Telecommunications Master Planning (TMP) Process

Building Capacity and Sustainability

Spring, 2010
Justification, Strategy, Tactical Plans

• Justification
  – County and Schools free access to inter-building Telecommunications Network is at risk
  – Need to reduce and eliminate dependency upon Comcast
  – Joint County – Schools Planning Process

• Strategy
  – Deploy ‘middle mile’ broadband telecommunications network
  – Leverage any and all opportunities to lay dark fiber
    • Dominion Power Grid Extension (co-location of County – Schools fiber)
    • Public Safety Radio Network (Bond funded fiber backhaul for Public Safety radio towers)
    • Intelligent Transportation System (Federal funded refreshment of copper connections to traffic signals with fiber)
    • New Site Development (e.g. Founders Square, Central Place, Virginia Tech / IBM Research Facility)
    • County and Schools Projected Capital Investments (To fund ‘last mile’ connections to County/APS facilities)

• Plan
  – Phase I (pre-2013)
    • Core, most trafficked Sites interconnected (includes: Ed Center, CHP Campus, Trades Campus / NOC II, Sequoia Campus, Public Health Campus at George Mason, Thomas Jefferson Middle School and additional sites to be identified by TMP Stakeholders Committee)
  – Phase II (post-2013)
    • Remaining, sites interconnected
Governance Model

Executive Sponsors
Superintendent of Schools
County Manager

Steering Committee

CFO
CIO
Director – DES
Director - CPHD

Schools
Deputy Superintendent – Finance
Deputy Superintendent – Info. Svcs
Deputy Superintendent - Facilities

Schools Representatives
Management & Finance
Information Services
Facilities

Stakeholders Committee

County

County Representatives
Management & Finance
Information Services
Facilities
Public Safety
Planning
Transportation

TMP Planner
Current INET Network Architecture

APS

Network Today
- Star Network Architecture
- Distinct County – Schools Networks
- Minimal Capacity
- Many Single Points of Failure
- Provided through Cable Franchise

Diagram:
- Schools Network
- County Network
- Comcast Head End
Current INET Network Architecture
County Network

Network Architecture Today
• Star Network Architecture
  • Also Called ‘Spoke and Hub’
• Separate Physical County – Schools Networks
• Minimal Capacity
  • 12 – 36 strands of fiber
• Many Points of Failure
• Provided through Cable Franchise

Schools Network
County Network
Comcast Head End

All County and Schools Connectivity flows through Comcast Head End, a critical single point of failure
Break 'X' in Fiber Path
Results in loss of services past break.

Failure at CHP results in wide spread County outage.

Failure at EdCenter results in wide spread School's outage.

Failure at Head End results in wide spread County and School's outage.

Multiple Points of Failure
• Disruption of Service Likely

Separate and Distinct Networks
• Missing Opportunities for Synergy
• Overlapping, Duplicative Coverage

Ownership
• 2013 Cable Franchise Renegotiation
• Legal Question as to Right to Use

Schools Network
County Network
Comcast Head End
Attributes

- Multiple Duplicative Fiber Routes
- Separate Schools, County Fiber
- Intersection at Comcast Head End
Dominion Power Grid Upgrade
Electric Company Funded Upgrade of County’s Power Grid
County to Co-locate Dark Fiber with Power Company
Public Safety Radio Ring
Six Public Safety 800 MHz Radio Towers
To be Interconnected with Fiber Ring

Radio Towers
Fiber Links
Integrated Transportation System
Phase I
Federally Funded Refreshment
Of Connectivity to Traffic Signals

Phase I
Phase II
Phase III
Fiber Links
Integrated Transportation System
Phase I and II

Phase I
Phase II
Phase III
Fiber Links
Intelligent Transportation System
Phase I, II and III

- Phase I
- Phase II
- Phase III
- Fiber Links
ITS, Dominion And Public Safety Ring Investments

ITS links
- Green
- Grey
- Blue

Dominion
- Orange

Public Safety Ring
- Red
Proposed CNET Network Topography

Overlapping Paths

Desired Outcomes:

- Multi Path Architecture
  As opposed to 'Star' or 'Spoke & Hub'
- No Single Point of Failure for Fiber Path in Middle Mile
  Traffic can be rerouted as needed
- High Capacity and Scalable for Future
  ~ 244 Strands of Fiber
- Wholly Government Owned
  Independence from Cable Franchise restrictions
Proposed CNET Network Topography

Desired Outcomes:

- **Ring Architecture**
  As opposed to 'Star' or 'Spoke & Hub'
- **No Single Point of Failure for Fiber in Middle Mile**
  Traffic can be rerouted as needed
- **High Capacity and Scalable for Future**
  ~ 244 Strands of Fiber
- **Wholly Government Owned**
  Independence from Cable Franchise restrictions

Break ‘X’ in Fiber Path
Results in traffic seeking
An alternative path with minimal Interruption of Service
CNET (Common Network) Design
Common Fiber Bundle - Tomorrow

County - Schools CNET

Desired Outcome
A shared government and schools owned fiber network infrastructure that provides for distinct, secure lines of business operations while preserving organizational independence, resiliency / recovery routes and creates broadband capacity to satisfy future connectivity demands.
Performance Measures

- **# of conduit or pole miles**
  - % of Phase I Core build out
  - % of Phase II Extended build out

- **# of miles of dark fiber laid**
  - % of Phase I Core build out
  - % of Phase II Extended build out

- **# of miles of fiber lighted**
  - % of Phase I Core build out
  - % of Phase II Extended build out

- **# of County / School Sites Connected**
  - % of Phase I Core build out
  - % of Phase II Extended build out