Success Story

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—Fiona Love,
Director of Learning and Development,
StateRail

Australia's StateRail Employs SGI® Reality Center™ Technology to Improve System Safety

Employees Learn Advanced Accident-Avoidance Procedures in a Secure, Immersive, Virtual Environment

The Challenge

- Improve passenger and worker safety at StateRail, Australia's largest passenger railway system
- Provide an enjoyable and realistic teaching environment that will help workers learn to think quickly and prioritize their tasks when faced with dangerous operating situations.
- Do so with a facility that can train large numbers of workers each year

The Solution

Two interlinked SGI Reality Center facilities provide group immersive training environments with interaction through a train simulator. The training scenarios in the Reality Center facilities run on an SGI® Onyx® family 24-processor graphics supercomputer with 12GB of memory and six graphics pipes. Scenario images are displayed on two immersive 160-degree screens, 18 and 24 feet in diameter. Train simulation and scenario management software was designed by Sydac Pty., Ltd.

The Result

In just three months of operation, 3,500 StateRail employees have partaken in training on the Reality Center facility. Over 90% of participants have found the training to be stimulating and very useful, helping them improve reactions, task prioritization and communications skills

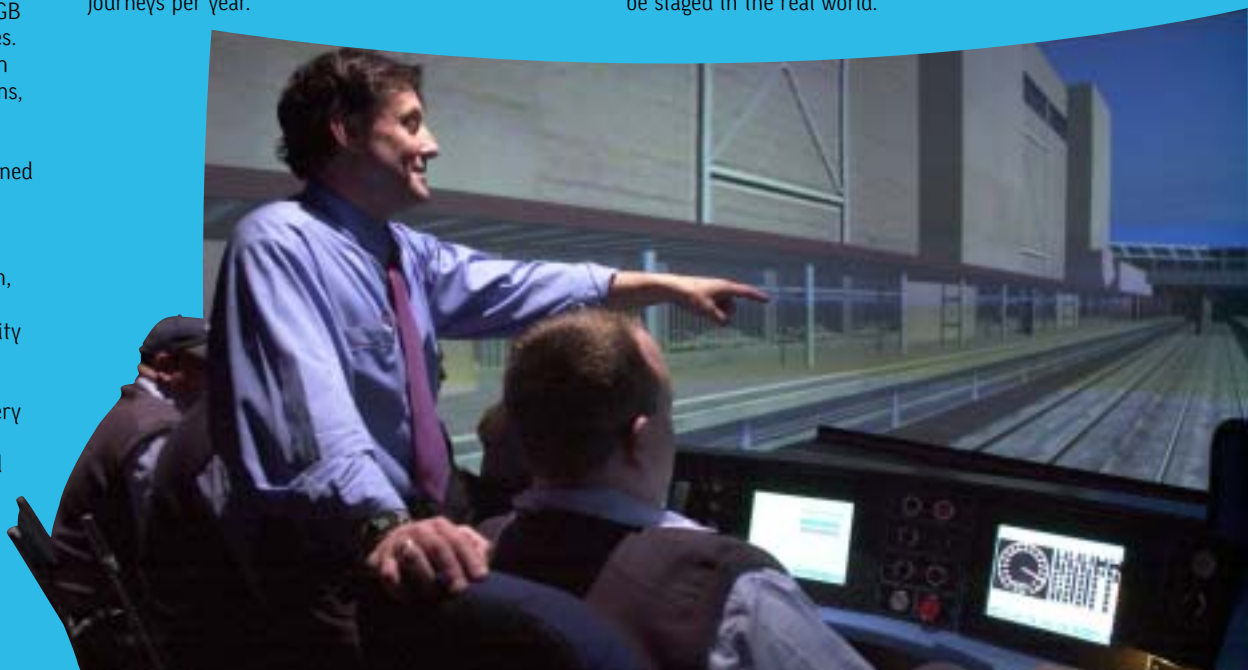
As the StateRail passenger train pulled into the station, the crew suddenly faced a hazard they had hoped never to see: a drunken man had fallen onto the tracks and was about to be run over. With little time to think the train staff leapt into action, smoothly communicating commands and successfully stopping the train before anyone was hurt.

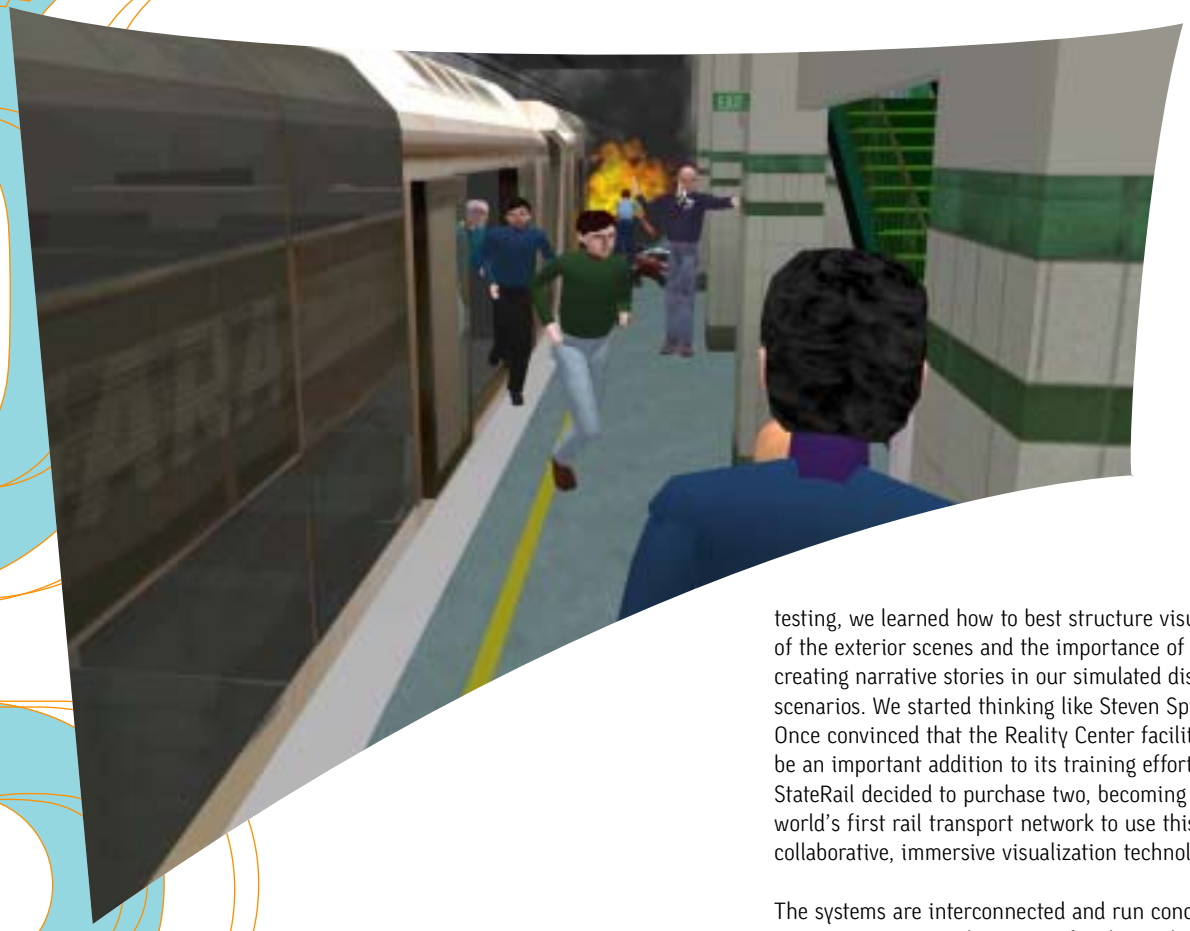
Fortunately, no lives would have been lost even if the train had failed to stop in time. This event was artificial, a scenario created for Australia's largest train operator using an immersive train simulator powered by an SGI Reality Center facility.

The 16 people undergoing training that day were part of a massive effort to help employees at Australia's largest passenger rail system respond better to sudden emergencies on their network of 4,900 miles (8,000 km) of track, serving more than 300 million passenger journeys per year.

While passenger security has always been paramount at StateRail, a tragic accident three years earlier caused the government and railroad to redouble their training efforts. To improve safety, the StateRail Authority instituted a dramatic change in its operational structure, switching from a rules-based to a risk-based operating environment. As a result, the former 17 volumes of regulations had been whittled down to one; employees would now be expected to act less according to strict rules and more through the use of critical thinking.

Doing so would be no easy task. "Many of our employees left school at an early age and weren't taught how to use their reflective skills," said Fiona Love, StateRail's director of learning and development. To prepare employees to be ready for the unexpected, StateRail needed a railway simulator that would help employees learn how to confront calamities that couldn't be staged in the real world.





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StateRail already understood the value of simulators for training employees, as it had been using them for driver training for the past decade. But the units were badly outdated and unreliable, analog systems with parts no longer available from the manufacturers. Participants quickly tired of them; the simulators had small screens and could run only one video loop. "With our old simulator, you'd watch the same shot of a seagull taking off from the end of the same station platform over and over for years," said Love. "Our employees were bored stiff looking at it."

For a simulator to actively engage personnel, it would need to actually model the real world. To do that, it would require an immersive, wraparound screen and real-time, lifelike graphics and multichannel sound. With such a system, drivers, guards, signallers, track workers, station staff , and others could safely learn how to fight fires and explosions and avoid hitting fallen passengers, debris, and other obstacles that could threaten lives and property, all while maximizing the safety of the network.

In 1999, StateRail entered into a research and development project with SGI and RMIT University in Melbourne to test a fire and evacuation module for the proposed simulator. "SGI never pressured us to buy their technology," Love said. "They wanted us to make sure that we first saw its value. Through the testing, we learned how to best structure visual angles of the exterior scenes and the importance of actually creating narrative stories in our simulated disaster scenarios. We started thinking like Steven Spielbergs." Once convinced that the Reality Center facility would be an important addition to its training efforts, StateRail decided to purchase two, becoming the world's first rail transport network to use this type of collaborative, immersive visualization technology.

The systems are interconnected and run concurrently using one partitioned SGI Onyx family graphics supercomputer with 24 processors, 12GB of memory, and six graphics pipes, making it the most powerful visualization system in Australia. Both Reality Center facilities display images in 160-degree fields of view, with one employing an 18-foot- and the other a 24-foot-diameter wraparound screen. Both are used for immersive training scenarios, while the room with the larger screen also provides a train cab from which drivers can operate a train and interact with the scenarios. The actual images, as well as the distinctive sounds of squealing wheels and brakes, are created using train simulation software from Australia's Sydac Pty., Ltd.

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After each simulation, the participants assess whether the steps taken to alleviate the emergency were appropriate. While the technology to create these situations is highly complex, those who participate in the training program, which began last July, perceive the environment to be low-tech and hence non-threatening. "Our Reality Center facility is development focused," said Love. "The atmosphere lends itself to creating an open discussion between participants."

StateRail knows that precise and professional communication between all employees must be fostered to provide the safest operating environment. To do so, the company will soon operate both Reality Center facilities collaboratively, creating a crisis and then testing the ability of all workers to cooperate to bring it to a positive conclusion. For example, a train driver using the virtual cab may suddenly see a worker on the tracks. At the same time, attendees in the other Reality Center facility, seeing the approaching train, will need to tell the driver via intercom the exact location of personnel and help him or her take the appropriate evasive action. In a second scenario, an instructor can purposely set the wrong route and then see how the driver responds and communicates his center problem to command centre personnel. In a third, a stalled car can be placed across the tracks, hidden beyond the driver's sight.

Not only must the driver stop in time, but he may also need to communicate his discovery to key station personnel and colleagues in nearby trains. Computers will measure the time he takes to stop the carriage; once the emergency is over, participants will evaluate whether verbal communications were clear, appropriate, and timely.

StateRail expects that all rail safety employees will participate in Reality Center training twice each year. While the technology has been in operation only since August 2002, early indications are that its use is bringing strong dividends to the rail system.

Satisfaction with the training is very high. "Participants are very positive about their Reality Center experience," said Love. "More than 90% of those who undergo training on the Reality Center facility truly enjoy it and believe that it will be helpful to their work." Next, rail officials will evaluate how specific behaviors, such as the ability of guards to open and close doors efficiently and safely, have improved after training.

"The arrival of Reality Center facilities at StateRail now is incredibly timely," said Fiona Love. "The technology has given us a unique way to help employees learn how to reflect upon a situation and constructively comment on the actions of their colleagues during a crisis. With the support of our Reality Center facilities, we believe that within the next five years we'll see a dramatic improvement in overall safety. The safe transportation of our passengers and crew is StateRail's primary goal."

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