: Create distribution](#)

Origin ID:

Restrict Bucket Access: Yes No

Default Cache Behavior Settings

Path Pattern:

Viewer Protocol Policy: HTTP and HTTPS HTTPS Only

Object Caching: Use Origin Cache Headers Customize

Minimum TTL:

Forward Cookies:

© 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. [Privacy Policy](#) [Terms of Use](#) [Feedback](#)

Distribution CNAME

Services ▾ Edit ▾ Christine Momjian ▾ Global ▾ Help ▾

CloudFront > Create Distribution

Step 1: Select delivery method

[Step 2: Create distribution](#)

Distribution Settings

Price Class Use All Edge Locations (Best Performance) ⓘ

Alternate Domain Names(CNAMEs) ⓘ

SSL Certificate Default CloudFront Certificate (*.cloudfront) ⓘ

Default Root Object ⓘ

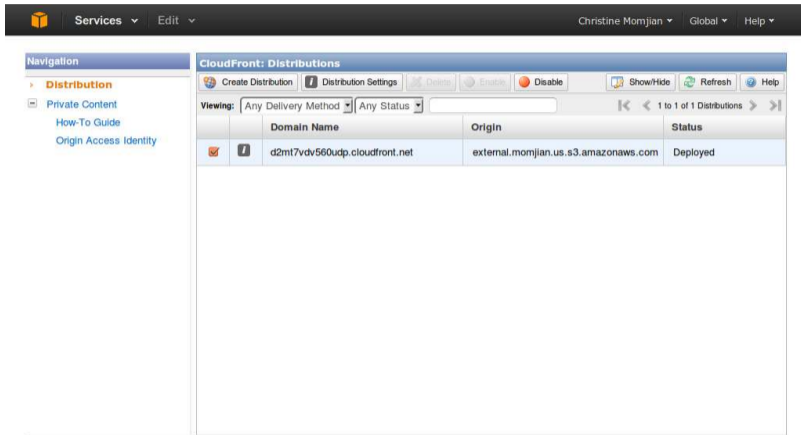
Logging On ⓘ
 Off

Bucket for Logs ⓘ

Log Prefix ⓘ

© 2006 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. [Privacy Policy](#) [Terms of Use](#) [Feedback](#)

Distribution Created



The screenshot shows the AWS CloudFront console interface. At the top, there is a navigation bar with 'Services' and 'Edit' dropdown menus, and the user's name 'Christine Momjian' along with 'Global' and 'Help' dropdown menus. On the left, a 'Navigation' sidebar lists 'Distribution' (selected), 'Private Content', 'How-To Guide', and 'Origin Access Identity'. The main content area is titled 'CloudFront: Distributions' and features a toolbar with 'Create Distribution', 'Distribution Settings', 'Delete', 'Enable', 'Disable', 'Show/Hide', 'Refresh', and 'Help' buttons. Below the toolbar, there are filters for 'Viewing: Any Delivery Method' and 'Any Status', and a pagination indicator '1 to 1 of 1 Distributions'. A table displays the distribution details:

		Domain Name	Origin	Status
<input checked="" type="checkbox"/>		d2mt7vdv560udp.cloudfront.net	external.momjian.us.s3.amazonaws.com	Deployed

DNS for Cloudfront

```
download      IN      CNAME    d2mt7vdv560udp.cloudfront.net.
```

Individual DNS lines can be adjusted to disable the caching of results, and DNS can be hosted on remote servers.

Hostname download.momjian.us

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
- <ListBucketResult>
  <Name>external.momjian.us</Name>
  <Prefix/>
  <Marker/>
  <MaxKeys>1000</MaxKeys>
  <IsTruncated>>false</IsTruncated>
  - <Contents>
    <Key>flower.jpg</Key>
    <LastModified>2013-06-25T16:55:35.000Z</LastModified>
    <ETag>"5543cdef6dbb1e5b0895a8481ce89f56"</ETag>
    <Size>3342844</Size>
    <StorageClass>STANDARD</StorageClass>
  </Contents>
</ListBucketResult>
```


Cloudfront Example

```

```

```

```

```

```

Local, S3, Cloudfront



Local



S3



Cloudfront

Apache Redirect to Local Storage

```
ServerName download.momjian.us  
DocumentRoot /var/www/s3-download  
</VirtualHost>
```

Apache Redirect to Cloudfront

```
RewriteCond %{HTTP_HOST} ^download\.momjian\.us  
RewriteRule ^(.*)$ http://d2mt7vdv560udp\.cloudfront\.net/$1 [redirect=302,1a
```

Conclusion



<https://momjian.us/presentations>

<https://www.flickr.com/photos/usfwspacific/>