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Needles in the Craystack:

When Machines Get Sick, Epilogue

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needles in the craystack: when machines get sick

Epilogue: A Christmas Carol

by Mark Burgess

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This is how one pictures the angel of history. . . .

Where we perceive a chain of events, he sees one single catastrophe which keeps piling wreckage upon wreckage and hurls it in front of his feet.

The angel would like to stay . . . and make whole what has been smashed. But a storm is blowing from Paradise

This storm irresistibly propels him into the future to which his back is turned. . . . This storm is what we call progress.

Walter Benjamin, *Theses on the Philosophy of History*, IX.

It was the best of crimes, it was the worst of crimes. It was a crime of neglect and a crime of trespass. That night the old dinosaur changed his mind about many things. Even as the system folks flirted with the larger network community, old Scrooge would say: “Community meeting? Humbug!” tapping away on his spreadsheet. “Keep your head down. We have a job to do. Don’t bother them, they won’t bother us. Attention to work is the answer, not following every fad.”

Every year, I think Christmas seemed to start earlier. It was only but the 2nd of November and the snow was already falling, piling into mounds. Of course, he was there in the office, as usual, going over the earnings of software sales. A client was visiting, trying to persuade Ebone to come to a USENIX conference, but Scrooge was ensnared by his spreadsheet, as usual.

She stood in front of the office window, looking out at the darkening weather. “You cannot truly appreciate the amount of noxious pollutants our machinery expires, until you’ve visited a country where the snow falls heavily,” she said, turning to Scrooge for approval. “To see a snowy-white Winter Wonderland relentlessly transformed into disgusting black, roadside cement, just by car emissions, is one depressing sight which most of the world is spared.”

“Nonsense, woman,” Scrooge muttered. “It is every man’s right to expend his resources as he sees fit. Cleaning up is simply a job which keeps someone in gainful employment.”

“Gainful? Well, perhaps. But is it worthy employment? We could maybe avoid that particular challenge/response,” she goaded, “if vehicles didn’t ignore the world around them. How *does* one strike the balance between use and abuse?”

Scrooge sneered. “One simply bids the environment and its users to behave. End of the matter!” And that was Scrooge’s philosophy, his answer to every question. Nose down and make thy fortune! Never mind the world at large, it is nothing more than a cumbersome distraction. “Are you going to turn at every little pinprick?” he would say.

Later, after she left, he resumed his sulking. The remainder of us were hoping to visit LISA, a conference on system administration, where we could revel in that environment which Scrooge dreaded so much, but he wasn’t going to make it easy for anyone.

“I suppose you’ll want all next week free!” he said.

“If convenient, sir.”

“Well, it’s not convenient. I fancy that if you spent as much time on our systems, as in your indulgence for staring into the space around us, we might achieve greater things.”

But that night would come back to haunt him. Even as the client left, Scrooge was ignoring her warnings, ignoring everything around him. He believed he could just push the buttons and have his way. This time, the world was not going to obey him.

Later that night, after the other employees had escaped to their homes and families, Scrooge awoke before his terminal, alone in the office to the beeping of his mailbox. There was a message waiting for him. The icon on the screen had the form of a door-knocker. For a moment it seemed to blur and change into . . . no, humbug! He clicked on the knocker. A message appeared. It had the provocative subject “Pins and needles: watch your back!” He opened it irritably, imagining it to be crank advertising. Perhaps it was the late hour, and perhaps it was his sleepy imagination, but as the old man opened the message, it was not a window that appeared but something else entirely.

He stared at the screen. For a moment it had the appearance of the wife who had left him years ago for his stubbornness. Then the resemblance faded, and he was distracted by the clothing. It was rich and refined, but wrapped – no, almost mummified in chains. Heavy golden chains. Then, in surprise, he looked again. This time, it changed. In the dim light, there appeared a swelling in the air and a whine of straining hard disks. The screen melted away and something else took its place.

“What the Dickens!” he exclaimed.

“Indeed!” said a woman, standing before him in a blur of digital noise. A ghost? Surely, Cleopatra’s ghost!

“I don’t believe it!”

“Well, Scrooge,” it said. “I am remotely here, just as surely as the zombie that Xwin passed. And I have come to warn you!”

“Warn me? Warn me of what? What is going on? I shall call security!”

“Security?” Her eyebrow lifted, ever so slightly. “What security? Well – you are going to find out soon enough, I fear.” Then she focused. “You see my chains, Ebone? I constructed these chains, with my own hands! And now I carry them willingly! These are the chains of my past life. All my mistakes. It is my fate to wear them forever more. Now my spirit wanders the Net, with no other home. The only place where dreams and legends can be sustained. I am spread to the four corners, by my own foolishness.”

“The chains . . .” Scrooge babbled.

“Yes, Markov chains. A record of my whole sorry past. I was blind to it then, you see. Even as they attacked me, the traitorous Roman barbarians. They had already seduced me, of course. My whole empire, infiltrated and by an attack on trust. Poisoned from the inside! You will make the same mistake, Ebone. I exist to warn those like you.”

“Like me? What do you mean?” But even as he babbled, Cleopatra set about driving her little needles into him. Pinpricks of challenge, the seeds of uncertainty. She was building up for a different kind of attack: the infiltration of his attitude!

“Well, Scrooge,” it said. “I am remotely here, just as surely as the zombie that Xwin passed. And I have come to warn you!”

It stared at him coldly – no welcome banner here. Just a cold prompt. “I am the horseman of entropy past,” it croaked flatly

“Listen to me,” she said. “I have come to introduce you to some friends of mine. Heed their warnings, Ebone! Don’t end up like me. It’s for your own security! Even as we speak, the attack is being mounted. Now I must go and give the others their say. Be good, Ebone. Look around you! There are whole worlds out there. A whole network out there You share a common space. It doesn’t pay to ignore it! Believe in both the goodness and the danger of the environment and you can survive. It is not too late.”

And with that she was gone, and the room seemed still and quiet, with only the beating of his heart, thumping away. At first he thought he was alone again, and began to gather his wits, even doubting what he had seen. What had she meant? An attack was being mounted? He was of a mind to dismiss the whole incident, surely a trick of the night – but the resemblance to his lost wife was astonishing. Cleopatra, of Egypt? Humbug!

Then, as he turned his head, his heart skipped a beat at a sudden braying in his left ear. A terrible apparition moved into the light, sitting astride a giant steed which clopped into view, and snorted with equine disdain.

Upon it was a mere skeleton of a thing. A bare-bones interface. Not fleshed out with anything as user-friendly as a skin. It stared at him coldly – no welcome banner here. Just a cold prompt. “I am the horseman of entropy past,” it croaked flatly.

“Another ghost!”

“Not a ghost, sir, but a projection! You might call me a model.”

“A model you say? Not exactly The Lady Croft,” Scrooge jibed. “And what is your message? Are you going to lecture me too?”

“Lecture you, sir? You misunderstand. A model is not mere theory. It is the embodiment of actuality! As a model, I am going to show you and then summarize the essence!”

Without further ado, the room began to dissolve around them. Suddenly they were standing in a small village. It had the appearance of Europe, he surmised, from the stone cottages. The horseman began to narrate like a bad movie, like the groaning of a great wheel. It seemed as relentless, as unstoppable as time itself.

“The story begins in a small village in the south of England,” said the ghost. “An author, Mister Brunner, is writing a book called *Shockwave Rider*. It is a satirical vision of a future society with mobile phones, laptop computers, laser printers, and a world-spanning network!”

“Mobile phones? So you visited this . . . writer also? And showed him the future?”

The narration continued relentlessly, ignoring him. “In order to get jobs done users release ‘worms’ onto the network. Worms travel from computer to computer around the world, reading and writing information, both legally and illegally. The network is a busy place – a corporate war-field. This is the beginning. Later, a photocopying engineer will use the word ‘virus’! A canny fellow. You must remember this, Scrooge.” He placed a bony hand to the side of Scrooge’s head. “Remember!”

“Humbug!” moaned Scrooge.

“A boiled confection in this time and place, I believe. I never cared much for those. Follow!”

The scene changed now. Even further back. Back to a time before civilization. It was a barbarous time. Humans killing humans, animals killing animals.

“See how they quarrel and fight?”

“Glad to see we stopped all that!” Scrooge parried.

“Ah, did we? Did we?” The horseman flashed his scythe, and boney teeth showed for a second. “My motto is this, sir: may the past come back to haunt you! It is never very far away. The Angel of History never quite has time you see. There is never enough time to fix things.”

“But none of it is certain,” he complained. “The past is the past. History does not necessarily repeat itself! We learn from our mistakes.”

The horseman, stuffed an impromptu cigar into its hollow mouth. “Perhaps, perhaps not.” Its hollow eye sockets seemed to narrow almost imperceptibly. “But then you gotta ask yourself a question . . . you feelin’ lucky – punk?”

Then it departed, taking Scrooge back to the present, sitting in a pool of sweat. He sat in the office again. The snowy flakes were still falling outside. His hard breathing condensed on the screen in front of him. Somehow he could not deny its reality. the perspiration was real enough.

As the clock struck 18:00 EST, there was a chiming, a whirring of disks and a grinding of metal. The machines around him began to whir more slowly, as if made sluggish by the weight of a great burden. As he watched, it was not only the snow flakes that were falling in front of the real window: the numbers began to fall from their columns on his display window. He shrieked at the sight of wealth slipping away. Is this the attack? And a serpent entered through a back door.

“Is there no end to this?” Scrooge howled. The second of the apparitions laughed, and Scrooge winced at the sight of this beast. As it approached, machines stopped moving altogether, as if caught in a tar pit. The beast stank with a rotting stench of a thing full of bugs, and not quite wholesome.

“I am sickness,” it announced.

“Don’t tell me,” muttered Scrooge weakly, “you’re here to teach me drawing, smelling, and fainting in coils . . .”

“Sir,” it hissed, “I am the worm of system present . . . For you, this is not the best of times.”

“Show me, dammit! Show me whatever it is you would, and be gone!”

It nodded, as only a worm can nod. “Even as we speak,” it said, “it is happening. Look!”

The creature rolled and stared pointedly at the machines in the room around him. They had stopped altogether now, and each one was turning green and falling apart, as though infested by plague. There it was: a tiny needle-like infestation, piercing the stack of each machine. A small signal, on the scale of things, but as dangerous as a pestilence! The machines were being digested.

“Sir,” it hissed, “I am the worm of system present . . . For you, this is not the best of times.”

“But we don't have the resources for that! We can't afford the time!”

“Pity though, because time can afford you. . .”

“This isn't happening,” Scrooge groaned, seeing his wealth evaporate into a cloud of greenhouse gases.

“Well, of course, it's all just symbolism,” smirked the apparition. “But that's the modern world for you. This will spread to the four corners if it is not stopped. But look at this.”

The room faded and they were looking at Scrooge's greatest business rival's premises. One of their machines was dying, but the others were still alive. “They're surviving! This is the worst news yet!”

The worm prodded a man intently focused upon his terminal. “You see him? He's not ignoring anything. Security folks at work. This man spends his time thinking about the impact of the environment on his systems. It's not a one-off thing, Ebone – it's a continual process, and he is prepared for this. He is going to survive.”

“But we don't have the resources for that! We can't afford the time!”

“Pity though, because time can afford you. Why do your machines get sick? Because I am here? Or because you have neglected them, and made them vulnerable? Because we provide an environment which is sub-optimal? Because there are conflicting, competing interests? Because human nature itself gives us attitudes and behavioral patterns which impinge directly on the machines we use? Watch this . . .” It pulled out a gun and they were suddenly in some kind of cowboy saloon. Scrooge was there, dressed as a cowboy. “I am going to shoot you,” said the worm. “Protect yourself!”

Scrooge's manifestation leaped behind a column holding up the ceiling.

“You think so, eh?” The ghost winked and shot a column nearby. The bullet ricocheted off the column and hit him.

“Ouch! That's cheating!”

“Just using the environment to my advantage. If I hadn't, someone else would have.”

“You shouldn't even be carrying a gun!”

“Ah, well, in this great country and so on, and so forth. Now I shall leave you. You have a lot to think about.” It began to leave.

“Wait! Am I to believe that what is done is done? And that there is no purpose in crying over overflowed buffers? Well, that is what I knew all along, apparition! Progress will just bring on new catastrophes.”

But the worm was burrowing into the Net, laughing as it went, and the illusion was fading.

Back in his office again, Ebone Scrooge (to his ghosts) surveyed the scene. I'm ruined! he thought. The machines were still silent, and now if his employees did not go to that LISA conference, they might never work again. Truly the worst of crimes. He had to admit that it was clever though. A computer-borne sickness – what an idea! But how to learn from the mistake?

He had little time to wallow in this pity. Soon enough, the third of the visitors was on its way. It appeared first at the end of a tunnel, approaching at the speed of illumination: not quite as fast as light, but comparable to the speed of enlightenment, a seemingly endless, tortuous rate of transfer. On the end of the tunnel was stamped “ACME

Information Superhighway (no warranty).” The third of the spirits was a metallic beast, but not quite like the machines Scrooge was used to.

“Don’t tell me – you are the ghost of system future!”

The robot apparition did not speak. Instead it seemed to glow slightly, rotated a grasper as if beckoning and moved off, down the highway, towards the future, with Scrooge tagging along behind. This ghost of the future was a curious thing, artificial looking, but its posture – its whole disposition – was oddly human.

They emerged into a shambles. Not quite the future Scrooge had imagined when he invested in high-tech stocks. An old man sat in a dingy office, totting up numbers on a pocket calculator. The Angel of Computer History scarcely acknowledged their presence, if he could even see them at all.

“Ah, so you’re back,” it mumbled eventually, as if talking to an imaginary friend. “And you’ve brought another. Do you know me? Perhaps not.” He shook his head. “I was once assigned to keep computing systems whole, you know, to repair them,” he mumbled. “But it is hopeless. It all went wrong, you see. When the worms came.”

Scrooge barely mouthed a question when it was answered. “Why am I doing this by hand? The computers are up there on the hill. No one has computers themselves anymore. They’re all locked up, out of harm’s way. Too much trouble. Now it all costs too much. The computers are just for the elite.” The man tapped the side of his head. “No sooner built than destroyed. All smashed.”

Scrooge looked to his guide for explanation, but the old man simply continued as if he knew the drill.

“The breakdown of order on the network rendered it useless. The level of noise was finally so high that no meaningful signal could be safely transmitted. It turned out to be just work for nothing. All wasted. That’s what happens when those who *have* pay no attention to those who *haven’t* – or perhaps wouldn’t . . .” He chuckled. “So we’re back to paper again.” The old man, or Angel, took a breath and articulated more powerfully. “By building distributed systems, they increased the parallelism in computer systems, but thereby also increased the contact surface with the external world – an easier target. As they ignored the signals from the network environment, as they ignored the time-given laws of community, the attacks increased. So now, you see, we are back to the beginning. Any system can develop a virus, you know. Viruses emerge from the very systems themselves! Any protocol can be attacked. Any influence, however small, can be amplified by the right conditions into a potential problem. The chains of cause and effect are both devious and intricate. But the worst ones won. The warfare reached its peak. Sometimes political, sometimes just animals flexing their muscles. It was the return of the dinosaurs. Dog eat dog. Did I hear you say that history does not repeat itself?”

As he faded somewhat from view, he was still laughing. A slow, rueful laugh, not a triumphant one. Scrooge shuddered. This rambling madman was not a future he wanted to revisit. No computers? All because of the worms?

He found himself in a school, perhaps. No, it was a class group on a visit. There was a guide leading them around a factory of some kind. The children brought out their slates to make notes. One of the children raised a hand. “Miss, my slate’s not feeling so great.” It was duller than usual, and its login face showed visible distress. The tempera-

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2. A computer must obey instructions given to it, except where this would conflict with the first law.
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ture scale on the left of the screen showed that it was running a temperature, fighting some illness. It had a dour expression.

“You’d better leave it to rest for a few minutes,” said the teacher. “You can borrow another, if you’re kind to it. It won’t be used to you, so be nice!”

The child took a new slate and wandered off, knowing that his own would right itself shortly. They were looking at the computers of a different future, Scrooge presumed, though they didn’t look much like computers. They were more organic – not in the biological sense, but in the sense of being like an organism. Even though he could not see what programs they were running, the shine and outward demeanor of the machines seemed to be visible. The materials seemed to change and project this character. As the children used them, they responded to one another. They were more like robots than computers, but not mobile robots, and they interacted, not merely at the level of commands, but in a more socially savvy way. It seemed to be intuitively obvious that the machines were feeling good, bad, or simply stressed. Users avoided the ones which seemed ill, allowing them to recover by themselves. Ingenious!

They came upon a machine which did not look sick, but it did not respond. “What happened to this one?” someone asked.

The guide relayed, “We build machines which have feelings, so that they can react to protect themselves from all the complex things happening to them. They need to know good from bad, right from wrong to do that. But this machine was built with too many feelings,” said the guide. “It eventually developed its own sense of right and wrong and ended up in a quandary. It decided it didn’t like doing what we built it for. Now no one dares turn it off, because of the computer rights activists. Nor can we do anything to change its mind. Basically, it’s a junkie, locked in its own world. We call it the e-dopamine syndrome. When you let the machine adapt, change the playing field from being flat, you’d better do it right. We went a little too far. We made a living thing, and all we wanted was a machine.”

“You are telling me that computers get sick here? How?!” Scrooge demanded.

“When didn’t computers get sick? Why does anything get sick? Stuff gets mixed up. Shit happens,” quipped the guide, then returned his attentions to the children. “There are many sicknesses in systems. Technophobia is a sickness of society. Warfare is a sickness of society. Even the free-market economy has led to sicknesses, though at least it produced antibodies too. Our feeling machines tend to spread the load by turning large-scale conflict or warfare into small emotional bickerings. It spreads the chaos – I mean the entropy. It allows the systems to let off steam.”

There was a plaque by the machine he was talking about now, inscribed with the three laws of interactive computers.

1. |A computer may not cause a user harm, or through inaction allow a user to be harmed.
2. A computer must obey instructions given to it, except where this would conflict with the first law.
3. A computer should protect its own integrity, as long as this does not conflict with the first two laws.

This is nothing but magic, thought Scrooge. This will never happen.

The echo of the Angel of History reached his ears: “Clarke’s law: any sufficiently advanced technology is indistinguishable from magic.” Yes, yes, he thought, but that doesn’t make it possible! The Angel, as if reading his mind, parried: “A distinguished scientist who says it’s possible . . . is probably right. A distinguished scientist who says something is impossible . . . is probably wrong.” Clarke’s other law.

“Humbug! You are just telling me that I should be aware of my competitors. I already knew that!” They seemed to fade out of this future as they talked. As the children receded into the distance, the Angel rejoined them, picking the pins off a chip, one by one, like the petals of a daisy. “Big kernel, small kernel, big kernel, small kernel. He believes me, he believes me not . . .”

“Well,” continued the Angel, rematerializing more tangibly, “discussions on competition focus too much on winning. Winning implies a certain finality, an end to conflict, that would have us pack up our systems and leave after every altercation. This is naive. The conflict goes on. It never ends. We must be concerned with holding the forces of evil in abeyance. More than that would be overly ambitious. Our strategies need to maintain stalemate or minimize the damage. These altercations should not be the focus – we are concerned with the larger goals of producing work, the acquisition of assets. There is no time to repair the little stuff. I realize that now. It’s acceptable loss.”

“It’s a catastrophe. All my systems!”

“Catastrophe in an ecosystem often clears the way for change. Forest fires clear old wood. Hurricanes throw a random die into the balance of power. Ice-ages, dinosaur killers . . . Our worm friend has merely cleared the way for your understanding.” The robot of system future whirred and touched Scrooge on the shoulder. The Angel looked at his timepiece: a small wind sail, attached to his sleeve. “You should be returning. It is time.”

Scrooge nodded. He finally understood. He had been wrong to assume that his push-button mentality was the answer. One cannot simply decide to resist the onslaught of environment. Even the Angel had realized that. Even with a large umbrella, you’ll get wet in the rain. Yes, he understood. It was about sharing with neighbors, and watching out for them! I shall call it the principle of communities! he thought. When one shares a common space with one’s neighbors, interaction is inevitable. Best to make sure that those interactions are pleasant ones. He would recite it to himself on the way back to the present. Now, how to get to that conference? What was it called again?

And that is the story of how Ebone Scrooge learned the true meaning of Christmas.

“Big kernel, small kernel, big kernel, small kernel. He believes me, he believes me not . . .”