

# Halloween Special Episodes

## Research Software Engineer Stories

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# Chapter 1

## Open Source Halloween

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In the deepest and darkest of dungeons, you might find them scheming. Hunched over mechanical keyboards and plug-in USB fans, the rulers of the expansive clusters are working. Fixing. Solving. Lou was one of these creatures of the expanse. But before you imagine darkness and dungeons meant for torture, let me tell you that Lou was a clean cut 35 year old with faded jeans and a button shirt. He ordered the same coffee every morning, and from the same small shop at the top of the hill. It was a daily ritual, a workout to walk up that hill before trying to catch the train. Sometimes he had a few extra minutes and would venture down the road to a bakery to produce a square pink box with special treats for his fellow dungeon dwellers. This was most of the week. Lou so looked forward to his Friday ritual of coming home to knock back a speciality beer and staring out his high-rise window into the horizon. Despite the expense, his home was hot, and the air was prone to being dirty when the fires were at bay. When not eating or drinking he had bought a respirator to wear in his own home, and only when it dawned on him how completely ridiculous this was, did he decide to spend more time at work. Yes, the dungeons were air conditioned, filtered, and filled with the spurring and whirring of machines. Yes, Lou was a sysadmin. And he was good at what he did.

The tenth month of the year brought a kind of unexpected relief, you see, because the cooling temperatures and slowing down of the summer

meant that the state started to win against the fires. The far parts of the horizon were visible again, and Lou took off his home respirator to breathe a refreshing breath. It wasn't like it used to be when he was in New England, where the trees turn beautiful shades of orange, red, and yellow, and the air starts to take on a crisp smell of pine to tell you assuredly that winter is coming. But he would take it. This clear day presented a lovely opportunity to spend some more time outside. The outside air was typically only marginally worse than the inside air, but he felt much safer inside from the city and unknowns. Lou shuffled down the narrow steps, carefully placing each foot to account for the differences of heights, and hit the street. It was early evening in the lull between commuting and the evening rush of people going out to dinner. Lou decided to take a walk in a nearby park, and I don't want to mislead you - this was a rectangle of grass with about a third of a mile perimeter path to walk, covered in dog poo that was irresponsibly left by owners, and little, neat tied up bags from owners that were responsible enough to bag it but not to return to retrieve it. Lou's mind wandered. Was he happy in his role? Assuredly yes, but it was thankless work. People typically only came to him out of a state of frustration. Something didn't work, or they needed something, and they needed it yesterday and not in the next week. Lou looked up and saw a little girl and her Mom, and she was wearing a pink tutu and wielding a fairy wand. "It's never a bad time for a tutu," Lou chuckled, as he remembered a skit night at his college when he, of course, was asked to play the role of the Tooth Fairy. His thoughts quickly jumped to Halloween. The neighborhood would fill up with kids in extensive costumes in just a few weeks. Lou loved Halloween. The world became somehow cooler, painted in the brightest and deepest of purples, and vibrant oranges. Adults treated it like an excuse to attend parties, and drink wearing scantily clad clothing that they claimed to be costumes. But being a kid? It was magical. Lou never really had grown up in that regard. He loved the magic. He loved the scare of hearing a ghost story, and even the quest for candy. Lou felt a small rush of happiness, a childlike happiness when you learn that it's snack time and you get to have your favorite thing, or that school just ended finally for the summer. He decided that this year, he didn't care about his age. He wanted to go trick or treating.

Lou ventured into the Walgreens on the corner of Market Street. As expected, there was an entire aisle of Halloween presents, with everything

from monster bowls that growled when you reached inside, to lovely purple lights that would make a house seem both spooky and like a Spencer's Gifts. After knocking over several items on the disorganized shelf, he found an amazing lobster costume that would completely hide his face so suspecting adults handing out candy would never know he wasn't an older teenager that just really didn't want to let go of childhood. He brought the costume to the register. \$79.99? His sticker shock quickly transitioned into indifference, because he felt sort of hopeless about his financial situation anyway. Oh well, that's what you get for a drug store in a city 2 and a half times more expensive than average in the US. "I'll just do it this one time," he justified to himself. Beep! The costume was rung up, bagged, and swinging in the white and red plastic bag alongside Lou as he walked home.

On the day of the trick or treating, Lou convinced a fellow colleague, a Research Software Engineer in his group, Emily, to come along. She was fairly short and had a girlish face, so she opted for a witch costume with a pointy hat and wig, and being in her late 20s she totally could be mistaken for a teenager. As the dinner hour approached, the two set out on their route. Part of the fun was really just commenting on all the weird houses that they saw - "Oh, there's the one that looks like a ski lodge, what it is doing here? And that one over there is baby pink, that's a sight for sore eyes!" And then there were the houses that were stacked up alongside one another like biscuits in a box, likely having been there for easily a century. The docile weather of the city made it easy to take care of these houses, and Lou always imagined the wind being like a cleansing spirit that would blow away any debris or signs of age. But maybe with the fires, an equally powerful spirit that brought dirt and dust to counteract the wind spirit, that would change.

The two canvassed the city, making sure to stop in all the lovely little neighborhoods with the Edwardian houses. By the end of the night they had amassed a massive bag of candy. "We are *so* bad" Emily exclaimed as she dumped her loot onto Lou's small kitchen table. Lou smiled warmly, also feeling the high of their candy success. "This will be super dangerous for me to bring home," Emily remarked. "Do you want to bring it in to work on Monday?" Lou liked the idea - he could present the bounty to his colleagues to make the daily grind a little less painful. "Yeah, sure." he replied. "I'll bring it in on Monday." He knew that his colleagues wouldn't

care where it came from. Something delicious, individually wrapped in colorful paper that smelled faintly of chocolate and plastic would be a welcomed interruption to the typical day.

Lou didn't think it would be a big deal to bring the candy on the train, but it felt kind of awkward carrying a large unmarked bag. He tried to act cool and casual, and place the bag between his feet akin to a piece of luggage, but his fellow passengers continued to give him weird looks, because now it looked like he was transporting body parts and making a failed effort to conceal them. He really regretted not putting them in a Duffel bag, so at least people would judge him for being an out of shape guy attempting a plan to partake in group sports after work over a serial killer.

It was a relief to arrive at the station and finally distance himself from the judging eyes of his fellow passengers. He ran into the group kitchen, found an old holiday bowl, and dumped the candy. His mission was done. Halloween decorations from the previous weeks were still up, so the spirit of Halloween was still there. Ironically, Lou spent most of the day in his office banging away to resolve old tickets, and only ventured to have his first piece of candy toward the end of the day. He still felt kind of guilty for, you know, hijacking a children's holiday. The more mental distance he could place between that and the consumption of candy, the better off. So it wasn't until just before the end of the day that he pushed away from his desk and lumbered over to the shared kitchen. The bowl was surprisingly still very full, and Lou grabbed for what he hungered for - a cute rectangular bag of some German looking candy with colorful, sweet chewy pieces. Ah, "Skeetles!" he thought. These are my favorite. The first Skeetle hit his mouth, and as the white innards dissolved on his tongue it was clear that there had to be some huge mistake. Lou retched. "Did they use salt, instead of sugar?" "Oh my god, this is terrible!" He spat out the candy and went to the sink to wash out his mouth. He let out a small cry when he saw it - whatever candy was removed from the bowl had only traveled a small distance, and was partially eaten in the trash. Lou sifted quickly through the discarded wrappers and partially eaten candies. There were Tweex, Skeetles, N&Ns, Sneakers, and... oh my god. This wasn't Halloween candy, this was OPEN SOURCE CANDY. Lou quickly collected the bowl and hurried back to his office, hoping that nobody else would try

it. Once in the safety of his lair, he started looking at the wrappers. They were obviously home crafted, and not what he expected. Emily had heard his small cry and was already at his office door.

"Oh," she whispered. So you finally tried it? Yeah, you know open source candy - some of it can be pretty good, but I think most of it is... questionable?" I can tell you more about it if you like, I did some work in this space." So Emily was a Research Software Engineer, and that meant she was hugely active in open source development, including having done work on open source candy. "Okay so this one," she said as she pointed to the Skeetles. They must have changed their recipe and they didn't do any tests before production. So yeah, I totally think they used salt instead of sugar. I think that also means they don't have good documentation of their ingredients - probably there are two bags of white crystals without labels and nobody knows which is which, and nobody bothered to test." Emily reached for the NNs next. These looked promising, but pulling the bag opening apart a little wider revealed a congealed mass of chocolate and color. I guess "Melt in your mouth not in your hand" didn't really work out. I think this is probably because they are using really old machines to produce the candy. I forget the details, but depending on the type of material used for the mold, and the temperatures in the melting oven and cooling belt, that totally determines how the candy endures after. I think they just are using really legacy systems. And then finally, she picked up the Sneakers. "Oh wow, so this one I can't really put my finger on. But judging from the texture, it kinds of tastes like when my Mom used to mix the muffin batter a little too much. It's sort of tough."

Lou scratched his head and looked closely at the soft folds of the candy bar. Candy was just something that he took for granted to be... right. He never stopped to think that there was a world of open source candy, and for some reason it was struggling. But no matter what the story, it was ending badly, because here he was staring at an entire bin of partially eaten Halloween candy, sad and sorrowful as having the promise of being delicious and then falling so short.

"Does it have to be this way?" he asked. Emily took a moment to respond, after some quiet thought. "Let me show you." she finally said.

They left the lair of the sysadmins and walked into the sunlight of the nearby Quad. Students flooded the space as some kind of physical manifestation of intellectual curiosity, flooding out from the university buildings into the cement valley with often no clear direction or purpose. There were smiles, and laughter, and in his ornery ways Lou was quickly caught up in it, almost to the point of his upper lip turning up slightly, when his left brain reminded him that they simply were naive to the truths of the world. Going to school at such a university was not the real world, it was a magical land where you could exist without cars, there were cute coffee shops and places to spend time around every corner, and there were interesting and vibrant people to interact with at every turn. The real world meant a crowded train with tired travelers, getting harassed on the street, or a single person sitting in traffic listening to an audio book or podcast. The real world meant making every effort to try and not recognize that the entirety of life was moving from one building to another 30 miles away, wash, rinse, and repeat.

"Are you OK?"

Emily had paused in her step when she noticed Lou zone out. He did that every once in a while, as if pressing pause on his personal play button, but forgetting to pause time itself.

"Oh, yeah," he mumbled. "So we are going to see something? This open source candy?"

He said it with a bit of a sarcastic tone, as if he already didn't believe her that there was a world of developing and producing open source candy. She could see the expression on his face, and decided it was best to just show over tell.

"Yeah, follow me," she said bluntly, walking off quickly in the direction of the Computer Science quad before Lou had a chance to roll his eyes, emit a giggle, or otherwise belittle what he hadn't even seen yet.

The Computer Science quad was even more crowded. You see, while a huge number of students were scattered around science buildings, likely pursuing pre-med because they wanted prestige and a higher salary or to please their parents, an equally large number of students were studying



computer science, with equal but different incentives for a higher salary and a glimmer of temporal freedom. And maybe a little bit starry eyed when then went into the adjacent town for dinner and saw the green, blue, and yellow bikes of the nearest tech company. Lou often wondered if he had a second chance at college if he might take a different route. You see he had studied something completely irrelevant, had not been able to get a job, and then started to learn system administration. From that point he worked really hard to get where he was, reading a lot of books, trying things on his own, and ultimately getting a certification, but none of his learning came from a traditional education, so it came with a bit of jadedness about the entire schooling process. He was distracted again. Emily was standing on the steps of one of the buildings with her arms folded, head cocked to one side, as if to say, "Really Lou, again?" He shuffled his feet more quickly to catch up, and followed behind her, catching the extremely heavy door that she almost purposefully didn't hold to show her annoyance with his flaky presence.

The stairs looked like they were designed in the 70s, a speckled brown pattern with little bits of white glimmer that, perhaps half a century ago, would have looked dazzling. Lining the stairs were glass displays filled with old machines, and small pieces of paper clearly written by a typewriter with a name and a date. The machines got bigger as the dates got older, and Lou wondered if anyone really knew how they worked anymore. "Is this what the dinosaurs used?" Lou made a feeble effort at a bad joke, which was well received by Emily, who turned her head and gave a quick smile. She knew that Lou was going through some stuff, and really was doing his best, despite being a little distracted and unyielding. She looked at him as someone kind that had developed a hard shell, not just to protect himself from the world, but to also protect the world from him. Kind of like an NN, but not melted yet. The latter was a maladaptive belief, of course, because Lou had so much to give back to the world, but since he didn't place much value in himself, he hadn't realized it yet.

Emily sat down on an old bench, either made of wood or something that resembled it. She patted on the seat next to her to motion for Lou to sit down. And then they waited. Lou felt like he was taken back to his college days when he might be waiting to see a professor in their office, or just trying to kill time between classes on a random bench. How many butts

had sat on this bench before him? He started to think about this deeply, and much more deeply than anyone really should. Perhaps if there are a few a day, and classes are going on maybe half of the days of the year, he could make a modest and possibly low estimate of 450 butts a year, and then going back about thirty years... "Gross" Lou said out loud, with absolutely no context, causing Emily to give him a quick glance with a face like she had just eaten something sour.

"Oh, sorry, um. I just realized there could be like, many many thousands of butts that have sat on this bench."

"They clean it every day, Lou," Emily responded, trying to comfort the seemingly spontaneous and random thought that had popped into Lou's head. Lou knew that he tended to overthink things, like butts on benches. Haha. Before he could laugh at himself in his head, Emily discreetly pulled out what looked like an ID card, was it her student ID card from when she graduated years earlier? She made a quick motion under the bench, and then in under 5 seconds the entire setup had rotated 180 degrees and they were facing a completely different, completely foreign and empty hallway.

"That was totally like what they did in Indiana Jones!" Lou exclaimed.

"Welcome to the open source candy labs!" Emily excitedly said. This is a not well known area of research, but its been going on here for decades. Only students and staff that stumble on a true desire to help have the ability to see it. As they walked down the long corridor, Lou marveled at the pictures on the wall. To his left was Willy Wonka, who he didn't even know was a real person let alone a distinguished faculty at the university. To the right was Franklin Mars, and a larger group photo of what must have been his lab. Oh, Professor Mars died long before the university was established. But we honor his mission here, and carry forward his research in the Mars lab. Come, let me show you! As they continued down the winding hallway, Emily shared her personal story of how she had discovered her desire to work on open source candy. "I was eating a piece of American chocolate one night, and comparing it to a gift of Swedish chocolate. They were so different, and I just had to know. Professor Wonka found me in a chemistry lab trying to derive the bases for both, and then brought me here. Some of my greatest graduate work was done here, but I'm not sure

that any of it is known.

The hallway suddenly turned and Lou got very tall, or perhaps it was the hall that got very small, it cannot be known for certain. "Ah! We've found the Wonka lab! Professor Wonka likes to change the entrance every once in a while, but you always know when you get there. Shall we?"

Lou stepped through a tiny door with only a narrow window at the top into what seemed like an endless lab fortress. The walls were stark white and the room filled with equipment churning and buzzing. Lou expected to see an army of graduate students, but instead only saw one lone person in the corner, hunched over a microscope and next to a double boiler of corn syrup.

"Marta!" Emily exclaimed, as she ran over to her old friend. "Emily!" Marta said, also equally excited, but also with a little bit of confusion in her voice, as Emily hadn't stepped in the lab for many years. "What are you doing here?" The two exchanged brief histories, and it came to light that Marta was a student that had stayed in the lab post graduation, and now was called a Research Associate.

"So I manage our recipes, and make sure the equipment is running, and also do new research on improving the candies."

Lou peeked around her shoulder, and quickly saw a piece of paper, or schematic of what she was working on. It was the Skeetles. The equipment was gorgeous, but Marta seemed to be working from scribbles on paper, and as he glanced around the room he saw what he expected - a corner where the lab seemed to receive and then stack deliveries. There indeed were bags of unmarked white substances, some powdery like citric acid or corn starch, and others crystalline like sugar or salt. They were properly closed and clean, but didn't seem to have any means of organization or labeling. Marta must be the only staff in the lab, totally overworked, and just didn't have the time to think about or create an organizational scheme. That's why there was a bad batch of Skeetles. Lou took mental notes as they waved goodbye and continued down the hallway.

The hallway filled with the rich scent of chocolate. It wasn't just any chocolate - it was like he had entered his family kitchen from childhood,

and his mom had just put peanut butter blossom cookies in the oven, and the chocolate was just starting to melt. But what was that other smell, was it color? Lou was fairly sure he had never smelled a color before, but AH, there it was! Reds, and oranges, blues and greens, all drifting into his nose and declaring their presence. Lou imagined himself lifting up on his tippy-toes and floating like a cartoon character toward the scent. And then all of a sudden, he really did feel lighter than air, and it could be that his memory doesn't serve him well, but he is fairly sure that he floated into the next lab, the Mars lab.

Lou only came down from his elevated state when Emily tugged quickly on the side of his trousers. "So this is Mars lab - home of the NN!"

Lou looked around. It was assuredly different than the Wonka lab. Where the Wonka lab had new, pristine equipment, this lab looked like it was running on machines that were antiques. On one side of the room was a massive cauldron of melting chocolate, likely where the smell was wafting from, and it looked like it was being prepared to be poured into thousands of tiny circle molds, likely that would form the shape of the candy. Those molds disappeared into a long circular cavern of layered belts that emerged onto a large spray gun, and here is where there were clouds of color aggressively being applied to the new candies. The result of that then continued on outside of Lou's view, into what appeared to be a cooling chamber with more belts.

And unlike the Wonka lab, this lab was bursting with graduate students, cleanly dressed in white overalls, gloves, glasses, and so immersed in their work that nobody noticed Emily and Lou enter. Except for a tall, lanky guy in his early 20s with reddish blonde hair that walked over to them, with the biggest of smiles on his face.

Hey there! Welcome to Mars lab. I'm Alex. Do you want to look around?

Lou couldn't help but smile back - the energy and kindness emitting from this graduate student was contagious. "I love what you have here," Lou responded. "I feel like I'm in an old fashion candy shop, but the smells are from another world. Do you make N&Ns?"

"Yes!" the graduate student responded with an equal amount of energy. "The equipment is kind of old because we haven't been able to afford to modernize it, but we do staff a large number of graduate students so the lab is still quite prolific! Do you want a quick tour?"

Emily and Lou followed the graduate student around for a tour of the lab. Lou couldn't help but notice that the equipment was very similar to the Wonka lab - both labs were producing the same shaped, round candy that ultimately was colored, shined and bagged. The only difference was that the Skeetle was sugar based, and the NN was chocolate. Even the colors were similar, although not exact. Lou giggled as he imagined tricking his colleagues by putting a bunch of NNs and Skeetles in the same snack bowl - anyone that is a grabber and muncher, meaning they grab an entire handful and throw it into their mouth without question, would get an unpleasant surprise. Lou and Emily finished the tour, thanked the graduate student, and as before, Lou took a mental note of what he learned.

They returned to the hallway, and Emily paused.

"So, I've never been beyond the third lab before. It's rumored that the hallway goes on forever, but I've never been brave enough to verify it." Lou wasn't going to argue with that, he agreed to check out the third lab and then they could head out. The third lab, of course, was the Sneakers lab.

"You know, Sneakers kind of sounds like an old shoe, leathery or something." Lou commented, "Given the toughness of the candy, I wonder if that's the secret ingredient?"

Emily slapped Lou's arm. She wasn't sure if he was just joking around, or really making a serious guess. "Of course not!" she "retorted." "You can actually read the entire recipe and its history in this ledger!" She pointed to the largest book that Lou had ever seen in his life, which was on a pedestal directly outside of the lab. He was sure it would be interesting to read, but he wasn't confident he was strong enough to lift the cover. "Oh don't worry, I got it" said Emily, who did a quick move of her hands and the book opened effortlessly, as if by an invisible force. Lou had reached the conclusion that there was just some magical stuff going on in here, and probably if he thought back in the future he would not remember it, or just

plain out deny it, but he made a mental note for his future self to assuredly state "This really does feel real." He also kind of enjoyed it. He wondered if he ever got tired of sysadmin-ing, if he's enjoy working in a magical candy lab."

The book came to life, the text almost dancing across the pages and capturing his attention. But there was so much of it! It became clear that reading this ledger would be an impossible task. Even if all of the information was there, the lack of a summary or clear, concise recipe was problematic.

"So you mentioned this is open source candy - I guess that means the recipes are published somewhere? I mean this book isn't exactly public knowledge, and I'm having a really hard time reading it. Like, who made this candy originally and how did it get here?"

Emily was pleased to have an answer. "The story is that the creator of Sneakers was trying to create a new caramel, but completely botched it in all possible ways, and wound up with something they call nougat. In an act of desperation, he added some extra ingredients, dunked the whole thing in chocolate to hide his mistakes, and that was history. He was a baker, and one of his early apprentices wrote down the recipe into this magical book, and it grows every year. It changes its mind about the recipe a lot, and the staff has to keep up with it. When it's having a good day, it's pretty easy to read. But today it must be ornery, didn't get enough sunlight from the window or something."

Lou cocked his head. An ornery book? Ha! Life was already hard enough with ornery people. He couldn't imagine his home bookshelf taking on personalities, and ransacking his apartment. "So... where are the recipes then?"

"Well, when a final recipe is derived, which of course is a work in progress because the labs are always doing research, they publish them on all-recipes, or other internet recipe sites. It's not perfect, but these sites are the equivalent of journals. And peer review is different - we don't get really good feedback about the candy itself, unless someone tells us, but we do get people trying the recipes and then commenting with useful ideas."

"Interesting," Lou thought. He wasn't super confident in this approach, because he definitely had seen random internet trolls make useless and derogatory comments on these recipe sites, with no aim to improve anything. What this really meant is that there was very poor review of the actual practices of the lab, and the resulting candy, and it would be easy to make a mistake. He wondered if the toughness of the Sneakers bar that came out of this lab was just a mistake in reading the recipe - something was beat longer than intended to.

Emily and Lou didn't venture into this lab because the door was closed, and a dim red light was coming from the door window, which Emily said was likely a light-based process that would be bad for them to interrupt. At that point they had been gone almost an hour, and really needed to return to their posts. They turned around down the hallway, again past the ledger, lovely smells of chocolate, the shining Wonka lab, and all the old portraits.

Lou arrived back at his office, but could not work. He was distracted with thinking about this open source candy. He was seeing so many parallels with academic labs, and it was surprising. He kept glancing over to the partially eaten candy disposed of in the waste basket. He wanted so badly for them to be successful. How could something that brings so much joy, and so much happiness to adults and children alike, have such oversights. On the way home on the train, he realized what was bothering him. "These things are fixable," Lou thought to himself. He saw how hard the students were working, and how much history was behind the open source candy, and he realized it was just that they couldn't see the holes. They didn't have the right protocol or procedure down yet. They were all so concerned with the research and publishing the next recipe, that the process was overlooked. Lou felt an energy, a motivation, like he had never before in his life. Is this like, my midlife crisis? He wondered. Was he really ruminating about candy labs instead of his nightly Netflix and beer routine? Without hesitation, he reached for an old notebook from his bookshelf, giving his books a weary eye just in case they also decided to develop personalities and jump out at him for taking one of their brethren.

Click. Lou exposed the ink of his one apartment pen. The thing about working with computers is that you kind of stop writing things by hand.

I mean, why would you need to, when you can sign things digitally and type? Lou sometimes wondered if he would forget how to write, or how to write well. He often noticed that his hands would get sore when filling out forms at the doctors office, as if his hand muscles were out of shape. But he would power through this task, because he needed to write this down.

First - it was obvious that the Wonka lab and the Mars lab had similar processing strategies, and could benefit from sharing equipment. It must be the case that the candy processing hours could be interleaved to be able to share the equipment. The Wonka lab had nice equipment and few staff, while the Mars lab had antique equipment and many staff. Perhaps they just needed to work together, a little bit of tit for tat? If the Wonka lab shared their equipment, the Mars lab could repay with extra staff. If the NNs were coming out melted together because of that old equipment, this would resolve the problem. And if the Wonka lab was really just mixing up salt and sugar because of lack of an organizational system, the lively students from the Mars lab could help. Lou scribbled all this down with an urgency he had never felt before. Finally, the Sneakers lab. The Sneakers lab had a manifestation of what he suspected was an issue across labs - they did not use proper recipe control to keep track of the ingredients and procedure. Perhaps there needed to be a database of ingredients, and then several repositories to keep the recipes, and all the changes over time? This was hugely something that Lou could help with. He had been creating databases for years, and had a knack for organization. He scribbled down a few more notes, and drifted into sleep.

Lou looked down at his chest and saw a white apron. It flowed down to his feet, where he discovered a bright pair of orange shoes. "Wow, when did I pick these up?" he wondered. But before he could think further, a large steam pipe shot off, and a shrill squeal filled the room triggering a smoke alarm, and the lights shot off.

Lou acted quickly. He reached for a set of levers and pulled several down, and then entered a combination of buttons that he didn't recognize. It was like he was looking out of his own eyes sitting in a chair in his brain, passively watching this crisis unfold. The beeping stopped, the room lights came back on, and Lou realized that he was inside the candy factory. He had resolved the crisis! "Thanks Lou!" the graduate student chirped from



across the room. "These new waffle cone N&Ns are going to be fantastic! Man, we just don't know where we'd be without you!"

Lou woke up in a sweat, as if he had been toiling all night in the lab. He was glowing. He smelled his shirt, and was sure that there was the faint scent of waffle cones, as if he'd been working the iron himself. Next to him was the piece of paper, which had seemed like immense wisdom the night before, but now looked like scribbles of a mad scientist. He knew what he needed to do.

Lou spent weeks trying to find the labs again. He went to sit on that bench for hours at a time, trying to will the bench to turn, if only he could enter just once more. Emily had gone for a vacation, so he was on his own. He couldn't get in, but he somehow kept dreaming of them, and waking up each time in a waffle cone or chocolate scented sweat as if he was working the night shift. His daily routine, which now seemed so dull, paled in comparison to his nightly adventure. He started to get distant in his day job, and rush home in the evening, eager to enter the dream land and continue working on the candy research. His friends and family started to notice that Lou was distant, and would give him questioning looks when he excitedly went on about a new standard organizational system, or ontology, that he was developing for candy. They looked him up and down with some judgment when he started showing up to the sysadmin dungeon wearing bright orange shoes and a white apron, and a huge smile plastered across his face.

"Where did you get those Lou, Target?" chuckled one of his colleagues as Lou passed the break room. Lou didn't notice. He was too deep in thought. His colleague continued to talk about him when he left. "I guess he's on something?" he whispered to another staff member. "But I mean, look how happy he is. And he's still answering tickets, so I kinda don't want to mess with that."

As the weeks passed, Lou continued to work in his dreams. He figured out how to get the labs to work together, and share equipment. His candy ontology was a huge success. The old recipe ledger was replaced with a repository that kept track of all versions, and was easy to access electronically to view or suggest changes. And he met someone, an also older aged

staff that was passionate about the same work. He fell in love with working with them. It was a kind of academic, and magical romance that he never imagined - infatuation with their ideas, and constant thinking about their long fingers, carefree laugh, and the devotion they placed in their work. He never expected to be taken with someone, or something both at the same time, all at once, it was like heaven. He was in a new groove, a new stage of his life and doing fulfilling work that he never imagined possible, working with people he cared for deeply intellectually and otherwise, and living for those dreams. But then, on a cool Fall day, almost one year after his initial discovery of the labs... the dreams stopped. It was as if a switch was shut off, and the world that had opened up his life and given him meaning had shut the door on him.

Luo stopped going to work, or more specifically, his previous day job. It was unbearable without the joy of working on the open source candy. It was unbearable without the person he loved. He took a break from work, slowly falling into a depression that he compared to the deepest, darkest of chocolates - bitter, overwhelming, and unforgiving. He used up all his vacation days, all of his personal time off, and there was nothing left. Lou was eventually fired from his job as a sysadmin. He couldn't even find the right emotion to feel. He felt nothing. He didn't care about the sysadmin job, or money, or anything anymore. His lack of dreams turned into nightmares about searching for the lab, and the people within it, only to find himself on his knees, alone, in a desolate place.

Lou took one more trip to campus to collect his last check. With his small amount of savings it would cover his rent for the remainder of the year, so he'd have to start looking for a new job soon, and possibly a cheaper apartment. And if he couldn't find work in his current city, he might consider going South to where supposedly a lot of tech workers were moving. Lou hated moving, uck. He stopped in the campus coffee shop one last time, and ordered a small black latte, sitting down at a small circular table in the back of the shop to nuzzle it like a weaning baby animal. He was distracted by the patterns on the table - it was made of small colorful tiles that were clearly chosen so it wasn't easy to write on, and it definitely wasn't big enough to even hold a laptop. Lou wondered if it was made for people just like him, those that just wanted to sip and think. Sip and think. He then started to again get lost in his thoughts. Was he doing

bad work? Did he mess something up, and the dreams disappearing was the equivalent of getting fired? It didn't even matter anymore, because he couldn't continue working in a job that didn't pay anything when he lost his sysadmin job. He missed the smell of the melting chocolate, and the people he cared for. It was too much. Lou felt heavy, as if his clothes were stained with sadness, and his heart was soaked and needed to be squeezed.

Just as Lou was contemplating his next, possibly unwise life decision, he saw a pair of green shoes appear beside his table. He smelled a faint waft of waffle cones, and his heart skipped a beat. He slowly looked up, and there in front of him was a tall man with curly brown hair, a large top hat, and a cheshire hat grin.

"Hi Lou, I'm Dr. Wonka"

Lou started to cry. He had started to doubt his experience, thinking it was just a dream, and the manifestation of an actual person in front of him was a final proof that he wasn't losing his mind.

"I've been looking for you, Lou! You've changed us. We've never had anyone that looked at our procedure, and provenance. And you brought a skill set that none of us candy designers have ever had - a knowledge of how to create databases, standards, and to make sure that our work is consistent. I can't believe we've been using those ledgers for all these years - one of them bit me the other day! When you left your internship I was going to offer you a job at the lab. But then you never came back to campus. Lou, I'd like to offer you the role of the entire department's first Research Software Engineer, in charge of open source candy organization, recipe control, and collaborative efforts. But first, are you okay?"

Lou's tears of sadness turned into joy, "Yes! I am definitely okay now! I felt like a piece of me was missing. I doubted myself, and I doubted that what I saw as important was even real. And yes, I'd love to work at the lab. What do I have to do?"

Dr. Wonka pulled out a shiny white card, but it wasn't actually white, when it moved in the sunlight Lou saw iridescent pinks, purples, and blues.

"This should get you into the lab. I think I remember that Emily

mentioned she showed you how to do that, it should work for you now. Oh, and by the way, Emily works for us too. She heads into research computing only once in a while to request more compute for our flavor analyses.”

Will’s eye’s widened. He never realized that Emily’s long vacations were, in fact, not vacations at all, and he didn’t talk to her much to realize she wasn’t in most of the time. ”Of course!” he thought. And then he wondered, why had Emily shown him this secret world? Did she see something special in him?

As if reading his mind, Dr. Wonka answered him.

”Yes, she saw something special in you. Do you remember your conversation with her about the candy, when you asked, ”Does it have to be this way?” Emily knows your abilities, and I think she also saw a spark of life in you. When you came into the labs, you must pardon my intrusion, but I peeked into your thoughts, and saw that you had fantastic ideas. We started your internship soon after that, and you did a great job, and well, here we are!

If Lou had been at any other moment in his life, he might have questioned how this character in front of him could read his thoughts, and he might have questioned his own sanity. But he was so overtaken with joy that he was speechless. When he finally found his voice again, it came out more strongly, and full of gratitude.

”Thank you,” you said.

You’re welcome! Take your time here, and come into the lab to continue where you left off whenever you are ready. And don’t worry about your paying rent anymore, we’ve talked to your landlord and it’s taken care of. And whatever you need, you will have. We will take care of you Lou, because we value you so much.

Dr. Wonka stepped away from the table, likely returning to the lab, and Lou was left in a wash of calmness. Lou had felt so out of place, and with just one conversation felt again that he was home. That he had found his people. The sadness that he once felt was replaced with the purest of joy, and a blanket a happiness and yellows, oranges, and purples swirled

into his emotional mind. He would see the people that he cared so much for again, and pursue the work that he loved. He felt more motivated than before - he was going to do better to find other open source candy labs, and better understand their needs and how to work together. He was a Research Software Engineer, and it was his job to lift this work to the highest, proudest place it could be, and to nurture the community to afford a successful, happy future.

That Halloween, Lou didn't wear a costume that covered his head. He went trick or treating with Emily again, and her younger brother, so hopefully they wouldn't get too many looks about being adults and trick or treating. But Lou didn't care - Halloween was the ultimate showcase of all of his (and his labs) hard work on open source candy. The three of them, dressed up as Witch, Ninja Turtle, and Vampire, danced around the neighborhoods and enjoyed the magic of the holiday. And as their bags filled up with candy, there they were! The Sneakers, Skeetles, N&Ns, and Tweex that he remembered from the year before. The Tweex still needed some work, and Lou suspected he needed to be brave and venture further down the hallway to discover new labs that might work on it, and learn new things. So he snuck out the Tweex from their candy bags when they got home, and they dumped out the rest on the kitchen table. Emily's brother was sampling everything. "These are delicious! And so shiny." he chirped. Why is this candy so much better than what we used to get in my old neighborhood?"

"Well, Lou responded. There's this thing called open source. And I can tell you all about it."

## Background

Thanks for listening to the third Halloween special episode of Research Software Engineer stories! This episode was less corny scary, and maybe just more magical to celebrate that aspect of the holiday. You know, Halloween isn't all scare - sometimes there is a bit of whimsy or magic in the air. You probably heard all the puns so I don't need to review those, but I will review the higher level messages that are embedded in the story. First, we might identify with Lou that he comes from a non-traditional background.

He goes through his daily routine, but it's just that - a routine that he does to sustain himself. He is almost a living dead, a twist on the story that I didn't wind up taking, as it would have made this more a scary than whimsical story. You then might identify with him when he stumbles on a passion working on non-traditional aspects of research. He is excited about the protocol, tools, and provenance behind open source candy development, and falls into this niche quite easily. The fact that he finds this place in a dream, something that feels unreal, further suggests that for many of us, when we are lost and first discover this role of RSE, it feels too good to be true. The last part of the story is the struggle that many of us go through - it's easy to identify with the role, fall in love with it, but then not have the structure or funding to really do it. Dr. or Professor Wonka, depending on your preference, is the sort of Deus Ex Machina that steps into the story, validates Lou's newfound passion, his value as a person and contributor to the labs, and then gives him the structure that needs. We all hope for this kind of turn of events in our own lives, but also remember that even you can be that person that brings structure to our community.

On that note, thanks for listening! I wish you a spooky, fun, Halloween, and keep a look out for that open source candy, or maybe whip some together yourself.

## Chapter 2

# The Interview

[Listen to this episode on RSE Stories](#)

Working from home, that had become the new normal in the year 2020. Leo stared out of his small San Francisco apartment building window. He had moved there right after graduation the previous year in a flutter of excitement and promises of avocado toast and small batch coffee. He never imagined that the world would change so quickly in just 8 months. Despite living in an 800 square foot apartment with a shared bathroom and micro-kitchen (cough, cough, microwave and portable fridge) his monthly rent was almost 2.5K. It was fine at first, but there was one problem...

Leo had lost his job, along with the other 30 people at the startup. It was a sexy, promising app that would help to optimize travel plans and find cheap ticket and lodging prices. Not surprisingly, travel wasn't really a thing anymore and the company went under. Unless you wanted to be trapped in a metal tube airplane cabin with other people's sneezes and halitosis. He sure didn't.

And now, the walk of shame for any recent graduate that obtained and lost a tech job - finding another one. He'd sent in at least a hundred resumes on LinkedIn, and was in correspondence with several recruiters. Sometimes he got through to an interview, and then it was an awkward series of virtual chats followed up by cold "Sorry we're not interested" emails, or just being ghosted entirely. Even his cat, who was previously excited to have his owner mysteriously at home for much more time, was turning to give him the butt

hole of death. The ultimate insult from a feline friend that now sees you as impeding him from a keyboard nap.

Today was no different from any other day during the apocalypse. He woke up late, browsed around his phone, the little internet, looking for hope, only to get a notification that he was spending now 3 and a half hours on his phone. Is that the best you can offer me, little internet? You fruit branded Traitor. But actually, he realized, maybe today was different. You see he had managed to get an interview with a VR company, Toolie, as a virtual reality engineer. It was a highly sought after specialty these days, even more-so with the stay at home orders. You know, if you can't go to a restaurant, or take a walk in the park, why not do it virtually? And take a step further and leave behind your flawed self and go as a unicorn instead. Or an ogre with purple hair. Turn it into an episode of your favorite action series where the dinner turns into a showdown and you roll under the table and start catapulting mashed potatoes across the room to use as a weapon against the zombie transformed wait staff. Anything goes in VR.

But I digress! Leo was excited for this opportunity. He fishes around for his development headset to test out a new VR technique he was trying - an effort to create an illusion of falling by combining nausea inducing visuals with a sense of acceleration. He placed the headset over his eyes. He was at the grand canyon. He'd never been there in person, but thankfully tiles from geographic services gave him the basic scene that he needed to reproduce it. He stepped to the edge of a rock - it was so real that he could almost feel the sun beating down on his pasty white skin. And then, he stepped forward.

The fall was instant. He was spinning, tumbling, accelerating, and so nauseous that he wondered if it would be too much for some future poor player of his game. His body flipped around and then was stuck looking at the sky. The amount of blue grew, grew, increased, until it was the entire screen. There was a sharp flash of bright blue and then everything went dark.

Leo opened his eyes, some time later. He was tired - had he fallen asleep during the simulation? Was it so neuronally charging that it had knocked him out? Oh no, look at the time! He was going to be late for his interview!



Leo lunged forward and did a barrel roll to get onto his feet. Pants. He was going to be on video. There was a good chance he'd want to show off something in VR which would require him to stand up and possibly reveal his Ninja Turtle boxers. He hopped over to his dresser by the window, and paused. The window. He looked outside and the sky was... red. It was beautiful, but... why? Did the wildfires reach San Francisco already? Wait a minute, wouldn't it be a bright orange instead? He didn't bother to think too hard about it - he'd already stocked up his apartment with high quality air filters and had a respirator handy. Hashtag 2020. Yet another set of needs he never anticipated having in 2019. Just as he was turning away from the window, a dark creature flew by. Was that seriously a bat? Do we have those in Silicon Valley? It must be something related to the changing climate, or confusion about the time of day.

Okay, Leo thought, sitting down in front of his laptop. I'm as ready as I'll ever be. Coffee, check, but it's old. Pants, check. Extra paper if I need to write, check. The Zoom call opened up, he started the audio and his video. The other party wasn't there yet. This first portion would be the technical interview. He was told to expect 2-3 problems with the same person. He was so tired of doing practice problems for algorithms. It's like he was being tested to be a competitive programmer or something, so far from the actual detail oriented, slow thinking kind of work that was his actual day to day. He was just praying it wasn't too strongly that. If he had to implement binary search one more time he was going to scream. Oh! Someone entered. That sounded like a doorbell.

He saw the background first. His interviewer had a house that he can only describe as Dr. Seuss like. The walls were covered with posters that looked like grids of numbers. Hugging them tightly were sets of red and orange trees with bright fruit. Was this a virtual background? He had never quite seen a plant like that, but when you are programming 12 hours a day in your cave it's not exactly the case that you go outside very often. The interviewer then moved, and came into Leo's awareness. "Sorry I'm late!" He chirped. Leo had taken a sip of coffee, and almost spit it out. This guy had a beak and bright, red and yellow feathers to match the trees. He knew it was almost Halloween but seriously, interviewing in a costume? This company was... different. He grinned. Ok. Just pretend it's totally normal.

The first question asked him to design a building to satisfy having some number of elevators operating all all times, with some capacity of people. That seemed reasonable, because he suspected that the company created VR simulations for other companies, maybe even for disaster preparedness. That could be cool - it would be nice to show up to family holiday events and tell Grandma that he was doing something positive for the world, and not just building games for adrenaline junkies or a high paying job that really came down to advertising. He walked the interviewer through his logic, and he seemed satisfied with the answer. But the next question threw him off a bit.

He had to calculate the maximum force that any single elevator would have when impacting the bottom from a free fall. He knew the height and the mass, so the question seemed relatively straight forward. But what the heck? His mind quickly moved to rationalizations for such a question. It could be that this particular question wasn't for disaster preparedness, but rather some VR experience. He had thought that his obsession with simulating near death experiences was a symptom exclusive to him, but this question begged to differ. There were clearly many other weirdos out there working in VR. "Anything goes!" he thought.

For his last technical question he needed to find the shortest path to escape from a maze. This first part was straight forward, how do you say it Dijkstra's algorithm? But again, part B threw him off. The interviewer looked up at him with is beady bird eyes, almost grinning. How would he change the maze to make it impossible to solve? He wanted to ask in what kind of infinite game would you desire such a condition, but he didn't want to come across as judgmental to the interviewer. He started with answers that seemed obvious to him - have an infinite number of paths by connecting edges to other edges with some probability of turning up in a random place. Have the maze generate itself as you go, so it really does never end, or... just seal off the exits? The interviewer seemed bored - other candidates had obviously given these answers. You know, Leo piped up, hoping to offer a more creative solution, "There's this book called the Odyssey..." The interviewer's eyes picked up, and he looked up. Oh? Yeah! Leo said. We could have something like the Sirens, a call so alluring that you give in to it for eternity. "Very nice" said the interviewer. You freshens always have new experiences to bring to the table. Leo wasn't sure he liked

being stereotyped based on his age, but if it helped with an interview, he'd allow it. The rest of the questions were expected. One was about tricks for sorting, another creating a graph. He never understood why they bothered with these questions.. none of them were ever related to something he'd need for an actual role. But whatever.

The behavioral interviews were next. His first interviewer was the development manager, a guy named Cuthulu. And oh my lord, this dude was in full costume too. It was like an octopus had eaten part of his face and he had several tentacles. And man, this costume was extra. The tentacles, he's pretty sure were actually moving. But as soon as he started to get absorbed by the costume, Cuthulu started to erupt a noise. Oh, sorry, that was speaking. The gigantic tentacle asked him how he would handle a disgruntled colleague? What was the most challenging life experience he had gone through? And then everyone's favorite- what's his greatest weakness? Like, really, what kind of answer can I honestly give you that would lead you to judge me positively? He decided to provide something that was true about him that he couldn't help, and hopefully wouldn't lead to some future discrimination. I'm colorblind, Leo told them. I have trouble creating environments with color, at least, I have trouble creating them how others who aren't colorblind would expect them to be. Another tentacle nodded excitedly. Too excitedly. What was this guys deal?

Leo hung up the call, of course after an awkwardly long wave where everybody was trying to hit the End Meeting button but couldn't quite do it quickly enough. The pants were off in a flash. Thank god, it's just too hot. His computer also released a sigh of relief for the memory hogging application to finally exit. He imagined his computer coming to life and... expressing its grievances. Yo, Leo, as if the 10,000 chrome tabs, multiple Docker images and video editing software running all at once weren't already enough. Ya killing me here, talls!" Leo felt badly, until he remembered this was his fantasy, and the computer was not a sentient being. He still had a few hours before the last part of the interview, which was strangely an in-person session. This gave his mind waaay too much time to wander. Oh my god, he didn't give the answer with the lowest complexity for the first question. This would surely be a deal breaker. "They must think I'm an idiot," Leo thought. So what does any good engineer do when in self doubt? Drown himself in snacks, of course. His old office had

micro-kitchens that he would wander between throughout the day, always grazing for the newest and best snacks. Find a chocolate bar? Maybe a new vegan bag of popped chickpeas? This was Silicon Valley gold. The companies might tell you that the in-person stuff is motivated by face to face interactions and productivity. No, let's be real folks, it's all about dem' snacks.

With a few bags of Doritos and peanut M&Ms, Leo powered through the next few hours with his low self esteem masked by cheese and chocolate. He then took a quick shower before heading out to the Caltrain to travel to a building in one of those South of San Francisco towns that families flock to because they can't actually afford, or maybe don't want to, live in the city. It's not that he wanted to take a short shower, but with consistently bad water pressure and cold water, it was kind of like standing outside under a storm pipe in a rainstorm. You might be washing off the big chunks of dirt, but you're really getting a communicable disease from someone else's backwash.

He exited the mostly empty Caltrain and walked down an empty street. It was spotted with houses, or more like scrunched up bundles of land that people seemed to live on or leave trash on, that were right by a train track and huge wall to protect them from highway noise. How miserable. He longed for the empty, and large open spaces from where he grew up in the US. He'd even go back to some of the farm-y South and spend a few hours listing to cows moo. Were they having interesting conversations? Whispering secrets behind his back? As he approached a looming building with one huge entrance, his fantasy of places without pollution and people faded in his mind. The door was at least 13 feet tall with a broad, brass handle. It opened seamlessly with barely a touch to reveal a set of elevators. He pushed the button, waited, and entered the leftmost elevator. He remembered the instructions were to go to the 13th floor. The elevator started slowly, and then began to accelerate. It jolted to a stop at just before the 13th floor. He was stuck. And, well, since he was between floors, probably trapped too. It was then that he noticed a ceiling tile that was slightly different from the rest. Without any sort of notice, the quiet turned to noise. The elevator started to shake and become unsteady. Instinctively he used the side handrail to lift himself up to the ceiling tile and kick it in. Surprisingly it gave without much effort, and he kicked up again to lift

himself through the hole and onto the top Of the elevator. Appropriately, there was the Entrance to the 13th floor, open and expecting him. He was sweating. This kind of thing does not happen to real people. He thrust his legs up and swung into the space, and pulled the rest of his body up with his arms. Thank goodness he did gymnastics as a kid, and still did some parkour in his free time. He couldn't let himself fall into the skinny white dude stereotype, so he aspired for muscular white dude instead. Just as he was completely in the door, the elevator dropped and free-fall-ed, crashing at the bottom.

Leo was scared out of his mind. He shirked and fell deeper into the entrance to the floor, and lay there for a minute to catch his breath. Was this the right building? Was this some kind of joke? What kind of elevator doesn't work and then free falls? He wanted to call the police but his phone was missing from his pocket. Heck, he might have even called his Mom at this point. But alas, no phone, it must have fallen during his elevator acrobatics. He was on his own. Maybe this was a test of his maturity. He decided to find the company suite.

He entered a waiting room, and was relieved to find it look like a standard waiting room. A small table was littered with women's magazines, a Popular science, and what looked to be a technology review. What ever happened to the good material he remembered at dentist offices when he was a kid? The highlights magazines, or play areas with blocks and trains. And let's not forget the tooth posters and alarmingly high number of white smiles. Any kind of entertainment material is tempting, but With A virus going around, he didn't dare to touch anything. He looked up to the desk. A "will Return in 15 minutes sign" was carefully placed in the center. "They must not be staffing the office normally since most people are working from home," he thought. And yet here I have to be. Jerks. What the heck kind of interview is in a falling apart building with an empty office without coffee or a sanitized waiting room? But then he felt it. Just the tiniest of shakes, possibly a small earthquake, not unheard of for Silicon Valley but the timing was extremely terrible because he already was at his wits end and probably would scream if he saw a spider. Leo decided to take a chance and sit down. He was wearing pants and decided he just wouldn't touch his legs for the rest of the day. It's funny how we always make promises like that to ourselves, and then either forget or adjust them later. He rested his

head in his hands and just tried to breathe. He needed to be ready for this in person component because he really needed this job.

But the shaking increased. And then Leo... was falling. He didn't even have time To react. As soon as he was contemplating his early death and extremely unwise life choices to interview at such a wacko company, it was again quiet. He blacked out. Who knows how long. When he came back to consciousness, he was confused. His legs really hurt, he knew they must be bruised, but hopefully not open. Did he have a head injury? Was he, dead? Why was the ground so soft? He looked up to a beautifully starry sky. It was unexpected but calming. My god, it was as if he were looking at the Milky Way. How long had he been out? What happened to the building? He stood up and started to stumble around. He found that the path was usually limited to just a few directions. After about 14 minutes, he started to get the sense of having been somewhere before. He then heard singing. It was beautiful... intoxicating. He started to wander toward it, but stopped in his tracks. Oh my god. The elevator, and the sirens, and this must be a maze? He was inside of a world of his own creation. This must be how interviews roll in 2020 - you design your own death and then have to figure out how to get out of it. He had barely survived the elevator free fall only because there was a flaw in his design - an escape hatch he did not account for, an edge case. What kind of screwed up, psychologically scarring candidate screen was this? He did not know if he could die or forever be trapped, but he did t want to find out. He needed to think. It was a game. Or was it a test? Was he in VR? He had survived the elevator, so maybe he needed to continue thinking on his feet. He needed to continue finding loopholes. What had not he thought of when he gave his answer to the infinite maze? He had accounted for moving around the board in all directions. But what about up? Well that's where he came from. He also was fairly certain he couldn't fly. But what about down? He hadn't accounted for that case in his answer. He started to dig. The soil gave away relatively easily. It feel wet, kind of like that childhood toy goo called Gak that served no purpose but to feel gross, and eventually get dirt and hairs stuck in it so you'd never want to touch it again. He kept digging. A small tickle of light light was starting to show. Then it was a legit pool. It was a brownish purple, but seemed to be changing. "Oh god, he realized, it must be changing between blue and red. I can't tell the difference."

The voice came to him, speaking directly in his mind. “What will it be, Leo? The red screen or the blue screen?” He did not really have time to think. The voices of the sirens were getting louder and his resistance was waning. He could not have made a choice, because he really couldn’t see the two colors. He also didn’t know the implications for either. MAKE A CHOICE LEO! the voice boomed in his head. So he just decided to fall. Right into the glowing pool. It was a 50/50 chance on a positive outcome, of course assuming that one color screen was bad, and the other good. But the world doesn’t always work like that.

Leo awoke, he was holding his VR headset, but had torn it off at some point. His head was throbbing. Crap, was this whole thing just part of his game? He looked into the boreholes of the headset and then he saw it - it was a blue screen, with some error messages in the middle. Does that mean that he chose the blue screen? Does blue mean life, and then red would mean death? He ran to the window - the sky was no longer red, but a dull, greyish haze. Yep, this is San Francisco. Leo looked down, and realized that he was wearing his boxers from early in the day. Wait a minute, but that would mean... no it’s not possible. If he never showed or changed clothes, there is a pretty good chance he never went to that interview. The entire experience had been right here, in his apartment. But it didn’t add up, because his legs were still bruised from the fall. He put his head in his hands. He had done that multiple times today. The VR had seemingly merged into a part of his life. This thing he was building, was more powerful than anything he might create. It had crashed earlier, and he hadn’t noticed that the simulation continued, but seemed to have learned to model his actual life. It was terrifying, like the modern story of Frankenstein and his monster, except this monster was disguised as a computer game. Leo decided that he had to destroy it. He quickly dressed, reached for his coat and hat, turned off the VR headset, and headed for the door. At that moment, his phone rang.

”Hello?” Leo answered. ”Ah yes, is this Leo? This is Leena calling from Toolie.” We just wanted to let you know, that you got the job. You can start on Monday. Cheers!”

Leo was speechless. He wanted to drop the phone. ”Umm, I think I’m going to need to think about it,” he responded. And that was the end of

that.

## Background

Thanks for listening to the Interview, the second of what might be a yearly tradition to write a Halloween Story for the RSE Stories podcast! In case you missed this, my dear listener, there are several hidden lessons in this story. Maybe surprisingly, I'm not one of those people that think technology is going to mean robots that take over the world. But on the other hand, the more reasonable take on that stance is that we must be thoughtful and responsible when thinking about the impact that technology has on human behavior and well being. Leo's experience with AI that almost led him to his death probably isn't just around the corner, but at least we hope that when he thinks about taking this job at what turns out to be a company of destructive monsters that he considers that perhaps the monsters don't have the best interests of the human race in mind. Again, very unlikely to be a real scenario. The story also offers a playful take on the blue screen of death, which many of you are likely familiar with. But instead of implying death, this blue screen was actually the path that Leo needed to take to continue living. Another lesson is about how we learn. Sometimes we can learn a lot by actually running directly into problems, breaking things, and figuring how to get out of them. And finally, the last lesson is about the challenges that we create for ourselves. There are two ways to look at it. On the one hand, if you think through something in detail, and consider edge cases and error handling, you could be doing a favor for some future self to prevent issues coming up. But on the other hand, what about Leo's case, where he was battling his own design, and the loopholes were in fact the only way to escape? Again, not a super likely future scenario, but this is a fun Halloween story, so we can do what we like. Perhaps the real takeaway here is that whatever you are working on, be mindful about what you will need in the future, and design toward that.



## Chapter 3

# The Ghost in the Container

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He didn't have a chance to write tests. The deadline for the manuscript was only two days away, and Dockarod Main had placed reproducibility as an afterthought, an "Oh crap, reviewer three is going to eat me alive and spit out the little pieces when I don't offer Tensorno in a container." So he built the container. He shared it on Docker Hub, he had a small twinge of pain in his chest as it was building in the interface. It looked so professional, it's Dockerfile proudly displayed, the README from the connected repository glowing in shades of white and blue. But sometime absence is harder to sniff out than presence. Sure, you couldn't get security scanning unless you were in the big players. But what escaped even from our protagonist's awareness was that there was a process of magic that went on that day, one that would forever change the course of his life.

The deadline approached, Dockarod didn't sleep - he spent every waking hour downing fast food, and early released Halloween candy that was typically bought for children and consumed by adults under stress. It was only early September, but somehow all the local department stores were ready for Halloween, Thanksgiving, and Christmas. At the same time. This will be the best "Hallowthanksmas, ever!" he thought sarcastically. His desk became a wasteland of used fast food containers, with coffee stain rings creating a new kind of art on his desktop. His only saving grace was to blame the sticky keyboard on his cat, who frequented the patio outside to

hunt for small rodents and would tromp around on the wet and sometimes sticky leaves. Why were they even sticky? But I digress. Dockarod was a shell of a human begin, but like all work remaining magically expands or contracts to fill the space allowed for it, the manuscript was submit.

The review was eerily quick - it went out for review within a few days, and the reviewers returned a positive result within two weeks. Given the impending doom that Dockarod felt approaching this work, it was a pleasant surprising. But it was also a bit suspicious. Did they read the entire paper? And test his container? "Oh well," he thought. It must be that if you add enough buzz words about machine learning and data intensive workloads the reviewers would become drunken with Silicon Valley hype and say "Yes, yes! It's great!" The publication was out within a week, just before the end of October. It was a blessing and a curse, because now Dockarod didn't have any excuses to wait around to hear back, he could continue on with other projects. He decided to return to a previous attempt to predict scooter stealing based on geographic area. That's useful, right?

The first email came in a few days later. It was from a collaborator at the University of Vermont that was testing the container. "Great work!" he commented. I can predict ice cream preferences with Reddit posts from the individual about how they feel about cows. But did you change your container? The paper says that you used version 4.3.1 of Tensorno, but the container seems to be packaged with 6.6.6. Is that even a release? Do you think you could take a look?"

Dockarod felt gruffled, which is a combination of ruffled and gruff. Once a publication was out, it was very hard to change, and he suspected that perhaps there was just an issue with the container build. He was going to watch a movie on Netflix, but instead his evening would (again) need to be used for random work. Dockarod always regret his life choices when this happened. He didn't want to consider the idea that he couldn't quell his own anxiety enough to choose to NOT work in the evenings. He blamed it on his profession, and jumped over to Twitter to complain about his life choices. Send tweet.

He pulled the container, and the layers cascade into his terminal like a waterfall. Pulling, extracting, these were all those lovely layers that were

generated from the automated build oh so long ago. Once the manifest and layers were obtained, Dockarod ran the container with an entrypoint as a bash shell. He was inside! And now to check the version of Tensorno.

Huh, it seemed to be 4.3.1, he wondered if his collaborator was just downing a few too many pumpkin ales. But to be completely sure, he ran one of his analysis scripts against a data file provided in the container.

That's when he saw it. The numbers 6 6 6 were printed in the terminal. And how were they colored in red? That's kind of... weird. To print colors in a terminal the terminal would obviously need to support it (his did) but he would need to print ANSI escape sequences to start and end color blocks. He had done that a few years ago for a useless Pokemon module, but it definitely wouldn't have been appropriate to do here. He found this... strange.

But the analysis result seemed to work okay - he used his Reddit posts to predict that he liked chocolate chip cookie dough ice cream. This made him wonder if he could use a similar method to predict cookie choices, but it would take rigorous study to know for sure. Anyway, he responded to his colleague. "You're right, the version is a bit wonky, but otherwise seems okay! Let me know if you run into any other issues."

It was later that night when he was helping himself to some rocky road ice cream (hey, a man can't always be stocked with his favorites) that... it happened. As he closed the freezer, (pop) there was a shuffle that came from the adjacent cabinet. He shirked back, knocking over his bowl, "Who's there?" Was it his cat? He opened the cabinet cautiously, and there was nothing. But then...

"There's a ghost in the container."

He fell back so quickly that he almost squished his pet cat, who was helping herself to the fallen ice cream. She sprang up as well, and was gone in the same instant. What did he just hear? Had HE had too many pumpkin ales to drink? He decided to skip over his bedtime snack and just go to bed. This was just too much.

He woke up the next morning, and reflected on the dull state of his life. Send tweet. But the memory of the voice, that eerie, creepy voice, saying something about a ghost in his container? It stayed with him. With Homer Simpson slippers adorned, coffee in hand, he set out to take another look. It was just... a container. It was all in his head. Click click click. Ug, he typed his password incorrectly. Click click click. Got it! Oh, but ug... two factor authentication. Where was his phone again? After bypassing the security measures that were most effective at locking himself out, he was up and running. He again shelled into the container, and did a simple listing of the working directory.

Strange, there was a binary sitting right there, named exactly the same as his analysis script. He must have run this thing the other day when he thought he was using his Python module! Gosh darn Python paths. Could he blame Python for this? Eh, probably not. What could he do with this binary thing? Vim wasn't super useful, it looked like goppelty-gook. Even though he ran it yesterday he was super freaked out and didn't want to do it again. "AH!" he thought, I'll look for it in the build history.

There wasn't evidence of compiling such a binary in his Dockerfile, so he used the Docker Hub API to request a version 1 image manifest, you know, the older one that still has a "v1compatibility" key, and then lots of history dumped in there. There was nothing out of the ordinary. Maybe if he ran the script again, he could trace it this time? Yeah, that would at least show him in more detail what was going on. It would just predict an ice cream preference after all, no harm done. Click. And away the binary went.

The TV in the room JOLTED on from nothing with a burst of static electricity that Dockarod didn't even think was possible for a modern television. It was the morning news, and they were reporting from a small town on the East Coast. Dockarod felt his stomach fall to his feet. He felt sick. It was his collaborator, who died unexpectedly in the night. His feet went cold. His palms were clammy, and his face was white. How old was he? Maybe in his 50s? Was it just a terrible chance? Oh god. He looked back to the trace, and it had finished. And that's when the phone rang.

It was a previous student of his, which wasn't a huge surprise, this

student had called before and liked to talk about her work, ask questions, and probably just make sure that he was okay. "Hey did you hear about Professor Crane?" I just, I can't believe it. I think he was really excited about your work... oh god sorry I didn't mean to make the call really dark, I actually wanted to ask you about the container you shared."

Another issue? What is the deal here? "Sure," he answered calmly, suffocating all of his internal angst and horror about the recent events. "What's up?" The student proceeded to tell him that the classifier wasn't reliable - she ran it a few minutes ago, and then just now, and the first time it gave her an ice cream flavor of peppermint, and now it was cookie dough.

"Did your reddit data maybe update? If someone else changed the ranking of a post, well it's a very sensitive algorithm so the result might be different." "Oh," the student reflected. "That's not very good. I mean, my favorite ice cream is definitely peppermint. It's kind of disappointing that, I don't know, your classified kinda got it wrong?"

Dockarod silenced a grumble that started to erupt from his ornery crevases. "Sorry about that, Karina." Maybe you can try downloading the data first, and keeping time-stamped versions to be sure?

He hung up the phone. He didn't have time for this, the binary sitting in front of him was emotionally all consuming and he had to understand where it came from. The trace didn't show much of interest, well, at least he wasn't good enough with computers to really interpret it. Instead, he sent an email to an old friend that now worked as a linux admin. They had started on the same path, but his friend decided that he wanted job security and was fairly terrible at data science so he went another route. Yes, Dockarod was bitter, why wouldn't he be? "Hey Frank, can you take a look at this trace?" I'm like, fairly certain there is something weird going on. Can you tell why it might change a prediction, or print out 666?

"Yeah sure," said Frank, who enjoyed relaxing on the weekends, but also didn't have much of a family and would wind up working on projects. He was a perfect counter to Dockarod's bias about his own profession being all consuming, but again, it was right in front of him so of course he didn't see it. "Hey do you think you could point me at the container so I could take a

look?” Dockarod felt ridiculous, but he didn’t want to chance it. ”Ah, you know maybe if it comes to that, but I think you can probably get pretty far without it.”

He hung up the phone and decided to have some breakfast. On the weekdays was suitable for forever staining his teeth and tinting his insides with some combination of nature and added carcinogens, but on the weekends Dockarod liked makin’ waffles. As an extra special treat he liked to add ice cream, so he grabbed a scoop and dumped it in the mix. It was just minutes later, just as he was sitting down to a freshly made concoction with syrup, chocolate chips, whipped cream and sprinkles, that the voice came to him again.

”There’s a ghost in the container.”

He basically crapped his pants. And that’s when the phone rang again. It was Frank.

”Hey, so I took a look, and I actually found a string for a URL the binary is requesting, something about ghost.new, I guess that’s a new domain extension that was just released? But there isn’t actually anything there. Everything else seems to be in the container, so maybe you could take a look at the layers? In the manifest?”

He hadn’t thought of that, the history of the container should show the steps to generate it, but he hadn’t double checked the layers. Ug, if only he had done best practices for layer based images and not put a single command on every run line. He had a lot of tarballs to dig through. Better have another waffle first. Yeah and maybe some more coffee.

Three hours of sifting through tarballs, and nothing. He thought harder about the voice that he kept hearing. Was he becoming schizophrenic? It was totally possible given his age, and demographic as a white male. But if he didn’t hear the voice, where was it coming from? And what ghost was it talking about?

ps. That's the command you use to list running processes. And there is was, a tiny little question mark. A ghost or zombie process, if you will. And that was pretty much all he could figure it. Maybe Frank could help debug this? But this time Frank didn't answer. He must have finally given in to an afternoon nap or trip to Target to wander around and buy household items that made you feel good in the store, but became counter clutter once you were home.

He took a closer look at the binary. Oh wait, he's a total idiot, it was a symbolic link! Let's just end this once and for all, and delete the thing, and manually push the container back to Docker Hub. If bad things were to happen every time he ran this thing (or was it the ice cream?) the resolution would be to get rid of it.

"Rm -rf". And then everything went black.

Dockarod awoke, feeling dizzy and out of place. The surroundings around him were entirely black, as if someone had sucked out any understanding of light and his eyes hungrily sucked at the space, hoping for something. Did he even have eyes? Did he have hands? He followed a small trickle of light and it led him to a flashing marker. It suddenly started to violently change, characters flying across the space and disappearing into some infinite dark sky. What was up might have been down, and what was down seemed to always be growing. Oh my god. Was he... no. That's entirely crazy. Was he inside of... his terminal?

The following sound was overwhelming. He'd never imagined what it might be like to be inside a computer, it was a world of clicks and hums and constant flowing of information. When a sound was played through the speaker, or input in the microphone, it was first passed as data through his space. And somehow, he could hear it.

You see, my dear listener, there indeed was a ghost in that container, but it was only a symbolic link - one that was forever connected to its creator. The link was the only thing preserving Dockarod's existence in what we know to be the real world, because he died the same night that the container was built, at the exact instant that it was built, and by some flaw in the universe or space time, or perhaps because he was so obsessed

with his work, his soul became trapped in the container, and his shell of a real life persisted outside of it. But now? His connection to the real world is shattered, and he is forever trapped in the container that turned out to be his final work.

Welcome back, ghost.

## Background

Thanks everyone for listening to this story, it was prompted by a conversation that I had with Jacob Chappell on the Singularity Slack, and his original story was much more succinct:

It was a Friday at 4:50 PM. My container was almost done building. Then it happened. A kernel update. Security madness. Darkness filled my stomach as I clicked over. "A CVE? Must be serious," I thought whilst munching into an avocado. But then, it turned out to be `runc` which Singularity doesn't rely on. A rush of relief rinsed over me, and I realized the darkness in my stomach was due to the avocado being old. - Jacob Chappel

and it inspired me to write something fun on my own! The lessons here, if there are any at all, should be obvious. That we should not be too immersed in our work, that we should write proper tests for our software, and that we should be very weary of shared containers, especially when run with a root daemon. Would the fate of Professor Crane, or our dear Dockarod have been different if there had been tests? Or execution with different permissions? We may never know. Dockarod is now the soul of a container, somewhere on Docker Hub, that even you might stumble upon one day and give a run. We may never know the mystery of how life turned to bits, but he's still out there, perhaps an un-named layer, sitting somewhere without a label on someone's computer, waiting to be brought to life when someone is interesting in predicting ice cream.

Happy Halloween everyone.