APACHE SLING & FRIENDS TECH MEETUP
10-12 SEPTEMBER 2018

7 Ways to Break AEM

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A Cognizant Digital Business

Intro

adaptTo()

What can go wrong...

- Drag'n'drop in CRXDE
- Deactivated Site (yes site, not page)
- Start AEM with wrong user

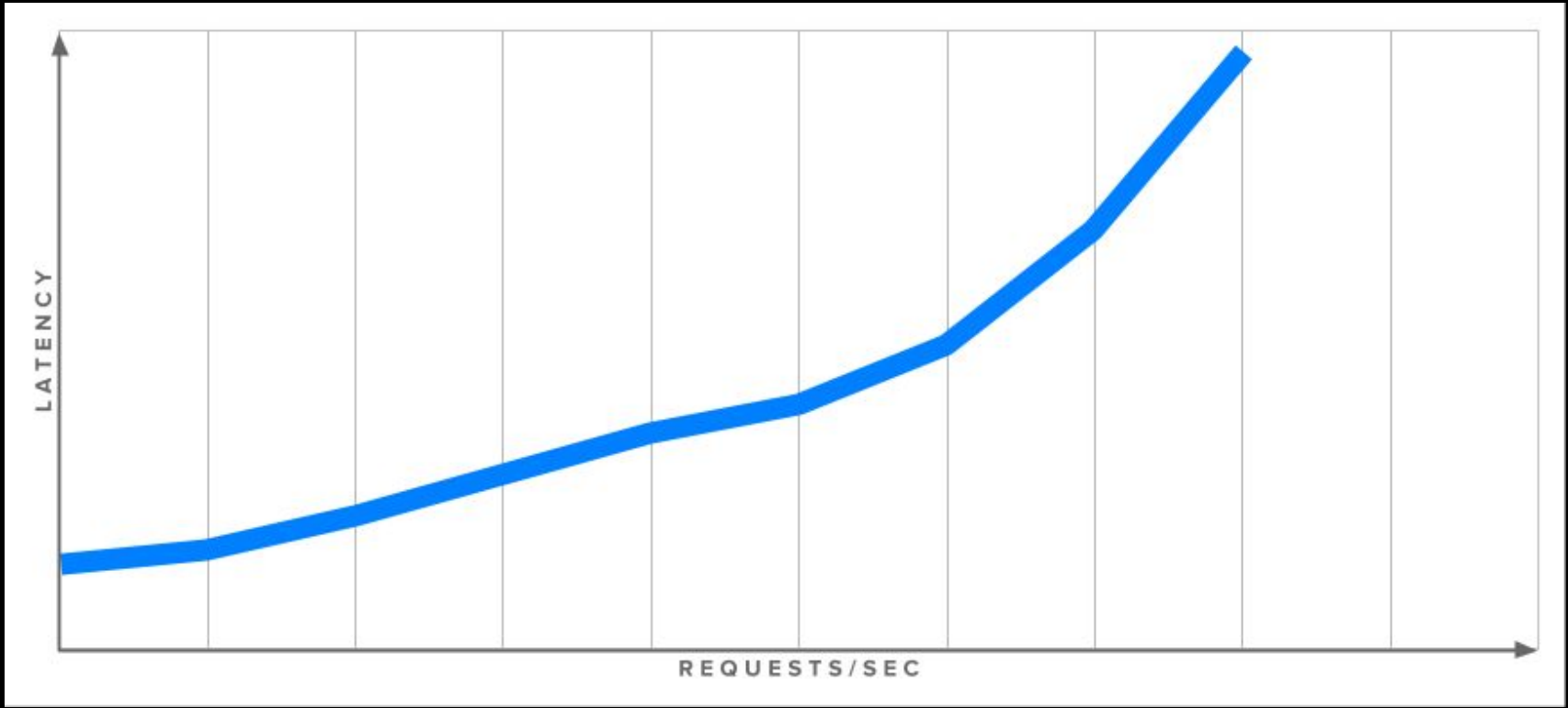
- **Performance**

adaptTo()

Performance Aspects

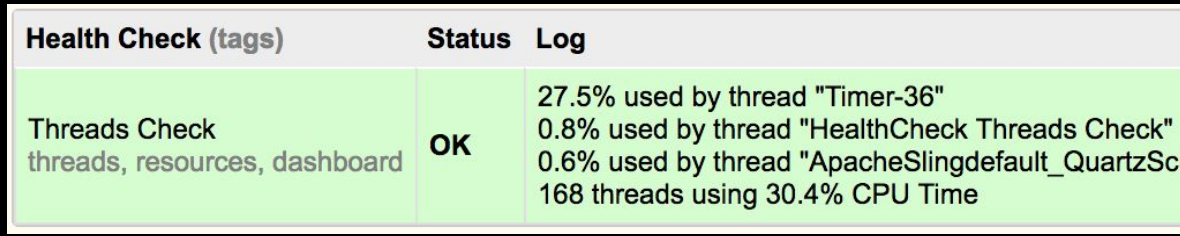
- Browser vs. Server Performance
- UI Readiness
- Production vs. Staging Load
- Response Times vs. Throughput

Performance Aspects



Approach

- Vanilla AEM
  - Groovy Console to create/run test setups
  - Netcentric AC Tool for groups and permissions
- Tools
  - Chrome Headless
  - Visual VM
  - JMeter
  - Threads Health Check



Health Check (tags)	Status	Log
Threads Check threads, resources, dashboard	OK	27.5% used by thread "Timer-36" 0.8% used by thread "HealthCheck Threads Check" 0.6% used by thread "ApacheSlingdefault_QuartzSc 168 threads using 30.4% CPU Time

Introducing….

Breaklets

Breaklets

- … iteratively make things worse
- … run until AEM breaks
  - until threshold is reached
  - until R.I.P
  - until stopped "while in panic"
- …are scripted

Maximum Child Nodes

adaptTo()

Maximum Child Nodes - Scenario

- Iteratively, all under one parent node
  - Create 1000 nodes
  - Save them
  - Reorder 1000 nodes
  - Save order
  - Traverse nodes
  - Query 10% of the nodes
  - Show all current nodes in CRXDE

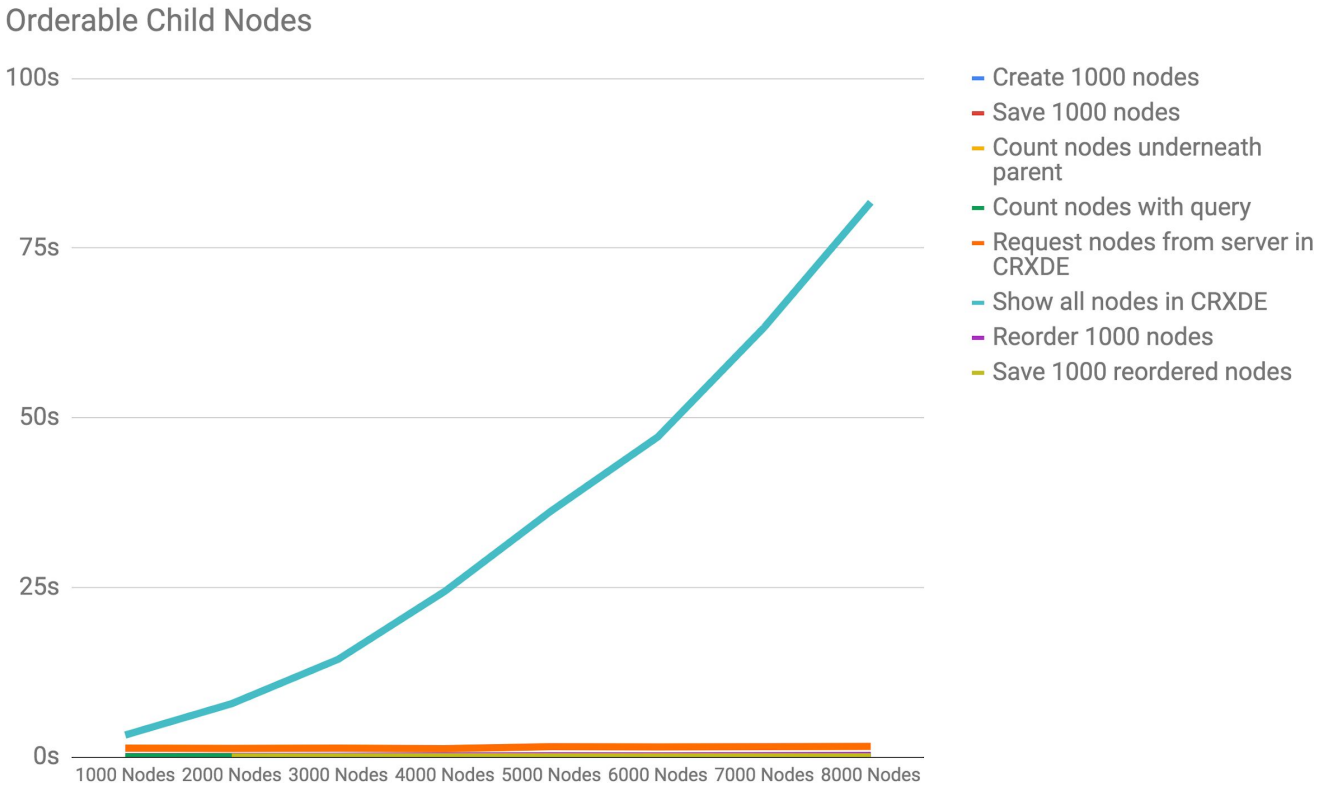
adaptTo()

Demo

```
1: 288ms:  Create 1000 nodes (up to 1000 nodes in total)
   259ms:  Save 1000 nodes
   1ms:    Reorder 1000 nodes
   0ms:    Save 1000 reordered nodes
   7ms:    Count nodes underneath parent (up to 1000)
   6ms:    Count nodes with query for resource type 'special' (found  100)
   15sec:  Show all nodes in CRXDE (all 1000 incl node00000000000001-1000)
2: 270ms:  Create 1000 nodes (up to 2000 nodes in total)
   137ms:  Save 1000 nodes
   278ms:  Reorder 1000 nodes
   16ms:   Save 1000 reordered nodes
   8ms:    Count nodes underneath parent (up to 2000)
   30ms:   Count nodes with query for resource type 'special' (found  200)
   30.6sec: Show all nodes in CRXDE (all 2000 incl node00000000000002-1000)
3: 325ms:  Create 1000 nodes (up to 3000 nodes in total)
   129ms:  Save 1000 nodes
   308ms:  Reorder 1000 nodes
   22ms:   Save 1000 reordered nodes
   29ms:   Count nodes underneath parent (up to 3000)
   14ms:   Count nodes with query for resource type 'special' (found  300)
   56.2sec: Show all nodes in CRXDE (all 3000 incl node00000000000003-1000)
4: 395ms:  Create 1000 nodes (up to 4000 nodes in total)
   165ms:  Save 1000 nodes
   414ms:  Reorder 1000 nodes
   60ms:   Save 1000 reordered nodes
   29ms:   Count nodes underneath parent (up to 4000)
   50ms:   Count nodes with query for resource type 'special' (found  400)
   1.4min: Show all nodes in CRXDE (all 4000 incl node00000000000004-1000)
5: 427ms:  Create 1000 nodes (up to 5000 nodes in total)
   189ms:  Save 1000 nodes
   442ms:  Reorder 1000 nodes
   40ms:   Save 1000 reordered nodes
   46ms:   Count nodes underneath parent (up to 5000)
   27ms:   Count nodes with query for resource type 'special' (found  500)


Breaklet broke at iteration 5: Operation 'Show all nodes in CRXDE' 2min >= 120sec
```

Maximum Child Nodes



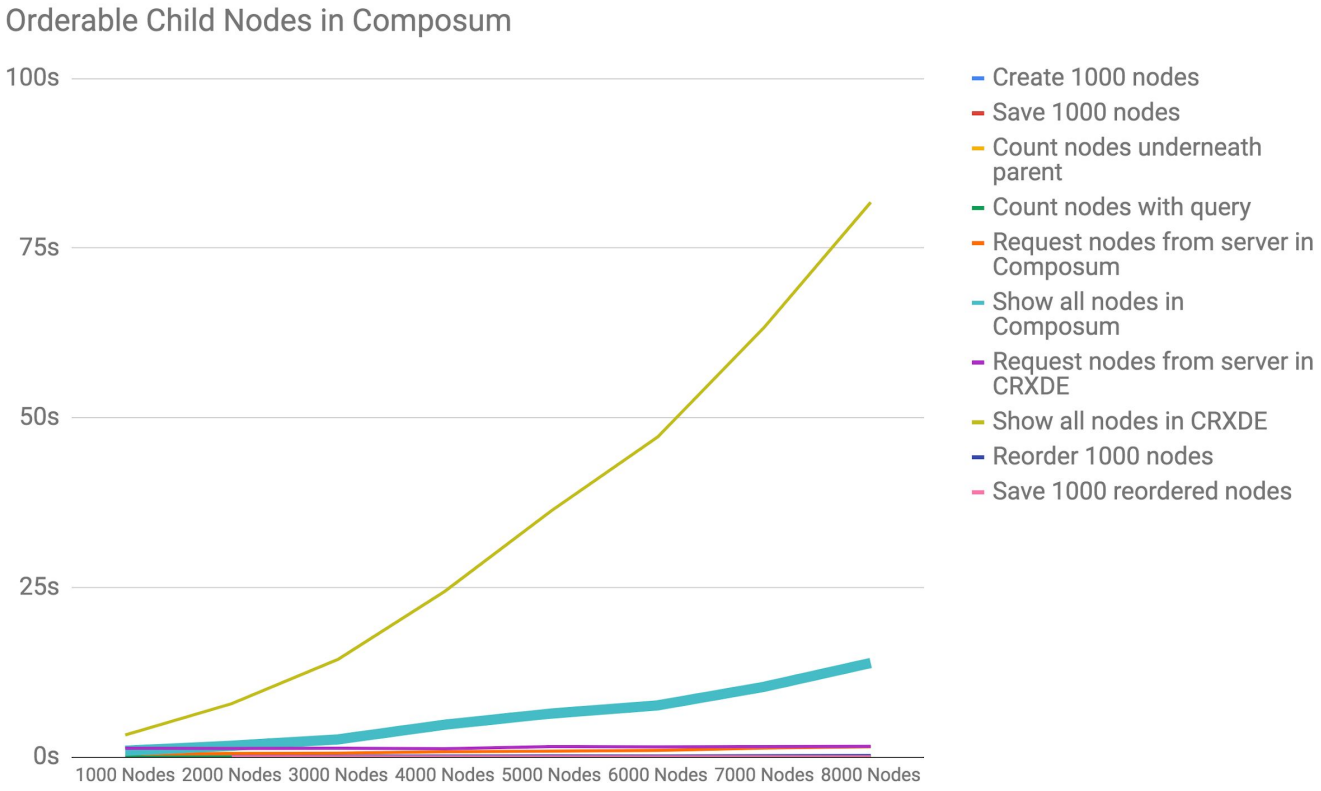
nt:unstructured

With CRXDE

~8k nodes

< 1min

Maximum Child Nodes



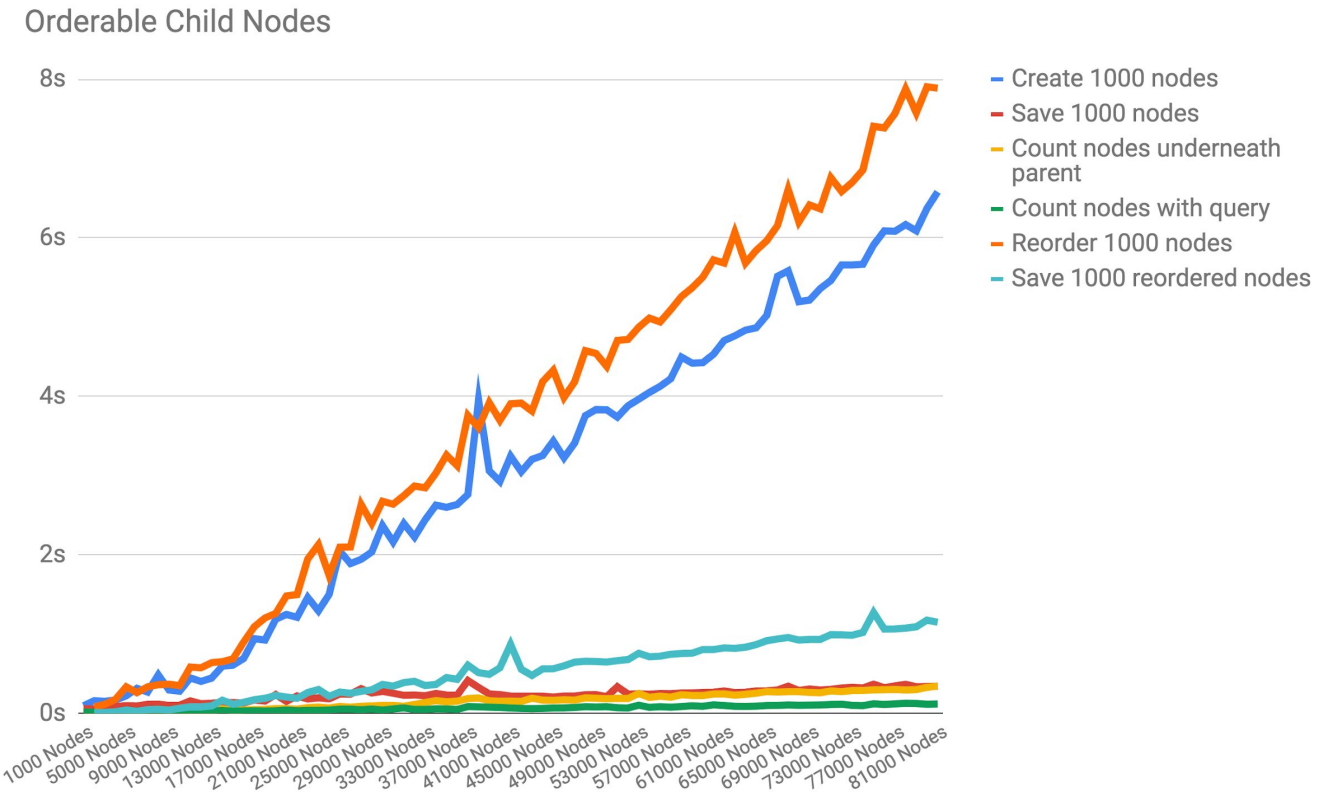
nt:unstructured

With Composum

~8k nodes

< 10sec

Maximum Child Nodes



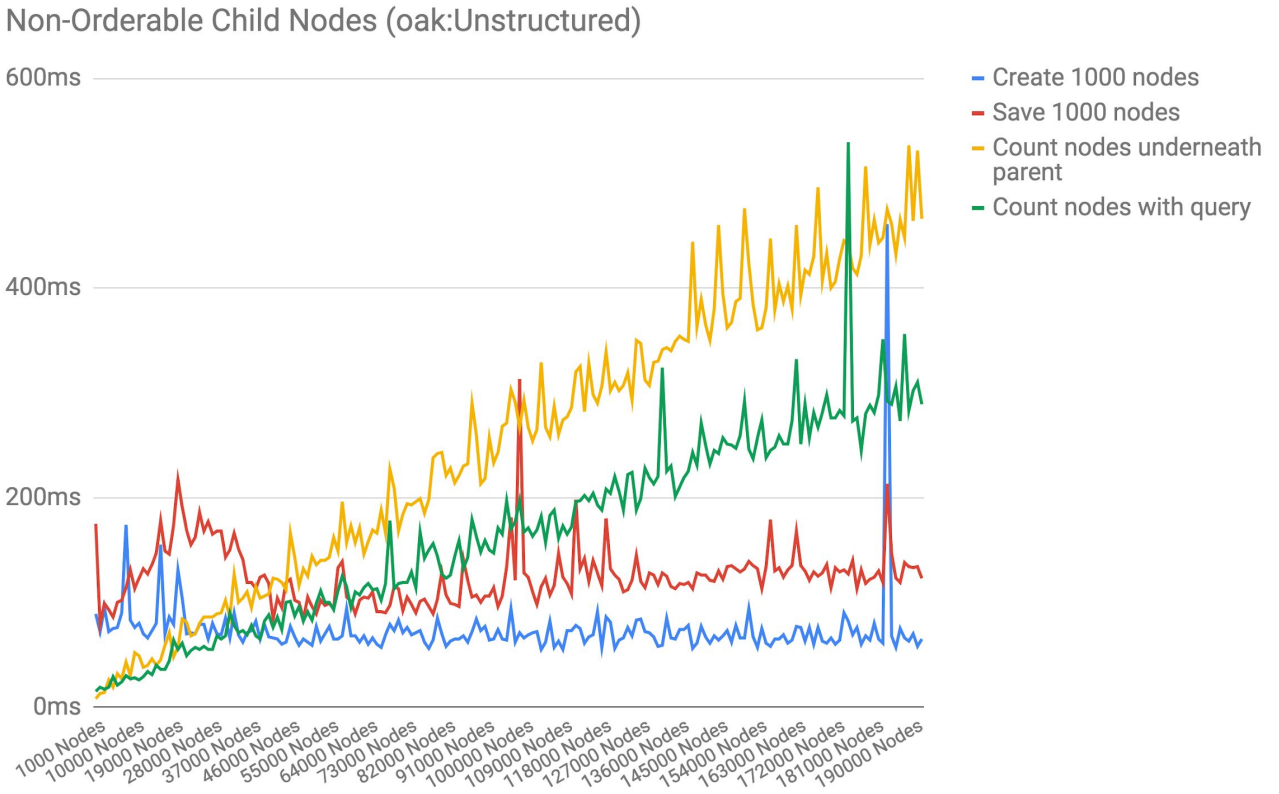
nt:unstructured

Without UI

~80k nodes

< 8sec

Maximum Child Nodes



oak:Unstructured

Without UI

~200k nodes

< 1sec

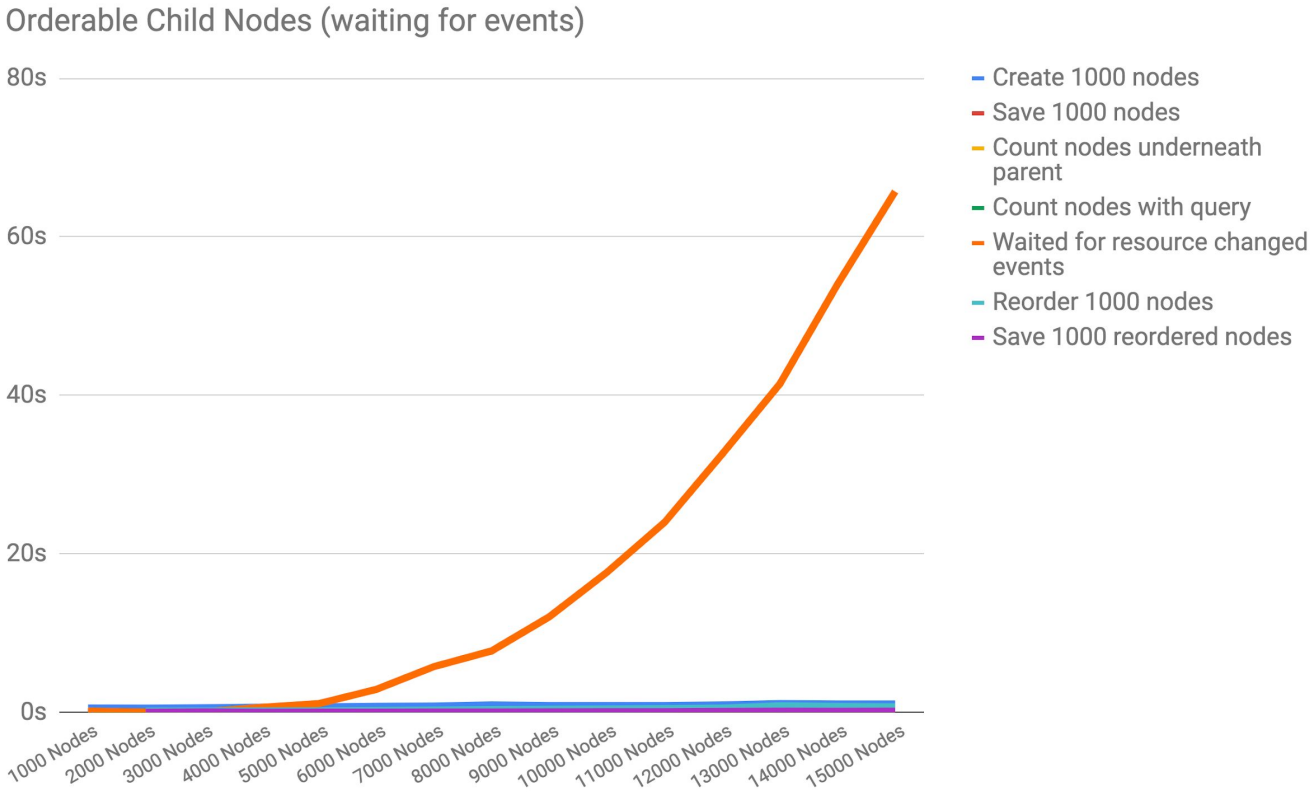
Maximum Child Nodes

04/09/2018, 10:56:28	org/apache/sling/api/resource/Resource/ADDED	path	/content/nodetest/node00000000000045-0149
		event.topics	org/apache/sling/api/resource/Resource/ADDED
		userid	admin
		resourceType	nt:unstructured
04/09/2018, 10:56:28	org/apache/sling/api/resource/Resource/ADDED	path	/content/nodetest/node00000000000045-0148
		event.topics	org/apache/sling/api/resource/Resource/ADDED
		userid	admin
		resourceType	nt:unstructured
04/09/2018, 10:56:28	org/apache/sling/api/resource/Resource/ADDED	path	/content/nodetest/node00000000000045-0147
		event.topics	org/apache/sling/api/resource/Resource/ADDED
		userid	admin
		resourceType	special
04/09/2018, 10:56:28	org/apache/sling/api/resource/Resource/ADDED	path	/content/nodetest/node00000000000045-0389
		event.topics	org/apache/sling/api/resource/Resource/ADDED

Health Check (tags)	Status	Log	Finished At	Time
Threads Check threads, resources, dashboard	WARN	98.1% used by thread "sling-oak-observation-8" 98.1% used by thread "sling-oak-observation-5" 98.1% used by thread "sling-oak-observation-16" 97.8% used by thread "sling-oak-observation-13" 97.7% used by thread "sling-oak-observation-20" 97.4% used by thread "sling-oak-observation-4" 96.6% used by thread "sling-oak-observation-14" 42.2% used by thread "Timer-50" 170 threads using 728.9% CPU Time WARN Threads are consuming significant CPU time (more than configured 400% within 200ms)	10:56:56.288	208ms

		userid	admin
		resourceType	nt:unstructured
04/09/2018, 10:56:28	org/apache/sling/api/resource/Resource/ADDED	path	/content/nodetest/node00000000000045-0386
		event.topics	org/apache/sling/api/resource/Resource/ADDED
		userid	admin
		resourceType	nt:unstructured

Maximum Child Nodes



nt:unstructured

waiting for events

~15k nodes

< 1min

Changeset Single Commit

adaptTo()

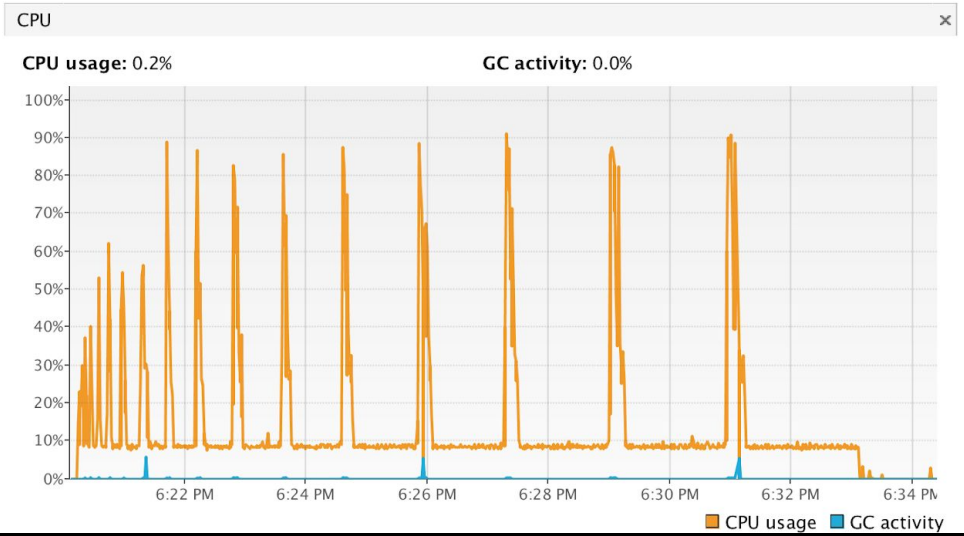
Large Changeset Single Commit

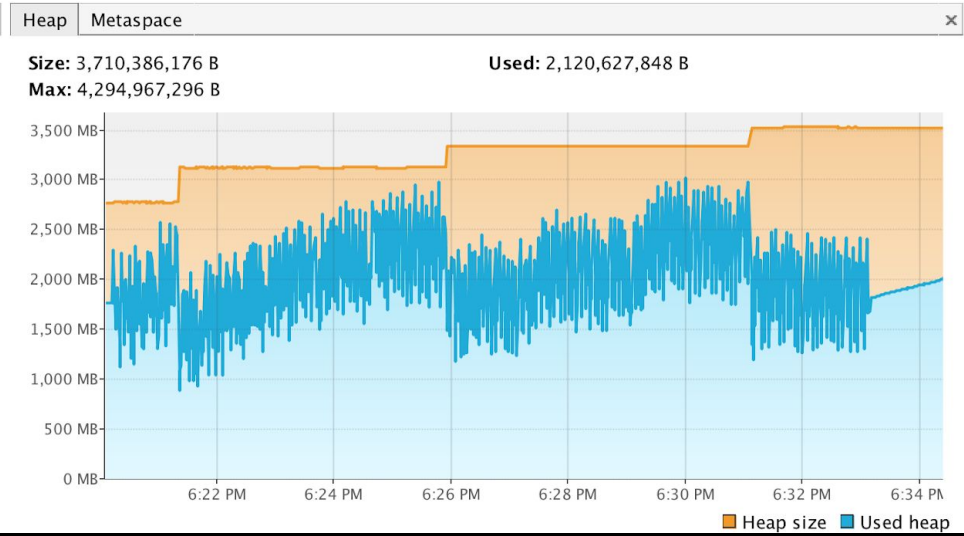
- Iteratively
  - Create a root node /content/nodetest
  - Create 1000 * iteration no nodes underneath
  - Save session
  - Wait for all change listener events
  - Delete root node
  - Save session
  - Wait for delete event

Large Changeset Single Commit

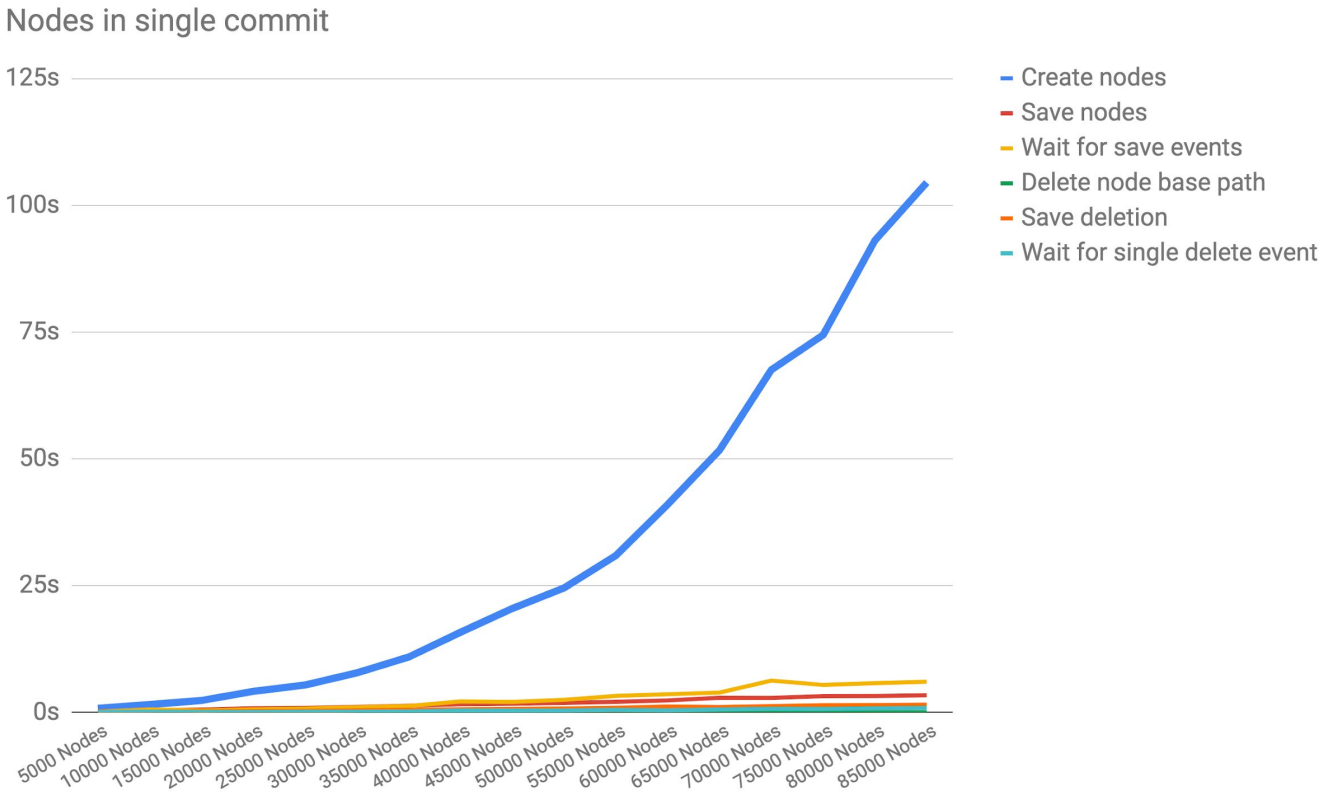
```
06.09.2018 00:48:33.899 *INFO* [0:0:0:0:0:0:0:1 [1536187493033] POST /bin/groovyconsole/post.json HTTP/1.1] groovyconsole         35.1sec: Wait for save events  changesReceived=3001 (in 1 calls)
06.09.2018 00:48:33.900 *INFO* [0:0:0:0:0:0:0:1 [1536187493033] POST /bin/groovyconsole/post.json HTTP/1.1] groovyconsole         0ms:     Delete node base path
06.09.2018 00:48:55.542 *INFO* [0:0:0:0:0:0:0:1 [1536187493033] POST /bin/groovyconsole/post.json HTTP/1.1] groovyconsole         21.6sec: Save deletion
06.09.2018 00:49:00.504 *INFO* [0:0:0:0:0:0:0:1 [1536187493033] POST /bin/groovyconsole/post.json HTTP/1.1] groovyconsole         5sec:    Wait for single delete event  changesReceived=1 (in 1 calls)
06.09.2018 00:49:03.454 *INFO* [0:0:0:0:0:0:0:1 [1536187493033] POST /bin/groovyconsole/post.json HTTP/1.1] com.adobe.granite.repository Service [7877, [org.apache.jackrabbit.oak.api.jmx.SessionMBean]] ServiceEvent UNREGISTERING
06.09.2018 00:49:15.721 *ERROR* [sling-default-5-com.adobe.granite.threaddump.impl.ThreadDumpCollector] org.apache.sling.commons.scheduler.impl.QuartzScheduler Exception during job execution of job
'com.adobe.granite.threaddump.impl.ThreadDumpCollector@4980375d' with name 'com.adobe.granite.threaddump.impl.ThreadDumpCollector' : GC overhead limit exceeded
java.lang.OutOfMemoryError: GC overhead limit exceeded
    at java.util.Arrays.copyOfRange(Arrays.java:3664)
    at java.lang.StringBuffer.toString(StringBuffer.java:669)
    at java.text.DecimalFormat.applyPattern(DecimalFormat.java:3474)
    at java.text.DecimalFormat.<init>(DecimalFormat.java:464)
    at sun.util.locale.provider.NumberFormatProviderImpl.getInstance(NumberFormatProviderImpl.java:180)
    at sun.util.locale.provider.NumberFormatProviderImpl.getNumberInstance(NumberFormatProviderImpl.java:149)
    at java.text.NumberFormat.getInstance(NumberFormat.java:875)
    at java.text.NumberFormat.getInstance(NumberFormat.java:861)
    at java.text.NumberFormat.getInstance(NumberFormat.java:442)
    at java.text.MessageFormat.subformat(MessageFormat.java:1271)
    at java.text.MessageFormat.format(MessageFormat.java:865)
    at java.text.Format.format(Format.java:157)
    at java.text.MessageFormat.format(MessageFormat.java:841)
    at org.apache.felix.threaddump.internal.ThreadWriter.println(ThreadWriter.java:112) [org.apache.felix.org.apache.felix.threaddump:1.0.0]
    at org.apache.felix.threaddump.internal.jdk6.Jdk16ThreadDumper.printLockInfo(Jdk16ThreadDumper.java:112) [org.apache.felix.org.apache.felix.threaddump:1.0.0]
    at org.apache.felix.threaddump.internal.jdk6.Jdk16ThreadDumper.printStackTrace(Jdk16ThreadDumper.java:67) [org.apache.felix.org.apache.felix.threaddump:1.0.0]
    at org.apache.felix.threaddump.internal.jdk5.Jdk15ThreadDumper.printThreadInfo(Jdk15ThreadDumper.java:142) [org.apache.felix.org.apache.felix.threaddump:1.0.0]
    at org.apache.felix.threaddump.internal.jdk5.Jdk15ThreadDumper.printThreads(Jdk15ThreadDumper.java:61) [org.apache.felix.org.apache.felix.threaddump:1.0.0]
    at org.apache.felix.threaddump.internal.ThreadDumpInventoryPrinter.print(ThreadDumpInventoryPrinter.java:82) [org.apache.felix.org.apache.felix.threaddump:1.0.0]
    at com.adobe.granite.threaddump.impl.ThreadDumpCollector.run(ThreadDumpCollector.java:337) [com.adobe.granite.threaddump:1.0.36]
    at org.apache.sling.commons.scheduler.impl.QuartzJobExecutor.execute(QuartzJobExecutor.java:347) [org.apache.sling.commons.scheduler:2.7.2]
    at org.quartz.core.JobRunShell.run(JobRunShell.java:202) [org.apache.sling.commons.scheduler:2.7.2]
    at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1149)
    at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:624)
    at java.lang.Thread.run(Thread.java:748)
06.09.2018 00:49:21.019 *ERROR* [sling-default-4] org.quartz.core.JobRunShell Job DEFAULT.Registered Service.4604 threw an unhandled Exception:
java.lang.OutOfMemoryError: GC overhead limit exceeded
    at java.lang.StringBuilder.toString(StringBuilder.java:407)
    at org.quartz.core.JobRunShell.run(JobRunShell.java:201) [org.apache.sling.commons.scheduler:2.7.2]
    at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1149)
    at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:624)
    at java.lang.Thread.run(Thread.java:748)
```

Large Changeset Single Commit





Large Changeset Single Commit



~70k nodes

< 1 min

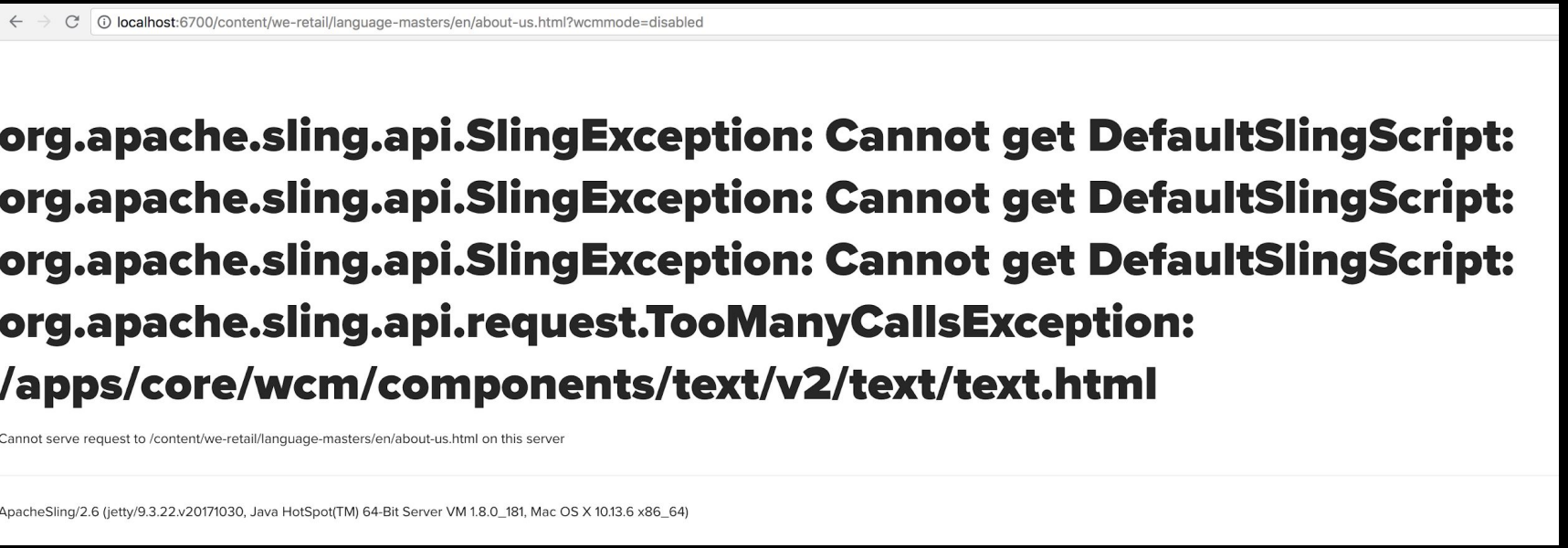
Maximum Components on Page

adaptTo()

Maximum Components on Page

- Iteratively on one page
  - Create 50 component nodes in responsive grid
    - text component
  - Save them
  - Open page in editor (browser)
    - edit the last component on page
    - save

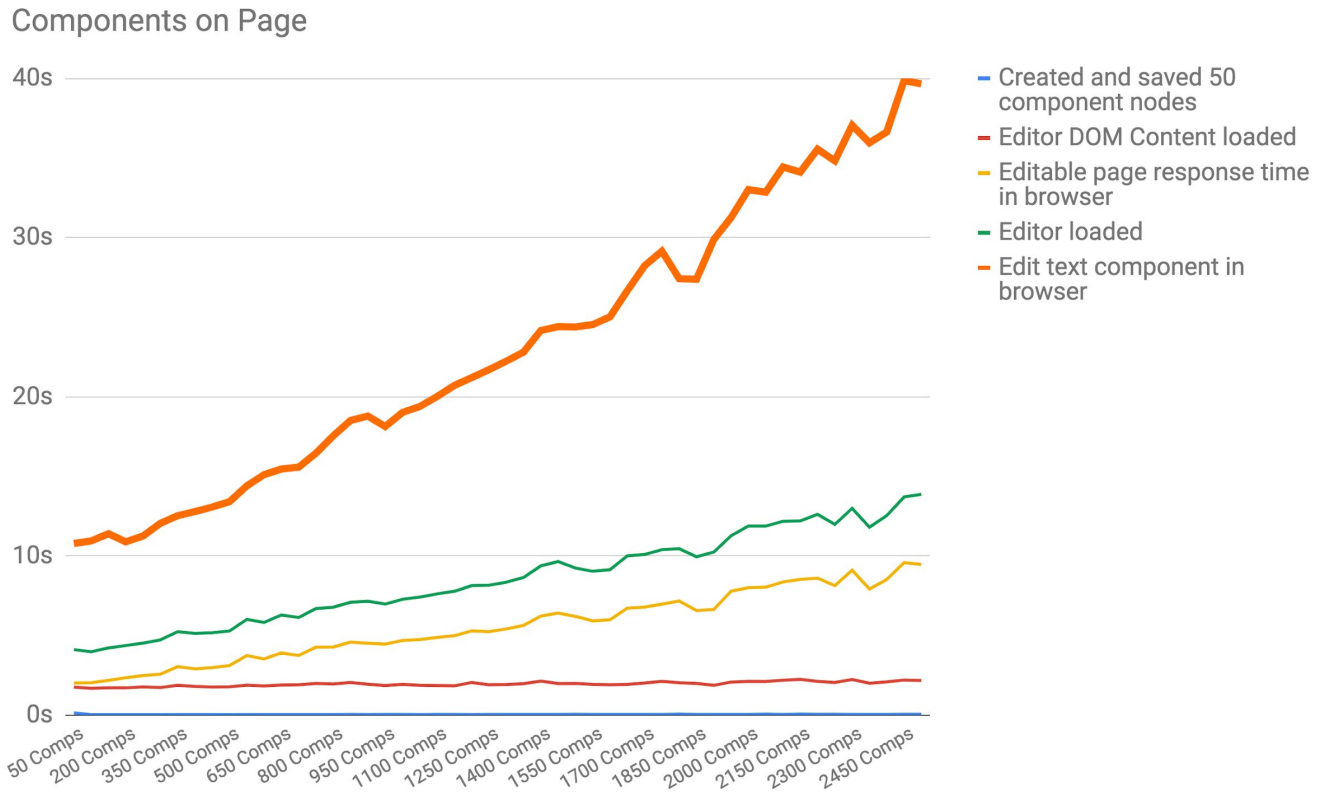
Maximum Components on Page



PID org.apache.sling.engine.impl.SlingMainServlet

Property "sling.max.calls" (default 1000)

Maximum Components on Page



~2k components

< 1 min for simple edit

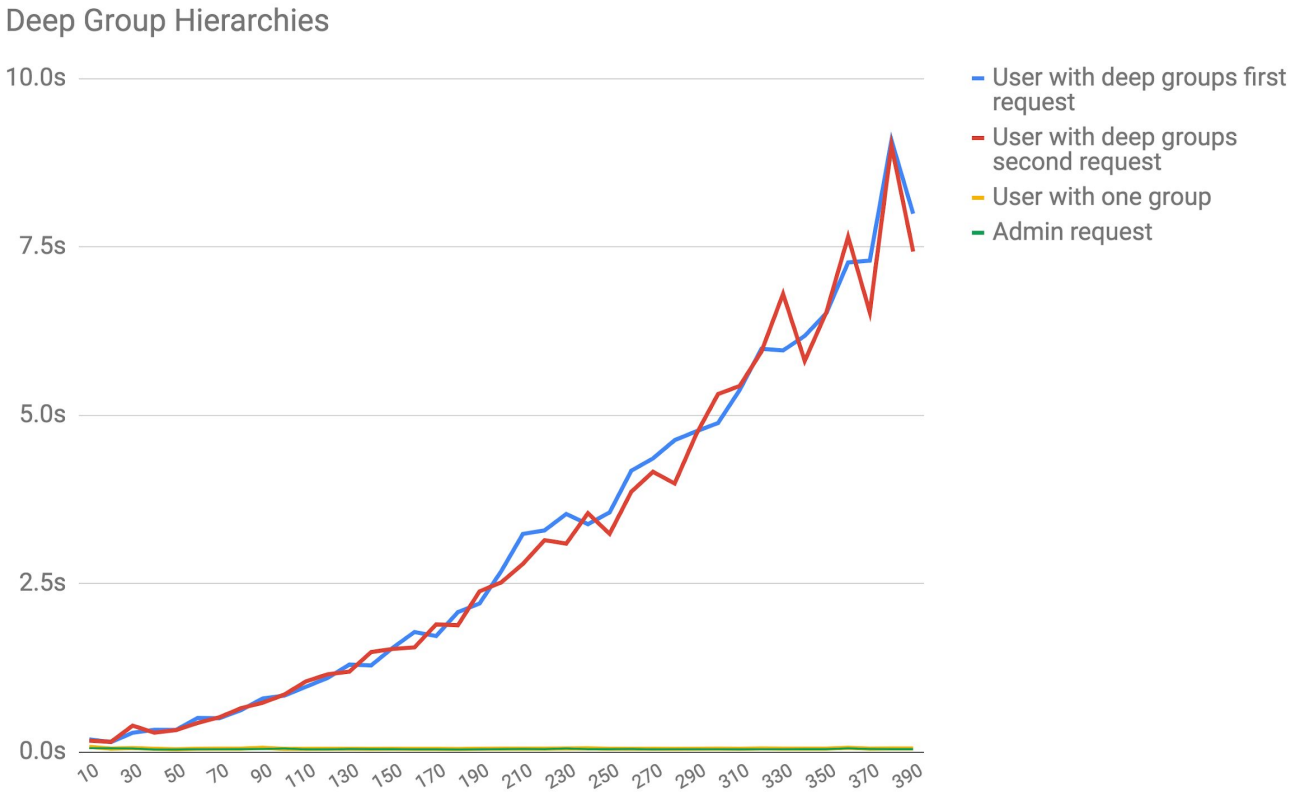
Deep Group Hierarchies

adaptTo()

Deep Group Hierarchies

- Base
  - 50 Text Components on one page
  - Breaklet User
- Iteratively
  - Create 10 more groups per iteration to allow user to text comp
  - unique groups are created per component to depth level
  - each iteration creates 10 x 50 groups

Deep Group Hierarchies



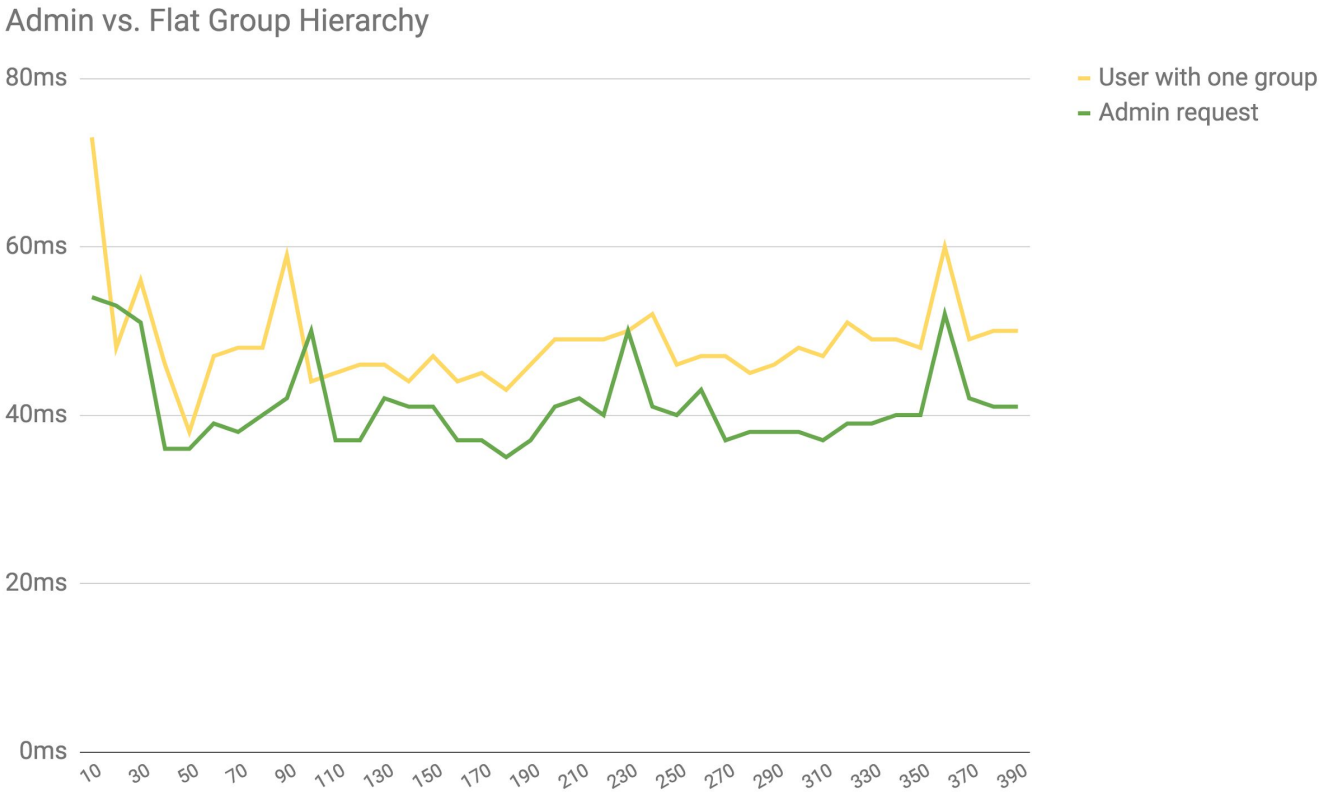
~200,000 groups

~400 levels

50 ACLs

< 10 sec render time

Deep Group Hierarchies



~200,000 groups

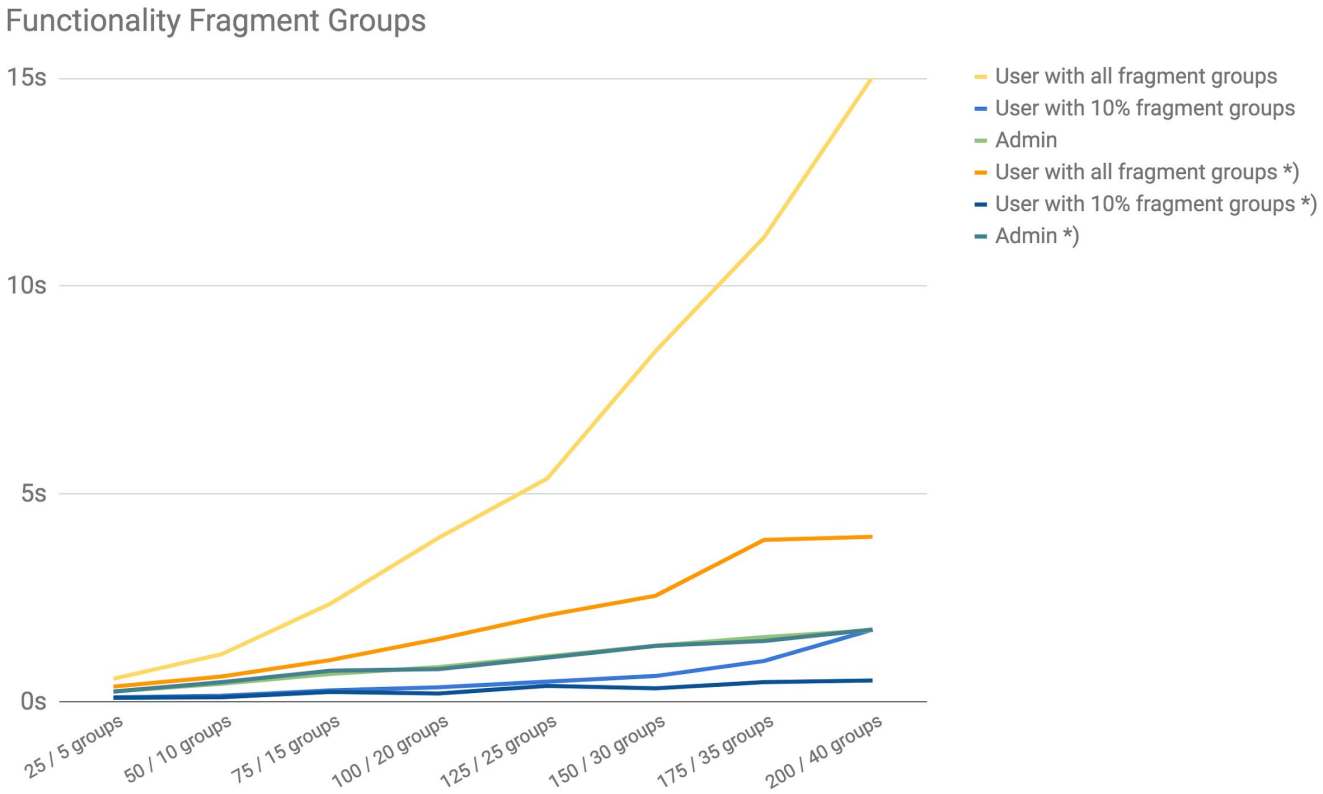
~50 groups relevant

< 100ms render time

Deep Group Hierarchies

- Base
  - 10 Text Components on one page
  - Breaklet User 1 (all groups) & User 2 (10% of groups)
- Iteratively
  - Create 5 components with with 5 fragment groups (5x5=25)
  - unique groups per component
- Now, each group has an ACE entry in content

Deep Group Hierarchies



~2000 groups

~2000 ACLs

~15s/1.5s render time

~ 4s/0.5s render time *)

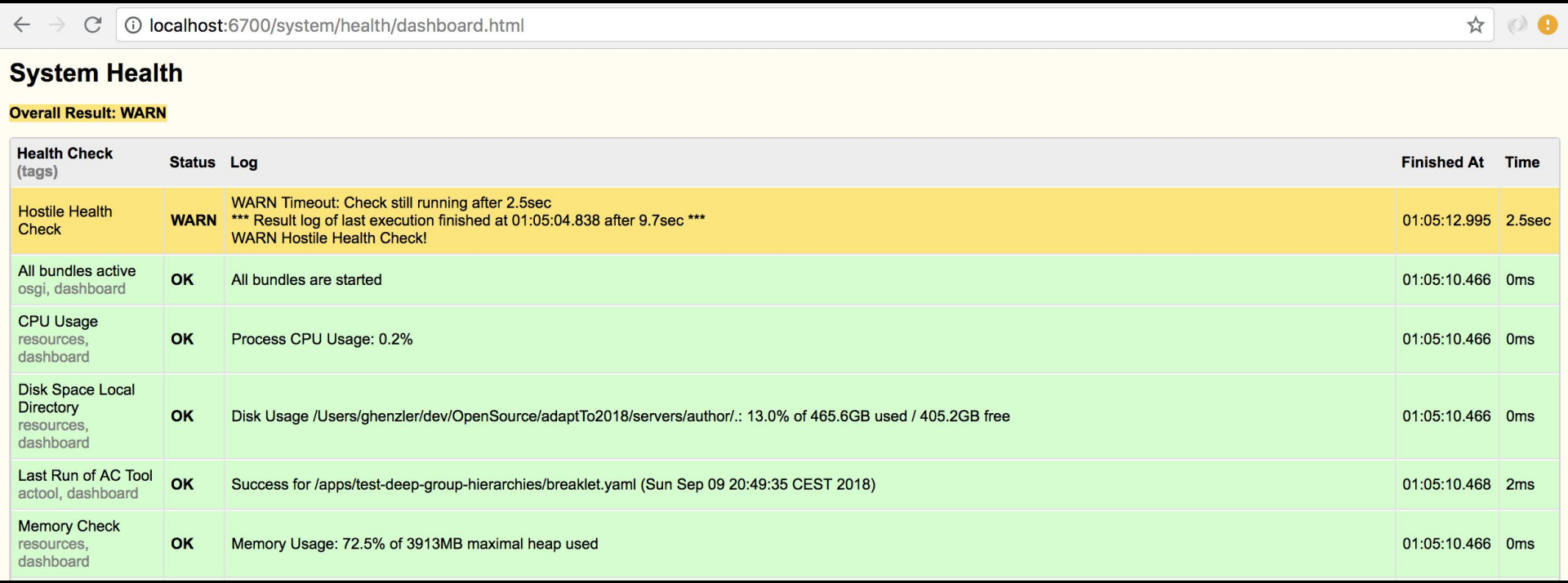
*) AC Tool virtual group

Hostile Health Check

Hostile Health Check - Scenario

```
 8 dynamicHealthCheck = new HealthCheck() {
 9     def serviceRegistration
10     def repository
11
12     Result execute() {
13         FormattingResultLog log = new FormattingResultLog()
14         log.warn("Hostile Health Check!")
15         for(int i=1; i<10;i++) {
16             def hcSession = null
17             try {
18                 hcSession = repository.login(new SimpleCredentials("admin", "admin".toCharArray()));
19                 hcSession.getNode("/").recurse { node ->
20                     log.debug("node: "+node.getPath())
21                 }
22             } finally {
23                 if(hcSession!=null) {
24                     hcSession.logout()
25                 }
26             }
27         }
```

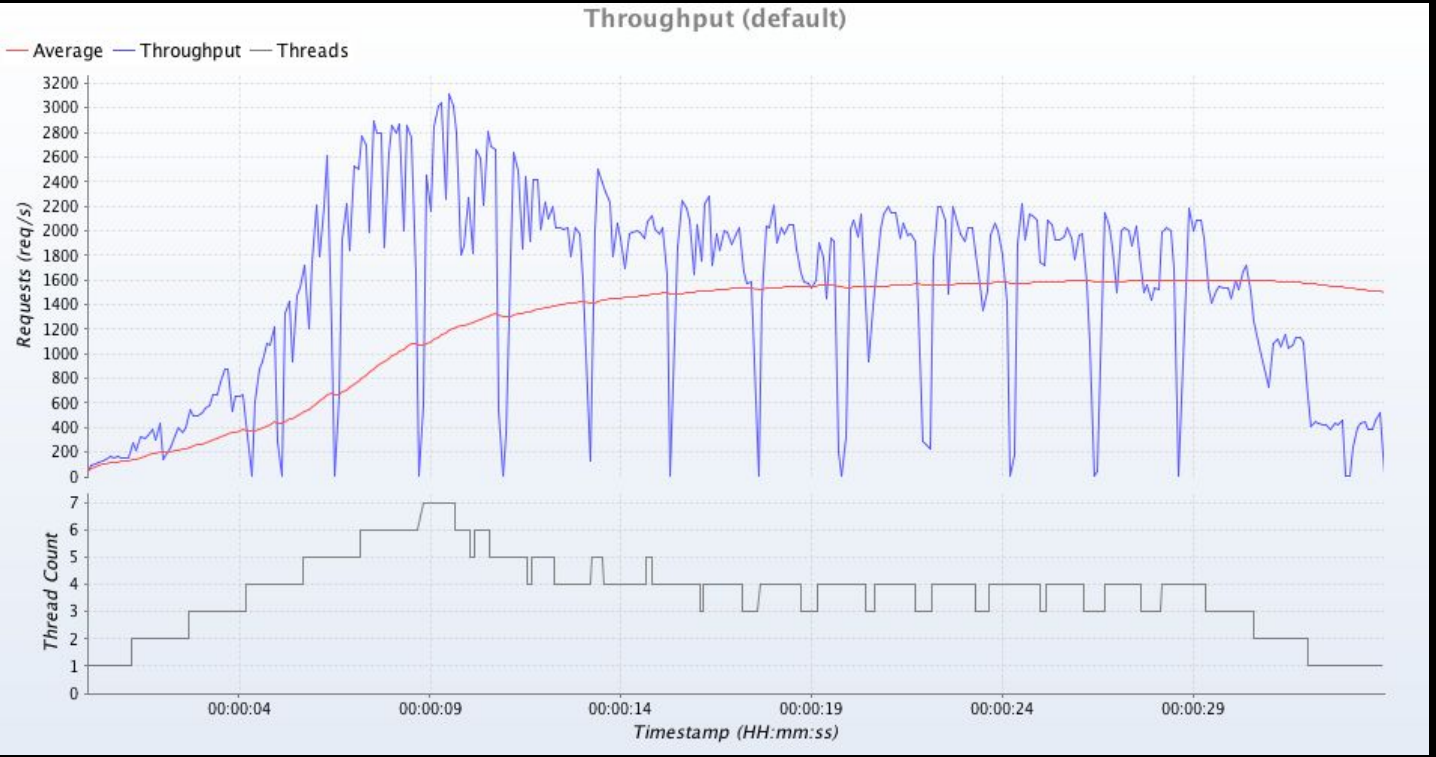
Hostile Health Check - Scenario



Hostile Health Check

- URL /system/health/dashboard.html
- JMeter
  - 7 Threads / 100 Threads
  - 10000 calls
  - all checks green
- Add Hostile Health Check
  - run again

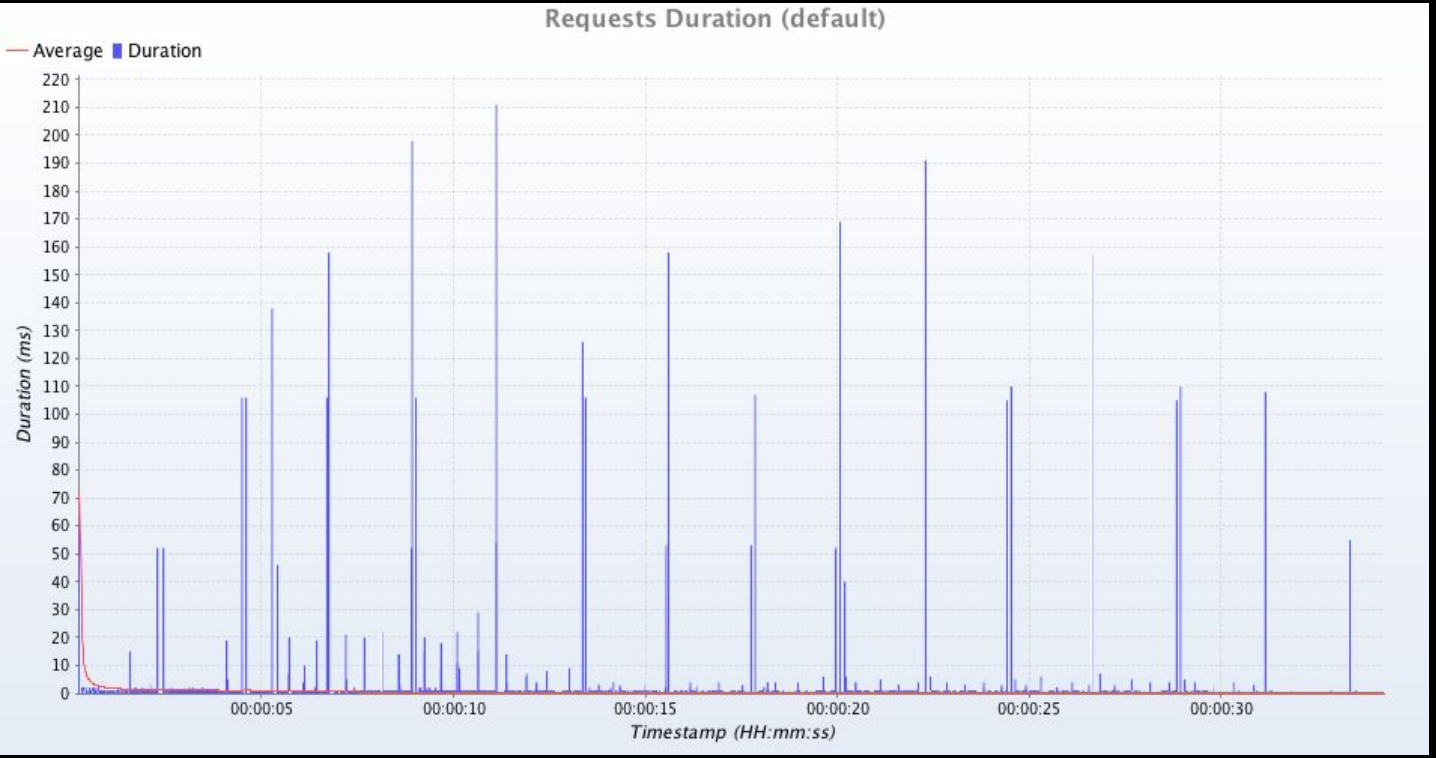
Hostile Health Check



~2000 req / sec

~50 req / sec during cache fill every 2 sec

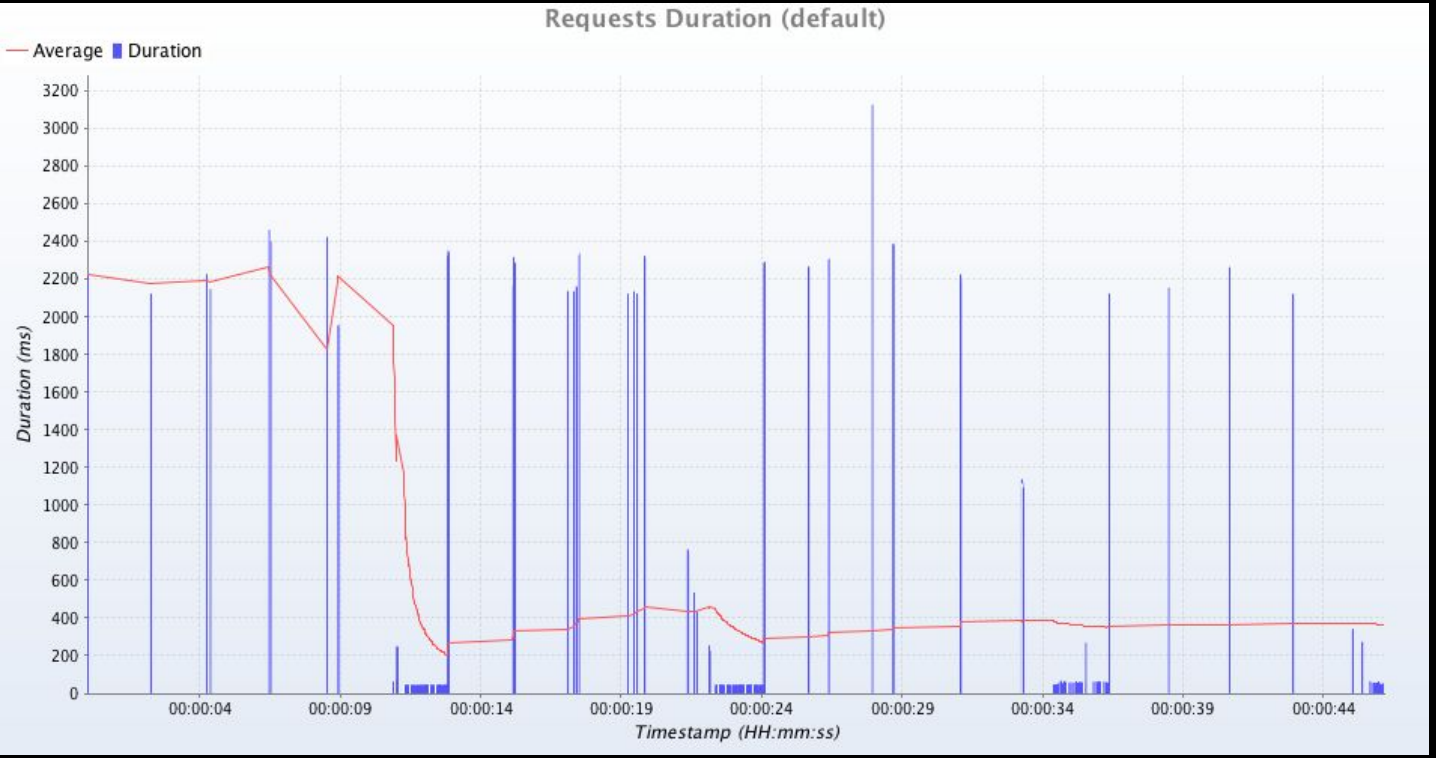
Hostile Health Check



~5ms response time for cached results

~200ms response time for cache fill

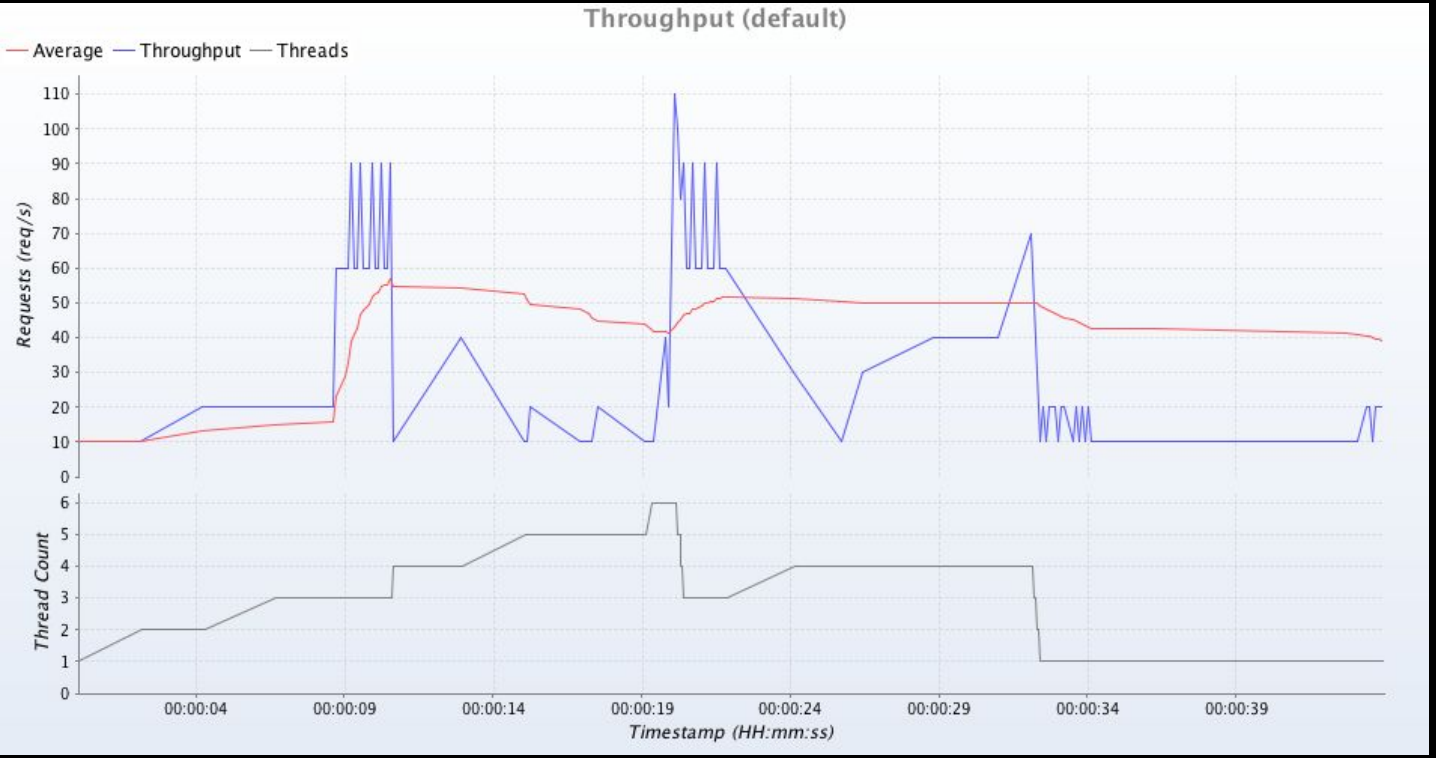
Hostile Health Check



2 sec timeout (default)

2 sec cache time (default)

Hostile Health Check



~20 req / sec

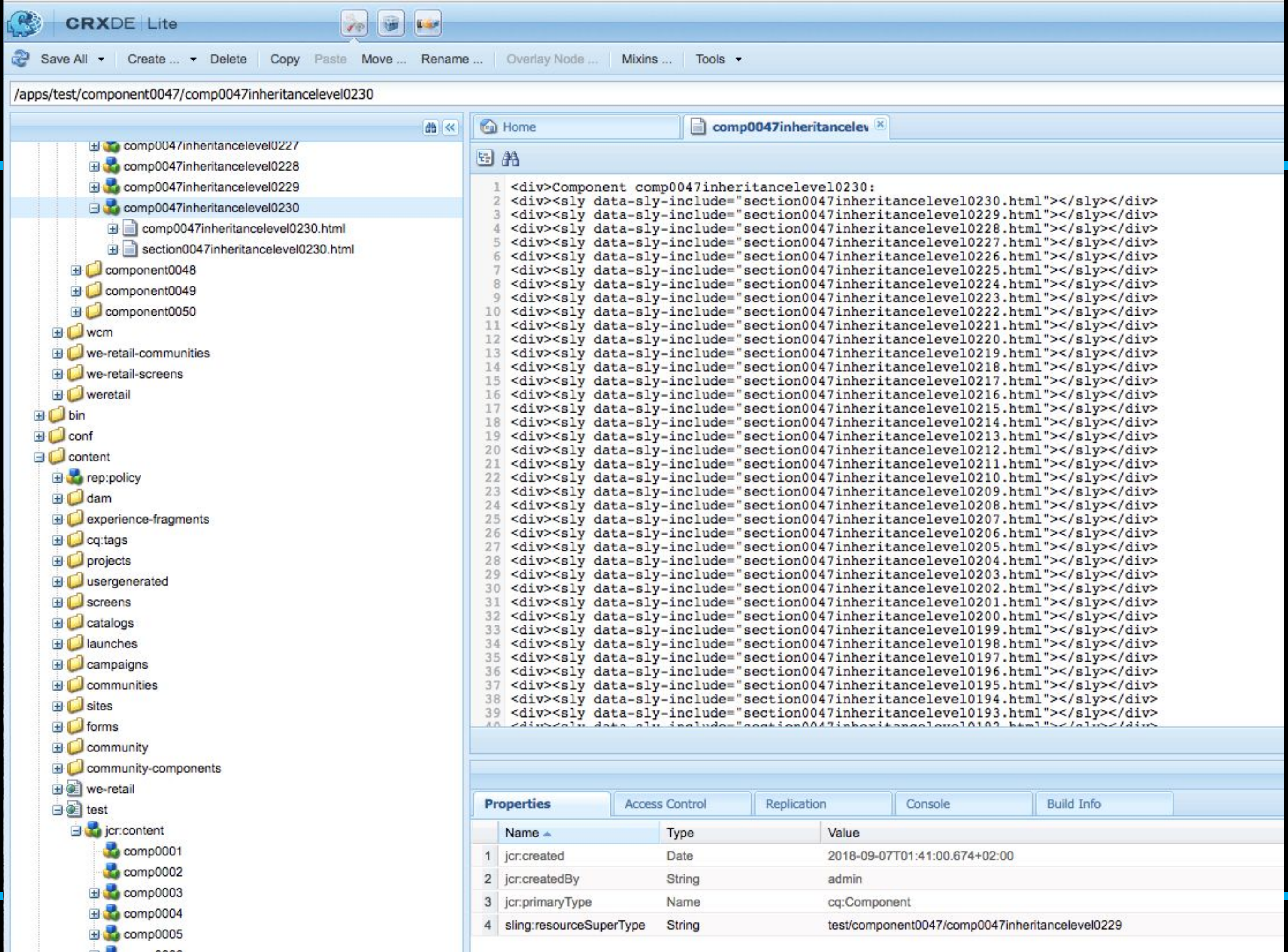
~100 req / sec when cached

adaptTo()

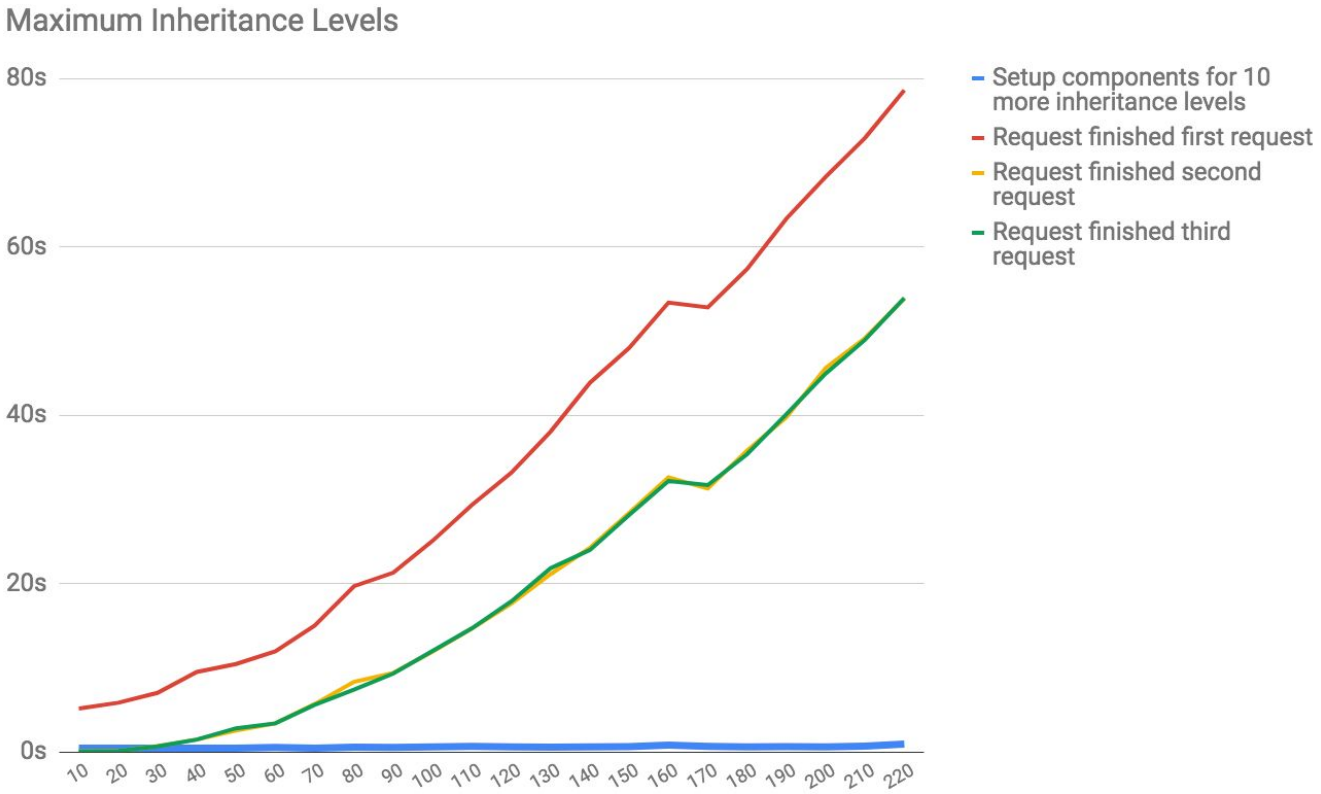
Resource Type Inheritance Levels

Max. Resource Type Inheritance Levels

- Iteratively
  - Ensure page /content/test exists
    - with responsive grid comp and 50 distinct components
  - each of the 50 components has their own hierarchy
    - each iteration adds 10 hierarchy levels to all 50 components
  - each of the 50 compoents uses exactly one script of each inheritance level


CRXDE Lite
Save All
Create ...
Delete
Copy
Paste
Move ...
Rename ...
Overlay Node ...
Mixins ...
Tools
/apps/test/component0047/comp0047inheritancelevel0230
comp0047inheritancelevel0227
comp0047inheritancelevel0228
comp0047inheritancelevel0229
comp0047inheritancelevel0230
comp0047inheritancelevel0230.html
section0047inheritancelevel0230.html
component0048
component0049
component0050
wcm
we-retail-communities
we-retail-screens
weretail
bin
conf
content
rep:policy
dam
experience-fragments
cq:tags
projects
usergenerated
screens
catalogs
launches
campaigns
communities
sites
forms
community
community-components
we-retail
test
jcr:content
comp0001
comp0002
comp0003
comp0004
comp0005
Home
comp0047inheritancelev
<div>Component comp0047inheritancelevel0230:
<div><sly data-sly-include="section0047inheritancelevel0230.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0229.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0228.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0227.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0226.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0225.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0224.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0223.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0222.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0221.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0220.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0219.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0218.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0217.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0216.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0215.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0214.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0213.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0212.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0211.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0210.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0209.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0208.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0207.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0206.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0205.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0204.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0203.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0202.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0201.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0200.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0199.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0198.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0197.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0196.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0195.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0194.html"></sly></div>
<div><sly data-sly-include="section0047inheritancelevel0193.html"></sly></div>
Properties
Access Control
Replication
Console
Build Info
Name
Type
Value
1 jcr:created Date 2018-09-07T01:41:00.674+02:00
2 jcr:createdBy String admin
3 jcr:primaryType Name cq:Component
4 sling:resourceSuperType String test/component0047/comp0047inheritancelevel0229

Max. Resource Type Inheritance Levels

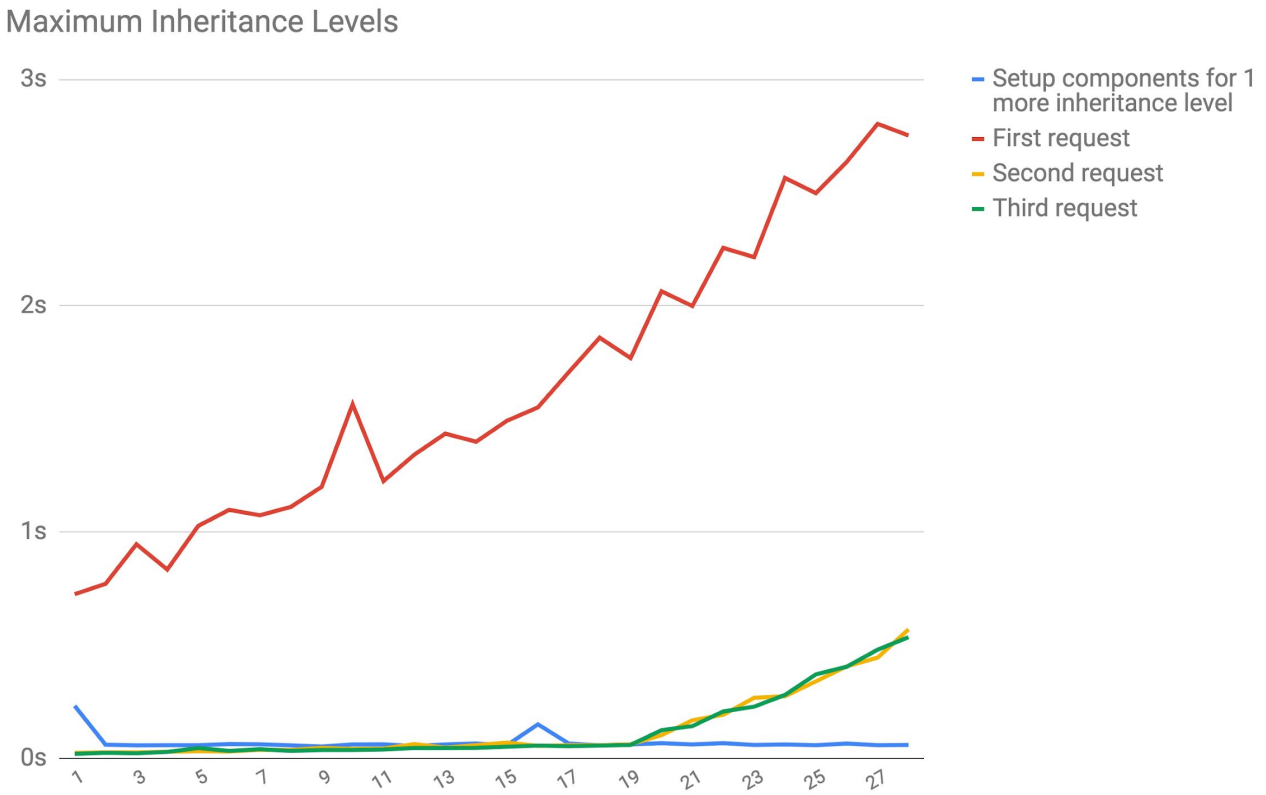


~200 inheritance levels

< 1 min first load

< 40 sec consecutive loads

Max. Resource Type Inheritance Levels



once cached:

~30 inheritance levels

< 1sec

Max. Resource Type Inheritance Levels

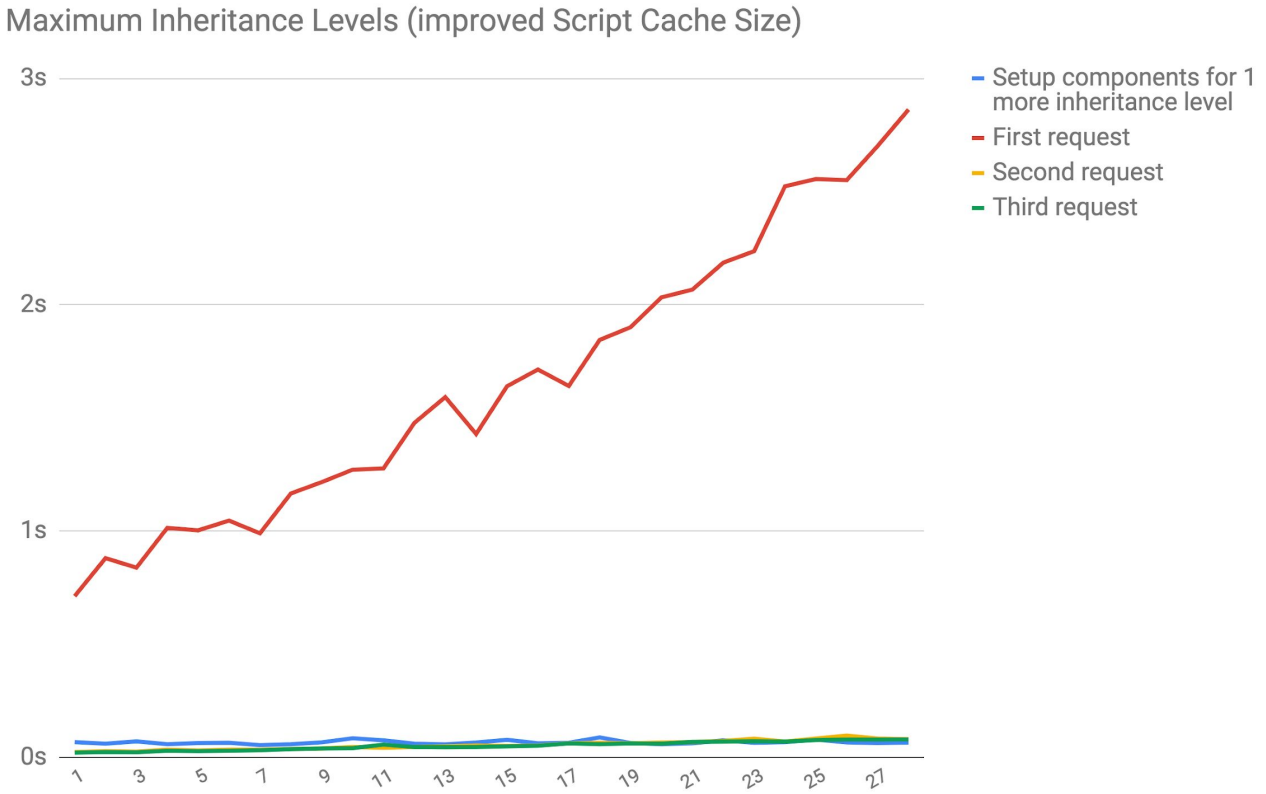
```
st.json HTTP/1.1] groovyconsole     26: 64ms:    Setup components for 1 more inheritance levels
entCacheImpl$1:294f23ab-ce56-4772-bba7-4fe936d6bce3] com.day.cq.wcm.core.impl.components.ComponentCacheImpl Loaded 2423 components in 264ms
entCacheImpl$1:294f23ab-ce56-4772-bba7-4fe936d6bce3] com.day.cq.wcm.core.impl.components.ComponentCacheImpl Cache rebuild has been completed
 org.apache.sling.servlets.resolver.internal.SlingServletResolver Script cache has reached its limit of 1000. You might want to increase the cache size f

st.json HTTP/1.1] groovyconsole         2.6sec:  Request finished first request 145038 chars received
st.json HTTP/1.1] groovyconsole         405ms:   Request finished second request 145038 chars received
st.json HTTP/1.1] groovyconsole         404ms:   Request finished third request 145038 chars received
```

PID org.apache.sling.servlets.resolver.SlingServletResolver

Property "servletresolver.cacheSize" (default 1000)

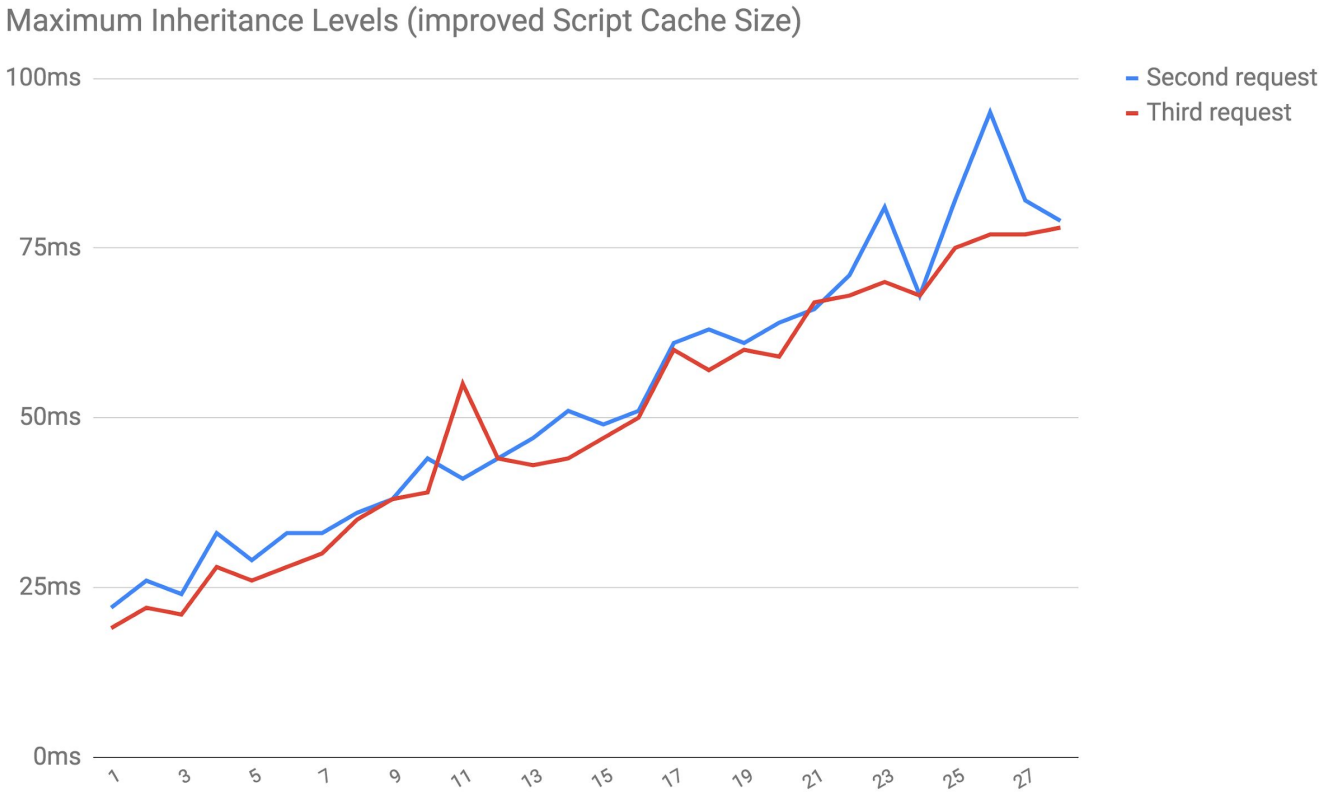
Max. Resource Type Inheritance Levels



~20 inheritance levels

< 500ms

Max. Resource Type Inheritance Levels



~20 inheritance levels

< 500ms

Max. Resource Type Inheritance Levels

… rather use composition!

Conclusion

```
D:\win98>FORMAT C:

WARNING, ALL DATA ON NON-REMOVABLE DISK
DRIVE C: WILL BE LOST!
Proceed with Format (Y/N)?_
```

Test System Specs

- AEM 6.4 / OAK 1.8.3
- 4GB JVM Heap (JDK 1.8)

Conclusion

- The Truth is better than Myths
  - AEM mostly behaves "linear" to the task given
  - Bottleneck can be both server-side or Web UI
  - Web UI testing 2018 is a breeze
  - Breaklets...
    - quick to write, but there are infinite test scenarios
    - run on infrastructure comparable to production
    - watch the log file closely for warnings
    - fill the gap between "speculating" and prototyping

Conclusion

Knowledge what works

(No myths)

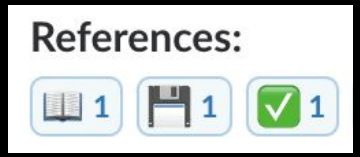
Good Software & Information Design

(Prototyping)

Usability

(Responsive & Appropriate UI for all users)

References

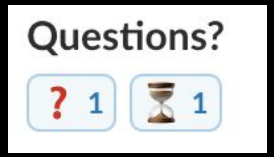


Breaklets https://gist.github.com/ghenzler/e4a924bc29a119a96d5abe1fa99122be#file-breaklets-readme-md

Groovy Console https://github.com/OlsonDigital/aem-groovy-console

Puppeteer https://github.com/GoogleChrome/puppeteer

AC Tool https://github.com/Netcentric/accesscontroltool



… … … … … … … …

Maximum Workflow Instances / Live Copies

Maximum Workflow Instances / Live Copies

Homework for you!