

# Internet of Things

## Keeping it Green and Sustainable



**Donald M. Snemis**

The Internet of Things, or IoT, involves the ever-expanding world of connectivity, like computers, sensors, drones and smart devices. The basic idea is that everything, including buildings, vehicles, home appliances, smart phones and even natural objects could be connected and could communicate over the internet, creating a vast global infrastructure for an information-driven society.

The IoT has already enabled unmistakable advances in smart cities, smart homes, smart power grids and smart logistics, and these technologies have become critical to our economy and our lifestyles.

The IoT can even help protect the environment. For example, connected devices eliminate or substantially reduce the need for paper, drones help track deforestation, environmental sensors monitor air and water quality, and small tracking devices are used to observe and quantify endangered species.

But when these devices age, fail or become obsolete, they become electronic waste or “e-waste,” and their disposal presents special environmental challenges. The U.S. Environmental Protection Agency estimates that in 2009 alone, American consumers discarded 2.37 million tons of e-waste, 75% of which was sent to landfills. Poorly handled, e-waste poses a threat to human health and the environment, but with proper management and recycling practices, e-waste presents an opportunity to conserve resources and advance economic development.

### Taking e-cautions

E-waste sometimes contains high levels of dangerous contaminants such as mercury, cadmium, lead, arsenic and hexavalent chromium that can cause long-term adverse health effects. E-waste also contains valuable recyclables such as steel, glass, plastic, copper, gold, tin, silicon, palladium, platinum and aluminum. Recycling and reusing these materials in a responsible manner conserves natural resources and reduces the need to mine them from the earth, which can disturb the environment, use large amounts of energy and produce air pollution, including greenhouse gases.

In 2011, the Interagency Task Force on Electronic Stewardship issued its *National Strategy for Electronics Stewardship*. Recognizing these issues, the report focused on reducing e-waste and promoting recycling over disposal. Examples include incentives for greener electronics, enhancing research and technology to improve recycling techniques, encouraging more manufacturers to establish take-back programs, improving recycling rates and monitoring the movement of e-waste.

EPA has not regulated heavily in this area. One exception is used cathode ray tubes (CRTs), which contain lead and would ordinarily be considered hazardous waste under the Resource Conservation and Recovery Act (RCRA). CRTs are now excluded from the definition of solid and hazardous waste if they are recycled or exported for recycling, and if certain conditions are met.

The market for used CRTs, however, collapsed

with the advent of flat panel technologies. Beyond the CRT regulations, EPA has generally deferred to the states to regulate e-waste.

As a result, many states have enacted laws to prevent or discourage the landfilling of e-waste and to promote recycling as an alternative. Indiana’s electronic waste laws require collectors and recyclers of e-waste to register with the Indiana Department of Environmental Management (IDEM) and submit an annual report that contains the type and amount of e-waste collected or recycled, among other things.

### Program in place

Manufacturers of video display devices must also register with IDEM and submit an annual report identifying the type and total weight of video display devices (VDDs) sold to Indiana households. In addition, VDD manufacturers must arrange for the recycling of at least 60% of the total weight of VDDs it sells in Indiana each year. Indiana retailers can only sell VDDs manufactured by registered VDD manufacturers. Hoosier households, small businesses and public schools (including charter schools) are prohibited from discarding e-waste as part of any municipal waste stream intended for landfilling or incineration.

IDEM manages Indiana’s “E-Cycle” program. In its 2016 E-Cycle Report, IDEM reported that 90 manufacturers registered 141 different brands of VDDs the previous year and recycled almost 21 million pounds of covered electronic devices. In addition, 144 collectors registered a total of 286 collection sites and 66 recyclers registered with the program.

They recycled over 25 million pounds of devices in 2015 and have recycled about 175 million pounds since the program began in 2009. Had those devices not been recycled, they would have likely ended up in Hoosier landfills.

Non-profit organizations have been created to establish standards for recycling electronics responsibly and to act as independent, third-party auditors that can assess recycling practices, provide accredited certification standards and oversee recyclers to ensure compliance with their standards:

- Sustainable Electronics Recycling International (SERI) established the “Responsible Recycling” or “R2” standard for electronics recyclers. The R2 Standard establishes best practices for global recycling of electronics, and SERI operates a program to certify businesses that adhere to the R2 standard.

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- e-Stewards is a global team of individuals and entities that created the “e-Stewards Standard” for e-waste recycling. Its mission is to define and promote responsible electronics reuse and recycling best practices worldwide. e-Stewards also offers a certification program for recyclers.

The IoT simplifies and improves our lives in numerous ways and can be used to help protect our environment. This modern technology utilizes dangerous contaminants that must be dealt with responsibly and valuable resources that should be recycled. With responsible management and oversight, a green and sustainable Internet of Things is entirely achievable.