

Overview

Using the Linux platform, Intelight's award-winning MAXTIME local controller software was built directly from the current NTCIP, NEMA, MUTCD, and FHWA (including NTCIP v2.06 and ATC 5201) standards as opposed to adapting older software to the newer standards. In addition to being the most complete NTCIP compliant Linux-based platform in the industry, MAXTIME has been intuitively designed with logical menu structures and provides built-in user functions that typically require complex logic strings or modified controller operations. Contact Intelight today to see how MAXTIME can help update your signal operations system to 21st century technology!



Sample MAXTIME home screen display as viewed from color front panel, tablet or smartphone (no app required)

Highlights

- Individual user accounts with change tracking (Front panel and Web UI)
- Advanced security based on current industry practices
- Integrated signal performance metrics to aid in signal optimization strategies
- Monitor and configure timings wirelessly from a laptop, tablet, or smartphone without database editor or third party software
- Runs exclusively on Linux O/S
- Supports serial and/or Ethernet communications
- 40 Phases, 16 Rings, 20 Sequences, 32 Overlaps
- 10 phase tables, 10 detector tables (select by TOD)
- Built-in master/closed loop functionality (included)
- Peer-to-peer communications (included)
- Locally adaptive transit prioritizer (included)
- Full NTCIP MIB supplied with software license
- Preconfigured or user-defined cabinet support (332, 336, TS-1, TS-2, ITS)
- Connected Vehicle ready via subset of NTCIP 1202 v3 objects

Overview

Built on Intelight's award winning MAXTIME ATC Framework, MAXTIME adaptive local controller software is a system-free traffic adaptive solution that runs on local traffic signal controllers and optimizes cycles, splits, and offsets along traffic signal corridors in real-time. Contrary to black-box solutions, MAXTIME adaptive algorithms are based on the signal timing performance metrics developed by Purdue, Indiana DOT, and Utah DOT. Contact Intelight today to see how MAXTIME adaptive can help update your signal operations system to 21st century technology.

Arterial Links

Link	Link From Peer	Link To Peer	Stop Allowed	Saturation Speed	Traffic Speed	Free Flow Speed	Distance
1	0	153	No	30	40	50	0
2	153	165	No	30	40	50	3370
3	165	170	No	30	40	50	1584
4	170	104	No	30	40	50	
5	104	61	No	30	40	50	
6	61	0	No	30	40	50	
7	0	61	No	30	40	50	
8	61	104	No	30	40	50	
9	104	170	No	30	40	50	
10	170	165	No	30	40	50	
11	165	153	No	30	40	50	
12	153	0	No	30	40	50	
13	0	0	No	0	0	0	
14	0	0	No	0	0	0	
15	0	0	No	0	0	0	
16	0	0	No	0	0	0	0
17	0	0	No	0	0	0	0

```
Operational Mode      COS
Data Collection Cycles 2
Minimum Cycle Length  50
Maximum Cycle Length  200
Min Required Score    0
Req. Offset Gain      2
Add. Cycle Gain       2
Forward Bound Weight  1
Backward Bound Weight 1
```

Adj. Num	Start Time	Adaptive Cycle Length	Adaptive Offset	Score	Sent To Controller
1	Tuesday February 16 2016 11:24:18	120	90	53	Yes
2	Tuesday February 16 2016 11:12:17	120	90	51	Yes
3	Tuesday February 16 2016 11:06:17	120	90	50	Yes
4	Tuesday February 16 2016 10:56:16	120	90	62	Yes

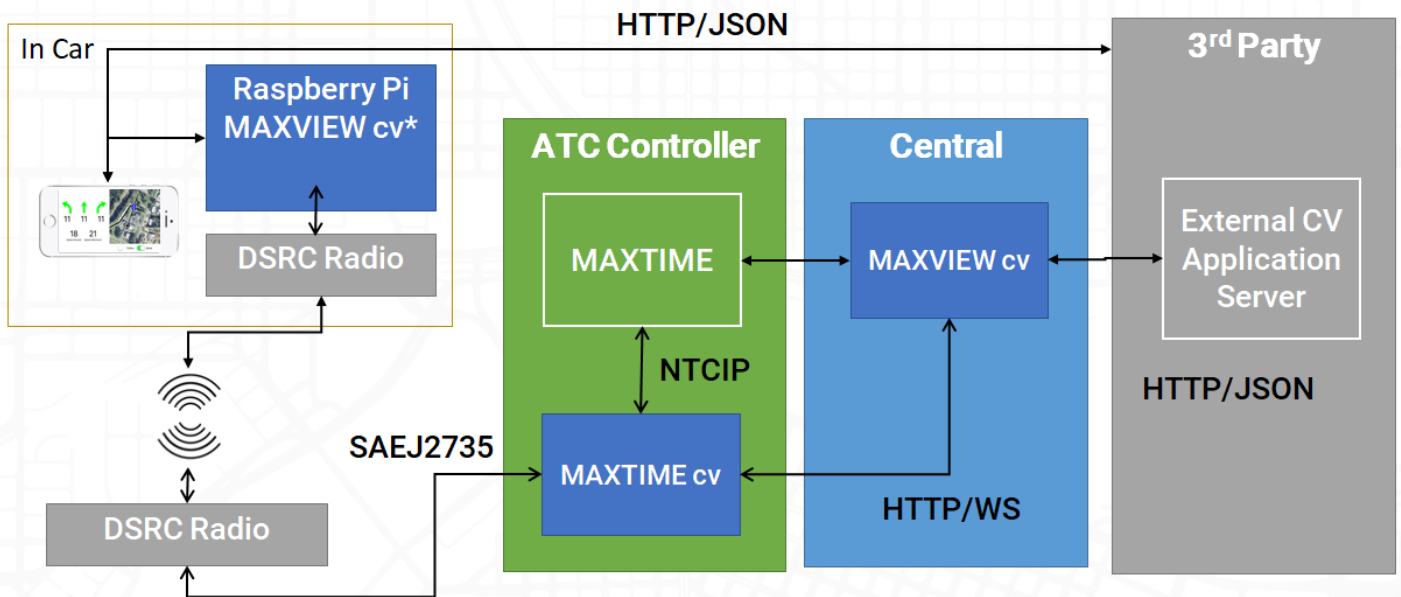
Highlights

- Adaptive cycle, offset, and split optimization
- Uses high resolution data (1/10th second logged on local controller)
- Uses distributive processing to optimize signal timings. No need for a master or system processor
- Runs alongside MAXTIME local signal control software on the industry standard ATC API
- Dedicated web and text user interfaces
- Robust peer-to-peer sync. mechanisms
- Compatible with MAXTIME transit priority, preemption, advanced phase and coord options, user logic, etc.
- Quick and efficient transition between plans when coupled with MAXTIME critical path transition algorithm
- Detection requirements consistent with Purdue, INDOT, UDOT Signal Performance Metrics (SPM) requirements

Overview

Intelight's Connected Vehicle applications, MAXTIME cv and MAXVIEW cv, are built upon the latest ATC, NTCIP and DSRC J2735 standards. MAXTIME cv is built as a stand-alone embedded firmware application designed to run on ATC 5.2b or above compliant controller hardware. In addition, by leveraging the Linux kernel and the ATC API Standard v2.06b, MAXTIME cv can run on the same physical ATC engine board as the existing MAXTIME intersection firmware, thereby reducing the overall hardware cost of the connected vehicle deployment.

MAXTIME cv communicates directly with the signal firmware utilizing NTCIP 1201, 1202 and 1211 message sets. MAXTIME cv then creates valid J2735 messages including SPaT, MAP, and SSM to be broadcast on a connected DSRC radio or via a connected MAXVIEW cv server application over the internet. Intelight's in-car CV App (Android and Apple devices supported) provides real-time connected vehicle data from MAXVIEW cv (Cellular) or MAXTIME cv (DSRC Radio). The application currently displays: real-time position and lane tracking, time to green/time to red, actual/suggested speed, preempt/EV notification, and traveler information messages.



MAXTIME

CV

- Runs on the same ATC intersection controller as MAXTIME signal controller software
- Uses ATC API specification for shared interface
- Full web browser with rich status and configuration view
- Web-based configuration of MAP data — shared across MAXTIME, MAXVIEW, and other apps
- Broadcast SPaT, MAP, SRM/SSM to connected DSRC or web service
- Connect with a broad set of DSRC radio or external services vehicle services
- Connected Vehicle Application Platform
- Supports subset of NTCIP 1202 v.3 connected vehicle objects

MAXVIEW

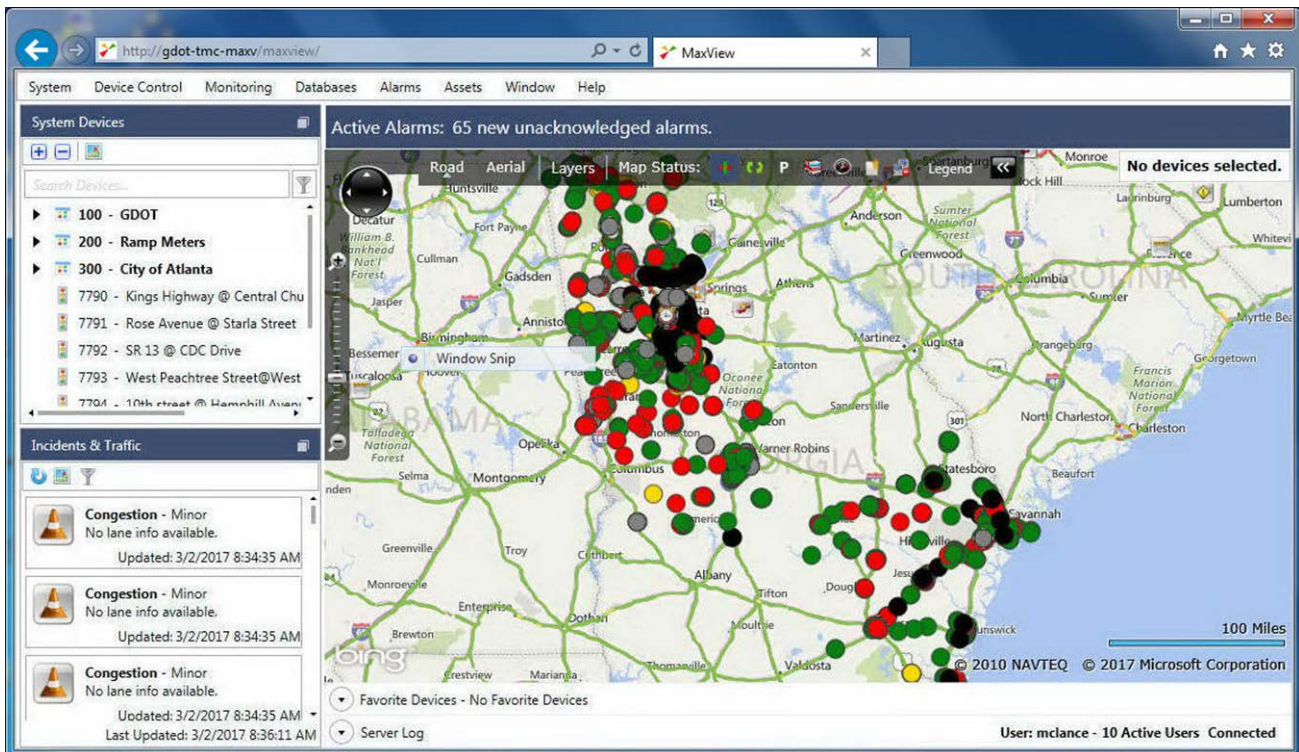
CV

- Central based connected vehicle data aggregator
- Direct real time communication with MaxTime CV over HTTP/Web socket for fast exchange
- Log and analyze incoming SPaT, MAP, SRM/SSM messages
- Provides third-party real-time access to aggregate SPaT, MAP, etc. data with <1 sec latency.

Overview

Intelight's MaxView Advanced Traffic Management System (ATMS) software is a modern client/server application built using modern frameworks and technologies. MaxView is designed from the ground up, utilizing modern Graphical User Interface (GUI) design standards. Intelight delivers a true web-based, thin-client platform with MaxView, while also delivering a rich client experience, including an incredibly responsive main map, multiple client windows and other rich client interactions. MaxView is not adapted from an older legacy system and as such is not constrained by legacy interaction models or design standards, but instead is reimagined to embrace the modern web and modern web technologies.

MaxView's strict adherence to the NTCIP protocol enables an agency to place any NTCIP-compliant controllers on the system immediately, reducing the need to manage the legacy and new central systems together during the integration process.



Highlights

- Manage your entire traffic network from a real-time map
- All servers and controllers in one tree
- See which devices are online and graphically follow the network path from the devices back to servers
- User and group level access management
- Simultaneously connect two or more system servers
- Switch between your sessions using a mouse click or keystroke
- MaxView includes online real-time data graphs and usage charts, with the ability to do trend analysis
- MaxView retains and displays a history of system events that can be used to monitor operations and/or troubleshoot

Unique Functionality

- Easy to configure maps; no external programs necessary
- Expanded status displays and event monitoring
- Outlook style time of day scheduler
- Day, month and timeline views
- Drag and drop scheduling
- Modify multiple intersection timings from single screen
- Real-time split monitoring in Coordination and Free
- Real-Time analysis tools and event monitoring

Embedded panorama and camera views

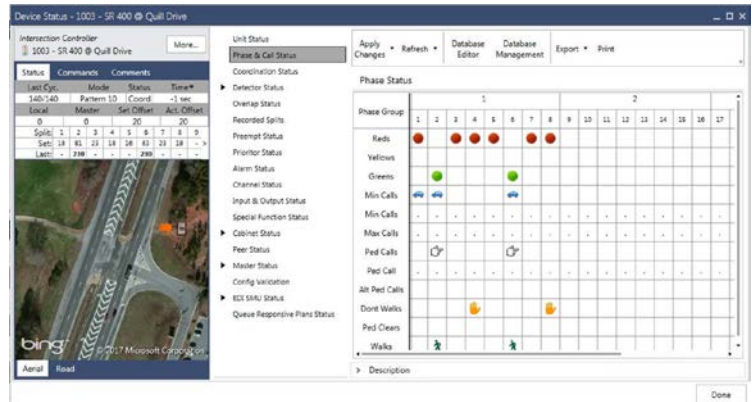


Support Advanced System Configurations

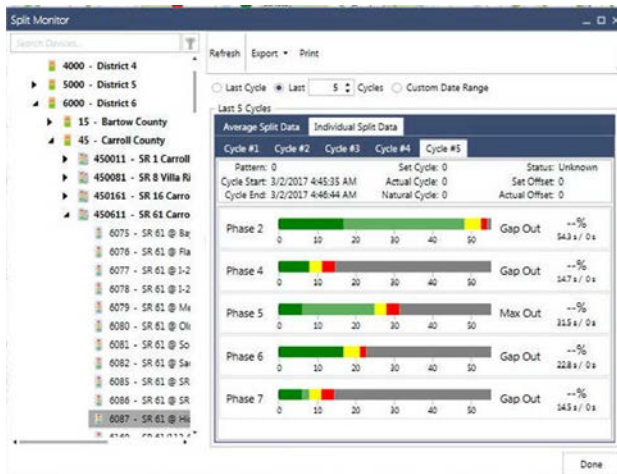
- Ability to embed hotlinks and shortcuts into the intersection displays and tabs
- Custom user configurations for maps based on user
- Dynamic status views by zoom level

Features and usability

- Time Space Diagram
- Split monitor
- VOS graphing
- Event monitoring
- Alarms and alerts



Detailed intersection status display



Split monitor



Unique platform

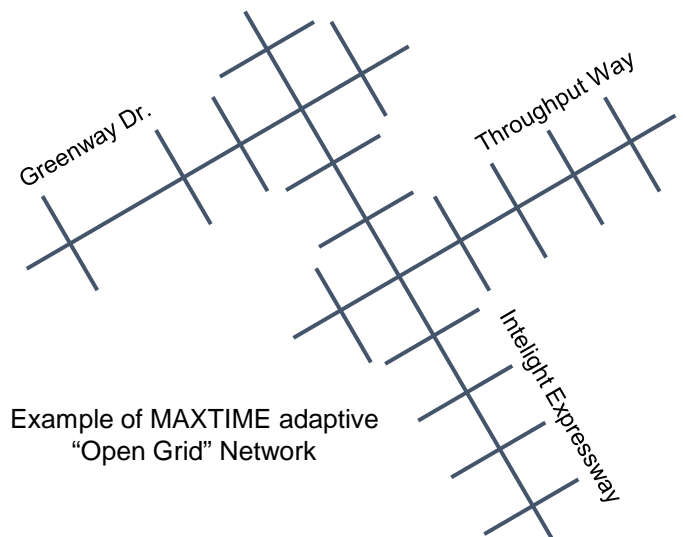
- Peer-to-peer communications between controllers
- No system/master field processor
- Onboard web server (edit database through web browser, no proprietary database editor)
- Monitor and modify configuration from Windows and Apple computers, IPADS, tablets, smart phones without special software
- Store and load hundreds of configuration databases on controller
- Easy, automated software updates via network or USB flash drive while intersection continues to run traffic signal operations
- Writes optimized timings to MAXTIME coordination pattern via NTCIP protocol

Infrastructure Requirements

- Detection requirements (lane by lane)
 - Cycle/offset optimization – advanced detection on coordinated/mainline (300 to 600 feet from stop bar- should be placed in advance of normal queueing)
 - Split optimization – stop bar detection on all approaches
 - Compatible with radar, video, inductance loop, magnetometer and various other detection technologies
- Hardware
 - Currently requires Intelight ATC with 1883 engine board or newer (NEMA or 2070) with ATC API
 - Currently requires Intelight's MAXTIME signal control software
 - Ethernet communications via fiber, wireless, or Ethernet over copper between signal controllers

Theory of Operation

- Cycle/offset optimization
 - Based on 1/10th second high resolution data: cycle-by-cycle optimization of vehicle capture rates based on detector calls and coordinated window
 - User-defined calculation period, cycle length optimization range, percent improvement required to change
 - Calculates and protects minimum corridor cycle time from MAXTIME databases (optional pedestrian protection)
 - Every controller optimizes the corridor and results are synced via peer-to-peer (distributive processing) – no master or lead controller in network
- Split optimization
 - Balances splits using approach/stop bar occupancy at local intersection
 - Uses combination of green occupancy (OCC_{GRN}) and detector occupancy during first five seconds of phase movement red ($ROCC_{5-sec.}$)
 - Balances across rings and barrier groups
 - Incremental adjustments made on a sliding scale



Unique Functionality

- Peer-to-peer communications between controllers
- Intuitive and advanced user logic programming
- Onboard web server (edit database through web browser, no proprietary database editor)
- Monitor and modify timings from Windows and Apple computers, IPADs, tablets, smartphones without special software
- Store and switch between hundreds of timing databases on controller
- Easy, automated software updates via network or USB flash drive (no need for terminal servers or proprietary installer programs)

Support Advanced Intersection Configurations

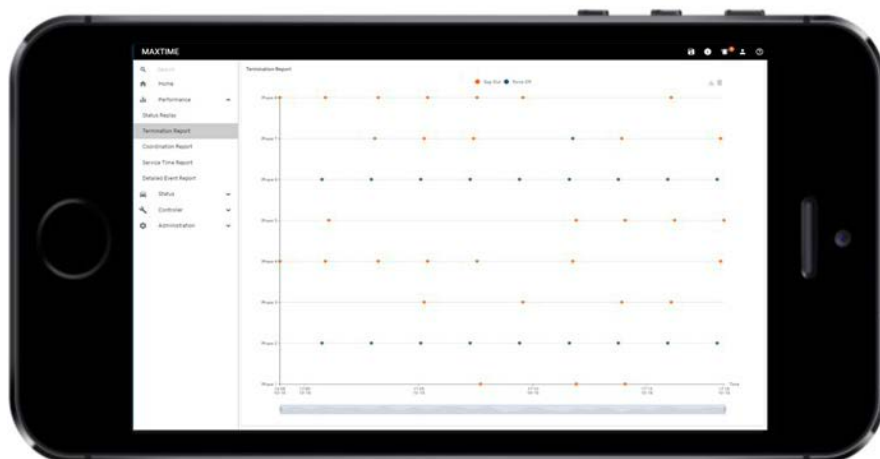
- Single Point Urban Interchange (SPUI)
- Continuous Flow Intersections (CFI)
- Diverging Diamond Interchange (DDI)
- Compound intersections with multiple approaches
- Bus and Light Rail Transit (TSP/LRT) applications
 - Predictive arrival/departure adjustments
 - Multiple check-in/out detectors via P2P
- HAWK/pedestrian hybrid beacons
- Preemption routing

Phase	1	2	3	4	5	6	7	8	>
Walk	0	0	0	0	0	0	0	0	0
PedClr	0	0	0	0	0	0	0	0	0
DontWlk	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MinGrn	5	5	5	5	5	5	5	5	5
Passage	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0	
Max 1	45	60	35	60	45	60	35	60	
Max 2	0	0	0	0	0	0	0	0	
Max 3	1	1	1	1	1	1	1	1	
YelChg	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
RedClr	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
RedRvrt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
DynMax	0	0	0	0	0	0	0	0	
MaxStep	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
DlyGrn	0	0	0	0	0	0	0	0	
DlyPed	v0	0	0	0	0	0	0	0	

MAXTIME front panel user interface

Features and usability

- Rapid transition times with user-override min/max limits
- Extended pedestrian features including: delayed walk, delayed, green, and alternate walk/FDW timing per 2009 US MUTCD, advanced handling to over-sized pedestrian times
- Multiple overlap types including :
 - NTCIP: types 1 through 3
 - Flashing Yellow Arrow (FYA) displays
 - Flashing Red Arrow (FRA) displays
 - Protected/Permissive Canadian operation
 - Light Rail Transit (LRT) bar indications
 - Pedestrian (normal and minus green/yellow)
 - Right-turn with conflicting pedestrian
- 128 independently programmable coordinated or free timing patterns
- Master/slave closed loop operation included
- Linux-based (facilitates memory and processor power expansion in future)
- Advanced phase Intervals
 - Min green 2
 - Pre-green/walk,
 - Delay green/walk
 - Pre-clearance
 - Alternate pedestrian times (extended push time)



Sample MAXTIME termination report as viewed from front panel, tablet or smartphone (no app required)

Connected Devices Status

Device	Device Type	Device ID	Connection Status
1	MaxTime	1	Connected
2	WaveRSU	2	Connected
3	None	0	Not Connected
4	None	0	Not Connected
5	None	0	Not Connected
6	None	0	Not Connected
7	None	0	Not Connected
8	None	0	Not Connected
9	None	0	Not Connected
10	None	0	Not Connected
11	None	0	Not Connected
12	None	0	Not Connected
13	None	0	Not Connected
14	None	0	Not Connected
15	None	0	Not Connected
16	None	0	Not Connected
17	None	0	Not Connected
18	None	0	Not Connected
19	None	0	Not Connected
20	None	0	Not Connected

[Next](#)

MAXTIME cv provides web pages with status screens showing connected devices and the generated messages.

Devices

Device	Device ID	Device Type	IP / Hostname	IP Port	HTTP Port	Serial Port	Device Address	Secondary Device Address	Peer Timeout	Description
1	1	MaxTime	192.168.1.32	161	80	0	0	0	15	
2	2	WaveRSU	192.168.1.11	161	80	0	0	0	15	
3	0	None		161	80	0	0	0	15	
4	0	None		161	80	0	0	0	15	
5	0	None		161	80	0	0	0	15	
6	0	None		161	80	0	0	0	15	
7	0	None		161	80	0	0	0	15	
8	0	None		161	80	0	0	0	15	
9	0	None		161	80	0	0	0	15	
10	0	None		161	80	0	0	0	15	
11	0	None		161	80	0	0	0	15	
12	0	None		161	80	0	0	0	15	
13	0	None		161	80	0	0	0	15	
14	0	None		161	80	0	0	0	15	
15	0	None		161	80	0	0	0	15	
16	0	None		161	80	0	0	0	15	
17	0	None		161	80	0	0	0	15	
18	0	None		161	80	0	0	0	15	
19	0	None		161	80	0	0	0	15	
20	0	None		161	80	0	0	0	15	

Apply

MAXTIME cv also provides web pages for configuring the connected devices and intersection geometry.

