Ren Kararou (fae/faer)
1010 Fake Blvd
Denver, CO
(303)555-4202
ren@kararou.space

Ætherials

by Liette Faerchild

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Foreword

I keep having weird dreams about things of all natures, as I think about technological problems and other assorted issues. So consider this anthology of aetherial short stories as some weird look into my demented head.

The Datacentre

As I stood there, in the middle of a field, I wondered what exactly to expect. This was the right address, I'd triple checked before leaving and then checked again once I'd arrived. The only indications that this place held anything other than a field of Colorado-native grasses and plants was the small shed. But there wasn't enough here to be able to tour one of the top ten super computing facilities in the nation.

I'd lined up so many contacts, pulled in so many favours, just to be able to be the first reporter inside this facility. I didn't want to miss the story because I got the wrong address. I sighed and checked my phone again, hoping for any new messages that would indicate I was in the right spot.

"Hello, you must be Azalea," a soft voice greeted me. I startled and looked around. A beautiful dragon-wolf hybrid had emerged from the shack.

"Yes," I replied, "I am she. You must be Ræn."

The hybrid nodded, and motioned me inside. Cool air blew my hair back as I entered the shed.

"You never mentioned your facility was underground in your correspondance," I noted quietly, "I was worried I had come to the wrong place."

"Its," fae trailed off, lost in thought for a moment, "there are a number of things you must understand. We only have an acre here at the research lab, but we've worked extensively with engineers to ensure our facility is more efficient than we can show for."

"How did you manage to fit so much compute in only an acre?" I asked, bewilderment showing on my face.

"Before I can explain further," Ræn replied, shuffling some papers around, then presenting me with a thick stack, "You'll need to sign these non-disclosure agreements."

"I'm a reporter," I stated flatly, "You can't expect to gag me."

"There are certain cutting edge technologies here," fae began to explain, "we won't be gagging you in full, but there's a lot that goes into a cutting edge facility like this. You'll receive a breifing on what you can and can't talk about after the tour."

I was no stranger to NDAs, there was red-tape all over the computing industry since the 2024 open source crash and companies started re-proprietizing all their software and hardware. One company stood outside of that paradigm, though. BreakPoint Industries. They were still a nearly fully open source company.

"Alright," I agreed, signing several pages, "but I expect to be able to publish my article without your oversight."

"We'll see about that," fae replied, "We'd like a pre-publish copy to review, we won't stop you from publishing, obviously, but you'll understand our reticience when you're inside."

"Understood," I stated, then handed faer the stack of NDAs.

Fae took the papers and put them in an envelope, rolled them up and put them in a circular tube, then turned to look at me.

"Now that we have that taken care of," Ræn said, an evil smile creeping up faer face, "lets talk about small things."

"Small things?" I asked, fear gripping me, "Why would we need to talk about small

things?"

Fae pulled a small metal box out of faer pocket, then handed it over to me. It looked like a much smaller version of the 3 server chassis that BreakPoint manufactures for companies.

"I discovered a way to miniatureize everything inside a given space," fae said, excitement bleeding through into faer voice, "That was my first experiment, and it ended up a bit small, the rest are only a little bit bigger than that, but the power savings are amazing."

"How do you service servers this small?" I asked, confused, "And how do you get power savings by just shrinking the servers?"

"I'm not sure of all the physics behind it," fae admitted, "but the guys over at BreakPoint said that the processors shouldn't even function this way. Something about breaking the laws of quantum tunneling? Anyway, follow me."

"Where to?" I asked, looking around, "There's nowhere to follow you."

In response, Ræn pulled on the wall in the corner. As fae pulled, a hidden door opened to a person sized tube.

"The door will close after you, so come down when you're feeling ready," fae explained, getting into the tube, "it will only feel a little bit awkward for a moment." After fae finished explaining, the tube started to lower, while also shrinking slightly.

I found myself staring as fae disappeared into the conical tube. As I peered over the edge, I could see Ræn standing at the bottom, only a few feet down. Fae looked much smaller, exiting to the left. I took a deep breath, realizing I was very confused, and wasn't sure how I was going to react to being shrunk down to the size of six inches.

But I wanted this, too. I wanted to be able to cover the story of the overnight supercomputer giant, offering its services to scientists and researchers completely for free with compute time booked for at least a year in the future. I wanted to know what made this work. I wanted to know where the Kararou Computer Research Lab had come from. I wanted to know why it was here.

I finally decided I'd do it, as the small floor returned to normal size and rested just below the lip of the tube. I stepped onto it, closed my eyes, and waited for the slight discomfort to pass.

I didn't end up feeling any discomfort, maybe due to my accutely human-level senses. There was no doubt that a dragon-wolf hybrid is much more sensitive to changes like this.

When I looked over, I saw an apparantly normal-sized Ræn waiting for me to exit.

"Hurry up and come with me," fae said, motioning down the hallway, "our staff don't like to keep the door open for too long, as its a security violation."

"Alright," I muttered, "I understand why there's so little information available about this place, though. It looks like it was built inside of a concrete box."

"It was," fae replied, "the whole acre was dug up a year ago, and we poured a concrete box with a fourteen inch internal height."

"Isn't there ventilation?" I asked.

"Oh yeah," fae replied, "we had an intake and an exhaust built, too. They were holes that were four inches over near the corners of the property."

As we walked down the hallway, Ræn pulled me into a reception area. There was a cat hybrid sitting at the desk next to the entrance. His green eyes were reflecting the light the rows of un-shrunk LED strips were giving off. Along the walls were several comfy looking couches with end tables and coffee tables. Everything was a white colour.

"So you do have staff down here, and you've prepared to have guests, too," I noted.

"Yes," Ræn stated, "We're also the model data centre that BreakPoint is going to use to sell the solution we've built here."

"I thought you said you discovered it," I noted, then asked, "so why go to BreakPoint?"

"I'm the one that bailed them out after the crash," fae responded, "I was the mysterious benefactor that kept them afloat, and I've been using them for research and development for years since, only fair I give them anything I develop, too."

I was taken aback. "But that would mean you'd have had to buy the company when you were, what twenty one?"

"Yeah," fae answered, "don't ask about the cash flow on that, but suffice it to say I think we have a real game changer here."

"If your claims of power efficiency aren't over exaggerated," I said, doing some calculations in my head, "all the costs of building and upkeep of a datacenter would be less than a quarter of a traditional datacenter."

"Not wrong, during buildout, we only spent a few million credits, though most of that was on compute itself and the shrinking tech is actually really inexpensive to make."

"Will it eventually be open sourced?" I asked, realizing that BreakPoint was the premier in open source technology.

"We're still working out how to do that," Ræn admitted, "Imagine the military applications of it, then realize that we don't want to change the world such that megacorps have even more power to destroy eachother and the world with them."

"You could transport nuclear material almost undetected," I said, my eyes widening in shock, "I understand the need for secrecy about this."

"I knew you would," fae said, wearing a smile, "The guys over at BreakPoint are working on how to add non-trivial defenses against putting fissionable materials through the matter gates, but its still a work in progress."

"Which is why I'm the first to see this place," I said, an understanding washing over me.

"Exactly. Do you want to sit down, I'll have Hector fetch some coffee if you'd like."

"That would be nice," I said, walking over to a couch and flopping down in it, "cream and sugar, please."

"Hector," fae said, turning to the reception desk, "would you be a dear and get us some coffee, I'm sure this is bound to be a long conversation, she'd like cream and sugar, as well."

"Alright, captain," Hector responded, his voice a low purr.

"Please refrain from calling me captain, I've never been in the military," fae responded. I knew that was a lie, though. During my research of the place, I'd made sure to run background checks on the contacts, Ræn and one other. Faer lack of military experience was greatly exaggerated.

Ræn had been a part of the Toa Heavy Industries Security and Defense Force for several

years. While not technically military, the THI SDF was easily several leagues beyond the flimsy military that the Colorado Free State had managed to pull together to defend itself from its neighboring countries, also mostly owned by megacorps.

"Yes ma'am," Hector replied, walking behind a recess in the wall, apperantly where the kitchen was.

"Sorry about that," Ræn said, turning to me, "Hard to find non-military personel that will keep a secret like this."

"No worries," I replied, "When can I see the rest of the datacenter?"

"Soon," fae replied, "just have to get a few formalities out of the way."

"Alright, are we going to wait for the coffee to begin, or can we multi-task a bit?"

"You're already accustomed to it, then. Alright, lets get started," fae said, beginning the 'few' formalities.

"First, we are only on shore power during maintenance of our powerplant. We have a sterling engine powering the whole facility using the heat from the servers and cool water from the ground to get the differentials. It produces two kilowatts, which is more than enough to power everything and charge our batteries. Our batteries are un-shrunken 18650 sized lithium iron-phosphate batteries. We picked those because they don't explode compared to lithium cobalt cells. We store enough power to run us for several days. This is the first area we'll visit. After that, we'll head to the colocation center, where my personal servers are. Its nothing special, but we water-cool all the servers and use a heat-exchanger for the whole facility, running that water through the sterling engine, then cooling it using a geothermal heat-exchanger. Its all quite neat, in my opinion."

"You're that advanced here?" I asked, confused as to how the servers were producing enough heat to power themselves, "It sounds like perpetual motion."

"Nice catch," fae answered, "but the sterling engine works on heat differentials, so as long as the cold side is cold enough, its fine. We scouted this place for its exceptionally cold ground water."

That didn't make much sense to me. Groundwater, especially at geothermal tempuratures, was supposed to be a uniform temperature no matter where you were.

My thoughts were interrupted by Hector coming back with the coffee.

"Please, enjoy," Hector said, handing me a warm mug of coffee.

"Thank you," I said, turning my attention back to Ræn.

"So, lets get down to it," fae said, standing up and motioning for me to follow. I was led down the hall to a door that had a bronze badge on it.

"This is the power plant observation room, it shows us a nice view of the power plant floor and the battery floor."

"Can't we go out onto the floors?"

"Unfortunately no, we're small enough now that even the twelve volts running through the wires is dangerous."

"Okay," I said as fae opened the door. I was pleasantly surprised when I realized that there was hardly any noise coming from the door.

As I walked in, I saw why. It was a deck, slightly raised for better viewing angles. A faraday cage was built around it to keep the observers safe from any lethal electricity, though the cage had to be for show. Bisecting the outside of the cage was a wall. On the left side, the batteries, on the right, the engine.

It looked like there were enough batteries, giant hulking towers from my relatively small point of view, to power a large electric scooter, but no more than that. The engine was much more interesting by comparison. The batteries merely had some circuity hooked up, and a few very large power converters along the floor. The engine was a large green box inset into the floor with see through tubes displaying some pink liquid and a blue liquid, small bubbles constantly moving around.

It was amazing to me that the liquid gurgling around inside the engine was creating more noise than the engine itself.

"BreakPoint really put in a lot of effort on that jobbie there," Ræn stated proudly, "its quite

the effective work they've done, too."

"Yeah," I agreed, "its even really pretty. I assume the pink liquid is the server coolant?"

"Indeed," fae confirmed, "The blue liquid is a special formula we use in our geothermal loop. Once it comes out of the engine, it goes to cool the server coolant."

After I'd had my fill of jotting notes about the power generation and storage facilities, I was led to another room. This one had a silver badge on the door.

It was another observation deck, this time over the coolant pumps, which pumped both the server coolant and the geothermal loop. This area also had several large heat exchangers, facilitating the heat transfer from the server coolant to the geothermal loop to warm the earth below us. I also took a lot of notes here before being led to another room, this one had a gold badge on it.

Fortunately for me, behind this door was a datacentre floor. I would actually be able to observer the hardware up close, this time around.

"So these are more or less standard BreakPoint OCP compliant racks," Ræn explained, pulling out one of the server sleds, "The only major difference is that instead of converting the twelve volts once per rack, we've converted the whole facility to use a single twelve volt source and send it across the bus bars to each rack, which still uses the bus bar system in the rack itself."

"You're really stacking up your efficiencies here, aren't you?" I ask, poking fun. It sounded like too many extremes just to go after marginal efficiency gains.

"When you're running nearly six thousand of these racks, every single efficiency measure adds up to less overall power consumption, whether your datacenter is fourteen inches or fourteen feet, every single microamp can make the difference." Wow, fae really meant it, too.

Ræn was running the most efficient datacenter in the world.

"Hey, you said that one of these floors was your personal datacentre," I began, "what does and individual such as yourself use all of this compute for?"

"Oh," fae smiled, "that, is a story for another time. Perhaps over coffee next week?"

"Sure," I responded shakily. Was fae asking me out on a date? Did fae count as an excentric

billionaire?