

a proven way to level up
your tech career

by Forrest Brazeal

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Special disclaimer for the Google Cloud edition: at the time of publication, I work for Google Cloud, but this book was created on my own time, represents my own opinions, and is not officially endorsed by Google Cloud.

This book contains numerous links to third-party internet resources, which were valid at the time of publication but could disappear at any time. If you find a dead link, please feel free to drop me a line at forrest@goodtechthings.com so I can correct it.

Table of Contents

How to use this book (Don't skip this part)	9
Prologue: The greatest resume I've ever seen	14
Part 1: Cracking the Cloud Resume Challenge	23
The challenge itself	24
Why does the Cloud Resume Challenge work?	30
Breaking down the challenge	36
Community resources	40
The Cloud Resume Challenge Discord Server	41
The Cloud Resume Challenge GitHub Repository	41
Google Cloud Resume Challenge Project Examples	41
Part 2: Challenge walkthrough	43
Setup and safety (before you begin)	44
Setting up your account	44
Local development setup	45
Billing	46
Cloud hygiene	48
Chunk 0: Certification prep	50
How to approach this chunk	50
Helpful resources	55

Paid resources	55
Free resources	56
Mods	56
DevOps Mod: If you have several years of existing IT experience	56
Security Mod: If you want a cloud security job	57
Developer Mod: If you want to become a cloud developer	58
Developer Mod: If you are about to graduate from college with a computer science-y degree	58
Stacy's story: From IT Service Desk Manager to Cloud Operations Engineer	
58	
Pause to reflect	61
Chunk 1: Building the front end	62
How to approach this chunk	63
Helpful resources	67
HTML / CSS	67
Static website tutorials	67
DNS and CDNs	67
Actual CRC sites	68
Jerry's story: From respiratory therapist to Associate Solutions Architect	68
Mods	71
Developer Mod: Frame Job	71
DevOps Mod: Automation Nation	72
Security Mod: Spoof Troop	74

Pause to reflect	74
Chunk 2: Building the API	76
How to approach this chunk	77
Helpful resources	83
Python	83
APIs	84
Google Cloud serverless	84
Source control	85
Jakob's Story: From Clinical Research Technician to Cloud Engineer	85
Mods	87
Developer Mod: Schemas and Dreamers	87
DevOps Mod: Monitor Lizard	88
Part 1: Establishing metrics	88
Part 2: Getting notified	90
Security Mod: Check Your Privilege	
91	
Pause to reflect	93
Chunk 3: Front-end / back-end integration	
95	
How to approach this chunk	96
How to write your very own smoke test	96
Helpful resources	99
Mods	100
Developer Mod: Playing the Hits	100
DevOps Mod: Browser Up	101

Security Mod: Wall of Fire	101
WAF	102
Backend security	103
Rate limiting	103
Pause to reflect	104
Nana's Story: From Tech Support to Cloud Native Engineer	105
Chunk 4: Automation / CI	107
How to approach this chunk	108
Google Cloud Deployment Manager	
110	
Pulumi	110
Setting up your deployment pipeline	
111	
Helpful resources	113
IaC	113
Docker	113
CI/CD (Continuous Integration / Continuous Deployment)	113
Mods	114
Developer Mod / Security Mod: Chain Reaction	115
Initial reading	115
Challenge steps	116
DevOps Mod: All The World's A Stage	119
Stephanie's Story: From Bank Manager to Cloud Engineer	123
Pause to reflect	124

Chunk 5: The blog ... and beyond	126
How to approach this chunk	126
Include a diagram	128
Make it about you, not about the challenge	128
Consider focusing on your mods	129
Don't ramble on	130
Tag me	130
Ian's Story: Writing a Blog That Gets Exposure	131
Helpful resources	133
Pause to reflect	134
Part 3: From challenge to career	135
What is a "cloud job", anyway?	137
The history of the cloud job	138
The first IT jobs	138
The "golden age" of IT: everybody has their own servers!	138
The emergence of the cloud job	142
What does a "day in the life" look like for a cloud engineer?	145
Is there actually such a thing as an "entry-level cloud job"?	147
Getting unstuck: the underrated skill of asking for help	150
What NOT to do: The Well of Despair	
152	
Three steps to get back on track	152

The career-changing art of reading the docs	
158	
Reading docs: the wrong way and the right way	160
What do I get out of all this?	169
Mapping your path to a cloud job	172
Getting hired without tech experience	
172	
Building your skill stack	174
When to apply	176
Getting hired with IT experience, but no cloud experience	178
Exploiting your "unfair advantage"	
179	
Avoiding a temporary step back	182
How to effectively interview for work with a portfolio site	184
The three questions interviewers ultimately want you to answer	184
How to show off your portfolio site during interviews	186
Reminder: Interviews are two-way streets	189
Tech takes a backseat to company culture and learning	190
Networking your way to a job	193
Resume Roulette: a losing game	193
How hiring happens	194
Network Bets: a better game	195

Owning your credibility	196
Building connections	197
But I'm an introvert ... I can't network!	
198	
Play the long game – it's a shortcut	202
Afterword: The side project that made the front page	204
Anatomy of the perfect cloud project	206
Paying it forward	209
Acknowledgements	212

How to use this book (Don't skip this part)

You will not get the most out of the Cloud Resume Challenge Guidebook if you just read it straight through. It's designed to accompany your hands-on learning.

This book has three main sections. In the first section, I give you some background about the Cloud Resume Challenge and break down the challenge into six smaller "chunks", which I propose tackling over six weeks.

These chunks are designed to be independently valuable as standalone mini-projects; if you quit after 2 chunks, 3 chunks, 4 chunks, or 5 chunks, you'll still have built something useful and interesting that you can talk about in a job interview or use as an entry point for future learning. There are many paths to a cloud career, and it's completely okay to use just part of the Cloud Resume Challenge to fill a gap or spur further exploration.

But if you're new to cloud, you should continue on to the second, longer section of the book, where we walk through each chunk in detail. I'll give you a bunch of preparatory reading suggestions to help you get your head around the new concepts introduced in each section. I'll give you some pointers and hints on how to tackle each chunk of work.

Perhaps most importantly, each chunk includes "mods" at the end - extensions you can make to the core challenge project in order to practice key skills. These mods come in three flavors:

- Developer Mods
- DevOps Mods
- Security Mods

I would suggest picking one set of mods to add on as you proceed through the book, depending on what kind of cloud job you are looking for. For example, if you do the security mods, by the end of the challenge you will have gained additional hands-on experience with secure DNS, least privilege access, API security, and secure software supply chains - all great discussion topics for a cloud security job interview.

What I will NOT do in this section is give you step-by-step "click here, then run this command"-style instructions for how to complete the challenge. Don't worry - even with the additional resources and guidance you'll find in these pages, the learning will still come from you!

The third and final section of the book, which you can read at any time, comprises six essays (corresponding to the six challenge chunks) that provide deeper advice on how to leverage your work on the challenge toward a successful cloud career.

The book contains links to many of what I consider to be the finest learning resources in the cloud world, some of which are true hidden gems you won't see recommended everywhere; you need to follow these links, do the exercises, and play with the interactive environments. You need to do the mods, not just read about them. The Cloud Resume Challenge isn't about passively consuming information. You truly will get out of it what you put into it.

Now since I wrote this book to help you get a job in IT, it's only fair that we conclude this section with a nod to horror master Stephen King: the author of perhaps the most famous book written about IT.

(checks notes) Oh, that book is called "It"?
Never mind.

But King did write another wonderful book about his own specialty, the craft of writing. *On Writing* - a book that I highly recommend, even for people who don't want to become professional novelists - is only incidentally about how to structure good sentences and craft a compelling plot. It's mostly about King's personal journey.

King had no Ivy League pedigree or wealthy connections. He worked in a laundry and wrote at nights in his doublewide trailer, filling wastebaskets with rejected story scraps until finally he made it big. Stephen King's talents are unique, but *On Writing* has played a key role in the development of thousands of other successful writers because King helps you see a path through the slog of rejection and setbacks to the happy ending - he makes you

believe that success is possible, as long as you just don't give up.

And that's the final thing this book (call it *On Getting a Cloud Job*) is designed to do.

Throughout, I've included stories from Cloud Resume Challengers who've gone on to start new careers in the cloud - some from older forms of IT, others from completely non-tech backgrounds like plumbing and HR. These stories are real, but they're not unique. They've inspired me, and I hope they'll inspire you, too, when you're up working late at night. I hope they'll help you see that if you put in the work, your cloud future is 100% attainable. And it all starts by building something real.

So on that note, let's begin our journey by meeting an unusual young man named Daniel Singletary.

Prologue: The greatest resume I've ever seen

When COVID-19 hit, Daniel Singletary was already pretty much fed up with his job. As a commercial and residential plumber in metro Atlanta, he pulled 11-hour days working some of the dirtiest, stinkiest problems in the country.

Take, for example, the day he got a call about an unexplained odor in a suburban shopping strip. Daniel and a coworker headed to the scene. There was no mistaking the smell. It was sewage, and it was raw.

On a reconnaissance trip to the restrooms, Daniel noticed something odd: a current of air was flowing around the base of the toilets. When he levered a commode off the floor, he staggered backwards, hit by a blast of noxious wind. "Imagine," he [wrote later](#), "a leaf blower blowing sewer gas in your face." Not only is this unusual, it shouldn't even be *possible*. Sewer pipes don't blow air. And yet somehow, this entire shopping strip was passing gas.

There was nothing to do but work the problem step by step. Over the next three days, Daniel and his partner worked over the building from opposite ends, unsealing and re-fitting every plumbing fixture they could find. Eventually, they narrowed the source of the mystery airflow down to two possible locations: a hair salon and a restaurant.

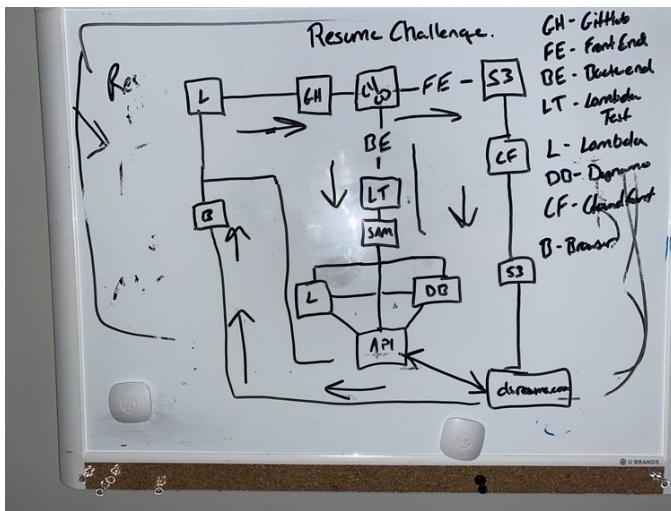
This is where the problem got extra tricky. How do you troubleshoot the plumbing in a restaurant without, you know, closing down the restaurant? Eventually Daniel had a bright idea: a smoke test. Literally. Up to the roof vents he went, armed with smoke bombs. His reasoning: "Wherever sewer odor can get in, so can smoke ... except we can see smoke with a flashlight."

Sure enough, following the clouds of smoke cleared up the mystery. Someone had tied the vent hood for the restaurant's stove into the sewer system, forcing air into the pipes. The immediate problem might be solved, but Daniel's desire to leave plumbing, maybe even to a job where he could choose what to smell, was only growing.

It was around this time that Daniel and I met. His roommate, an IT worker, had shown him a blog post I wrote about something called the Cloud Resume Challenge. The challenge was designed to help people get their first job in cloud. It came with a promise: host your resume in the cloud, and I'll do whatever I can to help you get it in front of the right people.

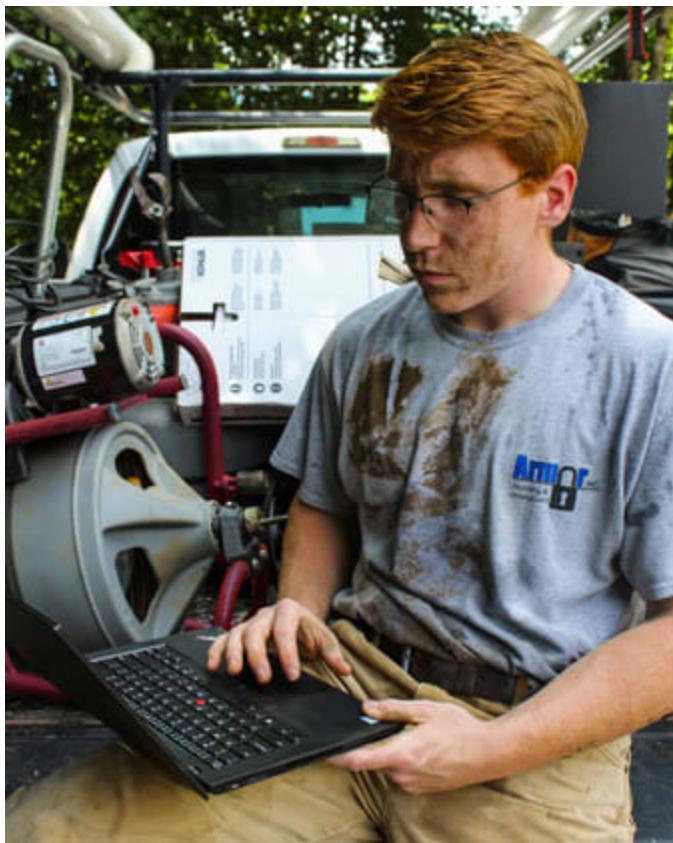
Of course, there were some caveats. Your resume had to have an intro-level cloud certification on it. And the project spec required you to get your hands dirty with source control, CI/CD, Python, front-end Javascript, back-end cloud services, and more - the full cloud stack. Basically, if you could pull off this project, you'd be doing things that even some professional cloud engineers have never done.

Daniel wasn't a professional cloud engineer. He'd never even seen YAML before. So he did the first thing that occurred to him: he went out and bought a whiteboard. He called what he drew there to help him make sense of the project an "engineered print," just like he'd used countless times as a plumber. He didn't know he was drawing a cloud architecture diagram.



Daniel's whiteboard (courtesy of Daniel Singletary)

Over the weeks that followed, Daniel forced himself to sit down at his computer after those 11-hour days. He grappled with Python and Javascript in the back of his work truck. One minute he was wrangling sewer pipelines - the next minute, CI/CD pipelines.



Let's not ask what's on his shirt. (Courtesy of Daniel Singletary)

Finally, miraculously, he completed the challenge. I reviewed his code myself; it was solid. And you can check out his [resume page](#) for yourself. It's not flashy, but it contains probably the greatest combination of

credentials I've ever seen. Daniel is licensed in backflow prevention, journeyman plumbing, residential / commercial septic installation ... and oh yeah, he's earned four cloud certifications too.

One of the most important requirements of the challenge is to write a blog post about your learnings. Daniel's post, [A Plumber's Guide to Cloud](#), went viral on LinkedIn and was shared more than 200,000 times. That got the attention of hiring managers.

And barely a month later, he started his first tech job as a cloud DevOps engineer. From all reports, he's killing it.

Now, to be clear, Daniel's success didn't come from some magic contained in the Cloud Resume Challenge. It came from Daniel. It came from his hard work, his perseverance, and (just as importantly) from the skills he'd mastered in his plumbing days.

For instance, if I'm a hiring manager on an infrastructure ops team, I'm taking away quite a few things from Daniel's story of the leaf-blower sewer:

He knows how to troubleshoot.

Given a fairly enormous problem (this entire building stinks), Daniel didn't flail around or try random stopgap measures. He narrowed the problem down to a root cause (the blowing air) and then methodically eliminated possibilities until he found the solution.

He knows how to collaborate.

Daniel worked closely with a colleague throughout the onsite engagement, dividing and conquering to speed up the "debugging" process. Pair programming will feel natural to Daniel because he's used to having a sounding board to work out complex problems.

He knows how to test and observe.

Until I met Daniel, I actually didn't know that "smoke testing" was a term with a literal smoke-related meaning. I'd always heard it used in the context of software tests. Daniel used a tracing technique to follow a problem to its source, instead of just making random guesses.

He understands business continuity.

Daniel had to keep several businesses online and operational while conducting his diagnostics and resolving the problem. He

couldn't simply flip a switch and cut the building's water supply for a few days while he figured out what was happening.

Put simply, Daniel had rock-solid real-world ops skills, better than that of most university computer science graduates I've met. What the Cloud Resume Challenge did was fast-track Daniel to the hands-on technical abilities he needed to build on that wealth of trade experience and vault into the cloud.

Daniel's story is unique, but he's not alone. Over the past two years, thousands of people have attempted the Cloud Resume Challenge. The majority of them don't get far; it's not easy, that's what makes it worth doing.

But those who persevere have seen incredible results. Career-changers have made the jump to cloud jobs from fields as diverse as food service, HR, retail, and recruiting. And even more people have used the challenge to polish up their existing IT skills and leverage better jobs within the industry.

You'll hear many of their stories in this book. Like them, you bring skills and perspectives that the tech industry needs. And if you commit

to follow the path I'm about to show you,
there's no limit to what you can achieve.

Ready? Let's do this.

Part 1: Cracking the Cloud Resume Challenge



In April 2020, as the first wave of COVID-19 descended, I found myself like millions of other people around the world: stuck at home, feeling bored and helpless.

I did have one huge privilege, though. As a tech worker, I could still do my job from home. Friends and family were telling me: "I've been thinking about changing careers and going into IT. Maybe doing something in the cloud, like you. Where should I start?"

I started jotting down some ideas: a blueprint, a roadmap of key cloud skills. Things that would make me say "Of course I'd hire that person!", never mind their previous work experience. What emerged a few days later would change a whole bunch of lives, starting with my own.

The challenge itself

Here are the sixteen steps of the original Cloud Resume Challenge, more or less as they first appeared in my "Cloud Irregular" newsletter on April 27th, 2020.

1. Certification

Your resume needs to have the [Google Cloud Digital Leader](#) certification on it. This is an

introductory certification that orients you on Google Cloud – if you have a more advanced Google Cloud cert, that's fine but not expected. You can sit this exam online for \$100 USD. [Google offers exam prep resources.](#)

2. HTML

Your resume needs to be written in [HTML](#). Not a Word doc, not a PDF. [Here is an example of what I mean.](#)

3. CSS

Your resume needs to be styled with [CSS](#). No worries if you're not a designer – neither am I. It doesn't have to be fancy. But we need to see something other than raw HTML when we open the webpage.

4. Static Website

Your HTML resume should be deployed online as a static website using [Google Cloud Storage](#). Services like Netlify and GitHub Pages are great and I would normally recommend them for personal static site deployments, but they make things a little too abstract for our purposes here. Use GCS.

5. HTTPS

The GCS website URL should use [HTTPS](#) for security. You will need to use [a Cloud Load Balancer](#) to help with this. Be aware - this will have a small cost to provision. You will also want to use [Cloud CDN](#) to cache your site - just check the box when configuring your load balancer backend.

6. DNS

Point a custom DNS domain name to the load balancer endpoint, so your resume can be accessed at something like `my-c001-resume-website.com`. You can use [Cloud DNS](#) or any other DNS provider for this. A domain name usually costs about ten bucks to register.

7. Javascript

Your resume webpage should include a visitor counter that displays how many people have accessed the site. You will need to write a bit of [Javascript](#) to make this happen. Here is a [helpful tutorial](#) to get you started in the right direction.

8. Database

The visitor counter will need to retrieve and update its count in a database somewhere. I suggest you use Google Cloud's [Firestore](#) in

Datastore mode for this. Be aware that Firestore may incur small costs to store and manipulate data.

9. API

Do not communicate directly with Firestore from your Javascript code. Instead, you will need to create an [API](#) that accepts requests from your web app and communicates with the database. I suggest using [Google Cloud Functions](#) or [Google Cloud Run](#) for this with an [API Gateway](#) in front. They will be free or close to free for what we are doing.

10. Python

You will need to write a bit of code in the serverless function; you could use more Javascript, but it would be better for our purposes to explore Python – a common language used in back-end programs and scripts – and its [Google Cloud Client Libraries](#). Here is a good, free [Python tutorial](#).

11. Tests

You should also include some tests for your Python code. [Here are some resources](#) on writing good Python tests.

12. Infrastructure as Code

You should not be configuring your API resources – the Firestore, the API Gateway, the serverless function – manually, by clicking around in the Google Cloud console. Instead, define them in a [Terraform template](#) and deploy them using the Terraform CLI. This is called “[Infrastructure as code](#)” or IaC. It saves you time in the long run.

13. Source Control

You do not want to be updating either your back-end API or your front-end website by making calls from your laptop, though. You want them to update automatically whenever you make a change to the code. (This is called [continuous integration and deployment, or CI/CD](#).) Create a [GitHub repository](#) for your backend code.

14. CI/CD (Back end)

Set up [GitHub Actions](#) such that when you push an update to your Terraform config or Python code, your Python tests get run. If the tests pass, the application should get packaged and deployed to Google Cloud.

15. CI/CD (Front end)

Create a second GitHub repository for your website code. Create a GitHub Action such

that when you push new website code, the Cloud Storage bucket automatically gets updated. (You may need to [invalidate your Cloud CDN cache](#) in the code as well.)

Important note: DO NOT commit Google Cloud credentials to source control! Bad hats will find them and use them against you!

16. Blog post

Finally, in the text of your resume, you should link a short blog post describing some things you learned while working on this project.

[Dev.to](#) or [Hashnode](#) are great places to publish if you don't have your own blog.

Why does the Cloud Resume Challenge work?

Unlike most technical resources you'll find, the Cloud Resume Challenge isn't a tutorial or a how-to guide. It's a project spec, and not a very helpful one at that. It tells you what the outcome of the project should be, and provides enough structure that you don't go too far off the rails, but other than that - you're on your own!

At first glance, this seems like kind of a mean thing to hand someone with no previous IT experience. Wouldn't beginners need their hands held every step of the way? And so my initial vision, that the challenge would help people get their first job in tech, was greeted with skepticism:



Cesar King
@cdgonzal

...

Replies to [@forrestbrazeal](#)

Over/under that a person who met your prequalifications will actually complete the whole steps ? One (1) I hope I'm wrong. But whoever does it, I'll share your resume as well and add links to it. Interested in seeing someone truly pull this off w/out the tech background

8:52 PM · Apr 27, 2020 · Twitter for iPhone

Not picking on Cesar here, but it would have been smart to take the over on his prediction.

A year later, thousands of people have attempted the challenge. Hundreds have completed it. Dozens have been hired into their first cloud jobs, from fields as diverse as banking, plumbing, recruiting, and HR. Never bet against raw human determination when dollars are on the line.

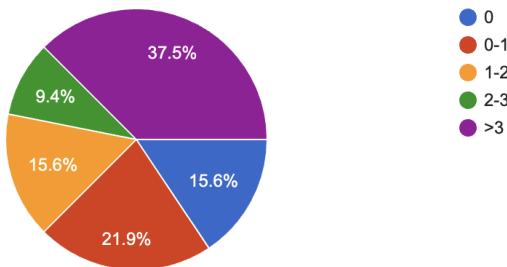
I didn't choose the challenge format arbitrarily, though. I designed it after some of the best learning experiences I've ever had: the capstone projects in my college and graduate-level computer science classes.

No, I'm not saying you need a master's degree in computer science to get a job in cloud. But good university classes gave me a gift, something most vocational training courses haven't adopted: open-ended projects that told me roughly the direction to go, then forced me to figure out how to achieve the objective as I went along. Because I wasn't just carrying out rote instructions, the learning wasn't pre-digested. The learning *came from me*.

Looking back, most of the good learning I had in college came from those types of projects. And whether or not you have a degree background, I want to give you that experience as well.

The biggest surprise to me has actually been not how many career-changers have tried the challenge, but how many *working engineers* have given it a shot. Here is a breakdown of prior experience as reported by the 4000-plus community members in the Cloud Resume Challenge Discord server:

Number of years of prior professional IT / software development experience by challenge participants



That's right - almost 40% of challengers are coming into this with more than 3 years of professional IT experience. It turns out there are good reasons (wholly unanticipated by me)

why the Cloud Resume Challenge has value for people well-established in their tech careers, and we'll get into that later.

But for now, just think of it this way: if the end result of the Cloud Resume Challenge is impressive enough to make experienced IT people say "I want that on my resume", it is *really* going to make you stand out as an entry-level job-hunter.

If you give this project a try and realize that you hate it, or you're just not interested, you'll have learned a valuable lesson about whether or not you really want a career in the cloud – because these are the types of problems that real cloud engineers and developers really work on. It's not a contrived toy exercise.

But I believe that if you can, in good faith, complete the Cloud Resume Challenge, you will already have more useful skills than a lot of people who graduate from university computer science programs. Specifically, you will understand something about:

- Full-stack software development (the static website and Python pieces)

- Version control (the Github piece)
- Infrastructure as code (the Terraform / OpenAPI piece)
- Continuous integration and delivery (connecting GitHub Actions, Terraform, and Google Cloud)
- Cloud services and “serverless” (Google Cloud Functions or Cloud Run, Firestore, Cloud DNS, Cloud Storage)
- Application security (IAM, CORS, API authentication/authorization)
- Networking, as in the way computers talk to each other (DNS, CDNs, the whole "cloud" thing)
- Networking, as in the way people talk to each other (the blog post, the [Discord community](#) - this is probably the highest-value step in the whole challenge because of the professional doors it can unlock for you, and we'll talk about that in more detail later on.)

I'd recommend preparing a story about your experience with each of these bulleted items to use in job interviews. The reality is that "baptism by fire" is the best way to learn, because there's nothing like pounding your head against a DNS problem for two days to

burn it into your head in a way that cramming for a test never could.

Moreover, you'll have learned by doing, because I didn't give you enough instructions to figure any of this out without going down some late-night rabbit holes.

Most importantly, you will have demonstrated the number-one skill in a cloud engineer's toolbox: the ability to **learn fast and google well**.

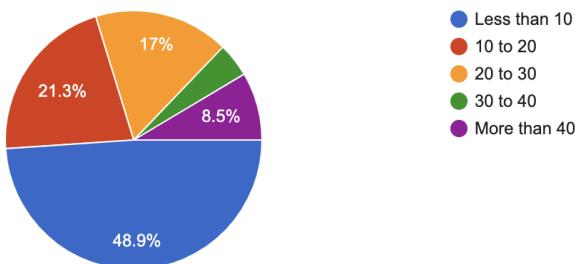
I've spoken with dozens of hiring managers over the history of the challenge, and all of them insist that "ability to pick up new things quickly, in a self-motivated way" is their most highly prized quality in a team member, more than competence on any specific technology. To be perfectly blunt, many of the tools and services you've used in the challenge may be obsolete in 5 years. But your ability to glue them together into something that works will remain. It will get you interviews and build your confidence that you can thrive in whatever technical paradigm comes next.

Breaking down the challenge

How long will it take you to complete the Cloud Resume Challenge?

This really depends on your previous level of experience. In a recent community survey, I asked a bunch of challengers to self-report how many hours they spent working on the project. (Note that I didn't ask for an overall time window, so I don't know if these people are working, say 8 hours a day for 5 days or 2 hours a night for 20. I also didn't ask them how long they spent preparing for their certification, since everybody's study habits are different.)

Number of hours to complete the challenge, as reported by participants



Huh! The divisions of this pie look pretty similar to the ones in the "previous experience" graph

I showed you earlier, with years of experience mapping roughly onto faster challenge completion. From that similarity, we might draw the following weak rule of thumb:

Assume at least 40 hours to complete the challenge (not including cert prep time) if you have zero prior experience in cloud or software development. For each year of experience you have up to 3 years, shave ~10 hours off the expected time.

Your individual mileage will vary, and the amount of time you need is ultimately not important to the outcome. The challenge is not a race. Taking shortcuts (say, by peeking at other people's solutions online) just devalues your own learning experience. Focus on really understanding why you are completing each step, not on blazing through them.

With all of the above in mind, here is a sample mapping of tasks to time that you may find more helpful than the original 16-step order.

How I would approach the Cloud Resume Challenge

If you're not sure how you want to tackle the 16 steps of the challenge, try this method.

Projected Time Commitment: 50-70 hours over 6 weeks (adjust expected hours downward if you have previous experience)

Week	Challenge Milestone
Week 0: Certification Prep (Challenge Step 1)	Complete a Google Cloud Digital Leader prep course and practice exam (10ish hours)
Week 1: Front End (Challenge Steps 2-6)	Get your resume laid out in HTML. Style it with CSS. Get the website deployed to Google Cloud and fronted with DNS / Cloud CDN. (5-10ish hours)
Week 2: Back-End API (Challenge Steps 8-10, 13)	Get source control set up. Get the visitor counter saving to the database. (10ish hours)

Week 3: Front-End / Back-End Integration (Challenge Steps 7, 11)	Get the visitor counter displaying on the homepage. Add tests for your code. (10-15ish hours)
Week 4: Automation / CI (Challenge Steps 12, 14, 15)	Get your infrastructure automated with Terraform and deploying via GitHub Actions. (10ish hours)
Week 5: The Blog ... and Beyond (Challenge Steps 1, 16)	Sit and pass the Digital Leader exam. Write your blog post. Celebrate! (as much time as you want/need)

So that's six self-contained chunks of work you can do in sequence. If a chunk takes you more than a week, or you want to double up, that's fine too. You're in the driver's seat here; go at your own pace.

Community resources

The double-edged advantage/disadvantage of starting the Cloud Resume Challenge now, as opposed to two years ago, is that the challenger community has created a *ton* of support resources to help you.

Why is this a disadvantage? Remember, the burning pain of sitting up late with fifty tabs open, trying to figure out why your API won't return anything, is actually the most powerful part of the learning experience. And I still recommend that you avoid looking at anyone's actual solution code if you can help it.

Think of other challenge solutions as spoilers. You didn't want to know the ending of *Avengers: Endgame* before you entered the theater. Don't let some other developer spoil the learning experience and pride of crushing the challenge on your own merits.

But with all of that said, there are still some wonderful helps and extensions to the challenge out there for anyone who's curious, masochistic, or just plain stuck.

The Cloud Resume Challenge Discord Server

This is the place to be if you are working on the challenge. Join 4000+ other cloud enthusiasts ranging from beginners to experienced mentors. Ask your challenge questions, get code review, view cloud job postings, or just chat about cloud and life. It's free and very chill. I'm there. What more reason do you need? [Join us already.](#)

The Cloud Resume Challenge GitHub Repository

The Cloud Resume Challenge [is open-sourced here](#), and this repository has also become a community destination for additional projects created in the spirit of the original challenge. If you want to give back to the community, this is a great place to do so.

Google Cloud Resume Challenge Project Examples

Many existing Cloud Resume Challenge projects out there were built on AWS (this isn't a bad thing! It'll help your project stand out!)

but in case you're curious, here's a list of several helpful blogs by challengers who've taken various cracks at designing the challenge on GCP.

- [Kevin P's approach](#) uses Google Cloud Deployment Manager instead of Terraform.
- [Quang Ngo's design](#) incorporates Cloud Build in place of GitHub Actions.
- Justin Wheeler, following a prompt from [A Cloud Guru's Mattias Andersson](#), used [a GitOps-style approach](#) that pulls in Cloud Source Repositories (CSR). You may find this an interesting extra DevOps Mod on the challenge.

Part 2: Challenge walkthrough



Setup and safety (before you begin)

Warning: The cloud is a power tool, and if you're not careful it will slice off your thumb.

Before you start this project, you'll want to take necessary precautions to protect your information, your sanity, and your wallet.

Do not proceed with the challenge steps until you have read and implemented the safety prerequisites below.

Setting up your account

You'll access Google Cloud in two ways: through the web interface (the "console"), and via code from your laptop or other services. Every cloud action you take - whether you are creating a new resource or just retrieving a list of your current ones - requires access credentials.

While a free Google Cloud account is [quick to set up](#) if you already have a Google account, take a few minutes to go through the common developer use cases in the Getting Started section of the docs, particularly the parts on [billing and administration](#).

The main thing to do right now is to set up some [folders](#) to help organize your account. I suggest creating at least two: one for “production” (live, user-facing) cloud projects and one for development / test projects. You can go ahead and create a project (Google Cloud’s name for a logical container for your cloud resources) in the test folder now if you want. Later, we’ll work on programmatically creating projects as part of our CI/CD pipeline.

I suggest also reading through Google Cloud’s [enterprise setup checklist](#). We will not be implementing many of these steps as they go beyond the scope of this challenge and / or require cost commitments we won’t want to make, but it’s important to understand what a well-maintained professional Google Cloud environment looks like.

Local development setup

Install the following tools:

- Visual Studio Code with [Google Cloud’s official Cloud Code extension](#)
- [The Google Cloud CLI, also known as gcloud](#)

Use [the gcloud auth login command](#) to authenticate from your local shell. Let Google

Cloud pop open a browser and go through their OAuth flow to authenticate you. After that, you should be able to launch the Google Cloud console or successfully run other gcloud commands from your VSCode terminal or other shell. Ensure that you can do this before moving on.

Billing

You can play with many services on Google Cloud for free, within limits. I designed the Cloud Resume Challenge to use resources that fall primarily within the free tier. If you're not sure whether a service you're about to use will cost you money, check [the free tier docs](#) first.

However, the cloud's billing model is designed primarily to make it easy for businesses to consume services, and that means it can cost you significant money if you're not careful. It's a good idea to [set up budgets and budget alerts](#) on your projects and keep an eye on them to keep apprised of any charges before you see them on your credit card bill. Be aware, though, that these alerts don't actually halt runaway spending.

You have two options for curtailing spending on a Google Cloud project:

- [Programmatically cap costs by catching billing alerts](#). If you detect a cost overrun via a billing alert, you could either:
 - Disable Cloud Billing (a disruptive measure that will shut down all resources in your project), or
 - Delete the project entirely, if you have a backup of its contents.Whichever option you choose, be aware that billing alerts happen on a delay, so you could still incur significant budget overrun before your code takes action.
- [Put a quota on API usage to ensure you don't spend more than you planned](#). This works without long delays, but requires sometimes-finicky planning; you have to think about which APIs you're using and how much you want to spend on them in a given timeframe!

The best way to avoid unexpected cloud charges is simply to delete any resources you're not using, as soon as you're done using them - ideally by deleting the whole project.

If you do run into a large unanticipated charge - say, you thought you deleted all the resources from a tutorial you worked through, but missed a GPU instance and got charged \$200 - it's always a good idea to contact Google Cloud support before you panic. Their customer support will sometimes forgive all or part of the bill on a first mistake.

Keep in mind that attackers would very much like to gain access to your Google Cloud account so that they can run their own workloads, such as expensive Bitcoin mining operations, on your credit card. Guard your Google credentials as if they're the keys to your bank account; they basically are.

Cloud hygiene

A few general rules for safe and healthy cloud living:

- Make a new Google Cloud project for each application and environment (dev, test, production) you work on - just be aware of quota limits on projects.
- Clean up after yourself at the end of each work session - don't leave services running if you don't need them.

- Use [workload identity federation](#) instead of downloading service account credentials to share with external providers like GitHub or Terraform Cloud.
- Use infrastructure-as-code (IAC) to define any resources you plan to keep. We'll spend much more time learning how to do this in Challenge Chunk 4.
- Whenever possible, build using "serverless"-style managed services that only charge you for actions you take, rather than server-based systems that run all the time and bill you 24/7.
- When you're done building something and don't need to run it anymore, delete the project out of its Google Cloud folder. (If you've used proper infrastructure-as-code, you haven't lost anything - you can just deploy the code in a new account later!)

Chunk 0: Certification prep

We'll dig into the challenge proper in the next section (though it's fine to work ahead!). In this chunk we are focused on certification prep.

The goal is to take [an initial practice certification exam](#) for the Google Cloud Digital Leader certification (or another, more advanced Google Cloud cert - your choice) to set a knowledge baseline. You can take the actual cert exam whenever you're ready. I suggest putting it on the calendar now - there's nothing like a deadline to get you serious about studying.

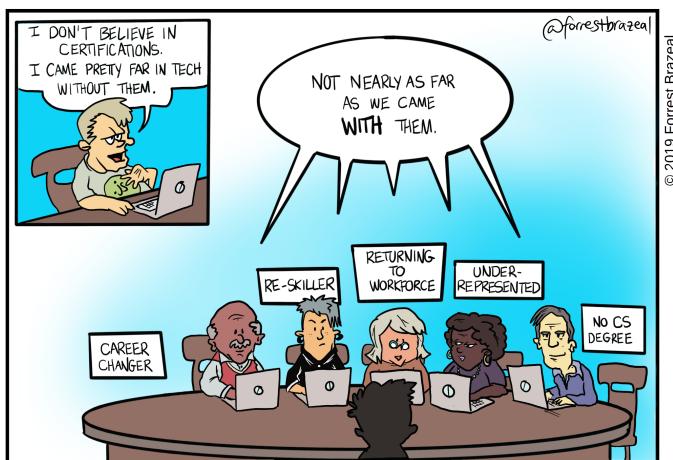
How to approach this chunk

Certification is the only step that you can complete literally at any point in the challenge. You can do it up front, save it til the end, or study for your cert while you are completing other steps. In that sense, it's disconnected from the rest of the challenge.

But let's get real about certs for a minute. I've yet to meet a hiring manager who believes that IT certifications guarantee technical ability. (And let's be honest, you wouldn't want to work for someone who believed that.) A cert is just a piece of paper, after all — and that's only if you

print out the PDF. It doesn't magically give you the experience you need to succeed in the real world.

And yet, cloud certification has been helpful in my engineering career, and I encourage it for everyone looking to get a foothold in the industry. Certs are powerful tools, as long as you understand what they are and are not good for.



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Certs give you a comprehensive knowledge base

You may not have a traditional computer science degree. But if you work through, say, the Google Cloud Associate Cloud Engineer exam material, you will get exposed to the core

GCP services and architecture patterns that industry professionals use. You won't have to worry that you missed big topic areas in your job prep. The cert puts it all in one place. Very convenient. In this sense, *it almost doesn't matter whether or not you ever sit the cert exam!* Just studying the material gives you the real value.

Certs help you get interviews

When a recruiter is reading through your resume, a cloud certification does stand out. It says you're serious about the field and that there is some external validation of that — especially if you are missing a traditional credential like a college degree in computer science. The cert's not going to get you the job, but it might get your foot in the door for the interview.

Certs are a big advantage ... for one particular type of job

Professional services companies like consulting shops and MSPs are among the biggest employers of cloud-certified people. That's because certs are very valuable in the consulting world:

- Certification counts help the consulting companies maintain important

partnerships with cloud providers like AWS, Google Cloud, and Microsoft.

More people with certs add up to higher partnership tiers and better benefits.

- Certs help communicate expertise to the consultants' clients. If I'm hiring an outside consultant, I want to see credentials!
- They are required for certain types of consulting engagements (for example, AWS only allows certified Solutions Architect Professionals to conduct an official [AWS Well-Architected Review](#)).

Big consultancies have a bottomless appetite for cloud-certified professionals ... assuming you actually know what the cert says you know, of course! So you really open up your job options by getting certified.

FAQ

How many certs do I need before applying to cloud jobs? Is the Digital Leader cert really enough?

I recommended the Digital Leader cert in the original challenge because I like it as a formalized way to introduce beginners to

cloud concepts - not so much because it is impressive to hiring managers. The Digital Leader (or an equivalent cert such as AWS's Certified Cloud Practitioner or Azure's AZ-900) is really intended more for nontechnical roles.

So, here's a pro tip: I think that nearly **everyone I've seen get their first cloud job through the Cloud Resume Challenge had earned a more advanced certification**, such as one or more of the Google Cloud associate-level technical certs. I've seen a few exceptions to this rule, but not many.

While in one sense, more certs are always better (I've never *not* been impressed by someone who holds all 11 Google Cloud certifications — that's an impressive achievement by any definition), you do reach a point where you need to focus on building other skills. Otherwise, you run the risk of appearing like you are all head knowledge and no practical ability. That's what the rest of the challenge is for.

Helpful resources

In this section, I'll try to provide some resources that will make your life easier if you take the time to read them before diving into your hands-on work. Since this chunk is about certification, I'll list some recommended cert prep resources. I don't get affiliate credit or anything for mentioning these; they're just my personal recommendations based on having been around the space for awhile.

Paid resources

For hands-on labs: [A Cloud Guru](#). I used to work at ACG and was repeatedly impressed by the quality of the cloud playground environments when I did - they're the same technology that was formerly the best thing about Linux Academy. With one click you can get a fresh Google Cloud (or AWS or Azure) sandbox that stays live for several hours of learning time. Best thing about that: it removes the worry of standing up resources on your credit card and getting a surprise bill.

For Google Cloud cert study: Google Cloud makes syndicated prep courses available through third-party training partners like [Pluralsight](#) and [Coursera](#). I believe it's the same material on each platform.

For realistic practice exams: [Whizlabs](#) and ACG both have options here.

Free resources

[Google Cloud SkillsBoost](#) (built on the old QwikLabs platform) has lots of learning paths and a 30-day free trial.

Andrew Brown of freeCodeCamp has [a free Digital Leader course](#) on YouTube.

Mods

In each "Mods" section, I'll offer some suggestions on how you can extend that portion of the challenge to incorporate additional learning; to go "above and beyond" in your pursuit of cloud excellence. Since we're talking about certifications here, I'll give some advice on what certs you might want to try, going beyond the baseline Digital Leader cert, depending on what your career goals are.

DevOps Mod: If you have several years of existing IT experience

Skip the associate-level cloud certs; go straight for a professional-level Google Cloud certification such as the Professional Cloud

Architect or Professional DevOps Engineer. You are sending a signal that you are not here to mess around: you are in fact an IT Pro and you have the paper to - well, if not to prove it, at least to not contradict it. Be aware that these certifications are quite difficult; they consist of page-length questions that ask you to make complex architectural decisions involving many moving parts. You will get multiple hours to take the exam and you will likely need them. But it's worth it if you want to make a smooth transition from your existing IT job to a mid- or senior-level cloud position.

Security Mod: If you want a cloud security job

I would suggest getting the Google Cloud Associate Cloud Engineer followed by the Google Cloud Professional Cloud Security Engineer cert. In my experience, cloud security applicants tend to stand out more if they have strong programming and automation skills, so it might not hurt to look into the Google Cloud [Professional Cloud Developer](#) exam as well. This is on top of any non-cloud security certs you might pursue.

Developer Mod: If you want to become a cloud developer

If you are going for a cloud software engineering job, forget certs, including the Professional Cloud Developer. Certs are going to be of no help in those interview loops. You are on the leetcode train now, my friend.

Developer Mod: If you are about to graduate from college with a computer science-degree

Be aware that your college degree is by far a more valuable credential than any particular cloud certification. If you have the time and means to get a cloud certification too, I would just go for the Associate Cloud Engineer as a nice resume-rounder-outer. You are supposed to be a generalist at this point on your career track; I wouldn't worry about picking up any pro or specialty-level certs until you get some experience.

Stacy's story: From IT Service Desk Manager to Cloud Operations Engineer

How long it took Stacy to complete the Cloud Resume Challenge: *50 or so hours, spread over 6 weeks*

How long it took Stacy to get a cloud job after completing the challenge: *1 month*

What was your background in IT before turning to cloud?

I'd been working in IT for several years with a Windows administration focus, but I wanted to specialize in cloud for career growth.

When I found the Cloud Resume Challenge, I thought it looked like a great way to learn cloud tech by getting hands-on experience and completing a project that could be added to a resume or used as a talking point in interviews.

How did you use the challenge during interviews?

When I was asked about AWS experience, what AWS services I was familiar with, or technical questions (the difference between public vs. private subnets, describe a 3-tier

architecture), I was able to bring up my work in the challenge as examples. Due to the wide variety of commonly used AWS services that were incorporated into the challenge, it was easy to use that as a talking point.

Any advice for other upskillers such as yourself?

Don't give up! The jobs are out there, but you need to find the right environment for growth. A lot of cloud jobs are geared towards senior-level people with years of experience, but there are companies out there that are willing to grow their own.

Doing the Cloud Resume Challenge will set you apart and show that you have the curiosity, resilience, and motivation to make a career in cloud.

Also, while you are interviewing, start learning Terraform and Linux administration. Those two skills will help you immensely both during the interview process and on the job.

Pause to reflect

Have you taken your initial practice exam?

Great! Take a few moments to think about what you've learned so far.

- What are the top 2-3 areas of cloud that you feel **least comfortable** with right now?
- When do you plan to take your certification? What's your study plan between now and then?
- What other areas of DevOps or software development do you want to get better at outside of cloud certification?

In a notes app or text file, write down your answers to these questions. This will come in handy later when it's time to write your blog post. Trust me, you do not want to be staring at a blank piece of paper at the end of this project!

Remember that you can also discuss these questions with your colleagues in [the CRC Discord server.](#)

Chunk 1: Building the front end

At the end of this chunk, you will have created and deployed a cloud-hosted resume at a live URL that you can share with anyone. (That's right!) Here are this chunk's steps again as a reminder:

(Challenge Steps 2-6)

2. HTML

Your resume needs to be written in [HTML](#). Not a Word doc, not a PDF. [Here is an example of what I mean.](#)

3. CSS

Your resume needs to be styled with [CSS](#). No worries if you're not a designer – neither am I. It doesn't have to be fancy. But we need to see something other than raw HTML when we open the webpage.

4. Static Website

Your HTML resume should be deployed online as a static website using [Google Cloud Storage](#). Services like Netlify and GitHub Pages are great and I would normally recommend them for personal static site

deployments, but they make things a little too abstract for our purposes here. Use GCS.

5. HTTPS

The GCS website URL should use [HTTPS](#) for security. You will need to use a [Cloud Load Balancer](#) to help with this. Be aware - this will have a small cost to provision. You will also want to use [Cloud CDN](#) to cache your site - just check the box when configuring your load balancer backend.

6. DNS

Point a custom DNS domain name to the load balancer endpoint, so your resume can be accessed at something like my-c001-resume-website.com. You can use [Cloud DNS](#) or any other DNS provider for this. A domain name usually costs about ten bucks to register.

How to approach this chunk

Many people find that setting out basic HTML and CSS is the easiest part of the challenge for them, and so they speed through steps 2-6 only to find that the challenge gets much more difficult around step 7.

This is not because front-end development is easy. It's because the challenge has very limited, basic requirements for the static site. I did this by design, for a couple of reasons:

- I'm not a front-end developer, and I'm not qualified to set you a really cutting-edge web development challenge!
- You are probably not going to be slinging a lot of front-end code in a cloud engineering role. You're going to be interviewing for infrastructure and ops jobs where your ability to center a div is not that relevant.

Creating the static site is more about completeness, and about having a project you can easily demo in an interview, than it is about building a web client that will really knock everyone's socks off. (Though I've seen some really slick challenge sites out there!)

But that said, having to work with gluing a front end and a back end together is SUPER important. Part of what makes steps 7 and following such a challenge is that you're not just creating an API in a vacuum. You have to

figure out how to communicate securely with a browser, handle client-generated errors, account for cache, and all sorts of other things that cloud engineers deal with every day.

All of which is to say: don't get complacent here! You are getting the pieces in place for the big challenges to follow.

FAQ

Why does the Cloud Resume Challenge ask me to upload my website to Google Cloud

Storage and figure out DNS and HTTPS by myself instead of using a purpose-built cloud static website service like Netlify?

In general, the best tool for a cloud job is "the most fully-managed service that meets your needs." So yes, using Netlify, or GitHub Pages, or a different cloud provider's static hosting service like Azure Static Web Apps or AWS Amplify, would be the fastest and easiest way to accomplish this week's portion of the challenge. Heck, cloudresumechallenge.dev runs on Netlify, and I have no reason to make a change at this point.

The reason I want you NOT to use those services for this project is because I really want you to understand and grapple with DNS, SSL certificate setup, and cloud storage. The reality is that most projects you will encounter in the work world will not fit neatly onto a static hosting service. But they will require you - over and over again - to deal with the basic building blocks of cloud storage, authentication, and networking.

In a job interview, you are not going to get asked to explain how you would follow the prompts in a Netlify dialog. But you might very well get asked to explain how DNS works. And you will remember the answer to that question much better if you do the Cloud Resume Challenge the way I've suggested.

But in future, when you're standing up a static site about your Magic the Gathering card collection, just use Netlify. It'll be faster, and probably cheaper as well.

Helpful resources

HTML / CSS

If you're brand-new to HTML and CSS, there are endless tutorials out there.

[Freecodecamp's course](#) gets plenty of love. Codecademy [seems to have plenty of good](#) stuff as well, though I'm not sure if it's all free. I also must recommend [CSS Tricks](#), the greatest source for CSS articles and guides on the web - much of it's advanced stuff, but if you want to continue your learning in this area you should subscribe to them right away.

Static website tutorials

The actual cloud part of this chunk is pretty tutorial-friendly; if you follow this tutorial from Google Cloud on [static site setup](#), you'll be 90% of the way there.

DNS and CDNs

CloudFlare (a Google Cloud CDN competitor) has an [excellent series of articles](#) explaining the theory behind DNS and CDNs. They also have a quick and easy [diagnostic center](#) for HTTPS issues. And, for good measure, their [domain registry](#) might be the best place to buy your website domain name, since they don't have any markups or hidden fees.

I am also a massive fan of the interactive DNS tutorials created by Julia Evans. [DNS Lookup](#) lets you explore the DNS servers behind your own site; even more epically, [Mess With DNS](#) is a free DNS sandbox that includes tutorials to help you understand the limits and ramifications of what DNS can do.

Actual CRC sites

For inspiration, here's [a curated list of actual challengers' websites](#) maintained by community member Lou Bichard.

Jerry's story: From respiratory therapist to Associate Solutions Architect

How long it took Jerry to compete the Cloud Resume Challenge: *About 20 hours over the course of 1 week*

How long it took Jerry to get a cloud job after completing the challenge: *1 month*

So you had never worked in tech before tackling the challenge?

I worked nearly 14 years as a respiratory therapist and in a healthcare management role.

I had certifications and other small projects for my portfolio but I wanted to accomplish a build that would give me hands-on experience with a broad range of services. Something I could explain in-depth and walkthrough in an interview situation.

How much did the certs help you get hired, as opposed to the project experience?

I had 4 AWS certifications. I would say it was a bonus to have getting my name in front of the right people but ultimately getting hands-on and understanding the HOW and WHY was the most beneficial aspect. For anyone who asks for advice that's the first thing I mention. Do the Cloud Resume Challenge or compatible challenge and get your hands on the console and CLI.

How did you use the challenge during interviews?

When interviewing with Amazon, the Cloud Resume Challenge was a big talking point for me. When going through the interview “loop”, everyone seemed to be impressed with the range of services used within this one project.

I also had to build something myself to demo during the interview process and included some skills I got from the Challenge to build a serverless transcoding pipeline integrated with my Synology NAS, Elastic Transcoder and Lambda functions.

What do you wish someone had told you during that 4-month job search?

Don’t. Give. UP! Keep pushing. No matter how hard someone says it might be, no matter how frustrated you may get at times, keep learning and stay positive. Imposter syndrome is a real thing and we ALL deal with it at some point in our careers.

Get hands-on experience building and architecting, anticipate failure and re-build again until you nail that project/build. As AWS CTO Werner Vogels famously said, "everything fails all the time." Keep pushing, keep building, and keep your head up in the clouds.

Mods

Developer Mod: Frame Job

If you have a little bit of front-end knowledge or ambition, you may not be satisfied with dumping some HTML and CSS into a GCS bucket. You may want to build your front end using one of the following Javascript frameworks:

- Next.js
- React
- Vue
- Svelte

At the very least, I'd recommend using a static site framework such as Hugo or Jekyll. This will make your site more maintainable over time than a single giant HTML file, and open up

opportunities for you to integrate the many features of those platforms and their templates.

DevOps Mod: Automation Nation

This is a forward-looking mod that requires several skills we won't officially touch on until Chunks 3 and 4. Feel free to come back to this mod then, or jump into it now if you're feeling confident.

The official challenge spec doesn't technically require you to port your front-end resources to infrastructure-as-code, but I think you should do it if you have time. Creating Google Cloud Storage and Load Balancer config is great practice, and this way you can run an end-to-end test that uses browser automation.

1. Make sure you have a GitHub repository set up for your website code and configuration.
2. Convert the resources in your website resource group (GCS bucket, load balancer, etc) to infrastructure-as-code (IaC) using Terraform, Cloud Deployment Manager, or whatever IaC tool you plan to use in Chunk 4.
3. Create GitHub Actions to automatically build and deploy updates to your static

site. I recommend creating a three-step workflow, as follows:

- **Build step.** Run any build commands necessary to get your website ready to deploy - depending on what front-end framework / generator you are using, this may take a few seconds.
- **Deploy step.** Deploy your IaC configuration to create or update your cloud resources such as the storage and CDN, then sync your updated website files to the storage container. You will also want to clear your CDN cache here.
- **Smoke test step.** Here's where you can run [Cypress tests](#) against the website itself, to make sure it looks and acts the way you expect. See Chunk 3 for more discussion of Cypress.

Confirm your automation works by nuking your manual website deployment and deploying it by pushing a change to your repository. Look Mom, no hands!

Security Mod: Spoof Troop

An advanced project mod that will be a great choice if you're looking toward a cloud security role. Protect your DNS setup from potential spoofing ("man-in-the-middle") attacks by configuring [DNSSEC](#) for your site domain name.

- Note that not every domain registrar supports configuring DNSSEC; [Google Domains does](#).
- Follow [this tutorial](#) to set up and test your DNSSEC setup with Cloud DNS.
- Use Dig to test your DNSSEC setup; [here's a guide](#).

Pause to reflect

When you've completed Step 6, and you're accessing your live site over HTTPS at your custom domain name, take a deep breath and celebrate! Even if you stop working on the project right here, you've still created something of value that can be a useful piece of your professional presence for years to come. Then, while your work is still fresh in your mind, write down answers to the questions below.

- What aspect of Chunk 1's work did you

find the most difficult?

- Note one or two problems you overcame to get the static site deployed; include the error messages or screenshots of the issues, and write down what you did to fix them.
- What's something you'd have done differently, or added, if you'd had more time?
- If you tried one of the mods, note what you did, and how it's an improvement over the basic challenge requirements.

Chunk 2: Building the API

We're going to break up the "visitor counter" piece of the project - which requires creating a cloud-based API that communicates with our website - over this chunk and next. By the end of this section, we'll have a working Google Cloud serverless API that updates the visitor count in a database. We'll also store our Python code in a GitHub repository, so we can track changes to it over time.

(Challenge Steps 8-10, 13)

8. Database

The visitor counter will need to retrieve and update its count in a database somewhere. I suggest you use Google Cloud's [Firestore](#) in Datastore mode for this. Be aware that Firestore may incur small costs to store and manipulate data.

9. API

Do not communicate directly with Firestore from your Javascript code. Instead, you will need to create an [API](#) that accepts requests from your web app and communicates with the database. I suggest using [Google Cloud](#)

[Functions](#) or [Google Cloud Run](#) for this with an [API Gateway](#) in front. They will be free or close to free for what we are doing.

10. Python

You will need to write a bit of code in the serverless function; you could use more Javascript, but it would be better for our purposes to explore Python – a common language used in back-end programs and scripts – and its [Google Cloud Client Libraries](#). Here is a good, free [Python tutorial](#).

13. Source Control

You do not want to be updating either your back-end API or your front-end website by making calls from your laptop, though. You want them to update automatically whenever you make a change to the code. (This is called [continuous integration and deployment](#), or CI/CD.) Create a [GitHub repository](#) for your backend code.

How to approach this chunk

There are a lot of half-finished Cloud Resume Challenges out there that never get past steps

7-10. Because this is the part where you have to write legit code, in both Python and Javascript. If you have not written code in a programming language before (and, frankly, even if you have) it is painful, time-consuming, and open-ended ... even though when you finally get done, you'll probably find that you've really not had to write that many lines of code at all.

So this is the part of the challenge that separates the wannabes from the champions. If you can build the back end of the Cloud Resume Challenge, you can do anything. Specifically: you can get hired as a cloud engineer. I'm quite confident of that.

OK, enough hype. It's a big chunk of work. Here's how I would break it down. You should be able to find online tutorials that cover each of these individual steps.

Goal 1: Get your container talking to the database (challenge step 8)

1. Make sure you have a fresh project to use for developing your API.
2. Figure out whether you are using Cloud Functions or Cloud Run to host your API code. I recommend Cloud Run because

I view it as Google Cloud's "canonical" serverless option at this point - the latest version of Cloud Functions is really just a functional abstraction on top of Cloud Run anyway.

3. Set up a Python Cloud Run service or Cloud Function using [the Google Cloud-provided quickstart](#) (don't worry about using infrastructure-as-code yet).
4. Create a new Firestore database in Datastore mode, again using point and click.
5. Figure out how to write the Python code in your Cloud Run service or Cloud Function that will save a value to Firestore. For Cloud Functions, you can test your code interactively through the console UI. For Cloud Run, you'll be testing the web service directly at this point - when you deploy your changes, you should get a live URL you can invoke through your browser or using [curl on your command line](#).

Goal 2: Trigger your Cloud Run service via an API Gateway (challenge step 9)

Both Cloud Functions and Cloud Run services expose URLs that can be triggered directly from the internet, but we want to put an API

Gateway in front of our code for more safety and control.

1. [Create the OpenAPI spec for your API](#). I would suggest using a POST HTTP method, since this method is typically used when API resources are updated, and you are going to be incrementing the visitor counter in your database every time this function is called.
2. [Deploy your API Gateway](#) in your API project.
3. When this is working, grab the public URL for your gateway and test your “update visitor counter” function route using an external API testing service like Postman. You want to see the same output from your API that you saw when testing the code directly in the console.

Goal 3: Trigger your API Gateway from your static site (challenge step 7 - for the next chunk!)

If you can get through these three chunks of work, you've solved the back end. And that means that you're going to get two-thirds of the way there in this section. (I know, I know. Easier said than done. If you're budgeting time for the challenge and you're new to cloud and

code, expect to spend easily 60% of your overall time commitment on these three chunks.) You can do it; I believe in you.

FAQ

Why are we building the API "serverlessly"?

The "Google Cloud serverless stack" of Cloud Functions / Cloud Run, API Gateway, and Firestore tables isn't the only way to build an API. In fact, it's a fairly new way; through much of IT history, web services have run on servers (or, at least, abstracted servers called "virtual machines"). There are three reasons I'm asking you to build your API on higher-level services instead:

- **Ease of use.** "Serverless" doesn't mean your API won't have servers underneath it (it will), but that you won't have to worry about them, because they're managed by the cloud provider. All you have to do is focus on writing your code and getting the configuration right to connect the managed services together.

- **Cost efficiency.** A traditional virtual machine runs all the time, even when it's not handling requests. In the cloud world, that means you get billed all the time. Since serverless functions only run in response to events, usually for just fractions of a second, they are extremely cost-effective. You will not pay anything to run the code for your visitor counter unless your API receives millions of hits per month.
- **The "new and shiny" factor.** While many cloud shops are still running older, traditional server-based architectures, there's wide interest throughout the industry in exploring more managed cloud technologies where they make sense. By getting your feet wet with serverless, you're actually placing yourself on the cutting edge. Many of your interviewers may not even have as much experience with serverless as you do. Standing out can be a good thing!

That said, if you really want to serve your website using a more traditional web hosting architecture, you're certainly welcome to. Lou

Bichard and Tony Morris have even created [a modified Cloud Resume Challenge that helps you do that](#). Just watch those costs!

Helpful resources

Python

If you are new to writing Python, expect to budget a fair amount of time for learning here, before you get into the actual project steps.

As with CSS, there's such an embarrassment of tutorials out there that it can be overwhelming to know where to start. If you like learning from books, try [O'Reilly's](#); if you prefer videos, here's [freeCodeCamp's](#); for hands-on tutorials, python.org has a [marvelous list](#). Candidly, there's so much good free stuff out there that I probably wouldn't consider paying for a course.

Here are the big things I would make sure you understand about Python before starting on this chunk's project work:

- How to [install Python](#) and set up [a virtual environment](#)
- Working with [lists](#) and [dictionaries](#)

- The [Google Cloud client libraries](#) for working with Python
- If you're using Cloud Run, that means you're actually running a little web server in your code. If you used the Google Cloud quickstarts, that web server is [Flask](#). Start at that link to understand how the Flask framework structures Python APIs.

APIs

The kind of API we are building is a REST API. [This podcast \(transcript included\)](#) is a nice introduction to what that means and what other kinds of APIs there are.

Understand [the OpenAPI spec for defining API resources](#).

The hands-on challenges at [The Ultimate API Challenge](#) seem like a great, free way to get some practice building and invoking different toy APIs.

Google Cloud serverless

I like [this article](#) for a good explanation of what we mean by the word “serverless” (don’t be

fooled, there are still servers down there somewhere!)

Get into all things Google Cloud serverless with official [Cloud Functions](#) and [Cloud Run](#) tutorials.

Source control

[GitHub's Learning Lab](#) is a good way to practice your git and hub skills.

You may also enjoy other interactive Git tutorials such as [Learn Git Branching](#) and [Oh My Git](#).

Jakob's Story: From Clinical Research Technician to Cloud Engineer

Time to complete the Cloud Resume Challenge: ~100 hours, including certification study

“The Cloud Resume Challenge helped me a great deal in my job search because it gave me something to talk about and refer back to.

“By far the most useful thing was my understanding and implementation of infrastructure as code. Setting up pipelines to test and deploy my changes seemed like an unnecessary step at first, but I think that being able to discuss how it made quick and safe iterations possible made me a much more attractive hire.

"Finishing the Cloud Resume Challenge showed me that a normal person like me could build things accessible to the whole world on the cloud. It changed my inner monologue from 'I wish someone would build something to address this need I have' to 'I could build something to address this need I have.'

"The Cloud Resume Challenge is a great way to open your eyes to your own potential. After you finish, KEEP them open and build the solutions you want to see in the world. People will notice that."

Mods

Developer Mod: Schemas and Dreamers

Store your visitor counter in a relational database instead of Firestore, maybe using GCP's [managed MySQL service](#). You'll have to defend this choice in a job interview because it will be less "serverless" than the rest of your setup, but it will get you into some challenges commonly faced by real cloud teams:

- **Connection pooling:** How do you connect a Google Cloud Function or stateless Cloud Run service to an inherently stateful database? Read Microsoft's [best practices for managing connections to Cloud MySQL](#), then determine how you will implement them in your function's programming language.
- **Schema updates:** You will also need to think about how you manage and apply updates to your database schema without breaking your running API. [Read this walkthrough of online schema update options](#) for Google Cloud MySQL and design your implementation.

DevOps Mod: Monitor Lizard

One of the most important ops practices is making sure that you get notified quickly when your running services do something unexpected. There are many, many services that can help you monitor the behavior and performance of your applications. In the modern cloud world, [Datadog](#) is perhaps the most ubiquitous third-party product; I wanted to recommend it for this mod, but it doesn't have a very flexible free tier. So unless you're willing to spend extra money for the sake of your resume, we'll use Google Cloud's built-in product, [Cloud Monitoring](#), to instrument our API.

Part 1: Establishing metrics

1. Take a minute to read about [monitoring](#) [Google Cloud Run](#) or [Cloud Functions](#), then decide on 3 to 5 types of incidents you want to be alerted about. Some typical ideas include:
 - If your Google Cloud Function execution crashes (exits with an error);
 - If the overall latency (response time) of your API is longer than usual;

- If the total amount of billable Cloud Run instance time within a short time period is unusually large (this could indicate that your API has become hugely popular - yay! - or that it's undergoing a denial-of-service attack - ugh!)

Each of these suggested incidents can be mapped to a Google Cloud Monitoring [metric](#).

2. Create a [public uptime check](#) for your API. You should create a new route in your API for this so that you do not update your visitor counter unnecessarily.
3. Configure a notification channel that will get alerted when these metrics or uptime checks misbehave; you can use your email address as the address to notify.
4. When you've decided on metrics you like, [create alerting policies for each metric](#), as well as [for your uptime check](#), and tie them to your notification channel. If you do this by hand, remember to add the policies to your infrastructure-as-code definitions in Chunk 4.

5. Do something outrageous with your API, like call it 500 times in 2 seconds or replace all the code with ASCII art, and make sure the alerting policies catch the issues and email you.

Part 2: Getting notified

You could just leave the alerts set to email you, but what if a critical alert went straight to spam or got lost in your inbox? What you really want to do is send the alerts to a service that will notify you **VERY LOUDLY AND SPECIFICALLY**.

The most widely-trusted service for doing this is called PagerDuty, and it has a pretty good free tier. Make a free PagerDuty account, download the app, and then follow [Google Cloud's setup guide](#) to connect PagerDuty to your notification channel. Confirm you can get alerts to your phone when the API misbehaves.

Finally, let's send information about API errors to a Slack workspace - this is sometimes called "ChatOps" and it could be a useful foundation for notifying a team about problems with your app. PagerDuty has a Slack integration, but for the sake of learning you could also do this integration directly:

1. If you don't have an existing Slack workspace you can use, make a free one.
2. Follow the steps in [this useful Google Cloud blog](#) to connect Error Reporting (stack traces emitted via Google Cloud Logging) with your Slack workspace via webhook. Now, when something breaks, you'll get an immediate Slack notification containing the cause of the error!

Again, a reminder: whatever infrastructure (uptime checks, alerting policies, notification channels) you've created in this mod needs to be converted into infrastructure-as-code before you can declare victory - it's the DevOps way!

Security Mod: Check Your Privilege

The principle of least privilege says that your code should have only the permissions required to perform necessary actions - nothing more. That way, even if an attacker compromises part of your system, they won't be able to use it as a springboard to infiltrate untouched parts of your cloud.

Microsoft lists [two different ways](#) that code can be overprivileged:

- **Unused permissions**, which grant access to a resource you aren't using;
- **Reducible permissions**, which give too much access to a resource you are using (for example, you've given your code admin-level access to your Firestore database, but it only needs permissions to read and write to a single table)

Google Cloud tends to prioritize an easy developer experience in quickstarts and tutorials, so as you've worked through this project you may discover that services such as Cloud Run are using overly-broad permissions by default.

Perform the following steps to scope down your permissions:

1. **Eliminate unused permissions.** Read Google Cloud's [Using IAM securely documentation](#) and implement the following best practices:
 - a. Avoid basic / predefined roles, which may include too many permissions;

- -
 -
 - b. Create a unique service account for each Cloud Function or Cloud service you have;
 - c. Add only the permissions to that role that the service needs to accomplish tasks such as reading / writing to Firestore;
 - d. Define these roles in infrastructure-as-code!
2. **Reduce permissions as much as possible.** Make sure that:
- a. You read [this blog](#) on least privilege role creation for Cloud Functions
 - b. You remove permissions for actions you are not using. Use [role recommendations](#) to identify overly-generous permissions in your IAM roles.

Pause to reflect

That moment when your API returns a valid response is a magical thing: you've built a real web service in the cloud! At this point, you've gone too far to stop now - but while this chunk of work is still fresh in your mind, write down answers to the questions below.

- What aspect of Chunk 2's work did you find the most difficult?
- Note one or two problems you overcame to get the cloud function talking to your database; include the error messages or screenshots of the issues, and write down what you did to fix them.
- Did you implement one of the mods? Note which you chose and what you learned. How did you improve your project over the basic spec?
- What's something you'd have done differently, or added, if you'd had more time?

Chunk 3: Front-end / back-end integration

It's now time to tie together everything you worked on in Chunks 1 and 2. You're going to connect your front end (the resume site deployed to the cloud storage bucket) to the back end (your API) and get the visitor counter displaying on your homepage. We'll also write some automated tests to make sure that behavior is really working.

(Challenge Steps 7, 11)

7. Javascript

Your resume webpage should include a visitor counter that displays how many people have accessed the site. You will need to write a bit of [Javascript](#) to make this happen. Here is a [helpful tutorial](#) to get you started in the right direction.

11. Tests

You should also include some tests for your Python code. [Here are some resources](#) on writing good Python tests.

How to approach this chunk

Here's how I would go about connecting your API to the website:

1. You'll need to write a tiny bit of Javascript to make the HTTP request to the API Gateway. (Seriously, it's just a couple lines of code - don't overthink it.)
2. Make sure you account for CORS issues between your browser and the API. This is almost certainly the most common and most frustrating issue faced by challengers. Good news: everybody eventually figures it out!
3. Verify that you can see output from your API Gateway returned from the Javascript call and printed out somewhere in the web app.

When you get this working, you will want to write an automated test or two against your API to confirm that the API always does what you expect.

How to write your very own smoke test

Writing tests for your code is never a step you should skip, even if your code is simple enough that the tests feel perfunctory. But for the purposes of this challenge, there's a specific

type of test you can write that should generate great conversation in a job interview. It's sometimes called an "end-to-end test" or a "smoke test". (Somewhere, Daniel Singletary is smiling!)

The original challenge prompt steers you toward writing "unit tests" using something like Python's built-in testing library. In a unit test, you verify that your code returns expected values before it is deployed.

This is fine, but not very interesting, since mostly what your code is doing is talking to cloud services. Without actual services to call, your code will have to "mock", or pretend to call, those services - and that means you're not really testing much of anything.

On the contrary, an end-to-end or smoke test is run *after* your API gets deployed. It uses the real, live URL of your API and makes sure that it provides the expected responses to a test call. This indirectly verifies that

1. your function or Cloud Run service code is working as expected,
2. permissions are correct between your API Gateway, your compute service, and your database, and

3. all your resources have been deployed successfully.

An excellent tool for running smoke tests is called [Cypress](#); it's a Javascript testing framework that (among other things) lets you call your API endpoint just like the Javascript code in your front-end app is doing. The Cypress test doesn't have to know anything about how your Google Cloud Function is written, or what language it's written in, or even that it's a Google Cloud Function. It just needs to know what output your URL should yield in response to input.

Some ideas for things to check in your smoke test:

- Make sure your API not only returns an updated value to you, but actually updates the database
- Make sure your API responds to unexpected input correctly; what if the inbound request is not formatted the right way?
- Make sure you are checking edge cases in your function logic. What happens if the visitor count is not initialized (ie, on the first time the function is invoked?)

Helpful resources

Javascript

Another week, another new programming language, another banquet of learning resources. You could spend your entire life reading about Javascript on the internet. I would focus on the parts that matter for this project:

- Run through a basic language overview and syntax tutorial, like [this one](#);
- Learn [how to make API calls with Javascript](#);
- Learn about [how to organize the files in your website and reference scripts in HTML](#)

CORS

CORS (cross-origin resource sharing) is the security feature that will make your web browser scream at you when you try to call your API because it's hosted at a different domain than your resume site, and it'll be the bane of your existence until you tweak your API headers to fix it. Here's [a good CORS explainer and tutorial](#); expect to open a few tabs and try a few things before you solve this one, as it's frustrating even for experienced engineers.

Mods

Developer Mod: Playing the Hits

Technically, the visitor counter we've built is a *hit* counter; it'll update every time you refresh your page, even though you're just one unique visitor. See if you can create a new API method to only count unique visitors. (Hint: check for the caller's IP address in the headers of the request that Google Cloud's API Gateway forwards to your function or Cloud Run app.) Add the unique visitor counter to your homepage and update your tests accordingly.

- You'll have to decide the timeframe in which a visitor is counted as a repeat visitor - daily, weekly, monthly, etc - before you count them as "unique" again. This will involve some fun date math!
- Note: IP addresses may be considered PII (personally-identifying information) in some jurisdictions, so if you're nervous about logging them to a database, you could consider storing a one-way hash of the address instead. [Here's how to do that in Python.](#)
- If you want more Javascript practice, try writing this function in Node.js instead of Python.

DevOps Mod: Browser Up

It turns out that Cypress does a lot more than just API testing; it's really designed to automate [full "end-to-end" tests against your browser](#), like clicking buttons and verifying the contents of HTML elements after API calls. See if you can write a test that loads your resume site a couple of times and confirms the updated visitor count values in your DOM. (Actually, you can test anything on the site you want, including the behavior of buttons and the content of text. Go wild!)

Security Mod: Wall of Fire

The API we've created has no authentication; it's a public API, connected to our public website, which means anyone on the internet can find it and make requests to it directly.

In one sense this isn't a big deal, since all our API does is update a counter. But we are still vulnerable to people who try to

- send malicious API requests in hopes of getting the API to do other things, like execute the attacker's code;
- execute a denial-of-service attack (or, as it's sometimes called in the cloud, a

denial-of-wallet attack) by spamming the API and filling up your credit card with billions of bogus requests

There's no silver bullet to mitigating these risks, so we'll take a "defense-in-depth" approach, applying several strategies to minimize misuse of our API.

WAF

One way to mitigate these risks is to put a web application firewall (WAF) such as [Google Cloud Armor](#) in front of our API. Be aware that Cloud Armor doesn't have much of a free tier; the managed rules will cost you \$1 per rule per month whether or not you are generating traffic. You will also need to [set up a global load balancer in front of your API Gateway](#) using [serverless network endpoint groups \(NEG\)s](#), kind of like you did in front of your cloud storage bucket. If you do decide to set up Cloud Armor for learning purposes, I suggest using the [preconfigured rules](#), and then use the [bot control features](#) to deny bots from accessing the API.

Whether or not you actually deploy Cloud Armor, take some time to read and understand the links above. If the Cloud Armor -> Global

Load Balancer -> API Gateway -> Cloud Run gauntlet is starting to feel a little ridiculous, you could also consider switching from API Gateway to Google Cloud's *other* API gateway service, Apigee. At the time of writing, Apigee has just announced some [advanced security features](#) that could be easier to integrate than plugging in Cloud Armor.

Backend security

Next, I suggest reading through [Google Cloud API Gateway's recommendation for securing backend services](#) and making sure that your Cloud Function or Cloud Run app is not publicly accessible except via the API Gateway.

Rate limiting

Even if you don't want to pay for Google Cloud's WAF, you still need to put some safeguards on your API. The quick and dirty way to do this is to [set a quota](#) to control the amount of calls that any given source can make to your API. Decide how many requests you are comfortable allowing your API to process in a given time period, then set the thresholds so that you will not exceed them.

Pause to reflect

Take a deep breath - you've done it! While some of the most important learning in this project is yet to come, you've now built an entire full-stack web application, front to back - and that deserves a celebration. But before you pop the confetti, write down answers to the questions below while they're still fresh in your mind.

- What aspect of Chunk 3's work did you find the most difficult?
- Note one or two problems you overcame to get the API talking to your browser; include the error messages or screenshots of the issues, and write down what you did to fix them.
- The mods in this section are fairly open-ended; if you chose one, how far did you go and why is it an improvement over the basic spec?
- What's something you'd have done differently, or added, if you'd had more time?

Nana's Story: From Tech Support to Cloud Native Engineer

Nana, based in New York City, already had some technical experience as a help desk administrator, but needed something more relevant on his resume to achieve his dream of getting a full-time cloud engineering job.

Nana says it took him about 4 weeks, coding about 5 hours each day to complete the challenge. "It was the kind of project that established full-stack as well as DevOps knowledge."

About his interviewing experience, Nana noted: "The resume challenge helped me demonstrate important skills, particularly understanding of CICD automation, DNS (and how the internet works), SCM/git, and serverless architecture. Hiring managers seemed to appreciate rounded developers who also had some experience with agile and the DevOps culture."

Nana used his first round of interviews, mostly with Fortune 500 companies, to

identify remaining gaps in his knowledge, then took a 4-month break from interviewing to pursue more hands-on learning (including the ETL challenge provided later in this book!). About six months after initially starting the Cloud Resume Challenge, he landed a job as a cloud native engineer at Accenture.

For future challengers, Nana offers this wisdom: "Get hands-on, and don't rush it!"

Chunk 4: Automation / CI

Your website will still look the same at the end of this section - but the underlying deployment process will look much different. You're going to represent your cloud resources as configuration, so they can be deployed identically in any environment - and you're going to automate those deployments using a CI (continuous integration) pipeline.

(Challenge Steps 12, 14, 15)

12. Infrastructure as Code

You should not be configuring your API resources – the Firestore, the API Gateway, the serverless function – manually, by clicking around in the Google Cloud console. Instead, define them in a [Terraform template](#) and deploy them using the Terraform CLI. This is called “[infrastructure as code](#)” or IaC. It saves you time in the long run.

14. CI/CD (Back end)

Set up [GitHub Actions](#) such that when you push an update to your Terraform config or Python code, your Python tests get run. If the tests pass, the application should get packaged and deployed to Google Cloud.

15. CI/CD (Front end)

Create a second GitHub repository for your website code. Create a GitHub Action such that when you push new website code, the Cloud Storage bucket automatically gets updated. (You may need to [invalidate your Cloud CDN cache](#) in the code as well.)

Important note: DO NOT commit Google Cloud credentials to source control! Bad hats will find them and use them against you!

How to approach this chunk

I encouraged you to use the Google Cloud console in the previous sections because I think it's the best way to explore cloud services that are brand new to you. But as the challenge prompt states, this isn't the way professional cloud engineers deploy services. For that, you need infrastructure-as-code (IaC).

FAQ

If I got my API working using the web console, do I really need to go back and write automation?

YES. Representing cloud resources as code using config tools like Terraform or Pulumi is

probably *the* most characteristic task in a cloud engineer's day-to-day job.

There are parts of this challenge you can hand-wave a little bit (nobody really cares if you kinda stole your static site template from somewhere else, for example).

But you *cannot* skip over the infrastructure automation piece. It is the most relevant job skill you will practice in this entire challenge.

I recommend Terraform as the IaC tool for this project because it's not only emerging as the standard for configuring Google Cloud resources, it's the rare example of a multi-cloud tool that *everybody uses*. Whether your DevOps team works with AWS, Azure, or Google Cloud, Terraform (and the other HashiCorp tools like Vault, Nomad, and Consul) are likely to put in an appearance. Terraform uses its own declarative, domain-specific configuration language called HCL, though they're adding programming language support as well.

If you want to branch out beyond Terraform, there are a couple of other options you can try:

Google Cloud Deployment Manager

Google Cloud Deployment Manager is Google's native IaC tool, roughly analogous to CloudFormation on AWS or ARM templates on Azure. While it's been around awhile, it doesn't fully support some services such as Cloud Run, so you're likely to get frustrated if you try to use it for this project. As I said, I'm seeing that more Google Cloud shops - and even GCP's own tutorials - are tending to recommend Terraform over Deployment Manager these days.

Pulumi

Unlike Deployment Manager or Terraform, Pulumi doesn't require declarative configuration files: you define your Google Cloud resources using your favorite language such as Javascript or Python and deploy them, no YAML required. I was an early reviewer of Pulumi several years ago and was initially unimpressed, but I'm happy to eat crow now; the project's clearly found a niche and seems to have some good ideas. Note that Pulumi probably has the smallest userbase of the tools listed in this section, but they do have a super friendly and engaged community, and my impression is that they're pretty well-known in the DevOps world at this point.

Before you choose one of these tools, take a few minutes to read up on them and compare. You will want to understand the following:

- How do these tools manage state? (If you make a manual change to your infrastructure after deploying, can the tool figure it out?)
- How do they interact with the underlying cloud APIs?
- What happens if you close your laptop in the middle of a deployment?
- The third-party tools tend to have their own hosted versions such as Terraform Cloud; what value might these provide over just deploying to Google Cloud directly?

Setting up your deployment pipeline

We are using GitHub Actions to automate our deployments in this challenge because they are free (for our purposes) and tightly integrated with our existing GitHub repositories. I would suggest you create a deployment workflow that looks something like this:

- **Build step.** This will be a little different depending on whether you are

packaging your code as a zip file (Cloud Functions only) or a container. Package up your function code or your Cloud Run container, making sure to install any needed dependencies. Your output at this stage should be a zipped-up Cloud Function artifact or tagged container and an IaC config file ready to deploy your resources.

- **Artifact step.** Upload your zip file or container image to a storage bucket or Google Cloud Artifact Registry so it can be accessed by the...
- **Deploy step.** Run your IaC tool to deploy the resources in Google Cloud.
- **Smoke test step.** Run your Cypress API tests to make sure the deployed API does what you think it should. (Here's [a handy pre-made GitHub action for running Cypress tests](#), so you don't have to install Cypress itself.)

Helpful resources

IaC

DigitalOcean has [a useful illustrated article](#) to help you visualize basic IaC concepts like state management.

Docker

If you're working with Cloud Run, you'll need to learn a little bit about building containers in this project. Download Docker and run through Docker's [self-paced 101 tutorial](#).

CI/CD (Continuous Integration / Continuous Deployment)

- Read up on [trunk-based development](#), the modern way of managing code changes in a repository. Unless you have other collaborators on this project, your workflow will probably look more or less like trunk-based development by default.
- GitHub Actions has [a nice learning section](#) that's worth reading before you get hands-on. Mainly you'll want to be sure you're [handling authentication between GitHub and Google Cloud appropriately](#), using workload identity federation (*not* long-lived JSON service account keys).
- You may come across [Google Cloud's official GitHub Actions](#), which contain actions for deploying to Cloud Run and Cloud Functions. I suggest not using

these (although they're great!) because they will not give you the opportunity to write your own Terraform config.

You might want to be aware of several other CI/CD tools that are commonly used in the industry:

- GitLab
- Jenkins
- CircleCI
- Google Cloud Build (super common in Google Cloud shops, and a viable alternate choice for this project)
- Azure DevOps (formerly known as Microsoft Team Foundation Server)

Mods

Developer Mod / Security Mod: Chain Reaction

(I've open-sourced this mod; you can contribute to it in [the official Cloud Resume Challenge project repository](#).)

The [software supply chain](#) is everything involved in getting code from your laptop to production: the code and configuration you write as well as any underlying packages and libraries they rely on (also known as

"dependencies"). Securing the software supply chain, particularly these dependencies, from compromise is an emerging discipline in modern software development and infosec. The stakes couldn't be higher - just check out [this list of recent high-profile supply chain attacks.](#)

In this challenge, you'll extend your Cloud Resume Challenge project to add protections to your code and dependencies.

Initial reading

- Check out [Microsoft's software supply chain best practices](#). These recommendations are based around NuGet, the package manager for Microsoft's .NET ecosystem, but much of the advice generalizes well.
- Take a whirl through the Cloud Native Computing Foundation's [software supply chain repo](#), particularly the [compromise definitions](#) and the [whitepaper](#).
- Here's [a helpful video](#) walking through supply chain attacks in the Kubernetes ecosystem.
- Get familiar with [GitHub's security features](#); a decent percentage of

real-world software supply chain protection is just "turning the right knobs in GitHub", it seems.

Challenge steps

1. **[Sign your Git commits](#)** to both the front end and back end resume repositories. You'll need to [set up a GPG key](#) to do this. You'll know it's working when you see the "Verified" badge next to the commit in the GitHub console.
2. **[Use status checks](#)** to ensure that only signed commits can be merged into your repository.
3. **[Set up automated code scanning](#)** using GitHub's CodeQL code analysis tool on GitHub Actions. Note that you will need to make your repositories public for this to work. You should automatically run the code scan any time a pull request is merged to your main branch and fail the merge if security issues at level "High" or higher are detected. You should also guard against dependency decay by running the scan on a schedule once per month. You will have to edit a config file to adjust the schedule.

4. **Generate an SBOM (Software Bill of Materials).** An [SBOM](#) is a manifest that lists all the packages shipped in your container image or other code environment. As part of the build step in your back-end repository's CI/CD pipeline, generate an SBOM attestation file for your deployment artifact using the open source tool [Syft](#). (If you are shipping your code and dependencies as a zip file on Google Cloud Functions, not using a container image, you should still be able to point Syft at the unzipped deployment artifact to get an attestation.)
5. **Automate at least one additional vulnerability check in your CI/CD workflow.** Using the package list in your SBOM, write some automation to run at least one other dependency check besides the GitHub automated scanning. Vulnerability databases are not always equally reliable, and it's a good idea to check a couple of sources to provide defense-in-depth. [Grype](#) is a scanner that works well with Syft (and has its own GitHub Action). You could also consult an API such as [OSV](#). Fail the build with an appropriate error

message if you encounter a compromised dependency.

6. [For container users only] **Sign your container image using Cosign.**

Generate a KMS key on Google Cloud KMS, then sign the container image with Sigstore's Cosign tool before uploading it to Google Cloud's Artifact Registry.

Make sure to include the Syft attestation from the previous step. This will verify for other consumers of this container that you have shipped the packages you said you shipped.

7. **Draw a diagram** showing how code flows through your system and where attacks can be detected / mitigated. Reflect on where you may still have risks, and what other steps you might take if this were a more sensitive project, or involved multiple collaborators.

DevOps Mod: All The World's A Stage

Thus far, everything we've built is living in one environment: our "production" environment that's serving live traffic. This is not ideal because any bug we deploy through our fancy automated pipeline will immediately break our site. Real-world applications usually have one

or more additional "stages", pre-production environments where the developers deploy code in hopes of catching and fixing bugs before they are released to users. Perform the following steps to transform your CI/CD pipeline into a multi-stage workflow.

Important note 1: Cloud Run supports the concept of “[revisions](#)”, different versions within the same app. These features can be useful for managing rollouts, but I recommend that you do not mess with them in this project. The cleanest, safest, and most straightforward way to implement multiple staging environments in Google Cloud is to have a separate project per environment per application. If you have used the model of structuring projects and folders I recommended back in the “Setup and Safety” section, this should be pretty straightforward to set up.

1. **Set up a Google Cloud project folder and project** strictly for testing, if you haven't already.
2. Add steps to your GitHub Actions that **deploy code changes to the test environment** on any pull request to the main branch, and **only allow a merge to main and a production deployment**

if all your tests and security checks pass. (This is the ultimate stress test of your infrastructure-as-code setup - you should be able to deploy your whole application into a fresh environment with no manual steps necessary! If you can't, keep tweaking your IaC until you can!) You should continue to run your end-to-end tests in your production environment deployment, but linting on your code and dependencies can be limited to your test environment, as it would be redundant to run twice.

3. But wait! You may have multiple different collaborators checking out your code and creating pull requests to main at the same time. **Make sure that each pull request has a fresh copy of your test infrastructure associated with it.** Ideally, you'd automate creating a fresh Google Cloud project for each test you deploy. You may run into issues with project quotas, though. If you don't have enough quota headroom to churn through that many projects, you can use a shared test project - just make sure that resource names are unique where necessary.

Important note 2: One thing that will be different about your production environment compared to your test environment is that your test websites will not be using your custom domain name. This is another thing you'll have to account for in your automation - make sure your Cypress tests in the test environment can find the right load balancer or API Gateway endpoint to reach.

4. In the real world, code changes often require human approval before being released to production. **Experiment with adding [a manual approval step to your workflow](#)** after all tests have passed.
5. Think about the performance of your pipeline. Do you have any steps running sequentially that could be parallelized? Are you installing any tools during the build process that should be packaged as part of the underlying action container?
6. Cleanup time! Lots of old test environments sitting around will eventually start costing you money, even in the serverless world. Plus, it's a good idea to regularly build your test environment from scratch, just to ensure

that manual drift hasn't crept in. **Add an additional step to your GitHub Actions workflow that tears down your test resources after a successful merge to main.** (You should be able to run this in parallel with your production deployment.) Again, in an ideal world you'd tear down the whole test project, but deleted projects still count against your quota for 30 days, so you may not have this luxury unless you request a big project quota increase.

Stephanie's Story: From Bank Manager to Cloud Engineer

"I took on the Cloud Resume Challenge because I wanted to gain real life experience in a brand new field. The challenge tested me on whether a career change was really what I wanted, as well as how quickly I could learn something new.

"The challenge took me about 150 hours to complete over about 6 weeks (though I really

started hitting it hard in the last 3 weeks or so). It took me longer in part because I **chose to make the challenge my own by doing my automation in Terraform instead of SAM.**

"As it turned out, this was one of my best decisions! I was able to speak to real life scenarios based on what I had faced during the process. One that stands out the most was a troubleshooting exercise I was given during an interview. I was able to answer quickly and confidently because it was something I had run into during my own resume challenge.

"After a 3-month job search, I am now an Associate Cloud Engineer for iRobot, and I freaking love it! I learn something new every day. Love my team, love the work and enjoy challenging myself every day."

Pause to reflect

And with that, you've completed the technical steps of the Cloud Resume Challenge. This is no small feat. Particularly if you are new to cloud, and emphatically if you are new to tech, you have beaten the odds and joined a very

select group of people who have pulled off this difficult project. Sincerely, from the bottom of my heart, wow. All that's left is to write the blog post (and get certified if you haven't yet), so make sure to take a few notes before you head to the next section:

- What aspect of Chunk 4's work did you find the most difficult?
- Which IaC tool did you choose? Why? (List a couple of specific considerations.)
- Note one or two problems you overcame to get your cloud resources automatically deployed; include the error messages or screenshots of the issues, and write down what you did to fix them.
- Both the mods for this section are long and gnarly. Each would be worth a blog on their own. Make sure to capture what steps you took and anything unusual you ran into.
- What's something you'd have done differently, or added, if you'd had more time?

Chunk 5: The blog ... and beyond

It's all about the blog now! (And maybe some catchup on previous sections, if you're behind.)

(Challenge Step 16)

Finally, in the text of your resume, you should link a short blog post describing some things you learned while working on this project.

[Dev.to](#) or [Hashnode](#) is a great place to publish if you don't have your own blog.

How to approach this chunk

After weeks of work, multiple late nights, you've finally finished the entire Cloud Resume Challenge. It works from front to back. You've even passed a certification or two. You'd be perfectly happy never to think about any of this again. The last thing you want to do is sit down in front of the computer again and ... write about it.

I know the feeling, believe me. (I've felt it plenty when writing this book!) Cloud Resume Champions often complain, only half tongue-in-cheek, that doing the blog writeup is the hardest part of the challenge. I am

imploring you, though, not to skip this step. It's kind of the punchline of the whole challenge. It's a signal to the world that you are participating in the cloud community, that you are giving back to future challengers, and that you are serious about leveling up your cloud career.

Recruiters may read it. Hiring managers may read it. Basically, the upside is unlimited and the downside is nil.

So just suck it up and write the dang blog, then share it on LinkedIn and Twitter. Worst case, you end up with good notes on what you built so that you can review them when prepping for interviews.

Realistically, you'll get some love from your network, and a few followers who are interested in what you build next - which is a great kickstart for a blogging habit that will grow your career over time.

Best case ... well, best case, your blog goes viral like Daniel Singletary's. I'm not promising this will happen to you. But, having reviewed hundreds of challenger blogs, I can provide a few tips to help you stand out from the crowd.

Include a diagram

This is the #1 pro tip for a great blog, right here. People love pictures. Make a little architecture diagram of what you built in Lucidchart or draw.io. Share it as a standalone image on social media along with the link to the article. It will get engagement, guaranteed. ([Here's an example of a challenge blog](#) that makes great use of images.)

Make it about you, not about the challenge

The Cloud Resume Challenge itself has been explained and analyzed to death by the last six hundred bloggers. Your troubleshooting experiences are probably not unique. What is unique is you. Why are you undertaking the challenge? What unusual skills do you bring to the table?

Go back and review Daniel's [Plumbers Guide to Cloud](#) again. Notice how he reflects on his plumbing skills and how they helped him learn to code. What life experiences do you have that helped you crack the challenge? [Another challenge champion blog that I really like](#) talks about the author's experience with mainframes,

and how it felt to transition to serverless applications. That's an interesting story!

Other marvelously unique champion blogs I've seen recently include [this dentist who compared CORS errors to pulling teeth](#), or [an audio engineer reflecting on how his experience mixing live events translated to cloud](#). Take a minute to read these stories and think about yours.

Framing your blog as a journey of personal discovery and growth, rather than a technical tutorial, will help you get more traction when you share it.

Consider focusing on your mods

While many people have completed the Cloud Resume Challenge, not too many have gone above and beyond and completed the mods suggested in this book. If you followed, say, the security track, consider framing your blog post around that - "How I improved the security of the Cloud Resume Challenge" is an interesting post in and of itself.

Likewise, you could scope your blog to a part of the challenge where you spent extra time. If you did a bunch of work figuring out how to

connect API Gateway, Cloud Armor, and a global load balancer, that's your blog right there. It's often better to be small-scoped and detailed rather than all over the place.

Don't ramble on

There's a famous line, "If I'd had more time, I'd have written less." Short and to the point wins in our hyperinflated attention economy. If your blog is more than a thousand words, you're probably rambling on. Save your in-depth observations on every error message you Googled over the past six weeks for your personal notes. Just focus on the takeaways that can benefit everyone.

Tag me

Seriously! I read and comment on just about every single Cloud Resume Challenge blog that I get tagged in on [LinkedIn](#) or [Twitter](#) (I'm @forrestbrazeal in both places). I'm always happy to help boost your reach.

Ian's Story: Writing a Blog That Gets Exposure

Ian Cahall's [May 2022 post](#) caught my attention as a strong example of a Cloud Resume Challenge blog. I reached out to him a few weeks later to hear about his strategy - and his results.

Forrest: I noticed you chose to write your blog post as a LinkedIn post rather than on a separate site like Dev.to or Medium - why did you decide to do this, and do you think it made a difference?

Ian: I actually think using LinkedIn's Article Publishing tool serves a number of purposes when writing a blog like this. First, the editor is easy and simple to use, so there's a low barrier to entry in making a good looking post. Second, and importantly, discoverability is significantly boosted as it integrates your profile and personal branding throughout the post. Finally, the out-of-the-box analytics that LinkedIn provides offer some benefits other sites won't - like viewer demographics (job title, company), impressions, etc. My CRC

post got WAY more engagement than most of my other posts both in viewership and interactions (likes, comments, click-throughs).

Do you consider yourself an experienced blogger, or was the process of creating the writeup new for you?

I'm not incredibly experienced in blogging specifically, but I've got some experience with Social Media presence and branding both professionally and personally. Writing a post that was specifically tailored to a technical project like this was new, though.

What happened after you published the post?

In the ~4 weeks since I published the post, two major shifts have occurred from a career perspective:

- I've been contacted an average of 5-6 times per week by recruiters for open opportunities. Not all have been cloud-related, but the increase in contacts has been drastic for both cloud and non-cloud IT role

opportunities. I'm preparing for my first cloud security interview as I write this.

- I've made connections with incredibly supportive members of the cloud community who see completion of the challenge as instant credibility and are willing to refer me or make introductions in places it makes sense.

Helpful resources

Blogging platforms

If your resume site itself has blogging capability - perhaps because you used a static site generator with a blogging theme - then the best possible thing to do is host your blog there, under your own domain name. "Owning your own words" helps drive traffic to your site over time, and could be the start of an ongoing blogging habit that will pay all sorts of career dividends.

If you don't want to host your own blog, don't worry - there can also be exposure advantages to publishing on a third-party blogging platform. At the moment I think Hashnode is my top recommendation, followed by Dev.to. Medium has declined in quality in my opinion, but you

may find their network effects somewhat helpful.

As indicated in Ian's story above, a lot of people get the best traction by cross-posting their story directly to LinkedIn as an article.

Writing help

I've heard good things about Philip Kiely's [Writing for Software Developers](#) (a paid resource). You can also feel free to share a draft of your blog in [the CRC Discord server](#) for feedback at any time.

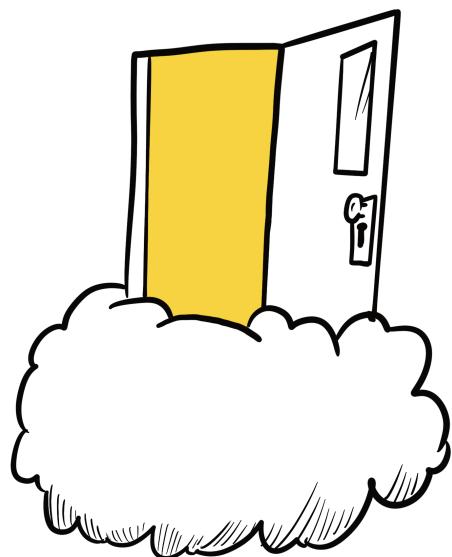
Pause to reflect

You're done. You did it. The Cloud Resume Challenge is behind you, and I couldn't be prouder of your achievement.

Make sure to share your blog on social media, and then take a well-deserved rest.

The only question left is the biggest one of all - what's next?

Part 3: From challenge to career



You did it. You really did it. Congratulations. You completed the entire Cloud Resume Challenge. You wrote the blog. Maybe you even did a couple of the extra mods in this book.

And maybe you did all that work just for fun. (I've met a few who have! No judgment, but you're cut from different cloth than most of us, that's for sure.)

No, it's much more likely that you completed the challenge with bigger things in mind. A promotion. A better job. Maybe even your *first* job in cloud. And that achievement is absolutely within your grasp.

While the challenges in this book can be a great advantage that set you apart from other job candidates, you have to know how to use them, and how to fill in the other gaps hiring managers may be interested in.

In the final section of this book, I'll share several essay-style pieces to help you connect the dots between the Cloud Resume Challenge and a cloud career.

What is a "cloud job", anyway?

You probably bought this book because you want to get a "cloud job". Perhaps you currently have some sort of IT job that doesn't seem especially cloudy to you; or perhaps you are working in a field that is only *literally* cloud-related, like weather reporting or aircraft maintenance, and now you would like to start using the cloud as a *metaphor*.

Odds are, whatever your background, you're interested in a cloud job because you have heard that people who work in the cloud make excellent salaries and likely will continue doing so for a long time to come. And this is pretty much true. You may have seen the industry studies that show people with cloud certifications earning six-figure salaries after just a couple years of experience. You have certainly noticed that seemingly every single aspect of your life has migrated to the cloud, from your family photos to your pizza orders, and *somebody* is going to have to do the job of maintaining our digital lives for the next few decades.

The history of the cloud job

So what is a cloud job, anyway? To answer that, we need to dig into a little bit of history.

The first IT jobs

In the beginning, there were sysadmins. System administrators guarded access to the UNIX-based corporate computer systems of the 1970s and 80s. They installed programs, made backups, tuned databases and networks, and figured out how to solve strange errors with manuals in hand, long before StackOverflow. Their jobs were lonely, and their knowledge was often tribal or documented only in their own heads. Their natural adversaries were developers: the people who wrote the software programs that sysadmins had to figure out how to keep running.

The "golden age" of IT: everybody has their own servers!

Over time, as companies moved from mainframes to client-server setups where every employee had their own PC, IT also became more specialized, with the central role of operating computer systems splitting into many functions:

- **Database administrators (DBAs)**, who installed, backed up, and tuned the performance of centralized database systems like Oracle and SQL Server;
- **Network admins**, who configured hardware devices called routers, switches, and firewalls to ensure that information traveled quickly and safely both within the company's internal network and across the public internet;
- **Storage admins**, who managed the arrays of storage disks that physically contained the data used by applications;
- **Linux or Windows system admins**, who installed and maintained the operating systems (OSes) used by application and database servers, as well as the applications running on top of the OS;
- **Security admins**, who specialized in keeping systems free of malware and unauthorized people from accessing sensitive data;
- **Corporate IT admins**, who made sure everybody in the company had the hardware, software, and access necessary to do their job;
- And, of course, the customer-facing **support teams**, including the

much-abused **help desk** that handled basic user requests like password resets and computer restarts.

A former coworker of mine once referred to this era, wistfully, as the "golden age of IT." And maybe it felt that way. Every company had their own full-stack IT staff! You could find a job managing servers for a local pet food manufacturer just as easily as at a Silicon Valley software company. But there were plenty of problems under the surface.

Unlike the old-school sysadmins, who mostly typed commands into text-based terminals, these new "ops people" often used point-and-click GUI-based management tools, many created by Microsoft. But software developers and quality assurance testers, the people who wrote and validated the programs running on top of all this infrastructure, continued to exist in their own separate worlds, often just handing off code for deployment with little context on how it worked or why.

That meant that releasing new software features was frequently a manual process, taking weeks or even months to roll out code changes to users. (You can read a gruesomely

realistic account of one of these releases in Gene Kim, George Spafford, and Kevin Behr's essential novel *The Phoenix Project*.)

During the late 1990s and early 2000s, the first successful internet companies like Google and eBay began to explore more efficient, reliable ways of delivering their biggest competitive advantage - their websites - to enormous numbers of users all over the world. Manual tweaks to small numbers of servers just wouldn't cut it anymore. They realized that the creation of infrastructure - servers, networks, databases, and so on - needed to be automated just like user applications. Huge datacenters sprung up to handle this user load, and with them, new ways of "virtualizing" infrastructure resources so that they could be brought online using code and configuration files.

Increasingly, it became clear that the next generation of IT professionals - those DBAs, network admins, and security folk, plus plenty of old-school sysadmins - would have to learn to code. They would have to retire their rickety scripts and work much more closely with developers to adopt standardized automation tools for building and releasing software.

Otherwise, the massive scale of these hosted data centers - which some people were beginning to call "the cloud" - would flatten them.

The emergence of the cloud job

This new alliance between developers and operators became known as DevOps, and it remains an uneasy and much-misunderstood arrangement. But what it has definitely accomplished is a massive shift, really a split, in opportunities for people with an IT operations skillset.

There are still plenty of traditional IT jobs out there: managing databases, servers, networks, or security for companies whose infrastructure may be hosted in their own data center.

Change is slow, and these jobs are not going away anytime soon, but they tend to be less well-paid and easily disrupted; increasingly, they are doing manual work that is handled better by cloud services.

(On the flip side, the cloud companies themselves have plenty of jobs for ops specialists now! We've just moved from *every company* needing a full-stack IT staff, to mostly

software infrastructure companies needing those specialists.)

And then you have the "cloud jobs" - designing and configuring infrastructure for companies whose applications run in the public clouds like AWS, Microsoft Azure, or Google Cloud. These jobs typically require more programming skill - you won't survive by pointing-and-clicking - and a broader understanding of how systems are architected for the cloud. That's why they're more valuable in the marketplace. Some example roles in this new world include:

- **Cloud engineers, DevOps engineers, site reliability engineers, infrastructure engineers, or platform engineers** - titles often used interchangeably, but with very different responsibilities depending on the company. At some companies, these jobs are really software engineering jobs, embedded on software development teams, with a specialty in automating and maintaining the cloud infrastructure that applications run on. At other companies, you may find yourself on a "platform team" that mostly creates cloud guidance, guardrails, and tooling

for development teams to consume. And at some places, who've paid lip service to the concepts of "cloud" and "DevOps" but never really embraced the intent behind the buzzwords, you may find that you're pretty much still on a traditional ops team.

- **Cloud architects** or **cloud solutions architects**, who take higher-level responsibility for designing and implementing distributed systems that perform well at cloud scale;
- **Release engineers**, a subset of DevOps engineers at software companies who are hyper-focused on streamlining the pipelines that ship code to users;
- **Cloud network administrators**, who design the software configurations for network resources in the cloud;
- **Cloud data engineers** (a fast-burgeoning specialty!), who design the data pipelines and compute arrays used in data science and machine learning workflows;
- **Cloud security engineers**, who stay on top of the unique security challenges of applications running on cloud-hosted infrastructure;

- And, of course, the customer-facing **cloud support teams**, including the much-abused **help desk** that handles basic user requests like password resets and computer restarts. (That's never going away - sorry!)

So, after all of that: what is a "cloud job"?

My opinion is that being a cloud engineer - my catch-all term that encompasses most of the roles listed above - means learning to become a great operator. In that sense, the job hasn't changed since the sysadmins of the 70s. Your role is to think critically and constantly about how to ship code to production more quickly, safely, and reliably. To run systems that are resilient to failure and - just as important - able to seamlessly scale to handle success. If you can do that, you'll have great job security no matter what titles they're using in 5 years.

What does a "day in the life" look like for a cloud engineer?

As with most technical questions, the lazy answer is "it depends". But here are some things you might expect to be doing on a typical day as a mid-level cloud engineer. (As a junior, replace most of these things with "sitting

next to the mid-level engineer, watching them do it, and asking questions.")

- Writing automation for cloud resources such as servers, databases, and security policies
- Creating automated pipelines to build and release software changes
- Writing code to build tools that developers in your organization will use to help them create and deploy cloud software
- Getting an alert to your phone that a cloud system is misbehaving, and jumping on a call with two other engineers to figure out what is going wrong and fix it quickly
- Writing some automation to migrate an old key management server to run on cloud services
- Doing what Charity Majors, in [her essential piece on the future of "ops jobs"](#), calls **vendor engineering** - solving a business problem by evaluating and gluing together various tools and services created by cloud providers and other SaaS vendors
- Spending a lot of time reading documentation trying to figure out how a

new service works - because the cloud changes fast and there's more to know than anyone can hold in their head

- Probably sitting in some meetings, attending some trainings, and doing other corporate desk-job things

Hey, many of those things sound like steps in the Cloud Resume Challenge! (Except the part about meetings. The Cloud Resume Challenge contains zero required meetings.)

Is there actually such a thing as an "entry-level cloud job"?

If you ask this question on Reddit, as people do every day, you will probably hear a resounding NO. "Get some traditional IT experience first," many will say. "You can't build cloud systems without understanding the way we built things before the cloud."

In my opinion, this advice is gatekeeping nonsense. The whole point of cloud was supposed to be creating higher-level, abstracted ways of building so that new engineers don't have to recapitulate the entire history of IT on their resumes in order to get hired. If there really is no such thing as a junior cloud engineer position after 15 years of

modern cloud evolution, that's a pretty sad indictment of our industry.

But thankfully, there IS such a thing as an entry-level cloud job. Throughout this book, you'll read stories from a number of Cloud Resume Challenge graduates who've transitioned to associate-level cloud or DevOps engineering roles from non-technical backgrounds. These stories are inspiring, but they're not miraculous. You can do this too.

It will not necessarily be easy, and it may take longer than you'd like. The grain of truth behind the conventional Reddit wisdom is that lots of teams don't know how to hire, support, and develop junior engineers. That problem is much older than cloud and affects all areas of tech - and it's even worse in our current remote-heavy work world.

For what it's worth, I find that big companies tend to have better hiring processes and onboarding support for junior engineers than startups do. For example, the three big cloud providers all have great programs for bringing on associate cloud solutions architects - and if you can complete this challenge, you'll know

many of the things you need to excel in an interview.

Remember, every person trying to tell you you don't belong in this industry yet was once a junior too. They made it because somebody took a chance on them. And despite what Reddit says, there are chance-taking hiring managers in tech. (My first boss was one of them.) Often, those managers come from non-traditional backgrounds too. They understand how to mentor, and they're looking for people who are self-directed, self-motivated, and aren't afraid to learn. By doing projects like the Cloud Resume Challenge, you'll start to increase the chances of connecting with one of those people and getting your first big chance - so that someday, you too can pass that chance along to others.

Getting unstuck: the underrated skill of asking for help

Here's the most common way people start a question about their Cloud Resume Challenge project: "Is it cheating if I ...?" (...use a static site generator, look at someone else's code repository, work on the challenge with a friend, etc, etc.)

I try to help those people understand that this is the wrong way to frame the question. "Cheating" is a concept from school. We are not in school here.

The goal of the project is to learn, so if your approach to solving the Cloud Resume Challenge is to copy and paste someone else's project without deeply understanding what you are doing and why, then the only person being cheated is you. You will not have interesting stories to tell in a job interview; worse, you will not find out if cloud building is really something you enjoy.

But assuming you are approaching the challenge in good faith, I would not be too worried about consulting existing resources like

blogs, tutorials, and other challengers. In fact, figuring out how to make appropriate use of help is one of the most valuable - and underrated - skills you can hone through this project.

Again, we're not in school here. In the professional world of IT, there are no bonus points for cloistering away in an ivory tower and figuring out a difficult problem all by yourself. You will likely be working on a team made up of people with different strengths and weaknesses, and your primary goal will be to solve problems *quickly and adequately*, rather than *individually*. That means strategically leveraging the help of teammates or internet resources who may know more than you.

But other people's help is a constrained resource; they don't have unlimited bandwidth to assist you, and in fact will be significantly MORE likely to lend a hand if you have done some investigating on your own. (We might call this the "God helps those who help themselves" model of debugging.) So knowing when and how to escalate a problem is critical.

Let's use the Cloud Resume Challenge as an example scenario to walk through how we can

practice proper asking-for-help skills. Suppose you're trying to get the visitor counter working on your resume site, but when you refresh the web page, the counter does not update.

What NOT to do: The Well of Despair

The worst thing you can do in this situation is to just start changing random things in your code, or Googling broad queries like "Javascript fetch statement not working". The responses to that search are probably not going to yield specific information that's relevant to your problem. Keep going down this rabbit hole, and you'll find yourself on the tenth page of search results, reading an unanswered Tom's Hardware forum post from 2003. This is how you get Stuck with a capital S: at the bottom of a deep well, with no handholds or even a shaft of light to give you hope you might find a way out, as hours turn into days. It's frustrating and demoralizing, both to you and (if you carry this style of troubleshooting over into a job) to your manager. Believe me, I know; I've been down that well myself.

Three steps to get back on track

To get out of the Well of Despair, you need a plan.

1. Set a time limit to get yourself unstuck

Recognizing when you're really blocked, and that spending more time beating your head against the problem isn't going to do any more good, is an important skill that comes with practice. In the meantime, it's not a bad idea to set a timer: "If I can't figure out why my visitor counter isn't updating after 30 minutes, I'm going to ask for help."

Within that 30 minutes, your goal should be to break down your big problem (my visitor counter isn't working) into the smallest problem you can (I am getting this weird error message and I don't understand what it means). Some basic troubleshooting steps to try:

- **Get comfortable with the developer tools in your browser.** Right-click in Chrome and click "Inspect", and a whole new window on the world opens up to you. Your Javascript isn't behaving? Look in the Console tab and see if an error message appears. Your CSS doesn't seem to be applying to your HTML? Check the "Sources" tab and see if it really got downloaded from your

CDN. Your API isn't returning what you thought? Explore the "Network" tab and see what request you really sent and what response you got.

- **Don't gloss over error messages.** I see lots and lots of questions in the [Cloud Resume Challenge Discord server](#) that boil down to "I got a stack trace; now what do I do?" Answer: read the stack trace! It looks scary, but most of it is just pointing you to the line of code that broke, and there will usually be an error message at that line explaining what happened. Is it saying something about authentication? Sounds like you have a permissions issue. Is it saying that the hash key you referenced doesn't exist? Sounds like the object you're working with doesn't have the data you expected; you should log that object and find out what's actually in it. Which leads to:
- **Log like a lumberjack.** In the world of serverless computing, you can't SSH into a server; your window into what's happening is limited to the logging statements you emit from your code. Log the contents of objects and the

responses of API calls until you understand the behavior of your code.

- **Shorten your feedback loop.** If it takes 5 minutes to rebuild and deploy your code to the cloud every time you test a code tweak, you're going to make slow progress. Look into setting up a local development environment for your code so that you can "fail faster".

If the timer dings and you still haven't made much progress on fixing the problem, then it's time to...

2. Formulate a specific question

Here's the wrong way to ask a question: "My visitor counter isn't updating, can anyone help me?" That question wouldn't get very good results if you typed it into Google, and it's not going to inspire many humans to sit down with you and figure it out from scratch either. It's too general. Instead, try a question like this: "My API returns 0 to the browser when I request the visitor count, but I can see the count updating in the database - here is my function code, can anybody see where the problem might be?"

That question has several good qualities:

- It **describes what you would expect to see happening** (the browser's visitor count widget updating) versus what is actually happening (returning 0)
- It **includes a couple of things you've already tried** (checked the API response, checked the database), to help narrow down the source of the issue
- It **gives enough context for someone to help** (the function code), rather than asking them to guess.

I would suggest typing out your question two or three times before putting it in the CRC Discord server or messaging it to a friend, just to make sure it includes these attributes - and also because it's hilarious how often just carefully writing out your question forces you to think through it systematically, which leads to you solving your own problem without needing to wait on anyone else.

If you find that you can't express your question coherently - say, because your question is "how do I write Javascript?" - then it's time to go back and do a little more learning, maybe run through a video course or a tutorial on the

technology in question, before you tackle this problem.

3. Build relationships

The most reliable way of getting help, especially from strangers on internet forums, is simply "being a person people want to help," which starts with asking good questions but also includes being a positive contributor to the community. Don't be the person who always takes but never gives; stick around and answer other people's questions too. It turns out that researching or troubleshooting someone else's error is *also* a great way to learn - and great job practice, too.

Even if you do all these things, you may still occasionally find yourself staring into the Well of Despair. Google's no help, your troubleshooting skills are maxed out, and nobody's responding to your question in the Discord server. If that happens, I would suggest getting up from your screen, going outside, and delegating the problem to Tomorrow You. It's amazing how revelatory a simple walk around the block can be.

The career-changing art of reading the docs

Even if you don't have any aspirations to build a public following, there is tremendous career value in becoming the go-to person within your technical niche.

The person who everybody on your team comes to with their toughest question about that language or framework. The person who knows where all the bodies are buried in ActiveDirectory or Typescript or DynamoDB. Those folks have great careers and job security because authoritative knowledge like that is rare.

To some extent, it's rare because wisdom only comes with experience. But I know plenty of engineers who've sat in the same chair for ten years getting the same year of experience ten times. Heck, I've been there myself; I spent a couple of years as an "accidental DBA" who never really learned that much about SQL Server beyond what the daily firefighting required.

I used to spend a lot of time wondering how other people seemed to level up so quickly on

new technologies. How do you break through that stagnant cycle of learning and forgetting stuff in bits and pieces, using the same technology for years without ever feeling like an expert?

A few years ago I learned a secret for doing this, a cheat code if you will, from my friend and AWS Hero Jared Short. This is his secret recipe for leveling up in tech:

Read the documentation for one job-relevant technology, cover-to-cover, every week.



Jared Short
@ShortJared · [Follow](#)



Forrest is giving away my secrets, but it's true. I'd estimate around 700+ hours of just reading AWS docs over my career with intent to retain / learn (not just reference). It feels silly until you almost immediately understand some esoteric side-effect or behavior.



Forrest Brazeal @forrestbrazeal

Want to become an AWS Serverless Hero? Read the docs.

Srsly. @ShortJared's secret weapon for career success is that ... he reads the docs. Really reads them. Over&over. It's simple but not easy.

That lets him perform feats of knowledge magic like you see in this thread.

2:41 PM · Jan 8, 2021

(i)



69



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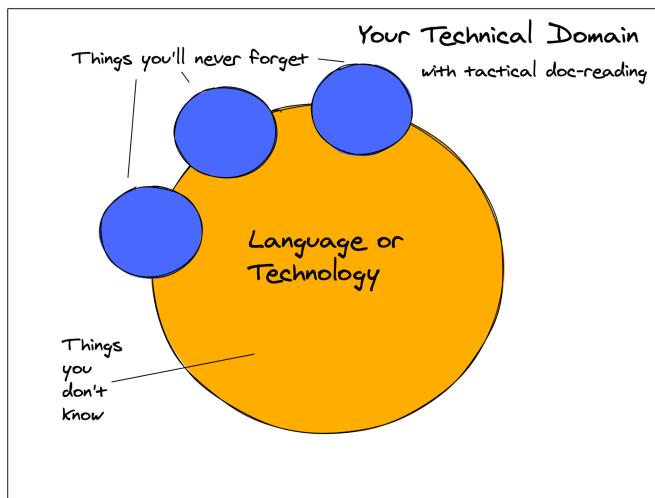
Reading docs: the wrong way and the right way

I get it, that doesn't sound revolutionary. "RTFM" is literally as old as computing itself. It's the classic kiss-off answer to questions you ought to be able to Google.

And that betrays a key limitation in how a lot of us think about documentation. We think of it

tactically, as a resource to query when we have a specific question or encounter a particular error. We use docs to fill in our *known unknowns*.

That's how you can get stuck for years, say, administering a PostgreSQL cluster and never really becoming that deep of an expert on Postgres. If you only learn something new when the situation demands it, your mental model of Postgres (or whatever) will look like a gradually expanding version of this:

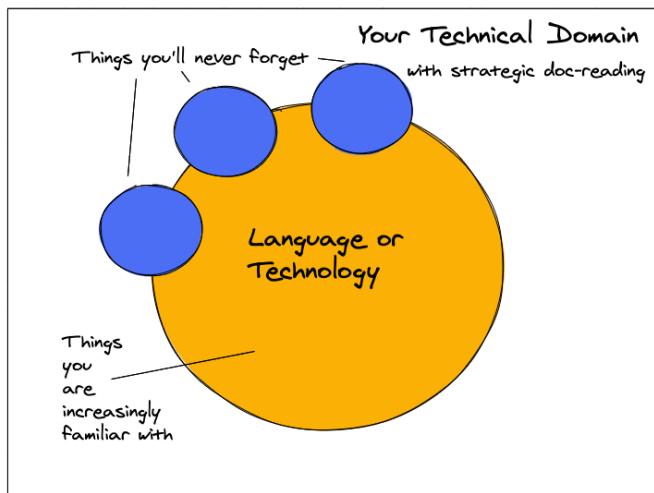


Over time, as you encounter more new use cases for the technology, you'll burn more

“never forget” bubbles into the mental model. But you’ll still have this heavy sense of unknown unknowns hanging over you, and you’ll never be sure if you’re really using the optimal approach to solve a new problem.

Instead, Jared’s approach is to read docs strategically, preemptively, curiously: as a way to fill in your *unknown unknowns*. The things you might not encounter in ten years, but that would cost you two days of troubleshooting if you ran into them tomorrow.

Read docs like novels (cover to cover), not like dictionaries (look up the term, cross-reference, and stop). Over time, that strategy will lead to a mental model of your professional domain that looks more like this:



(This is the same benefit you get from studying for certifications, by the way: you're building a mental map of the domain, so you don't have to stumble through the darkness on every new quest.)

On the surface, that sounds simple, but it's far from easy. Here are three common objections people raise when I advise reading docs as a career-advancement strategy:

"I don't have a photographic memory. I'll never remember a bunch of random docs."

Back when I was in college, a well-meaning friend convinced me I should read a book on SAP. Forget today — I couldn't have told you a

single thing about SAP *ten minutes after finishing that book*. I'd never been inside an enterprise, much less understood the problems these ERP integrations I was reading about were supposed to solve. It was like trying to talk to the aliens in the movie *Arrival*: my brain was the wrong shape.

Likewise, you probably won't get much value out of glancing through docs for a technology you don't use and have no context for.

So do these two things:

1. Focus on docs for technologies you are already using. We've all had that mind-numbing feeling when plowing through some esoteric text that doesn't relate to our daily lives, where you glaze over for three pages and then go, "what did I just read?"

Avoid this by focusing on docs for technologies or languages you've already got a vested stake in – say, because they're on your plate at work or you're trying to build them into a side project.

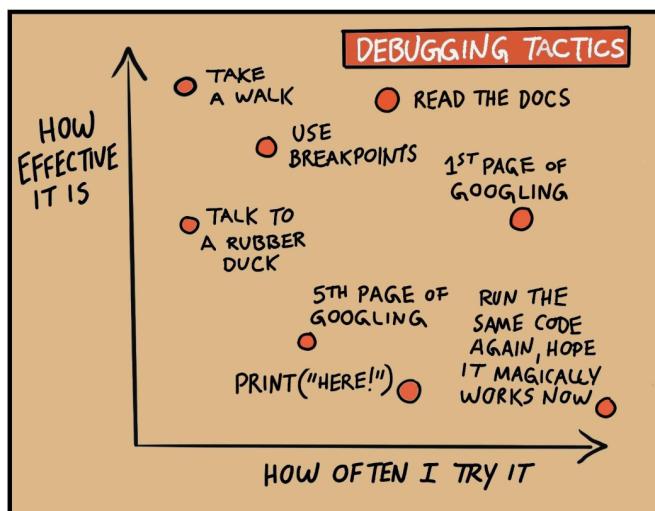
Encourage active reading and engagement with the information by asking yourself questions like these as you read:

- Did I understand that? (If not, maybe read the section again)
- Does what I just read match my existing mental model of how this technology works? (If not, do I need to go review a different doc and then come back to this?)
- Could this feature or fact help me on my current project?
- If I had known this six months ago, what would I have done differently? (“Chosen a different technology” is a totally acceptable answer!)

Then, **2. Read those docs repeatedly, on a schedule, over and over.** Seriously. If you’re on a team that’s building out centralized CI/CD for Google Cloud, maybe read the part of the Cloud Build docs on triggers this week and the part on security next week, and when you get to the end, start over. The cloud changes fast. You’ll fold in new information at the same time you’re reinforcing the old.

“I don’t have time to read a bunch of documentation.”

Yes, and weeks of work can save you hours of planning. Maybe use some of the time you currently spend injecting “HERE” print statements into your code to figure out why it’s not working.



More seriously, it's not a bad idea to block a bit of time on your calendar each day – 30 minutes, even – for targeted doc-reading. You may find it hard to carve that time out of your workday, but defending time and setting expectations with your manager is its own skill, worth practicing. Call the block of time “deep work.” It is.

**“The docs for [technology X] are no good.
Trust me, they’re not worth reading.”**

I don’t always buy this excuse. The docs might not be that bad; you might just have the wrong expectations.

For example, the AWS documentation gets a terrible rap for being wordy and poorly-organized. And it’s maybe even worse than you’ve heard – if you’re trying to look up the name of an IAM action or the syntax of a CLI command, that is.

But as an educational tool that dives deep on the architectural underpinnings and technical limitations of services, the AWS docs are *fantastic*. They’re better than any book you could ever buy about the cloud. (And the Builder’s Library is better still.) The AWS docs are designed not just to be referenced, but to be read. Read ’em!

On the other hand, some types of docs like step-by-step tutorials are very much designed to be referenced during hands-on builder time. It may not make sense to spend a lot of time reading those in the abstract. So bring your common sense.

However, there are also plenty of technologies out there where the docs are truly incomplete, out of date, or just plain wrong – many smaller open-source projects, in particular.

Turns out you have another option here, at least for OSS projects: *read the source code*. Not sure what a module does, what its edge cases are, what the error code means? Read the source code and find out! It might be faster than (and will definitely be at least as accurate as) looking for the answer in the docs, *even if the docs are pretty good*.

If you write code for a living, reading other people's shipped, battle-tested code — not just PRs from your own team — is genuinely one of the most transformative things you can do for your career. Because while you're answering your immediate question, you'll also be picking up style, organization, and technique from professional programmers operating under all kinds of interesting constraints. Seriously. Read code.

(And then, if it's open-source, maybe consider contributing some docs!)

What do I get out of all this?

If you read a targeted set of docs consistently over a sustained period — say, a couple of years — while actively practicing on that technology, you will be able to perform magic. That's a promise.

Let's go back to Jared Short again for an example. (Yes, I checked with Jared, he graciously agreed to let me spill his secrets in this piece.) As an engineer at an AWS shop, Jared ...

- Reads the documentation for one AWS service, cover to cover, every week.
- Blocks daily time for this on his calendar.
- Focuses on services he's actually using at work (he tells me that so far in 2021, he's been through all the docs for Lambda, AppSync, and Step Functions).

Jared's been doing this week in, week out, for *years*. And that unglamorous commitment lets him perform nerd magic like this:



Bryson Tyrrell @bryson3gps · Jan 8, 2021



Replying to @ShortJared and @edjgeek

@ShortJared did you happen across this recently as well and went digging or just a happy coincidence?



Jared Short

@ShortJared · [Follow](#)

I needed to understand extensions better for a thing, read the docs cover to cover like an insane person.

1:34 PM · Jan 8, 2021



29



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If you don't want to take the time to read [that whole Twitter thread](#), let me sum it up for you.

1. An experienced AWS engineer encounters a weird behavior: AWS Lambda seems to be executing code when it should not be. He posts a plea for help on Twitter.
2. Other experienced engineers take a look and go, "huh. Weird." To be clear, this is not a case of RTFM. The problem is nontrivial and the solution, if there is one, is not well-known. Somebody starts tagging in AWS employees for advice.
3. Jared waltzes in and immediately suggests an answer: Lambda is tripping

an error during its startup sequence and resetting the execution environment.

Jared guesses this even though he's never encountered that specific situation, because he has internalized a passing reference in the docs for Lambda Extensions – *a totally different feature* – and intuited that the underlying behavior must be the same.

4. AWS employees confirm that Jared is right.
5. The legend of Jared grows slightly bigger. Guess who's gonna get tagged *instead of the AWS employees* next time there's a weird Lambda problem?

That's how you become an AWS Hero or a Microsoft MV, folks. Or at least a hero on your engineering team. It's how you level up, get known, get paid, get promoted.

Don't wait for knowledge to find you through years of inefficient trial and error. Go get it. And the most convenient, comprehensive place to grab it was there in front of you all along.

Read the docs.

Mapping your path to a cloud job

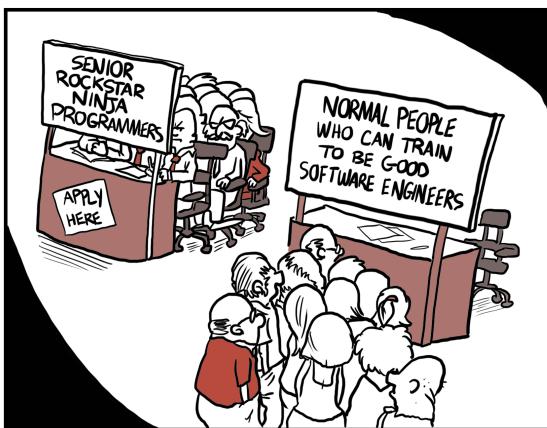
I find there are two main categories of people who read this book:

- People with no professional technical background at all
- People who have worked in some older form of IT, but have little or no experience with cloud technologies

While the challenges in this book can be a great advantage that set you apart from other job candidates, you have to know how to place them in the context of your existing experience, and how to fill in the other gaps hiring managers may be interested in.

Getting hired without tech experience

For hiring managers, real-world experience trumps everything. Certification, formal education, side projects -- they all have value, but someone who's Done It Before and gotten paid for it will always have the upper hand in an interview.



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Don't be discouraged, though. You can absolutely compete and win junior-level cloud jobs without previous IT experience. The Cloud Resume Challenge is your ace in the hole here. Remember, what you're building is real, and it's complex enough that many of those "experienced" people - even, in some cases, the hiring managers themselves! -- have never done anything like it.

You will, however, likely need a bit broader and deeper background to really pass a cloud interview.

FAQ

How long will it take me to get hired after completing the Cloud Resume Challenge?

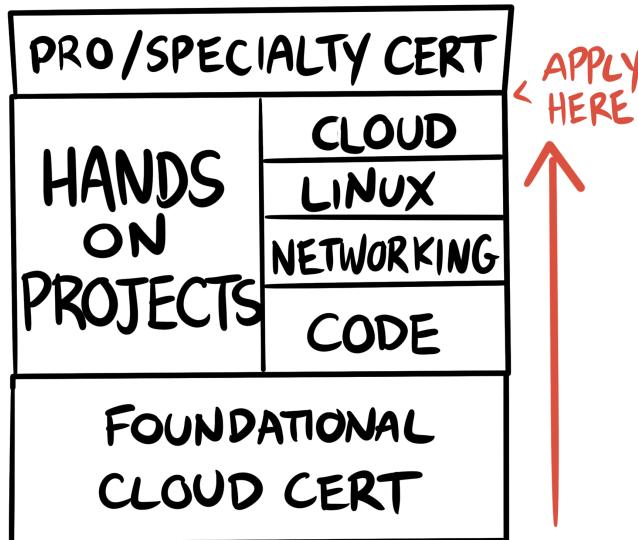
One to twelve months is the average from career-changers I've heard from; however, this is a biased metric that probably self-selects for success. The odds of getting hired will greatly increase if you work on all elements of the "skill stack" shown in this section.

Check out [the detailed post by this Redditor](#) who breaks down all the certs, projects, and skills they worked on over a six-month period before getting hired into a \$70k/year job. One interesting feature you may note in that timeline: they didn't attempt the Cloud Resume Challenge until fairly late in the six-month window, getting hired about 1.5 months later. In the comment section, this person confirmed that they held off on the challenge for so long because they just didn't feel ready for it yet -- and this is totally valid.

Building your skill stack

I encourage aspiring cloud engineers to build a "skill stack" that looks like the following:

THE CLOUD SKILL STACK



Cloud is the latest in a long line of IT paradigms. But though it's highly in demand, "cloud" isn't exactly a skill on its own. Hiring managers are going to want to see that you have knowledge in several foundational areas.

Code

You must be able to write basic scripts. I recommend Python as a programming language to learn — it's used on cloud teams the world over. You don't need to be a rock star at algorithms and data structures, but you

should know how to [manipulate data objects](#) and interact with cloud services.

Networking

You will be expected to have solid familiarity with how the internet works. DNS, TCP/IP, and certificates — these protocols will rule your life in the cloud, where everything is made up of services talking to each other over a network.

Linux

Linux is just as relevant in the cloud as it was in old-school sysadmin jobs. Know how to navigate the Linux filesystem, use Vim and terminal commands, and a bit about containerization.

The friends of the Cloud Resume Challenge behind [Learn To Cloud](#) have lots of resources to help you dig deeper into each of these areas.

When to apply

Once you have built a hands-on project that touches each of the basics listed above, I would say go ahead and start applying for associate-level cloud support and engineering roles. You should continue to improve your skills and level up your resume during this

process by studying for a professional- or specialty-level certification on your chosen cloud, like the GCP Professional Architect. It's okay if you haven't taken the exam yet; hiring managers like to see that you are self-motivated and keep learning on your own.

It may feel uncomfortable to start interviewing at this stage, and you may encounter some early rejection. But the weaknesses these interviews expose will help you keep a short feedback loop to go back and polish up those key coding, Linux, and networking skills.

Plus, now that you've been through the foundational study process, you'll have a better sense of where you might want to specialize, and why. You can share that information in an interview – along with the war stories you picked up from your portfolio projects.

Will the transition to your first cloud job take a lot of work? Quite possibly. You can expect to spend some late nights at the kitchen table and some time down frustrating rabbit holes on StackOverflow. But a few months of dedication here is going to pay lucrative dividends down the road.

Because if you study smart and build your skill stack the way I'm showing you, you won't have to spam out thousands of resumes and wonder why nobody's calling you back, no matter how many certifications you've lined up. The right combination of certs and hands-on builder experience will stand out among the crowd, and that's the fastest way to get ahead in the cloud.

Getting hired with IT experience, but no cloud experience

Often, when I give presentations about the Cloud Resume Challenge, I tend to focus on the stories of people who used it to find their way into cloud jobs from completely different careers, like plumbing or HR. That's because these stories are surprising!

But inevitably, after those talks people tell me: "I want to get into cloud too, but I have 15 years of experience in IT. Can the challenge work for me?"

Absolutely, it can.

Remember, almost 40% of people who undertake the challenge have more than 3 years of professional IT experience. So it can

still be a valuable addition to your resume even if you're not brand new to the industry.

That said, you'll have different challenges - and different advantages - landing a cloud engineering role as a mid-career IT admin or software developer compared to someone who's just starting out.

Exploiting your "unfair advantage"

In the startup world, venture capitalists like to talk about finding your "unfair advantage". What is the thing you do better than anybody else, the thing nobody can compete with?

If you already work in some form of tech, your unfair advantage in finding a cloud job may simply be that *you already work in tech*. You have more connections and more situational awareness. IT is in your blood.

Most importantly, you may have opportunities to get hands-on with cloud at your current work. Is your team doing a migration project that requires somebody to know a little bit about EC2 or VPC? Are you an integration engineer with opportunities to run some scripts in the cloud? Push yourself, get outside your comfort zone, and build your resume.

I suggest a three-step process for converting an existing skill to cloud:

1. Build the thing you know.

Let's say you're a SQL Server DBA, like I used to be. Great! Stand up a SQL Server on a Google Cloud VM. You can do this completely by hand; just ClickOps your way through it in the Google Cloud portal. Your main goal here is the what, not the how: to end up with a running server that executes queries and connects over the same ports you're used to seeing in the old data center. Cloud's not so different after all!

2. Automate the thing.

Now you want to stand up that server again, but do it the DevOps way. Instead of manual clicking in the console, create a Terraform or Deployment Manager config to manage your VM. Bake a VM image that includes your SQL Server. Add some user data automation to get the server standing up the way you want. And throw in a little CI/CD pipeline, just like in the Cloud Resume Challenge, to make sure you're getting that config from your laptop to the cloud

the same way every time. When the end result of step 2 looks like the end of Step 1 ...

3. Convert the thing to managed services.

Now's when you can start looking around the cloud and expanding the circumference of what you already know to things the cloud does a little differently. Hey, instead of rolling your own VM, what would it be like to use Google Cloud's managed SQL Server? What's this "Spanner" thing? You can ask comparative questions that draw on your own experience:

- Where am I giving up control in exchange for lower operations burden?
- What features am I used to that may not be available in this managed service?
- How fast does this service run? If it seems to respond a lot slower than the applications I used to run in the data center, why is that, and is there a fix?

But *be realistic about this*. If the cloud experience you're looking for can't be had in your current role, don't hang around forever waiting for it. It may make sense to start looking for a new position that may not have the fancy "Cloud Architect" title, but will let you

get hands-on with Azure in some capacity. The type of role where previous cloud experience is a "nice-to-have", not a "must-have".

The Cloud Resume Challenge may be a nice assist in helping you stand out for that role - it could be your "unfair advantage" at a crucial moment in your career.

Avoiding a temporary step back

One challenge of revamping your skill set for cloud: you may find that many of the opportunities you get as a junior cloud engineer are a financial step backwards from what you were making in a less future-proof, but more senior role.

Depending on what you're doing right now, it may be difficult to find a cloud-related role that pays what you need. It's a hard sell to go from senior sysadmin to junior cloud engineer. That's why I'm recommending that you try to build cloud skills on the job, rather than starting from scratch.

It's also true that, due to the explosion of remote work combined with the huge demand for cloud talent, more and more companies are opening up to the idea of hiring consultants for

cloud project work. Startups are especially noted for doing this, usually with low friction and a high degree of autonomy.

You may also choose to take a "stepping stone" role, somewhere in between your current IT job and a true cloud engineering position, that lets you use your existing skill set while getting closer to cloud. I've listed several ideas for "stepping stone" roles in [this video](#).

How to effectively interview for work with a portfolio site

a guest essay by [Corey Quinn](#)

If you've taken the Cloud Resume Challenge, it's reasonable to assume that you're looking to start a career in the world of cloud computing. Congratulations or condolences, to your preference.

There's a good chance that in hopes of snaring your next great job, you've built a portfolio website on top of AWS to show off your cloud computing prowess. Unfortunately, the interview process isn't as easy as saying, "Here's the site I built, where's my desk?"

Instead, let's explore how to talk about the site you've built in ways that answer the questions your interviewer has, but likely isn't going to do a great job of articulating.

The three questions interviewers ultimately want you to answer

Every job interview you ever have distills down to three questions, asked in a variety of ways. They come down to your ability, drive, and

compatibility. Cast the questions your interviewer asks through the lens of these high-level questions, and you'll understand where the employer is coming from a lot better.

1. Can you do the job?

Are you crap at computers?

Do you have the raw technical skills needed to do the job? Do you have experience working at similar points of scale? Are you current with the technologies we work with / can become so in a reasonable timeframe?

The hiring manager absolutely needs to have confidence that you can get the job done. It doesn't matter how much they like you, how convenient it would be to hire someone immediately, or how impressive your resume is if you're fundamentally incapable of doing the job that they need done.

2. Will you do the job?

Are you going to rage quit in a month?

Is the role aligned with your interests, or are you likely to job-hop six weeks in and leave the employer back at square one? Will you be happy in the role, or will you hate large parts of

it and constantly try to avoid them? Does the job align with your future plans?

Hiring people is expensive. Once they start, it's even more expensive because now other staff needs to devote time and energy to bringing the new hire up to speed. If you're going to quit before the company has the chance to realize that investment, you're not a solution, you're an expensive problem.

3. Can we stand working with you?

Are you a jerk?

Are you going to pick fights with colleagues? Are you going to interrupt people when they're explaining things? Are you going to presume that your coworkers are fools?

If you're amazing at the role but can't collaborate with other people for more than four hours before they threaten to quit, you're not a hire that any reasonable company is willing to make.

How to show off your portfolio site during interviews

The Cloud Resume Challenge was posted in 2020 and continues to be a popular structure

for folks new to cloud to demonstrate their skills. The challenge outlines requirements for cloud career hopefuls to go through the process of building a blog on top of AWS and creating a blog post. This includes:

- Passing the entry-level Cloud Practitioner certification.
- Creating an HTML version of your résumé.
- Styling with CSS.
- Hosting on S3.
- Configuring DNS correctly to get TLS working
- Enabling a counter with Javascript that stores its data inside of a database.
- Building an API in Python for the previous two things to communicate.
- Testing for the aforementioned Python.
- Making sure all of this lives in GitHub, via "Infrastructure as Code."
- Putting in place CI/CD for both the frontend stuff as well as the backend.
- Above all else, writing the blog post!

If it wasn't clear, this is a lot of stuff.

It touches basically everything under the sun in terms of cloud skills. It requires research and

asking for help. In the process, you'll discover some aspects that naturally align with how you think while other stuff remains a mystery to you.

In the context of an interview, if you say building this site was all easy, absolutely nobody will believe you. Be prepared to talk about what parts were easy for you, which parts were challenging, and why you made the choices that you did. Be prepared to pull up different sections of the code you wrote (this is part of the reason to keep it in GitHub—easy demonstrations mid-interview!) and show the parts you're particularly proud of. Be prepared to explain any aspect of your code in terms of why it works the way that it does.

Let me underscore the importance of being prepared. It may take you a minute or two to come back up to speed if it's been a few weeks or months since you built your portfolio. Most of us see code we wrote six months ago as having been written by a stranger.

Talk through your thought process during the interview. You want to show the interviewer how you think.

Reminder: Interviews are two-way streets

If your interviewer makes comments along the lines of "that doesn't seem hard to me" or is otherwise dismissive of your portfolio, it's a red flag.

Someone who's universally good at everything contained within the Cloud Resume Challenge is an incredible rarity. Prospective employers who don't recognize that are likely to have incredibly unreasonable expectations for their staff. I'm pretty good with the cloud stuff myself, but the JavaScript, CSS, and testing portions are all things I'd struggle with if I personally did the challenge.

I absolutely understand being in the position of "I need a job, any job." I spent a lot of time there myself in my early career days! But if you have the luxury of being picky, the first thing I'd veto is obnoxious managers and colleagues—especially those who underestimate the work and workload. The job and its managers should be as good a fit for you as you are for them.

Remember those three questions an interviewer is trying to figure out the answers

to? You need to find your own answers to them, too.

1. Can I do the job?
2. Will I do the job?
3. Can I stand working with you?

If the answer to any of these is “no,” you should think long and hard before accepting the job.

Tech takes a backseat to company culture and learning

A lot of folks are very picky about what technologies they'll work with. I get it! If I were taking a cloud job, I'd be far less useful in a shop that used Azure than I would one that used AWS. But I'll put even that preference in the backseat compared to how I'd consider working somewhere that didn't treat people like human beings.

Technologies come, and technologies go. The danger in tying your identity so closely to a particular stack is that when the technology starts to be supplanted in the market, you're more likely to dig in your heels and resist the change.

It happens to all of us. I started my technical career as a large-scale email systems administrator. The SaaS wave started supplanting email because most companies don't need a dedicated on-site email admin when they're using Gmail or Microsoft 365 to serve their email needs. It was apparent that this wasn't going to be something I could coast on for the next four decades, so it was time to improve my core skillset and embrace something else. I focused on configuration management for a time, using tools like Puppet and SaltStack—and then it happened again. Containerization and "immutable infrastructure," particularly infrastructure as code, changed that particular landscape.

These days I focus on cloud, specifically AWS. If AWS starts losing market share and mind share, it'll be time for me to once again shift to embrace whatever the market is doing.

One thing about technology that stands in stark contrast to many other professions such as accounting, law, civil engineering, and many more: Today's "state of the art" is tomorrow's "how legacy companies do things." You'll be forced to learn new things and experiment wildly as you evolve your career, and so will

the companies you work for. That's going to be something you need to take to heart, lest you wind up with 10 years of experience that's really just one year that you repeated 10 times. "Evolve or die, dinosaur," is the way this industry works.

Networking your way to a job

I have hired many people over my 10+ years in technology, and helped others transition into their first tech jobs through the 26-month life of the Cloud Resume Challenge. In all that time, the worst way to find a cloud job that I have seen is by playing a game I call Resume Roulette.

Resume Roulette: a losing game

Resume Roulette is easy to play but very hard to win. Here are the rules:

1. Wait for random companies to post public job listings
2. Spam out a bunch of applications
3. Hope that some stranger likes your resume enough to set up an interview
4. If you don't strike it lucky, repeat steps 1-3 indefinitely until you get hired or burn out

Do people get hired by doing this? Sure, every day. You can find inspiring stories on LinkedIn of people who sent out 190 job applications, got 10 interviews and 1 job offer. But far more

get discouraged and give up long before then. I know I would.

In fact, when I do hear of someone beating the odds and getting hired after sending out hundreds of cold resumes, I don't think "Wow, that's great perseverance" (although it certainly is) — I think "We are celebrating a broken process."

How hiring happens

Let me tell you what happens inside most companies when they list a public job posting:

1. 150 random people submit their resumes, some of which are pretty good and some of which are pretty bad. Hard to say without really digging in.
2. Three current employees know somebody who would be great in the role, and they submit referrals with a glowing recommendation: "I worked with her at Company X! She would kill at this!"

If you're a recruiter (or especially a time-strapped hiring manager), which resumes are you going to move to the top of the pile?

Many companies offer referral bonuses to their employees for exactly this reason: the best hire is often someone your existing team already knows. And it's much more efficient to vet those people than to do a phone screen with 150 total unknowns.

(Yes, there are a few companies out there, the Googles of the world, that have such a massive recruitment engine that they can reliably crank through hundreds of thousands of unsolicited resumes every year. But you're fighting a numbers game there as much as anywhere else – you're just more likely to get a formal rejection, rather than having your application sit ignored for six months.)

Network Bets: a better game

But that doesn't mean you're stuck on the outside looking in. You should not have to send out 190 job applications to get a cloud job. There is MASSIVE demand for qualified professionals in this field! If you know your stuff, companies should be basically coming to you.

But to come to you, they have to know about you!

So in my experience, the BEST way to get a cloud engineering job is to play a different game, one we might call Network Bets, a game with many ways to win but just two rules:

1. Own your credibility
2. Build connections

Owning your credibility

I covered foundational cloud skills in more detail above, so I won't reiterate everything here, but if you're brand-new to cloud you need to make sure you have:

- A solid ability to write code in Python or another common back-end language
- Hands-on familiarity with Linux and network fundamentals
- A foundational cloud certification or two

If you don't get your feet under you here, you're just going to be demoralized coming out of interviews. I don't want you to be demoralized! I want you to skip to the head of the line.

Getting proficient at code, networks, and Linux (not a rockstar! Just the basics!) is your cheat

code. Seriously. Do it. You can get there faster than you think. Projects help.

Building connections

Yes, this is the part where we talk about networking. No, not about getting your CCNA, I'm talking about knowing the right people to work with.

I've noticed that a lot of engineers tend to bristle when faced with the idea that they might have to network in order to land a good job: "My skills should stand on their own. My career shouldn't depend on having connections; that's not fair."

But what they are missing is that connections go both ways. You are more than just an interchangeable YAML-generation unit. You are a person with likes and dislikes and personality quirks of your own. There are tech jobs out there that would be toxic for you, where you would not be happy or productive — and plenty more where the work itself simply isn't interesting or beneficial to your future career.

And when you fling random job applications into companies you know nothing about, you face the very real possibility that even if you do

win the lottery and get hired, it'll be on a team that is nothing but bad news.

Networking is your chance to vet the job market at the same time they are vetting you. It lets you figure out the good people to work with, at companies where you will fit in and be set up for success.

But I'm an introvert ... I can't network!

I'm an introvert too! In fact, I'd venture to guess the majority of people in technology are. The amazing thing about building public credibility in tech is that you don't have to go around glad-handing, passing out business cards or whatever. (Not that that would even work!)

As AWS Hero and fellow introvert Alex DeBrie [points out](#), the internet lets you connect with people very effectively through less draining, more asynchronous means.

As long as you are demonstrating passion for your skills in public, you'll find yourself encountering great people and opportunities.

So let's run through three practical ways to make that happen. Here are my cheat codes

for networking your way to a cloud job that will actually be good for you and your career:

1. Find a new niche

If you're new to the cloud, you stand an obvious disadvantage against more experienced people. Many people try to close this gap with certifications, but the most common entry-level credentials are not that impressive to hiring managers. (You have an A+ cert? Cool, so do 100 million other people!)

So the smart move is to stop playing the game everyone else is playing — to skip to the head of the line and get good at cloud services that are so new, nobody has that much experience in them. After all, nobody can ask for 5 years of experience in a technology that's only existed for 18 months.

I'm not talking about becoming an expert in a huge, broad area like the entire Kubernetes ecosystem. You can find a niche here that is really specific. Here is a list of some hot cloud tools and services that are in desperate need of more community attention. There are many, many others; this is just what I could write down in 60 seconds.

1. Config Connector (a Google Cloud service that helps automate Kubernetes deployments)
2. Cloud Build and/or GitHub Actions
3. Serverless workflow services (AWS Step Functions, Google Cloud Workflows)
4. A managed Kubernetes service like GKE, AKS or EKS
5. Popular Infrastructure as Code tools like Terraform or Pulumi

If you get good at any one of these 5 things, you are guaranteed to make some interesting friends and raise your profile as a cloud technologist, as long as you also ...

2. Plug into the community

As you start getting hands-on with your chosen technology, write about what you are learning. I suggest using an established developer blogging platform with some built-in network effects, like [Hashnode](#) or [dev.to](#). For example, if the service you are learning about releases a new feature, write up a short exploration of what it does and why you are excited about it.

Then, SHARE those good vibes! And tag the creators of the feature you are excited about.

Devs love to see their good work recognized, and they will welcome you with open arms.

You will also start to discover Slack and Discord channels, Twitter hashtags, etc, that your chosen community rallies around. Engage with these outlets and note who the influencers are — the people you would want to be your mentors if you knew them.

I highly recommend joining Twitter and following key influencers in your niche. Engage with them, reply to their tweets with questions. People remember people who engage with them positively and helpfully. And you'll start to branch out into other connections as well.

Then, when you see a job opportunity pop up inside that community (which is guaranteed to happen)...

3. Ask for referrals

This feels really uncomfortable at first, but it's way easier than it seems. You can literally just message people who work at the company you are interested in and politely ask for a referral for the open job position. Without pestering, you could even ask if they have any openings

that are not publicly listed. The worst they can do is say no.

But remember – they’re likely incentivized by their company to say yes. And they’re much more likely to give you that boost if you’ve interacted with them by building and sharing work in their space in the past. If you’ve blogged or built open-source projects, they can pass that along to their internal recruiters. And familiarity with them gives you a shared basis of trust to know if this role and company would really be a good fit for you.

I’d also be remiss not to recommend [The Coding Career Handbook](#), written by ex-AWS and Netlify developer (and friend of the challenge) Shawn "swyx" Wang. His book goes into much more detail about how to play and win the online networking game.

Play the long game – it's a shortcut

Landing a job through the Network Bets process — nailing down the fundamentals, finding a cloud niche, and getting plugged into the community — is not necessarily fast. It could take six months to a year or more. But that’s a lot faster than getting a college degree. Plus, you can do it very cheaply and in your

spare time – while building connections that ultimately will pay off for decades to come.

On the contrary, Resume Roulette has no barrier to entry, but is a bad game because it has so many poor outcomes:

1. You compete with everyone else on the job market, decreasing your chances of getting hired
2. You go months or years without getting hired, and you get so disillusioned that you stop searching
3. You actually **do** get hired, but in a job that's not a good fit for you

So be active, not passive. Own your credibility. And create a niche for yourself, don't wait for the perfect opportunity to open up. That's the best way to find a cloud job that becomes the foundation for an awesome career.

Afterword: The side project that made the front page

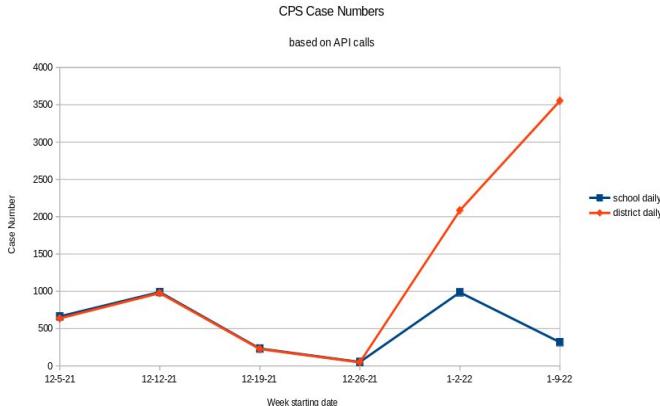
We've talked a lot in this book about the value of cloud projects, both as a way to get hired and for ongoing professional development.

But not too many cloud side projects end up creating [front-page news](#).

The "Chicago Public Schools dad" in that linked article is Cloud Resume Champion Jakob Ondrey, who we've already met in this book as our Chunk 2 case study. He needed a little extra push to make the career transition to cloud after completing the Cloud Resume Challenge, so while still working in the infectious disease lab at Chicago's Lurie Children's Hospital he decided to take on [the COVID case count dashboard project I created at ACG](#). Instead of using the default US case numbers, Jakob scoped his project to focus on data reported by his local schools.

Jakob landed a DevOps engineer job in 2021 on the strength of his project portfolio, but still maintains [his dashboard of CPS COVID cases](#). When the calendar flipped over to 2022, he

noticed something strange: the numbers stopped adding up.



Source: [CPS Covid Twitter](#)

Up until January 2022, the daily COVID cases reported by the school system (blue line) had tracked the overall cases reported in the district (red line) more or less exactly. But right around the turn of the new year, the lines diverged: the district cases shot way up in the midst of Chicago's Omicron wave, while reported school cases actually *went down*.

This didn't seem right. And it wasn't.

Jakob did a deep dive into the data and concluded that the Chicago school system had

intentionally changed their reporting methods to undercount school-related COVID cases — right in the midst of an acrimonious fight with the teacher's union over in-person learning.

He brought receipts to Twitter in a thread that [quickly went viral](#), leading to [national coverage](#), [calls for investigation from city alderpeople](#), and a couple of [suspiciously timed school administrator resignations](#). While the school system claims they weren't being intentionally misleading, they can't argue with his data - and they can't mislead parents anymore, because every news outlet in Chicago ran screenshots from Jakob's dashboard.

Anatomy of the perfect cloud project

I'm shouting out this story for two reasons: 1) because Jakob is awesome and I'm really impressed by the work he's doing, and 2) because his COVID dashboard is, like, the platonic ideal of how to do a cloud side project. Think about it:

He made something useful

It helped that he started with the ACG challenge prompt, which was built around widely-applicable ETL (extract, transform, load) concepts - half of every cloud team's work can be summed up as "take some data from here, munge it into some other format, and then store it over there". He didn't content himself with a "hello world" tutorial; he dug deep enough into cloud services to ship an actual application, something with a defensible purpose in the world.

He made it his own

But Jakob didn't just follow the prompt to the letter. He used it as inspiration to build something that was relevant to him as a Chicago dad: a case tracker for the local schools. This gives the project a unique reason to exist, and also gave him motivation to keep up with it over time. It took almost a year after the dashboard went live for him to catch the issue that catapulted him into the headlines. Who would nurture a side project that long, and pay such close attention to it, if it wasn't personally meaningful?

Plus, he leveraged his domain expertise outside cloud; I'm not sure exactly how much

of his previous experience working with COVID in the hospital system went into making this dashboard, but it's clear he understands how to work intelligently with infectious disease data.

He made it accessible

There's nothing wrong with building a side project that spackles over something deep in the inner workings of a cloud provider. But those types of projects are helpful mostly to people who have experienced a very specific technical pain point. Jakob built something with a public interface that could be understood by hiring managers, angry parents, and obfuscating public officials alike. Long before he ever went viral, his skills had become undeniable.

Bottom line: this is why we need more career-changers in cloud. A hospital background plus cloud ability helped Jakob discover an urgent public health issue that nobody else had spotted. If you're new to cloud (or even if you're not!), what's your domain expertise? How can you stack your skills to build something useful and unique? Something that helps others at the same time that it advances your own career?

Paying it forward

You see, the door to every big career opportunity has two sides. The outside says "Hard work", or maybe just "Luck."

The inside says "Generosity."

Every one of us working in cloud today, senior or junior, got started in our career because someone took a chance. Someone believed we could succeed. And then we busted our tails to prove them right.

I started the Cloud Resume Challenge because I wanted to pay forward that generosity to others. People that didn't look like the stereotypical software engineer.

A commercial plumber in downtown Atlanta. A researcher in an infectious disease laboratory. A single mom returning to the workforce. A [professional poker player](#). All of them brilliant, self-motivated, fast-learning people. Every one of them just needed that little nudge, a quick guide, the right connection, to set them on their way.

The Cloud Resume Challenge is about more than just you and me, a writer and a reader. It's now a community initiative that has touched thousands of people. It's a movement.

It's about the hiring manager who realizes they need to build an apprenticeship program to onboard more junior engineers. The senior engineer who mentors a challenger. The kid who decides to leave a dead-end degree program to build cloud skills.

And every blog post you write, every project you share, spreads the movement a little further.

When you support the Cloud Resume Challenge, you help to teach the world that a great cloud engineer can come from anywhere, from any background. In a small way, you are helping to build the future of this industry.

If the Cloud Resume Challenge helps you enter a new phase of your career, don't forget to hold the door open for those behind you. The challenge has grown, but the spirit remains: senior, junior, career-changer or upskiller, we are all in this together.

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July, 2022

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Daniel Dersch, Corey Quinn, Jennine Townsend (times 2!), and Justin Wheeler contributed essays or challenges to various editions of this book. I owe you all a drink the next time that's a thing people can do.

The entire Cloud Resume Challenge community, now more than 4,000 strong, assisted in the creation of this book by responding to surveys, offering feedback on the challenge, and creating resources that everyone can use. Special thanks to Nana, Ian, Stephanie, Stacy, Daniel, Jerry, and Jakob for their featured testimonials. I'm also especially grateful for the tireless community contributions of Tony Morris and Lou Bichard.