09 May 2025

# Vendor Interoperability

Let’s leverage the Standards to get the most out of this technology

# Agenda

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SWARCO McCain, Inc.

**01. Introduction**

Brief review of the standards that allow for interoperability- ATC, TEES, NTCIP, etc..

**02. Hardware**

ATC controllers, engine boards and Linux

**03. Software**

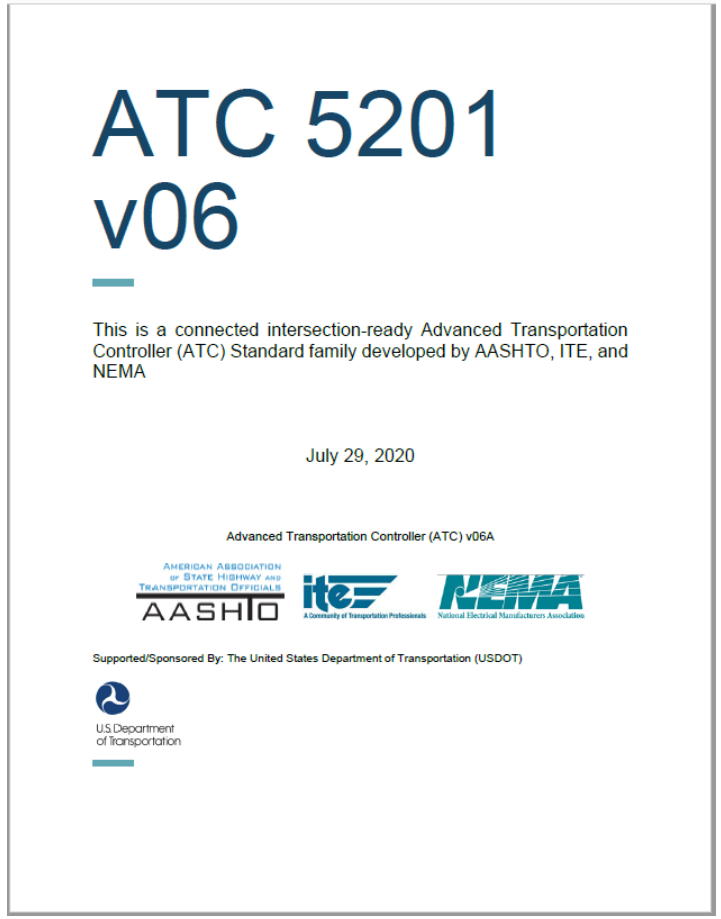
NTCIP compliance, MIBs, ATSPM data

**04. Practical Use & Q&A**

Leveraging the benefits of the standards with the technology

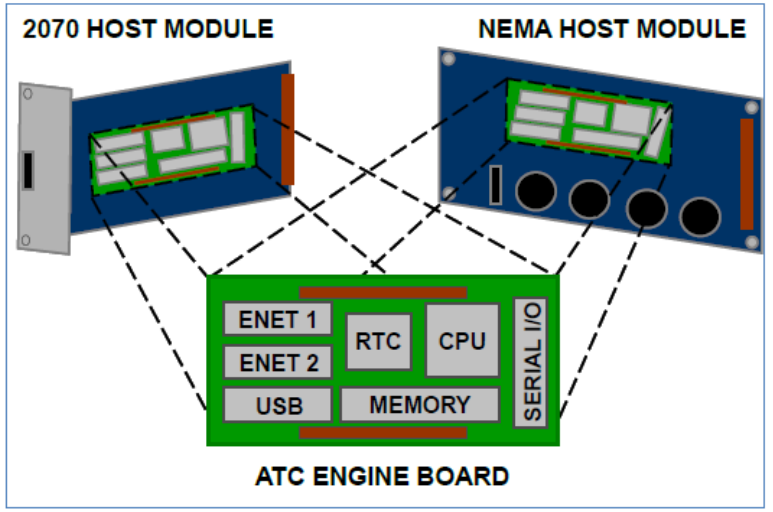
# STANDARDS
## *A LOOK AT THE ATC STANDARDS- ATC 5201 CONTROLLERS*

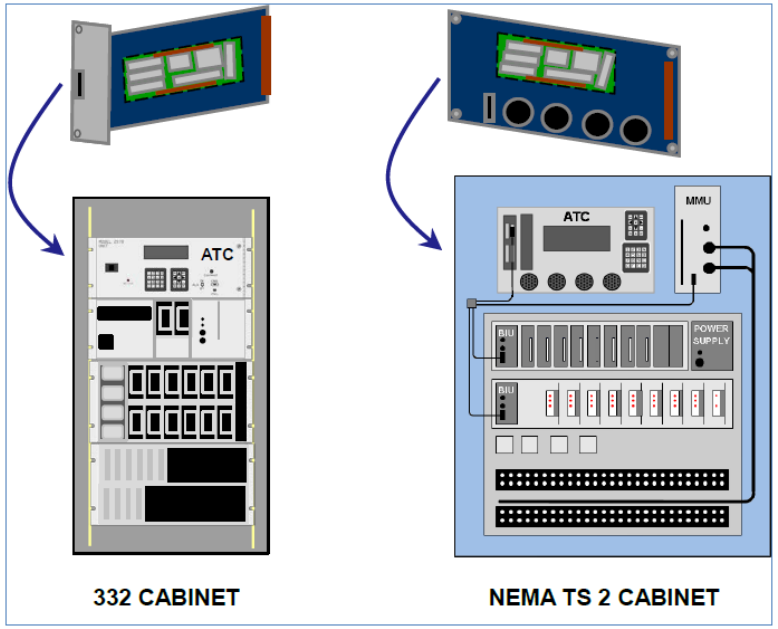
- ATC 5201 is the traffic controller hardware standard- latest version 06.37A
- Provides guidance on the physical controller design and expected operation
- Standardized the ATC engine board specs and features
- Provides guidance on the Linux OS and application operations



# ATC 5201 V06.37A ENGINE BOARD BLOCK DIAGRAM

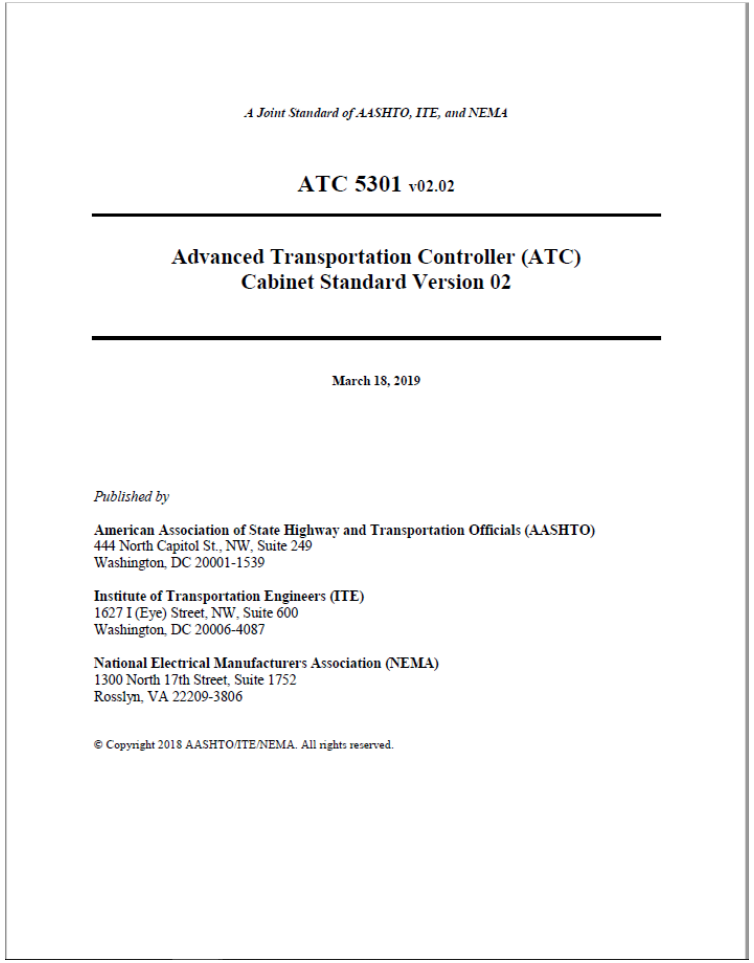
- The engine board includes all critical computing components to drive the ATC- CPU, RAM, etc..
- Engine boards are intended to operate in all North American traffic cabinet types.
- The intention was set for vendor compatibility, interchangeable hardware and software.



# STANDARDS
## *A LOOK AT THE ATC STANDARDS- ATC 5301 CABINETS*

- ATC 5301 is the cabinet hardware standard- latest version v02.02
- Defines the functionality of cabinet assemblies and components
- Defines the ATC cabinet serial bus (HDLC and SDLC) protocols
- Provides baseline operational specs for electrical/logic signals, wiring diagrams, etc



*A Joint Standard of AASHTO, ITE, and NEMA*

**ATC 5301** v02.02

**Advanced Transportation Controller (ATC)**
**Cabinet Standard Version 02**

**March 18, 2019**

*Published by*

**American Association of State Highway and Transportation Officials (AASHTO)**
444 North Capitol St., NW, Suite 249
Washington, DC 20001-1539

**Institute of Transportation Engineers (ITE)**
1627 I (Eye) Street, NW, Suite 600
Washington, DC 20006-4087

**National Electrical Manufacturers Association (NEMA)**
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209-3806

# ATC 5301 V02.02 BLOCK DIAGRAM



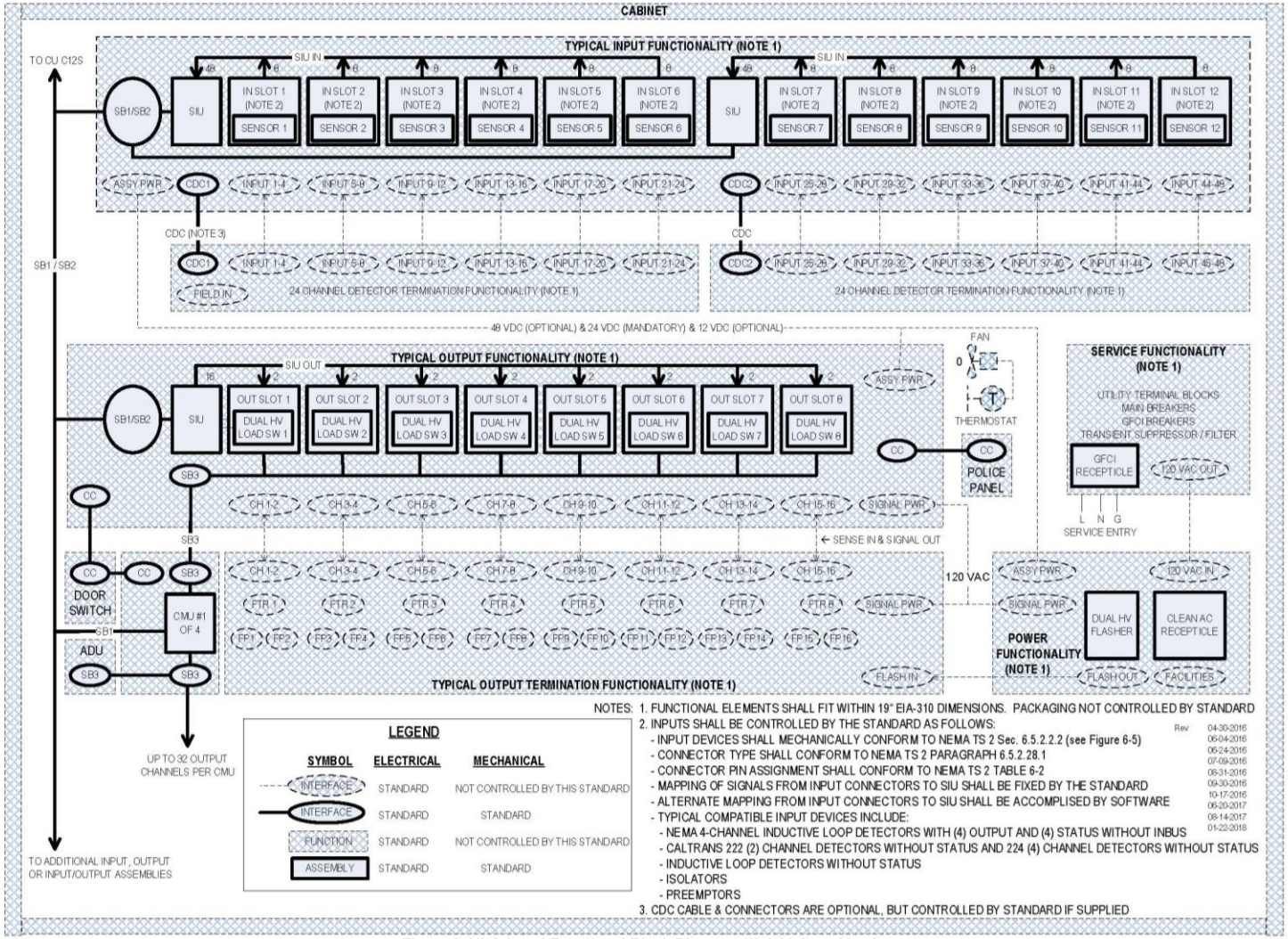
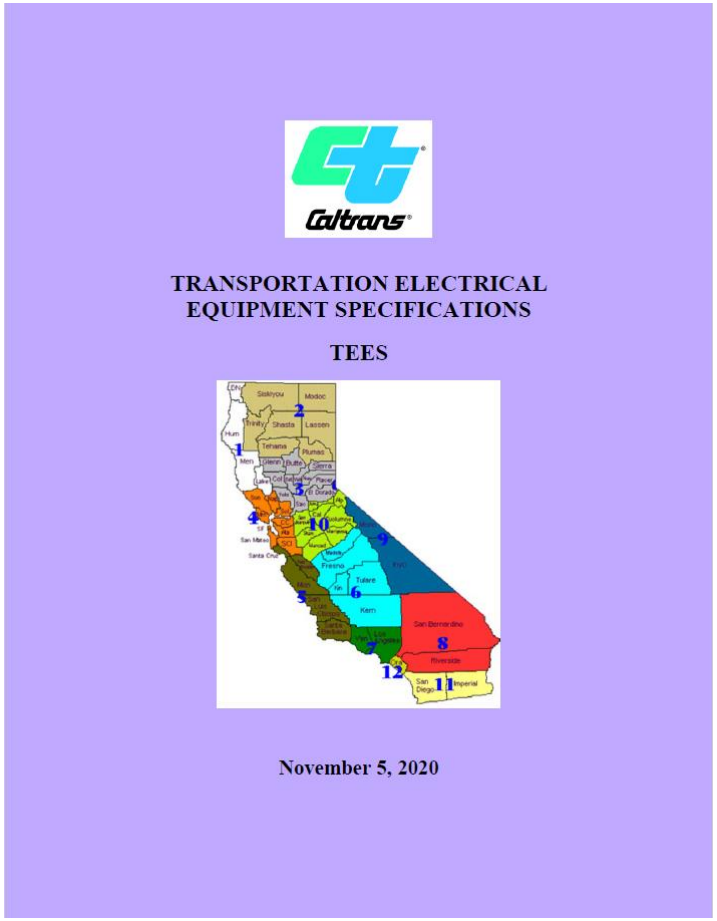


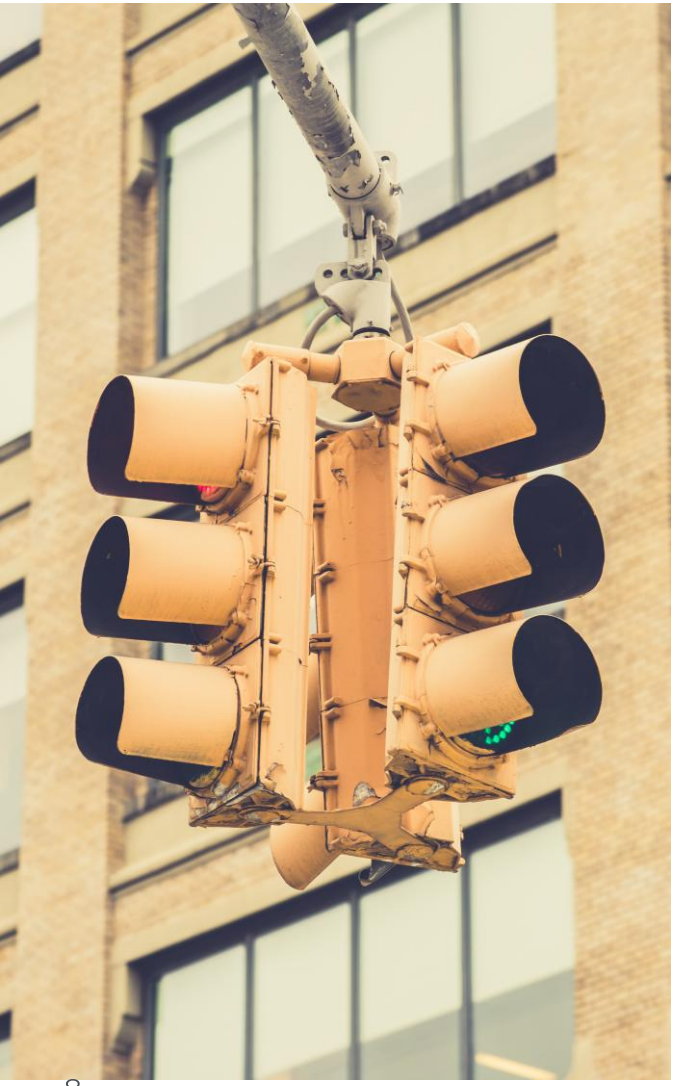

**Figure 2: High Level Functional Block Diagram, High Voltage Version**

# STANDARDS
## *CALTRANS TEES*

- TEES- Transportation Electrical Equipment Specifications. Current release is 2020
- California state specification used by many agencies in North America
- Defines specs for cabinets, controllers, and auxiliary devices
- Resource material for the ATC 5201 and 5301 standards



# STANDARDS
## *NTCIP 1202*



- Part of a family of standards that provide protocols and standard objects for Intelligent Transportation Systems
- 1202 relates to the actuated signal controller-mainstream version 2.02 released in 2005.
- Version 3 published May 2019.

"NTCIP is the first set of standards … that allows traffic control systems to be built using a "mix and match" approach with equipment from different manufacturers. NTCIP standards reduce the need for reliance on specific equipment vendors and customized one-of-a-kind software."

https://www.ntcip.org/about,

# Hardware Interoperability

Controllers & ATC engine boards

01.

# HARDWARE INTEROPERABILITY
## *WHAT DOES THIS ACTUALLY MEAN?*

- **Hardware compatibility**- CALTRANS TEES requires controllers to accept any manufacturer sub assemblies and modules. NEMA does not, allowing for proprietary controller input/output functionality.

- **Operating third party software**- There was once a term in IT- *the IBM compatible PC*. Installing any compatible OS on a computer. *Why can't we do that with ATC controllers?*

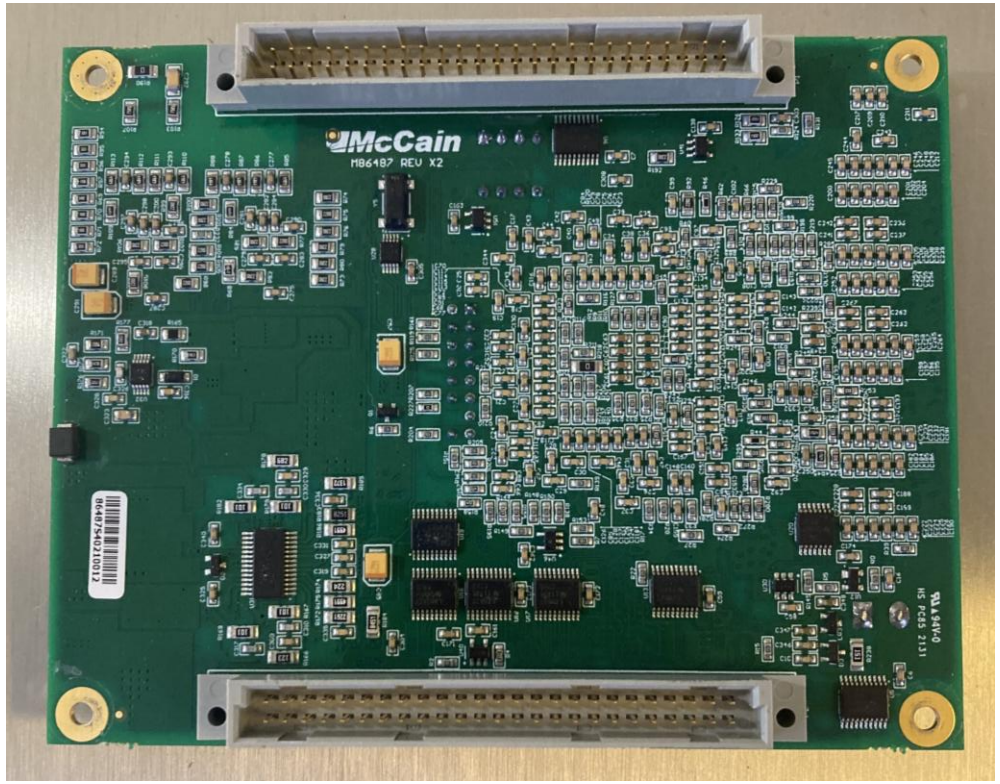
- **Embracing the Standards**- Implementing a higher level of compatibility embraces the intention of the ATC 5201 standard.

# HARDWARE INTEROPERABILITY
## *THE ATC 5201 ENGINE BOARD*

- **From the ATC 5201 Standard, section 4.1.1:**
  - *The Engine Board is the heart of an ATC. The CPU, all memory devices, serial interface devices and processor housekeeping circuits are located on the Engine Board, which shall be interchangeable between manufacturers. The plug-in form factor and standardized connection of the Engine Board allow it to fit onto the Host Module of any manufacturer's controller to suit any particular application.*

- **Engine board dimensions are defined by the ATC 5201 standard.**

- **The engine board mates to the controller host board or CPU module.**



# HARDWARE INTEROPERABILITY

## *RUNNING SOFTWARE ON THIRD PARTY ENGINE BOARDS*

- **Engine boards that meet the current standard should be able to run any intersection control application.**

- **Linux versions are the responsibility of the manufacturer.**

- **The ATC 5201 standard requires manufacturers to distribute the engine board development tools to anyone.** *This includes the BSP (board support package, similar to drivers).*

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# Software Interoperability

The Standards help hit all of our marks

02.

# SOFTWARE INTEROPERABILITY
## *WHAT DOES THIS MEAN?*

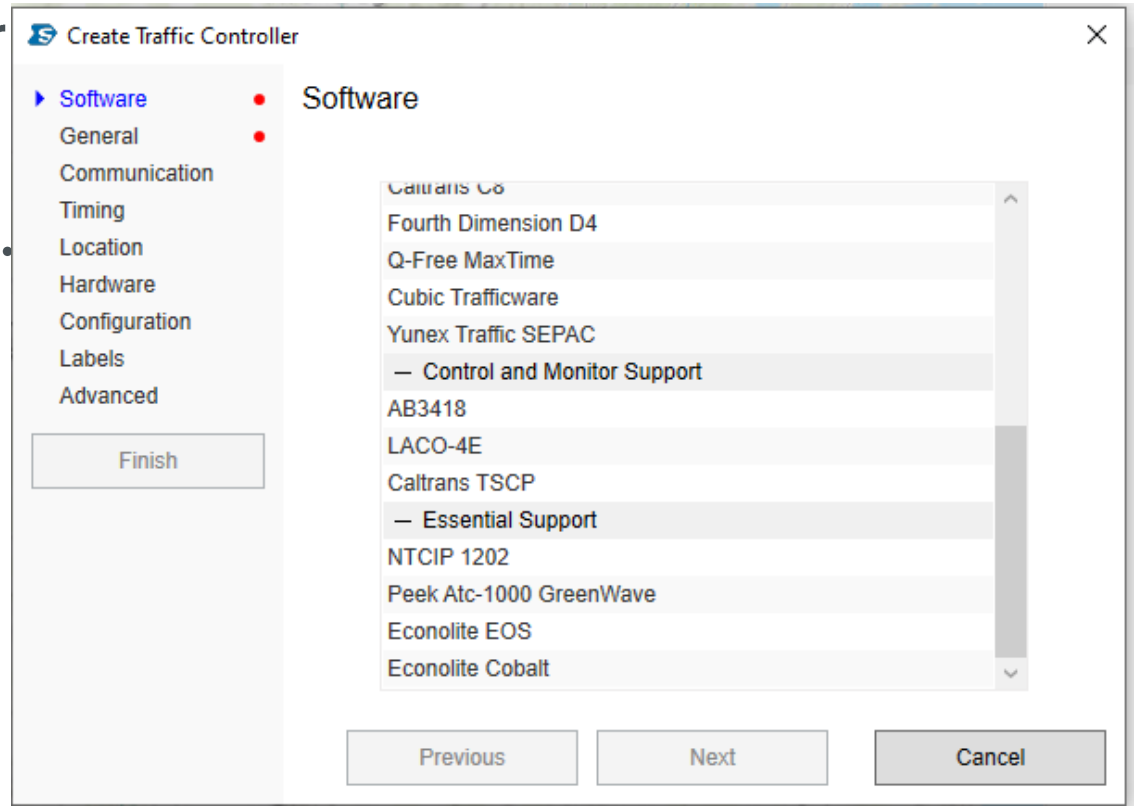
- **Central system compatibility**- Almost every controller manufacturer has a central management system. Why not embrace the standard and allow third party controllers to be operated by the Central software?

- **Information sharing**- Remember ***Free the MIBs***? A partial success story- sharing MIBs lowered the barrier on compatibility challenges but created massive development overhead to Central system providers. Every version update required new MIB integration.

- **Third Party devices**- It's not just Centrals anymore that need to communicate with controllers- detection and priority systems.

# SOFTWARE INTEROPERABILITY
## *THIRD PARTY CONTROLLERS IN CENTRALS*

- **NTCIP 1202 set the intention for generic controller support in Centrals.**
- **Monitor Controller Status including Alarm objects.**
- **Have the ability to manage/control the intersection using time sync, system pattern control from Central.**
- **Database editing should be supported even without the vendor MIB integration-** Basic phase times, coordination & TOD plans are supported by NTCIP 1202.




***Manufacturer support of NTCIP 1202, even the standard objects, is inconsistent.***

# Practical Uses & Q&A

How the industry puts this concept into action

03.

# PRACTICAL USES
## *KEY CONCEPTS*

- **Leverage existing equipment**- Having the ability to reload existing ATC compliant hardware with a new local software enhances the capability of the controller hardware.

- **Central system compatibility**- Avoid running a “dual Central” architecture due to incompatibilities between Central and local devices that still meet the ATC and NTCIP standards.

- **Future-proof your investment-** Peace of mind knowing that acquiring new hardware will not create a vendor lock-in scenario. Companies are bought and sold, key vendor support personnel move on…etc.

***The End User should never be stuck with unsupported hardware that still meets the Standards.***

# PRACTICAL USES
## *RUNNING THIRD PARTY SOFTWARE ON ATCs*

- **Pictured on the right:**
  - McCain FLeX RM running Econolite EOS on McCain engine board series 3.
  - McCain FLeX RM running Q-Free MaxTime on McCain engine board series 4.


- **Field I/O and communication port functionality needs to be tested to ensure proper functionality.** NEMA configurations are not likely to work “out of box” due to proprietary I/O.

- **Engine board swaps to another manufacturer chassis typically don’t yield desired results.**


***The end user gets the choice of their preferred software and controller hardware.***

# PRACTICAL USES
## *RUNNING THIRD PARTY SOFTWARE ON ATCs*

- **Pictured on the right:**
  - Trafficware 980 ATC running SWARCO McCain Omni eX application.
  - Full cabinet control- NEMA TS2 type 1 in this example

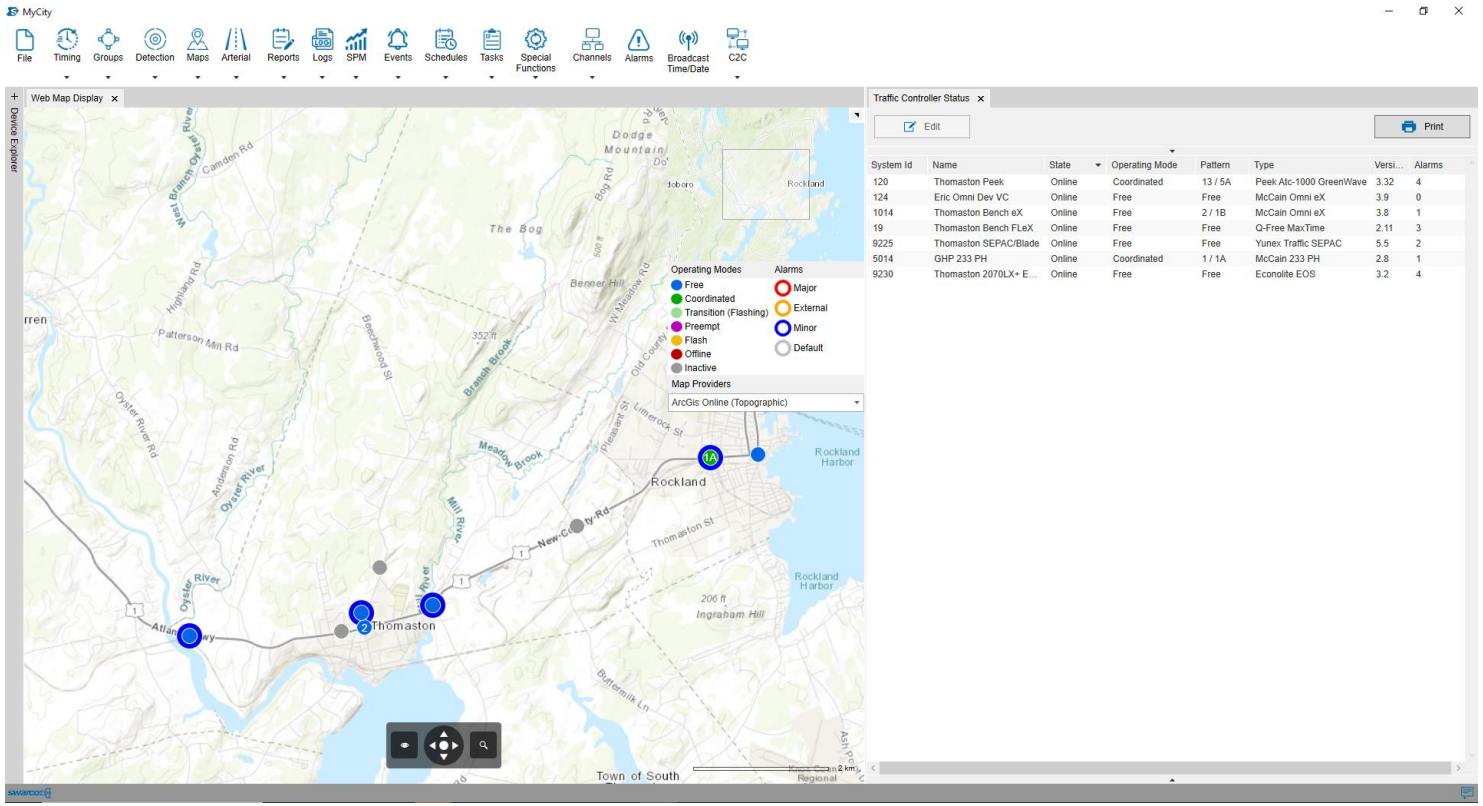
- **True interoperability.** Agencies can leverage their investment in ATC controller hardware and have the option to run the software of ***their*** choosing.

# PRACTICAL USES
## *THIRD PARTY CONTROLLERS IN CENTRAL*

- **Central Systems don't last forever.** The end user should be allowed to run Standards compliant controllers in their preferred Central system.

- **Full MIB integration.** Ideal but that comes with a development investment.
  - Everytime a MIB changes a developer has to update the central system.

- **In the future..** Central to ATC comms will likely not rely on MIBs and operate more like SCADA or IoT systems.
  - HTTP based APIs for upload/download and monitoring have been in use by one controller vendor for years. **It works really well.**



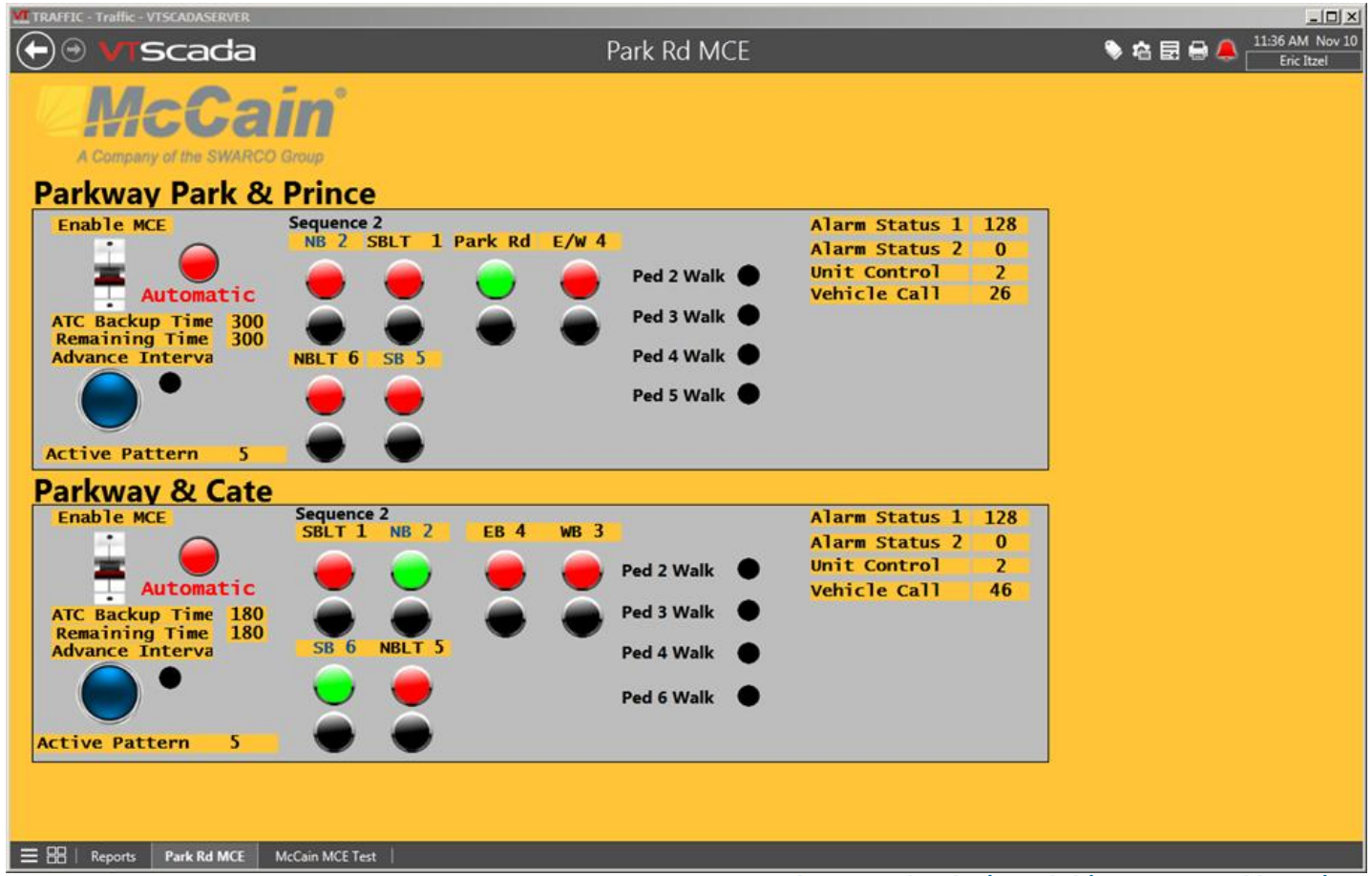
# PRACTICAL USES
## *THIRD PARTY MONITORING AND CONTROL*

*This is just good clean fun…*

- **Back in the 201x's** an agency in Tennessee decided to monitor and control intersections with a SCADA system. They custom built an application, leveraging the standards bases controllers

- **Use cases** included simultaneous remote MCE of multiple intersections, custom VOS logging to the SCADA historian, custom alarms, whatever else they wanted to do…

- **Today many other agencies** connect their controllers to network monitoring platforms and other third party software systems outside of the traditional TMS.




*The guy who designed this was a total lunatic…*

***They had a marvelous time customizing everything…***

# PRACTICAL USES
# AND BY THE WAY.. ONE LAST THING- *DATA AND ATSPMS*

- **High resolution data and ATSPMs are now a requirement and priority for almost all agencies.**

- **<u>Every</u> ATC controller platform supports high resolution data using the Purdue enumerations and beyond.**

- **End users are having to create their own solutions to retrieve, decode and use the controller hi-res data when their ATSPM solution doesn't support "other" ATCs.**
  - Third party companies are now bypassing controllers and solving for ATSPM using other technology, blunting the investment in Central based ATSPM reporting suites.

***Interoperability concepts should also include using third party controller hi-res data. Vendors are just recreating the same reports with each solution.. redundant to the end user.***

# SUMMARY
## *SO HOW DO WE MOVE FORWARD?*

- **Reduce** reliance on device vendors working in a proprietary space and rely on more Standards based solutions, free of vendor influence.

- **Acquire** the necessary tools and software maximize the capabilities of the devices and system. This still includes vendor specific MIBs.

- **Adopt** the current standards and practices. The Standards are evolving to keep up with the times. Push the vendors to embrace these Standards.

- **Work Together.** ***Free the MIBs*** shook the earth in the intelligent transportation industry but even today vendors are still not working together for the greater good of the end users. **Let's change that.**

***This isn't the 1990's anymore.. the way forward requires industry buy-in on how devices need to communicate including modern Cybersecurity requirements and best practices.***

# Summary

## 01. Embrace the Standards

- Standards based devices opens the door to interoperability
- Enhances the capabilities of a Central system

## 02. Leverage your existing investment

- System enhancements and migrations can be streamlined due to the new system supporting the legacy solutions
- The agency gets to decide on their preferred hardware and software solution, less limitations.

## 03. Avoid Vendor lock-in

- No need for buyers remorse if the tech can be utilized by other vendor solutions.
- Companies come and go, key support people move on.
- More competitive procurements by avoiding sole source scenarios

# Q+A

## Let’s talk!

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