

# Intelligent CCTV Project with Queensland Transport and Port of Brisbane

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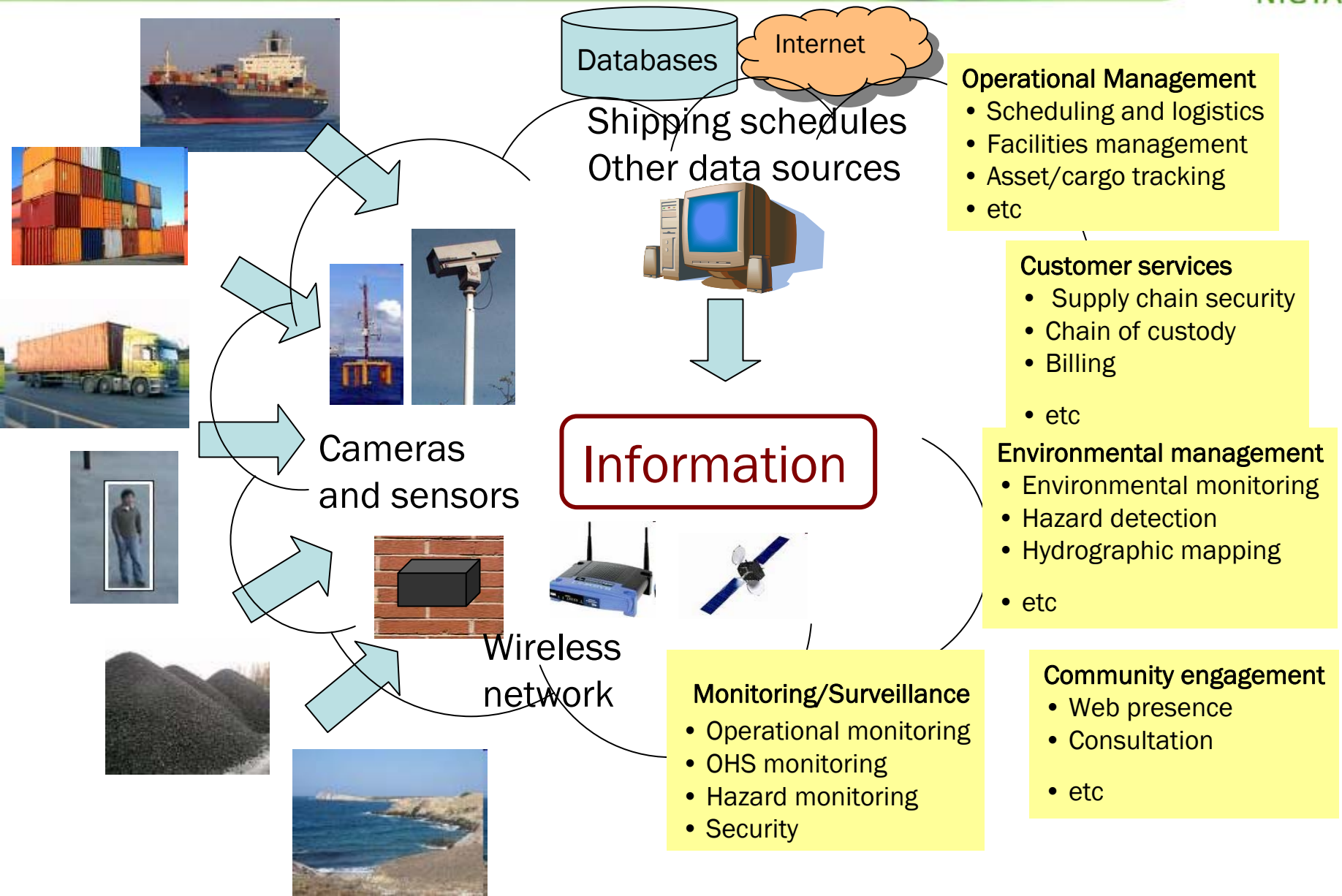
Australian Government  
Department of Broadband, Communications  
and the Digital Economy  
Australian Research Council

NICTA Members



NICTA Partners

# Information & Communication Technology (ICT) in Ports



# The Need for Intelligent CCTV

- The project is to evaluate and develop state-of-the-art technologies for protection of Critical Infrastructures. The project partners in this project are Port of Brisbane and Queensland Rail.
- Help prevent crime and terrorism in areas with public access such as transport centres
- Examples
  - identify and track persons of interest
  - detect persons performing dangerous acts before an accident occurs
  - Monitor vehicles and persons of interest at a port





Incident



# NSST Project



NICTA is currently undertaking a \$1.016M contract project funded by Department of Prime Minister and Cabinet. Project started on 1 July 2009 and solid progress has been made over the last 7 months.

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As of last week this Project is now linked to a similar US DHS funded project at LA Long Beach.



# Project Aims



- Build and evaluate vision algorithm within a calibrated 3D environment to mitigate the effects of object occlusion, and provide the estimated location, speed, and dimensions of people and vehicles.
- Develop a framework for situational analysis using data fusion from multiple sources. This will include the integration of CCTV sensors with a wireless mesh network of local sensors to measure wind speed and direction, and which can locally detect invisible hazards such as toxic spillages and radiation leaks.

# Project Aims – Cont.



- Evaluate a range of advanced alarms available through our extensive research network from other leading international research groups – current candidates include
  - visual detection of smoke and fire
  - remote determination of a person’s height from CCTV
  - iris on the move biometric person identification
  - reliable visual detection of objects of interest in or on the water such as usually encountered in a maritime environment
  - mitigation of the effects of rain and fog
  - detection of explosive traces via remote laser spectroscopy.

# Enhanced Capabilities Being Developed and Trialed – Example : Poor Quality Face Recognition



- Computer monitoring of ALL cameras at ALL times, so events are not missed
- Reliable person identification services that will enable persons of interest to be detected, tracked, and monitored
- Identification of potentially dangerous people and the recognition of suspicious and dangerous activities
- Advanced presentation of video feeds in a 3D immersive environment instead of a confusing bank of video monitors



Khalid Al-Midhar



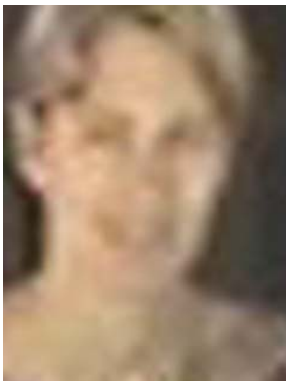
Mohamed Atta

CCTV photographs taken the day before the 911 attack



Both were on FBI watch list. If CCTV had been monitored, they would have been taken into custody.

## Examples of Typical Images NICTA FR can handle

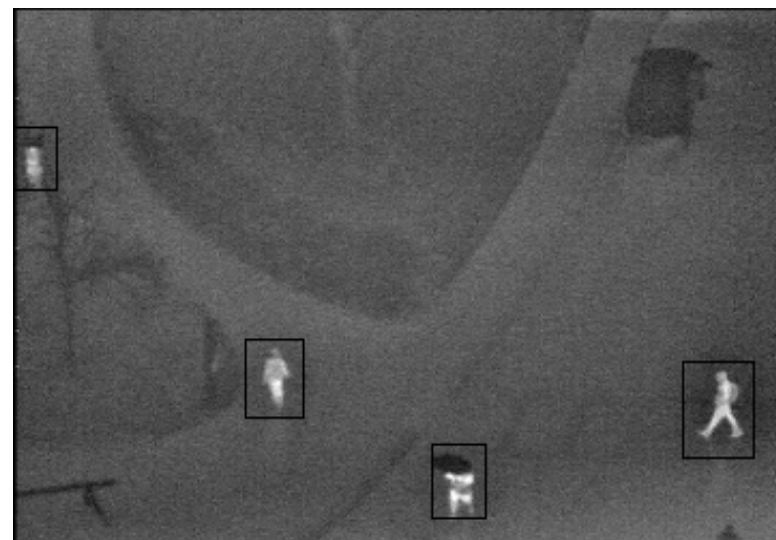


## Passport Quality Photo's



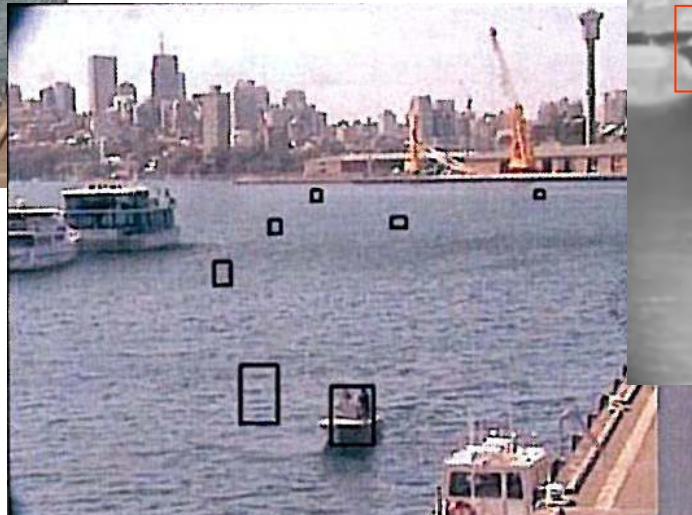
# People Detection & Tracking

- Have built “human classifiers” to detect people in images, using:
  - Visual imaging cameras
  - Thermal imaging cameras
- Techniques for tracking the movements of detected individuals over time



# Vessel Detection & Tracking

- Developing marine vessel detection & tracking employing a combination of:
  - Visual imaging cameras, and
  - Thermal imaging cameras



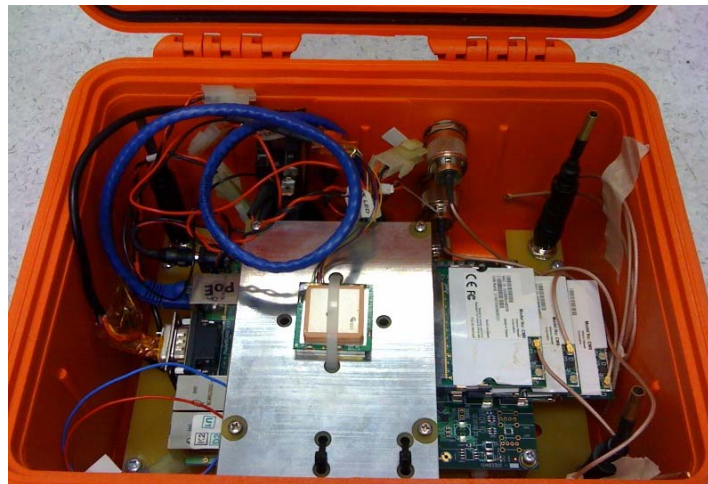
# Fog/Rain Reduction

- Video processing technologies to reduce the impact of fog & rain



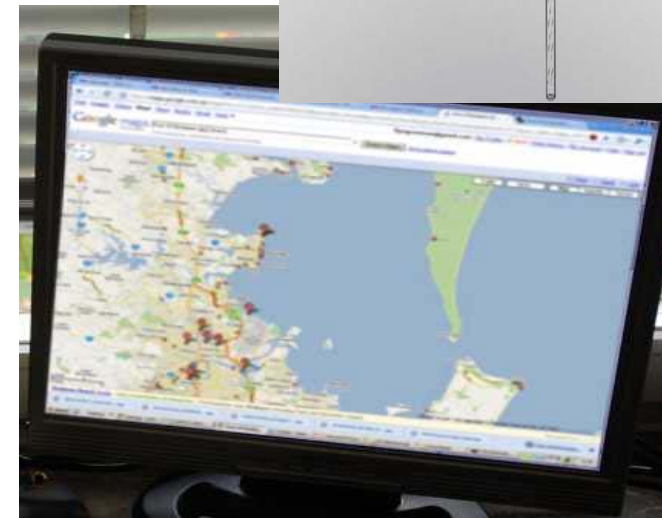
# Wireless Mesh Networks for Emergencies

- Systems for rapid deployment and automatic configuration of wireless networks for data, voice & video
- Scenarios: emergency situations



# Remote Environmental Sensing

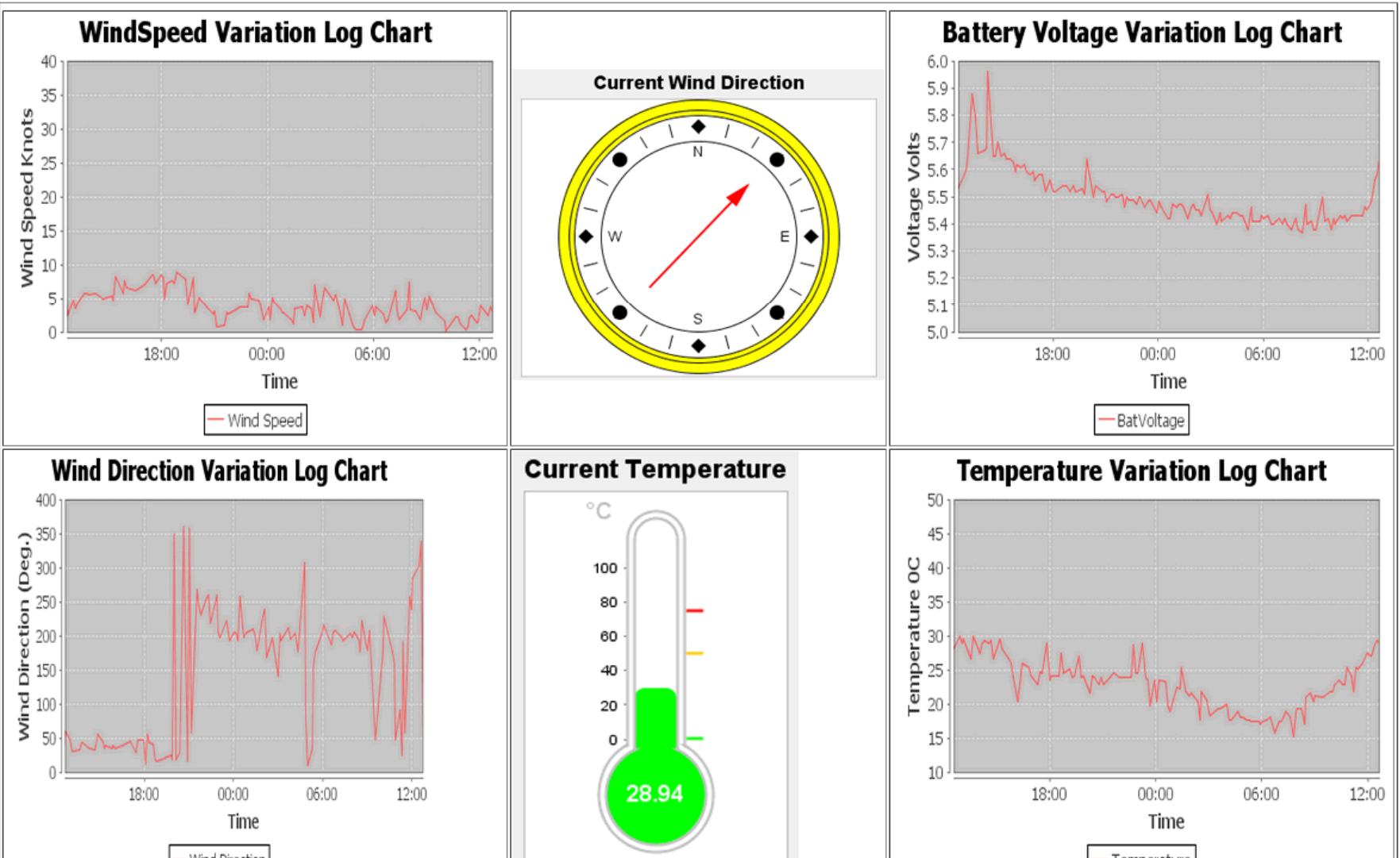
- Developing an environmental sensor detecting (depending on configuration):
  - wind speed & direction
  - dust by particulate size & amount
  - chemical (petrochemical, and other)
  - radiological sensing
  - SO<sub>x</sub> & NO<sub>x</sub> sensing
- Robust design & ease of setup/installation:
  - No moving/mechanical parts
  - Solar powered with battery backup
  - Wireless (3G or Wireless Mesh)
- Accessible via secure web connection



# A Sensing Eye for Security and Surveillance

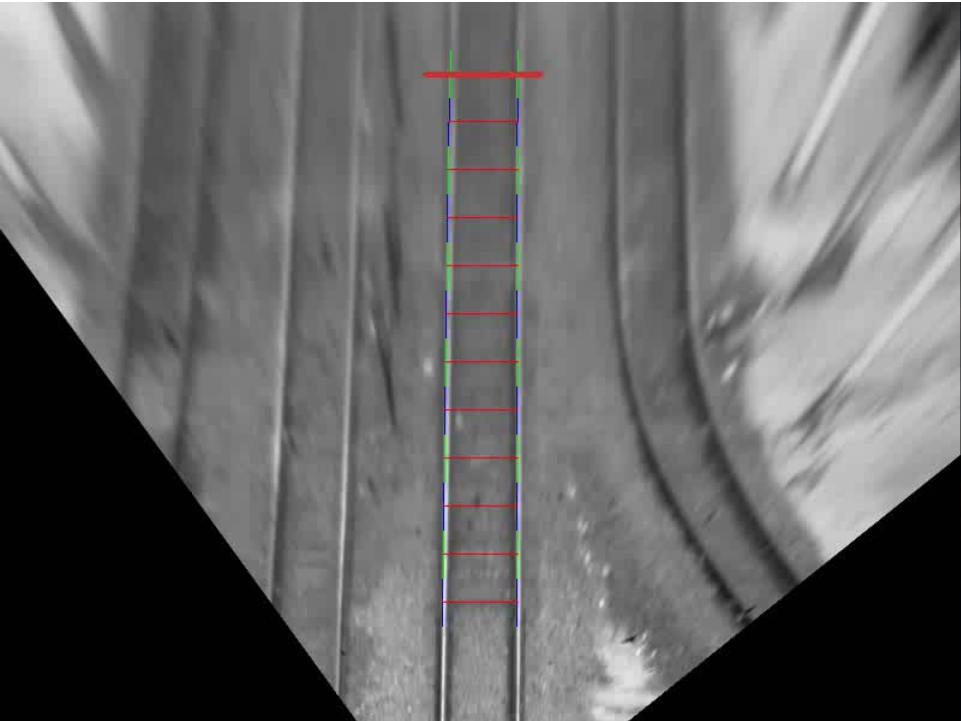
## Sensor Node DataView N01

This chart shows real time data from gather from sensor nodes at the sensing field.



- Vision-based Anti-collision System for Maintenance Trains  
Maintenance trains travel in convoys. Only the first train of the convoy uses the track signalization. Because of human errors, collisions can happen between the maintenance trains. The existing anti-collision system based on a laser range finder is limited to straight tracks.





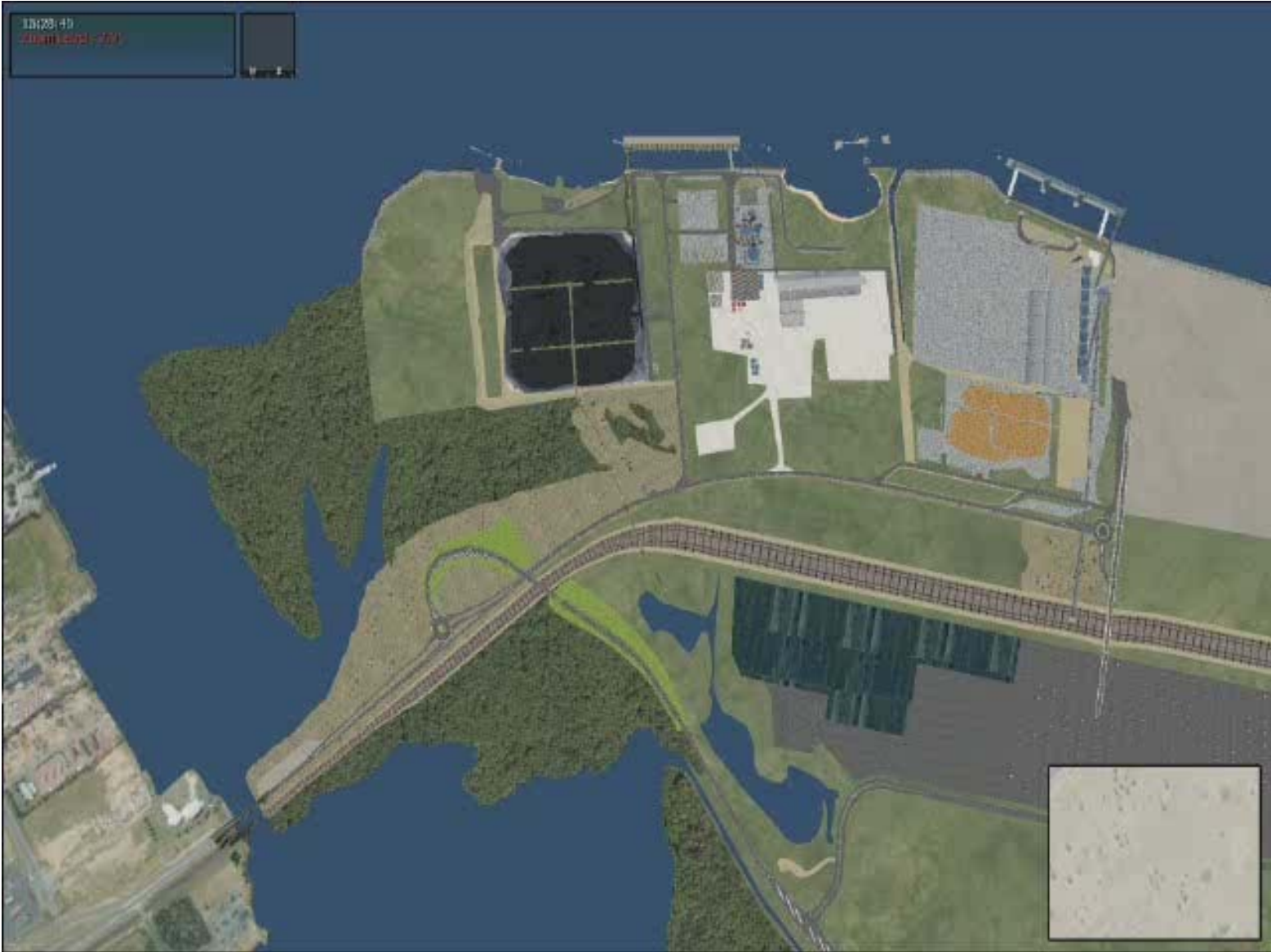


# Port of Brisbane Project - “Port Watch”

# Overlay of Video on 3D Model for Context



# Real Security Incident: Fire at Port of Brisbane



# Laboratory Face Recognition Results



- Large scale trials in 2010
- Link project with similar projects around the world
- Build a larger pool of leading researchers to develop and test Intelligent CCTV algorithms
- Test on real surveillance videos from sites of interest and benchmark against commercial best practice
- Make competencies available rapidly to user agencies through vendor partners via licensing once demonstrated and tested



# Questions?





From imagination to **impact**