

**Maryland General Assembly
Joint Committee on Cybersecurity,
Information Technology, and Biotechnology
2016 Interim
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THE MARYLAND GENERAL ASSEMBLY
ANNAPOLIS, MARYLAND 21401

JOINT COMMITTEE ON CYBERSECURITY, INFORMATION TECHNOLOGY, AND BIOTECHNOLOGY

November 30, 2016

The Honorable Thomas V. Mike Miller, Jr., Co-chairman
The Honorable Michael E. Busch, Co-chairman
Members of the Legislative Policy Committee

Ladies and Gentlemen:

The Joint Committee on Cybersecurity, Information Technology, and Biotechnology respectfully submits this summary report of its 2016 interim activities. As you know, the committee's statutory charge is to "work to broaden the support, knowledge, and awareness of advances in cybersecurity, information technology, and biotechnology to benefit the people of Maryland, evaluate State cybersecurity systems and the adequacy of economic development and job skills training programs to advance cybersecurity in the State, and make recommendations regarding actions to promote cybersecurity, information technology, and biotechnology industries in the State." The committee met twice during the interim: September 20 and November 10, 2016.

At the first meeting, the committee was briefed on the status of the Maryland Autonomous and Connected Vehicle Working Group and the development of driverless vehicles, the status of digital equity in public schools, and the use of open source textbooks at some colleges and the elimination of textbooks at other colleges. At the second meeting, the committee was briefed on the need for classroom computer safety, the development of portable worker benefits in a gig economy, the status of the Department of Information Technology's (DoIT) preparedness plan and readiness for cybersecurity defense and the status of defenses and strategies for cyber attacks by the electric industry, and DoIT's strategy to develop innovative major information technology projects.

On behalf of the committee, we wish to thank those individuals who contributed their time and effort during the 2016 interim in assisting the committee with its work.

Respectfully submitted,

Handwritten signature of James C. Rosapepe in cursive, with initials 'JR' at the end.

James C. Rosapepe
Senate Chairman

Handwritten signature of C. William Frick in cursive, with initials 'CF' at the end.

C. William Frick
House Chairman

JCR:CWF/TDB/nac

cc: Mr. Warren G. Deschenaux

Joint Information Technology and Biotechnology Committee 2016 Interim Report

Status of Maryland Autonomous and Connected Vehicle Working Group and Development of Driverless Vehicles

On September 20, 2016, the committee heard from Christine Nizer, Administrator, Motor Vehicle Administration (MVA), Maryland Department of Transportation (MDOT); Robert Kreeb, Chief, Intelligent Vehicle Technologies Research Division, National Highway Traffic Safety Administration (NHTSA); and Renée Gibson, Director, State Affairs, Alliance of Automobile Manufacturers.

Administrator Nizer began her remarks by saying that the briefing on driverless vehicles is timely because the federal Department of Transportation's Automated Vehicle Policy had just been issued. According to Administrator Nizer, it is only a matter of when, not if, connected vehicles (CV) and automated vehicles (AV) will be on the streets. CVs are vehicle-to-vehicle, vehicle-to-infrastructure, and vehicle-to-pedestrian. Driver assist technology has already been developed, including adaptive cruise control, lane keeping assistance, automatic parking, and automatic emergency braking. Also, driver alerts and warnings have been developed, including forward collision warning, emergency electronic brake light warning, blind spot warning, lane change warning, do not pass warning, and curve speed warning. More than 90% of traffic collisions are caused by driver error. With automation aimed at improving compliance with safety laws, driver errors and collisions can be significantly reduced. Fewer collisions also reduces the demand for law enforcement response, emergency rescue and medical services, and infrastructure repair. Possible benefits include increased mobility of young, elderly, and those with disabilities; potential synergies with car-sharing; decreased operator insurance costs; easier first- and last-mile connections with major transit corridors; and efficiencies in freight/transportation of goods and economic activity.

Administrator Nizer continued her comments by saying that there are many complex questions about automated vehicles to answer, including (1) are they safe; (2) who is the driver; (3) who is liable; (4) what safety standards apply; (5) do current rules of the road laws apply; (6) what infrastructure changes will be needed; (7) how do we plan for changing technologies; and (7) will this affect transportation investments? MDOT is receiving CV and AV applications, evaluating potential test bed opportunities, researching and gathering information (including implications on the motor vehicle code and lessons learned from other states' pilots and policies), participating in the Maryland Autonomous and Connected Vehicle Working Group (which is the central point of the strategic planning of MDOT's role with AVs/CVs and includes 70 relevant stakeholders), and participating in national discussions and workgroups (including several federal agencies' studies and the AV Information Sharing Group of the American Association of Motor Vehicle Administrators).

Mr. Kreeb briefly mentioned that the federal automated vehicle guidance policy was not developed in a vacuum. There were comments collected from public meetings and directly from other stakeholders. The federal policy provides manufacturers with key principles to follow, including human machine interface, privacy, and safety fall back. The industry needs some level of certainty about what to expect from the government as they invest in new technologies. With the implementation of more safety technology, the number of lives lost on the roads each year can decrease.

Ms. Gibson began her remarks by saying that the Alliance for Automobile Manufacturers is the leading advocacy group for the auto industry and it supports state efforts to improve and protect the safety of all road users. A summary of remarks follow. The issues surrounding the research, development, production, and the ultimate safe operation of driving automation technology are highly complex and rapidly evolving, but the eventual benefits are broad and significant. Automakers are working to bring driving automation technology to market as soon as possible. Vehicles can now be purchased with various sensors, including radar, light detection and ranging (LIDAR), ultrasonic sensors, and cameras. Certain vehicles have the ability without driver input to steer (lane correction/real wheel steer), brake (electronic stability control), pivot headlamps, and adjust the accelerator (adaptive cruise control and e-throttle override). These technologies are the building blocks of the rapidly unfolding process that will lead to driverless vehicles. Alliance members are reinventing the automobile to make personal transportation safer, cleaner, more fuel efficient, more accessible, and more enjoyable. Alliance members work with NHTSA to establish the regulatory framework for these vehicles. As vehicle connectivity increases, new measures must be taken to guard against cyber threats, especially considering that the computer system is the driving force for vehicle controls. Working with the Automobile Information Sharing and Analysis Center, automakers are developing automotive-focused cybersecurity best practices.

Following the briefings, there was discussion regarding the timeline for the deployment of driverless vehicles. Uber recently announced that it will test its driverless vehicles (supervised by humans in the driver's seat) in Pittsburgh. Other discussion items included the liability in the event of a crash in a driverless vehicle, the cost and planning of roadway infrastructure to support driverless vehicles, when data experience will be available from those who are testing, and whether legislation to make definitional changes in the law needed.

Update on Digital Equity in Public Schools

Also on September 20, the committee heard from Andrew Kenny, State Engagement Manager, Education SuperHighway; Michael Turzanski, State Engagement Program Director, Education SuperHighway; Antonio Herrera, Chief Information Officer, Maryland State Department of Education (MSDE); and Kristy Michel, Deputy Superintendent for Finance and Administration, MSDE.

Mr. Kenny began his remarks by explaining that the Education SuperHighway, a nonprofit, nonpartisan *pro bono* organization based in California, has a mission to upgrade Internet access in every public school classroom in America so that all students can take advantage of the promise of digital learning. Mr. Kenny's and Mr. Turzanski's comments are summarized below. The federal E-rate Program established by the Federal Communications Commission (FCC) is designed for implementing Category 1 services to a school (Internet access) and Category 2 services that deliver Internet access within schools (internal connections, basic maintenance, managed internal broadband services). The second FCC E-Rate Modernization Order increased the spending cap and adopted new guidelines to enable schools seeking to purchase high-speed broadband to maximize their options, including widespread Wi-Fi deployment. The program refunds the cost of technology based on discounts ranging from 20 to 90%, with higher discounts for higher poverty and more rural schools. Schools that need fiber construction are eligible for an additional 10% discount if a state has matching funds (also, 10%) for the school. The funding opportunity for fiber construction expires in 2018 and the enhanced funding for intra-schools networks is not guaranteed beyond 2019.

The SuperHighway's Maryland Connectivity Report (K-12 Broadband and Digital Learning Policy Academy), dated March 31, 2016, states that "Maryland has some of the greatest assets and resources to support school connectivity in the nation, but not all schools have what they need." Five challenge areas for Maryland are (1) only 9 counties meet the Internet access of 100 kbps/student goal (vs. 77% national average); (2) Statewide affordability is good with Maryland median cost at \$3.31 per month per Mbps (vs. national average cost \$11), but these costs may still be a barrier for some counties; (3) district transport (wide area network or WAN) performance is better than national average (goal is 1 Gbps per school), but up to 354 State schools need to upgrade; (4) about 217 State schools need to upgrade to fiber; and (5) \$72 million of \$79 million of federal Category 2 funds have not been utilized. For the 72 Maryland schools who qualify for an 80% discount rate, State matching funds of 10% means an additional 10% federal funds and allows these schools to connect to fiber at no cost to the county.

Mr. Herrera and Ms. Michel spoke about MSDE's mid-2016 broadband and Wi-Fi report survey. Their remarks are summarized below. The results of the survey show that 11 local education agencies (LEAs) fall below the bandwidth per student minimum standards (national standard is 100 Kbp/student). Nine LEAs are above the bandwidth average cost standard (national standard is \$3/Mbps). MSDE found that connectivity has improved, most LEAs have adequate local area bandwidth, and Wi-Fi access is good with virtually one wireless access device per classroom; 269 schools need improved WAN connects; and 84 schools still have copper connections and need fiber installed. Concerns of LEAs include needing funding for infrastructure and direction from MSDE. In Maryland, as of September 19, 2016, there are 879,760 students, 1,427 schools, and 671,470 devices, resulting in a 1.31 student to device ratio. About 243 schools need WAN upgrade and 78 schools need fiber connections.

There was discussion about the total cost for the State match so that a county can get federal funding and whether the State can request federal funding on behalf of a county. A pool of State funds could be established to provide funds for schools to be used for their upgrades and reimbursed federal funds could go back into the pool. The committee requested MSDE to provide updated information on the number of schools that need fiber connections.

Use of Open Source Textbooks at Some Colleges and Elimination of Textbooks at Other Colleges

Additionally, on September 20, the committee heard from M.J. Bishop, William E. Kirwan Center for Academic Innovation, University System of Maryland (USM); and Marie Cini, Provost at University of Maryland, University College (UMUC). Ms. Bishop began her remarks by talking about open educational resources (OER). OER are any openly licensed instructional materials that are also typically available at little or no cost. OER can be textbooks, course reading, and other learning content; and any other material that can be used for instructional purposes. Her remarks are summarized below. In replacing proprietary textbooks with OER, a huge potential exists to make a difference in affordability and access for Maryland students. Textbooks costs increased 812% since 1978. Students spend approximately \$1,200 per year on textbooks. Maryland (like several other states) passed a College Textbook Competition and Affordability Act in 2009, which requires public institutions of higher education to develop and implement specific practices and processes relating to textbook selection and adoption with the specific aim of reducing textbook costs to students. The Maryland Open Source Textbook Initiative (MOST) began in 2013 as a collaboration between the USM Student Council and the William E. Kirwan Center for Academic Innovation to provide a Statewide opportunity for faculty to explore the promise of OERs to reduce students' costs while maintaining, or perhaps even improving, learning outcomes. To date, the project involved faculty teaching 45 different course at 13 institutions across the State, saving over 3,000 students almost \$450,000 on textbooks. Students have full access to all learning materials from day one of class and faculty have full control over the amount, order, design, and content of the learning materials.

Ms. Cini spoke about the recent move by UMUC to a zero-cost instructional materials, converting all of its over 700 undergraduate and graduate courses to OER. Savings for 84,000 students enrolled in UMUC is about \$20 million per year. While MOST has piqued interest among faculty and administrators across Maryland institutions, awareness needs to be raised and implementation of OER needs to be expanded to other schools.

There was discussion about whether an equivalent level of quality learning can be maintained under open source textbooks or the elimination of textbooks. Evaluations of the programs have not seen degradation of learning. Also, under these approaches, resources can be constantly kept up to date. An incentive plan may be needed to encourage faculty to participate.

Need for Classroom Computer Safety

On November 10, the committee heard from Cindy Eckard, an advocate for medical regulations for classroom computer use. Ms. Eckard described her extensive professional computer experience which led to her research in the health risks from classroom computers and the need for safety medical regulations. She cited numerous medical organizations that have commented in some way on the medical issues. Several academia have conducted studies. While the use of technology for academic pursuits has increased, schools' demand for more screen time, in class and at home, can be associated health risks. During the 2016 session, Senate Bill 1150 "Primary and Secondary Education – Computer Health and Safety Guidelines and Procedures" (failed) would have required MSDE, in consultation with the Department of Health and Mental Hygiene (DHMH), to develop computer health and safety guidelines and procedures to be implemented in every county and develop a process to monitor its implementation.

According to Ms. Eckard, health risks begin with myopia. The University of Southern California reports that screen time has caused myopia to double in the United States. The myopia epidemic needs to be addressed immediately to safeguard children's distance vision and to protect them from the associated problems myopia brings, such as cataracts, retinal detachment, and glaucoma. Macular degeneration is another major concern. Researchers warn that blue light is putting the children at risk for early macular degeneration, which leads to blindness. Scientists also agree that the blue light from the digital devices mimics sunlight and interrupts sleep cycles by suppressing melatonin production. Without melatonin, children cannot get the sleep they need. Lack of sleep is directly related to a compromised immune system, obesity, and diabetes. Psychological issues related to screen time are also emerging in children. A nationally recognized author and addiction expert found that depression, anxiety, isolation, and all manner of addiction – including gaming, pornography, and gambling – are now becoming prevalent among children. Ergonomic guidelines are also needed, to address issues such as lighting, glare, and proper posture so that children experience less eye strain, and reduced head, neck, and shoulder pain. Ms. Eckard stated that, although classroom computer use has become a public threat, it can be remedied. She suggests that DHMH develop best practices standards and guidelines for the schools; educate school nurses, teachers, and parents about classroom computer safety; and track and document symptoms of health risks that may relate to classroom computer use.

Development of Portable Worker Benefits in a Gig Economy

Also on November 10, the committee heard from Shayna Strom, Senior Fellow, The Century Foundation, a progressive, nonpartisan think tank that seeks to foster opportunity, reduce inequality, and promote security. Ms. Strom described how the changing work world may lead to the need for portable benefits. Her remarks are summarized below.

Employment classification matters. Employees are paid at least minimum wage and overtime, if eligible. Employers contribute to Medicare and social security on behalf of their employees. Employees are eligible to join a union and sue if discriminated against by an employer. Employees may also be eligible to contribute to a 401K. Large employers must offer employees health insurance or pay a penalty. Employees are eligible to file for unemployment benefits and receive workers' compensation benefits. On the flip side, independent contractors are not generally eligible for any of these benefits. The employer-based social safety net dates back to the New Deal and the 1950 "Treaty of Detroit," a time when the average person worked at the same job for many years. Today, the growth in overall employment is in jobs without benefits (temporary, contractual, freelance, or gig). Examples include, the Uber or Lyft driver, a nanny, or a freelance writer or editor. With portable benefits, a worker can keep his or her benefits from job to job or across multiple jobs at once. An individual pool could be set up for each employee to include funds (paid by the employer and/or employee) that the worker could obtain if needed. In offering portable benefits, several questions need answering: (1) what benefits or protections are encompassed (*i.e.*, health care, retirement, unemployment insurance, workers' compensation, paid leave, overtime, tax withholding, liability insurance, disability insurance, paid sick days, vacation days, and skills training); (2) who will fund the benefits (*i.e.*, workers, employers, government, external parties, or customers); (3) how will the funding be structured (*i.e.*, mandatory, optional, or opt-in/opt-out); (4) who will administer the benefits (*i.e.*, private or nonprofit sector third party, worker organization, or government); (5) who would be eligible for portable benefits (*i.e.*, all eligible workers or only those who opt-in/opt-out); and (6) at what level of government will benefits be mandated or regulated (*i.e.*, federal, State, or local)?

The committee expressed interest in learning whether any state has been developing a macro design of portable benefits or studying the issue through a task force. The committee also requested additional information from Ms. Strom related to the types of occupations that may benefit from portable benefits. There was discussion about how the design structure would need to consider the balancing of the overall burden on businesses with the opportunities for workers.

Cybersecurity Defenses

Additionally, on November 10, the committee heard about status of the Department of Information Technology's (DoIT) preparedness plan and readiness for cybersecurity defense and the status of defenses and strategies for cyber-attacks by the electric industry.

Status of the Department of Information Technology's Preparedness Plan and Readiness for Cybersecurity Defense

According to Charles Ames, Director of Cybersecurity, Department of Information Technology, DoIT's preparedness plan centers on the adoption of three separate documents. His remarks are summarized below. The Maryland Cyber Disruption Contingency Plan, published by the Maryland Emergency Management Agency, is the most prominent document supported by DoIT. This document outlines the roles and responsibilities State agencies and officials must

understand and execute in the case of a large scale or persistent cyber events DoIT has exercised this plan with the entirety of the State's emergency response apparatus and expects to be able to publicize the plan by the end of 2016. The federal Department of Homeland Security (DHS) initiated a National Cyber Incident Response Plan earlier this year with the goal of producing a cabinet-level, fully coordinated plan that links cyber security into longstanding and well understood FEMA constructs by early 2017. Maryland is among a dozen participating states.

The Security Operations Incident Response Plan and the Security Operations Concept of Operations plans, two internal DoIT documents, formalize DoIT's internal organization and responsibilities for day to day cyber security issues affecting State agencies, local governments, critical infrastructures, businesses, and citizens. Both are anticipated to be finalized by early 2017. DoIT has re-allocated resources from pure networking to a more focused security role. DoIT is providing next generation perimeter cybersecurity defense services for more than two dozen agencies and government activities through State government. Centralizing the management and delivery of its cybersecurity defense services is a crucial component. In overhauling all of its cyber security policies, DoIT anticipates publishing 27 new policies, each explicitly tied back to the National Institute of Standards and Technology Cyber Security Framework or the Center for Internet Security's Benchmarks and Security Controls. DoIT is establishing a baseline so that it can measure Maryland's progress in increasing cybersecurity defense against industry accepted metrics. DoIT has been evaluated by the National Governors' Association and the National Association of State Chief Information Officers. DoIT's broad cybersecurity functions will be benchmarked against the efforts of the others states participating in the DHS's Nationwide Cybersecurity Review.

There was discussion about the participation of State agencies and working with federal agencies and private sector companies. Some State agencies have implemented protections, while other State agencies are just understanding their baselines. One challenge is monitoring and training employees in the safe use of computers. DoIT works with the federal DHS and private companies, including grid operators. DoIT is able to find experienced and qualified personnel who are able to get security clearance. A top issue is keeping employee and taxpayer health and other private information safe. DoIT is working on issuing a best practice guide for cloud computing similar to federal guidelines.

Status of Defenses and Strategies for Cyber Attacks by the Electric Industry

Ed Goetz, Vice President and Chief Security Officer, Exelon, began his remarks by saying that BGE, PEPCO, and Delmarva Power are under Exelon. The cyber threats the country faces change by the millisecond on the Internet. Exelon knows to stay ahead by looking for threats, instead of only reacting to threats. The company works to appropriately configure firewalls at its utility substations and in its corporate offices. Its top priority is securing the electric system. Another company priority is securing personal information of its employees and ratepayers.

Terrorists may not have the capability to carry out a cyber-attack, but they have a willingness and

persistence.

There was discussion about risk assessments, emergency exercises, and cyber-attacks. The company has many liaisons at the federal and State level, as well as an internal team, to identify and mitigate vulnerabilities. The company has not had any attacks on the electric system, however, similar to the experience of other companies, there have been millions of probes.

Department of Information Technology's IT Strategy to Develop Innovative Major Information Technology Projects

Lastly, at the November 10 meeting, the committee heard from Lou Estrada, Deputy Secretary, DoIT. DoIT adopted an Enterprise Plan as a way to reorganize its information technology operations and optimize capabilities and service delivery of information technology projects. DoIT's information technology operations include implementing projects for the Governor's cabinet and opt-in agencies. DoIT centralizes commodity services (for multiple agencies) to develop a broad-based project; it delivers services early in the implementation phase, with ongoing incremental revisions and feedback throughout the development timeline. This process, known as Agile, allows for a useful system to provide value early on and throughout the process and avoids later costly "modernization" efforts or single major software failures. In year one, the system is defined, built, tested, and deployed; over the years, the system is continuously checked, adjusted, expanded, and improved. The plan is not a workforce reduction effort. The prior process had many stages of a long planning process before an end user had access to the system. Millions of dollars will be saved over time with the new process. Many of its system requests can be grouped together allowing for a more efficient process. Prior to the new plan, DoIT was supporting about 1,000 users; now, DoIT supports 10,000 users.

There was discussion about the possible savings from this new approach. Now, all State agency chief information officers are under DoIT, similar to the attorney general model. While they report to DoIT, they are still in the agency assisting directly with the agency's mission and employees.

As an example of how Agile may pave the way for innovation, Mr. Estrada mentioned Maryland Total Human-services Information Network (MD THINK), a new shared human service platform (a system of modular, interconnected components that is a common data repository with shared service elements and resources) capable of supporting multiple programs and missions. This system allows for the greater use of data analytics to improve efficiency and case management of human resources services. There are a dozen agencies that provide human services, each of which may contribute and use the system. As a multi-agency data sharing platform, it will provide a single point of entry for applicants seeking health and human services. DoIT anticipates that this system will identify insights to questions that it does not even know to ask.