scats™

SCATS Suite of Applications

NSW GOVERNMENT

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SCATSIM

SCATSIM is a suite of software that allows you to simulate your SCATS traffic network.

SCATSIM allows a network of SCATS controlled traffic signals or ramp metering signals on motorway entry ramps that are controlled by the SCATS Ramp Metering System, to be simulated by traffic micro-simulation software.

Traffic micro-simulation software (the "simulator") is widely used to simulate traffic networks to evaluate traffic performance, especially for proposals to implement road improvements. Most simulators by themselves can simulate traffic signals, but they cannot emulate the sophisticated control techniques of a traffic control system such as SCATS.

SCATSIM has three basic components:

- SCATS Core software
- WinTRAFF controller emulation software
- SCATS simulation hub.

SCATS Core

The SCATS Core components include SCATS Central Manager, SCATS Region, SCATS Access user interface and other support software. This is the same software as supplied for real-world systems. In simulation mode, SCATS Core can run faster than real-time in conjunction with the simulator which will run as fast as possible.

SCATS Core communicates with the simulated controllers in WinTRAFF in the same way that it communicates with controllers in the real world. Multiple SCATS Regions are supported, and each Region can control up to 250 simulated traffic signals which uses real-world SCATS configuration data.

WinTRAFF

The WinTRAFF software is the same software that runs in real SCATS traffic signal controllers but adapted to run on a personal computer.

A real controller is emulated by using the real-world configuration data. WinTRAFF emulates up to 250 traffic signal controllers. WinTRAFF communicates with the simulator, receiving data from the simulated vehicle detectors and sending signal colour change messages to the simulated traffic signals.

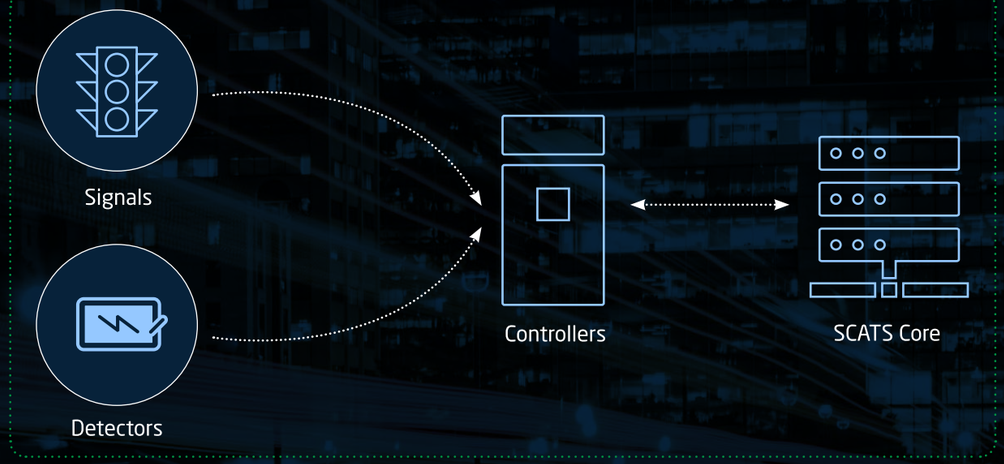
SCATS simulation hub

When multiple SCATS Regions need to be simulated, a separate instance of WinTRAFF is required for each Region. In this case, the SCATS simulation hub allows each instance of WinTRAFF to communicate with the simulator.

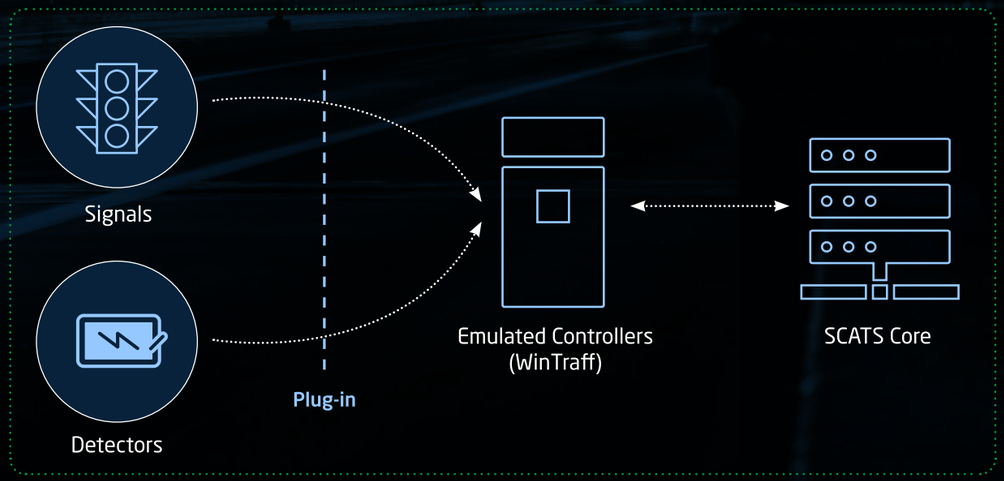
How it works

The diagrams below show the operation of SCATS Core in the real world and under simulation.

SCATS Core in real-world



SCATS Core in simulation



SCATS Communications Analyser

SCATS Communications Analyser is used to evaluate and collate data related to breaks in communication between SCATS traffic signal controllers and their associated SCATS Region.

SCATS Communications Analyser is an Intelligent Transport System (ITS) application that extracts data from SCATS event log files to gather information about:

Communication breaks: an interruption in data exchanged between a SCATS traffic signal controller and SCATS Region.

Fallbacks: traffic signal controllers switching from adaptive control by the SCATS Region, to localised control (e.g. Flexilink or Isolated), which can explain a break in communication to the SCATS Region.

Region faults: unexpected events that cause a SCATS Region to go offline, which may explain the communication break between sites.

Used to investigate communication issues, identify communication patterns and trends, locate problem sites and provides statistical data for reporting.

How it works

Data is retrieved from the SCATS event log files in Central Manager, decoded and visualised in text, table or graph formats for easy understanding and available to export.

Data can be filtered by selecting a date and time range, region, communication fault type, and fault cause.

Benefits

- ✓ Pinpoint communication break problems
- ✓ Identify patterns and trends in communication breaks
- ✓ Collate data for reporting
- ✓ Troubleshoot loss of adaptive control due to fallback
- ✓ Troubleshoot hardware malfunctions.

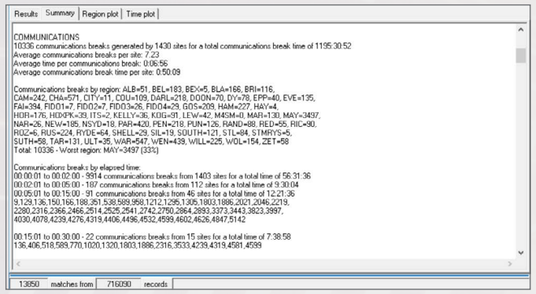
Capabilities

- Lists communications breaks, fallbacks and Region faults in a tabular view with sortable columns that can help identify specific areas of concern
- Analyses and collates statistics to help measure overall communication performance
- Visually identifies the Regions that are most heavily affected by communication breaks and fallbacks via Region plot graphs
- Visually identifies times of day where the communication breaks and fallbacks are most prevalent via time plot graphs
- Runs multiple instances of SCATS Communications Analyser to compare different data sets and study trends.

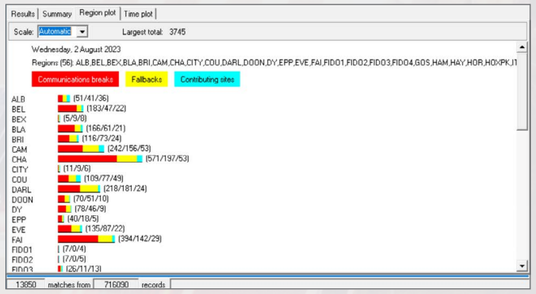
Features

- Reports communication breaks, fallbacks and region fault data, including start date, start time, duration, site, potential cause and remarks
- Provides a text summary of the communication breaks including statistics about the data
- Data can be filtered by criteria and is grouped by hourly time bands, showing communication up-time as percentages.

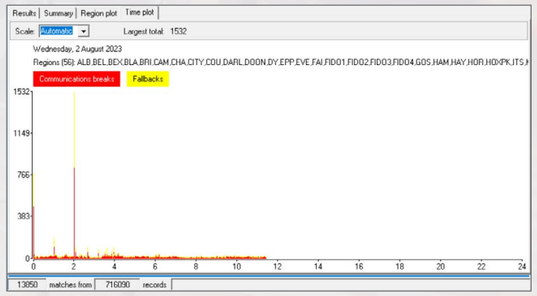
- Data is customisable to:
  - ✓ Exclude communications breaks and alarms from parked sites or test sites
  - ✓ Restrict alarms and communications breaks specific time periods for focused investigation (e.g. peak or off-peak periods)
  - ✓ Exclude irrelevant communication breaks
- Communication graphs display break and fallback data through Region and Time plot graphs



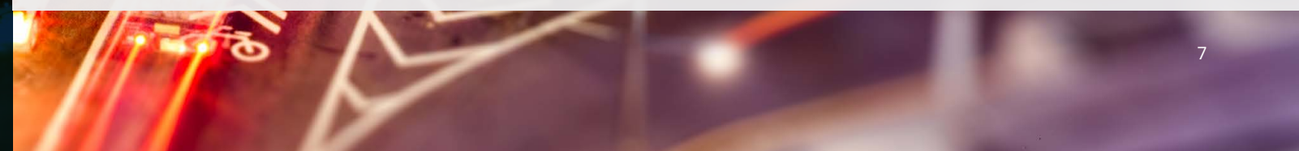
- A Region plot shows a graph of the total number of communications breaks and/or fallbacks and the total number of sites that caused them



- A time plot shows a graph of the total number of communications breaks and fallbacks for each minute of the day



- Region and Time plots can be scaled automatically or manually.



SCATS Detector Counts Viewer

SCATS Detector Counts Viewer is an Intelligent Transport System (ITS) application used to view detector count data stored in files.

It summarises traffic counts captured historically at SCATS sites for traffic modelling and diagnostics.

A detector count represents the total number of detector actuations within a specific time interval.

This detector count data is obtained from:

- **Detector count files - Volume Store (VS) format:** captures a log of detector counts and alarm information. This data is available in 5-15 minute intervals.
- **Detector data files - Detector Data (DET) format:** captures detector-related events for all sites within the Region. This data is available in the files in 5 minute intervals.

Both data formats are supported from SCATS Core version 6.9.3.11 and beyond.

How it works

SCATS Region generates daily detector count files, including counts for each configured detector at every site. These files are available for download and can be viewed using the SCATS Detector Counts Viewer (DCV).

SCATS Detector Counts Viewer can filter data based on various parameters such as detector count interval, date, time, location, and peak hours. It can also track and filter detector alarms and unknown counts.

Detector alarms occur when no detector actuations are identified, possibly due to faulty detectors.

Unknown counts are recorded when requested count data is not received from the controller.

This filtered data is crucial for analysing peak hours, intersection movements, and traffic flows. Additionally, it serves as valuable input for simulation, modelling and further analysis.

Features

- Detector counts for each site can be downloaded and viewed after midnight
- Responses are sent at the same time that the detector counts are written to file
- Shows site graphics from SCATS Picture
- SCATS Region can be configured to send detector count data to SCATS Central Manager.

Benefits

- ✓ Provides data and insights into peak hours, intersection movements and traffic flow
- ✓ Displays data in a tabular and graphical format for easier interpretation
- ✓ Files can be maintained for 365 days and backed up in an offline location
- ✓ Ability to create profiles to group detectors.

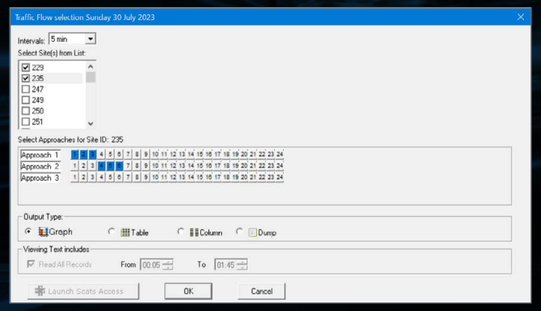
SCATS Traffic Reporter

SCATS Traffic Reporter is used to view historical data about the volume of traffic that passed through SCATS traffic signals, and the strategic decisions that SCATS made to those traffic signals.

SCATS detector count files contains information about the number of times each detector is actuated within a specific time interval. Loop detector counts are a good indication of relative traffic counts.

SCATS strategic monitor files contain information about strategic decisions made by SCATS in order to control the incoming traffic and these traffic signals.

Both are binary files that Traffic Reporter retrieves from Central Manager decodes so that users can view and analyse this data further, to determine patterns, trends, and troubleshoot unexpected decisions that SCATS made in order to control the traffic.



Traffic Reporter user interface

How it works

Traffic Flow: Detector count data is collated for selected sites, approaches and time intervals. Traffic volume is visualised graphically plotting volume counts at 15-minute intervals for each approach. Data can also be presented in a tabular format which is divided into AM and PM blocks and counted at 15-minute intervals.

Strategic Monitor: Strategic approach data, link data and plan data is collated for a selected sites and sub systems.

Active plans, voted plans, cycle lengths, strategic approach control, degrees of saturation and vehicle counts are displayed in table format.

System and strategic data is visuliased in either graph format, and includes, split plans, link plans, cycle length, link status and phase split, phase time, degree of saturation volume.

Benefits

- ✓ Examine traffic flow data, look for patterns and foresee trends
- ✓ Determine the performance of sites and sub systems to make data informed decision for optimisation
- ✓ Interrogate the information further by refining dates and locations
- ✓ Corroborate your findings with other factors such as manual traffic counts and system performance.

SCATS WinTRAFF and NGEN

WinTRAFF is a suite of software applications designed to test operation of an intersection and test SCATS by simulating intersections in a virtual environment.

It enables the testing of site operations (personalities) within a SCATS network without the need to configure and use controller hardware. Bench testing can be performed to ensure efficacy, safety and accurate site operation prior to real-world deployments.

There are 3 WinTRAFF applications available:

- WinTRAFF Single
- WinTRAFF Simulation
- WinTRAFF Test.

All applications are available in VC5 and VC6 variants.

WinTRAFF Single

WinTRAFF Single is a traffic controller emulator which runs the standard SCATS-compatible controller algorithm TRAFF.

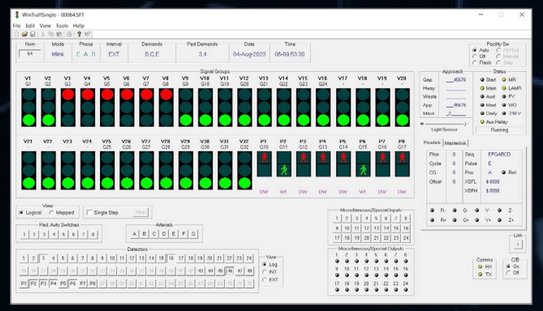
It can be used to test:

- The operation of a single intersection
- TRAFF behaviour
- Standard TRAFF personalities
- Communications with SCATS
- Integration with C-ITS and V2x: used in conjunction with SCATS Cit-e to communicate Signal Phase and Timing (SPaT) and Map Message broadcast to connected autonomous vehicles (CAVs).

How it works

WinTRAFF Single is packaged as a standalone application and is manually controlled by the user. It allows for detector and pushbutton actuation via the user interface or an input file.

It's useful for controller manufacturers, personality creators and researchers.



WinTRAFF Single user interface

Features

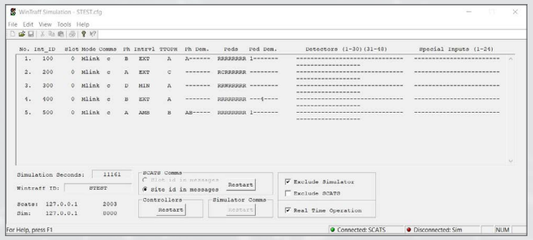
- Full control over execution speed:
  - slower than real-time (0.1 or 0.5 speed)
  - real-time
  - faster than real-time (2, 5, 10 times speed)
  - a single processing step (100-millisecond)
- For each detector and pushbutton, allows the following data to be set, so that it can be automatically turned on and off:
  - simulation status (enabled or disabled)
  - on time & off time (deci-seconds)
  - optional controlling signal group
- Works both when connected to SCATS (Masterlink) and disconnected from SCATS (Isolated)
- Emulates the controller hand-held terminal (HHT).

WinTRAFF Simulation

WinTRAFF Simulation is a multi-site emulator which runs the standard SCATS-compatible controller algorithm TRAFF.

It can be used to test:

- Multiple traffic controllers up to a whole region or network (each instance can simulate up to 250 intersections)
- The operation of SCATS coordinated and adaptive algorithms.



WinTRAFF Simulation user interface

How it works

WinTRAFF Simulation is packaged as part of the SCATSIM simulation suite. WinTRAFF Simulation accepts inputs (detectors, pushbuttons, special inputs) from a 3rd party simulator software, and sends its outputs (signal group colours) to the 3rd party simulator.

It's used to evaluate road network performance and fine-tunes SCATS data.

It can be used by urban planners, traffic microsimulation developers and SCATSIM users.

Features

- Choices of simulation speed:
  - real-time
  - faster than real-time (dependant on system resources and simulation size)
- Offers scalable simulations through flexible connection options
- Operates automatically when connected to a simulator or a SCATS environment for testing purposes.

WinTRAFF Test

WinTRAFF Test is a multi-site emulator which runs the standard SCATS-compatible controller algorithm TRAFF.

It can be used to test:

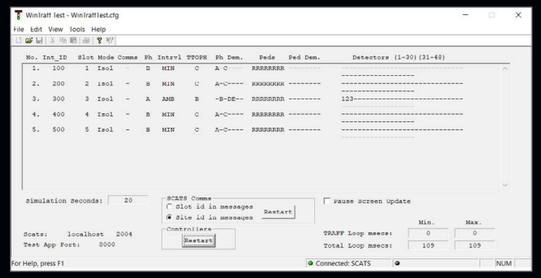
- Multiple traffic controllers up to a whole region and network-wide
- The operation of multiple intersections (up to 250)
- The operation of SCATS coordinated and adaptive algorithms
- The load capacity of SCATS.

How it works

WinTRAFF Test is packaged as part of the SCATS ITS Developer Kit. It allows for automatic detector/pushbutton actuation via:

- JSON Input file
- Test application connected via a TCP socket

It can be used by SCATS and TRAFF developer, testers and users of the SCATS ITS Developer's Kit.



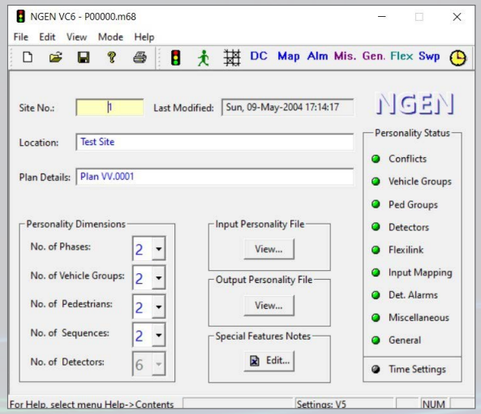
WinTRAFF Test user interface

Features

- Operates independently in a SCATS environment, eliminating the need for a separate simulation tool
- Can set up detector simulation rates by reading data from a file
- Runs simulations in real-time
- Helps operators to optimise SCATS configuration.

NGEN

NGEN is an application that facilitates the generation of 'personalities' or configuration data for Traffic Signal Controllers (TSC). These personalities specify the operation required of a TSC at each site.



NGEN user interface

How it works

NGEN software creates personalities based on data and ensures the data is sense checked, complete, and consistent.

NGEN can utilise a standard set of tables that can be used as a starting point to define the unique attributes of the site.

Once the personality is developed, it can be tested using WinTRAFF Single to verify its correct operation.

NGEN is used by traffic engineers, adaptive personality developers, and system integrators when implementing new intersections.

Features

- Performs error checks on imported personality data
- Validates imported personality data against standard tables (where used)
- Generates time settings and cross-checks personality data
- Provides personality "health" status. Red LEDs indicate an error, whilst Yellow LEDs indicate the need for attention across sections of data
- Produces personality documentation for saved personality and time settings data
- Generates the binary personality file for installation and use by the TSC.

SCATS ITS Port and ITS Developers Kit

SCATS Intelligent Transport System (ITS) Port is a software interface that enables two-way data exchange between a SCATS server application and an external ITS application.

ITS Port is used to exchange messages between the SCATS server application and the ITS client application using a published protocol for successful data exchange.

- **SCATS server applications:** Central Manager and Region
- **ITS client applications:** developed by SCATS, SCATS' users, or third-party organisations

How it works

ITS port uses Transmission Control Protocol (TCP) or Internet Protocol (IP) for its communication. An ITS client application requires a license that must be registered with a SCATS server application before communications can be established.

Features

ITS Port enables client applications to request up to 30 different messages that provide a status of the SCATS network, including;

- View a site's alarms, a sub-system's status, or a detector counts
- Site graphics from SCATS Picture
- Action lists
- Regional and controller details
- Site status
- Strategic monitor
- Make requests for manual site interventions such as applying dwells and locks
- Prevent access to the SCATS server by denying unauthorised message exchange.

Licensing

Two ITS Port licenses are required to enable an ITS client application to connect to the SCATS network.

- **ITS client license:** used by the external ITS client application
- **ITS server license:** used to register the ITS client application, and thereby allow access, to a specific SCATS server application
- The ITS Port license defines the types of messages that can be exchanged between the client application and the server application.

ITS Developers Kit

An ITS Developers Kit is available on request. This provides 1 Central Manager, 1 Region containing 13 sites, plus the necessary ITS Developer Licences to develop a custom ITS client application.

ITS Developer's License is used to develop and test ITS applications before they are enabled.

ITS Commercialisation Licence

This is available on request. Please contact your SCATS sales representative or email scatshelp@transport.nsw.gov.au

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Move Smarter

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For more information, contact **scatshelp@transport.nsw.gov.au**

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