

# LEGION

## Legion for Olympic Games Planning

The Olympic Games is the largest single sporting event in the world. The Games attract hundreds of thousands of visitors, who will need to be kept safe and comfortable as they move through public infrastructure that has been newly developed or adapted for the Games. Keeping spectators safe and comfortable is a major management and security challenge. Typically, the majority of the crowds will lack any knowledge of their environment, so established behaviour patterns exhibited at regular domestic events will not occur. Also, operation teams will generally not have experience in planning or managing events of this magnitude. Failing to proactively address the event's challenges will have implications on costs, safety and risk management, and overall effectiveness.

Effective Olympic hosts plan for and manage the influx of Olympic visitors to a vibrant host city, in order to regulate congestion and safeguard people. They also strategically plan and rigorously implement provisions for security, crowd management and safety procedures. Typically, they apply best-of-breed solutions, balancing innovation with validated experience. For an Olympic host, success means:

- Integrating venues effectively with transport services, including for periods when demand surges due to event schedules;
- Improving operational efficiency through decreasing bottlenecks and increasing the effective capacity of the circulation routes;
- Safeguarding visitors by correctly assessing safe capacities, rehearsing for special conditions, and streamlining evacuation;
- Making the best possible financial trade-offs, by objectively assessing costs and benefits, maximising yield of available space, streamlining approval processes by reducing decision-making times.

The outcomes of successful planning are a positive image for the host city and an enjoyable experience for both athletes and visitors. Clearly, transport planning is integral to Olympic success.

In order to better prepare for the 2000 Games, the Sydney Organising Committee for the Olympic Games (SOCOG) commissioned crowd simulation services and consultancy from Legion. Legion provides a software system which realistically models how people move through crowded places and associated expert consulting. For SOCOG, Legion assessed how the fixed rail service would cope with the actual demands expected during the Games. Specifically, Legion's study considered how Olympic Park would integrate with a single, newly built train station providing the key service to and from Central Sydney.

The organisers planned for rail to provide the principal access for spectators attending events at Olympic Park. The capacity and frequency of the train service had been fixed prior to finalising the Park design. Actual demand for rail services to and from the Park on any given day of the games would follow sporting event schedules. The question for Legion was: How would the station cope?

To evaluate the station's performance, Legion simulation software was used to model departure patterns during peak hours, modelling each footstep of every spectator as they walked through the Park to the train station. These simulations showed that the surges in demand following the close of important event days would mean that queues of up to 48,000 people could be expected, with queuing times of up to 2.5 hours. This foresight led planners to devise a series of operational strategies to protect spectators' comfort and safety during this long waiting period.

With Legion, the planners tested a set of corrals to organise the queues within the train station (Figure 1). These corrals were implemented, and their effect was that people waiting to board a train remained orderly and comfortable. The corral system was supported by stewards and a public information programme advising visitors about the departure times and queuing they should expect.

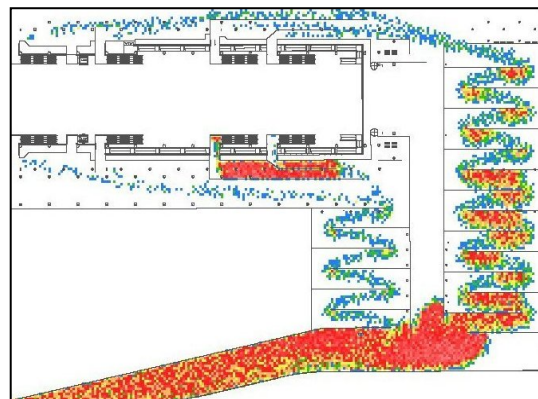


Figure 1: Corraling system at the entry to station

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In addition, Legion simulations assessed pedestrian flows in the proposed design for the Olympic Park (Figures 2 & 3). It was found that along Olympic Way, almost 2500 people would experience densities of over 5ppl/m<sup>2</sup>, which is the sort of unsafe and uncomfortable conditions experienced at the worst old football grounds. On the strength of Legion's findings and recommendations, the Park design was changed.

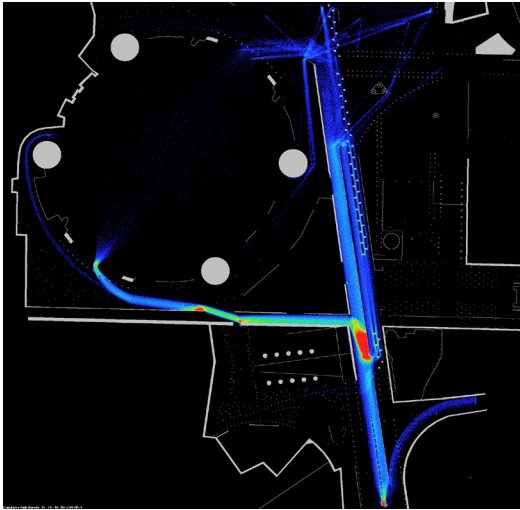


Figure 2: Unsafe congestion shown in red

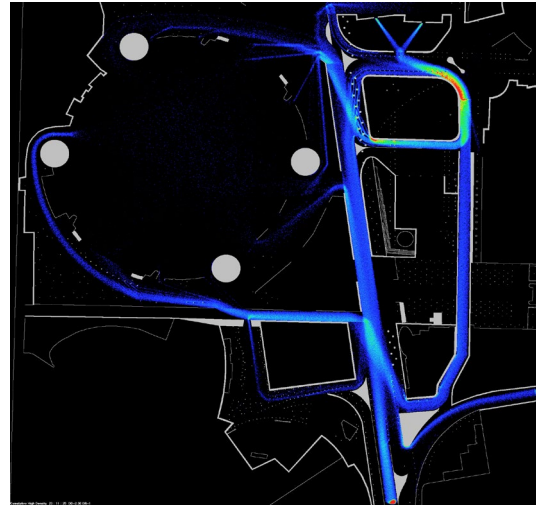
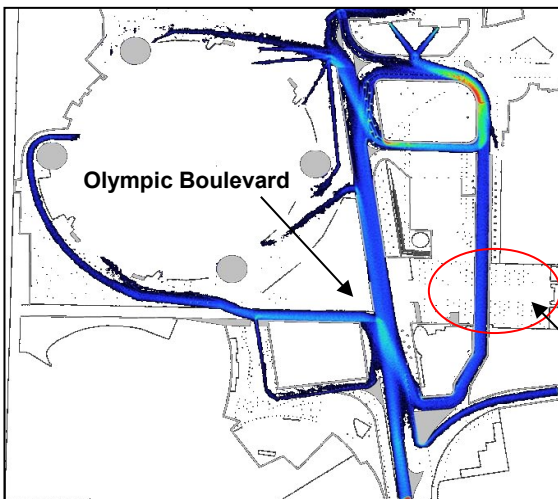


Figure 3: The bottleneck was designed out, with a comparatively low cost design change

In particular, a pedestrian footbridge providing a new access route to the Olympic Park Station was incorporated (Figures 4 & 5). The capital expenditure for this additional infrastructure was justified on the basis of improvements in pedestrian circulation rates through the Park quantified using Legion simulation software.



Figures 4 (left) & 5 (above): Congestion decreases on Olympic Boulevard with the adoption of the pedestrian footbridge over the rail tracks closing the circulation loop.

Train Station

Overall, Legion's involvement helped ensure that the redesigned Park integrated well with the local rail service. Legion's study:

- Quantified the impact of event schedules on rail service demand, showing how high demands impacted on people queuing
- Advised on a corral system to help manage the expected crowds waiting for train service
- Justified additional capital expenditure targeted to improve crowd circulation by eliminating key congestion hotspots

The result of implementing recommendations validated by the Legion software system was an Olympic Park that was safer, more secure and more effectively served by its local rail service.

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The positive impact Legion made on Sydney's Olympic success has been documented by Peter Ryan, who as Chief of Police of New South Wales was responsible for security at the Games and who now advises the International Olympic Committee on security, and by Jim Sloman, COO, Sydney Organising Committee for the Olympic Games, who observed: "This new generation of tools enabled us to actually see the human traffic flows, densities and use of space, well before taking irreversible planning decisions or implementing specific designs. In our view, Legion's scientific software has an important role to play in the planning and operation of large and complex public environments."

When a UK visitor to Sydney 2000 was asked about crowd conditions, he replied in his own words: "We expected long queues and crowding, but it was absolutely fine. We had a 4-month old daughter with pushchair. We were so taken with how easy it was that we did everything we wanted to do while at the Olympic Park. Friends of ours went back for an extra day and saw more events. It was a total joy getting around."



Overall, Sydney hosted what IOC President Juan Antonio Samaranch called 'the best Games ever'. The success in 2000 enhanced Australia's global reputation as an attractive tourist destination and an outstanding super-event host.

Saturday, 29<sup>th</sup> September, 2000, Sydney, Australia

Since delivering services to the Sydney Organising Committee for the Olympic Games, Legion has undertaken projects on behalf of a range of rail, metro and stadium operators. In every case, pedestrian simulation has provided reliable foresight about essential operational and/or strategic decisions.