



# Synchro Studio 9

with Warrants and TripGen 2014

*Getting Started and What's New in Version 9*

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# Table of Contents

- CHAPTER 1 – INTRODUCTION .....1-1**
  - LICENSE OPTIONS ..... 1-1
- CHAPTER 3 – INSTALLING SYNCHRO STUDIO 9 .....3-1**
  - TO ACTIVATE SYNCHRO STUDIO 9, WARRANTS 9, AND TRIPGEN 2014 ..... 3-3
  - TO DEACTIVATE SYNCHRO STUDIO 9, WARRANTS 9, AND TRIPGEN 2014 ..... 3-4
  - TO VIEW SAMPLE FILES ..... 3-4
  - LIST OF SAMPLE FILES ..... 3-4
- CHAPTER 4 - WHAT'S NEW IN SYNCHRO AND SIMTRAFFIC .....4-1**
  - CUSTOMIZABLE TOOL BARS ..... 4-1
  - VIEW PORTS ..... 4-1
  - TEMPLATES ..... 4-2
  - ENHANCED OPTIMIZATION FUNCTIONALITY ..... 4-2
  - DEFAULT NETWORK SETTINGS..... 4-3
  - CHANGES FOR HCM 2010 ..... 4-4
- CHAPTER 5 - WHAT'S NEW IN TRIPGEN 2014 .....5-1**
  - INTRODUCTION ..... 5-1

# Chapter 1 – Introduction

Welcome to the new and improved **Synchro Studio 9, Warrants 9, and TripGen 2014** software applications. Trafficware's software suite is a complete solution for analysis, optimization and visualization of roadway networks. Using Synchro Studio, traffic professionals can easily analyze capacity and timing optimization as well as simulate, check and fine-tune traffic signal operations. With Warrants 9, the user can check the need for a traffic signal based on user input traffic volumes. TripGen 2014 is an easy to use tool to determine the estimated number of trips generated by a variety of ITE land use categories.

## License Options

Trafficware offers the following purchase options.

- Synchro Studio 9 (Synchro, SimTraffic, 3D Viewer and SimTraffic CI)
- Synchro/SimTraffic 9 (includes SimTraffic CI software)
- Synchro/SimTraffic 9 Light (includes SimTraffic CI software)
- 3D Viewer 9
- Warrants 9 (Not part of Synchro Studio)
- TripGen 2014 (Not part of Synchro Studio)

This **Getting Started, Synchro Studio User Guide, Warrants 9 User Guide, and TripGen 2014 User Guide** includes information on the full product line. Depending on your license level, you may not have access to the full features of the Studio Suite, Warrants 9, or TripGen 2014. Contact Trafficware for details on licensing or visit [www.trafficware.com](http://www.trafficware.com).

## Demo Versions

Upon successfully downloading Synchro, users have the option to Demo those applications that were not purchased. The following section highlights each of the software applications.

### Synchro

The Demo version can be used to perform various functions within the software. Reports will not be created.

### SimTraffic

The Demo version can be used to record and playback simulations for the sample files located in the Trafficware directory. The Demo version cannot be used to record animations on other files.

The Demo version can also be used to playback prerecorded history files. This allows unlicensed users to view animation files. If you would like to share a SimTraffic animation with a colleague or run an animation on a laptop, install and use Synchro and SimTraffic in the Demo mode. The Demo can view the animations but not make changes. You will need the following:

1. The Synchro Data file (SYN)
2. The SimTraffic Parameters file (SIM)
3. The History file (HST)
4. Timing or volume data files, if data access is used.
5. The Synchro/SimTraffic download file (setup.exe).

### **3D Viewer**

The Demo version can be used to view the sample file located in the Trafficware directory.

### **Warrants**

The Demo version can be used to open the sample file to review various functions within the software, including viewing individual warrants to determine if they have been met.

### **Trip 2014**

The Demo version can be used to open the sample file to review various functions within the software, including adding land uses (a limited list is included in the Demo) to calculate the number of expected trips via the average rate or equation.

## Chapter 2 – Operating System and Software Prerequisites

Beginning with Synchro 8 - Build 805, Synchro requires a few software prerequisites to operate. This section highlights these requirements.

### Basic Requirements

This section summarizes a few requirements related to the computer's set-up that should be reviewed prior to installing Synchro 9.

- Ensure *Admin Rights* have been allowed
- Hard drive cannot be compressed or encrypted
- Itanium drives are not supported

### Windows XP Prerequisites

The following software applications are required:

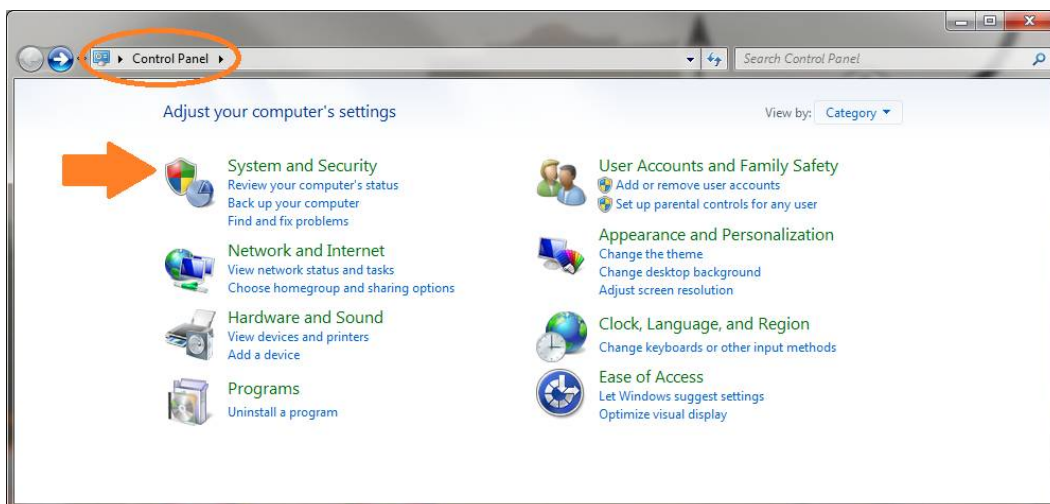
- .NET Framework 3.5 (<http://www.microsoft.com/en-us/download/details.aspx?id=2>)
- Windows Installer 4.5 (<http://support.microsoft.com/kb/942288>)

### Windows Vista or Windows 7/8 Prerequisites

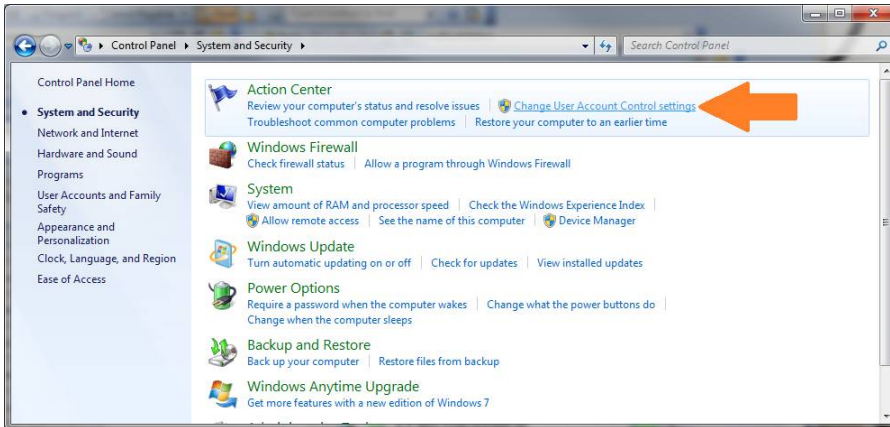


If you have a computer running *Windows Vista or Windows 7* operating system, please modify the UAC settings prior to completing the steps listed in the next section.

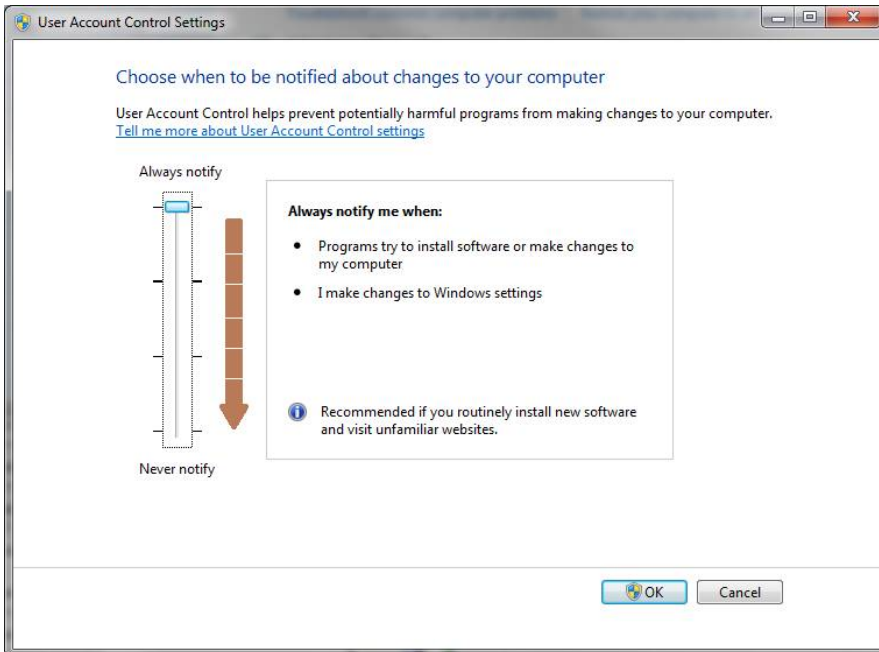
1. Go to Control Panel.
2. Select the “*System and Security Icon*”



3. Select the “*Change User Account Control Settings*” from the Action Center



4. Pull down the scroll bar to the bottom.



5. Click OK to close the User Account Control Settings window.
6. REBOOT to have changes to security take effect.
7. Install and Activate as directed.
8. Once installation and activation have been completed, return to the Control Panel and set your security to the highest setting, if so desired.
9. REBOOT to have changes to security take effect.

## Chapter 3 – Installing Synchro Studio 9

This section guides you through the installation process for Synchro Studio 9, Warrants 9, and TripGen 2014..

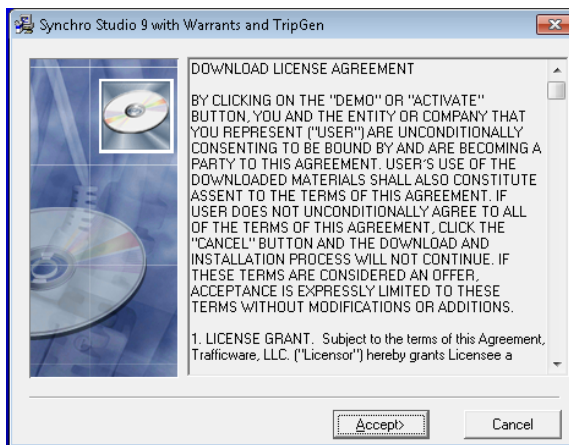


If this is an upgrade, you will first want to install **version 8** on new machine using your version 8 key (and deactivate from the old machine). You will want to do this prior to installing v9. If you have a computer running **Windows Vista or Windows 7/8** operating system, please refer to the previous section before completing the following steps.

Synchro 9 can be downloaded by visiting the Trafficware website, [www.trafficware.com/store](http://www.trafficware.com/store).

The Installation Wizard will guide you through the installation process (after you download the setup file).

1. Read the license agreement carefully.

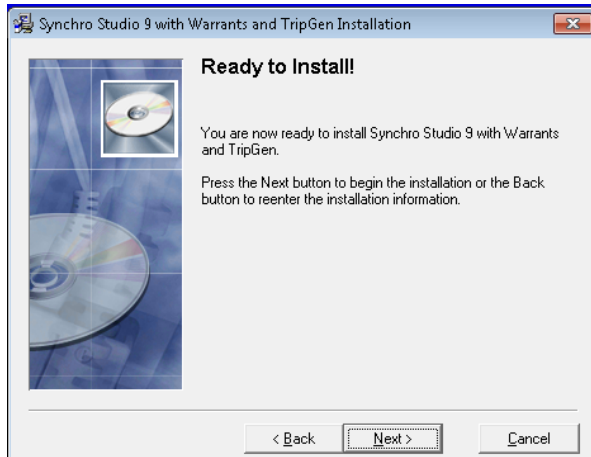


Select the [Accept] button to accept the terms of the license agreement and proceed with the installation. You must accept the license agreement to install Synchro Studio 9, Warrants 9, and TripGen 2014.

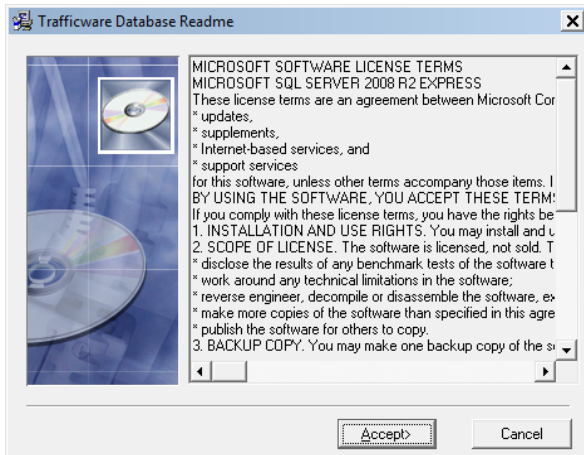
2. The Installation Wizard saves all files to the default directory (C:\Program Files\Trafficware for 32-bit machines and C:\Program Files (x86)\Trafficware for 64-bit machines)



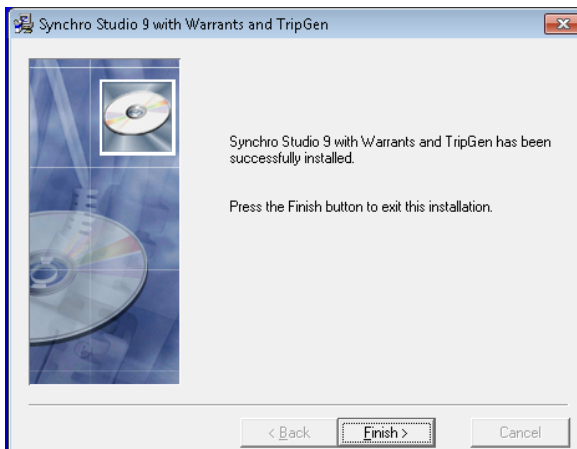
3. Synchro Studio, Warrants 9, and TripGen 2014 are now ready to install. Select the [Next] button to install in the selected directory.



4. The required TripGen 2014 database files are now ready to install. Select the [Accept] button to install the required TripGen 2014 databases in the selected directory. Read the license agreement carefully.



5. When the installation is complete, select the [Finish] button to exit the Installation Wizard.





## To Activate Synchro Studio 9, Warrants 9, and TripGen 2014



When you activate Synchro Studio 9, Warrants 9, and TripGen 2014 activate under the user's profile on the laptop/PC. Log on to the laptop/PC as the User Profile of the individual that will be using Synchro Studio 9, Warrants 9, and TripGen 2014.

1. Select the Start Menu, then choose Programs→Trafficware→Synchro 9 (3D Viewer 9, Warrants 9, TripGen 2014) or double click on the shortcut from your desktop (if created in step 3 above).
2. Read the license agreement carefully.



Check the 'I Accept the General License Agreement' box to proceed.

Select [Activate] to proceed with the activation. Press [Demo] if you want to use the demo version. The demo version will allow you to try out the features by viewing the sample files. The sample files are located in the directory where you have installed Synchro Studio 9, Warrants 9, and TripGen 2014. You will not be able to create your own network with the demo mode.

3. The first time using Synchro (3D Viewer, Warrants, TripGen 2014), you will be asked to activate your software. Enter the requested information on the Application Activation dialog shown here.



The information entered in the Application Activation dialog is used to setup the profile for online support with Trafficware. Be sure to enter the information for the individual that will be using the software.

The License Key is provided by Trafficware and will be shown on your license certificate and will be emailed to you. The License Key is in the format (Serial Number / Company Name - Product Key).



To ensure accurate entry into the Application Activation dialog, copy the entire string from your email message and paste into the License Key box.

The entries with the asterisk "\*" are required to activate the software.

After entering the necessary information, select [OK].

4. The next dialog gives you two options to activate and an option to activate later.



'Activate using the Internet' is the preferred method for activating your software. Choose this option and select [OK] to automatically and quickly activate your software. Allow 10 business days from purchase date to activate your software. Use the 'Activate Later' option to work with Synchro Studio and Warrants during the grace period.



The grace period is forty-five days from the date of your order. When activating via the internet, a message may appear indicating that the invoice has not been paid.

If you do not have an internet connection, use the 'Activate by Phone' option and press [OK]. Follow the instructions on the Phone Activation dialog. Before calling, make sure the invoice has been paid and have your license key available. Trafficware staff will ask for the Machine Key listed in the Phone Activation dialog. With this information, an Activation Code will be provided.

## To Deactivate Synchro Studio 9, Warrants 9, and TripGen 2014

A Synchro license is activated to one user. You can de-activate on your primary user and move to another user.

1. Select the Start Menu, then choose Programs→Trafficware→Synchro 9 (3D Viewer, Warrants, TripGen 2014) or double click on the shortcut from your desktop.
2. From Synchro, choose Help→License Key.
3. Make a copy of your full License Key.
4. Choose the [Deactivate] button and write down the Deactivation Code.
5. Call Trafficware at (281) 240-7233 during business hours with the Deactivation Code. Or email the code to [sales@trafficware.com](mailto:sales@trafficware.com).



**BE CAREFUL**, this will deactivate your software on your machine. Once deactivated, you will need to contact Trafficware to reactivate on your laptop or PC. Please be sure to time this during normal business hours of 8:30am-4:00pm (CT) M-F.

## To View Sample Files

1. Synchro Studio, Warrants 9, and TripGen 2014 come with sample files so that you can see how street networks are modeled in Synchro. To view the sample files:
2. From Synchro, choose the **File→Open** command.
3. Navigate to the Trafficware\Version9\Sample Files folder.
4. Select a file from the list.
5. Review the "Synchro Examples.pdf" document (installed in the Trafficware directory) to see how these files were created.

## List of Sample Files

The sample files are located in the Trafficware\Version 9\Sample Files directory. The table below is a listing of the files with a brief description. The column "HCM 2010 Computational Engine 7.12 Compliant" indicates if the sample confirms to the 2010 HCM signalized intersection methods. If the answer is "No", then the sample file cannot be viewed in the HCM 2010 Settings Screen of Synchro.

Sample File Name	Description	HCM 2010 Computational Engine 7.12 Compliant*	Notes
<b>HCM_AWSC_Example</b>	Coding elements for an All-Way Stop Control T-Intersection.	Not Applicable	This example matches the HCM 2010 Chapter 20- Example 1.
<b>HCM_TWSC_Example</b>	Coding elements for a Two-Way Stop Control intersection with flared approaches and median storage.	Not Applicable	This example matches the HCM 2010 Chapter 32 - Example 3.
<b>Single Lane Roundabout</b>	Coding elements for single lane roundabout with slip ramps	Not Applicable	This example matches the HCM 2010 Chapter 21- Example 1.
<b>Dual Lane Roundabout</b>	Coding elements for dual lane roundabout without slip ramps	Not Applicable	This example matches the HCM 2010 Chapter 21 - Example 2.
<b>99 diverging diamond3</b>	Complex Diverging Diamond Interchange (DDI) example file, also known as a Double Crossover Diamond Interchange <a href="http://www.fhwa.dot.gov/publications/research/safety/09054/index.cfm">www.fhwa.dot.gov/publications/research/safety/09054/index.cfm</a>	No	Includes a closely spaced frontage road intersection. Notice the use of the Link Offset ( <i>Simulation Settings</i> ) at the DDI intersections.
<b>CFI Step 4 Signal Timing</b>	Complex Continuous Flow Interchange (CFI), using all four quadrants	No	Synchro allows 9 intersections to be grouped (clustered). The center intersection is set as unsignalized and all directions have sign control set to "Free".
<b>Leading Peds</b>	The EBR and WBR have a Hold phase 5	No	The EBR and WBR begin 5 seconds after the EBT and WBT. This allows the EB/WB ped phase to get a 5 second head start prior to the conflicting rights.
<b>Super Street, Signalized</b>	Example of a Super Street signalized network <a href="http://www.fhwa.dot.gov/publications/research/safety/04091/10.cfm#c1025">www.fhwa.dot.gov/publications/research/safety/04091/10.cfm#c1025</a>	No	This file was created with two parallel E/W links. Node 100 and 240 are the signalized U-turn intersections. Notice that the cycle can vary for the EB and WB directions, thus allowing good progression in both directions.
<b>Tucson concurrent lagging lefts</b>	Example of concurrent lagging lefts as used in Tucson	No	Notice the modified Ring & Barrier Designer (Options> Ring and Barrier). This ensures that the lagging lefts run concurrently.
<b>2 Inter One Controller</b>	Coding for grouping two intersections using one controller	No	The two intersections in the "dog-leg" are clustered by going to Options> Cluster Editor. Notice the Splits and Phasing diagram in the Timing Settings screen. It shows the phasing design for both intersections at one time.
<b>6 Leg Intersection</b>	Example of a multiple approach intersection	No	This example illustrates the use of barrier 3 (Options> Ring and Barrier) to model the diagonal intersection.

Sample File Name	Description	HCM 2010 Computational Engine 7.12 Compliant*	Notes
<b>Basic 2P w Porkchops</b>	Example illustrating the channelized islands coded	Yes	This example has basic two-phase intersection coding. Note that Synchro cannot model channelized rights, it is for simulation in SimTraffic.
<b>Basic 2-Phase</b>	Simple 4-leg intersection with basic 2-phase operation.	Yes	This is a very basic example using a pretimed controller.
<b>Demo3D</b>	Includes vehicle mix, buildings, etc.	Yes	Requires 3D Viewer
<b>Diamond – Leading Alt</b>	A complex diamond interchange coding example (also known as a Texas Diamond operation)	No	This example illustrates the use of the cluster editor and the ring and barrier designer. In addition, notice the Link OD use for the internal E/W movements to reduce unrealistic turns.
<b>Diamond Lag Lag</b>	A complex diamond intersection with lagging lefts at both intersections	No	The example uses the cluster editor, ring and barrier designer and Link OD volumes as done in the above example. Also notice the unique coding of the EB and WB left turns. You can see that the storage lane begins upstream of the first intersection.
<b>Diamond w Front Roads</b>	A complex diamond intersection where the ramps merge onto a frontage road	No	As with the other diamonds, this example uses the cluster editor and ring and barrier designer. Also notice the merge and diverge points of the ramps at the frontage road. The Lane Alignment is used to keep movements freely flowing.
<b>Dual ring</b>	Example using standard NEMA phasing	Yes	This example uses common NEMA phasing. Also notice the use of the lagging NBL (phase 3).
<b>Fixed Cycle Coordination</b>	Two coordinated arterial roadways	Yes	This example includes 8 actuated coordinated intersections operating on a fixed, system cycle length. The cycle was determined by using the Optimize> Network Cycle command.
<b>Florida T no peds</b>	Example of an intersection with a free through movement (EBT)	No	The EBT movement never stops even when the SBL phase operates. Notice the coding of the Lane Alignment at the intersection.
<b>Florida T with peds</b>	Same as the above example but includes a pedestrian phase	No	The EBT movement never stops unless a ped phase 7 is activated.
<b>Gate_Stop on Yellow</b>	An example of a gate or a meter	Not Applicable	Notice use of <i>Mandatory Stop on Yellow</i> in the Timing Settings. Also, the NW link is Hidden (see the Lanes Settings <i>Link is Hidden</i> ).

Sample File Name	Description	HCM 2010 Computational Engine 7.12 Compliant*	Notes
<b>Group Control 2</b>	Complex coding for grouping two intersections using one controller	No	This is another example of grouped intersection with complex phasing.
<b>Mich Left</b>	An example of a Michigan Left intersection	No	Similar to the Super-Street example, however, main street lefts are not allowed (they must proceed to the median U-turn).
<b>Roundabouts (for SimTraffic)</b>	An example with two roundabouts	Yes	This example shows two roundabouts at the terminal points at a diamond interchange. It illustrates how simulating multiple roundabouts can be done with SimTraffic.
<b>Single Point</b>	An example of a single point urban interchange (SPUI)	No	This example also includes a portion of the freeway showing the merge and diverge areas.
<b>Single Ring</b>	Example showing coding with one ring (instead of dual ring)	No	In this example, the ring and barrier designer was modified (Options> Ring and Barrier Designer)
<b>Spillback blocking</b>	Example that shows the queue delay (Spillback) between adjacent intersections	No	Notice the high Queue Delay (Timing Settings) at node 1. This is due to vehicles spilling back from node 2 and blocking node 1.
<b>Starvation</b>	Example that show the queue delay (Starvation) between adjacent intersections.	No	Notice the high Queue Delay at node 2. This is due to poor offsets starving intersection 2. That is, node 2 EBT turns green, however, the vehicles are held back at node 1 causing unused capacity.
<b>Two way traffic control</b>	Example that illustrates a one-lane bridge	Not Applicable	In this example, a dummy intersection is created on each end of the "bridge". Notice use of <i>Hidden Link</i> feature. The intersections are clustered and operate as phase 1 then 2 (thereby, only allowing one direction at a time). Notice the long all-red period that is used to clear the traffic before the opposing phase begins.

\* The current version of Synchro 9.0 implements the HCM 2010 computational engine (version 7.12).

## Chapter 4 - What's New in Synchro and SimTraffic

This section summarizes the changes between Synchro version 8 and version 9. Be sure to fully read this section if you are a user of previous versions of Synchro.

### Customizable Tool Bars

The Map View within Synchro 9 includes a new and enhanced look. Each of the toolbars can be moved to anywhere within the Map Window as well as be customized based on user preference. The following provides a few features of the customizable tool bars:

1. Dock individual tool bars anywhere within the Map Window, as well as float within the monitor display, including multiple monitors.
2. Create custom tool bars based on user preference.
3. Choose between small and large icons for ease in navigation.
4. View only commonly used features on the main drop down menus.

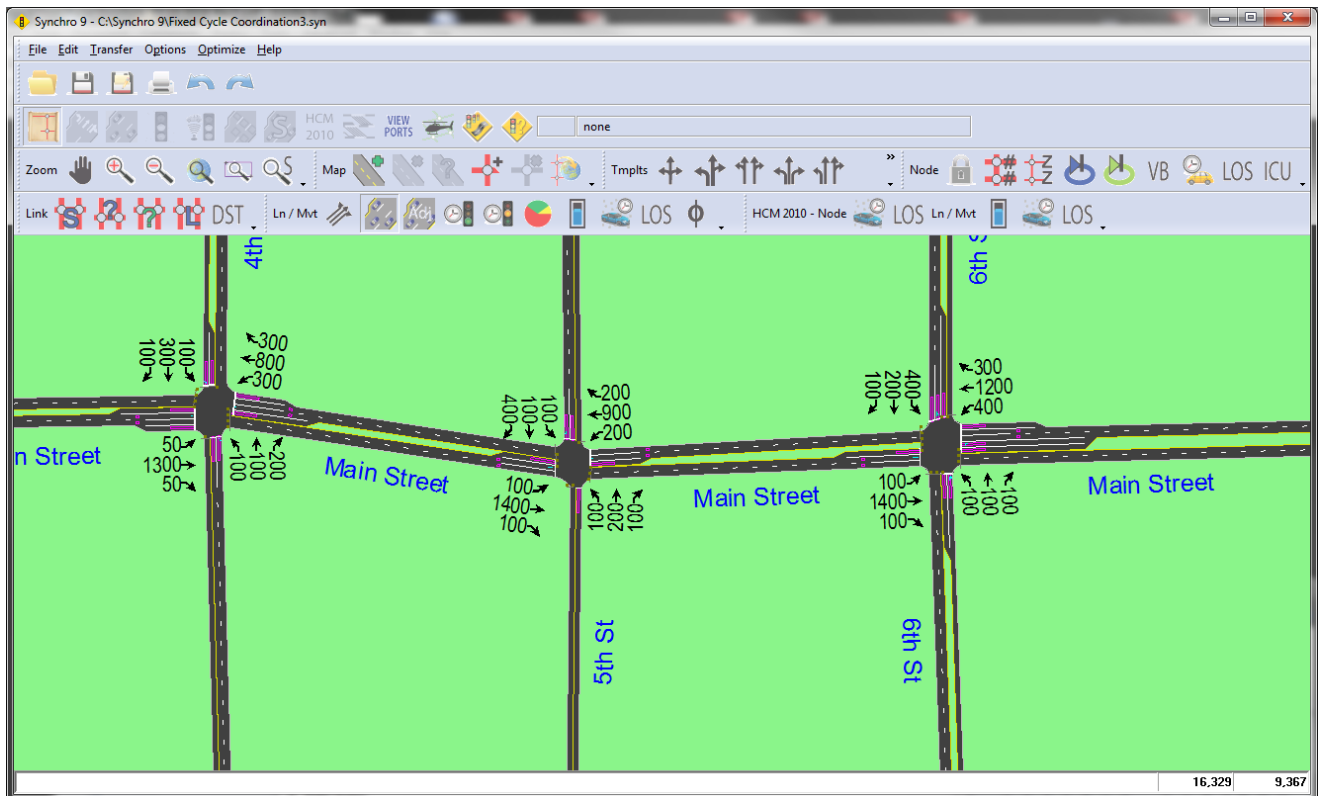
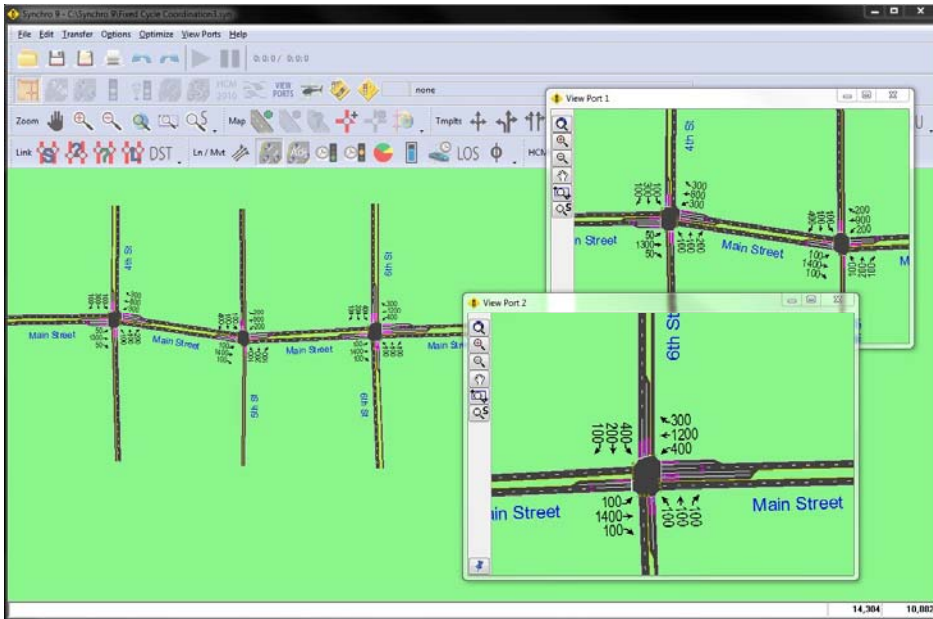


Figure 1 Synchro 9 Map View with New Tool Bars

### View Ports

Users have the ability to create up to four (4) View Ports within the Synchro Map View Window. Each View Port is independent of each other, thus allowing users to zoom in or out without affecting the roadway network within the main Synchro Map View window.



**Figure 2** View Ports

## Templates



Synchro 9 includes a powerful new feature (Templates) that can be used to quickly populate an approach or intersection lane geometry, timing, and volume input fields. Users can choose among the default templates or can create custom templates.

## Enhanced Optimization Functionality

Users now have the ability to add weighting factors during the optimization routine. The weighting factors can be applied to individual phases or directly to the reference phases. The following provides a few features of the enhanced optimization functionality within Synchro 9:

1. Detailed measures of effectiveness (MOE) summary table created directly within Synchro.
2. Ability to export three MOE summary tables to .csv files.
3. Summary tables can be appended after making final timing adjustments within Synchro
4. Weightin factors during the offest optimization routine can also be conducted.

Cycle	Node	Approach	Lane Group	Zone	Index	Queue Delay (hr)	Total Delay (hr)	Delay Per Veh...	Total Stops			
100					237	0	195	22	14922			
110	1				43	0	37	4	2197			
	2				69	0	60	7	3276			
	3				44	0	36	4	2905			
	4					EB	1	0	1	0	54	
						NB	6	0	3	0	1106	
						SB	L	0	0	0	0	12
							TR	2	0	2	0	276
						SB Total	3	0	2	0	288	
	WB	4	0	3	0	176						
	4 Total					14	0	9	1	1624		
	5					7	0	5	1	592		
	6					EB	1	0	0	0	25	
						NB	L	0	0	0	0	3
							R	0	0	0	0	0
T							10	0	8	1	628	
NB Total						10	0	8	1	631		
SB	7	0	6	1	496							
WB	8	0	7	1	353							
6 Total					26	0	22	3	1505			
15					3	0	2	0	297			
24					15	0	12	1	1329			
32					13	0	10	1	1323			
110 Total					235	0	193	22	15048			
120					230	0	187	21	15585			
130					231	0	188	22	15256			

Figure 3 MOE Summary Table

### Default Network Settings

Synchro 9 includes value updates to a few key traffic signal parameters. In addition, a few parameters were added to the Network Defaults Settings window.

1. Default pedestrian Walking Speed updated to 3.5 ft./sec (MUTCD).
2. Default All-Red Time updated to 1.0 sec (FHWA)
3. Default Minimum Initial updated to 5.0 (FHWA)
4. Default Walk Time updated to 7.0 sec (MUTCD)
5. Emission factors added to Network Settings and can now be adjusted.
6. Area Type and Adj Parking added to Network Settings.



## Changes for HCM 2010

TRB released Computational Engine 7.12 that included a few updates to the signalized intersection methodology. Synchro 9 includes the updates as well as a few additional enhancements. The following includes a summary of the HCM 2010 updates:

- Corrections based on the computations when an approach had no shared lanes and no detection.
- Corrections for exclusive left-turn lanes with permitted or protected-permitted operation AND opposed by a single lane approach.
- Two changes were made that affect the results obtained for single-lane and two-lane approaches with shared permitted left-turn operation.
- Addition of the analysis method for the HCM 2010 TWSC Pedestrian Mode. Figure 4 depicts a sample of the Synchro input/output screen for the analysis of pedestrians at TWSC intersections.

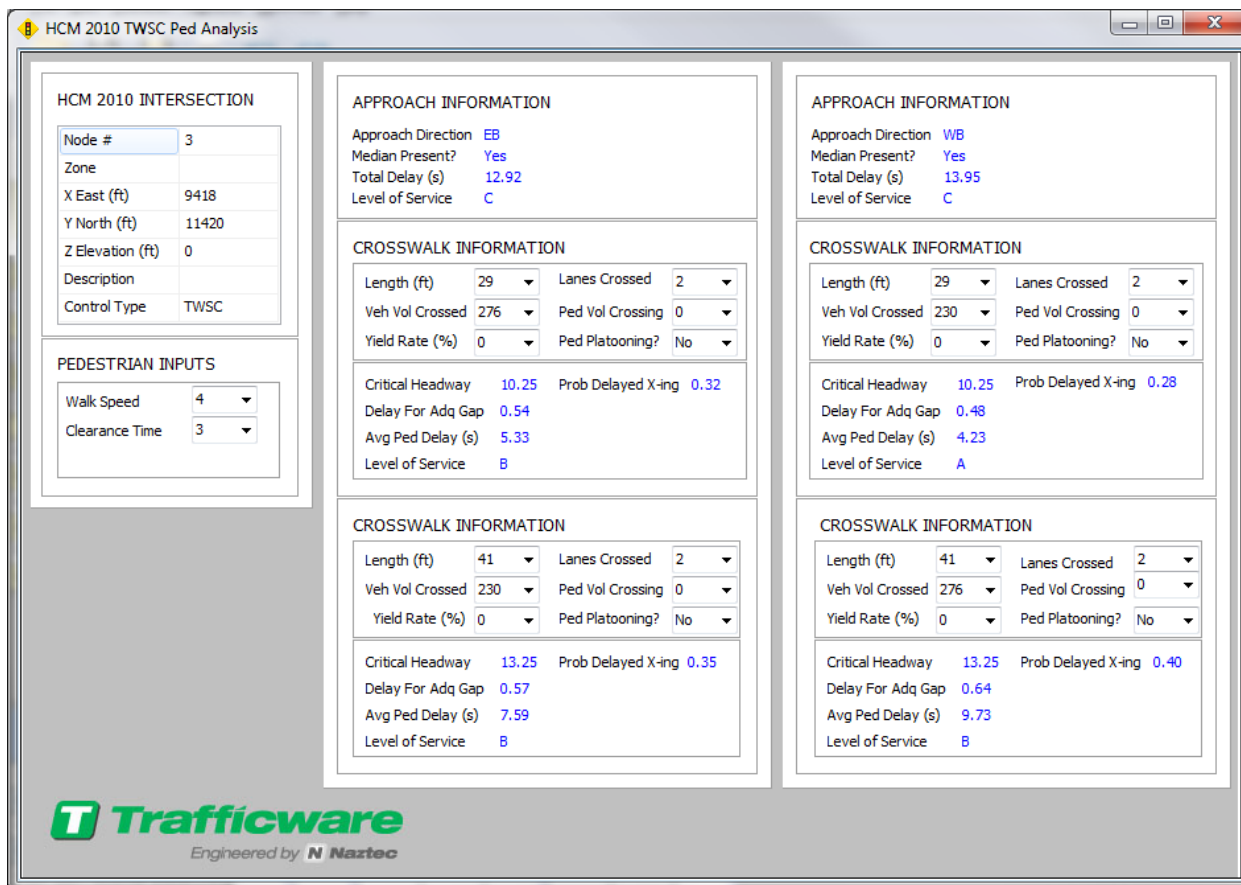


Figure 4 2010 HCM Signalized Intersection Pedestrian Mode Screen

## Chapter 5 - What's New in TripGen 2014

### Introduction

TripGen 2014 is a simple, easy-to-use tool for estimating the number of trips expected to travel to/from a development consisting of one or more land uses. TripGen 2013 - Build 804 was Trafficware's initial release of TripGen. The latest release (TripGen 2014) has been updated with a few new capabilities. A few of the enhancements include;

- New Add Land Use button on the main screen
- Export calculated trips to a .csv file.
- Additional report options

TripGen 2014 also includes the following features:

- Trip generation rates based on the 8<sup>th</sup> & 9<sup>th</sup> Editions of Institute of Transportation Engineer's (ITE) Trip Generation Manual are now available
- Land uses categorized by alternatives and/or phases
- Create and save custom pass-by & internal capture rates for future use
- Create and save custom labels for alternatives, phases, and land uses
- Viewable charts and graphs displaying various trip generation attributes
- Driveway volumes determined based on user entered percentages

The analyst first configures the phasing of the proposed development. Land uses are then added by the analyst based on the desired independent variable and whether an average rate or equation should be used to calculate the number to trips. The analyst can then enter the number of driveways that access the intersection to determine the distribution among the various driveways. Pass-by trips and internal capture trips for mixed-use developments (NCHRP 684) are taken into account. Several reports are available for users to quickly review calculations. Future versions of the software will be integrated with Synchro, thus significantly reducing the time required to analyze traffic impacts.