LETTERS

SYSTEM RECOVERY ALTERNATIVES

The authors of "Recovery-Oriented Computing: Building Multitier Dependability" (George Candea et al., Nov. 2004, pp. 60-67) mentioned several techniques for recovering from inevitable system failures, including microreboot and system-level undo.

I agree in principle that "A first-line-of-defense recovery mechanism should be low cost and low overhead, with a good probability of repairing the problem…" In the event of a hardware or software failure, the basic objectives are getting the system back to normal operation in the shortest time and restoring individual files and folders as quickly as possible.

In some cases, a reboot can remedy minor problems and serve as "a universal form of recovery for many software failures, even when the exact causes of failure are unknown." However, unidentified problems frequently recur, resulting in a complete system malfunction. In this circumstance, rebooting merely postpones the inevitable.

The traditional tape backup technology is increasingly becoming a secondary option because the stored files can be corrupt or blank when restored. Moreover, manually rebuilding and restoring data from tape backups or reinstalling it from scratch can take hours, which is not acceptable for most businesses these days.

Disk-to-disk backup with system imaging offers a viable option for ensuring against system failure.

This technology can store either individual files or entire directories without requiring backup software. IT administrators can use online server imaging to create a full image of the system and to perform frequent disk-to-disk backup of data files.

With system imaging, backups evolve from merely being a disaster recovery option to become an integral part of the information management process.

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The authors respond:

Great observations. Microrebooting aims to complement—rather than replace—existing, more expensive high-availability techniques such as redundancy and failover. It is not a cure-all.

Our paper on "crash-only software" (www.stanford.edu/~candea/papers/) presents the design of systems optimized for shutdown-by-crashing. In these systems, the effectiveness of microrebooting is maximized. Failures whose root causes recur deterministically—a problem for any form of recovery—are handled by recognizing the repeating failure pattern in a recovery manager and employing an alternate form of reovery.

Extensive logging at runtime and recovery time provides the means to identify impending larger problems. In this case, if microrebooting can delay a problem, operators gain time to prepare for handling it when it strikes.

All these topics and more are covered at the URL provided above.

THE RELEVANCE OF COMPUTER SCIENCE RESEARCH

Reading the December The Profession column (Simone Santini, "Determining Computing Science's Role," pp. 128, 126-127) brings up several questions: Is this column relevant? Is computer science relevant? Are universities relevant?

The author illustrates no reasons for or benefits from pure computer science research. He illustrates no accomplishments of this research in the past half century.

Why should society be obligated to pay the salaries of pursuers of pure research? There are nonscientists who do accomplish things, some of which have a huge impact on society—not all of them economic. Since computer science is still a field where a lone researcher could accomplish something significant, perhaps pure computer science researchers should retreat into their garages to do their work.

The author bemoans the fact that economic factors are driving research, while his essential complaint is that not enough money is going into pure research. This seems rather self-contradictory.

He is unhappy about universities churning out professionals who can actually contribute to society. God forbid! I'm glad this is happening at long last, with the captains of academia reluctantly coming out of their caves to see the light of reality.

Let's remember that computer science was born because Turing wanted to help the war effort, not because he had too much idle time on his hands.

This column appears to exist either simply to be a voice for disillusioned academia or to generate controversy. If this is indeed a column about "the profession," let's hear from some professionals. Otherwise, print something else that might be useful because useful information is the only thing I'll pay for.

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The author responds:

In what sense are the terms "relevant" and "significant" to be taken here? Economically relevant? Industrially significant? Nothing else?

If I agreed on the exclusivity of these criteria, I could simply resort to the many examples of technical (and economic) breakthroughs generated by pure research that probably never would have happened in the frantically application-oriented world of industrial development.

To stay on familiar ground: Turing published his Entscheidungsproblem (the "Turing machine" paper) article in 1936, well before World War II. Its

origins are indeed in the mathematical literature—in one of the 23 unsolved problems that Hilbert outlined at the first mathematical congress in 1900. Other examples, from Fourier to Maxwell, abound: Creativity often—although not always, of course—comes to life as an epiphenomenon of unattached culture. Industrial research is useful and important, but it can't be our only model.

But to artificially restrict ourselves to this monochromatic reading of the term "relevant" would miss my point: Computers probably would have been developed even without Turing and Von Neumann (another pure mathematician). But the point is that to reduce the entire human experience to industrial productivity would be to deny our intellectual richness.

One reason that people work is to carve a space in their life in which they can pursue their own interests. Education—not just in universities—should take this essential fact into account. If industrial ethics is the only thing that matters, if the only purpose of education is to make us productive, then the education system fails to give us the intellectual tools needed to fully experience an essential aspect of our lives.

The idea that production is the mover of history is a bit Marxist, but even Marx's ideal man would work in a factory in the morning, play violin in the afternoon, and go to the theater in the evening. Even the most econocentric view includes a cultural life, in the discipline of one's choice.

I don't complain that not enough money is going to research; I do complain that not enough public money is going there. Universities do have too much private money—witness the gigantism and scientific poverty of many a university project.

Finally, one goal of my column was indeed to generate controversy, for a discipline without controversy is condemned to wither and die.

We welcome your letters. Send them to computer@computer.org.