

A young boy with dark hair and glasses is sitting at a desk in a classroom, looking intently at a laptop screen. He is wearing a grey hoodie over a light blue collared shirt. The background shows other students and classroom furniture, slightly out of focus.

# Enabling the Digital Leap: Strategies for K-12 Schools

Cisco Education Solutions Team

July 8, 2015

# Today's Speakers

- **Mary Schlegelmilch**  
Cisco Education Advocate
- **Albert Salazar**  
Cisco US Public Sector Solutions, Systems Engineering Manager
- **Doug Walsten**  
Cisco US Public Sector Solutions, Senior Education Solutions Architect
- **Polly Gifford**  
Education Partners Solutions, Inc.

# Agenda

Introduction

How can you ensure that your technology initiatives are successful?

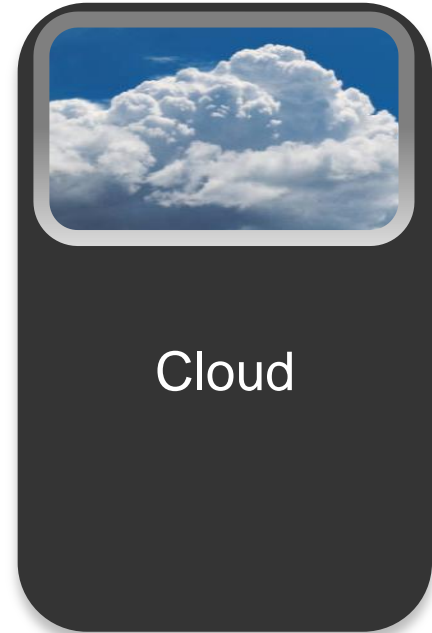
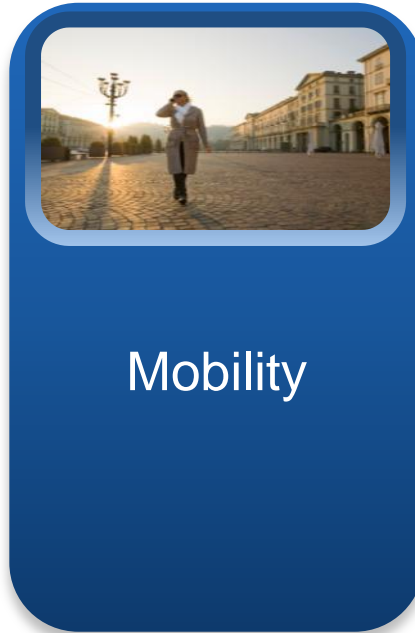
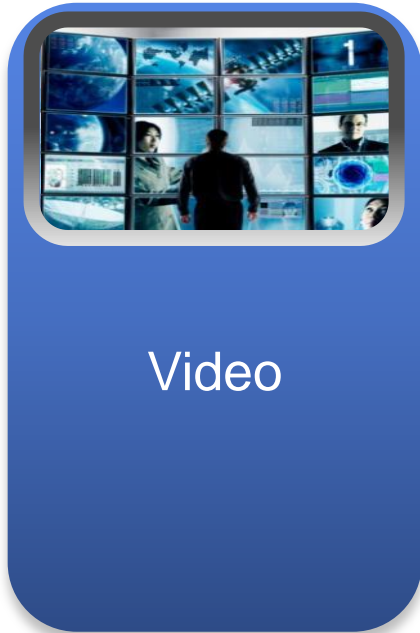
CoSN SEND II Decision Tree

Wide-Area Access Initiatives

Live Q&A

# Introduction

# Three main drivers of change



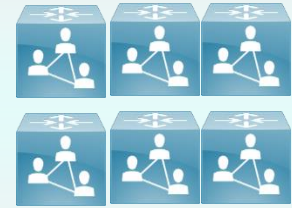
# Access from Every Pane of Glass



Desktop, tablet, web,  
smartphone  
Inside and outside  
enterprise



Video in every room  
Smart desk for knowledge  
workers



Virtualized infrastructure  
Simplified licensing

# Horizon Report K-12 2015 Edition

Topics from the *NMC Horizon Report > 2015 K-12 Edition*



## CHALLENGES

### SOLVABLE

- > Creating Authentic Learning Opportunities
- > Integrating Technology in Teacher Education

### DIFFICULT

- > Personalizing Learning
- > Rethinking the Roles of Teachers

### WICKED

- > Scaling Teaching Innovations
- > Teaching Complex Thinking

## TRENDS

### SHORT-TERM IMPACT

- > Increasing Use of Blended Learning
- > Rise of STEAM Learning

### MID-TERM IMPACT

- > Increasing Use of Collaborative Learning Approaches
- > Shift from Students as Consumers to Creators

### LONG-TERM IMPACT

- > Rethinking How Schools Work
- > Shift to Deeper Learning Approaches

2016

2017

2018

2019

2020

### NEAR-TERM 1 year or less

- > Bring Your Own Device
- > Makerspaces

### MID-TERM 2-3 years

- > 3D Printing
- > Adaptive Learning Technologies

### FAR-TERM 4-5 years

- > Digital Badges
- > Wearable Technology

## DEVELOPMENTS IN TECHNOLOGY



Educator designs a task that targets a higher-order cognitive skill level

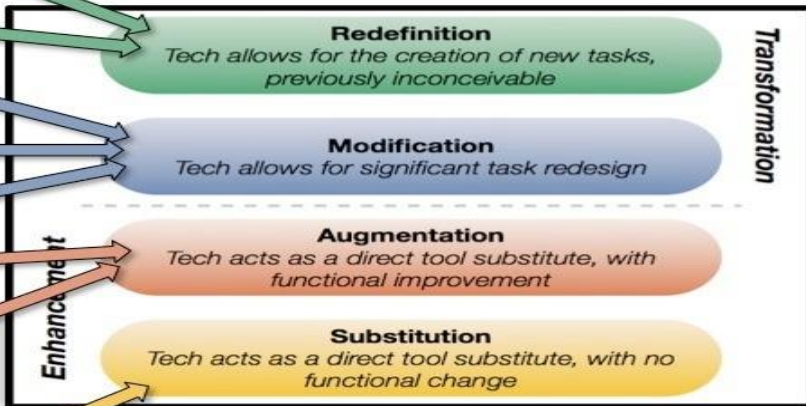
# BLOOM'S

<http://schrockguide.net/bloomin-apps.html>



Educator designs a task that has a significant impact on student outcome

# SAMR



<http://www.hippasus.com/rrpweblog>

Developed by Kathy Schrock  
November 2013



This work is licensed under a Creative Commons Attribution-NoDerivs 3.0 Unported License.

Inspired by the work of Andrew Churches and Loui Lord Nelson



# Stakeholder Alignment is Critical

Policy

Parents

All Internal  
System  
Voices

Superintendent

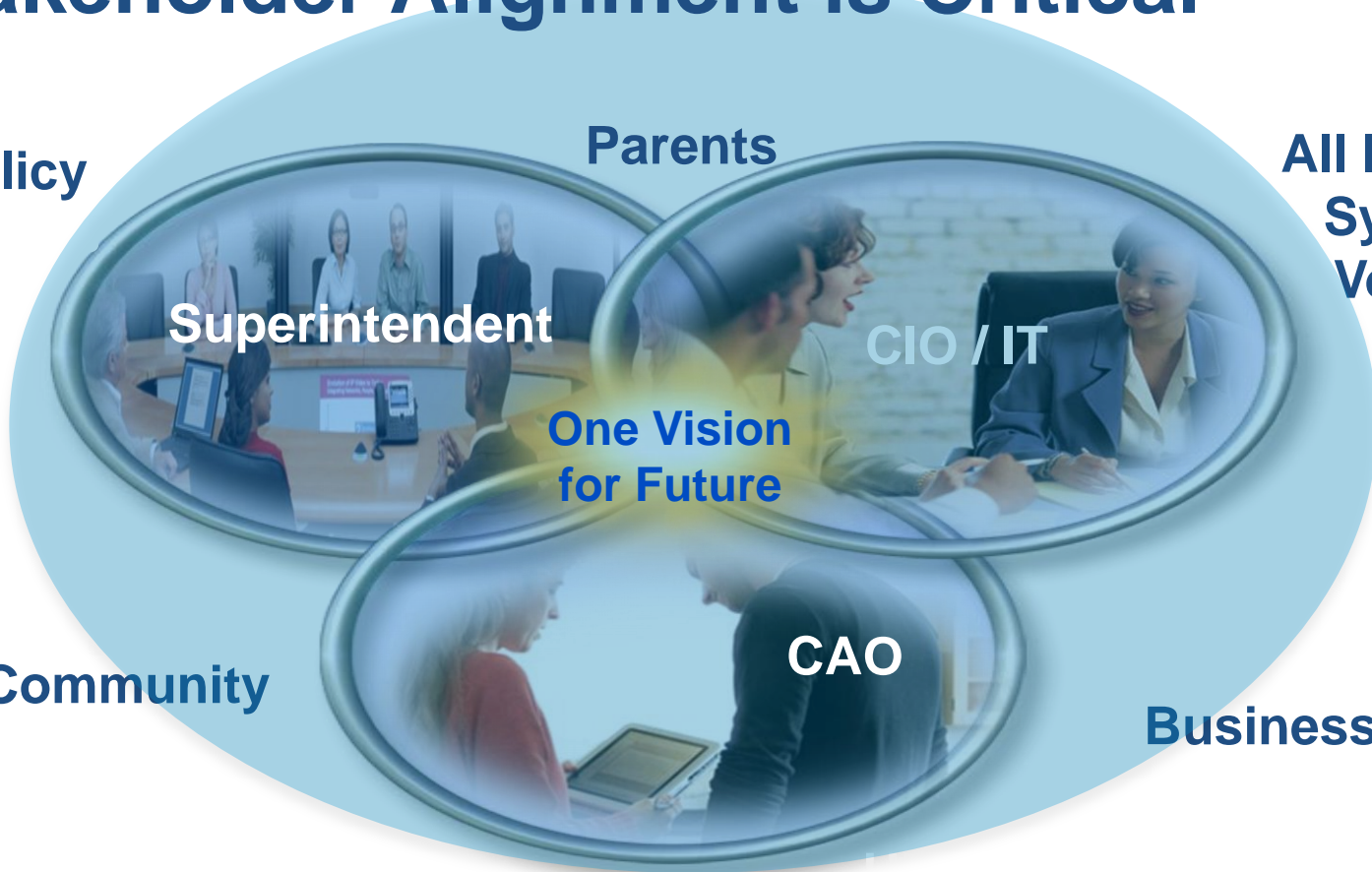
CIO / IT

One Vision  
for Future

Community

CAO

Business



# Drivers of Change

More Innovation and Change than at Any Other Point in Our Lifetime

## Technology Transitions



BYOD



CLOUD



NEW BREED OF APPS



SENSORS & DEVICES



BIG DATA ANALYTICS

## Network as the Platform

INNOVATION

NEW TEACHING  
AND LEARNING  
MODELS

STUDENT  
EXPECTATIONS

GLOBALIZATION  
AND  
COMPETITION

SECURITY &  
PRIVACY

## Education Transitions

How can you ensure that  
your technology initiatives  
are successful?

# Translating the Business of Education to Information Technology

## Successful Deployment and Implementation of Digital Learning will change:

- How the Learners Think: Improvement in cognitive thinking
- What the Learners Know: Improved access to knowledge and the structure of that knowledge as it relates to core subjects
- Learning skills and techniques: Learners accept ownership of learning itself while improving time management, note taking, strategic reading and collaborative learning

# The Student Experience

## Student

- Text
- Dynamic Data
- Collaborative Environments
- Audio
- Accessibility
- Online Assessment
- Distance Learning

## Information Technology

- Cached
- Locally Stored
- Interactive
- Streaming
- Bit Rate
- Data Compression

# The Educator Experience

## Educator

- Project Based Learning
- Monitor Class Progress
- LMS
- Professional Development
- Educator Collaboration Tools
- Curriculum Based Applications

## Information Technology

- Interactive
- Streaming
- Bit Rate
- Data Compression
- Locally Stored

# The Network Care-Abouts

- Classroom Devices
- Non-Instructional Components
- Physical Security
- Application Synchronization
- Cyber Security
- Curriculum Based Applications
- Bandwidth
- District and/or Campus Caching
- Data Compression
- Network Broadcast
- Locally Stored
- User Ratio



# CoSN SEND II Decision Tree

# What is CoSN SEND II?



Brought to you by  
**Smart Education Networks**  
by **Design** a CoSN leadership initiative

*SEND Initiative developed guidelines for network design and a checklist for district network planning.*

*Currently, SEND II is building on that work in collaboration with leading technology partners Cisco, Comcast, ENA, Ipswitch, and Presidio. SEND II is developing next-level resources for building network architectures that can handle and evolve with new demands.*

*In May 2015, we launched the [Design Performance Guide](#), a digital platform that delivers resources, videos, and information about strengthening network design in school districts.*

# Digital Transformation Environments

## Basic

Support enterprise systems like student information systems, payroll  
Staff and educators have access to computers  
Computer lab being available for students

## Emerging

Support initial 1:1 student-to-computer ratio pilot(s)

## Transformational

Support full 1:1 student-to-computer ratio and/or BYOD

# Decision Tree Introduction



## Introduction

Welcome to the School Preparedness Decision Tree.

At the end of this self-directed activity, you will have a complete list of all of the questions asked, as well as your responses and additional guidance.

Be advised that none of your input is being stored after your session ends. The final output screen will be displayed once with your ability to print or capture, then it will be deleted.


Click Next to begin.

<< Previous

Next >>


Reset


# Overview

 **Begin Here**

This decision tree is composed of four topic areas of School Preparedness for Personalized Learning. You will be guided through each of the topics:

1. Devices
2. Content & Applications
3. Analytics
4. Professional Development

 **Topic Choice**



- Devices
- Content & Applications
- Analytics
- Professional Development

[<< Previous](#) [Next >>](#) [Reset](#)

# Devices



**What is the percentage of students who have 1:1 student to device ratio in your district today?**



Elementary

Middle School

High School

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Next >>

Reset

# Devices



**What learning applications are currently in use today?**



Application 1

Application 2

Application 3

Application 4

Application 5

<< Previous

Next >>

Reset



# Content & Applications



**Will your curriculum encompass project based learning?**



- multi-media presentations
- publishing
- social media
- online research

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Next >>

Reset

# Content & Applications



**Given the wide variety of learning content available online, will you be implementing publicly available learning content into the classroom?**



- Yes, already using
- No, but will within 12 months
- No, but will within 18 months
- No plans

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Next >>

Reset

# Content & Applications



**Are there plans to incorporate collaborative two-way video sessions across campus(s) and geographical regions in support of added curriculum or enhanced student experience?**



- Yes
- No

<< Previous

Next >>

Reset

# Analytics



**If, you had indicated that you have deployed or have plans to deploy curriculum based applications, are those applications Adaptive Learning based?**



- Yes
- No

<< Previous

Next >>

Reset

# Professional Development



**With regards to Professional Development, are there plans enhance the educators experience to deploy collaborative tools?**



- Collaborative tools already in place
- Yes, plan to deploy immediately
- Plan to deploy in 12-18 months
- Plan to deploy beyond 18 months
- No plans to deploy

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Next >>

Reset

# Summary / Readout

## Session Summary

**i** Introduction

---

**i** Begin Here

**Q** Topic Choice

**A** Devices

---

**Q** What is the percentage of students who have 1:1 student to device ratio in your district today?

**A** Elementary: 10-50  
Middle School: 10-50  
High School: 10-50

---

**Q** What percentage of the student population do you have targeted for Personalized Learning adoption?

**A** Elementary: 50-75  
Middle School: 50-75  
High School: 50-75

---

**Q** What learning applications are currently in use today?

**A** (No input provided)

---

**Q** What learning applications are planned over the next 12-18 months?

**A** (No input provided)

---

**Q** Do your teachers understand how to use the learning applications that you have today?

**A** No

---

# A New Network for Education

Reference Architecture Framework -

Design Drivers and Requirements

Network Models – First Generation and a New Network Infrastructure to support the Digital Future.

New Network Components for Consideration

Polly Gifford  
EPS, Inc.





# Reference Architecture Framework: A New Network For Education

## *Comprehensive and Integrated Design*



# The Impact of Information and Communication Technology (ICT) in the World in 2015 - 2020




**Connected Devices  
In the World  
2015 - 12 B  
2020 - 20 B**

- **The Transformative Power of Information and Communication Technology (ICT).**
- **Digital Economy, health, education, society and communications.**
- **Big data, data analytics, the Internet of Everything, everything and everyone connected.**
- **Connected learning community.**

# The Impact of ICT In 2015 – 2020 in Education

The Transformative Power of Information and Communication Technology



Big data, data analytics, the Internet of Things, everything connected.

Digital Economy, health, education, society and communications.

- Relevance and Impact of ICT in K12 Education in 2015
- Safe Schools, Facilities, Management and Operations
- Parent, Community and Stakeholder Involvement
- Transformed Learning Environment

Digital content, creation, communication in a Connected Learning Community.

Houston 5 Districts  
2015 - 220,000  
2020 - 1 M

SETDA: The Broadband Imperative: <http://www.setda.org/priorities/equity-of-access/the-broadband-imperative>,  
E-Rate Modernization Order: <https://www.fcc.gov/page/summary-e-rate-modernization-order>



# The Impact of ICT in 2015 - 2020 In Your Schools

The Transformative Power of Information and Communication Technology

Relevance and Innovation in a Digital Society.

Mission, Vision and Goals of Schools.



## TECHNOLOGY LONG-RANGE PLAN

2014 - 2017



- Academic Achievement
- Safe and Healthy Environment
- Human Capital
- Communications and Community Relations
- Financial, Technology and Operations Management

24/7 Online Living and Learning, 1:Many Mobile Devices, Video Rich Content.

Transformed Learning Environment

Digital content, creation, communication in a Connected Learning Community.

App for Everything, All Stakeholders Internet Connected

Digital Economy, health, education, society and communications.  
Parent, Community and Stakeholder Involvement.

CFISD

2015 – 60,000

2020 – 405,697

CCISD

2015 – 20,000

2020 – 89,697

Big data, data analytics, the Internet of Things, everything connected.

Safe Schools, Facilities, Management and Operations

Security Cameras, Connected HVAC, Banking, Tele-health.

Cypress Fairbanks Long-Range Plan and 2014 Bond Program

<http://www.cfid-technologyservices.net/strategic-planning.html>



The Digital Revolution is Real and the Result is a Digital Society.

Relevance and Innovation in a Digital Society.

Mission, Vision and Goals of Schools.

# REFERENCE ARCHITECTURE FRAMEWORK: A New Network for Education

24/7 Online Living and Learning, 1:Many Mobile Devices, Video Rich Content.

Transformed Learning Environment

Digital content, creation, assessment, communications

Big data, data analytics, the Internet of Things, everything and everyone connected.

Safe Schools, Facilities, Management and Operations

Security Cameras, Connected HVAC, Online Banking, Tele-health.

Digital Economy, health, education, society and communications.  
App for Everything, All Stakeholders Internet Connected.



# REFERENCE ARCHITECTURE FRAMEWORK:

A New Network for Education

Big data, data analytics, the Internet of Things, everything and everyone connected.

Safe Schools, Facilities, Management and Operations

Security Cameras, Connected HVAC, Online Banking, Tele-health.

Design Drivers	MOBILITY	INTERNET	CLOUD	E-RATE
Requirements	Capacity	Scalability	Reliability	Sustainability

App for Everything, All Stakeholders Internet Connected

Digital Economy, health, education, society and communications.  
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Digital content, creation, assessment, communications





# Design Drivers and Requirements – Clear Creek ISD

## Education Partners Solution Bandwidth and ERate 2015-2020 Trending Report

Created For:

CLEAR CREEK ISD

### Internet Target

Aggregate Internet need near term: 4.21 Gb  
 Aggregate Internet target long term: 42.09 Gb

**Current Internet 2 GB Scalable to 10 GB**

TOTAL	HS	MS/JH	EL
4.21 Gb	1.30	0.96	1.94
42.09 Gb	13.02	9.63	19.44

### WAN Target

Aggregate WAN Bandwidth near term: 42.09 Gb  
 Aggregate WAN Bandwidth target long term: 420.86 Gb

TOTAL	HS	MS/JH	EL
42.09 Gb	13.02	9.63	19.44
420.86 Gb	130.16	96.34	194.36

### ERate 2.0 Category 2 Budget

Projected ERate District Budget 2015-2020:  
 Projected ERate District Share 2015-2020:  
 Projected ERate Funding for 2015-2020:

URBAN	URBAN	Program: ERate 2.0
50%		Per Student: \$150
\$5,945,250	\$150.00	ADA: 39635
\$2,972,625	\$75.00	Discount: 50.0%
\$2,972,625	\$75.00	Budget: \$2,972,625

Category 1 Max = 90%  
 Category 2 Max = 85%  
 5 Yr Max Urban Samp

## Wireless and Associated Network Access Wireless Infrastructure High Level Device Estimates

Impact: -1.0% 39.64 Gb

### Mobile Device Support

	Total	HS	MS/JH	EL
Mobile Device (District)=:	22,270	6,905	5,099	10,266
Mobile Device (BYOT)=:	63,382	25,241	18,704	19,437
Mobile Device (Guest)=:	3,964	1,222	907	1,834
Mobile Device Support Target 2017-2018=:	89,616	33,368	24,710	31,537

BYOT Assumption: 2:1 for HS, MS/JH and 1:1 for EL  
 Guest Assumption: 2:1 for HS, MS/JH and 1:1 for EL

**Current Devices 20K**





# Design Drivers and Requirements – Cypress-Fairbanks ISD

## Education Partners Solution Bandwidth and ERate 2015-2020 Trending Report

Created For:

CYPRESS-FAIRBANKS ISD

### Internet Target

Aggregate Internet need near term: 11.63 Gb  
 Aggregate Internet target long term: 116.32 Gb

**Current Internet  
8 GB  
Scalable to 20 GB**

TOTAL	HS	MS/JH	EL
11.63 Gb	3.40	2.61	5.62
116.32 Gb	34.00	26.15	56.18

### WAN Target

Aggregate WAN Bandwidth near term: 116.32 Gb  
 Aggregate WAN Bandwidth target long term: 1163.20 Gb

TOTAL	HS	MS/JH	EL
116.32 Gb	34.00	26.15	56.18
1163.20 Gb	339.96	261.47	561.77

### ERate 2.0 Category 2 Budget

Projected ERate District Budget 2015-2020:  
 Projected ERate District Share 2015-2020:  
 Projected ERate Funding for 2015-2020:

URBAN	URBAN	Program: ERate 2.0	
80%		Per Student:	\$150
\$16,500,900	\$150.00	ADA:	110006
\$3,300,180	\$30.00	Discount:	80.0%
\$13,200,720	\$120.00	Budget:	\$13,200,720

Category 1 Max = 90%  
 Category 2 Max = 85%  
 5 Yr Max Urban Samp

**Current Devices**

**60K**

### Wireless and Associated Network Access Wireless Infrastructure High Level Device Estimates

Impact: 12.4% 110.01 Gb

### Mobile Device Support

	Total	HS	MS/JH	EL
Mobile Device (District)=:	61,318	17,961	13,793	29,564
Mobile Device (BYOT)=:	173,101	66,066	50,857	56,178
Mobile Device (Guest)=:	11,001	3,207	2,471	5,323
Mobile Device Support Target 2017-2018=:	245,420	87,234	67,121	91,065

BYOT Assumption: 2:1 for HS, MS/JH and 1:1 for EL  
 Guest Assumption: 2:1 for HS, MS/JH and 1:1 for EL



# Design Drivers and Requirements - CFISD



## Bond Project Status Technology Infrastructure

### Project 1 – Install Wireless Access Infrastructure

The Technology Services team with EPS, reviewed and updated the capacity requirements of the new wireless network based on a 5-year student to mobile device ratio estimates including the projected growth in student populations. EPS will provide Layer3 and the Aruba team the wireless capacity report for CFISD to update the final recommended wireless core design to meet the needs of CFISD. This information will be reviewed for implications on current design and the implementation strategy and associated schedule will be developed based on the capacity requirements, the ISC core network support, the new Data Center availability schedule, and the Wide Area Network upgrade schedule.

Cluster	District Devices	District Device Totals	BYOT Devices	BYOT Device Totals	Visitor Devices (25% of Staff and Student Count)
Elementary Student	0.5	30382	1	60763	15191
Middle Student	0.5	14374	2	57494	7187
High School Student	0.5	19060	3	114362	9530
Staff and Teachers	2	29468	3	44202	3684
<b>Totals</b>		93284		276822	35591
<b>Total Wireless Expected Devices</b>	<b>405697</b>				
	2014-2015	2020-2021	Increase		
Total Student Count	112948	127631	13%		
Total Staff Employment	14000	14734	14683		
Total Student Count in Elementary	53773	60763			
Total Student Count in Middle School	25440	28747			
Total Student Count in High School	33735	38121			

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# Design Drivers and Requirements

## CFISD Firewall, Wireless and Internet Capacity Requirements

January 14, 2015

### BASELINE FOR IMPLEMENTATION

Cluster	District Devices	District Device Totals	BYOT Devices	BYOT Device Totals	BYOT Students	BYOT Teacher and Staff	Visitor Devices (10% of Staff and Student Count)	Total Subgroup Counts	2014-2015
Elementary Student	0.5	26887	1	53773	53773			Student ES	53773
Middle Student	0.5	12720	2	50880	50880			Student MS	25440
High School Student	0.5	16868	2	67470	67470			Student HS	33735
Staff and Teachers	2	28000	2	28000		28000		Total Staff	14000
<b>Totals</b>		<b>84,474</b>		<b>200,123</b>	<b>172,123</b>	<b>28,000</b>	<b>19,042</b>	Total Student	112948
<b>Device Description</b>									
	<i>Total Wireless Devices</i>	<b>303,639</b>							
	Wireless District Owned Devices	<b>84,474</b>							
	Wireless BYOT Teacher/Staff Devices	<b>28,000</b>							
	Wireless BYOT Student Devices	<b>172,123</b>							
	Wireless Guest Devices	<b>19,042</b>							
	Wired Computer Devices	<b>80,000</b>							

### BASELINE FOR IMPLEMENTATION SERVICES REQUIREMENTS

ISC REQUIREMENTS			
Wired Computer Devices	80,000	ISC Firewall - Standard Operations	80,000
<b>FAILOVER WIRELESS DEVICES - District Owned</b>	<b>84,474</b>	<b>Firewall in FAILOVER</b>	<b>164,474</b>
<i>FAILOVER Wireless BYOT Teacher/Staff Devices</i>	-		
CyrusOne Requirements			
Wired Computer Devices	-	Internet Access Firewall - Standard Operations	191,165
<b>FAILOVER WIRED - District Owned Wireless Devices</b>	<b>80,000</b>	<b>Internet Access Firewall - Failover</b>	<b>191,165</b>
BYOT Students and Guest	191,165	DMZ Firewall - Standard	112,474
BYOT Teachers and Staff	28,000	DMZ Failover	192,474

\*3 CyrusOne Firewalls & Loadbalances  
Active/Passive Firewall (Wired)



# Design Drivers and Requirements

## CFISD Firewall, Wireless and Internet Capacity Requirements

January 14, 2015

### EXPANSION PLAN

Cluster	District Devices	District Device Totals	BYOT Devices	BYOT Device Totals	BYOT Students Totals	BYOT Teachers and Staff	Visitor Devices (25% of Staff and Student Count)	Total Subgroup Counts	2020-2021
Elementary Student	0.5	30382	1	60763	60763		15191	Student ES	60763
Middle Student	0.5	14374	2	57494	57494		7187	Student MS	28747
High School Student	0.5	19060	3	114362	114362		9530	Student HS	38121
Staff and Teachers	2	29468	3	44202		44202	3684	Total Staff	14734
<b>Totals</b>		<b>93,284</b>		<b>276,822</b>	<b>232,620</b>	<b>44,202</b>	<b>35,591</b>	Total Student	127631
<i>Total Wireless Devices</i>		<b>405,697</b>						<b>Increase</b>	
<b>Total District Owned Wired Devices</b>		<b>100,000</b>						14683	
<b>Wireless BYOT Teacher/Staff Devices</b>		<b>44,202</b>							
<b>Wireless BYOT Student Devices</b>		<b>232,620</b>							
<b>Wireless Guest Devices</b>		<b>35,591</b>							
<b>Total Wired Devices</b>		100000							

### EXPANSION PLAN SERVICES REQUIREMENTS

#### ISC REQUIREMENTS

Wired Computer Devices	100,000	ISC Firewall(s) - Standard Operations	100,000
<b>FAILOVER WIRELESS DEVICES - District Owned</b>	<b>93,284</b>	<b>ISC Firewall in FAILOVER</b>	<b>193,284</b>
<i>FAILOVER Wireless BYOT Teacher/Staff Devices</i>	<i>44,202</i>		

#### CyrusOne Requirements

Wired Computer Devices	-	Internet Access Firewall - Standard Operations	268,211	*3 CyrusOne Firewalls
<b>FAILOVER WIRED - District Owned Wireless Devices</b>	<b>100,000</b>	<b>Internet Access Firewall - Failover</b>	<b>268,211</b>	<b>&amp; Loadbalances</b>
<b>BYOT Students and Guest</b>	<b>268,211</b>	<b>DMZ Firewall - Standard</b>	<b>137,486</b>	<b>Active/Passive Firewall</b>
<b>BYOT Teachers and Staff</b>	<b>44,202</b>	<b>DMZ Failover</b>	<b>237,486</b>	



# REFERENCE ARCHITECTURE FRAMEWORK:

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Security Cameras, Connected HVAC, Online Banking, Tele-health.

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Mission, Vision and Goals of Schools in a Digital Society.

Design Drivers	E-RATE	MOBILITY	INTERNET	CLOUD
Requirements	Capacity	Scalability	Reliability	Sustainability
STRATEGIC IT PRIORITIES & INITIATIVES	ORGANIZATIONAL & SYSTEM STRUCTURES	NETWORK FOUNDATIONS	INFRASTRUCTURE SYSTEMS	
Instruction & Assessment	Leadership & Vision	SERVICES POINTS OF PRESENCE (POPs)	WIDE AREA NETWORK (WANs)	ACCESS NETWORKS Wired Wireless (Wi-Fi)
Devices – District, BYOD	Governance			
Cloud Services	Organizational Structures	Internal Network and Data Center – Existing Facility Within District	Internal WAN Within District Connects Facilities	INTERNET SYSTEMS Commodity State/Reg/Internet2 Service/Security/AAA
Software Defined Networks	Funding			
Consolidation	Training & Development			
Network Virtualization	Data Management	External Services Point of Presence: Shared Service CoLo Carrier Neutral DC	External / Extended WAN Internet Transport SIP Transport	NETWORK ACCESS SERVICES SYSTEM Network Functions Virtualization
Open Standards	Access & Security Policy			
Disaster Recovery	Technical Support	Internet POP Telecom POP Cloud Access	Internet 2 Access Data Center & Consortiums	CONNECTED LEARNING COMMUNITY
Business Continuity	User Support			
Mobile Device Mgt.	Documentation			
Security	Facilities	TECHNICAL NETWORK REFERENCE MODEL		

App for Everything, All Stakeholders Internet Connected

Digital Economy, health, education, society and communications.  
Digital Economy, health, education, society and communications.

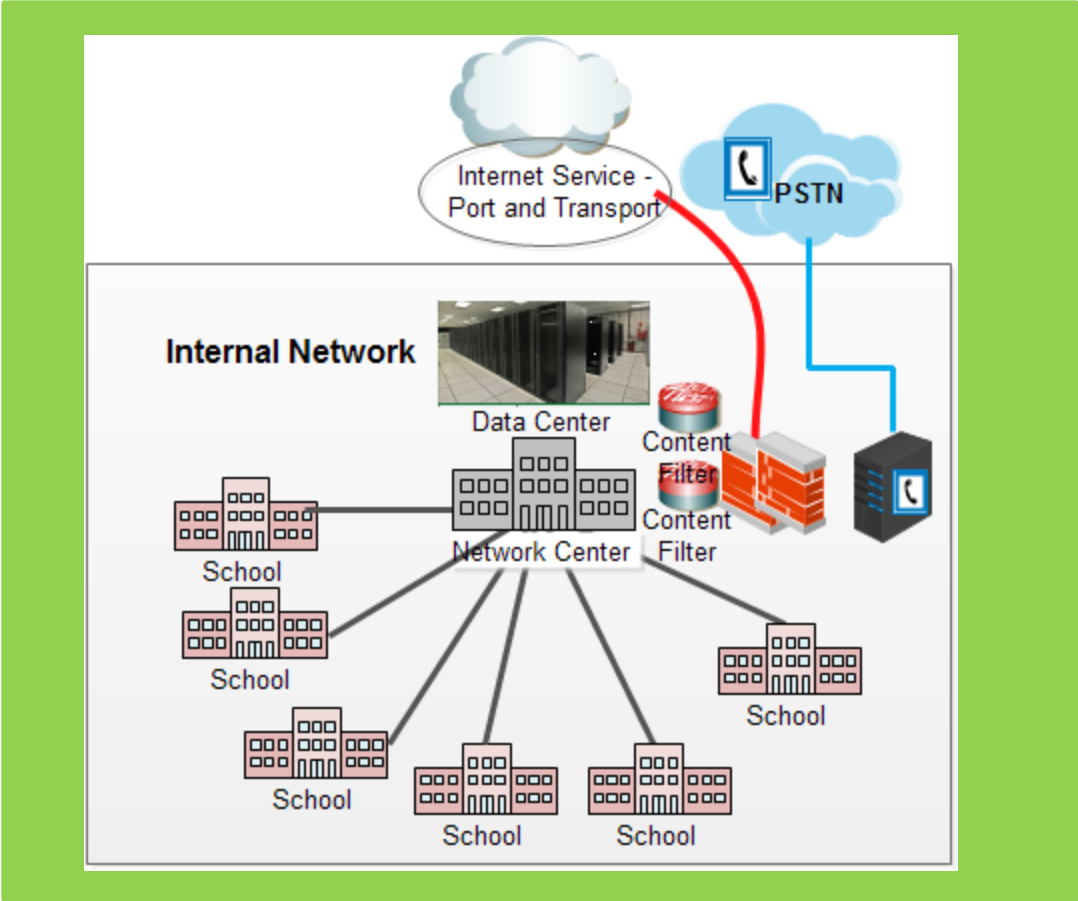
24/7 Online Living and Learning, 1:Many Mobile Devices, Video Rich Content.

Transformed Learning Environment

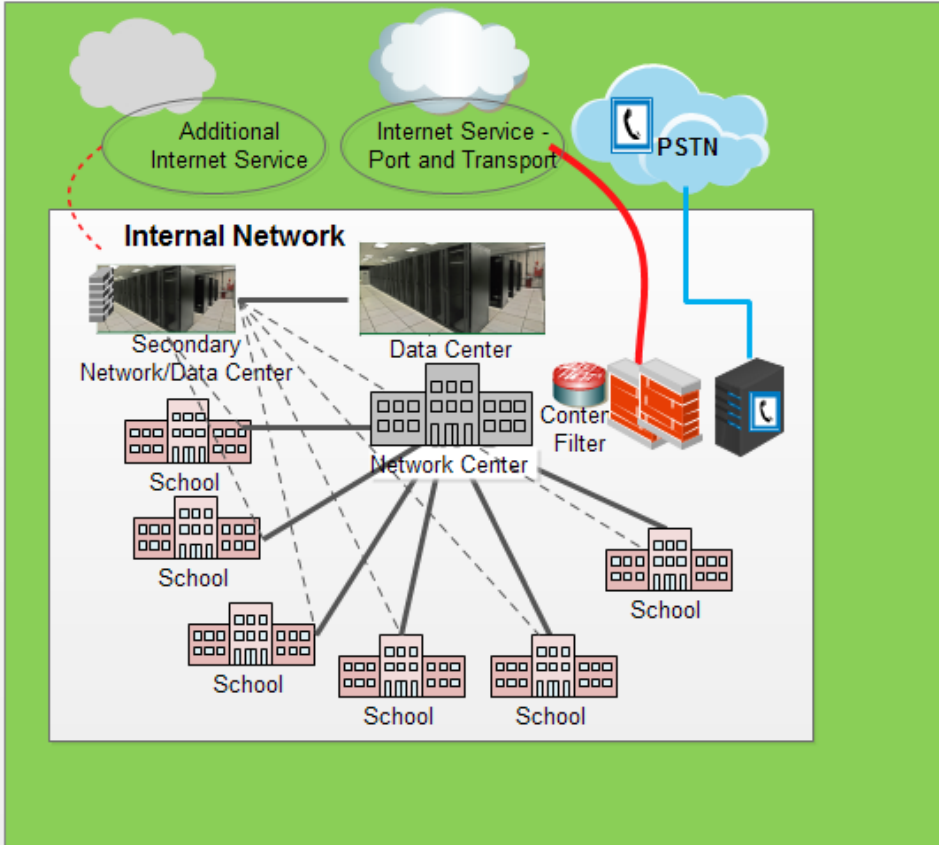
Digital content, creation, assessment, communications



# First Generation Networks – 1996 - 2015



# First Generation Networks – Upgraded and Expanded



## External Services



Carrier Neutral Data Centers

High Quality, High Capacity Internet Port Service

SIP Services

Cloud Services

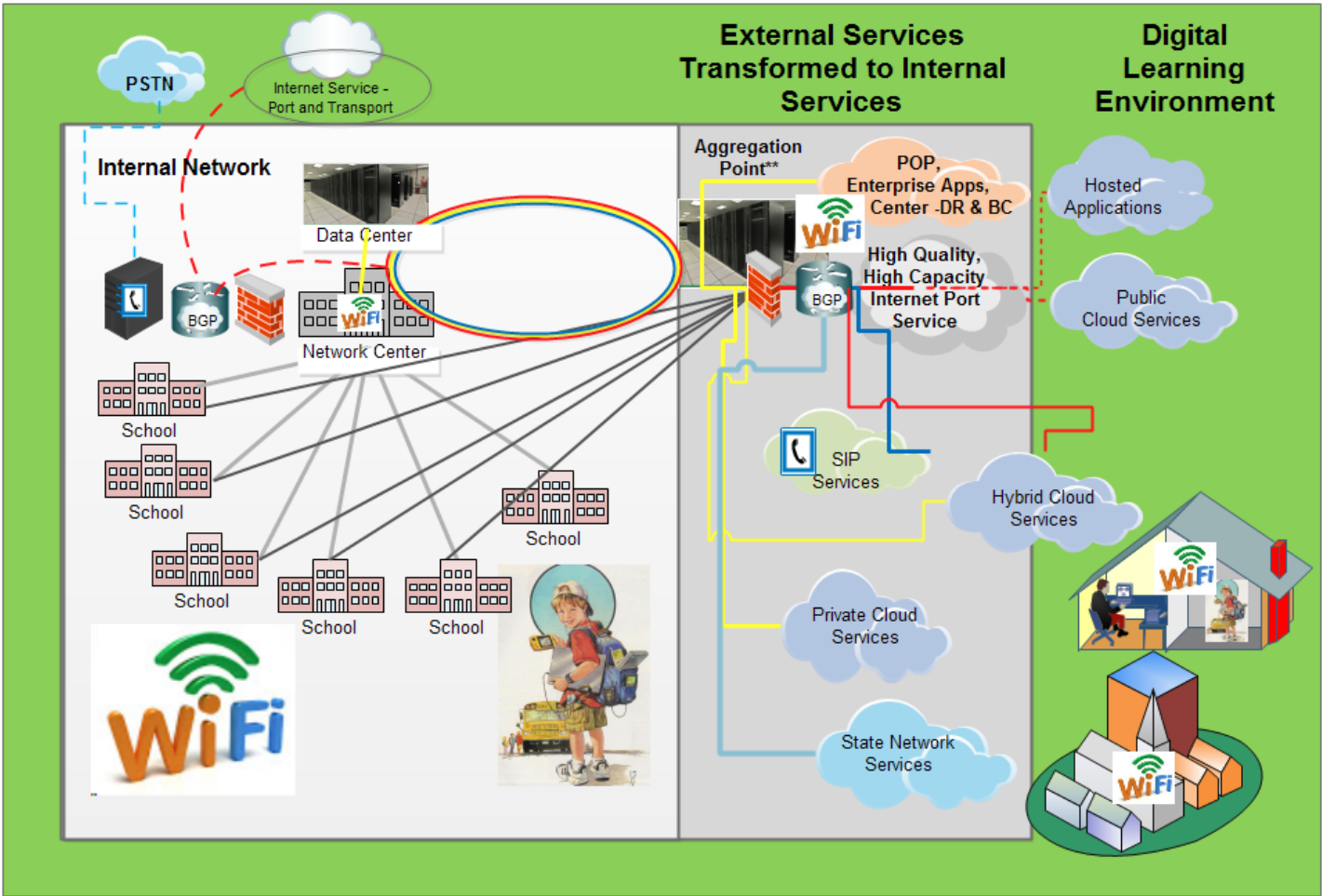
State Network Services

Disaster Recovery & Business Continuity





# A New Network for Education 2015 – 2020 and beyond.





# Second Order for E-Rate Modernization

- first priority - addresses the connectivity gap facing many schools and libraries, particularly in rural areas, by maximizing the options available for purchasing affordable high-speed connectivity.
  - Dark Fiber
  - Lit Fiber
  - Self Provisioned Broadband



# Q&A



**CISCO**

*TOMORROW starts here.*