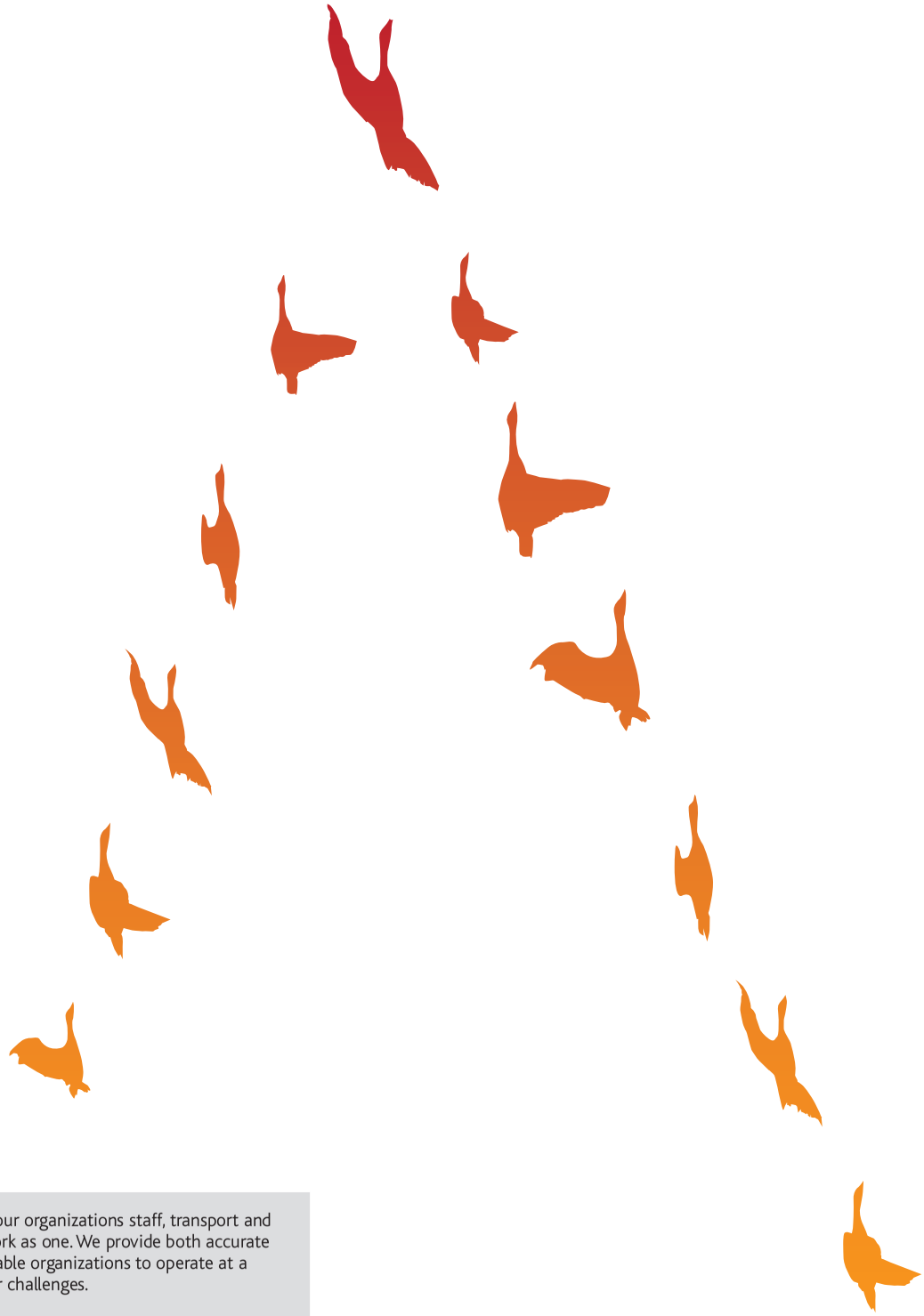


optima predict

# Predict

By using advanced mathematical based technology we fuse your organizations staff, transport and the community's requirements together to enable them to work as one. We provide both accurate 'real time' and 'long term' strategic recommendations that enable organizations to operate at a higher level of efficiency, make better decisions and face fewer challenges.

# IMAGINE BEING ABLE TO ACCURATELY SIMULATE ANY "WHAT-IF" SCENARIO.

What would happen if your operation experienced a 10 percent increase in call volume? Would you be able to present a compelling case for increased system funding? If hospital offload times increased or if one of the hospitals in your community closed or changed specialization, how would it impact your staffing requirements and response times, and what would you do to ensure performance was maintained? What would happen if you changed the mix of crews and vehicles at certain bases? What would happen if there was paramedic strike action planned?

When it comes to handling the unknown, you can't afford to rely on an intuitive guess. Strategic planners in today's emergency services require intelligent decision support at their fingertips. Optima predict[tm] is the only commercially proven simulation based planning solution that has been designed specifically for emergency services. Optima predict[tm] enables operations and planning personnel to model endless "what-if?" scenarios and examine the likely benefits (or otherwise) of those scenarios.

Optima predict[tm] is an interactive strategic planning solution for emergency services that provides a platform for effective planning and simulation of resource requirements. Optima predict[tm] takes into account key performance indicators such as response times, vehicle types and coverage, shift rosters, post locations and hospital ramp times to enable users to quickly build scenarios that make logistical and business sense.

Optima predict[tm] uses the simulation of emergency calls with the response to those calls, and sophisticated analytical tools to provide the critical feedback needed to make complex resource cost/benefit decisions. Optima predict[tm] provides decision-makers with the tools to optimize operational strategies and provides the evidence to support decisions.

Optima predict[tm] can be used to estimate call volume, for the coming year and beyond, test different coverage and posting plans, test alternative rostering strategies and then analyze their impact enabling the organization to select the most effective option and take action.

All of this is achieved by using Optima predict[tm]'s simulation and modelling capabilities before time, effort, resources and real money is spent on changing the operation.

A USER CAN:

- Analyze historic data to identify trends where response targets are not being met before they become critical

**Evaluate the impact of operational changes:**

- What is the performance impact of growth in call volume?
- What new demands will result from a new housing development?
- What is the impact of changes to response targets?
- How much performance improvement is gained from new dispatch rules?
- How does the closure of an emergency department affect the ambulance service?
- A hospital is no longer accepting cardiac patients: how does this impact workload?
- What is the impact of road closures or roadworks?
- What would happen if half the crew went on strike?

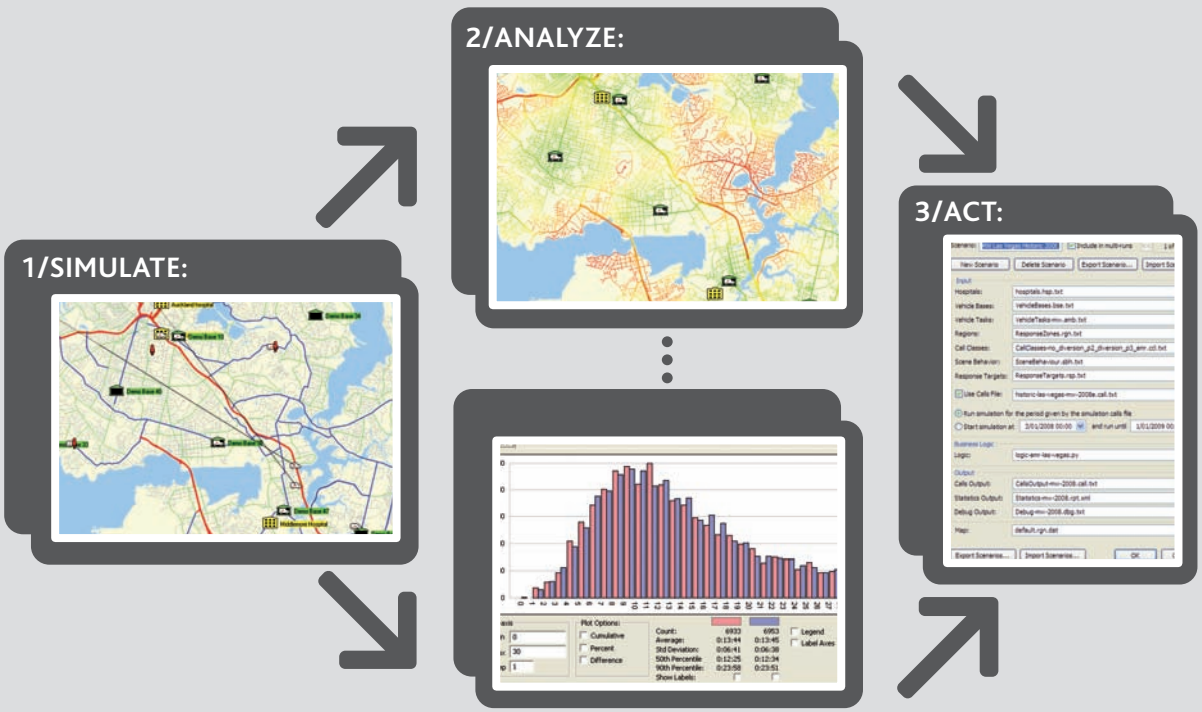
**Evaluate resourcing strategies:**

- What is the best location for a new base?
- Do we need a new base or can resources be added to existing bases?
- What is the impact of adding a new resource type?
- How does resource mix affect performance?
- Are all the vehicles starting at the right base?
- What is the impact of changing the staffing schedule?
- Do staggered shifts improve performance?

During implementation, Optima predict[tm] is configured to model the specific operation and tuned to ensure that it accurately simulates the historic behavior of the service. The range of scenarios that can be simulated is unlimited. The variety of graphical displays and reports provides rich information to easily compare the differences of performance between multiple scenarios which in turn provides solid evidence to make strategic decisions about the future management of the organization.

The illustration below demonstrates the process. First data is entered to identify any parameters of the operational model that are to be reviewed. Once the simulation is complete the results are analyzed, further changes to the model are made and then the simulation is repeated. The output of the simulation can then be used to make low risk, informed decisions about any changes to be executed within the organization.

## EVIDENCE BASED DECISION MAKING



# HOW DOES IT WORK?

Exploiting Optima's Operations Research expertise, Optima predict[tm] provides a sophisticated model that enables simulation of scenarios based on changes to calls, resources or business rules.

### CREATING A SCENARIO

An Optima predict[tm] scenario takes into account various inputs including incidents, available resources, and business rules to decide how resources should be used to respond to calls. A Call Generator is included that provides the tools to create and edit the input call file and hospital selection. In addition, the Resource Editors provide the tools to edit the available resources. At any time the at-scene business rules can also be modified.

### CALL IMPORT AND GENERATION

The call import function is used to import historic calls, allowing a user to keep Optima predict[tm] up to date with the current call demand. The call generator is a tool that enables the simulation to model any changes to historic calls reflecting projected call growth or changes to call categorization. These calls are used by Optima predict[tm] in processing its scenarios. The generated calls can be:

1. **Based on historic calls:**
   - Applying a simple, uniform growth rate
   - Applying variable growth rates by region
   - Copying calls from one area to another to simulate a new development
2. **Randomly generated**
   - Using statistical distributions

### RESOURCE EDITORS

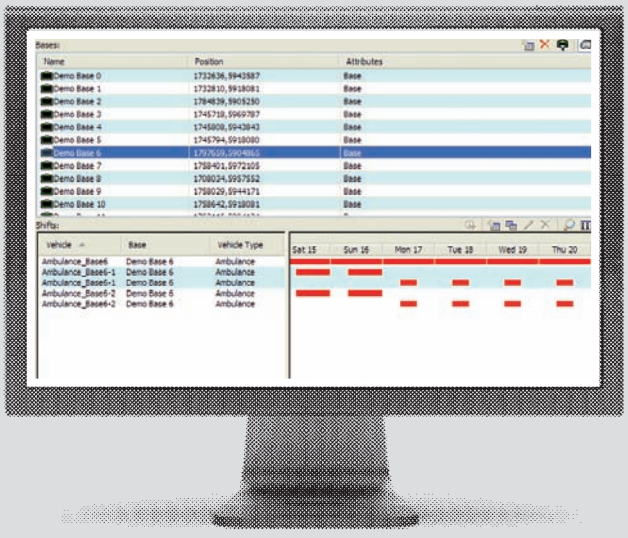
Each Optima predict[tm] scenario comprises a number of files that specify the availability of resources and the business logic describing which resources should respond to calls and hospital selection based on the call type. The resource editors make creating and editing scenarios a straightforward process, allowing Optima predict[tm] to be used every day as part of the service's planning cycle. The resource editors can be used interactively with visual feedback in the Graphical Display, allowing the user to drag and drop bases, hospitals and vehicles around the system quickly and easily.

### SIMULATION ENGINE

The heart of Optima predict[tm] is the simulation engine. Optima predict[tm] manages the full operational response from the start of the dispatch process until the resources clear the call at scene or at hospital. The simulation engine responds to each call, applying the business rules to dispatch the appropriate resources to each call, while managing the complex interactions created as other calls are processed.

Optima predict[tm] uses a highly tuned road network to provide realistic travel times for all vehicle movements. The travel times are calibrated for each customer using optimization techniques. These techniques account for traffic congestion by time of day, for lights and sirens and normal responses and are based on historic call and AVL data.

RESOURCE EDITOR



ROAD NETWORK

The road network display can be configured to show a number of options, including the road class, the drive-time coverage from bases or available shifts, allowing the user to visually analyze the coverage provided.

**Optima predict[tm] allows the user to edit the road network. This means they are able to:**

1. Close down a road entirely
2. Reduce the speed on a road
3. Edit each segment of a road

This allows the user to create scenarios that model major roadworks, road closures due to major incidents or the impact of special events on performance.

## ANALYZING RESULTS

When a simulation is complete, it produces output data that users can analyze and compare multiple scenarios. This enables them to identify and refine how to maximize performance improvement or fiscal accountability. Optima predict[tm], through the native graphical user interface and the Optima predict[tm] output reports, provides multiple options for analysis of scenario outputs.

## GRAPHICAL USER INTERFACE

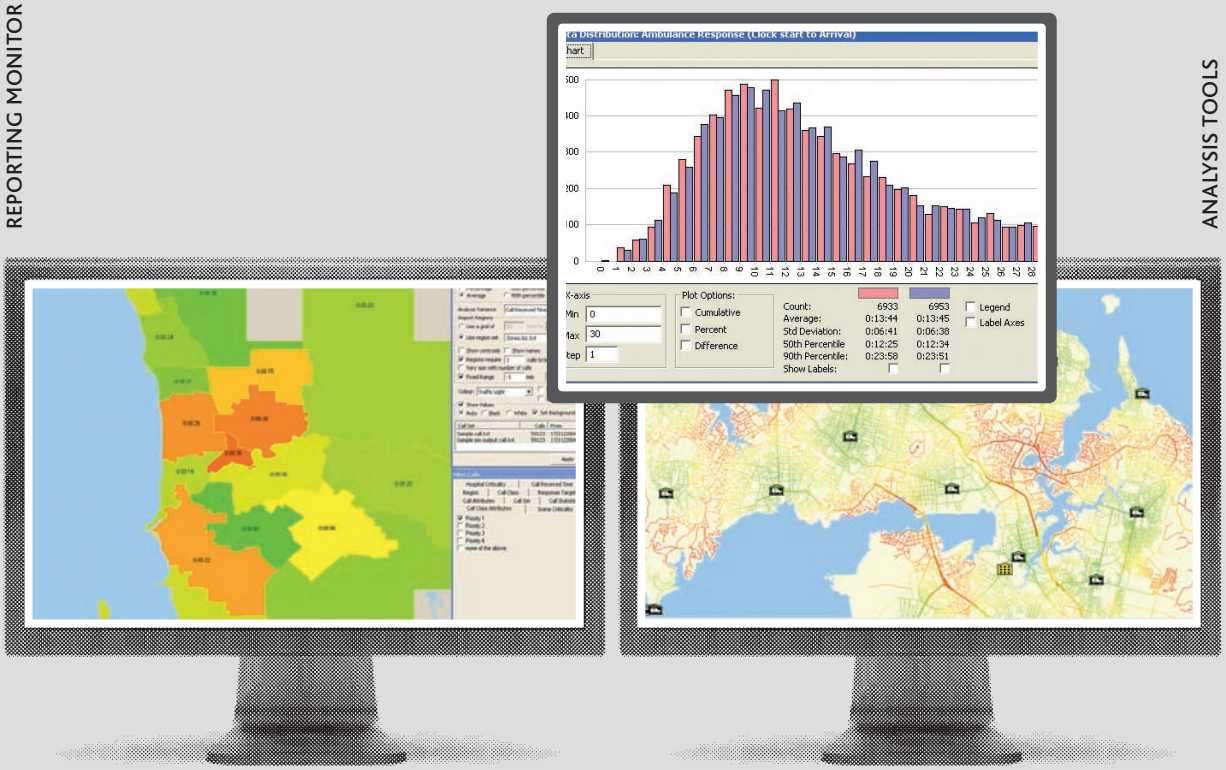
The GUI is used to create scenarios and view a scenario running in interactive mode. However, its primary purpose is to provide a number of analytical options to the user;

- View various call statistics
- By user selected region set
- By a user defined grid overlay
- Compare two or more scenarios
- Filter results by call or response attributes
- Display histograms for each of the statistics

## REPORTING

The results of each simulation run can be analyzed using graphical analysis and statistics tools. The user can make use of the flexible filtering, reporting and statistical analysis functions or make comparisons with other scenarios to identify the most effective strategies to implement. A comprehensive suite of reports is provided for each simulation run.

REPORTING MONITOR




ANALYSIS TOOLS

# MORE ABOUT SIMULATION

Simulation is "the use of a mathematical model to recreate a situation, often repeatedly, so that the likelihood of various outcomes can be more accurately estimated".

Discrete event simulation models have the unique ability to model and mimic the performance of complex real systems. Other models, including high-powered optimization models and analytical models, cannot take into account the dynamics of a real system and, therefore, provide less accurate results when evaluating strategies for system design or modification. This benefit of using simulation enables complex scenarios to be tested prior to any significant capital or operational expenditure.

**Discrete Event Simulation Models for Emergency Services**

An emergency services system is exactly the type of complex real-world system that can only be effectively modeled using discrete event simulation. These systems typically comprise the following components, all of which may act together to cause unforeseen interactions which directly impact the operational performance of the system:

- The number of incidents and responses to which the system must respond varies by time of day and day of week. The number of incidents typically increases annually and may have strong seasonal trends. While generally patterns in incident distribution exist, individual incidents are generally unique and independent of other calls.
- The location of the incident varies, generally having underlying patterns based on time of day and day of week.
- The type of incidents (call type) will vary by time of day, day or week, and may vary seasonally.
- The availability of resources depends on staff schedules and frequently varies by time of day, day of week. This is further complicated by shifts starting at different geographical locations

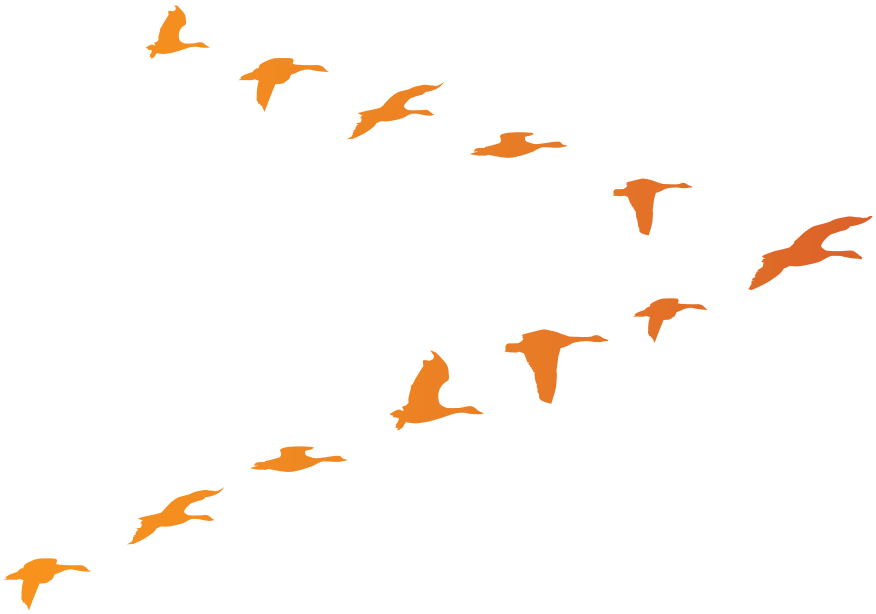
The time taken to drive on the road network (either to incidents or to other locations) is highly variable, depending on:

- Traffic congestion, with time-of-day and location effects.
- Road network features, such as bridges, one-way streets, long term construction and the potential for seasonal variation.
- Whether vehicles are operating in emergency or non-emergency mode.
- Where and when a vehicle becomes available is impacted significantly by whether the incident requires transportation of the patient to a facility providing the required services, the location of that facility, and how long the patient turnover process takes.
- The capability of different vehicles and the requirement for different types of responses to have different skill-sets dispatched to scene.
- The mandated/contracted operational policy, such as how to respond to the different types of incidents and the required at-scene resources and skills.
- Required response time performance measures that are applied to different types of incidents and/or to different geographical regions.

**Discrete Event Simulation Helps Solve Challenges with High Levels of Confidence**

The power of discrete event simulation allows the investigation of a broad range of possible changes in emergency service operations including impacts of:

- Changes in the prioritization of calls that result in different numbers of calls being responded to emergency vs. non-emergency.
- Changes to the skills required at scene which require changes in the dispatch rules. Specialized response to incidents such as STEMI, Stroke, collisions with entrapment, hazardous materials and others which can benefit from a multi-unit response can be modeled to assess their impact on response time performance achieved for all other incidents.
- How changes to hospital turnover times and increasing off-load delays impact response time performance and the associated financial impact of these.
- Hospital closures, hospital specialization, or new facilities can be investigated.
- Initiatives to reduce the number of calls that ambulances respond to, such as nurse triage, alternative destinations for patient transport, and treat & release.
- Many other proposed external changes or possible improvements to the system design or to mandated response times, performance measurements, geography, and changes to the road network.



Using simulation, the outcomes of the investigations into the examples described above as well as other scenarios, provides the empirical evidence to incorporate into resource planning, budgeting, and performance discussions. In all cases, management decisions can be made with the confidence that the discrete event simulation approach provides realistic modeling of detailed real-life behavior, essential to ensure that the impacts of the proposed change are actually captured in the model and accurately reflected in the response time performance.

**Discrete Event Simulation As Compared to Mathematical or Analytical Approaches**

Discrete event simulation models allow the development of detailed scenarios representing changes to any of the parameters (inputs) incorporated into the model. The scenario is run through the simulation model over an extended period of time (configurable by the service), collecting detailed statistics on key performance measures such as incident response time performance (as well as other intervals), vehicle utilization, and distance travelled.

The scenario is compared against the base-line scenario (historic system performance) to identify the benefits/costs of implementing that scenario in real-life. A range of alternative scenarios can be modeled to provide the empirical evidence on which to base the management decisions to deliver optimum performance.

Unlike simulation, simple calculations based on average unit task time and unit hour utilization calculations are not able to provide a detailed understanding of operational performance. They can also not illustrate how best to improve system performance with any degree of confidence that predicted improvements will actually be delivered "on the street". Similarly, analytic models are not able to provide the same high-quality insights into complex real-life systems as those provided by simulation models. Analytical models are required to make simplifications in model behavior in order to allow system of mathematical equations to be solved. For emergency response systems (emergency medical services, law enforcement and fire service) the best-known analytical model is Hypercube. This approach models an emergency system as a spatial queuing system and when solved it predicts the long-run system performance assuming vehicles are based at specific fixed stations.

Simple but important operational behaviors (especially within emergency medical services systems) such as diverting a vehicle from a low-priority call to a high priority call are not included in this model. Analytical models are not able to model the entire emergency response process without substantially simplifying assumptions about total time required to process a request for service and the patient transport phase of the incident. Since it is frequent that more than 50% of incidents within a busy emergency services system are assigned to units that are mobile and not actually at a fixed location (station or post), the key assumption within Hypercube (fixed station modeling) can substantially impact the accuracy of analytical model results. Analytical models are simply not as sensitive to changes in the system inputs as simulation models and are not as powerful as the more advanced and detailed discrete simulation models.

# KEY BENEFITS OF OPTIMA PREDICT™

Optima predict™ is designed to be used frequently: creating, running and analyzing scenarios that can be integrated into day to day planning processes providing users with up to date information. This information can be used to improve response time performance, to improve planning processes, and to improve your financial management.

**Improve response time performance by modeling the impact of operational changes on response time performance, including:**

- Analyzing alternative operational options prior to implementing potentially costly changes
- Analyze and evaluate resourcing strategies
- Detailed geospatial analysis of your historic performance

**Analyze and plan responses to day to day trends and pressures, such as:**

- Increasing call volumes
- Changes in call patterns and call response requirements
- Increasing pressures on resource utilization and performance

**Plan how to meet new business challenges and radical changes before they become critical:**

- New response models
- Changes to hospital services
- New resource types and resource mixes

**Take control using Optima predict™, with key features that include:**

- An easy-to-use, GIS-based user interface to run scenarios, analyze operational behavior and compare results
- A highly tuned road network to provide realistic travel times for all vehicle movement, calibrated specially for the service using advanced mathematical optimization techniques
- Customizable Resource Editors that let users easily specify availability of hospitals and ambulances, as well as the business logic describing how units respond to incidents
- Geospatial and statistical reporting, with flexible filtering and a wide variety of standard reporting formats
- Simulation modeling based on the proven scientific approach of Operations Research

**Improve your fiscal management by:**

- Helping ensure that new bases are in the right place
- Ensuring that new vehicles and staff are acquired only when needed
- Ensuring that vehicles are fully utilized
- Improving business cases by providing robust evidence

**Help keep operating expenses under control by:**

- Helping plan shifts to eliminate unnecessary overtime
- Ensuring utilization of only the vehicles needed
- Ensuring that only the bases that are needed are used and they are located in the right place

**Today's complex emergency services operational decisions require intelligent decision support. Put the power of Optima predict™ to work for your organization.**



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PEOPLE MOBILISATION