

A NEW PARADIGM FOR DATA SECURITY AND SCHOOL SURVIVABILITY.. AND HOW TO PAY FOR IT

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What a D.I.E.T.S. Plan Can Look Like

(Digitally Integrated Educational Technology and Security Plan)

Provide enhanced and personalized K-12 education in an environmentally sound and technologically resilient setting (no longer oriented to acquisition of network. Internet access and hardware):

- Telecommunications and *secure* Internet
- Electrical energy with “renewable” back-ups
- *Secure* Educational Sources—books, internet, other live/stored/streaming sources
- Ability to continue to do “business” during adversity.

Inclusions in the DIETS Plan

- Educational displays/Interactive Screens, 3D+ projections especially around STEM
- HVAC, Lighting, Audio/Sound, Safety
- Student Data to the State; Testing;
- Financial Reporting & Money Transfers
- Smart technology which recognizes students, staff and administrators.
- Secure and redundant data continuation.
- Readiness for the Internet of Things (2018 – the year of Alexa and Watson)

Inclusions in the DIETS Plan-2

- Smart technology which recognizes students, staff and administrators and is location intelligent. (Example: facial, finger print, retina and other bio-recognition)
- Secure and redundant data continuation.
- Dynamic and robust infrastructure

Backbone of a DIETS plan

- Strong and resilient architecture and electronic backbone.
 - Mobile “hot-spots” (cell phones, mobile units, public-guest networks, etc.)
- Redundancy to primary ISP.
- Stored coursework, books, streaming sessions.
- Renewable energy resources as backup, for now.
 - STEM courses to emphasize applications (Solar? Hydro? Wind?)

Defense against Data Loss

- Backup and/or Parallel Data can be located on multiple servers and at multiple physical/virtual locations.
- K-5 curricula can likely be stored on local “caching” servers, when internet is unavailable *
- Grades 6-12 present additional challenges without internet resources but caching and data servers can fill much of the void for a few days, when necessary.*
- *Assumption is that “the cloud” is down/disconnected

DATA SECURITY

- The obvious: Filtering, passwords, levels of authority, permissions, phishing...
- The not-so obvious: Cookies, sniffing, DDOS & probing attacks from the inside/outside
 - (Students looking at your data from within the network if on your drive. E.g. District/schools “Home” server space, or linked to Google Drive);
- School email/document(s) are **public records** (Home or Share drive/Google drive/iCloud drive); Personal information on the school network *may* now become public record.

Data Security-2

- Personal devices on the school network *MAY* become public and be *susceptible* to subpoena and/or an attack.
- First Step: Always have:
 - Secure network with sufficient bandwidth
 - Multi-fiber runs, micro-cells, DNS recognition & at least Active Directory of all network IP addresses
 - VPN software on your Personal Device in any public network, including school, when using your personal information.
 - Anti-virus/ cleaner on mobile devices (Avast, Malwarebytes, AVG, etc.) from iTunes or Play store.

PERSONAL DEVICES – Before?

- Devices brought from the outside:
 - Cell phones, tablets, laptops..Is stopping the flood worth it?
 - Liability for damage release? Using Google domain?
 - .exe files in the network?
 - Note the internal DDOS (denial of service) susceptibilities.
- Put a program/app on each device that is yours to control that device and have it report to I.T. (Chromebook admin control for your domain? Or other login)
- Updating devices on the school network?
 - Reboots and errors
- Sign a release/usage form for each device.
- DHCP controls, personal hotspots shared by students, “anonymous” browser use.
- Actively:
 - Scan for unrecognized?
 - Discovery = What procedures are in place? Challenges?

ATTACKS – After? (too late?):

- Grades, payroll, testing---Data, Don't leave it to the hacker's imagination! (Video displays, Environmental systems, etc.)
- Distributed Denials Of Service: effects on class lessons, testing or on financial information reporting
- Ransomware– missing something? What do you do?
- Social engineering attacks! (There's nothing up my sleeve... or phone. Did I drop my digital pencil?), What about Cyberbullying?

FIRST LINE OF DEFENSE: Behavioral training

- Let's go phishing with your public email address- harvesting, viruses and malware; Possible Behavior training
- <https://info.knowbe4.com/phishing-security-test> ; <https://phishme.com/>; Public SchoolWorks

SECOND LINE OF DEFENSE: active packet sampling, network scan.

- Mac Attack-Is your Mac “Typhoid Mary?”
- Unix kernel and Intel chips.

OUTAGES: return to yesterday?

- **What happens when the internet goes down?**
 - Classes?
 - Connections to services? Paying your bills?
 - Environmental Systems? Feeling the heat? Servers do too!
 - Security? Backed up and failsafe?.. What happens when kids make hotspots?
- **Caching servers? (E-rate eligible?)**
 - Distributed servers with teaching materials?
 - Licensing? (Movie License Corp.), Fairness Doctrine
 - Daily pre-loads of “go-to” information?
 - How many days of data access would you need?
 - Some redundancy (LFI \$): cable modem to another ISP? (bridging)

Why assume a return to Yesteryear?

- More than one core switch -east/west city schools, redundant distribution? Fiber ring?
 - Adequate bandwidth, inexpensive safety net but E-rate limited!
 - Mobile Hotspots
- **What happens when the electricity goes down? (why assume “back to basics?”)**
 - Generators?
 - Solar Panels?
 - Wind Power?
 - Hydro?
 - Energy Storage Devices
- **Teaching moments for STEM classes or an organic, holistic approach to self-sufficiency?**

Data Scenario: District and/or students with sudden or recurring data access issues

- Redundancy to redirect to data
- District puts cellular receivers/routers on their buses so students can do homework back and forth from school. This is “out of pocket” \$ (Locally Funded Initiative)—LFI
- Buses retransmit internet to students in non-internet available areas. May park overnight in safe places.
 - One such district, Coachella USD, CA uses solar panels on school bus roofs to supplant the energy supply required for re-transmission of data.
- Consider using buses as mobile hot-spots with parallel image servers and caching servers as additional network nodes in cases of outages, attacks, or emergencies. They are reasonably self-contained.

Mobile Hot-Spots-1

- Several school districts have put mobile hot-spots into operation in dozens of buses:
 - Examples: Coachella Valley USD, CA; Richmond County Schools, GA; Sunnyside USD, AZ.; Eastern Carver County Schools, MN.
- USAC “E-rate” has granted waivers for allowing these in Alaska; West Virginia has recently filed for a waiver and more states are likely to follow as there are still many areas with inadequate Internet availability.

Mobile Hot-Spots-2

- A D.I.E.T.S. plan should include Mobile Hot-Spots as mobile nodes to fill in for:
 - Data outages
 - Network outages
 - Related emergencies
 - Bridging to adjacent Districts

DIGITAL INTEGRATION of EDUCATIONAL TECHNOLOGY and SECURITY (DIETS)

- Who creates the Digitally Integrated Educational Technology and Security(D.I.E.T.S.) plan?
 - What's its Mission and Scope?
- Who funds the plan and what will it cost?
- What will be its payback (ROI)?
- What are its real benefits—
 - Intended and unintended consequences.

Who Creates the DIETS Plan?

- Administration along with Technology, Education, Building Operations, Finance, Student/Parent Survey
- D.I.E.T.S: Essentially a more integrated Technology Plan “on steroids”.
- Some of the costs are already there, some virtual, some additional based on level of redundancies:
 - Redundant internet, redundant data, redundant energy, redundant network nodes (LFI).

What is the “Cost” of a day without data?

- **Assume 24 students per teacher and 20 teachers** (480 students).
 - Teacher cost is \$40,000 w/benefits and 180 school days per year.
 - Assume buses seat 40 and yield 10 miles per gallon, do 50 miles each day with drivers paid @\$12,000 per year.
 - Opportunity loss per student day is \$8000/180 or \$44.44/day
 - Utilities cost \$1 per day per student.
- **Without all the other detail and expenses of the real world, the daily cost is:**

Costs per School Day-2

480 Students, 20 teachers

- Teacher costs: \$222.22 per day
X 20 teachers or \$4,444
- 12 buses and drivers: =
\$180 fuel + \$800 sal = \$980
- Students opportunity cost:
\$8000/180 = \$44.44 X
480 = \$21,333 lost per day.
- TOTAL: \$26,757 PER DAY.

2400 students, 100 teachers

- \$22,220 teacher costs
- \$4,900 busing costs
- \$106,665 student opportunity cost
- NO ADMINISTRATORS' OR OTHER COSTS NOTED.
- TOTAL: \$133,785 PER DAY.

Opportunity Costs-3

- This is a very rudimentary estimate but shows key elements:
 - Teachers salaries may be fixed but have a real value.
 - Busing costs can scale up quickly and Utilities (not included), even if underestimated at \$1.00 per student/day, can add up quickly if added in.
 - **The biggest factor is the opportunity cost for students not receiving classes for a day. (\$44.44 per student per day.)**
 - Other costs to consider are gaps in financial obligations and student data. Can the “business” remain viable? How long?

Why DIETS?

- Secure and ever available data are critical.
- Additional network nodes, mobile or otherwise, may alleviate certain data outage situations.
 - Costs are nominal compared to losing days of school and giving up educational opportunity.
- Additional internal servers can store data, or provide redundant paths to the data/” the cloud”
- Continuity of electrical energy and student/financial data are essential to the district’s operation.

How do we pay for this?

Two E-rate areas to review first*

- Internet-one to ten Gb/s per 1,000 students
 - (cellular only if nothing else is cost-effective or consider a directional fixed-wireless bridge).
 - Only one internet source allowed per redundancy rules
- Category 2 Internal Connections **(do it now!)** and related Managed Internal Broadband Services and Maintenance

**E-rate funding for voice (almost completely phased out in 2018)*

Broadband E-rate Changes

(supply side)

- ❑ **Internet services are bandwidth based only;**
 - ❑ No Web Hosting, No E-mail
- ❑ All the Bandwidth you need up to 1 Gb-10 Gb per 1000 students per FCC guidelines.—Must be CIPA filtered, see below.
- ❑ Purchase through a Consortium or direct from ISP; lit or dark!
- ❑ Build Your Own Fiber Network-IRUs, self-owned if cost-justified...
- ❑ Cabling and Fiber Rings/Coax (AT&T vs. cable cos. Vs consortiums such as One Community...
- ❑ Wireless 802.11N/802.11AC; Microwave
- ❑ Filtered or not (filtering costs not covered by E-rate, if sold separately)
 - ❑ **CIPA PROTECTIONS ARE REQUIRED** including pro-active cyber-safety training and the capability to monitor users
- ❑ **Does your Board Policy book include a specific article on Internet Safety?**
 - ❑ How are you documenting and teaching this topic?

Broadband Sources?

- Phone Company;
- Internet Service Providers (ISP)
 - MCOECN > NEOnet, Connect, Meta, Ohio DA sites
 - Third party providers as ISP's
 - Utilities, Cities, States, Counties (One Cleveland???)
 - National or Regional providers (AT&T, Spectrum Cable, Comcast, Cox Cable, etc.)
 - TV white space providers...
 - Bridging? Is it worth it? (Erate-able?)

Net Neutrality FAQ

- On December 14, 2017 the FCC voted to repeal the net neutrality laws governing the internet.
- The financial and physical impacts on schools and libraries is yet to be discovered.
- Best hunch is that overall costs will not decrease, bandwidth needs will increase and providers' paid ranking will be key to access and speed.
 - If Amazon pays more to a provider (AT&T, Spectrum Cable, etc.) for Amazon Prime video bandwidth, it *may* take precedence and bandwidth away from PBS video, thus slowing PBS streams.

Broadband Topics

- **What are your longer term needs?**
 - 1, 3, 5, 10 years?
 - Think ahead about testing, voice usage, streaming services, HVAC, alarms(including water/flooding), smart lighting, PA systems, occupancy sensors, books, video streaming, financial reporting, monetary payments and transfers, student data, the Internet Of Things (IOT)...
- **How the Bandwidth gets to your Buildings (E-rate Cat 1):**
 - Fiber, cable, satellite, microwave or laser—combinations.
 - SB225 (Ohio Broadband Development Grant Program) for hard to reach rural areas; grants for providers only?

Broadband Topics

- Currently, E-rate only allows \approx one internet provider but doesn't preclude purchasing some backup cable modems or another provider's internet. (LFI \$)
- To Classroom (E-rate Cat2) via Ethernet, Fiber, Wireless, Microwave...

E-rate Reimbursables

- ❑ Eligible Hardware, cabling, MIBS, Maintenance
- ❑ Capped pool of money for 5 years beginning in 2015-16: \$150+/enrolled student, pre-discount.
- ❑ Hardware (Internal Connections)- routers, switches, cabling, ups, racks, wireless access points (WAPs), controllers, firewalls, caching servers...
- ❑ MIBS-Managed Internal Broadband Services
 - Third Party purchase or management (MIBS)
- ❑ Basic Maintenance of Internal Connections

A New Paradigm- DIETS?

- Integrate the costs of digital education with more **cost-effective, secure and redundant** technologies, to keep the District mission moving forward:
 - Communications
 - Intra-District: Voice, peer-to-peer, conferencing, streaming, public addressing, mobile hot-spots...
 - External: Other districts, other constituencies, streamed learning, streamed operational needs...
 - Self-Maintained vs. Paid Service

Pensives

WHERE DO OUR RESPONSIBILITIES END?

- District security of students, employees, data & physical assets: Who sets the guideposts and limits?
- Is Mr. Moore's law accelerating? Or does it just feel that way?
- Speed of Technology vs. Laws/Revised Code



QUESTIONS?

Thank you very much
for your attentiveness
and thoughts.