

# K-12 SCHOOL SAFETY

Vaping Sensors and the Ruckus IoT Suite



## SOLUTION OVERVIEW

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## STUDENT HEALTH AND SAFETY

For primary and secondary education, the core mission is not only to educate the students, but also to take reasonable steps to ensure the learning environment is safe and secure. It can feel clichéd to point it out, but it is a cliché only because it is so universally true: our children are our most precious charges. Unfortunately, school safety is a very wide-ranging topic. To tackle the subject in a manageable fashion, these Ruckus Solution documents are focused on specific aspects of safety and related technologies.

### Vaping is the new smoking, and it is not healthy

E-cigarettes were initially marketed as a way to help adult smokers quit the habit. However, companies moved quickly to targeting non-smoking youth, introducing a variety of flavors, personalization of vape devices, etc. Just to be clear, vaping is inhaling a heated and vaporized liquid (e-juice, vape juice, etc.) from an e-cigarette, vape, or any similar device. Overwhelmingly, the juices are nicotine based, with an infinite variety of flavors, although other drugs, such as cannabinoids can also be taken this way.

“Less unhealthy than cigarettes” is a very low bar to clear, and nicotine is one of the most addictive of drugs. Berkley Lab has found significant amounts of [31 toxic chemicals such as formaldehyde](#) in typical vapor. The nicotine content is often much higher than cigarettes with one Juul pod equivalent to a full pack of cigarettes. Furthermore, there are good reasons to be concerned with secondhand vapor delivering the effects to bystanders. We are engaged in an unplanned social experiment to introduce a new nicotine addiction to our youth.

As they are with so much in our society, schools are right in the middle of the vaping epidemic. Schools are responsible for the health and wellness of the students in their care and are required to put into place measures to help protect students from exposure to harmful or unsafe conditions. Parents of students expect the school to protect their children from both the health implications as well as the social pressures that can create anxiety and emotional conflicts between students, which can result in psychological health concerns.

The need to cope with vaping is straining educational resources. Vaping in schools is a leading cause for out-of-school suspension. High school out-of-school suspensions cost the country \$35bn annually, squeezing already tight district and school budgets as well as decreased national economic potential. Costs include added administrative oversight, remediation/counseling, parent meetings, credit recovery programs, increased truancy, increased criminal justice costs, and fewer graduates/reduced Higher Ed enrollment, and a lower-skilled work force.

Monitoring for vaping is difficult. The residual odor is easy to mask, the visual signature is limited, and use in areas protected by personal privacy such as restrooms is common. Supervision by faculty may be limited by other priorities like teaching, the high costs for faculty monitoring, union contracts that limit responsibilities, or understandable privacy concerns. Restrooms are particularly difficult in that they preclude visual supervision by faculty or security cameras.

A **vaping detection sensor** connected over a Ruckus network enables a cost-effective means to directly target vaping use on campus. Ruckus has partnered with [Soter Technologies](#) to bundle an ICX PoE switch with FlySense™, Soter’s real-time *vaping and elevated sound incident* detection solution. FlySense gives schools control of areas where they cannot place a camera. Soter’s multi-sensor devices are capable of detecting vaping, as well as smoke and noise disturbances that may suggest violence or bullying. On detection, alerts can be sent by text or email, with simple and thorough customization of who gets what alerts on what schedule. Future integrations with the Ruckus IOT suite will enable sensors to trigger additional connected devices such as security cameras (outside of bathrooms) and incident notification lights.

## ADVANTAGES OF FLYSENSE NETWORKED VAPE SENSORS

### Let teachers teach instead of standing outside bathrooms

It is not possible to have adult monitors everywhere, nor is it an ideal use of resources for valuable teachers to spend their time monitoring trouble areas when they could be teaching, and it is flat out impossible to have staff monitor even the most critical spots for the entire day. Students are vaping in restrooms, locker rooms, and other areas on school property where cameras are not permitted and where traditional smoke detectors fail to detect vape ‘smoke.’

Networked sensors capable of detecting vaping (and more), can help schools identify and deter vaping while protecting the privacy of their students, all without taking educators and other personnel away from their core duties. FlySense™ captures real-time vaping and elevated/anomalous sound incidents, giving schools control of areas where they cannot place a camera.

### Networked sensors enable real time control of vaping and bullying

- Monitor areas where privacy concerns are high
  - Place FlySense monitors where cameras cannot go – bathrooms locker rooms, or other hotspots
  - Sound anomaly detection does not record sounds or conversations, but monitors decibel level, alerting on unusual patterns

- Vape and smoke detection is no more invasive than traditional smoke detectors
- Advanced custom scheduling – use teachers wisely
  - Schools can organize which staff members get alerts on specific days, times of day and locations
- Rebuild trust between teachers and students
  - In many schools, vaping has created an atmosphere of mistrust between students and teachers. The assurance of FlySense helps rebuild that trust
- Create positive environments and deter unhealthy habits
  - A high likelihood of being caught is the most effective deterrent
  - Reduce bullying and fighting
  - Ensure the restroom is a safe spot
  - Reduce secondhand exposure to nicotine and toxic chemicals

### *HIGHLY CONNECTED 'SMART SCHOOLS' ENABLE NEW SOLUTIONS TO NEW AND OLD PROBLEMS*

It has been said, 'when you have a problem, you have a problem, but when you have many problems, sometimes they can solve each other.' Technology trends have ways of introducing new solutions. What makes this and similar solutions manageable and cost effective is the fact that our schools are already required to be highly connected. Reliable Wi-Fi and the necessary back-haul network are well past the "nice-to-have" stage and well into the "must-have" stage.

FlySense multi-sensor vaping detectors are the kind of device that falls under the heading *Internet of Things* or *IoT*. IoT devices usually don't belong to an individual in the way a smart phone does, and usually have more specific purposes. IoT devices are typically characterized by low bandwidth network traffic with a very high tolerance for network latency and uncertainty, so their traffic can even have low priority while working well.

The Ruckus IoT Suite is designed to simplify the deployment and integration of many IoT technologies in order that they can cooperate and work with each other; the sum can be greater than the parts. Soter FlySense sensors are fully supported on our ICX access switches. In particular, our compact, fan-less high capacity PoE (PoH) 7150 switches, being small and silent, can go almost anywhere and connect to other ICX or even another vendor's switches. If the switch closet is less than 100 meters from the bathrooms, the ICX7150-24P would also be an excellent choice.

IoT traffic like that from FlySense traffic can be centrally tunneled over SSL to the Ruckus IoT Controller (a virtual machine). The IoT controller enables two things:

- 1) Better network security with a uniform policy for all IoT devices. Tunneled and SSL encrypted traffic cannot be eavesdropped on, connections cannot be hijacked, and all IoT traffic is isolated and rule checked before forwarding to the IoT management system(s). IoT traffic remains isolated from the rest of your network. Instead of building firewall and other rules for many additional devices, only minimal rules need to be applied for the IoT Controller.
- 2) Integration of multiple IoT systems. The Ruckus IoT Controller Rules Engine enables messages from one IoT system to trigger events in another one. When a FlySense sensor detects an event and sends a message, the IoT controller can forward that message to another system. A warning light could go on over the bathroom or in the office, a hallway camera can be told to focus on and zoom in on the bathroom door, etc.

The possible integrations of IoT options are as limitless as the number of IoT systems. In another scenario, where a school has deployed connected door locks, a FlySense detected sound anomaly could be the trigger for a lock down (critical doors lock automatically) or an evacuation (all doors unlock). Ruckus is actively seeking out and partnering with vetted IoT vendors to solve real world safety issues in schools by enabling 21<sup>st</sup> century converged networks.

### *THE RUCKUS AND SOTER ADVANTAGE*

**Ruckus Networks** is a leader in enterprise networking and a top provider for primary and secondary education (K-12). Ruckus builds access networks that get students, teachers and their machines on the network easily and securely, keep them on reliably, and deliver the highest capacity and scalability while requiring minimal training of IT personnel. These advantages can help drive school efficiency, enabling educators and students to focus on their main purpose – teaching and learning.

- Converged IoT support enables not only vaping and sound anomaly detection, but also connected entry applications, asset tracking, automated attendance and emergency student tracking (see other Ruckus Networks solution overview documents)

- Secure device onboarding that streamlines the process of getting new devices onto networks through a self-service portal that dramatically reduces the number of helpdesk calls without compromising on security
- Innovation and a relentless drive to build networks that “just work” brings carrier-grade performance, reliability and scalability to critical network needs
- Smart algorithms and heuristics allow the network to make optimization decisions without requiring constant IT attention--reducing overhead costs to deploy and manage as well as reducing troubleshooting needs

**Soter Technologies.** The Soter takes its name Greek mythology, where Soter is the personification of safety, deliverance and preservation from harm. Soter Technologies develops sensor and software technology, that delivers innovative solutions for environmental and social intelligence – to make the world a safer place.

In education, Soter’s Digital Fly product line includes a suite of school safety tools for detection and prevention of bullying, cyberbullying, vaping, and smoking. These products and services are making an impact in more than 500 schools internationally and have a proven record of identifying and averting threats – including being credited with saving the lives of students who were contemplating suicide.

Ruckus top performing switches are specifically tested to work seamlessly with Soter sensors. Ruckus is the only major networking company working with Soter and actively helping them improve their product. Soter’s expertise is in their technology, while we at Ruckus are the networking experts. Not all backbone platforms are alike, and the Ruckus IoT Suite secures and enables integration of all types of IoT devices including Soter sensors, for a sum greater than the parts.

### *STUDENT HEALTH AND SAFETY*

#### **A School’s Mission**

Times are challenging for primary and secondary education. While educators’ primary goal is to prepare their students for the coming years of the 21st century, there is an unrelenting anxiety driven by news of how students can be harmed – physically and emotionally. Parents send their children to school with the expectation they will return home in as good or better condition. School administrators and facility managers have an additional key responsibility: making sure their learning environment is safe, secure and healthy.

School culture is very important for the well-being of students. A positive school environment creates and balances among multiple factors: a safe, supportive, inviting, encouraging, and challenging atmosphere for students and staff. Such an environment allows students to focus on their academics and enables learning to flourish.

At Ruckus Networks, we think technology should serve human needs, and we understand that we cannot build it all. We have focused, in our IoT Suite, on securing, enabling and integrating all types of IoT devices, and then seeking out partners that are solving real world problems. We want to leverage what we bring to the table with what our partners bring to the table. Soter, is one such partner.

As a society we cannot allow vaping or bullying to discourage students in what should be a safe place. Students that endure bullying in school are more likely to become depressed and suffer negative effects in the long term.

Vaping is a national epidemic among America’s youth. Technology can allow us to detect vaping by monitoring the air quality in a restroom. With Soter FlySense sensors we can detect a vaping incident in real time. Real time response, the very high likelihood of getting caught, is a significant deterrent. Combined with education, students can come to realize that what they are inhaling is not “just water vapor,” but significant amounts of toxic chemicals and high doses of addictive nicotine.



### *DEPLOYING IOT: THE RUCKUS ADVANTAGE*

The IoT landscape is varied and rapidly changing. Each IoT system brings individual challenges and may use any number of network access technologies. When combined with other network vendors, IoT systems typically work in isolation from each other. Low power radio-based systems (Bluetooth/BLE, ZigBee, etc.) require a radio *hub* or *gateway* device specific to the protocol it uses, and that device requires a network port and power. Best practices demand Wi-Fi systems be isolated and secured on dedicated VLANs and may need careful examination of performance requirements. Wired IoT devices can be powered using PoE, but power budgets add new dimensions to network design and switch management. Unfortunately, even solving all that, each IoT system is usually logically isolated from every other one with proprietary management systems.

Ruckus has a vision of unifying and integrating multiple IoT technologies and vendors so that they are secure and can integrate with each other, passing secure messages from one IoT system to another so that more complex problems can be solved with the interaction of multiple technologies – a simplified and unified network infrastructure. Ruckus brings the networking expertise to our partners, who bring expertise in their areas.

At the logical layer, IoT devices are secured and unified by the Ruckus IoT Controller, a virtual machine. IoT devices use a lightweight message protocol called MQTT (think ‘https for IoT’). Because all such traffic is encrypted and forwarded to the Ruckus IoT controller (acting as a MQTT *broker*), messages from different IoT systems can trigger functions on each other. A vaping or sound anomaly event can trigger not only an alert but can trigger a PTZ camera in the hallway to focus on the bathroom door or pull existing video from a VMS (Video Management System) with the correct time stamps to identify the involved students.

Depending on the physical layer, Ruckus simplifies IoT connectivity. Ruckus ICX switches have unmatched flexibility and scalability. For out-of-closet environments, ICX fanless compact switches are silent with PoE/PoE+/PoH power options. For Wi-Fi IoT Ruckus APs have unmatched capacity for more devices, and more performance. For Bluetooth, ZigBee and similar protocols, the Ruckus IoT suite moves all low energy radio gateway functions onto our IoT ready APs with a mix of integrated and add in modules. The snap in IoT module becomes the gateway for radio based IoT devices, and piggybacks power and network on the AP cable. No additional cable runs or switch closet ports.

### *IOT REDEFINED: THE RUCKUS IOT SUITE*

The Ruckus IoT Suite solves many of the problems currently present in networking and IoT deployments.

**Consolidated IoT Device Management** – A single place to look for all IoT devices and an IoT management system that eliminates the need for additional gateways and separate management systems. A single IoT pane of glass makes management and troubleshooting simpler and more intuitive for what would otherwise be a dauntingly complex task.

**Reuse Existing Infrastructure** – IoT can be deployed across the existing LAN and WLAN infrastructure, saving on deployment time and reducing costs. By providing a common point of management and cabling, multiple physical layer networks are consolidated into a single converged network. This simplifies IoT device onboarding and establishes uniform security protocols and policy.

**Multi-layered Protection** – data transmitted between IoT Suite components is protected via standards-based security such as over-the-air encryption, SSL-secured MQTT and HTTPS REST communication.

**Simplified Device Onboarding** – Ruckus IoT Suite quickly connects Soter and other IoT devices simply and easily.

**Expedited Deployment of follow on IoT** – connect an IoT Module to an IoT-ready Ruckus AP to quickly upgrade the WLAN to support new wireless technologies such as ASSA ABLOY locks, BLE ID tags or wristbands or building automation sensors

**Easily Deployed and Managed IoT** – Soter sensors can be managed online and integrated with other IoT devices through the Ruckus IoT suite for a sum greater (and less expensive) than the parts

### Better Together: Ruckus Networks and Soter

A great IoT deployment is only as great as the foundation it is built upon. The Ruckus portfolio is designed from the ground up to deliver better experiences: to get devices on the network quickly and easily, keep them on reliably, and deliver the capacity and scalability needed to support new applications and devices. Soter is the networked vaping detection solution provider with a mission to simplify school health and safety. Ruckus is the only network vendor to recognize how critical this technology is in schools and to elect to specifically test, QA and support FlySense sensors, and to work with Soter on advanced network standards

### Better Deployments

Ruckus access layer ICX switches come with more PoE options and higher PoE capacities (PoE+, PoH) than other vendors switches, and we are the only network vendor to commit to testing and support of FlySense sensors. Ruckus things should “just work”, and we bring our networking expertise to this partnership so that Soter can focus on their expertise instead of troubleshooting switch issues with other network vendors.

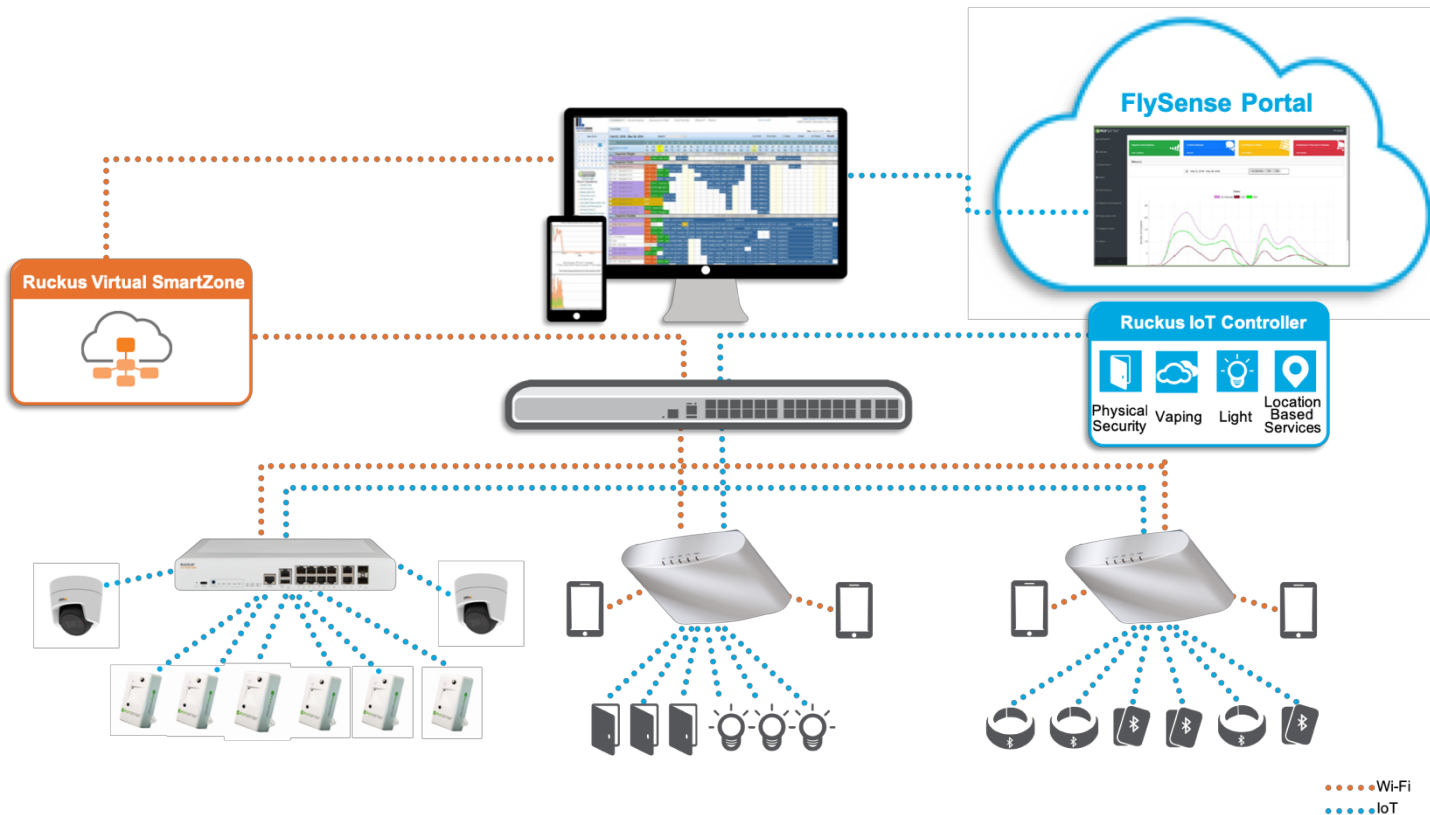
### Better Security

The Ruckus IoT Suite secures FlySense sensors, and all manner of IoT devices. IoT traffic is tunneled over SSL to the IoT controller so that it is encrypted, it is security isolated from the rest of the network, it is rule checked. Instead of dozens of sensors accessing the FlySense cloud management system, one readily secured controller accesses the cloud managed system on their behalf.

### IoT Strategy – integration and Futureproofing

IoT has been the high-tech buzz phrase for some time, but it is now truly here. Soter may be the first IoT system rolled out at a given school, but it will not be the last. A piecemeal approach will mean higher costs and complexity down the line, while Ruckus’ integrated approach will enable multiple IoT systems to interact and integrate with each other. Deploying a Ruckus IoT controller will secure Soter sensors today, and position the school for simplified deployment and integration of the next IoT system tomorrow.





A complete Ruckus IoT network

### Ruckus Networks: Premium Connectivity Without the High Price Tag

Ruckus offers the best in access networking for schools and does it affordably, bringing premium enterprise features and connectivity within reach of any facility. We do it through a relentless obsession with:

- **Performance** – a typical Ruckus Wi-Fi deployment requires fewer APs to provide the same, or better, performance than competing vendors
- **Fewer IT Helpdesk Calls** – self-optimizing networks and self-service onboarding reduce helpdesk calls. Accurate, Automated, 24/7 Monitoring with Real-Time Alerts
- **Ease of Use** – intent-driven user interfaces reduce the risk of misconfigurations and the need for extensive training
- **Reliability** – carrier-grade reliability and redundancy options reduce downtime and truck rolls
- **Scalability** – Ruckus switches and APs offer flexibility and modularity to minimize rip-and-replace network upgrades. Multi-tenant access network controllers and Cloud easily scale manage thousands of sites and tens of thousands of APs and switches
- **Integration with IoT systems** – integration reduces redundant spending costs and add new capabilities
- **A Vision of the Future of Connectivity** – the newest Ruckus APs go beyond LAN and WLAN, with integrated LTE radios that can be deployed for private LTE today and, soon, neutral host systems that will offer an affordable alternative to in-building DAS

### RUCKUS NETWORKS AND SOTER TECHNOLOGIES TRANSFORMING SCHOOL SAFETY

Today's school district administrators face a far more complex set of challenges than they did even a decade ago. In addition to providing a top-notch education, they must also ensure the safety and security of their students, faculty and staff in an unfortunately more complicated world. In the education space, Soter's Digital Fly product line includes a suite of school safety tools for detection and prevention of bullying, cyberbullying, vaping, and smoking. These products and services are making an impact in more than 500 schools internationally and have a proven record of identifying and averting threats – including being credited with saving the lives of students who were contemplating suicide.

Ruckus Networks elevates the digital learning experience with safe and reliable network access. The classroom of tomorrow promises an amazing education. Blended learning, flipped classrooms, video delivery of digital curriculum, video conference and other modern learning models can better engage students and help educators be more effective. We power the modern classroom with grade-A Wi-Fi and edge switching performance coupled with simple, market-leading secure onboarding and policy management. With the addition of the Ruckus IoT suite, that grade-A network can be leveraged to improve safety, lower facilities costs and reduce administrative and IT overhead.

Contact your Ruckus Networks reseller today and explore what we can do to help you navigate the available technology to provide a safe and outstanding educational environment.

### About Ruckus Networks

Ruckus Networks enables organizations of all sizes to deliver great connectivity experiences. Ruckus delivers secure access networks to delight users while easing the IT burden, affordably. Organizations turn to Ruckus to make their networks simpler to manage and to better meet their users' expectations. For more information, visit [www.ruckuswireless.com](http://www.ruckuswireless.com).

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### About ARRIS

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