

Are spiders eating your servers?

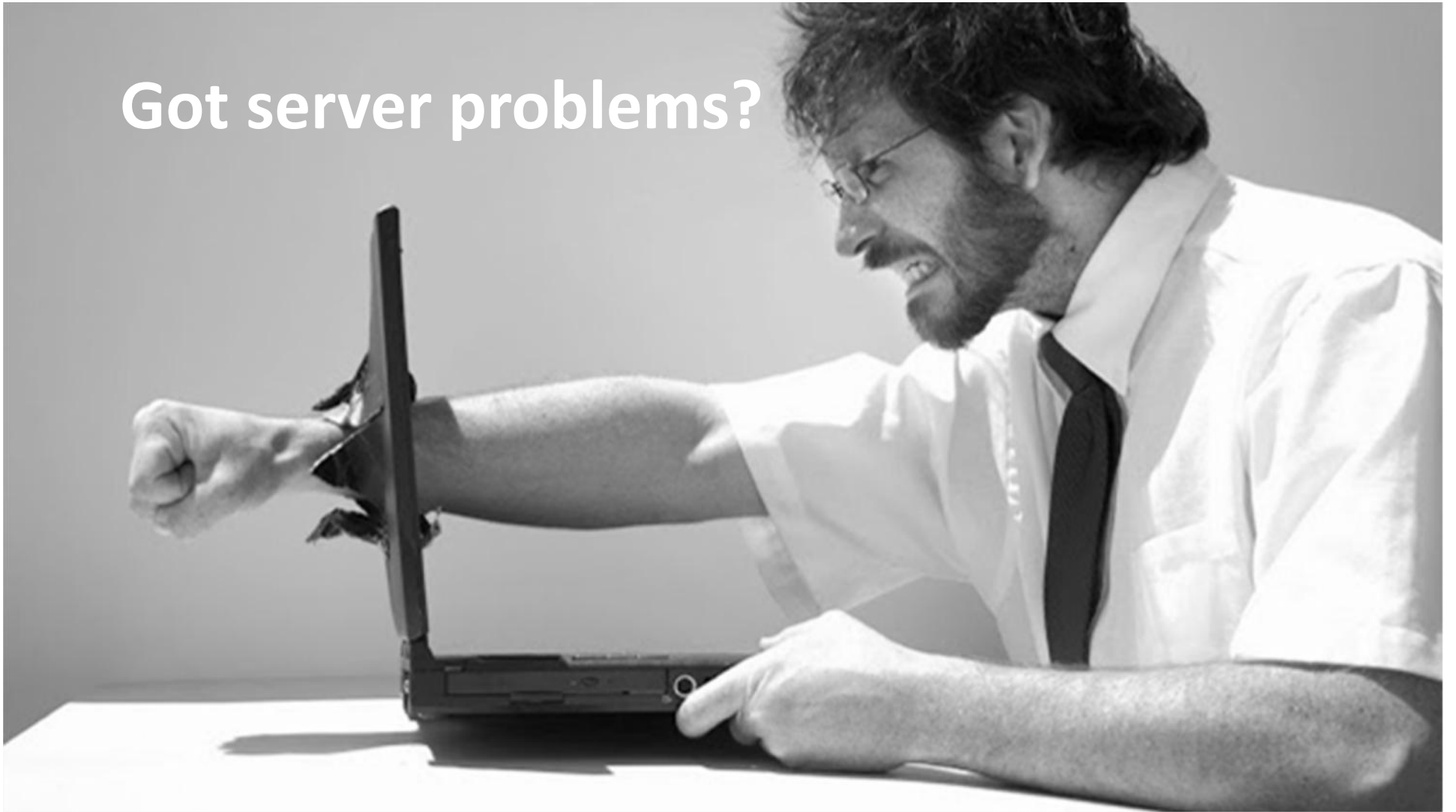
The impact of their unexpected load
and how to counter it



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Got server problems?



There's good news

- Good news: there are solutions to mitigate impact, perhaps reduce load
- That said, some automated requests are getting smarter, harder to control
- Beware: think intranet/private/login-required site is safe from impact?
- We'll cover all this and more in this talk
- To be clear: this discussion is not really specific to SQL Server
 - More about impact of these things that would FLOW to SQL Server (or any DB) and from any web/application server
- This is a talk to get you thinking, point you in perhaps new directions

Topics

- Understanding automated web requests
 - The nature of such automated requests (many, varied, not always friendly)
 - How we can generally identify such requests
 - Their generally unexpected volume
- The impact of such request volume, app/DB server-specific & more generally
- Observing the volume in your environment
- Dealing with automated requests: tools and techniques
 - Preventing undesirable ones
 - Mitigating the impact of expected ones
- Resources for more
- Slides at carehart.org/presentations

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UNDERSTANDING AUTOMATED REQUESTS

The nature of such automated requests: crawlers

- Of course most common automated agents are search engine crawlers
 - The intent/approach of such search engine crawlers/bots/spiders
- There are many:
 - Some legit and desirable (google, bing, yahoo, etc.)
 - Some legit but maybe not your market: Yandex (Russian search engine), Baidu (China, also SoGou, Youdao), Goo (Japan), Naver (Korea), etc.
 - Some may be legit but perhaps unfamiliar to you (Rogerbot, for seomoz.org, mj12bot, for majestic12.co.uk)
- Analogy: restaurant scrambling to serve crush of non-paying reviewers
- ...

The nature of such automated requests: crawlers

- Some crawlers visit your site for other purposes:
 - Some are looking to find **copyright violations** (maybe ok)
 - Some grab ecommerce site prices **to show elsewhere** (may be dubious)
 - Some grab content to **sell to competitors** context about your site/business (not cool)
- Then there are **RSS/atom readers/services**, calling into feeds on your sever
- And you may **expose APIs, web and REST services** that are called in auto. ways
- And before you feel safe with non-public/intranet site, behind firewall or login
 - Beware: site may be crawled by **internal search appliances**
- But that's not all (that can affect both intranet and traditional web sites)...

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The nature of such automated requests: Other checks

- And how about **load balancer health checks**?
- And **monitoring checks** (setup by you, your IT folks, or your clients)?
- Consider also **site security scans**
 - May be run by folks in your IT org, to find vulnerabilities
 - These often run requests at high rates, trying many ways to “break in”
- Analogy: restaurant scrambling to serve free-loading family members

The nature of such automated requests: Errors

- And consider also the added impact of error handling of those, or 404s
- Still another cause: **coding mistakes** leading to repeated requests
 - Such as a runaway ajax client call

The nature of such automated requests: Miscreants

- And of course **hackers, thieves, miscreants** attempting increasing harm:
 - Comment and other forms of spam
 - Theft of content
 - Break-in/takeover of accounts
 - Including outsiders running security scans to find vulnerabilities
 - Fraudulent transactions
 - Denial of service (ddos)
 - Which could be as simple as them running load test tools against your server
- Analogy: restaurant scrambling to serve folks stealing from the register, blocking the door, etc.
- OK, so now we know some common kinds of automated requests...

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Identifying such bots

- Requests typically self-identify with a **“user agent” header**
 - Browsers identify the kind of browser they are (Chrome, FF, Safari, IE, etc.)
 - And most legit bots will also provide a user agent (UA) string
- Some bots also provide a URL in the UA as well
 - A page to explain perhaps what they do, how to manage their requests
- Nice free web site to lookup and better understand UA strings
 - <https://www.distilnetworks.com/bot-directory/>
 - Gives ratings (good/bad), known IP ranges, more

Identifying such bots (cont.)

- Do beware: a requestor can **lie about their user agent**
 - Some may look like “real browser”, others like “legit spider”, to throw you off
 - If you see a “Googlebot” UA from an IP on Amazon, they’re a liar!
- Still others may provide no user agent at all
 - And we could use that against them, in **rejecting requests without any UA**
- Let’s talk about other ways to identify them, then how to handle them

Bot characteristics we might watch for to block them

- Most automated agents also present **no cookie** (important impact, later)
 - Of course, real first-time user will also have no cookie from your site
 - But if we get many frequent requests from same IP with no cookie, we might count that against them
- Many automated requests might show **no “referrer” header**
 - Of course, neither will a request where someone types URL into a browser
- IP addresses of many requests at once may be same, or in a small range
 - Or **may have same UA but totally random IPs**, which could be suspicious
- We’ll revisit consideration of such characteristics under “mitigation” later

Their generally unexpected volume

- So again, why might all this be a problem?...
- Most of these automated requests (of all types) tend to come every day
 - Generally hitting ALL your site pages
 - And a given single “page” may be reached by different URLs (bot won’t know)
- Not unusual for folks to have “paging” links, accessing all pages of a type
 - For instance, all products, and as viewed over all categories, then all vendors, etc
- And remember, each kind of bot may visit thousands of your pages per day
- This is why it’s not unusual to find these being 80% of site requests!

- And so what?

THE IMPACT OF SUCH REQUESTS

General Impact

- Of course, such high volumes of requests have impact on:
 - General compute resources (cpu, memory, disk), on app server or SQL Server
 - Some may be tempted to increase hardware to “handle the site’s load”
- Consider also the bandwidth used to serve each page requested
 - And all associated files (CSS, JS, image files)
 - Perhaps millions per day, per bot, day after day ad infinitum
 - Someone’s paying for that bandwidth!
- Then consider impact on entire infrastructure
 - Web server, application server, database server, network, san/nas, perhaps mail server, etc.
- For web app server pages specifically, impact is even more significant...

Application server-specific impact: sessions

- First, **session creation**
 - Talking here about app server sessions, stored in memory of app server
 - Not referring to “web sessions” tracked by web servers, Google Analytics, etc
- App server sessions are used to track data for a user across many requests
 - Based on sessionid cookie being passed from client on each request
- But most automated agents **send no cookie**, thus creating a new session for EACH page requested!
 - Not unusual for me to help folks find 20k, 100k, or more “active” sessions!

App server-specific impact: sessions (cont.)

- Such high session count could have **impact on app server memory use**
 - And “weight” of session influenced by what your code puts into session
- Consider also **session timeout**: how long sessions remain in memory
 - May be hours or even days in some setups
- Longer timeout X more mem per session X more sessions = more memory

App server-specific impact: sessions (cont.)

- Still worse: consider session startup code, running for each new “session”
 - May create queries, objects, arrays/structs, stored in session scope for user
- Consider then the incredibly high rate of executions per minute, hour, day
 - May be executed FAR more often than the developer ever anticipated

App server-specific impact: errors and more

- Consider also impact of spiders/bots on your 404 and error handling
 - Automated agents may call many pages that don't exist (repeatedly)
 - Or they may call pages in an unexpected "order", triggering errors
 - Or just their high volume may create still more errors
- Consider needless filling of caches, or SQL Server buffer pools
- Consider also impact on httpclient calls your code may make to other sites
 - Maybe to obtain information, or to share it, on each/many/most requests
 - Such high volume of automated requests may cause YOU to be abusing others
 - Your requests may be throttled by such other sites, affecting your "real" users

App server-specific impact (cont.)

- So I hope I've made the case that you may well need to worry
 - How can you know if you should?

OBSERVING VOLUME IN YOUR ENVIRONMENT

Overview of a couple of simple ways

- There are a couple relatively straightforward ways to observe such traffic
- You may know that some built-in tools log every request
 - And tools exist (free and commercial) to help analyze such logs
 - Such logs can also be configured to track user agent, cookies, referrer
- Some tools/services track visits via tracking beacons
- Some tools also let you track count of sessions
- Let's look at these a bit more closely

Analyzing logging of requests

- Web server logs (IIS, Apache, nginx) track every request
 - Of course, they track requests of every type: images, js, css, etc.
 - These can optionally be configured to track user agent, cookies, referrer
- Tools exist to monitor such web server logs, track web site “traffic”
 - Some are more “marketing” oriented, may literally hide spider/bot traffic!
 - Some may well distinguish spider traffic
- Tools for log analysis: <http://carehart.org/cf411/#loganal>

Tracking of requests via beacons

- Again there are tools/services that can track visits via tracking beacons
 - You implement a small bit of javascript in your code
 - When that page is visited, a request is made from the client to some server service, which tracks requests
 - Examples: Google Analytics, Google and Bing Webmaster Tools, and more
- And better versions of such tools do distinguish spider/bot traffic
- Do beware, some “clients” won’t execute the Javascript that triggers such tracking
 - And so some such automated requests may not be tracked at all

Tracking sessions and more

- ASP.NET sessions can be tracked via its Perfmon counters
 - Or if you use any various state server solutions, they offer counts as well
- So once you confirm you DO have lots of automated traffic, how do you handle it?...

DEALING WITH AUTOMATED REQUESTS: TOOLS AND TECHNIQUES

Preventing undesirable ones

- First thought may be “block” undesirable requests by IP address
 - Beware: most come from a block of them (and bad guys may falsify IP)
 - Becomes game of “whack-a-mole”
- May think to block by user agent
 - Beware: some bad guys present legit-looking user agents
- The black hats are trying always to stay a step ahead of the white hats
 - Consider also Perimeterx’s “4 generations of bots”
 - <https://www.perimeterx.com/resources/4th-gen-bots-whitepaper>
- Still, for a large amount of most common automated traffic, these simplistic approaches may be better than doing nothing (more in a moment)

Mitigating impact of expected ones, more generally

- Simplistic solutions to manage such agents may exist already in your env
 - Robots.txt: simple, but could be ignored
 - Web server IP blocking features: like playing whack-a-mole
 - URL rewrite tools could block requests by a variety of characteristics
 - IIS request filtering can block by user agent string
- Any of these might work just fine for some, but may be too simplistic for many
- There are still other options...

Mitigating impact of expected ones, more generally (cont.)

- Some firewalls (software or hardware) can manage bots
 - Some web app firewall solutions in or available for most web servers can help
- Indeed, some cloud services offer protections against spiders/bots/hacks
 - <https://azure.microsoft.com/en-us/blog/azure-web-application-firewall-waf-generally-available/>
 - <https://aws.amazon.com/blogs/aws/new-aws-waf/>
- You could also consider also web content caching proxy solutions
 - To at least reduce impact reaching your server
- Or we can get still more sophisticated about this specific problem...

Mitigating impact of expected ones, more generally (cont.)

- There are tools/services that detect/mitigate negative bot impact
 - Some free, some commercial
 - Some easily implemented, others even offered as SAAS with virtually no change
 - Examples: Distil, Incapsula, Shieldsquare, PerimeterX, Akamai
- These companies are making it their job to watch for and block bots
 - Even the most sophisticated ones
 - Most offer report-only option, can then tweak/turn on to block bad guys
- And may want to consider those focused more on blocking hacks rather than bots, per se
 - Shape Security, Securi, Cloudflare, etc
- Now on to more app server-specific mitigations...

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Mitigating the impact of expected ones, app server-specifically

- May want to modify session timeout on per-request basis, lower for bots
 - Consider watching programmatically for characteristics like:
 - No user agent, no referrer, and no cookie
 - Modify `httpsessionstate.timeout`
- May also want to reconsider coding choices in your session startup code
 - Maybe don't store large amounts of info at session startup (queries, objects, arrays, structs) if request is determined to be for an automated agent
 - Given that session won't be re-used anyway by automated request agents
- Could also add code to throttle excessively frequent requests from an IP

Mitigating the impact of expected ones, app server-specifically (cont.)

- “Outside the box” possibility
 - Create a separate site/server to JUST serve automated traffic
 - Direct such traffic there with web server rewrite features

We're about done...

- So, phew, that's a lot to take in!
 - Understanding issue, mitigating it
- I've provided a broad overview
 - You may want to dig in to the topic further
 - There are many resources focused on the topic generically in significant depth

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Resources

- <http://www.itproportal.com/2015/04/25/7-ways-bots-hurt-website/>
- <https://searchenginewatch.com/sew/news/2067357/bye-bye-crawler-blocking-parasites>
- <https://blog.cloudflare.com/introducing-scrapeshield-discover-defend-dete/>
- <https://www.digitalcommerce360.com/2016/11/11/bad-bots-are-real-heres-how-hayneedle-fought-them/>
- <https://www.incapsula.com/blog/bot-traffic-report-2016.html>
- <http://scraping.pro>
- <https://resources.distilnetworks.com/>
- <https://www.incapsula.com/resources/>
- <https://www.perimeterx.com/resources/>
- <https://www.cloudflare.com/resources/>

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Summary

- The nature, volume and impact of automated requests is often hidden
 - It is possible to observe the volume, mitigate the impact, perhaps easily
 - Can lead to a substantial improvement in performance, bandwidth savings
- My contact info for follow-up:
 - @carehart (Tw, Fb, Li, Slack)
 - carehart.org/consulting
- Thanks, and enjoy the rest of the conference
 - Including my other talk, “SQL Server 2016 SP1 Changes the Game”

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