

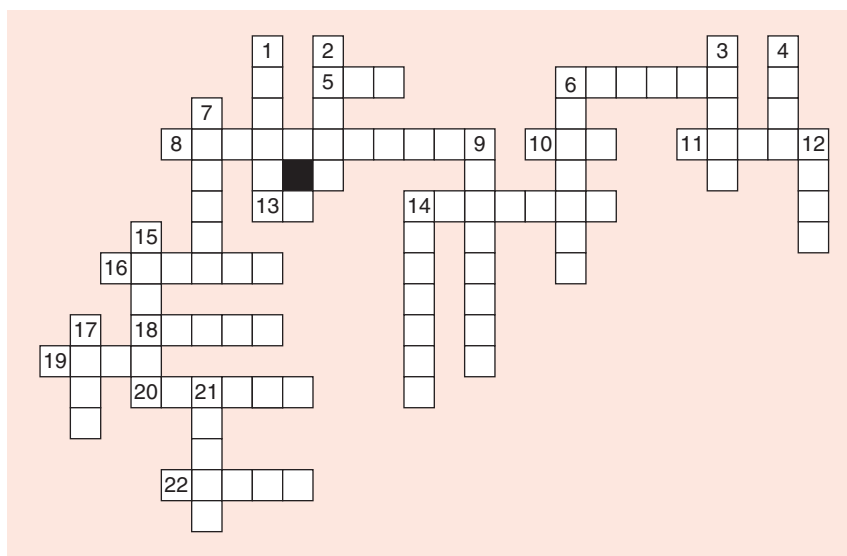
2018 IEEE International Conference on Consumer Electronics Crossword Challenge

At the January 2018 International Conference on Consumer Electronics (ICCE), we challenged our attendees to complete an arcane engineering knowledge crossword puzzle. Eight teams of ten engineers each competed for 1 h during our evening opening welcome party. The teams were randomly selected as people arrived so that people who had never met were tasked with working together. At ICCE, we try to do an annual networking event so that people can meet and make new friends.

Try your skills on the crossword first (and without cheating by searching the Internet). If you are stumped, then feel free to turn to the Internet. At ICCE 2018, we had one of the eight teams get a perfect score, and a second team got all but one of the answers. When you finish your work, turn to page 111 for the answers. Have fun!

ACROSS

- 5 Quality of service in TCP/IP header field
- 6 HTML link
- 8 A maximally flat magnitude filter
- 10 Initials of developers of public key algorithm
- 11 Effect causing variation in the width of the base in a bipolar junction transistor due to a variation in the applied base-to-collector voltage
- 13 dash-dot-dash-dot dash-dash-dot-dash
- 14 A family of linear error-correcting codes that can detect up to two-bit errors or correct one-bit errors
- 16 Type of klystron with reflector plate instead of output cavity



- 18 Chart to map S parameters
- 19 Merger of AIEE and IRE
- 20 Last name of inventor of spread spectrum modulation
- 22 The hypothetical energy level of an electron, such that at thermodynamic equilibrium this energy level would have a 50% probability of being occupied at any given time

DOWN

- 1 Popular three-quarter-inch videotape format
- 2 Y-parameter stability analysis k factor that takes account of load
- 3 AC version of an SCR
- 4 A parameter used to limit the bandwidth of a sampled image signal to avoid the appearance of beat frequency patterns when displaying the image in a discrete display device
- 6 Impurity introduced into silicon for n-doping as an alternative for phosphorus
- 7 Negative-resistance diode

- 9 A variant of heterodyne detection where the local oscillator frequency equals the signal frequency and avoids spurious image responses
- 12 Antenna named for Japanese inventor
- 14 A particular type of optimal prefix code that is commonly used for lossless data compression that employs a variable-length code table from the estimated probability for each possible value of the source symbol
- 15 Mathematical function that reveals the sidebands in an FM-modulated signal
- 17 Law named for scientist that declares that an induced electromotive force always gives rise to a current whose magnetic field opposes the change in original magnetic flux
- 21 Microwave laser

threat. Unlike the conventional broadcast stations, the cable operators had to finance and build substantial infrastructures. They fought to get the right to put television cables on the same utility poles that carried telephone and electrical cables. They had demanded national policies to protect their investments from local governments, which might refuse to renew operating permits.

Initially, the industry tried to limit the spread of satellite dishes through local zoning regulations. While some communities agreed to make such dishes illegal, not enough of them were willing to ban the antennas. By 1982, the industry estimated that between 40,000 and 50,000 dishes were installed each month. Needing to secure the future of their business, the cable operators began to consider how to scramble the satellite signals and requested a national policy to make it illegal to receive satellite signals without prior authorization.

When cable operators proposed scrambling the satellite systems, they faced substantial opposition. It was “a bitter confrontation between programmers and satellite dish owners,” reported *The New York Times*. Shortly after HBO started scrambling its signals, one dish owner, who took the name *Captain Midnight*, temporarily hijacked its sat-

ellite channel in protest. Ultimately, the federal government offered a compromise. Cable operators could scramble their signals provided that individual customers could unscramble them for a reasonable fee.

The compromise secured the future of the cable industry. It allowed cable operators to increase investments and expand their network. It also enabled a few operators to consolidate the industry and gain the advantages of scale. By 1990, the number of cable operators, which had once been more than 4,000, had been reduced to roughly ten.

As the cable industry grew, its operators continued to invest in security. They had to replace their original scrambling algorithm, which was too easily circumvented. By 2000, critics began to argue that the industry was too secure. They pointed to mediocre service, limited offerings, and the growing costs of cable service. The U.S. Bureau of Labor Statistics reported that the cost of cable television is increasing at roughly three times the rate of inflation. Customers have been responding to the increased prices by abandoning cable services.

Critics have pointed to a number of reasons for cable television’s decline. In addition to high prices, they point to mediocre offerings and products that

require customers to buy access to more channels than they use. In this debate, no one has pointed to the rule of security. Without a secure supply chain, the cable television industry would not have full control over its operation. It might not have survived the initial challenges of the 1980s. It also might not have been able to make some of the decisions that have led to the current business challenges. If we think too narrowly about security, we only ward off the social disturbances that we face today. We also have to think about the long-term impact of such technology and ask if we are protecting the progress and life of a business in the future.

ABOUT THE AUTHOR

David Alan Grier (dag@dagrier.net) is the author of *When Computers Were Human*, the former president of the IEEE Computer Society, and the former editor-in-chief of the *IEEE Annals of the History of Computing*. His podcasts can be accessed at <http://HowWeManageStuff.com>.

REFERENCE

- [1] I. Kamen, “Design of video security systems for pay-TV,” *IEEE Trans. Broadcast. Telev. Receiv.*, vol. BTR-10, no. 1, pp. 42–54, 1964.



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