VIEW POINT

CYBERSECURITY FOR EDUCATION SECTOR

Infosys®
Navigate your next

Abstract

With the ever-increasing threat landscape and hackers targeting all industries and services, cybersecurity incidents are on the rise for education sector as well. This is solely because the security controls are usually not as stringent in this sector and attackers can extract valuable data of students, teachers and parents and misuse it. The number of students in education sector as well as in the higher education sector using online channels and mobile devices have increased multi-fold in the last couple of years. Higher education is at even higher risk as the learning doors are now open not only physically but also virtually to the whole world. Data being the new currency, there's lot to attract the hackers in colleges and universities including personally identifiable information of students and staff, research data on cutting edge technology at universities / specially schools. The risk is multi-fold and may result into financial and reputational losses, while bringing the day-to-day operations and learning to a halt. Teaches / staffs are motivated, but neither equipped nor trained to handle cybersecurity incidents, and the same is true for students who are very tech savvy but lack understanding of online safety. While it's paramount to raise cybersecurity awareness among the many actors of education sector, security controls also need to be implemented based on the "secure by design" principle. Through this paper, Infosys proposes a multi-layered cybersecurity approach tto strengthen security posture of education sector.

Need for Cybersecurity in the Education Sector

In the new normal, online studies and remote access are norm of life. Even in classrooms, multiple online channels and tools are being used to accelerate the learning, complete the assignments, and advanced research. With 70% of educational institutions having very basic cybersecurity governance and more than 50% facing security incidents, the risk is at a critical stage. With data being shared at fast speed and being available from anywhere, at any point and from any device, a holistic approach to cybersecurity is need of the hour.

Key Actors of Education Sector

Following are the common actors of education sector

Core Users: Students and teachers / staffs make most of education sector's users. Teachers publish and utilize online content, while it's part of day to day activities for students. The access for this core group doesn't just rely on school provided endpoints (servers, laptops / desktops); it is mostly through personal devices (laptops / tablet / mobile devices) and security for these devices fall into a no man's land at times. Parents, school administrators and coaches also form the core users' section. Parents usually need to access progress of students and provide required information to school administration. Administrators require access for admin and housekeeping purpose as well as to understand larger needs of students and teachers. Coaches require access to schedule sessions and track the progress of students. Often some of these users have access to PII (Personally Identifiable Information) data of students such as financial data, social security number. As some of the health records such as vaccination records, medicines are also maintained at school / college levels, and so securing PHI (Protected Health Information) data is very critical.

Partial Users: Prospective students, students from other schools / colleges, users from social services agencies and guests come under this category, which may require limited access to schools / colleges premises, general information and in some cases, data about students.

Vendors: Vendors / staff for food, cleaning, schools / colleges supplies may require limited access to data and apps, but they are integral part of education eco-system. The IT vendors / system providers are the core backend users, thus their being cybersecurity aware and access to them should be provided based on least privilege principle only.

Core Users	Students	Teachers / Staff	School / College / University Administrators	Parents	Coaches
Partial Users	Prospective Students	Students from other schools / colleges	Social Service Agencies	Guests	
Vendors	IT / System Providers	Vendors / Support Staff	Security Agency / Guards		

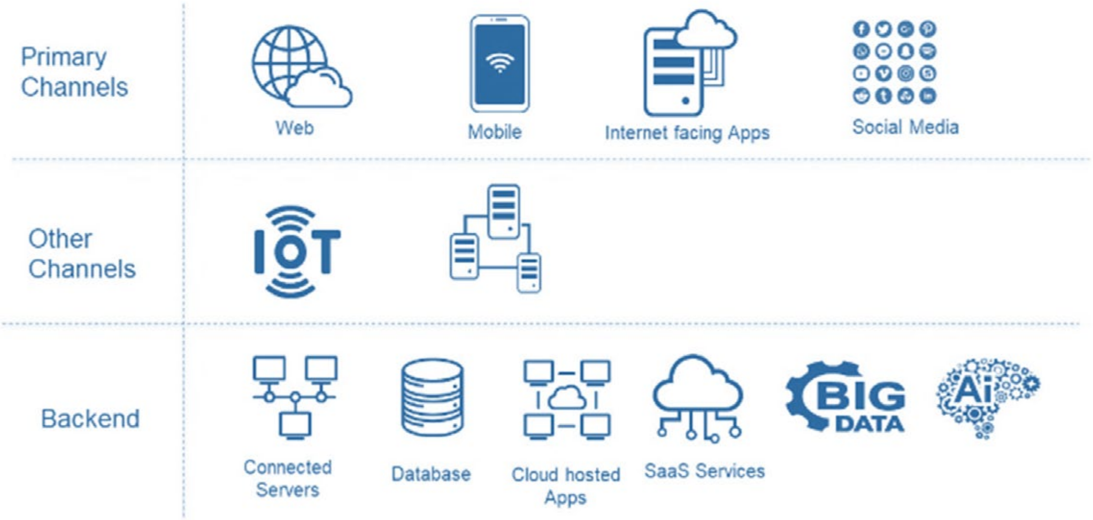
Key Systems Involved

Let’s understand the systems that the actors in education sector require access from / to

Primary Channels: This includes devices, users explicitly use such as laptops / desktops, mobile devices, tablets. In these devices, users use web browsers, web/ mobile apps, backend channels (such as APIs / commands), social media accounts. Many of these apps are internet facing and can be accessed from anywhere. School / colleges usually provide very limited devices and so the BYOD (bring your own device) concept is common for students. This poses a significant challenge of securing such devices as the their control is not completely with the school. In addition, productivity applications such as Microsoft (office) 365, G suite are used daily and any access to them and usage also require proper security controls.

Other Channels: With cloud and IoT being an integral part of our everyday life, there are some channels, that are gaining time share in daily usage. Students and teachers often use devices such as Google Home, Amazon Alexa to obtain information on the fly. Smart routers also are used extensively. If these channels are not secured robustly, there can be devasting repercussions with regards to cyber breach. In fact, last year 70%+ IoT cybersecurity attacks were targeted on smart routers and smart cams.

Backend: These systems are used implicit, but provide the core functionality. They include backend servers (on-premise or in cloud), database, cloud hosted applications / APIs, SaaS applications, Big data, Artificial Intelligence (AI) services. With students being tech-savvy, the landscape is huge involving poly-cloud (provided from different cloud services providers), development and productivity platforms, tools, online education data and material, etc. Securing these backend services becomes critical for the education sector.



Applicable Security Standards and Security Frameworks

The industry standards and frameworks relevant to the education sector are as follows:

NIST

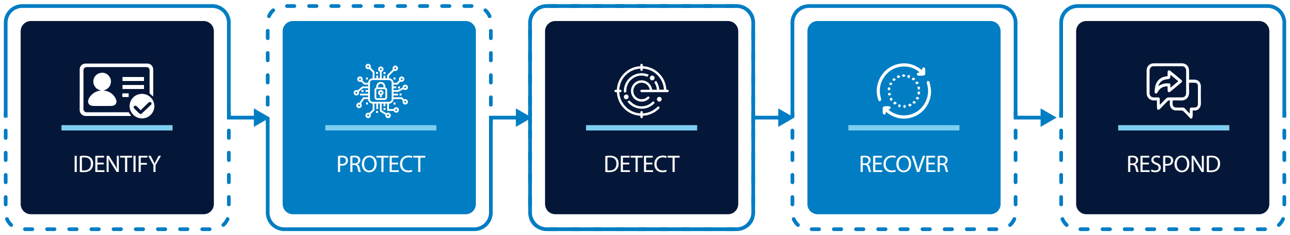
- NIST 800-53
- NIST 800-171
- NIST 800-88
- ISO 27000
- ISO 27001
- ISO 27002:2013
- ISO 31000 (Risk Management)

Other key controls:

- HIPPA - health records of students
- PCI-DSS (for contractual obligations)
- SOX
- OWASP Top 10 / SANS Top 25
- CSA CCI (CCM - cloud control matrix)
- Security Assessment
- HECVAT (Higher Education Community Vendor Assessment Toolkit) - only for 3rd party risk assessment
- SIG (shared assessment)

Cybersecurity based on NIST View for Education Sector

Following are the key activities that can be undertaken to implement a cybersecurity program for education sector



IDENTIFY → PROTECT → DETECT → RECOVER → RESPOND

IDENTIFY

- User list (core users, partial users, vendors) and associated accounts – verify if readily available in a directory
- Create roles matrix for all users
- Identity end-to-end user life cycle management process (on-boarding, off-boarding, termination, providing access based on privileges / roles)
- Inventory of all hardware, systems and software and mapping of who have access to all and in what capacity
- Current state assessment to find gaps, address them and edge towards a standard cybersecurity reference architecture
- Risk assessment to identify existing critical vulnerabilities
- Identify data privacy requirements
- Create target cybersecurity architecture and roadmap
- Identify requirements for security awareness program and training
- Review and update relevant school board policies for security governance and risk management

PROTECT

- Build a zero trust strategy encompassing all facets of cybersecurity and focus on user, devices and network first (access, authorization, multi-factor authentication, context-based access, network micro-segmentation)
- Protect network – network segmentation based on tiers, track traffic and log related information
- Protect endpoints – encrypt laptops, implement Endpoint Detection and Response (EDR) solutions
- Protect data – encrypt sensitive data at rest, in transit, backup data, data archival and purge policies and automation, implement Data Loss Prevention (DLP) solution for network, endpoints and emails
- Protect workloads (services, APIs, applications) – enable API security and security for backend services with proper authorization and protection against atop vulnerabilities (OWASP top 10 and SANS 25)
- Protect devices – use modern device management techniques to authorize devices and restricting access from registered devices for critical information
- Protect users – create unique identities for all users and leverage multi-factor authentication, which is risk-based and adaptive
- Centralized SOC solution (SIEM) – collect security related logs in one place; monitoring and early detection is key to analyze the ecosystem and identify malicious activities
- Secure by Design – cybersecurity embedded in each step from product envisioning to market release for any applications (web or mobile), portals, solutions in education sector
- Periodic patch management for all the infrastructure
- All RFPs should involve cybersecurity requirements or/and compliance to already existing one
- Run security awareness programs and campaigns periodically

DETECT

- Monitor the infrastructure and web/mobile usage
- Leverage data loss prevention (DLP) tools for monitoring at endpoint, network and email level especially for protected, confidential and PII data
- Utilize SIEM (Security Incident and Event Monitoring) solution to log, create alerts for any unusual activities on the network or by the staff / students.
- Track user behavior through analytics for unusual activities
- Enable visibility into cloud workloads (Infrastructure, Data, Applications, SaaS services, Office 365, etc.)

RESPOND

- Build a process for responding to a cybersecurity incident
- Ensure timely notification to stakeholders whose information/data may be at risk
- Build a process to manage communications with parents, community and the press
- Create a business continuity / disaster recovery plan
- Leverage cloud for additional backup
- Build a process for reporting the attack to the authorities
- Define processes for investigation and response (and simulation exercises)

RECOVER

- Build a process across the organization to repair and restore the affected components
- Create RACI matrix and involve teams from infrastructure, network, applications to remediate
- Keep stakeholders updated about recovery progress
- Work with cybersecurity vendors (for third party tools) for any updates required in tools and their implementation

“Secure by Design” based Security Framework

Infosys recommends the implementation of “Defense in Depth” and “Secure by Design” based cybersecurity framework for education sector. The below diagram depicts key security capabilities required across security tracks.

Physical Security	Access to campus | Access to building, class | Guest access | Vendor access
Security Governance	Information Security Governance | ISMS System based on NIST and ISO 27001 | Security awareness for teachers / staff and students | Cybersecurity trainings | Audit and compliance | Third party risk management
Threat Detection and Response	Record all security events to SIEM solution | Student / user behavior analytics | SOAR solution | Threat intelligence | Cyber incident response strategy
Identity & Access	Unique identity for all users | Biometrics | Password-less authentication | Single sign on | MFA | Privilege access management | Social login | Least privilege access | Identity governance
Endpoint Security	EDR/XDR Solution for end user devices and servers | Anti-malware | HIPS | HIDS | Infra vulnerability scanning | Periodic infrastructure pen testing | Patch management
Network Security	Remote access | Internet access | Next Gen firewalls | URL filtering | DDOS | Intrusion detection and prevention | Segmentation | Sandboxing | WAF | ATP
Data Security	Email security | Data loss prevention | Data classification | Data privacy | CASB | Database activity monitoring | Encryption | Key and secret management | Certification management
Application Security	Secure apps | Threat modeling | DevSecOps | Secure coding | SAST | DAST | Container security | API security | Periodic application penetration testing

Mapping Cybersecurity Controls with Actors

In case of major gaps between current cybersecurity posture and target security framework, security controls need to be prioritized. Given below is a table that provides quick reference to map security controls and actors in the education sector.

This table will require revisions based on school district’s / universities’ / colleges’ current cybersecurity posture, target reference architecture and roadmap.

Security Controls	Student	Teacher	Parent	Administration	Others
Physical Security	Yes	Yes	Yes	Yes	Yes
Security Governance	-	-	-	Yes	-
Security Awareness	Yes	Yes	Yes	Yes	Yes
Security Monitoring	Yes	Yes	-	Yes	-
User behavior analytics	Yes	Yes	-	Yes	-
IAM – Profile	Yes	Yes	Yes	Yes	-
IAM – Access / SSO	Yes	Yes	Yes	Yes	Yes
Endpoint Security – User Devices	School / college provided devices only	School / college provided devices only	-	School / college provided devices only	School / college provided devices only
Endpoint Security – Servers	Yes – only for applicable students	Yes – only for applicable teachers / staffs	-	-	Server / App administrators
Network Security	Yes - Implicit	Yes - Implicit	-	Yes – Implicit	Yes
Data Security	Yes	Yes	Yes	Yes	Yes
Data Privacy	Yes	Yes	Yes	Yes	Yes
App Security	Yes – for any students involved in app development	-	-	-	App developers / admins

Recommended Initial Goals for a Roadmap

To implement the cybersecurity framework, Infosys recommends security tracks that can immediately tackle key risks and vulnerabilities. The important steps and priorities are stated below; the remaining security controls can be selected based on current maturity state and roadmap:

1. Define / update security governance and risk framework
2. Make cybersecurity top priority for every transformation program
3. Leverage cloud (such as AWS, Azure, GCP) for transformation and enable native cloud security controls to kick-start proceedings for quick wins
4. Security governance controls – Create a security awareness program and conduct trainings for students and teachers
5. Threat detection and response – Enable a centralized SIEM (Security Information and Event Management) solution for security incidents and event monitoring
6. Identity and Access Management – Enable single sign-on and MFA; for administrative access, enable privilege access management solution
7. Endpoint security – Enable EDR (Endpoint Detection and Response) and MDM (Modern Device Management) solutions
8. Network security – Enable journey toward network micro segmentation. Internet being the new intranet, ensure secured internet access.
9. Data security – Encrypt data, enable DLP (Data Loss Prevention) and email security solutions
10. Apps / APIs security – Automate security testing for applications and empower developers for secure coding

Conclusion

Implementing cybersecurity controls, creating awareness and conducting trainings for the education system will not only secure the young generation from dangers and vulnerabilities, but would also help them become young cyber-aware citizens. With digital touching every day of our life and technology moving at a rapid pace, the principle of "Secure by Design" will play a major role in combating increased cyber threats in the education sector.

References:

1. https://www.nist.gov/cyberframework

2) https://www.nist.gov/itl/applied-cybersecurity/nice

3) https://library.educause.edu/resources/2020/4/higher-education-community-vendor-assessment-toolkit

4) https://k12cybersecure.com/blog/how-should-we-address-the-cybersecurity-threats-facing-k-12-schools/

5) https://studentprivacy.ed.gov/sites/default/files/resource_document/file/checklist_data_breach_response_092012_0.pdf

6) https://privacy.a4l.org/geps/

About the Author

Neeraj Mathpal, *Senior Technology Architect*

Neeraj possesses over 17 years of experience in Cybersecurity and offers next generation advisory and creative solutions for cybersecurity problems. He is passionate about helping enterprises and businesses to be cyber secure and leads strategic security assessment and large security transformation programs in North America.

Neeraj_Mathpal@infosys.com

For more information, contact askus@infosys.com

Infosys®
Navigate your next