Troubleshoot a Slow APIC GUI

Contents

Introduction

This document describes the general methodology to troubleshoot a slow APIC GUI experience.

Quick Start

It is frequently found that slow APIC GUI issues are the result of a high rate of API Requests sourced from a script, integration, or application. The access.log of an APIC logs each processed API request. The access.log of an APIC can be quickly analyzed with the Access Log Analyzer script within the Github Datacenter group aci-tac-scripts project.

Background Information

APIC as a Webserver - NGINX

NGINX is the DME responsible for the API endpoints available on each APIC. If NGINX is down, API requests cannot be handled. If NGINX is congested, the API is congested. Each APIC runs its own NGINX process, so it is possible that only a single APIC can have NGINX problems if only that APIC is targeted by any aggressive queriers.

The APIC UI performs multiple API requests to populate each page. Similarly, all APIC 'show' commands (NXOS Style CLI) are wrappers for python scripts that perform multiple API requests, handle the response, then serve it to the user.

Relevant Logs

Log Filename	Location	Which techsupport is it in	Comments
access.log	/var/log/dme/log	APIC 3of3	ACI agnostic, gives 1 line per API request
error.log	/var/log/dme/log	APIC 3of3	ACI Agnostic, shows nginx errors (throttling included)
nginx.bin.log	/var/log/dme/log	APIC 3of3	ACI specific, logs DME transactions
nginx.bin.warnplus.log	/var/log/dme/log	APIC 3of3	ACI Specific contains logs that are warning+ severity

Methodology

Isolate Initial Trigger

What is affected?

- Which APICs are affected; one, many, or all APICs?
- Where is slowness seen; via UI, CLI commands, or both?
- Which specific UI pages or commands are slow?

How is the slowness experienced?

- Is this seen across multiple browsers for a single user?
- Do multiple users report slowness or just a single/subset of users?
- Do the affected users share a similar geographic location or network path from browser to APIC?

When was the slowness first noticed?

- Was an ACI integration or script recently added?
- Was a browser extension recently enabled?
- Was there a recent change in ACI configuration?

Check NGINX Usage and Health

Access.log Entry Format

access.log is a feature of NGINX and is, therefore, APIC agnostic. Each line represents 1 HTTP Request that the APIC received. Reference this log to understand the NGINX usage of an APIC.

The default access.log format on ACI version 5.2+:

```
log_format proxy_ip '$remote_addr ($http_x_real_ip) - $remote_user [$time_local]'
                    '"$request" $status $body_bytes_sent '
                    '"$http_referer" "$http_user_agent"';
```

This line represents an access.log entry when a moquery -c fvTenant is performed:

```
127.0.0.1 (-) - - [07/Apr/2022:20:10:59 +0000]"GET /api/class/fvTenant.xml HTTP/1.1" 200 15863 "-" "Pyth
```

Map of example access.log entry to log_format:

log_format field	Content from example	Comments
$remote_addr	127.0.0.1	IP of host which sent this request
$http_x_real_ip	-	IP of last requester if proxies in use
$remote_user	-	Not generally used. Check nginx.bin.log to track which user logged in to perform requests
$time_local	07/Apr/2022:20:10:59 +0000	When the request was processed
$request	GET /api/class/fvTenant.xml HTTP/1.1	Http Method (GET, POST, DELETE) and URI
$status	200	HTTP Response Status Code
$body_bytes_sent	1586	response payload size
$http_referer	-	-
$http_user_agent	Python-urllib	What type of client sent the request

Access.log Behaviors

High rate request bursts over a large period of time:

- Continual bursts of 15+ requests per second can cause UI slowness
- Identify which host(s) are responsible for the queries

- Reduce or disable the source of queries to see if this improves APIC response time.

Consistent 4xx or 5xx responses:

- If found, identify the error message from nginx.bin.log

Check NGINX Resource Usage

NGINX CPU and memory usage can be checked with the **top** command from the APIC:

<#root>

```
top - 13:19:47 up 29 days, 2:08, 11 users, load average: 12.24, 11.79, 12.72
Tasks: 785 total, 1 running, 383 sleeping, 0 stopped, 0 zombie
%Cpu(s): 3.5 us, 2.0 sy, 0.0 ni, 94.2 id, 0.1 wa, 0.0 hi, 0.1 si, 0.0 st
KiB Mem : 13141363+total, 50360320 free, 31109680 used, 49943636 buff/cache
KiB Swap: 0 total, 0 free, 0 used. 98279904 avail Mem

PID   USER PR NI VIRT    RES   SHR    S %CPU %MEM TIME+     COMMAND
21495 root 20 0  4393916 3.5g 217624 S

 2.6

  2.8  759:05.78

nginx.bin
```

High NGINX resource usage can directly correlate to a high rate of processed requests.

Check for Cores

An NGINX crash is not typical for Slow APIC GUI issues. However, if NGINX cores are found, attach them to a TAC SR for analysis. Refer to the ACI Techsupport guide for steps to check for cores.

Check Client to Server Latency

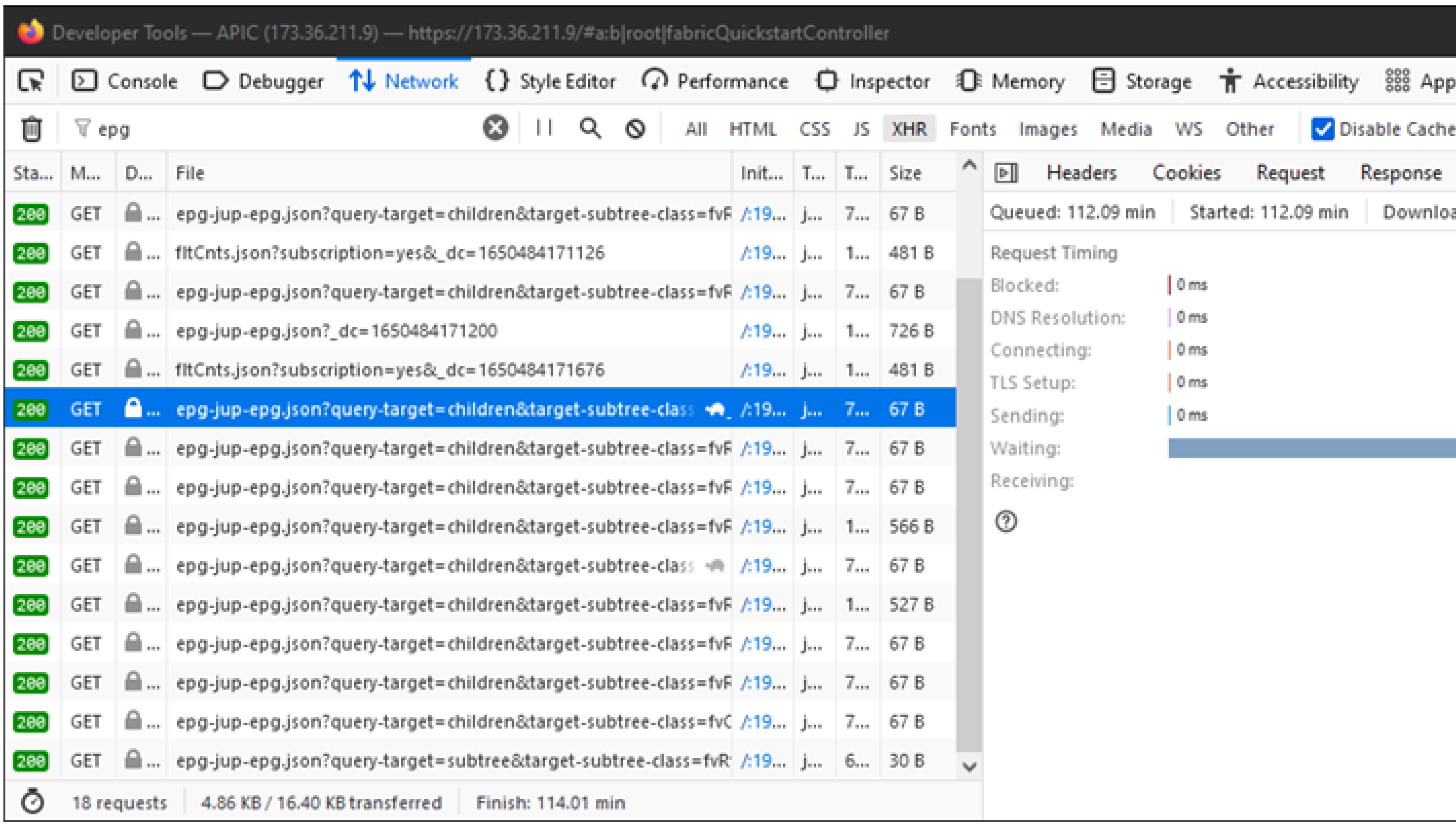
If rapid requests are not found but a user continues to exhibit UI slowness, the issue can be Client (browser) to Server (APIC) latency.

In these scenarios, validate the data path from the browser to the APIC (Geographic distance, VPN, etc). If possible, deploy and test access from a jump server located in the same geographic region or Data Center as the APICs to isolate. Validate if other users exhibit a similar amount of latency.

Browser Development Tools Network Tab

All Browsers have the ability to validate HTTP requests and responses via its **Browser Development** toolkit, typically within a **Network** tab.

This tool can be used to validate the amount of time it takes for each stage of browser-sourced requests as shown in the image.



Sta...	M...	D...	File	Init...	T...	T...	Size
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvR	/:19...	j...	7...	67 B
200	GET	...	fltCnts.json?subscription=yes&_dc=1650484171126	/:19...	j...	1...	481 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvR	/:19...	j...	7...	67 B
200	GET	...	epg-jup-epg.json?_dc=1650484171200	/:19...	j...	1...	726 B
200	GET	...	fltCnts.json?subscription=yes&_dc=1650484171676	/:19...	j...	1...	481 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class	/:19...	j...	7...	67 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvR	/:19...	j...	7...	67 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvR	/:19...	j...	7...	67 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvR	/:19...	j...	1...	566 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class	/:19...	j...	7...	67 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvR	/:19...	j...	1...	527 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvR	/:19...	j...	7...	67 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvR	/:19...	j...	7...	67 B
200	GET	...	epg-jup-epg.json?query-target=children&target-subtree-class=fvC	/:19...	j...	7...	67 B
200	GET	...	epg-jup-epg.json?query-target=subtree&target-subtree-class=fvR	/:19...	j...	6...	30 B

18 requests | 4.86 KB / 16.40 KB transferred | Finish: 114.01 min

Queued: 112.09 min | Started: 112.09 min | Downloa

Request Timing

Blocked:	0 ms
DNS Resolution:	0 ms
Connecting:	0 ms
TLS Setup:	0 ms
Sending:	0 ms
Waiting:	
Receiving:	

Example of the Browser Waiting 1.1 minutes for the APIC to Respond

Enhancements for Specific UI Pages

Policy Group page:

Cisco bug ID CSCvx14621 - APIC GUI loads slowly on IPG policies in the Fabric tab.

Interface under Inventory page:

Cisco bug ID CSCvx90048 - Initial load of "Layer 1 Physical Interface Configuration" Operational Tab is long/induces 'freeze'.

General Recommendations for Client > Server Latency

Certain browsers, such as Firefox, allow for more web connections per host by default.

- Check if this setting is configurable on the browser version that is used
- This matters more for multi-query pages, such as the Policy Group page

VPN and distance to APIC increase overall UI slowness given client browser requests and APIC response travel time. A jump box geographically local to the APICs significantly reduces the browser to APIC travel times.

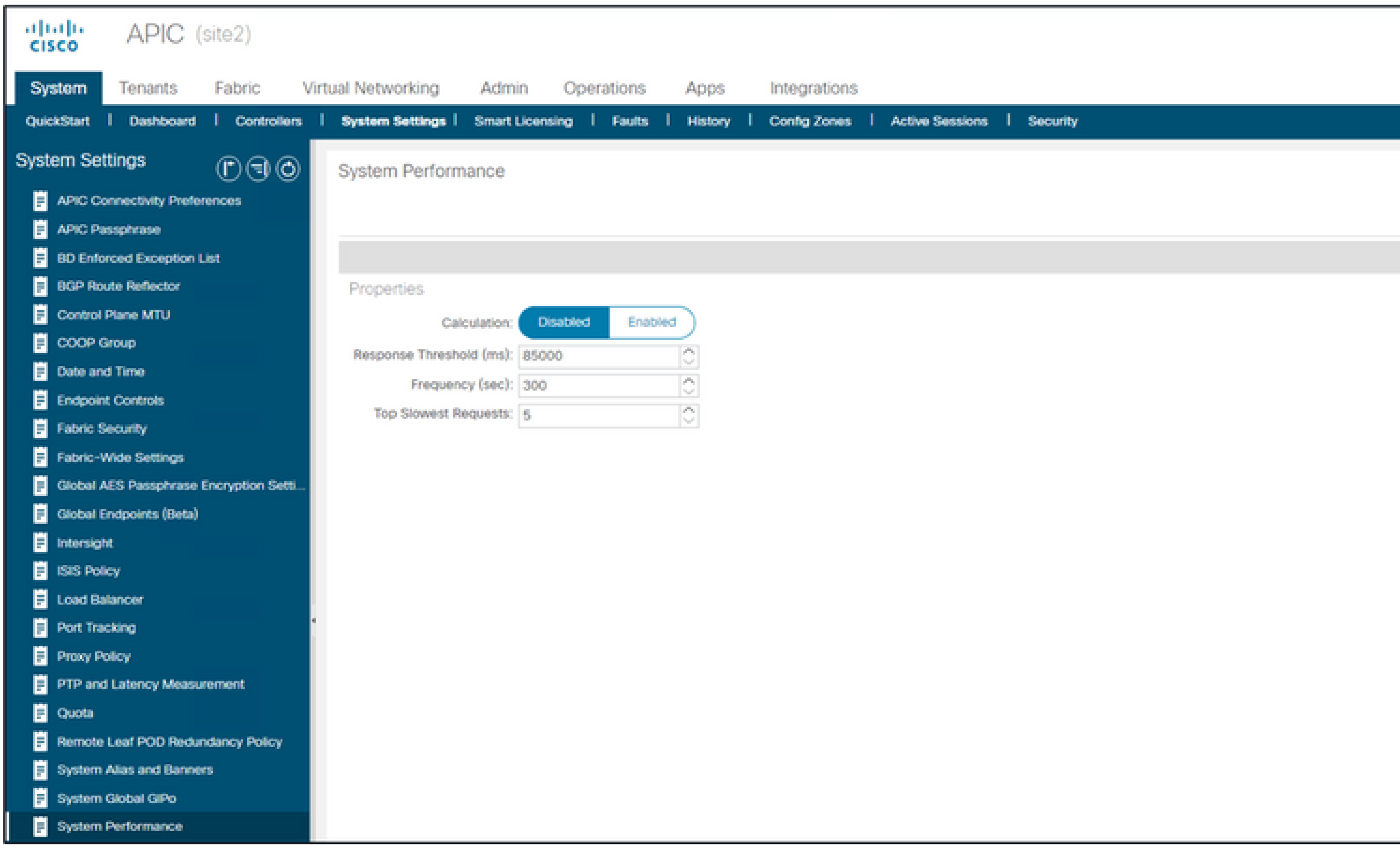
Check for Long-Web Requests

If a Webserver (NGINX on APIC) is handles a high volume of Long-Web Requests, this can affect the performance of other requests received in parallel.

This is especially true for systems which have distributed databases, such as APICs. A single API request can require additional requests and lookups sent to other nodes in the fabric which can result in expectedly longer response times. A burst of these Long-Web Requests within a small time frame can compound the amount of resources required and lead to unexpectedly longer response times. Furthermore, received requests can then time out (90 seconds) which results in unexpected system behavior from a user perspective.

System Response Time - Enable Calculation for Server Response Time

In 4.2(1)+, a user can enable "System Performance Calculation" which tracks and highlights API requests that took along time to handle.



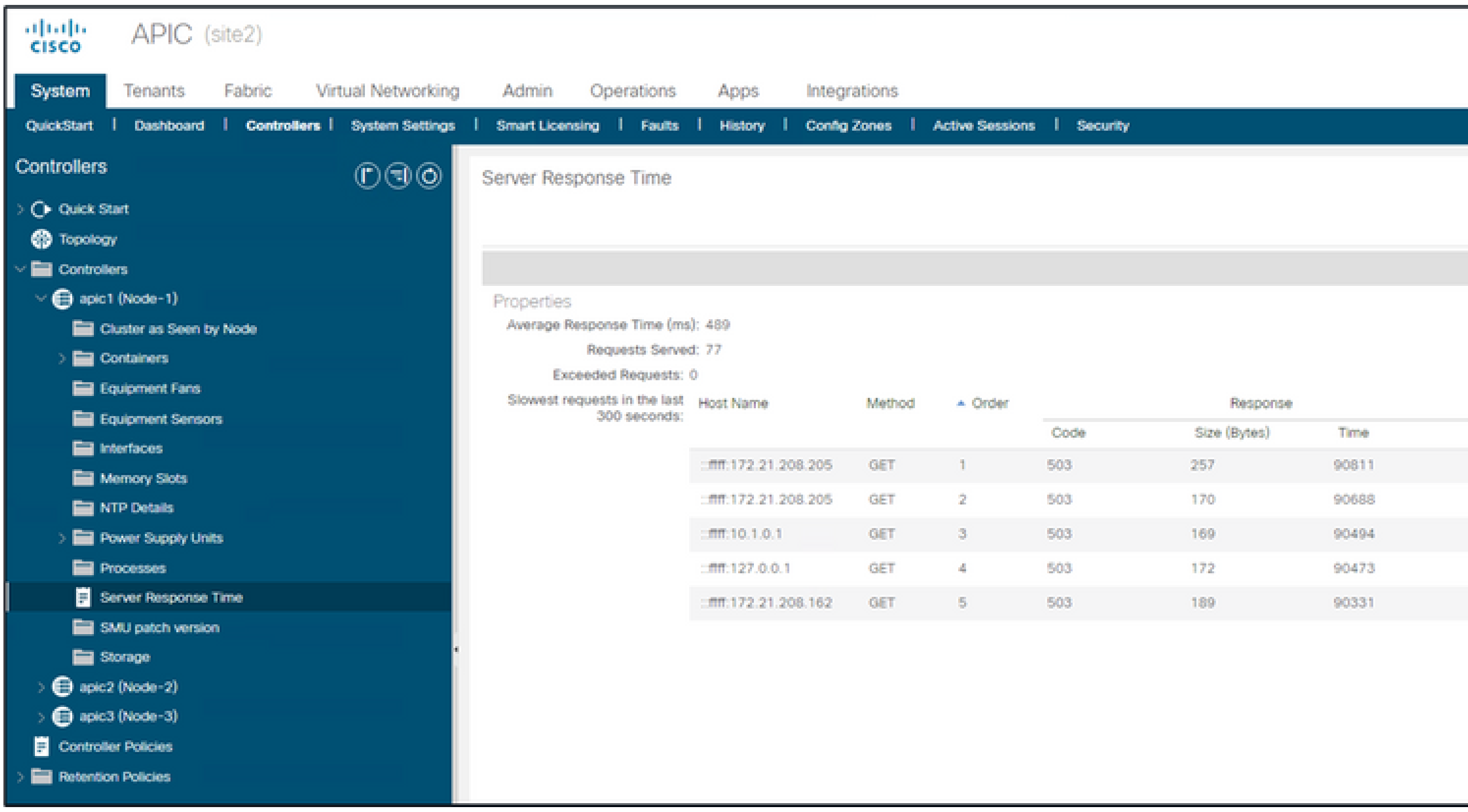
System Performance

Properties

Calculation:	[✓ Disabled] Enabled
Response Threshold (ms):	85000
Frequency (sec):	300
Top Slowest Requests:	5

Calculation can be enabled from System - System Settings - System Performance

Once "Calculation" is enabled, a user can navigate to specific APICs under Controllers to view the Slowest API Requests within the last 300 seconds.



Server Response Time

Properties

Average Response Time (ms): 489

Requests Served: 77

Exceeded Requests: 0

Slowest requests in the last 300 seconds:

Host Name	Method	Order	Response Code	Response Size (Bytes)	Response Time
::ffff:172.21.208.205	GET	1	503	257	90811
::ffff:172.21.208.205	GET	2	503	170	90688
::ffff:10.1.0.1	GET	3	503	169	90494
::ffff:127.0.0.1	GET	4	503	172	90473
::ffff:172.21.208.162	GET	5	503	189	90331

System - Controllers - Controllers Folder - APIC x - Server Response Time

APIC API Usage Considerations

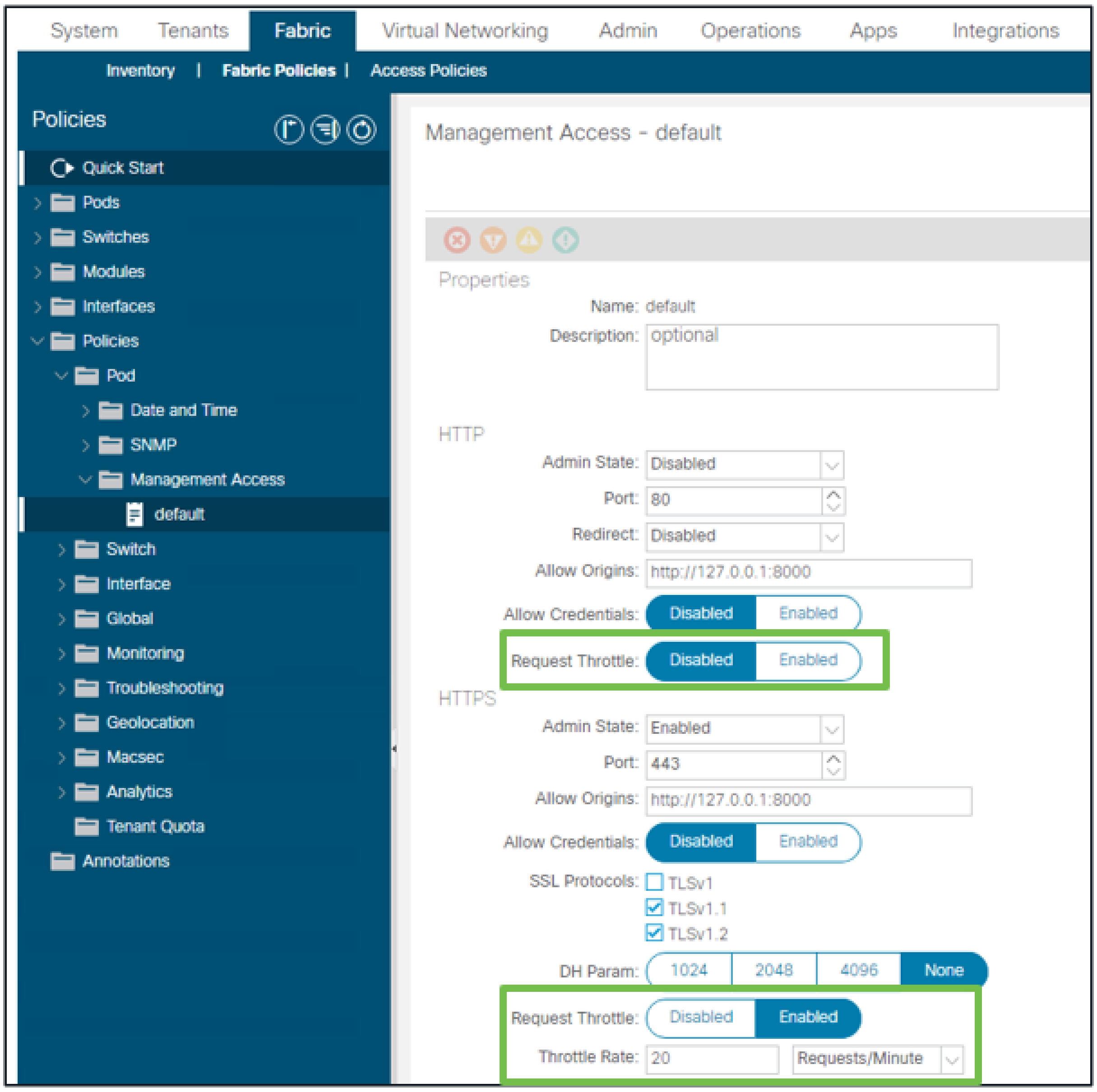
- In general, 15+ API requests per second over a long period of time debilitates NGINX.
  - If found, reduce the aggressiveness of requests.
  - If the Requests host cannot be modified, consider NGINX Rate Limits on the APIC.

Address Script Inefficiencies

- Do not log in/log out before each API Request.
  - The default timeout for one login session is 10 minutes. This same session can be used for multiple requests and can be refreshed to extend the validity time.
  - See Cisco APIC REST API Configuration Guide - Accessing the REST API - Authenticating and Maintaining an API Session.
- If your script queries many DNs that share a parent, instead of collapse the queries into a single logical parent query with Query Filters.
  - See Cisco APIC REST API Configuration Guide - Composing REST API Queries - Applying Query Scoping Filters.
- If you need updates of an object or class of object, consider websocket subscriptions instead of rapid API requests.

NGINX Request Throttle

Available in 4.2(1)+, a user can enable request throttle against HTTP and HTTPS independently.



Name: default
Description: optional

HTTP
Admin State: Disabled
Port: 80
Redirect: Disabled
Allow Origins: http://127.0.0.1:8000
Allow Credentials: [✓ Disabled] Enabled
Request Throttle: [✓ Disabled] Enabled

HTTPS
Admin State: Enabled
Port: 443
Allow Origins: http://127.0.0.1:8000
Allow Credentials: [✓ Disabled] Enabled
SSL Protocols: ☐ TLSv1 ☑ TLSv1.1 ☑ TLSv1.2
DH Param: 1024 2048 4096 [✓ None]
Request Throttle: Disabled [✓ Enabled]
Throttle Rate: 20 Requests/Minute

Fabric - Fabric Policies - Policies Folder - Management Access Folder - default

When enabled:

- NGINX is restarted to apply config file changes
    - A new zone, **httpsClientTagZone**, is written to nginx config
- The Throttle rate can be set in **Requests per Minute** (r/m) or **Requests per Second** (r/s).
- Request Throttle relies on the Rate Limit Implementation included in NGINX
    - API Requests against the **/api/** URI use the user-defined Throttle Rate + burst= (Throttle Rate x 2) + nodelay
        - There is a non-configurable throttle (zone **aaaApiHttps**) for **/api/aaaLogin** and **/api/aaaRefresh** which rate-limits at 2r/s + burst=4 + nodelay
    - Request Throttle is tracked on a per-client-ip-address basis
    - API requests sourced from the APIC self-ip (UI + CLI) bypass the throttle
    - Any Client IP Address which crosses the user-defined throttle rate + burst threshold receives a 503 response from the APIC
    - These 503s can be correlated within the access logs
    - error.log will have entries indicating when throttling has been activated (zone **httpsClientTagZone**) and against which Client hosts

<#root>

```
apic#
```

`less /var/log/dme/log/error.log`

```
...
2023/04/17 20:19:14 [error] ...
```

`limiting requests`

```
, excess: 40.292 by zone "
```

`httpsClientTagZone`

```
", client: h.o.s.t, ... request: "GET /api/class/...", host: "a.p.i.c"
2023/04/17 20:19:14 [error] ...
```

`limiting requests`

```
, excess: 40.292 by zone "
```

`httpsClientTagZone`

```
", client: h.o.s.t, ... request: "GET /api/node/...", host: "a.p.i.c"
```

As a general rule, Request Throttle only serves to protect the server (APIC) from DDOS-like symptoms induced by query-aggresive Clients. Understand and isolate the request-aggressive Client for final solutions in the app/script logic.