



PENNSYLVANIA TURNPIKE COMMISSION COMMUNICATIONS INFRASTRUCTURE



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AGENDA

- Existing Communications Systems
- Emerging Needs
- Radio Systems Projects
- Broadband Project
- Maintenance and Operations





Existing Communications Infrastructure

Towers 54

Fare Collection Facilities 68

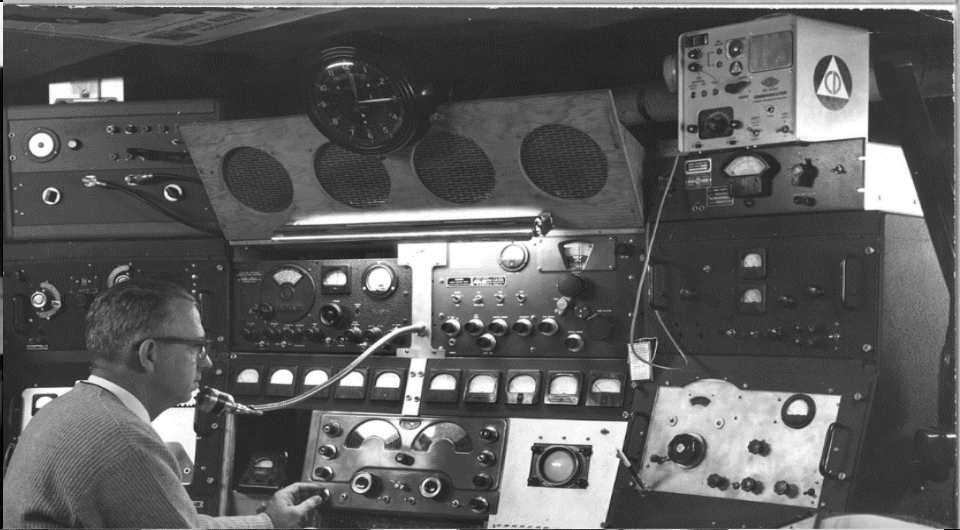
Vehicles 200 Million Per Year

Miles 552

E-ZPass 76 Percent

Maintenance Buildings 22

Tunnels 5





↓ Inputs

- *11
- Call Box
- Phone Calls
- Waze
- PennDOT Events
- Weather Events
- Special Events
- Construction & Maintenance Events

🚒 Incident Response

- Fire
- EMS
- PSP
- Towing
- HAZMAT
- First Responders
- Safety Advisers

- Avg. 8,000 crashes/year
 - 15-20 fatalities/year
 - 800+ involve injuries
 - 327 crashes in Work Zones last FY

🚗 PENNSYLVANIA TURNPIKE Traffic Operations Center (TOC)

🖥️ Systems

- CADS
- ATMS
- ENS
- MIST
- Vanguard
- Platinum (HAR)
- RWIS
- Genetec

📊 System Data

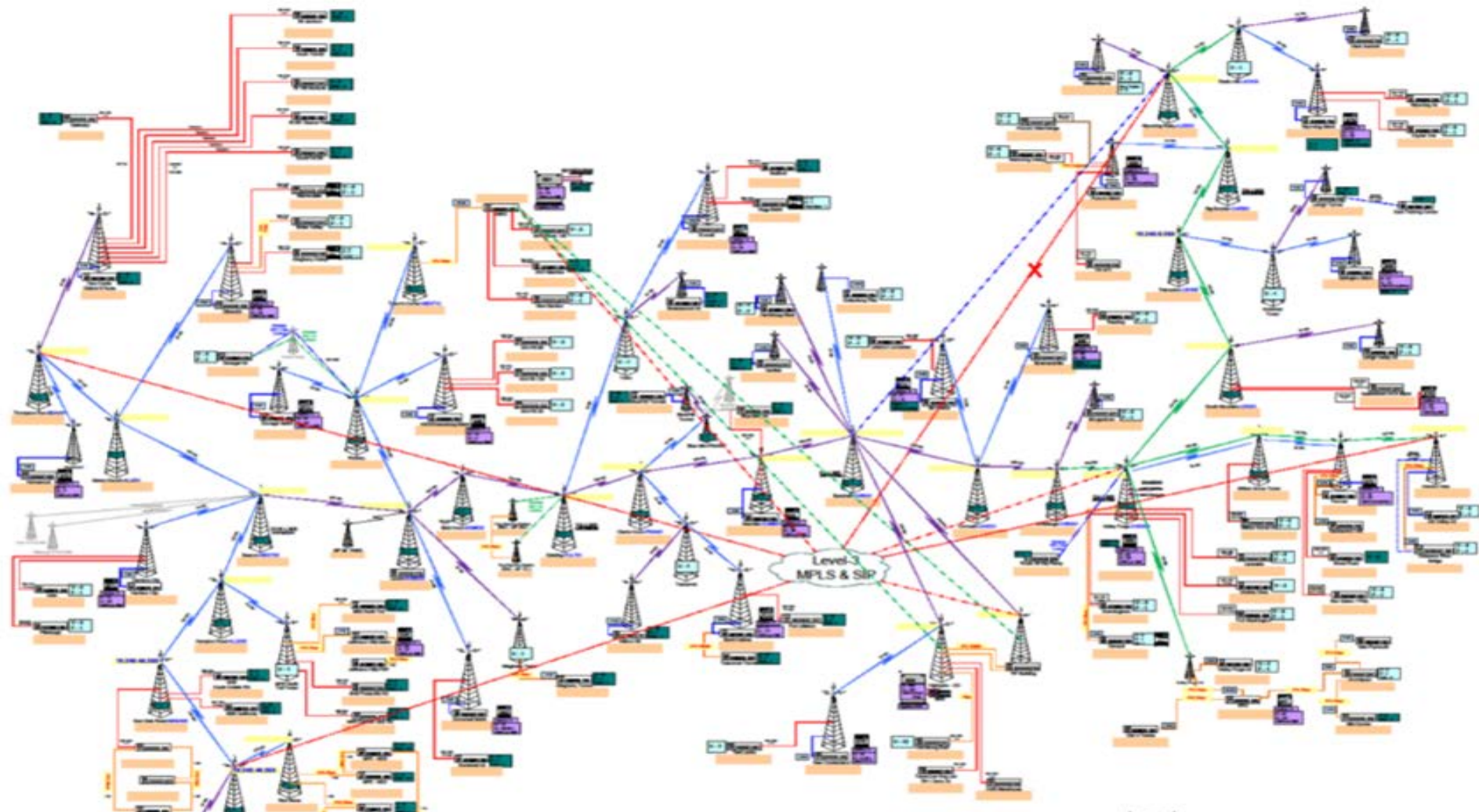
- Performance Measures

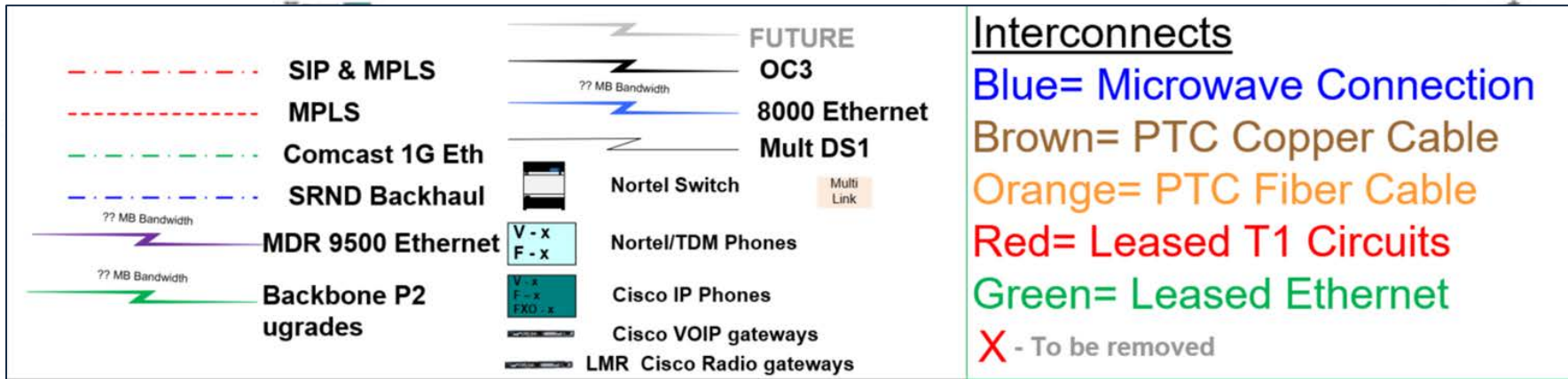
🚗 Traffic Management/Traveler Information

- DMS
- HAR
- CCTV
- TRIP/TRIPTALK
- Agency Coordination (PennDOT, PEMA, etc.)
- PA Turnpike Travel Conditions Map

- 552 Centerline Miles
 - 194 Million Vehicles/Year
- 13,000 SF Facility, 24/7
 - 1 TOC Manager
 - 8 Duty Officers
 - 24 Radio Operators
- 400 calls/day (500+/hr during weather event)
- 11,000 radio transmissions/day
- 250+ CAD entries/day

- 88 DMS
- 65 CCTV
- 37 HAR

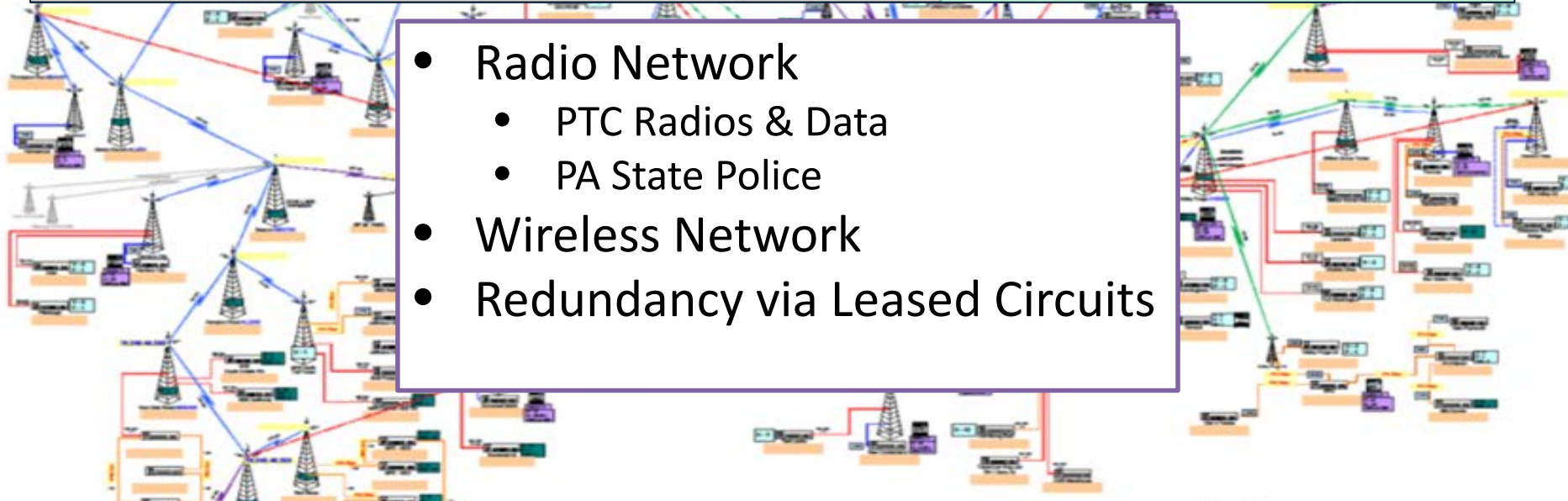




Interconnects

Blue= Microwave Connection
 Brown= PTC Copper Cable
 Orange= PTC Fiber Cable
 Red= Leased T1 Circuits
 Green= Leased Ethernet
 X - To be removed

- Radio Network
 - PTC Radios & Data
 - PA State Police
- Wireless Network
- Redundancy via Leased Circuits





COMMUNICATIONS EXPANSION CHALLENGES

- Limited infrastructure capacity available – upgrading from 500 Mbps to 1 Gbps but not enough
- No more microwave spectrum to purchase
- High cost of repairs and leased bandwidth
- Capacity life – approximately 7 more years
- Limited geographic flexibility for future high-bandwidth devices



Emerging Needs



TECHNOLOGY GROWTH

14%

per year average
bandwidth growth since
2003

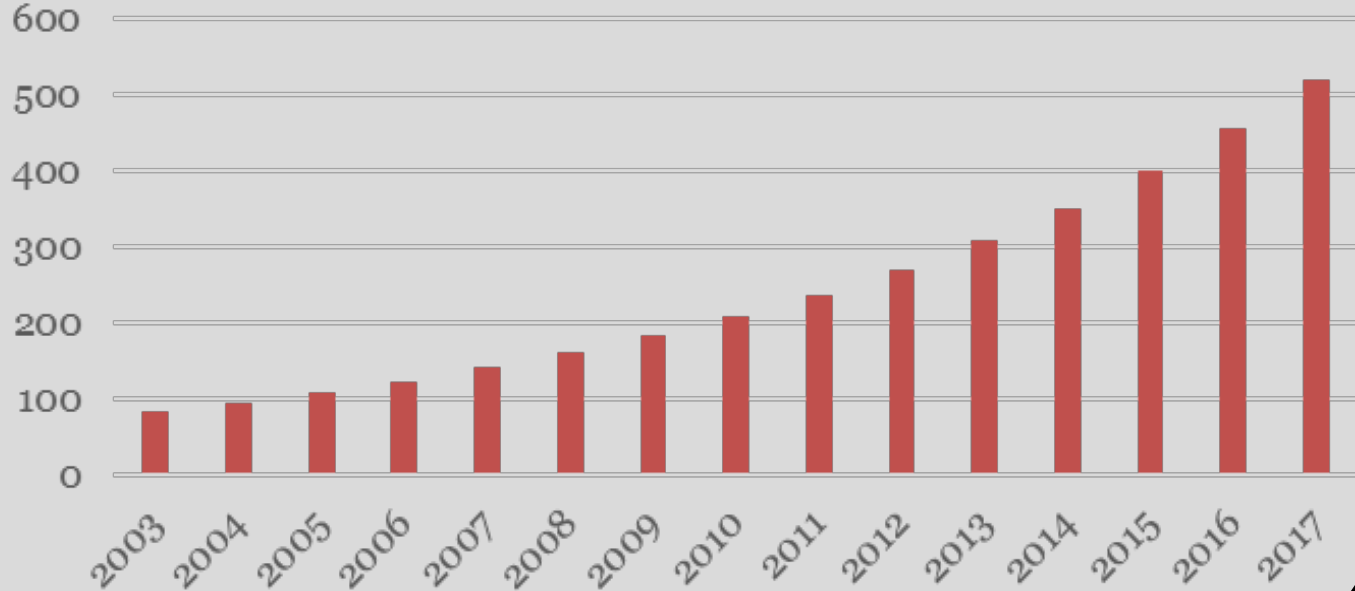
24%

per year average new
device growth

212%

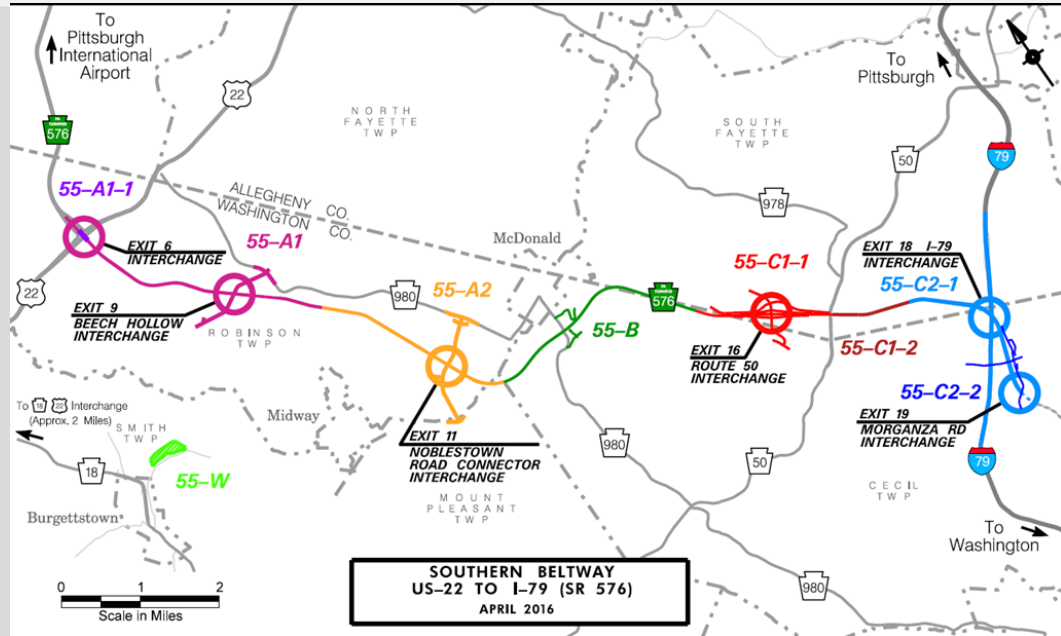
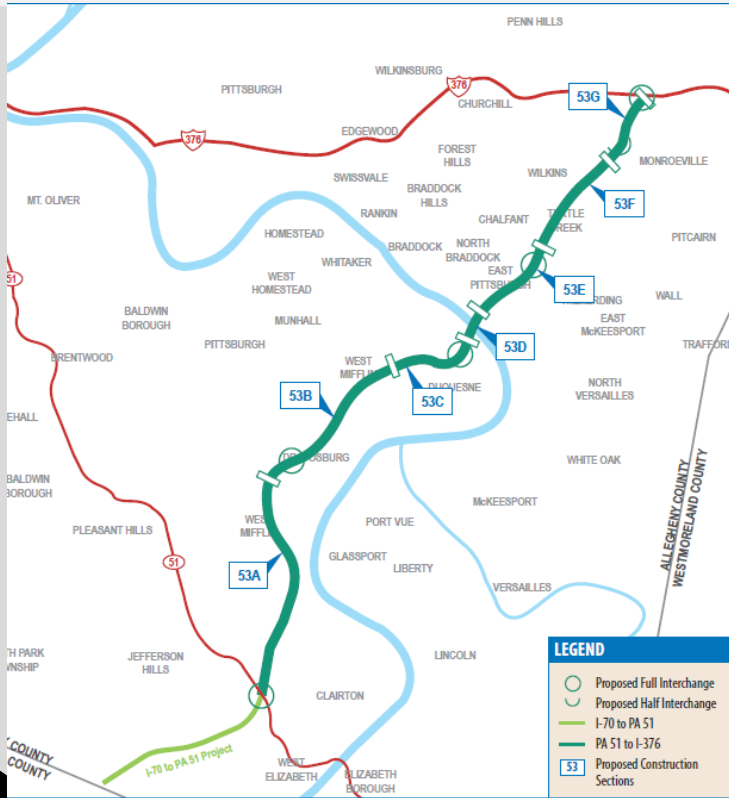
per year average data
storage growth

Combined Mbps



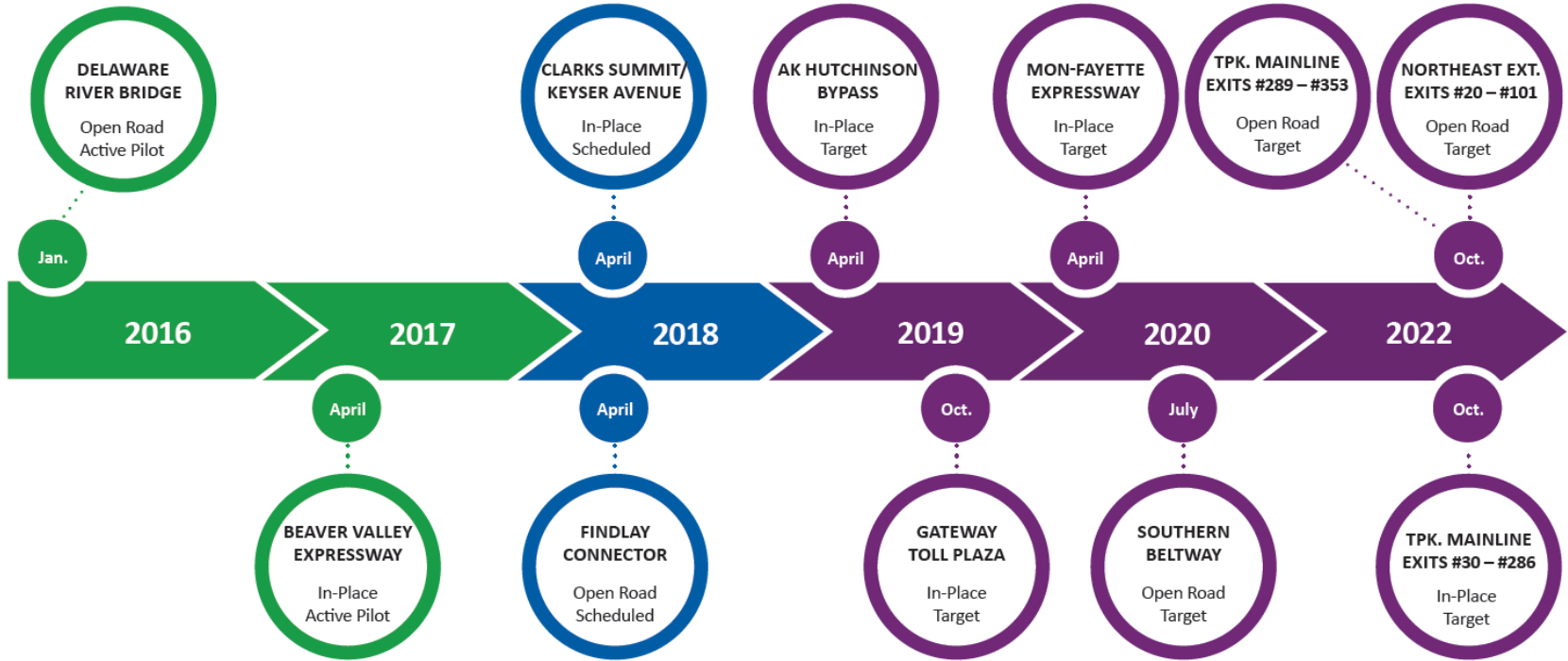


MAJOR EXTENSION PROJECTS



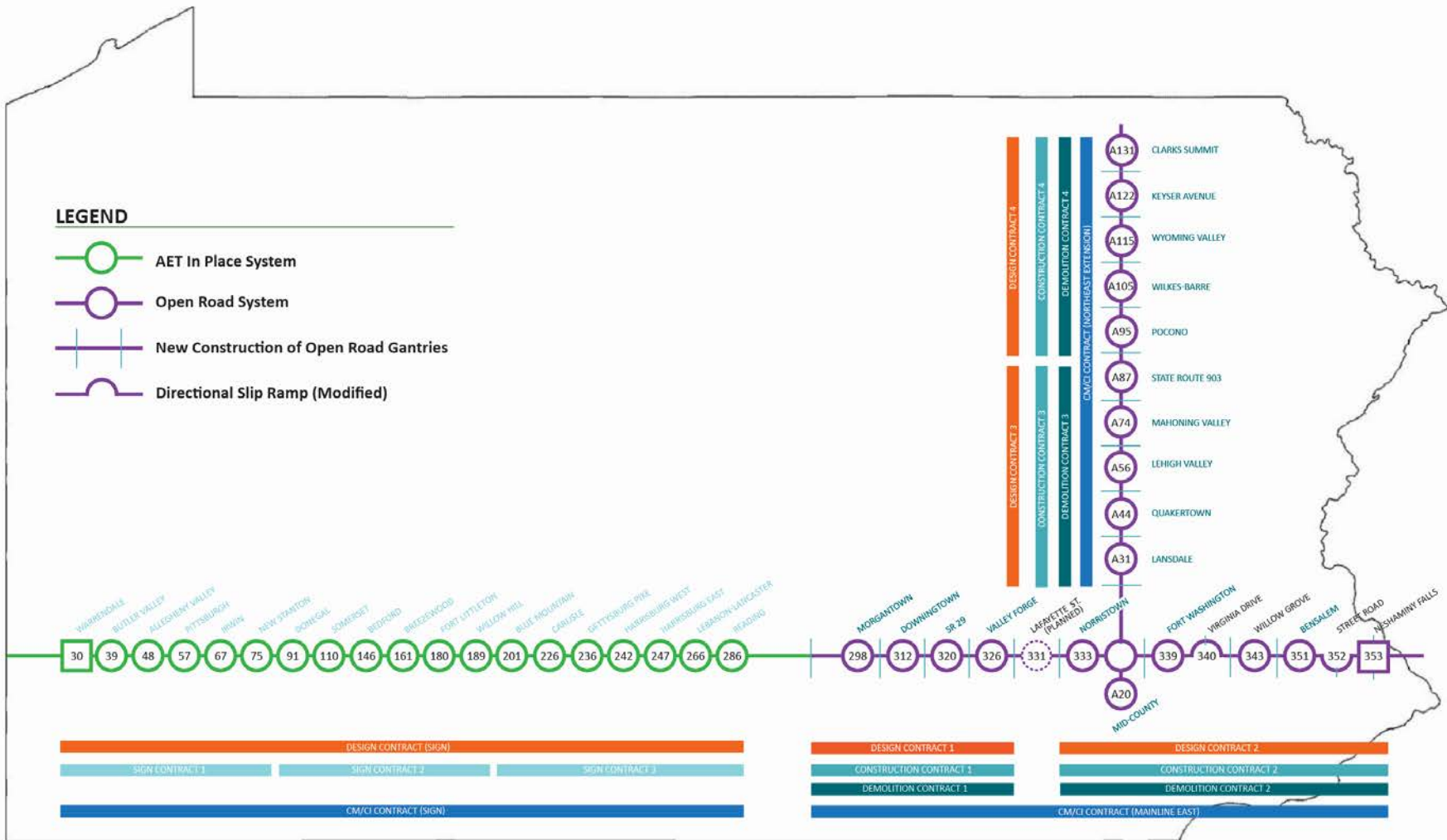


CASHLESS TOLLING



LEGEND

-  AET In Place System
-  Open Road System
-  New Construction of Open Road Gantries
-  Directional Slip Ramp (Modified)





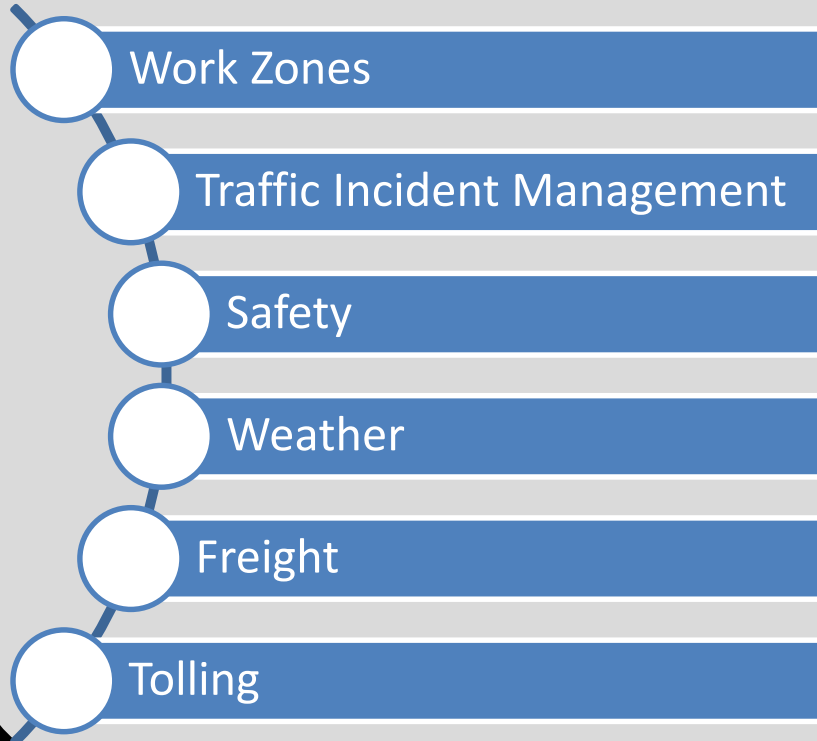
ITS DEVICE EXPANSION

Device	Locations	Existing	Construction	Planned
Dynamic Message Signs (DMS)	<ul style="list-style-type: none"> • Interchanges – Located on approach roads to PTC interchanges • Tunnels – Located prior to entering tunnels 	90	64	61
CCTV	<ul style="list-style-type: none"> • Interchanges • Urban Areas –every mile where fiber is present • Tunnels and Bridges • High Crash Locations • Mobile Applications –mobile CCTV and UAV 	65	11	11
RWIS	As needed and per 2007 PennDOT RWIS Study	22	1	1

- ITS Western Extension Needs Study
- ITS Gaps Study - Crash Cluster and Weather Needs
- Truck Parking System
- Tunnel Traffic Management Systems



CONNECTED AND AUTOMATED VEHICLES

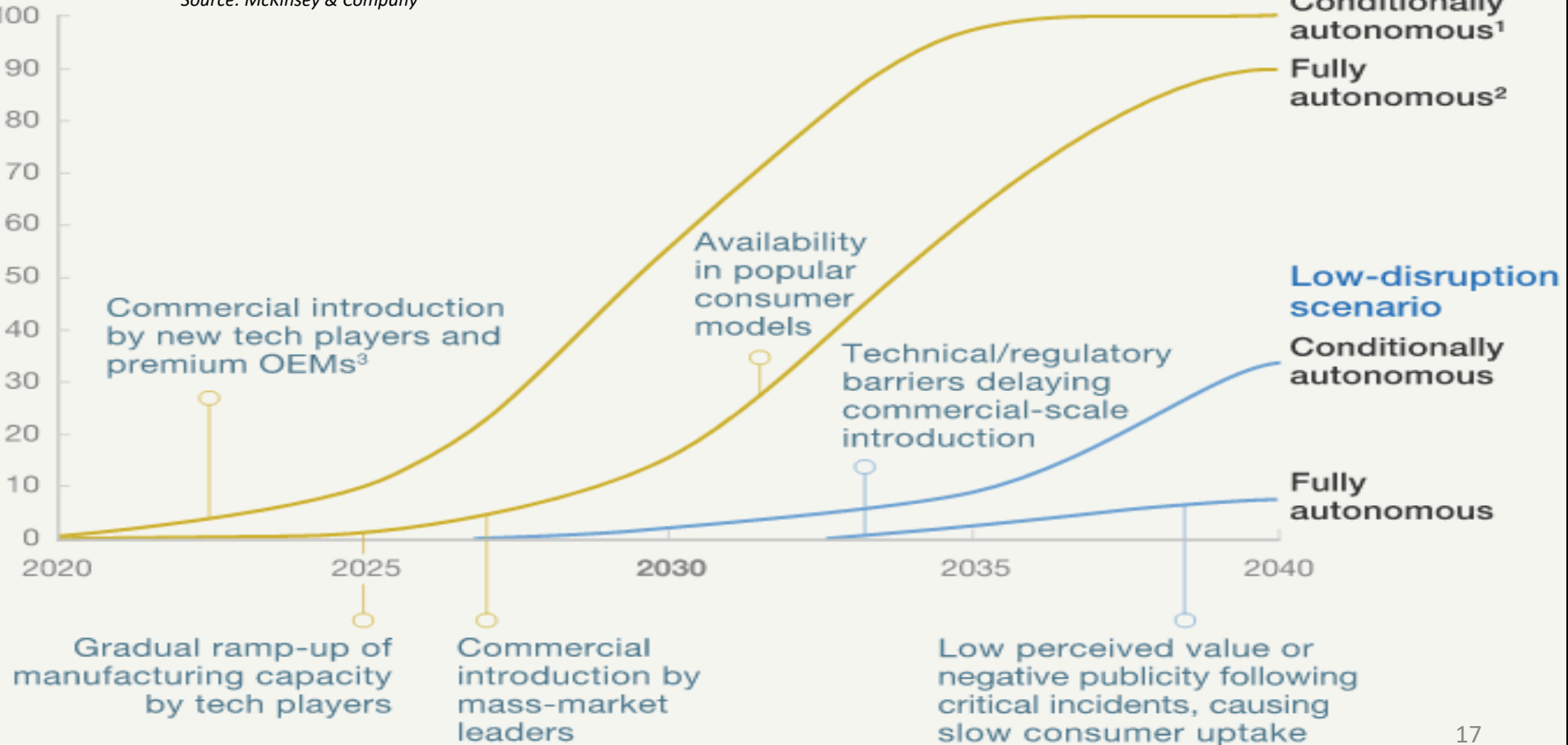


- PTC CAV Roadmap – Pilot and Phase 1
- PennDOT CV/AV Strategic Plan
- Smart Belt Coalition

New-vehicle market share of autonomous vehicles, %

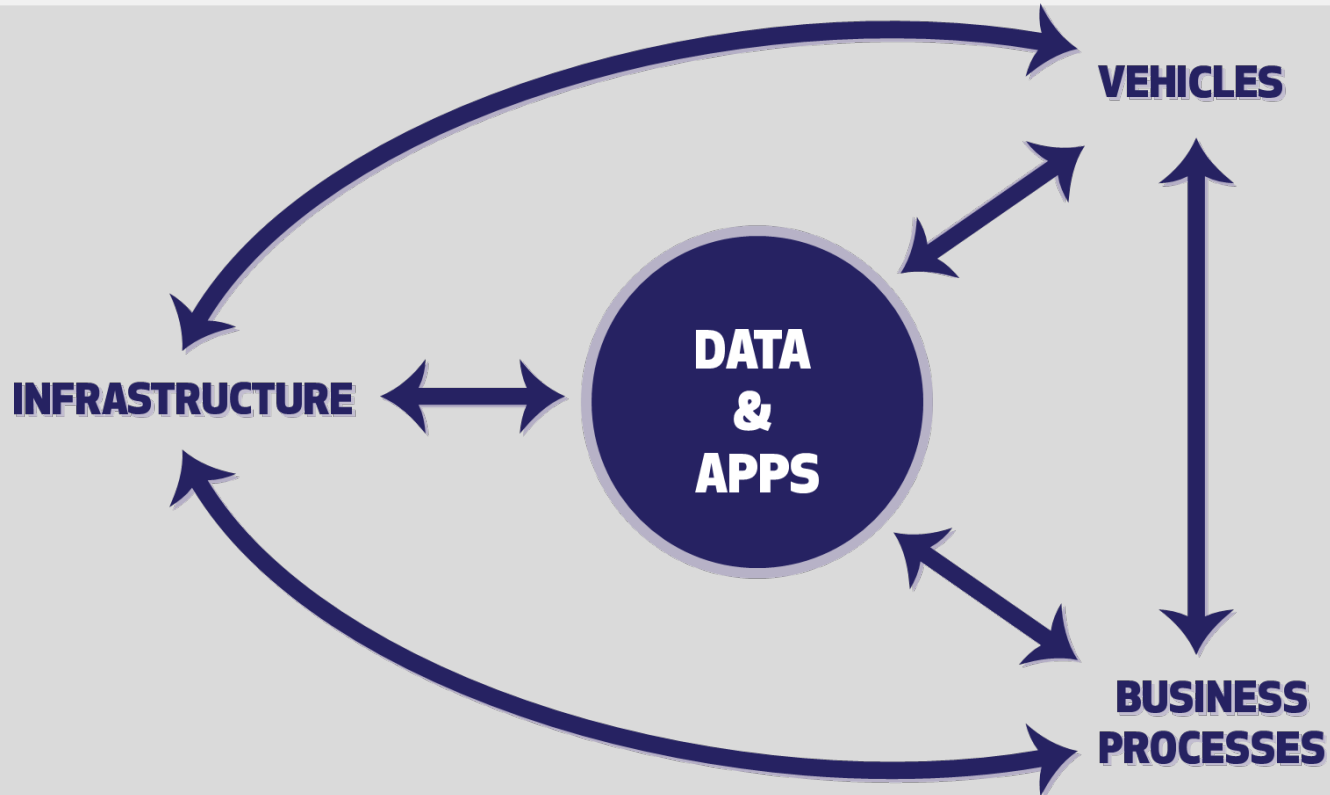
Source: McKinsey & Company

8.5 versus 11.5





CONNECTED AND AUTOMATED VEHICLES





DSRC OR 5G

- Testing OBU and RSU
- FCC Licensing Requirements
- Permanent vs Mobile



Big Data

Michigan

Connected Vehicle Pilot

= 17 TB/ year

Pennsylvania Turnpike =

250,000 TB/ year



Radio Systems Projects



RADIO SYSTEM UPGRADE

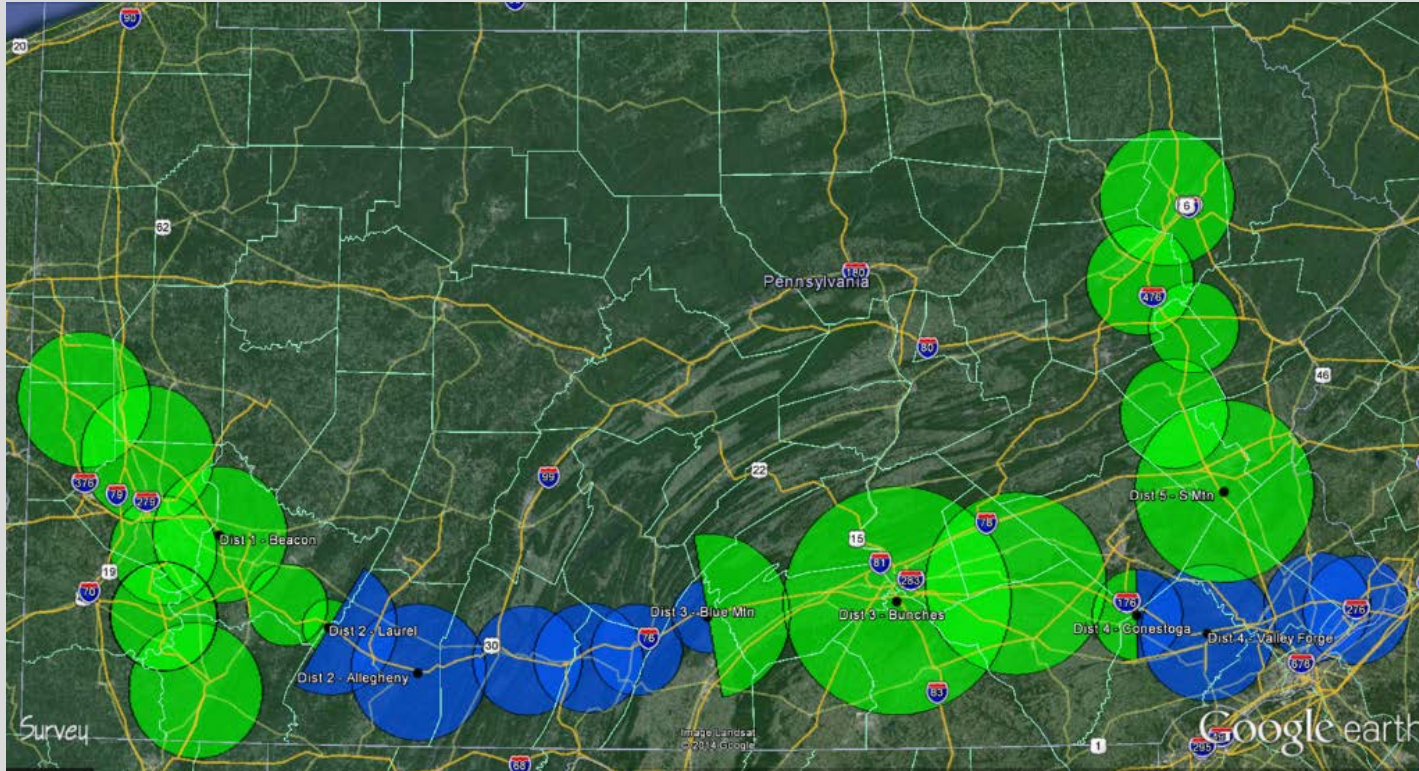
Recent/ Near-term:

- VF Retune Project – FCC Compliance
 - Frequency
 - Power Adjustments
- Enhanced Push to Talk Pilot
- IPICS Laptop Access





RADIO SIMULCAST ZONES



File View Help

disp1 - SJC@map2ru142.cisco.com

1

- ch11-g711
- Supervisor_PSW1
- TG1-clear
- TG1-Select
- TG1-clear
- HAZ MA1
- TAC-OP31
- ch11-g711
- TG1-Select
- TG1-clear
- VTG
- VTG-SJC
- VTG-SJC1
- VTG-SJC2
- VTG-SJC3
- Unit Call
- Direct Call
- Incident Mgt 1266

2

3

4

5

Region 1

VTG	ch11-g711	VTG-SJC1
TG1-Select	TG1-clear	SUPERVISOR_PSW1
VTG-SJC	HAZ MA1	TAC-OP31
TG11-Select	TG1-select1	Incident Mgt 1266
VTG-SJC3	TG1B-Clear	TG1-select
Unit Call	Direct Call	ch21-g729
VTG-SJC2		

1 of 1

- VTG
- VTG-SJC
- VTG-SJC1
- VTG-SJC2
- VTG-SJC3

ADD Details

Dial Pad

2058

9003 (Auto dialer... Line 1)

1	2	3
4	5	6
7	8	9
*	0	#
Clear	◀	Redial
End	Hold	

Patch

All Task

001.mw 002.mw 003.mw 004.mw

005.mw 006.mw 007.mw 008.mw

CISCO

Fast Supplementary Services

ALPT, QM, CHK, EPCN, DICH, IWB, MWD

15:52

Unit Call (0): Connected

Navia State Running



KEY REQUIREMENTS

Key Requirements

- Guaranteed 95% coverage area and reliability
- Portable radio on the hip performance
- In-building coverage at guaranteed locations
- Tunnel coverage



INTEROPERABILITY REQUIREMENTS

- Radio roaming between systems
- Talkgroup sharing between systems
- IP network interoperability gateway support
- Provide Push To Talk (PTT) over Cellular
- ISSI to ISSI interface to IPICS
- ISSI to ISSI interface to Troop T on PA-STARNet
- Communications with Service Providers



PROCUREMENT STATUS

- Dedicated P25 PA vs partnering with PA-STARNet
- RFP issued target date of Q1 2018



Broadband



ALTERNATIVES CONSIDERED

- Lease Bandwidth
 - Ease of implementation; risks transferred to private sector
 - High cost; no control over future increases
 - Limited flexibility for future applications
- Conventional Procurement
 - Exclusive ownership and control
 - High capital costs
 - High operational costs
 - Deferral of core business capital projects
 - Not a core business function
 - Lack of resources/expertise to operate and maintain fiber optic network and market excess capacity



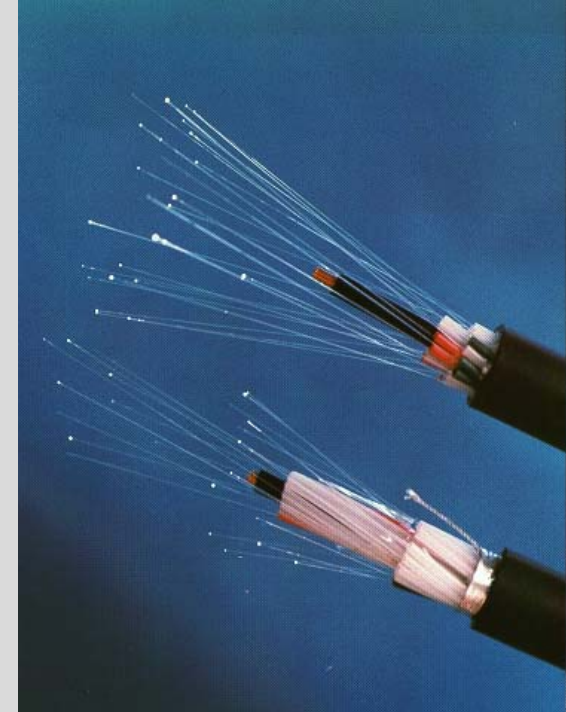
KEY OBJECTIVES

- O&M savings by moving data from towers to fiber
- Address long-term bandwidth needs (capacity)
- Provide maximum flexibility for unforeseen high-bandwidth deployments (network accessibility)
- Capitalize on value of ROW to private sector
- Project affordability through a balanced P3



BROADBAND FIBER OPTIC NETWORK

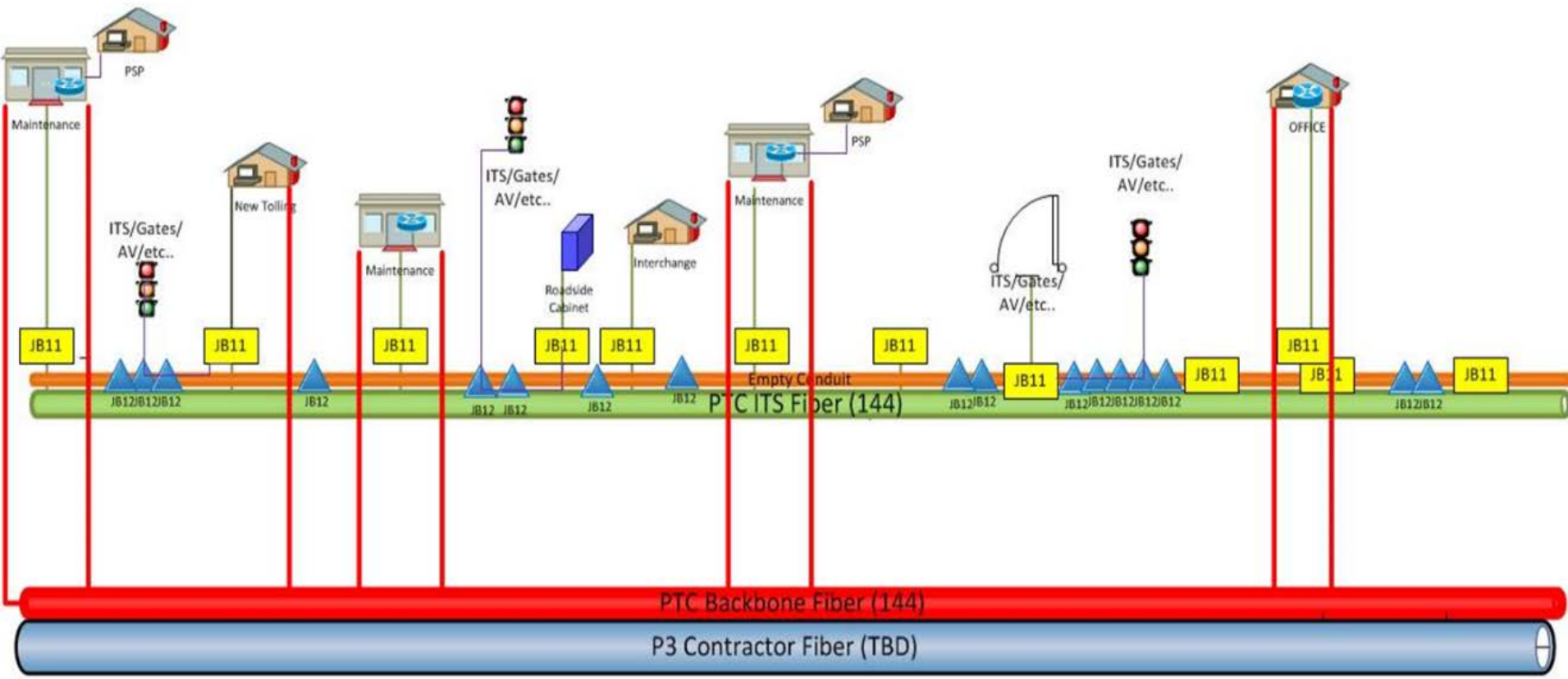
- Public-Private Partnership (P3)
- Fiber – minimum 288 strands for PTC
- Spare conduits for future use
- Highly accessible network
 - 95 demarcation sites
 - Distribution boxes every 1,200'
- Fiber operations and maintenance by development entity
- 30-year term P3 agreement





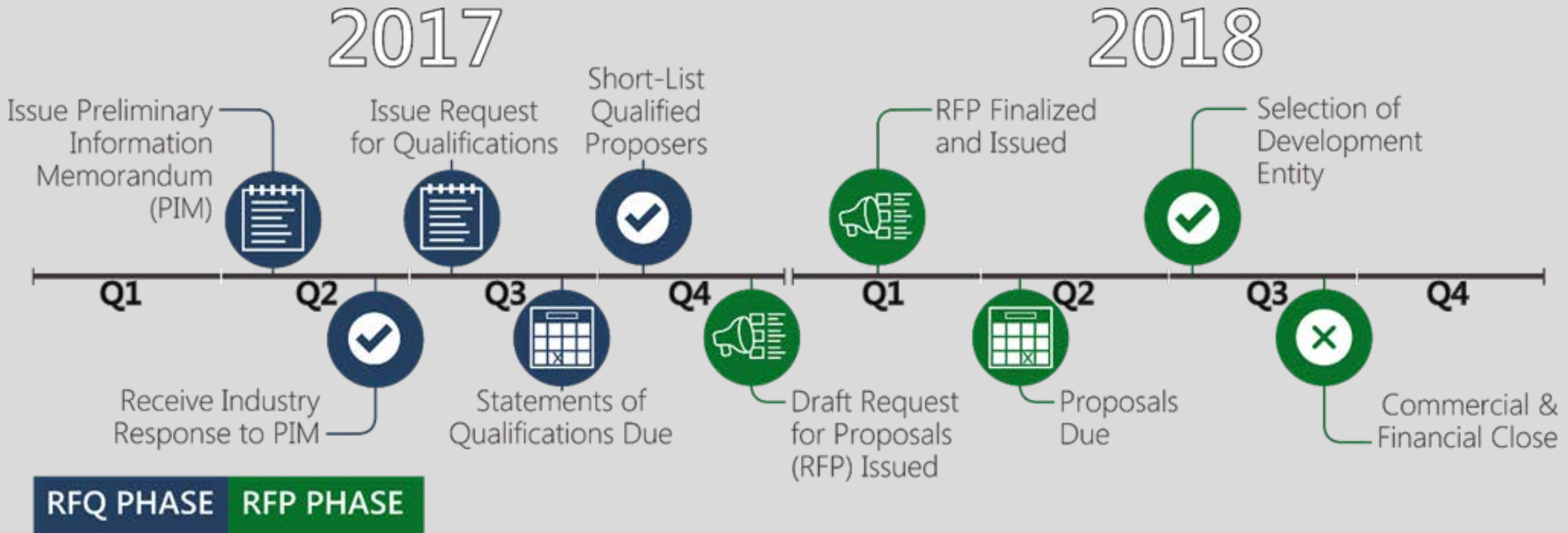
BANDWIDTH NEEDS







PROCUREMENT TIMELINE





PROCUREMENT DETAILS

- Six teams responded to a RFQ
- Four teams have been shortlisted

The screenshot shows a web browser displaying the Pennsylvania Turnpike Commission's website. The URL is https://www.paturmpike.com/business/Broadband_P3.aspx. The page features a navigation bar with categories: TRAVEL TOOLS, TOLLS / E-ZPASS, COMMERCIAL, TURN PIKE (logo), DOING BUSINESS, ABOUT US, and HOME. The main content area is titled "BROADBAND PUBLIC-PRIVATE PARTNERSHIP (P3) PROJECT OVERVIEW".

BROADBAND PUBLIC-PRIVATE PARTNERSHIP (P3)
PROJECT OVERVIEW

On May 31, 2016, Pennsylvania's Public-Private Transportation Partnership Board approved the Pennsylvania Turnpike Commission's proposal to pursue a public-private partnership (P3) agreement with a private entity to install a fiber optic network within its right-of-way. The network will accommodate the Commission's existing and future data communication needs and will allow the private entity to generate revenue from third party broadband customers. One development entity will be responsible to design, build, finance and maintain the fiber optic infrastructure. The network will provide connectivity for the Commission's cashless tolling system, administrative buildings, tolling systems, intelligent transportation systems, and connected and automated vehicle applications.

The P3 option is being utilized because it is expected to result in cost savings to the Commission as a result of the private sector's ability to generate revenue from the project by marketing communications services to third parties.

Questions from interested parties should be directed to the project email account: BroadbandP3@paturmpike.com

PROCUREMENT PROCESS

The Pennsylvania Turnpike Commission is pursuing a public-private partnership (P3) with a developer to design, build, finance, operate and maintain a fiber optic broadband network within the turnpike right-of-way, for the benefit of the Commission and its users, as well as for the benefit of the developer and its customers.



Maintenance and Operations



EXISTING ITS AND COMMUNICATIONS MAINTENANCE CONTRACT

- **Maintenance** of Technology Assets:
 - ITS - CCTV, DMS, HAR, RWIS, TRWS
 - Microwave Communications Backbone
 - Land Mobile Radio
 - TOC Systems + Software – Video Management, ComLog recorder, Consoles, etc.
- **Key Issues:**
 - Limited inventory management and asset lifecycle visibility
 - Lack of operational knowledge of new technology, security and applications
 - Inconsistent field device maintenance
 - Limited documentation
 - No means to replace devices quickly
- **End date: May 31, 2019**



PLANNED ITS, COMMUNICATIONS, AND TECHNOLOGY OPERATIONS AND MAINTENANCE CONTRACT

- **Operations** and Maintenance of Technology Assets
- Five years with ten optional years
- Existing Systems - ITS, Communications, LMR, and TOC Systems
- New Systems:
 - CV/AV Field Equipment
 - P-25 LMR
 - P3 Broadband IP Networking
 - Short-Term and Emergency Smart Work Zones
 - Commission traffic signals



PLANNED ITS, COMMUNICATIONS, AND TECHNOLOGY OPERATIONS AND MAINTENANCE CONTRACT

- **New Services:**
 - Emergency device replacement, design, and deployment
 - Spare parts procurement
 - TOC application management
 - Hardware/Software/Systems Contract Management
 - IP Networking and Security
 - Engineering and Design
- Performance based contract
 - High Availability (>99% Uptime)
 - Financial incentives and disincentives



NEXT STEPS

- Approved to advertise
- Commission to hold an Industry Forum
- Advertisement in March 2018



UTILITY COORDINATION REQUIREMENTS

- More PTC “utilities” underground
- Workforce knowledge lost
- Impacts to development entity
- Every project will “touch” broadband
- Defining business process and tools needed



THANK YOU!



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Commission

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