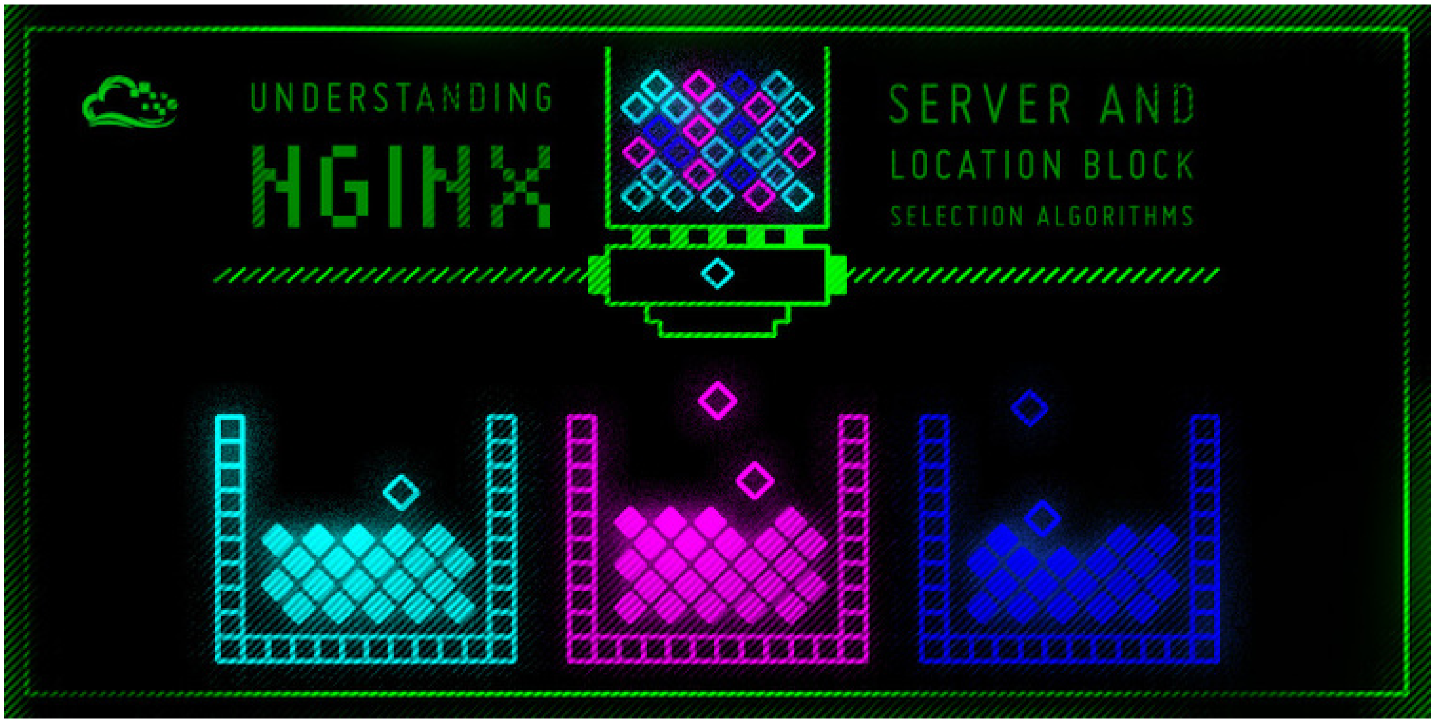
By: Justin Ellingwood Subscribe Share Contents



Understanding Nginx Server and Location Block Selection Algorithms

Posted November 17, 2014 391.2k NGINX 70

Introduction

Nginx is one of the most popular web servers in the world. It can successfully handle high loads with many concurrent client connections, and can easily function as a web server, a mail server, or a reverse proxy server.

In this guide, we will discuss some of the behind-the-scenes details that determine how Nginx processes client requests. Understanding these ideas can help take the guesswork out of designing server and location blocks and can make the request handling seem less unpredictable.

Nginx Block Configurations

Nginx logically divides the configurations meant to serve different content into blocks, which live in a hierarchical structure. Each time a client request is made, Nginx begins a process of determining which configuration blocks should be used to handle the request. This decision process is what we will be discussing in this guide.

The main blocks that we will be discussing are the **server** block and the **location** block.

A server block is a subset of Nginx's configuration that defines a virtual server used to handle requests of a defined type. Administrators often configure multiple server blocks and decide which block should handle which connection based on the requested domain name, port, and IP address.

A location block lives within a server block and is used to define how Nginx should handle requests for different resources and URIs for the parent server. The URI space can be subdivided in whatever way the administrator likes using these blocks. It is an extremely flexible model.

How Nginx Decides Which Server Block Will Handle a Request

SCROLL TO TOP

Since Nginx allows the administrator to define multiple server blocks that function as separate virtual web server instances, it needs a procedure for determining which of these server blocks will be used to satisfy a request.

It does this through a defined system of checks that are used to find the best possible match. The main server block directives that Nginx is concerned with during this process are the `listen` directive, and the `server_name` directive.

Parsing the "listen" Directive to Find Possible Matches

First, Nginx looks at the IP address and the port of the request. It matches this against the `listen` directive of each server to build a list of the server blocks that can possibly resolve the request.

The `listen` directive typically defines which IP address and port that the server block will respond to. By default, any server block that does not include a `listen` directive is given the listen parameters of `0.0.0.0:80` (or `0.0.0.0:8080` if Nginx is being run by a normal, non-root user). This allows these blocks to respond to requests on any interface on port 80, but this default value does not hold much weight within the server selection process.

The `listen` directive can be set to:

- An IP address/port combo.
- A lone IP address which will then listen on the default port 80.
- A lone port which will listen to every interface on that port.
- The path to a Unix socket.

The last option will generally only have implications when passing requests between different servers.

When trying to determine which server block to send a request to, Nginx will first try to decide based on the specificity of the `listen` directive using the following rules:

- Nginx translates all "incomplete" `listen` directives by substituting missing values with their default values so that each block can be evaluated by its IP address and port. Some examples of these translations are:
  - A block with no `listen` directive uses the value `0.0.0.0:80`.
  - A block set to an IP address `111.111.111.111` with no port becomes `111.111.111.111:80`
  - A block set to port `8888` with no IP address becomes `0.0.0.0:8888`
- Nginx then attempts to collect a list of the server blocks that match the request most specifically based on the IP address and port. This means that any block that is functionally using `0.0.0.0` as its IP address (to match any interface), will not be selected if there are matching blocks that list a specific IP address. In any case, the port must be matched exactly.
- If there is only one most specific match, that server block will be used to serve the request. If there are multiple server blocks with the same level of specificity matching, Nginx then begins to evaluate the `server_name` directive of each server block.

It is important to understand that Nginx will only evaluate the `server_name` directive when it needs to distinguish between server blocks that match to the same level of specificity in the `listen` directive. For instance, if `example.com` is hosted on port `80` of `192.168.1.10`, a request for `example.com` will always be served by the first block in this example, despite the `server_name` directive in the second block.

```
server {
    listen 192.168.1.10;

    . . .

}

server {
    listen 80;
    server_name example.com;

    . . .

}
```

SCROLL TO TOP

In the event that more than one server block matches with equal specificity, the next step is to check the `server_name` directive.

Parsing the "server_name" Directive to Choose a Match

Next, to further evaluate requests that have equally specific `listen` directives, Nginx checks the request's "Host" header. This value holds the domain or IP address that the client was actually trying to reach.

Nginx attempts to find the best match for the value it finds by looking at the `server_name` directive within each of the server blocks that are still selection candidates. Nginx evaluates these by using the following formula:

- Nginx will first try to find a server block with a `server_name` that matches the value in the "Host" header of the request *exactly*. If this is found, the associated block will be used to serve the request. If multiple exact matches are found, the **first** one is used.
- If no exact match is found, Nginx will then try to find a server block with a `server_name` that matches using a leading wildcard (indicated by a `*` at the beginning of the name in the config). If one is found, that block will be used to serve the request. If multiple matches are found, the **longest** match will be used to serve the request.
- If no match is found using a leading wildcard, Nginx then looks for a server block with a `server_name` that matches using a trailing wildcard (indicated by a server name ending with a `*` in the config). If one is found, that block is used to serve the request. If multiple matches are found, the **longest** match will be used to serve the request.
- If no match is found using a trailing wildcard, Nginx then evaluates server blocks that define the `server_name` using regular expressions (indicated by a `~` before the name). The **first** `server_name` with a regular expression that matches the "Host" header will be used to serve the request.
- If no regular expression match is found, Nginx then selects the default server block for that IP address and port.

Each IP address/port combo has a default server block that will be used when a course of action can not be determined with the above methods. For an IP address/port combo, this will either be the first block in the configuration or the block that contains the `default_server` option as part of the `listen` directive (which would override the first-found algorithm). There can be only one `default_server` declaration per each IP address/port combination.

Examples

If there is a `server_name` defined that exactly matches the "Host" header value, that server block is selected to process the request.

In this example, if the "Host" header of the request was set to "host1.example.com", the second server would be selected:

```
server {
    listen 80;
    server_name *.example.com;

    . . .

}

server {
    listen 80;
    server_name host1.example.com;

    . . .

}
```

If no exact match is found, Nginx then checks to see if there is a `server_name` with a starting wildcard that fits. The longest match beginning with a wildcard will be selected to fulfill the request.

In this example, if the request had a "Host" header of "www.example.org", the second server block would be selected:

SCROLL TO TOP

```
server {
    listen 80;
    server_name www.example.*;

    . . .

}

server {
    listen 80;
    server_name *.example.org;

    . . .

}

server {
    listen 80;
    server_name *.org;

    . . .

}
```

If no match is found with a starting wildcard, Nginx will then see if a match exists using a wildcard at the end of the expression. At this point, the longest match ending with a wildcard will be selected to serve the request.

For instance, if the request has a "Host" header set to "www.example.com", the third server block will be selected:

```
server {
    listen 80;
    server_name host1.example.com;

    . . .

}

server {
    listen 80;
    server_name example.com;

    . . .

}

server {
    listen 80;
    server_name www.example.*;

    . . .

}
```

If no wildcard matches can be found, Nginx will then move on to attempting to match `server_name` directives that use regular expressions. The *first* matching regular expression will be selected to respond to the request.

For example, if the "Host" header of the request is set to "www.example.com", then the second server block will be selected to satisfy the request:

```
server {
    listen 80;
    server_name example.com;
```

SCROLL TO TOP

```
    . . .

}

server {
    listen 80;
    server_name ~^(www|host1).*\.example\.com$;

    . . .

}

server {
    listen 80;
    server_name ~^(subdomain|set|www|host1).*\.example\.com$;

    . . .

}
```

If none of the above steps are able to satisfy the request, then the request will be passed to the *default* server for the matching IP address and port.

Matching Location Blocks

Similar to the process that Nginx uses to select the server block that will process a request, Nginx also has an established algorithm for deciding which location block within the server to use for handling requests.

Location Block Syntax

Before we cover how Nginx decides which location block to use to handle requests, let's go over some of the syntax you might see in location block definitions. Location blocks live within server blocks (or other location blocks) and are used to decide how to process the request URI (the part of the request that comes after the domain name or IP address/port).

Location blocks generally take the following form:

```
location optional_modifier location_match {

    . . .

}
```

The `location_match` in the above defines what Nginx should check the request URI against. The existence or nonexistence of the modifier in the above example affects the way that the Nginx attempts to match the location block. The modifiers below will cause the associated location block to be interpreted as follows:

- **(none)**: If no modifiers are present, the location is interpreted as a *prefix* match. This means that the location given will be matched against the beginning of the request URI to determine a match.
- **`=`**: If an equal sign is used, this block will be considered a match if the request URI exactly matches the location given.
- **`~`**: If a tilde modifier is present, this location will be interpreted as a case-sensitive regular expression match.
- **`~*`**: If a tilde and asterisk modifier is used, the location block will be interpreted as a case-insensitive regular expression match.
- **`^~`**: If a carat and tilde modifier is present, and if this block is selected as the best non-regular expression match, regular expression matching will not take place.

Examples Demonstrating Location Block Syntax

SCROLL TO TOP

As an example of prefix matching, the following location block may be selected to respond for request URIs that look like `/site`, `/site/page1/index.html`, or `/site/index.html`:

```
location /site {

    . . .

}
```

For a demonstration of exact request URI matching, this block will always be used to respond to a request URI that looks like `/page1`. It will **not** be used to respond to a `/page1/index.html` request URI. Keep in mind that if this block is selected and the request is fulfilled using an index page, an internal redirect will take place to another location that will be the actual handler of the request:

```
location = /page1 {

    . . .

}
```

As an example of a location that should be interpreted as a case-sensitive regular expression, this block could be used to handle requests for `/tortoise.jpg`, but **not** for `/FLOWER.PNG`:

```
location ~ \.(jpe?g|png|gif|ico)$ {

    . . .

}
```

A block that would allow for case-insensitive matching similar to the above is shown below. Here, both `/tortoise.jpg` *and* `/FLOWER.PNG` could be handled by this block:

```
location ~* \.(jpe?g|png|gif|ico)$ {

    . . .

}
```

Finally, this block would prevent regular expression matching from occurring if it is determined to be the best non-regular expression match. It could handle requests for `/costumes/ninja.html`:

```
location ^~ /costumes {

    . . .

}
```

As you see, the modifiers indicate how the location block should be interpreted. However, this does *not* tell us the algorithm that Nginx uses to decide which location block to send the request to. We will go over that next.

How Nginx Chooses Which Location to Use to Handle Requests

Nginx chooses the location that will be used to serve a request in a similar fashion to how it selects a server block. It runs through a process that determines the best location block for any given request. Understanding this process is a crucial requirement in being able to configure Nginx reliably and accurately.

SCROLL TO TOP

Keeping in mind the types of location declarations we described above, Nginx evaluates the possible location contexts by comparing the request URI to each of the locations. It does this using the following algorithm:

- Nginx begins by checking all prefix-based location matches (all location types not involving a regular expression). It checks each location against the complete request URI.
- First, Nginx looks for an exact match. If a location block using the `=` modifier is found to match the request URI exactly, this location block is immediately selected to serve the request.
- If no exact (with the `=` modifier) location block matches are found, Nginx then moves on to evaluating non-exact prefixes. It discovers the longest matching prefix location for the given request URI, which it then evaluates as follows:
  - If the longest matching prefix location has the `^~` modifier, then Nginx will immediately end its search and select this location to serve the request.
  - If the longest matching prefix location *does not* use the `^~` modifier, the match is stored by Nginx for the moment so that the focus of the search can be shifted.
- After the longest matching prefix location is determined and stored, Nginx moves on to evaluating the regular expression locations (both case sensitive and insensitive). If there are any regular expression locations *within* the longest matching prefix location, Nginx will move those to the top of its list of regex locations to check. Nginx then tries to match against the regular expression locations sequentially. The **first** regular expression location that matches the request URI is immediately selected to serve the request.
- If no regular expression locations are found that match the request URI, the previously stored prefix location is selected to serve the request.

It is important to understand that, by default, Nginx will serve regular expression matches in preference to prefix matches. However, it *evaluates* prefix locations first, allowing for the administer to override this tendency by specifying locations using the `=` and `^~` modifiers.

It is also important to note that, while prefix locations generally select based on the longest, most specific match, regular expression evaluation is stopped when the first matching location is found. This means that positioning within the configuration has vast implications for regular expression locations.

Finally, it it is important to understand that regular expression matches *within* the longest prefix match will "jump the line" when Nginx evaluates regex locations. These will be evaluated, in order, before any of the other regular expression matches are considered. Maxim Dounin, an incredibly helpful Nginx developer, explains in this post this portion of the selection algorithm.

When Does Location Block Evaluation Jump to Other Locations?

Generally speaking, when a location block is selected to serve a request, the request is handled entirely within that context from that point onward. Only the selected location and the inherited directives determine how the request is processed, without interference from sibling location blocks.

Although this is a general rule that will allow you to design your location blocks in a predictable way, it is important to realize that there are times when a new location search is triggered by certain directives within the selected location. The exceptions to the "only one location block" rule may have implications on how the request is actually served and may not align with the expectations you had when designing your location blocks.

Some directives that can lead to this type of internal redirect are:

- **index**
- **try_files**
- **rewrite**
- **error_page**

Let's go over these briefly.

The `index` directive always leads to an internal redirect if it is used to handle the request. Exact location matches are often used to speed up the selection process by immediately ending the execution of the algorithm. However, if you make an exact location match that is a *directory*, there is a good chance that the request will be redirected to a different location for actual processing.

In this example, the first location is matched by a request URI of `/exact`, but in order to handle the request, the `index` directive inherited by the block initiates an internal redirect to the second block:

SCROLL TO TOP

```
index index.html;

location = /exact {

    . . .

}

location / {

    . . .

}
```

In the case above, if you really need the execution to stay in the first block, you will have to come up with a different method of satisfying the request to the directory. For instance, you could set an invalid `index` for that block and turn on `autoindex`:

```
location = /exact {
    index nothing_will_match;
    autoindex on;
}

location  / {

    . . .

}
```

This is one way of preventing an `index` from switching contexts, but it's probably not useful for most configurations. Mostly an exact match on directories can be helpful for things like rewriting the request (which also results in a new location search).

Another instance where the processing location may be reevaluated is with the `try_files` directive. This directive tells Nginx to check for the existence of a named set of files or directories. The last parameter can be a URI that Nginx will make an internal redirect to.

Consider the following configuration:

```
root /var/www/main;
location / {
    try_files $uri $uri.html $uri/ /fallback/index.html;
}

location /fallback {
    root /var/www/another;
}
```

In the above example, if a request is made for `/blahblah`, the first location will initially get the request. It will try to find a file called `blahblah` in `/var/www/main` directory. If it cannot find one, it will follow up by searching for a file called `blahblah.html`. It will then try to see if there is a directory called `blahblah/` within the `/var/www/main` directory. Failing all of these attempts, it will redirect to `/fallback/index.html`. This will trigger another location search that will be caught by the second location block. This will serve the file `/var/www/another/fallback/index.html`.

Another directive that can lead to a location block pass off is the `rewrite` directive. When using the `last` parameter with the `rewrite` directive, or when using no parameter at all, Nginx will search for a new matching location based on the results of the rewrite.

For example, if we modify the last example to include a rewrite, we can see that the request is sometimes passed directly to the second location without relying on the `try_files` directive:

SCROLL TO TOP

```
root /var/www/main;
location / {
    rewrite ^/rewriteme/(.*)$ /$1 last;
    try_files $uri $uri.html $uri/ /fallback/index.html;
}

location /fallback {
    root /var/www/another;
}
```

In the above example, a request for `/rewriteme/hello` will be handled initially by the first location block. It will be rewritten to `/hello` and a location will be searched. In this case, it will match the first location again and be processed by the `try_files` as usual, maybe kicking back to `/fallback/index.html` if nothing is found (using the `try_files` internal redirect we discussed above).

However, if a request is made for `/rewriteme/fallback/hello`, the first block again will match. The rewrite be applied again, this time resulting in `/fallback/hello`. The request will then be served out of the second location block.

A related situation happens with the `return` directive when sending the `301` or `302` status codes. The difference in this case is that it results in an entirely new request in the form of an externally visible redirect. This same situation can occur with the `rewrite` directive when using the `redirect` or `permanent` flags. However, these location searches shouldn't be unexpected, since externally visible redirects always result in a new request.

The `error_page` directive can lead to an internal redirect similar to that created by `try_files`. This directive is used to define what should happen when certain status codes are encountered. This will likely never be executed if `try_files` is set, since that directive handles the entire life cycle of a request.

Consider this example:

```
root /var/www/main;

location / {
    error_page 404 /another/whoops.html;
}

location /another {
    root /var/www;
}
```

Every request (other than those starting with `/another`) will be handled by the first block, which will serve files out of `/var/www/main`. However, if a file is not found (a 404 status), an internal redirect to `/another/whoops.html` will occur, leading to a new location search that will eventually land on the second block. This file will be served out of `/var/www/another/whoops.html`.

As you can see, understanding the circumstances in which Nginx triggers a new location search can help to predict the behavior you will see when making requests.

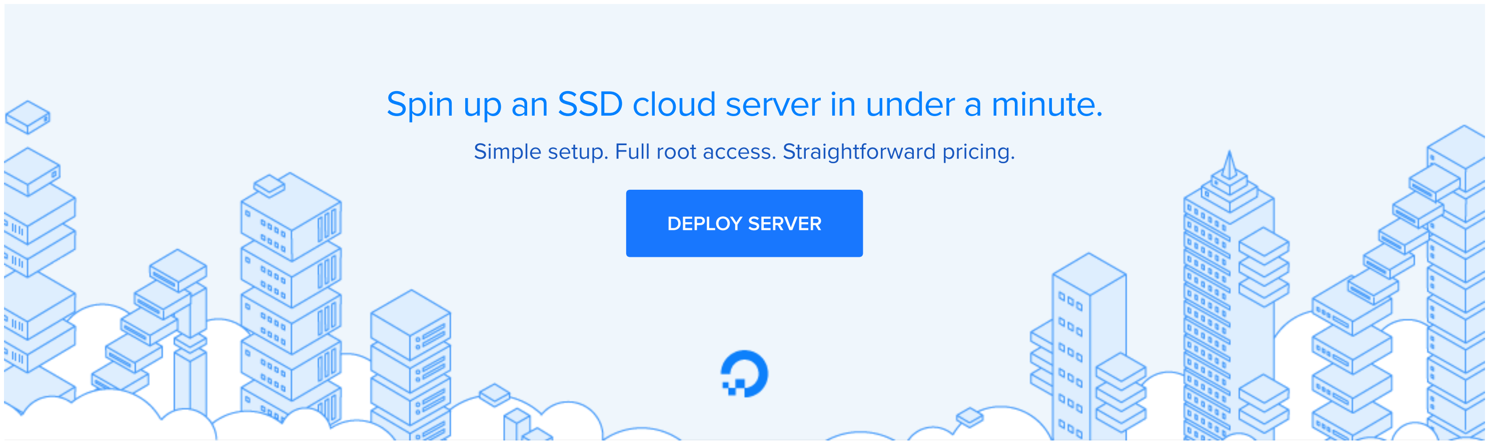
Conclusion

Understanding the ways that Nginx processes client requests can make your job as an administrator much easier. You will be able to know which server block Nginx will select based on each client request. You will also be able to tell how the location block will be selected based on the request URI. Overall, knowing the way that Nginx selects different blocks will give you the ability to trace the contexts that Nginx will apply in order to serve each request.

By: Justin Ellingwood

Upvote (70) Subscribe Share

SCROLL TO TOP



Related Tutorials

How To Upgrade Nginx In-Place Without Dropping Client Connections

How To Target Your Users with Nginx Analytics and A/B Testing

Understanding the Nginx Configuration File Structure and Configuration Contexts

How to Create DigitalOcean Snapshots Using Packer on Ubuntu 16.04

How to Use the OpenResty Web Framework for Nginx on Ubuntu 16.04

19 Comments

Leave a comment...

Log In to Comment

0 dillybob92 *April 29, 2015*

I had a question about an nginx problem last night. Found this article and boom, you explained nginx very well. Thank you!

(http://stackoverflow.com/questions/29935201/rate-limiter-not-working-for-index-page) My original question that I answered!

0 vkronlein *May 9, 2015*

Justin,

Maybe you can help with this. I've posted on StackOverflow but I can't seem to get any response.

I have a single index PHP application that uses a user defined keyword to route requests for that keyword to the admin section of the application.

In other words, it's a dynamic url segment, a directory for it doesn't exist.

In my case I've set the admin keyword to 'manage', so my url looks like:

```
http://example.com/manage/index.php?route=xxx/xxx&token=yyy
```

SCROLL TO TOP

I've tried several location blocks but my thought is that this "should" work, but it doesn't:

```
location /manage {
    try_files $uri $uri/ @manage;
}

location @manage {
    rewrite ^/(.+)$ /index.php?_route_=$1 last;
}
```

I'm an Nginx noob so any help would be greatly appreciated.

--Vince

---

kamaln7 MOD May 11, 2015
0
Does the php script expect `_route_` to be `manage`? If so, you need to update your regex to match that and include the rest of the arguments:

```
# replace both location blocks with the following:
rewrite ^/(manage|keyword)/? /index.php?_route_=$1&$args last;
```

Inside the parentheses should be a list of supported keywords separated by a pipe, e.g. `(manage|users|posts|etc)`. If you do not want to whitelist it and prefer to have PHP handle it, `try_files` can check if a path exists, and if not, pass it to PHP:

```
location ^/(.+)/? {
    try_files $uri $uri/ /index.php?_route_=$1&$args;
}
```

Make sure you reload/restart nginx after modifying the configuration file.

---

vkronlein May 12, 2015
0
Perhaps I didn't explain it correctly.

The application has 2 modules:

1. admin (aliased by a user defined keyword, in this case "manage")
2. front (which converts slugs to route variables within my router class)

```
define('FRONT_FACADE', 'front');
define('ADMIN_FACADE', 'manage');
```

Urls are defined differently for the admin module than they are for the front.

Admin urls look like so:

```
http://example.com/manage/index.php?route=xxx/yyy&token=123456&product_id=6
```

Front urls are rewritten into slugs like so:

```
http://example.com/acme/widgets/digitalocean
```

In my IoC container, the request object maps urls to the modules based on the first segment of the *route* variable. If the first segment matches a declared facade, then the request is routed to the module, if it doesn't match ie: a slug url, it's automatically routed to the FRONT_FACADE.

This being the case, a pipe delimited list doesn't work. Aside from which, the front side routing is perfectly fine with this:

```
location / {
    try_files $uri $uri/ @front;
```

SCROLL TO TOP

```
}

location @front {
    rewrite ^/(.+)$ /index.php?_route_=$1 last;
}
```

It works fine in Apache with a simple htaccess file, I just can't understand why I can't get the location block correct in Nginx.

Thanks

---

kamaln7 MOD *May 13, 2015*
0
Oh, I see. Can you please post the htaccess config?

I think the admin section is not working because the rest of the GET parameters are not passed when the URL is rewritten. Try using the following config instead:

```
location / {
    try_files $uri $uri/ @front;
}

location @front {
    rewrite ^/(.+)$ /index.php?_route_=$1&$args last;
}
```

---

vkronlein *May 13, 2015*
0

```
location @front {
    rewrite ^/(.+)$ /index.php?_route_=$1&$args last;
}
```

Doesn't work, "No input file specified."

Here's my .htaccess rewrite routine:

```
<IfModule mod_rewrite.c>
    RewriteEngine On
    RewriteRule ^(.*)/$ /$1 [L,R=301]
    RewriteRule ^asset/(.*)$ public/asset/$1 [L,QSA]
    RewriteRule ^image/(.*)$ public/image/$1 [L]
    RewriteCond %{REQUEST_FILENAME} !-f
    RewriteCond %{REQUEST_FILENAME} !-d
    RewriteCond %{REQUEST_URI} !.*\.(ico|gif|jpg|jpeg|png|txt|html|woff|ttf|eot|svg|css|js)
    RewriteRule ^([^?]*) index.php?_route_=$1 [L,QSA]
</IfModule>
```

Thanks again for your help.

Settings *May 11, 2015*
0
After reading through,

I still can't quite get it right. I might be missing something.

Say I have site1.com as my default server block.
And site2.com in the next server block. Both are of different site and content.

Inputting www.site2.com would go to site2.com, as it should. However, if I were to put anything else, say testtube.site2.com or rollerskat SCROLL TO TOP
directed to site1.com

The server_name line reads

```
server_name site2.com www.site2.com *.site2.com;
```

Why isn't the wildcard domain working properly?
Any ideas?

jellingwood MOD *May 11, 2015*
0
@Settings: I'm not exactly sure. You can use the special wildcard `.site2.com` to match both `site2.com` and `*.site2.com`. Perhaps Nginx would parse that more correctly?

```
server_name .site2.com;
```

I don't really know why it wouldn't parse what you have correctly though (assuming the host header is being set correctly, the rest of the configuration is correct, and there is no weird caching going on). Sorry I can't be of more help. You might try turning on verbose logging to see if that gives you any clues.

Settings *May 11, 2015*
0
@jellingwood Thanks, tried it but still did not work.

Will monitor debug log.

I'm just in way over my head.

luitzifa *June 16, 2015*
0
This post is awesome, thank you so far!

We've had a behavior of nginx with location within location i do not understand.

Our goal is to use basic HTTP Auth on a subdirectory named mon.

This was our config:

```
location /mon {
    auth_basic "Monitoring";
    auth_basic_user_file  /etc/nginx/auth/mon-htpasswd;
}

location ~ [^/]\.php$ {
        try_files $uri =404;
        include fastcgi_params;
        fastcgi_pass unix:/var/run/fpm.sock;
}
```

After reading this post i do actually understand why /mon/index.php was still accessible without authentication. Thank you!

Some research later we end up with this config:

```
location /mon {
     auth_pam "Monitoring";
     auth_pam_service_name "nginx.elwis_mon";
     satisfy all;

     location ~ [^/]\.php$ {
         try_files $uri =404;
         include fastcgi_params;
         fastcgi_pass unix:/var/run/fpm.sock;
     }
}
```

SCROLL TO TOP

```
location ~ [^/]\.php$ {
        try_files $uri =404;
        include fastcgi_params;
        fastcgi_pass unix:/var/run/fpm.sock;
}
```

So, this actually works... but why? As you mentioned, there is the "only one location block" rule, this shouldn't work at all.

jellingwood MOD June 16, 2015
0

@luitzifa: Hi! Thanks for the comment. Let me try to explain what's going on.

First of all, I should say that your confusion likely comes from my failure to explain another exception to the location selection algorithm. Maxim Dounin (an incredibly knowledgeable and helpful Nginx developer) explains the rule in this mailing list response. Basically, Nginx will allow nested regex locations within matching prefix blocks to "jump the line" when it is ready to evaluate regex locations.

As explained in the article, Nginx first evaluates non-regex location blocks to try to find an exact match or the longest possible prefix match. It then moves on to evaluate the regex locations.

This is where the information I accidentally left out starts to affect the location handling. While the general process for regex location processing is to evaluate the blocks from top-to-bottom, Nginx will *first* check if there are any regex locations within the longest prefix match it found. If there is a regex location (or locations) nested within the longest prefix location, Nginx will move those, in order, to the top of the list to evaluate, regardless of the parent prefix location block's placement within the file.

This is the reason for the behavior you are seeing. I apologize for the oversight in this doc and I'll try to schedule some time to make an update later in the week. I hope that helps explain what you are seeing with your configuration. Thanks for taking the time to ask; I wouldn't have spotted that error otherwise!

michael931192 July 23, 2015
0

I don't understand the section that discusses the `index` directive. How does a request to the URI /exact end up being processed by a block that matches location "/" if the inherited `index` is set to index.html? Could you walk us through how that works?

jellingwood MOD July 23, 2015
1

@michael931192: Sure, I'll do my best.

When the `/exact` location is requested, initially the first block is used to try to satisfy the request. Since we are assuming in this instance that `/exact` represents a directory and not a file, Nginx must then determine the content that it should display.

Typically, Nginx is configured to show an index file located within that directory. The index files it looks for are determined by the `index` directive:

```
. . .
location = /exact {
    index index.html index.htm index.php;
}
```

Another option is to simply show the files present int the `/exact` directory, which is possible if `autoindex on;` is set instead:

```
. . .
location = /exact {
    autoindex on;
}
```

In the example in this guide, the `index` method is used. Instead of being defined within the location block itself, it is inherited from the parent context:

```
index index.html;
location = /exact {
    # this will inherit the `index` directive above
    . . .
}
```

SCROLL TO TOP

```
location / {
    . . .
}
```

Nginx will use the `index` directive to attempt to serve content for the directory request. This causes an internal redirect in which Nginx will now look for a file called `/exact/index.html`. Nginx starts its location block search algorithm once again.

This time, the `location = /exact` block **does not** match, because the "=" indicates that the request must be 100% the same. The `/exact` portion matches, but the internal redirect now has `/index.html` appended to the end.

Nginx will then see the `location /` block. This doesn't match the request very well, but it is the best match that it can find. Nginx will follow whatever instructions are within the `location /` block in order to search for and serve the `/exact/index.html` request. Typically, it just looks for a directory called `exact/` within its document root with an `index.html` file inside. But this is entirely up to the directives listed in the `location /` block. The fact remains that while the first block was used to handle the initial `/exact` request, it ended in a redirect caused by the `index` directive. The `location /` block was then used to decide how to find and serve the actual content that was returned to the client.

You can test this further by creating two document roots, an `exact` directory in each, and `index.html` files within those, like this:

```
$ sudo mkdir -p /var/www/exact_match_root/exact
$ sudo mkdir -p /var/www/regular_root/exact
$ echo "exact index" | sudo tee /var/www/exact_match_root/exact/index.html
$ echo "regular index" | sudo tee /var/www/regular_root/exact/index.html
```

Set up some location blocks like this to test:

```
. . .
root /var/www/regular_root;
index index.html;

location = /exact {
    root /var/www/exact_match_root;

    # We'll add a different log location here so that we can tell when this block is being accessed/processed
    access_log /var/log/nginx/exact_match.log;
}

location / {
}
```

Restart your Nginx service:

```
$ sudo service nginx restart
```

You can now verify that the file in the `/var/www/regular_root/exact` directory is being served, even though you are requesting `/exact`:

```
$ curl -L 127.0.0.1/exact
```

```
output
regular index
```

If we checked the log entry we added to the `location = /exact` block, we can see that it was indeed accessed:

```
$ tail -f /var/log/nginx/exact_match.log
```

/var/log/nginx/exact_match.log

```
127.0.0.1 - - [23/Jul/2015:14:59:21 -0400] "GET /exact HTTP/1.1" 301 193 "-" "curl/7.35.0"
```

SCROLL TO TOP

I hope that helps a bit. It's can definitely be difficult to understand where and when Nginx transfers control between different blocks.

michael931192 *July 23, 2015*
0
@jellingwood Thank you, it does clear things up. I appreciate the clear and broken down explanation.

RitterKnight *January 29, 2016*
0
Great info in here Justin, thanks for sharing. Much more approachable than the nginx official docs (which are sorely lacking for such a great product).

whiteadi *April 8, 2016*
0
Hi,

nice article but I cannot make something:

I want to have all http to https and only some paths to http with different ports:

server {
listen 80;
server*name _;
return 301 https://$host$request*uri;

location /bamboo {
rewrite ^/bamboo(.*)$ http://mydomainname:8085/$1 last;
}

location /api {
rewrite ^/api(.*)$ http://mydomainname:8080/$1 last;
}

return 403;
}

the above does not work,

also this does not work:

Redirect paths
server {
listen 443;
server_name _;

location /bamboo {
rewrite ^/bamboo(.*)$ http://mydomainname:8085/$1 last;
}

location /api {
rewrite ^/api(.*)$ http://mydomainname:8080/$1 last;
}

return 403;
}

Redirect http -> https
server {
listen 80;
server*name _;
return 301 https://$host$request*uri;

return 403;
}

nitai *July 12, 2016*
0
I'm having some issue here with a request to an API. Everything works with proxying with following nginx location:

SCROLL TO TOP

```
location / {
        proxy_set_header X-Real-IP $remote_addr;
        proxy_set_header Host $host;
        proxy_set_header X-Forwarded-Proto $scheme;
        proxy_set_header X-NginX-Proxy true;
        proxy_set_header Upgrade $http_upgrade;
        proxy_set_header Connection "";

        add_header Cache-Control "public";

        proxy_set_header   X-Forwarded-Host   $host;
        proxy_set_header   X-Forwarded-Server $host;
        proxy_set_header   X-Forwarded-For    $proxy_add_x_forwarded_for;

        proxy_http_version 1.1;

        proxy_pass http://127.0.0.1:3000;
    }
```

With the above I can get to URLs like https://domain.com/main/found/users

However, as soon as I try to use the API I get a 404 back. The URL to an API call looks like:

https://domain.com/api/v1/users/find

In the nginx error log I then see an entry like:

```
[error] 1137#0: *3552 open() "/usr/share/nginx/html/api/v1/user/find" failed (2: No such file or directory)
```

Obviously files are not stored there as they should be served by the proxy.

Totally confused here, so an advice greatly appreciated. Thank you.

0 nitai *July 12, 2016*

I solved my issue here with adding a second location directive. This is what I did:

```
 location ~ /api/v1/(?<ns>.*) {
        expires -1;
        proxy_pass http://127.0.0.1:3000/api/v1/$ns;
}
```

Hope this helps anyone.

1 Brinman *August 17, 2016*

Wow, absolutely excellent writeup Justin! Your writing style is so clear, and your inclusion of examples for each thing you're explaining is incredibly helpful. Thank you!

SCROLL TO TOP