



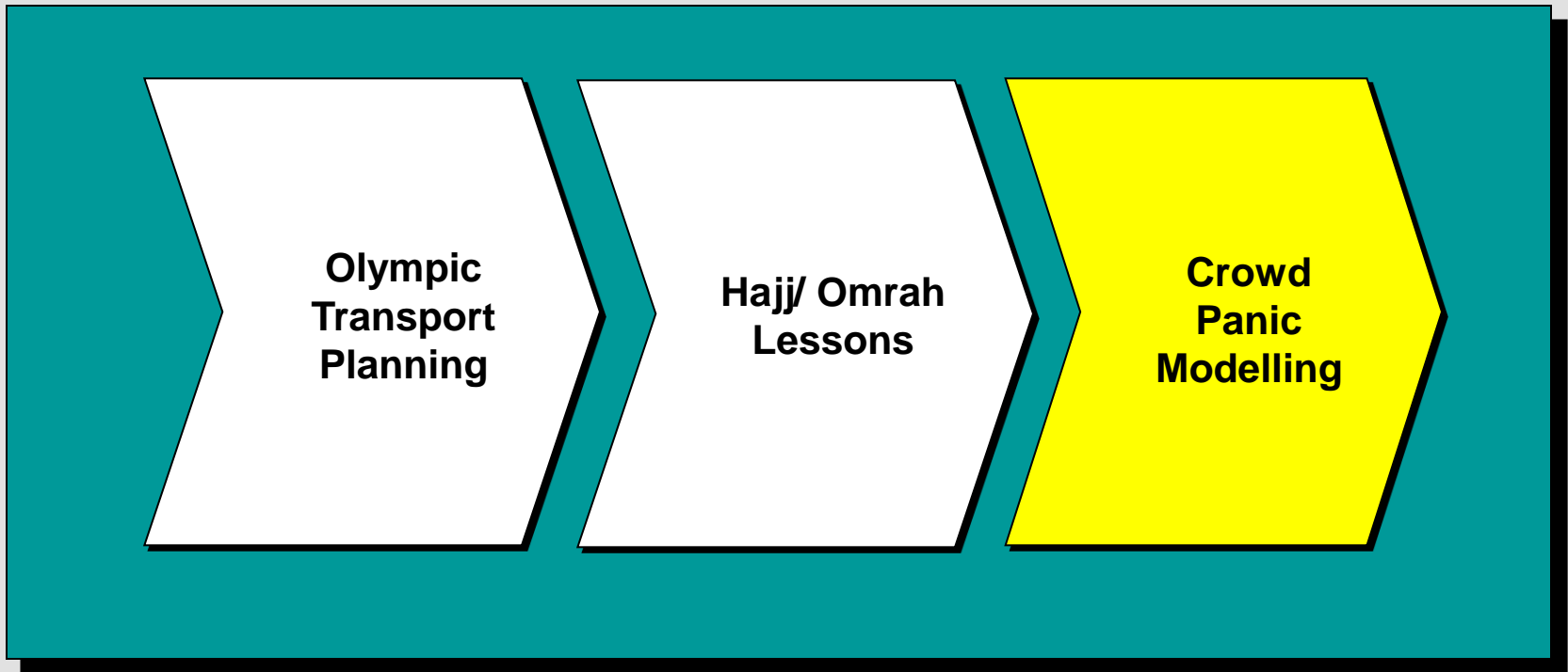
Transport and Crowd Management Forum,
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Park Hyatt Resort, Jeddah, Saudi Arabia



Olympic Transport Planning Experience - Lessons for Hajj

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This paper outlines Olympic Transport Planning experience relevant to the Hajj



Agenda

1. Olympic Transport Planning

2. Hajj/Omrah Lessons

3. Crowd Panic Modelling

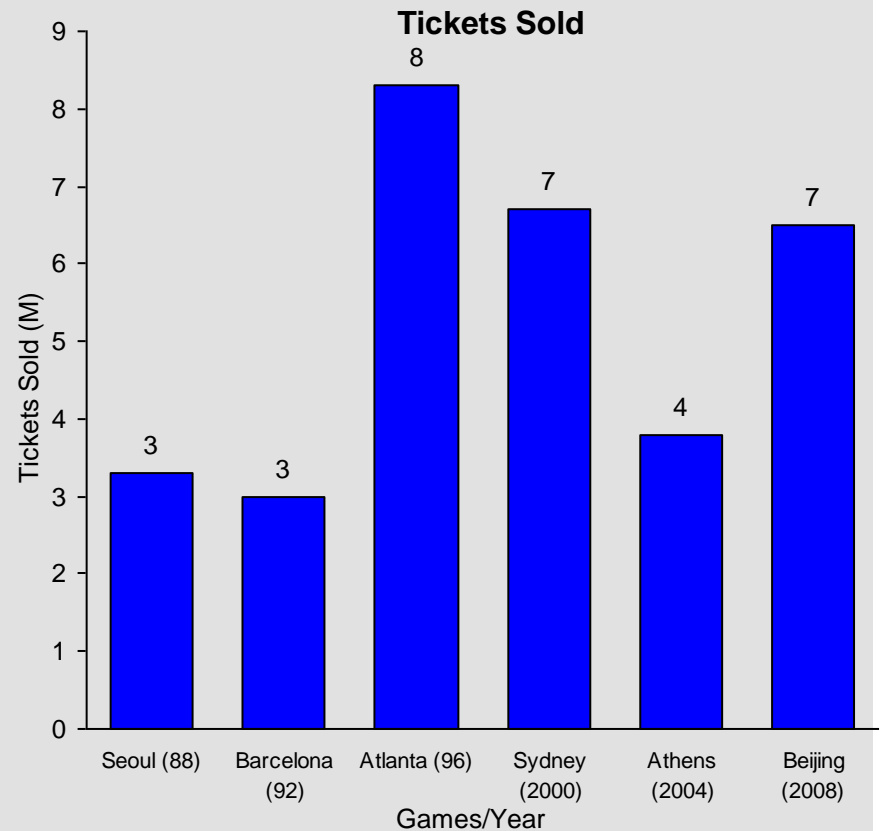
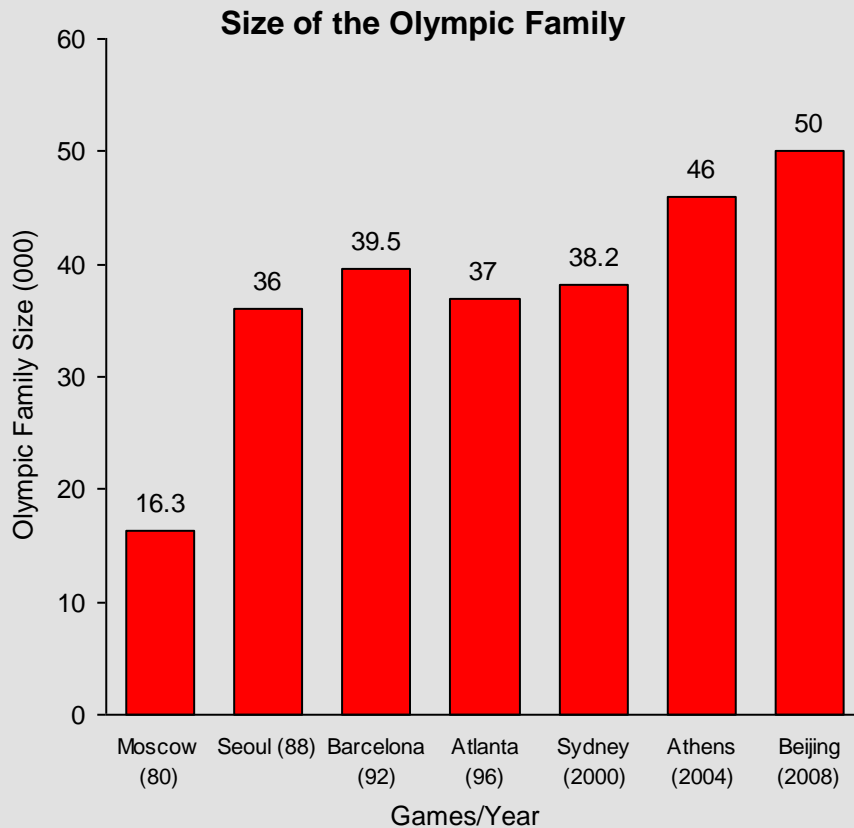
Some of the worlds biggest & most congested cities run the summer Olympic Games – how?



The summer Olympic games represents the biggest city transport planning challenge in the world

- **Cities will experience the largest demand for travel in their history**
- **Trip Demand:**
 - Olympic Family and Spectators
 - Base Load – usual city resident travel
- **Media scrutiny means the actions of planners are watched by a worldwide audience**

Olympic transport is for 3-8 M spectators and 40-50K athletes/officials each day over 2 weeks



Source: Based on Bovy, P. 'Mega-events : catalyst for more sustainable transport in Cities' UITP Latin America Division -- RECIFE - Brazil Seminar / Nov. 2009

A range of markets must be catered for using substantial and diverse transport resources

Scale of Participants and Transport Resources – Sydney 2000

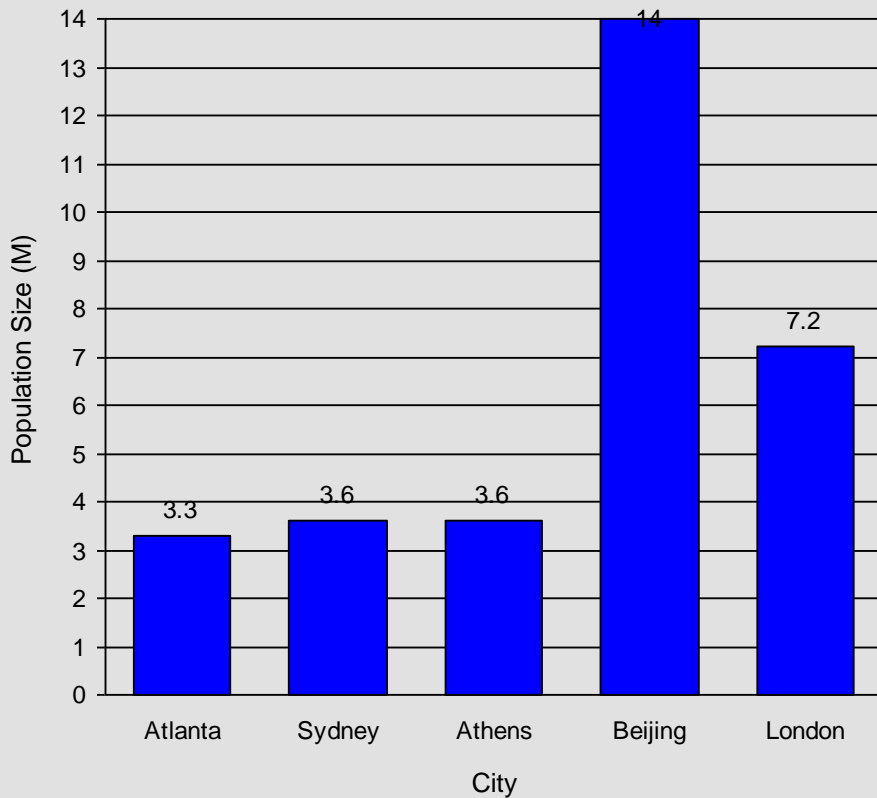
Market	Size	Services
T1-T3 – Olympic VIP's	4,650	Olympic Car Fleet – 4,700 vehicles
T4 – Athletes	10,800	Athlete Bus Network
T4 – Officials	7,600	Officials Bus Network
T5 – Media	19,800	Media Bus Network
Spectators	7,000,000	Public Transport

3,850 Buses

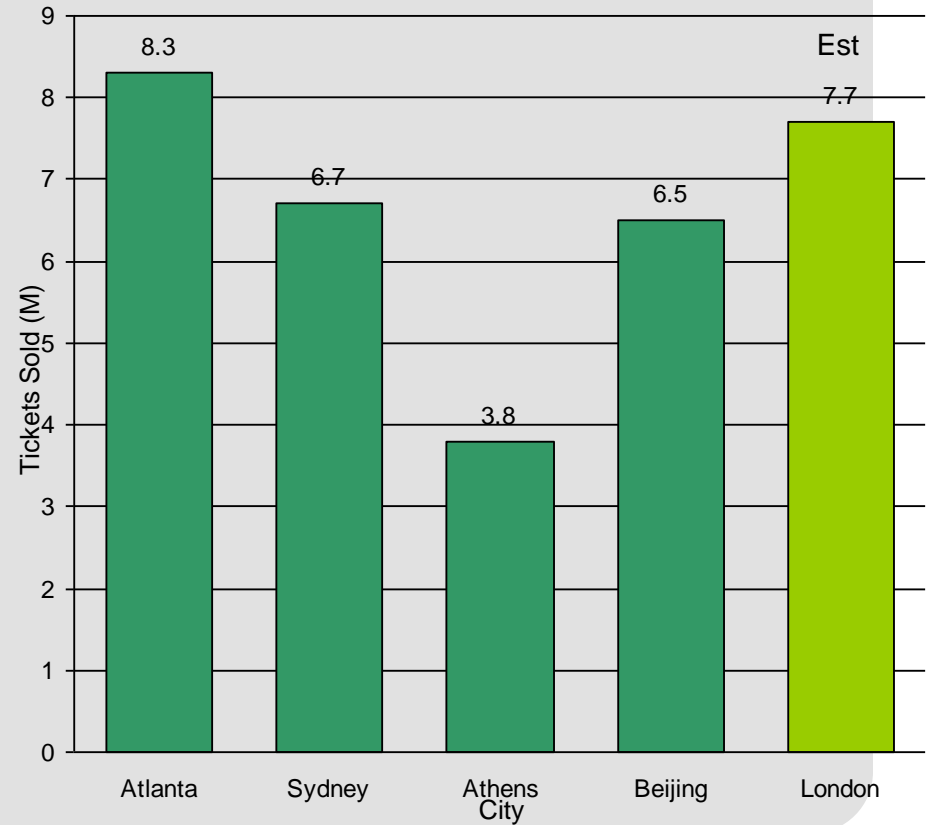
Source: Based on Bovy, P. 'Transport and Exceptional Public Events' ECMT Feb 2002

There are big differences in the circumstances for the games in each city.....

Comparative Population

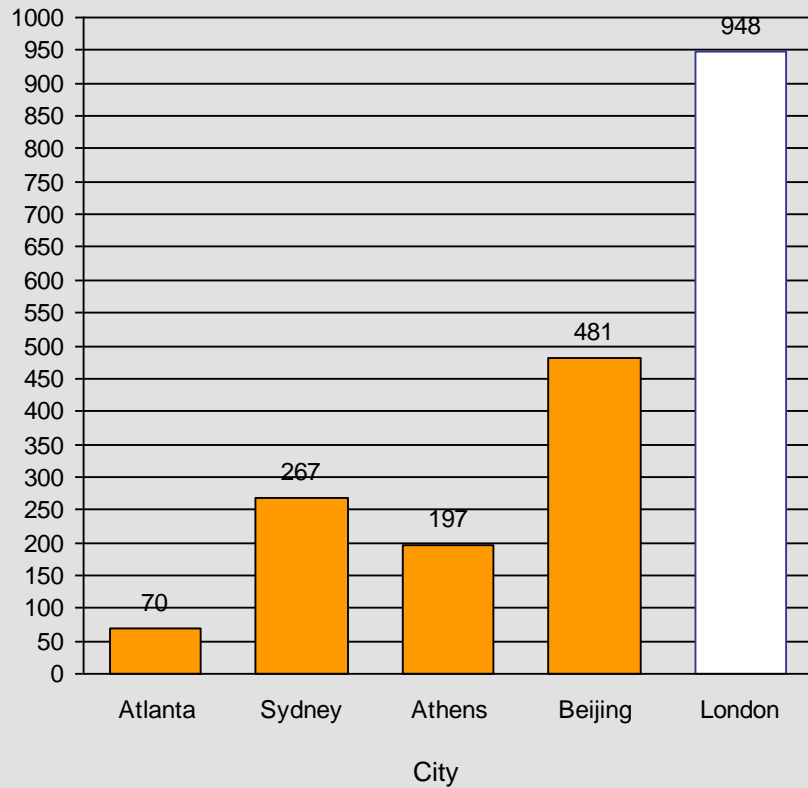


Comparative Olympic Task

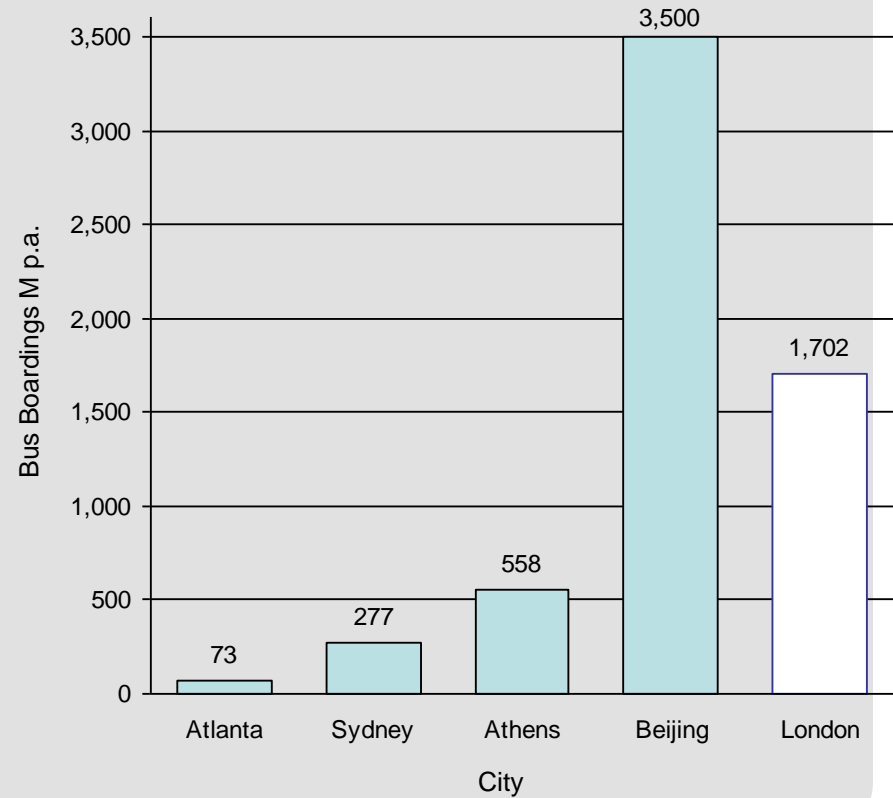


...these require different approaches and explain variations in games transport performance

Rail Trips p.a.



Bus Trips p.a.



All Olympic transport strategies aim to maximise available transport capacity

Olympic Transport Approach

Maximize Available Transport Capacity

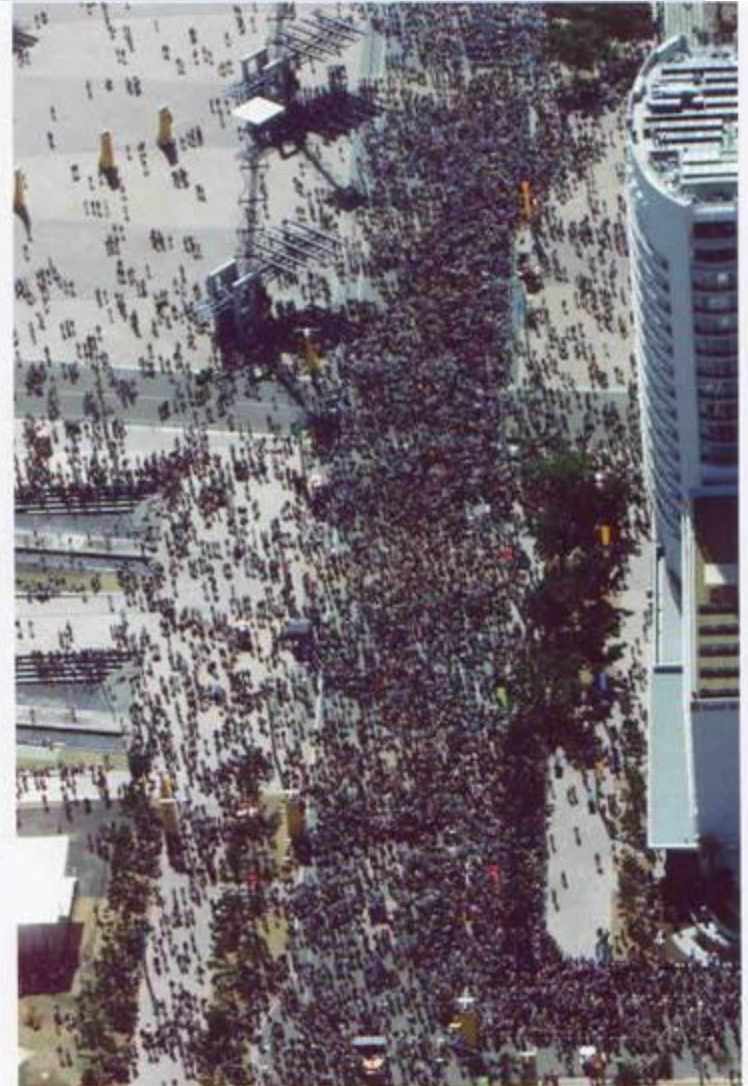
Increase Supply

Transit Orientation

Reduce Base Load

Demand Management

Lower Service Quality Expectations



5 key TDM strategies are adopted

Olympic Travel Demand Management Measures

A. Travel Capacity
Creation Measures

B. Travel Behaviour
Change/Marketing

C. Traffic
Efficiency Measures

D. Traffic
Bans

E. Public Transport
Emphasis

A. Travel Capacity Creation measures aim to reduce 'base load' demand during the games

	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	A. Travel Capacity Creation Measures				Lake 2002
School/Public holiday during games		✓			✓				
Summer daylight hours retiming		✓							
Employee holiday/vacation incentives	✓	✓	✓		✓	Promoted			
Large Govt/Business employee contingency plans		✓							
Working week reduction			✓			✓			
Work hour retiming	✓	✓			✓	✓			✓
Construction/road maintenance bans			✓			✓			
Reschedule road/rail freight		✓	✓						
Truck loading restrictions/diversion	✓	✓	✓	✓		✓			
Event finish time spreading			✓						
Pedestrian focussed event site plans		✓	✓						
Night event site deliveries	✓	✓	✓						
Carpooling/ride matching			✓			✓			✓
Disperse demand using 'live site' around city		✓							
Car use on every second day	Some				✓				
Use of Freeway shoulders for travel						✓			

Such as removing factors blocking traffic...

A. Travel Capacity Creation Measures

School/Public holiday during games

Summer daylight hours retiming

Employee holiday/vacation incentives

Large Govt/Business employee contingency plans

Working week reduction

Work hour retiming

Construction/road maintenance bans

Reschedule road/rail freight

Truck loading restrictions/diversion

Event finish time spreading

Pedestrian focussed event site plans

Night event site deliveries

Carpooling/ride matching

Disperse demand using 'live site' around city

Car use on every second day

Use of Freeway shoulders for travel

Traffic Delay Removal Factors

- **Athens 2004**
 - Odd/even number plates for driving in CBD
- **Sydney 2000**
 - Road/rail freight rescheduling through Sydney – free up railway capacity
 - Retiming truck deliveries to nighttime – many companies continued this post games
- **Atlanta 1996**
 - Ban on road construction/maintenance
 - Road/rail freight rescheduling through town
 - Carpooling/ride matching
- **Los Angeles 1994**
 - Ban on road construction/maintenance
- **Soeul 1988**
 - Ban on residents driving every second day during games

... and spreading event timing to reduce per hour load

A. Travel Capacity Creation Measures

School/Public holiday during games

Summer daylight hours retiming

Employee holiday/vacation incentives

Large Govt/Business employee contingency plans

Working week reduction

Work hour retiming

Construction/road maintenance bans

Reschedule road/rail freight

Truck loading restrictions/diversion

Event finish time spreading

Pedestrian focussed event site plans

Night event site deliveries

Carpooling/ride matching

Disperse demand using 'live site' around city

Car use on every second day

Use of Freeway shoulders for travel

Demand Time Spreading Factors

- **Athens 2004**
 - Numerous events with 24 hour focus
- **Sydney 2000**
 - 'live' sites throughout the city at interesting venues to watch all features



Event “node” location can spread demand or reduce transport needs

A. Travel Capacity Creation Measures

School/Public holiday during games

Summer daylight hours retiming

Employee holiday/vacation incentives

Large Govt/Business employee contingency plans

Working week reduction

Work hour retiming

Construction/road maintenance bans

Reschedule road/rail freight

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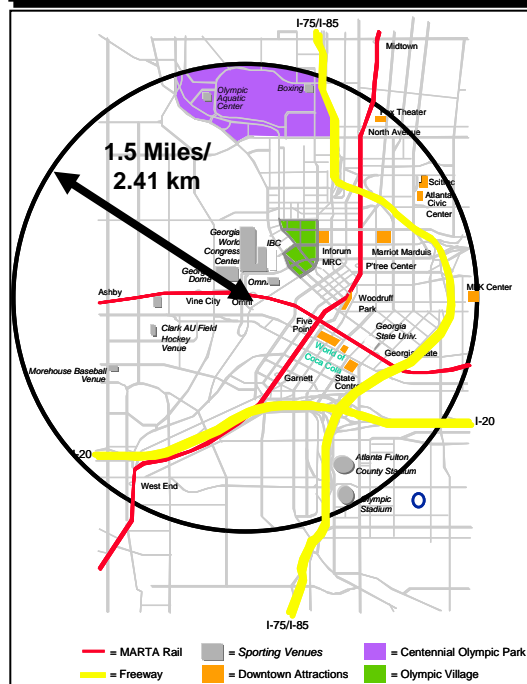
Disperse demand using ‘live site’ around city

Car use on every second day

Use of Freeway shoulders for travel

Spatial Demand Spreading Factors

Atlanta 1996



Athens 2004



Travel behaviour change matches demand to available capacity

B. Travel Behaviour Change/Marketing	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	Soeul 1988	Los-Angeles 1984	Moscow 1980	Salt Lake 2002
The big scare, travel warnings & communications strategies	✓	✓	✓			✓		✓
Employer/business telecommuting/ work retiming	✓	✓	✓					
Test events as education	✓	✓						
Spectator public transport use education		✓						✓
Resident public transport use education		✓						✓
Affected business/community consultation and travel plans	✓	✓	✓			✓		✓

The big scare and 'managed expectations' aim to carefully reduce 'base load'

B. Travel Behaviour Change/Marketing

The big scare, travel warnings & communications strategies

Employer/business telecommuting/ work retiming

Test events as education

Spectator public transport use education

Resident public transport use education

Affected business/community consultation and travel plans

The Big Scare/Communication Strategy

- **Athens 2004/Sydney 2000**
 - Single coordinated 'voice' of system management
 - (Continuous) message of 'biggest ever challenge' – start early, avoid busy areas, plan ahead, use public transport
 - UNDER PROMISE AND OVER DELIVER
- **Atlanta 1996**
 - Multiple uncoordinated messages
 - Too much wishful thinking (e.g, world standard quality) a long way from the truth
 - Over promise and under deliver?
 - Some evidence that negative messages about 'gridlock' in Atlanta and LA reduced road demand

'Test Event' strategies were a means of public education as well as operations training

B. Travel Behaviour Change/Marketing

The big scare, travel warnings & communications strategies

Employer/business telecommuting/ work retiming

Test events as education

Spectator public transport use education

Resident public transport use education

Affected business/community consultation and travel plans

Test Events

- **Athens 2004/Sydney 2000**
 - Strategy of Test Test Test Test
- **Atlanta 1996**
 - Untested at high capacity/volume



More traditional brochure marketing is used to learn about Olympic transport

B. Travel Behaviour Change/Marketing

The big scare, travel warnings & communications strategies

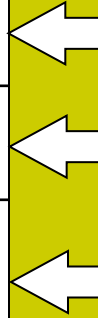
Employer/business telecommuting/ work retiming

Test events as education

Spectator public transport use education

Resident public transport use education

Affected business/community consultation and travel plans



Marketing/ Travel Plans

Official Spectator Guide
Sydney 2000

Business Infosheet
For Central Sydney

3,000 people visit Central Sydney everyday. During the Sydney 2000 Olympic Games an additional 400,000 people are expected for this increased demand while maintaining smooth traffic flow and deliveries to business. Sydney 2000 has a detailed traffic and transport plan for the Sydney CBD.

From September to 3 October, the city will operate differently, and you will need to adjust your business arrangements - especially with servicing and delivery of stock.

Key Dates

- 10 September
- 14 September
- 15 September
- 16 September - 1 October
- 18 - 17 September
- 24 September
- 1 October

Traffic practices for athletes
Olympic Torch Relay arrives in Central Sydney
Olympic Games Opening Ceremony
Olympic Sports Complex
Traffic in Central Sydney (Sat & Sun, am only)
Women's Marathon (am only)
Men's Marathon and Olympic Games Closing Ceremony including Harbour Foreshore Spectacular (pm only)
Athletes Ticketstape Parade

services have specific arrangements, please check with your service provider for further details.

GAMES INFO

A number of more tactical traffic efficiency measures have been adopted

C. Traffic Efficiency Measures	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	Soeul 1988	Los-Angeles 1984	Moscow 1980	Salt Lake 2002
High occupancy vehicle lanes			✓					
Turning traffic bans	✓	✓						
Ramp metering			✓			✓		
Real time parking and road condition signing			✓					✓
Increase tow away trucks		✓						

Traffic bans are now a common feature of the modern games

D. Traffic Bans	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	Soeul 1988	Los-Angeles 1984	Moscow 1980	Salt Lake 2002
Event/venue site traffic/car bans	✓	✓	✓	✓			✓	✓
CBD parking/traffic bans	✓	✓	✓	✓				✓
Dedicated Olympic lanes/parking bans	✓	✓					✓	
Enhanced traffic measure policing	✓							
Site fringe suburb parking bans	✓	✓						

Olympic family lane priority is now the norm

D. Traffic Bans

Event/venue site traffic/car bans

CBD parking/traffic bans

Dedicated Olympic lanes/parking bans

Enhanced traffic measure policing

Site fringe suburb parking bans

Olympic Lane Priority



Athens Olympic Lanes







Beijing "O" Lanes

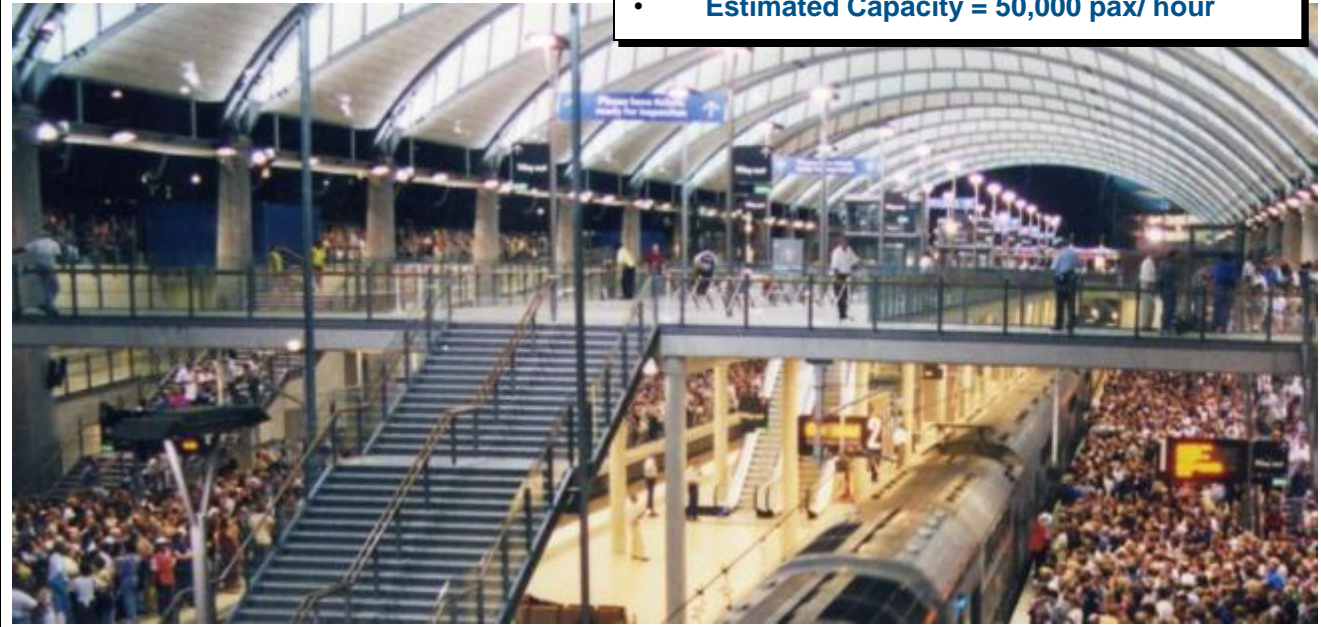
As are measures to emphasise public transport...

E. Public Transport Emphasis	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	Soeul 1988	Los-Angeles 1984	Moscow 1980	Salt Lake 2002
Expanded public transport system (particularly rail)	✓	✓	✓					✓
Rail capacity enhancement	✓	✓	✓					
Free spectator/Olympic family public transport	✓	✓						
Park and Ride	✓	✓	✓					✓




...mainly system expansion...

E. Public Transport Emphasis	Expanded Public Transport Systems	
Expanded public transport system (particularly rail)		
Rail capacity enhancement		
Free spectator/Olympic family public transport		
Park and Ride		

...notably rail with high capacity design

E. Public Transport Emphasis	<h2 data-bbox="504 325 1843 386">High Capacity Rail Design</h2> <div data-bbox="1116 401 1818 468">Sydney Olympic Park Station</div> <ul data-bbox="1122 475 1812 615" style="list-style-type: none">• Well designed crowd handling• Separate platform loading/unloading• Estimated Capacity = 50,000 pax/ hour 
Expanded public transport system (particularly rail)	
Rail capacity enhancement	
Free spectator/Olympic family public transport	
Park and Ride	

Bus volume is a problem and also needs high capacity design

E. Public Transport Emphasis	High Capacity Bus Design	
Expanded public transport system (particularly rail)	 <p>Rio 2016</p>	
Rail capacity enhancement	 <p>Athens 2004</p>	
Free spectator/Olympic family public transport		
Park and Ride		

Agenda

1. Olympic Transport Planning

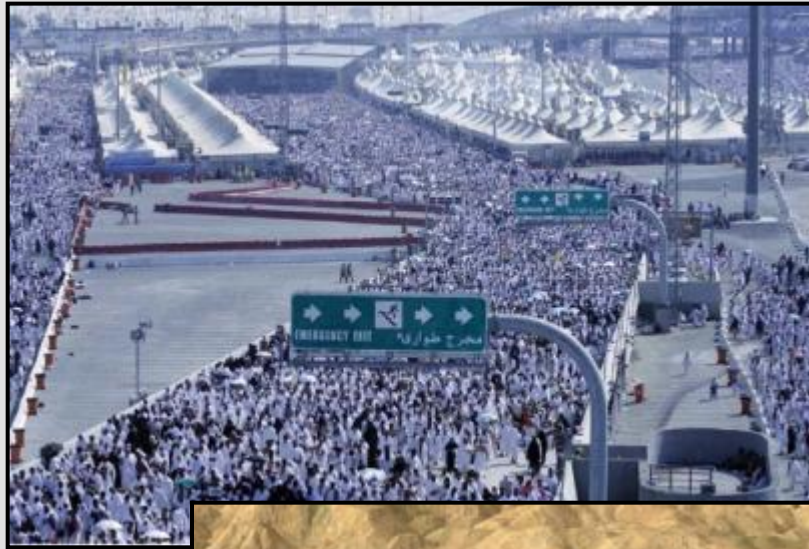
2. Hajj/Omrah Lessons

3. Crowd Panic Modelling

The Hajj and Olympic events have very different features

	Olympics	Hajj/Omrah	
Time Scale	2 weeks	Continuous	Implications for Hajj Planning More opportunity to learn from experience and to experiment. Permanent not temporary planning agencies and Infrastructure.
Frequency	4 Years	Continuous/ Annual	
Venue	Variable	Constant	
Context	Major City	Makkah/Holy Sites	Easier to develop infrastructure solutions
Travel Baseload	Very Large	Modest	Less concern with baseload reduction
Luggage	Minor Influence	Major Influence	Important influence on mode choice and travel quality

Many olympic “lessons” are already adopted



Jamarat Bridge – Key Features

Travel Capacity Creation Measures

- Splitting pedestrian access into multiple levels
- Grade separation – one way demand flows

Travel Behaviour Change/Marketing

- Timing of Group Visits – Marketing this

Traffic Efficiency Measures

- No waiting/sitting or blocking access

Traffic Bans

- No visitor personal transport access

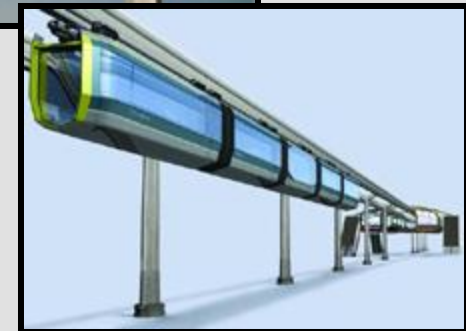
Transit Emphasis

- Bus access for selected groups

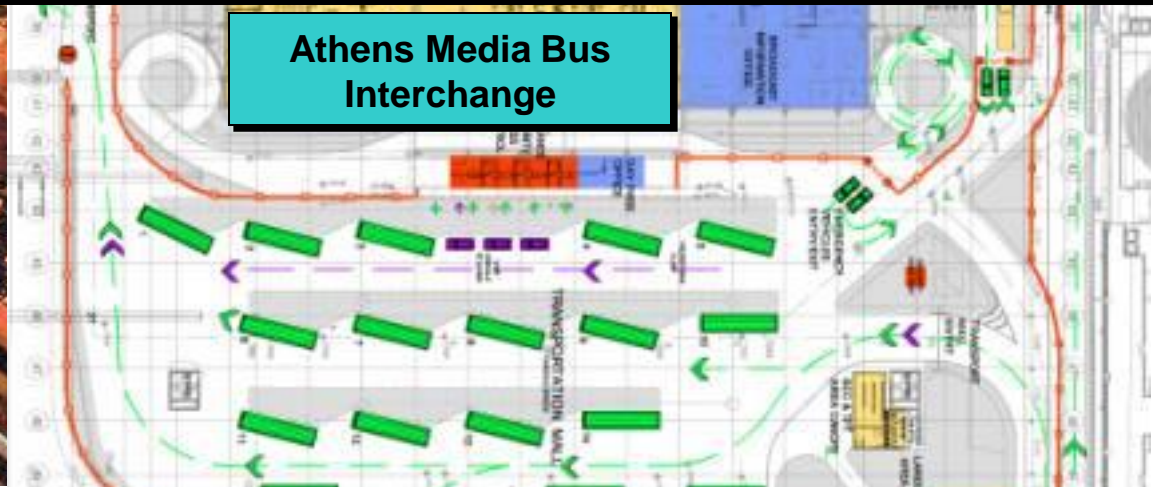
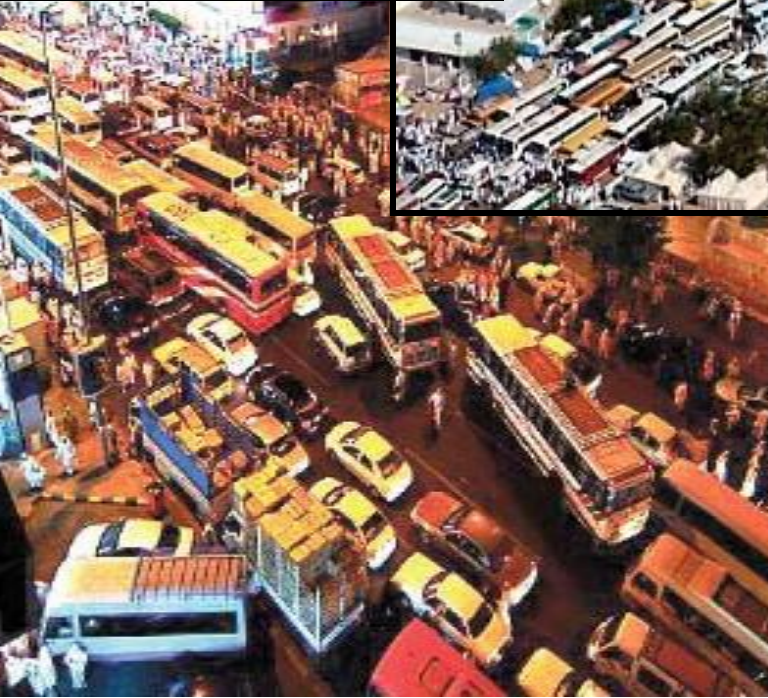
Preliminary comments: Quality & efficiency would be improved with high capacity rail...



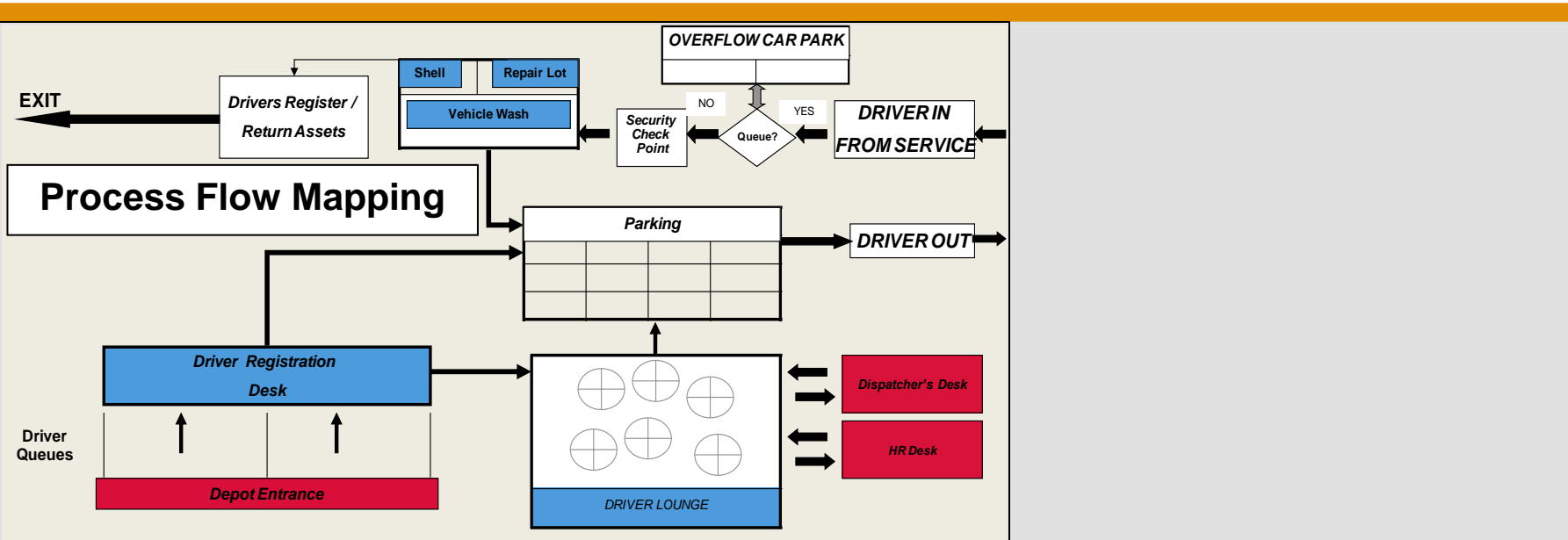
Al Mashaer Al Mugaddassah Metro



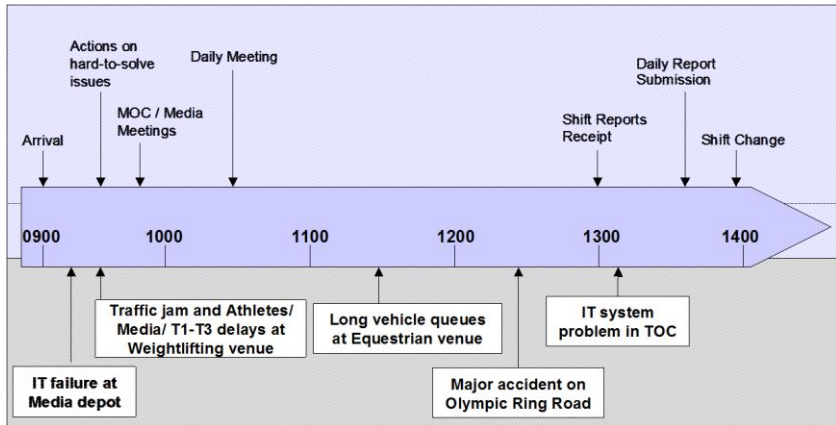
...bus priority, bus capacity management and removal of bus-pedestrian conflicts



Olympic planning methods and plan documentation may also be of value



Wargaming – Testing Resilience



Fleet Resource Risk Assessment Methodology

Key Risks Factors for Each Market and Estimated Size of the 'Contingency'

Market Segment	Demand Estimates	Travel Times	Operational Requirements	Overall Risk
Athletes	Low	Medium	Low	Medium
Media	Medium	Medium	High	High
Technical Officials	Low	Medium	Low	Medium

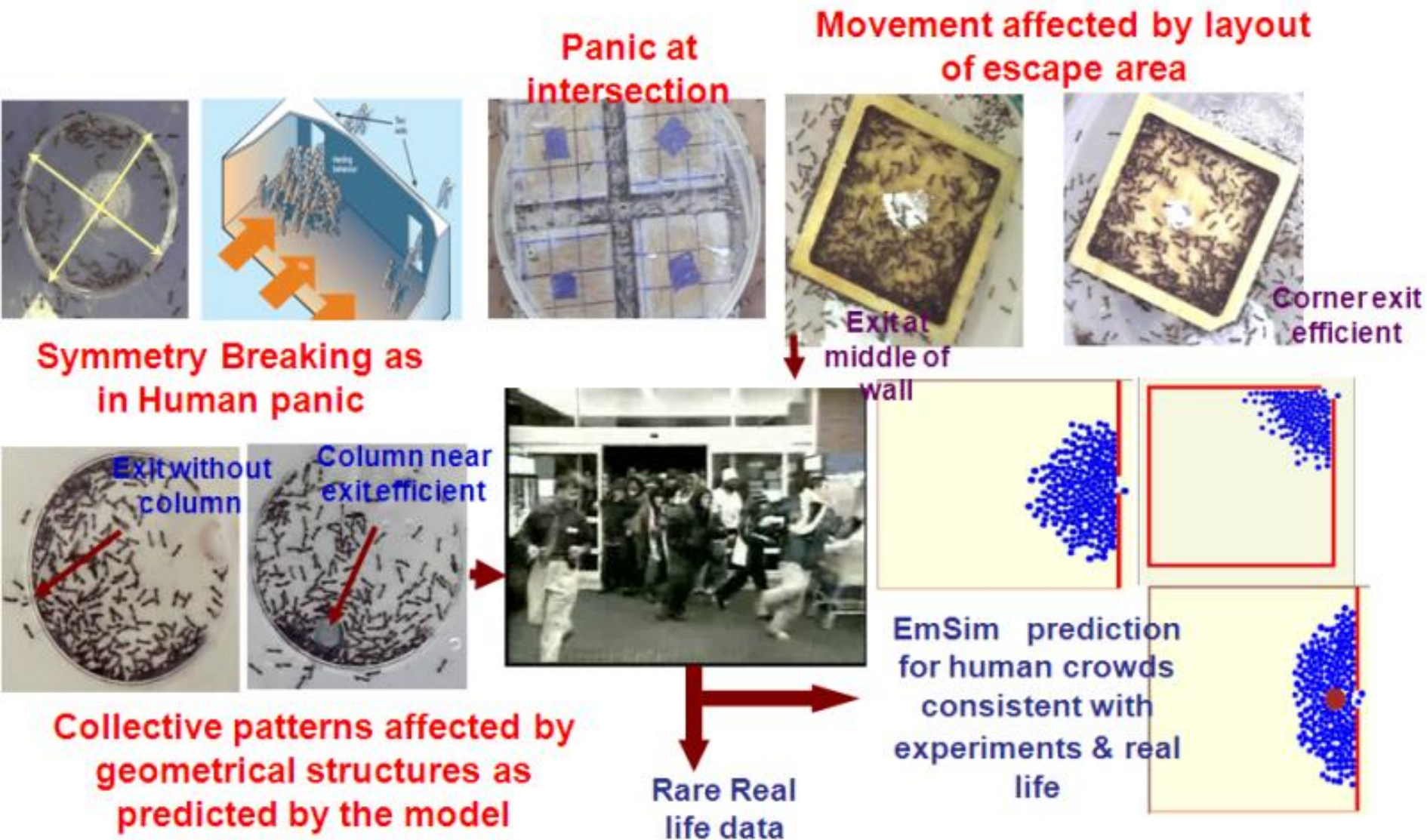
Size of Fleet Contingency	
Moderate	10%
Large	25%
Small	5%

Scale of Risk: Low (○), Medium (◐), High (●)

Agenda

1. Olympic Transport Planning
2. Hajj/Omrah Lessons
3. Crowd Panic Modelling

Our research focus is crowd panic models based on biological experimentation..



EmSim (Ver 1.6) has a clear role in Hajj planning for event design

Architectural Design and Crowd Safety – Indoor/Outdoor Environments



Olympic crowd



Possibility of designing architectural adjustments that enhances the safety of collective movement patterns in mass events such as Hajj or Olympic.

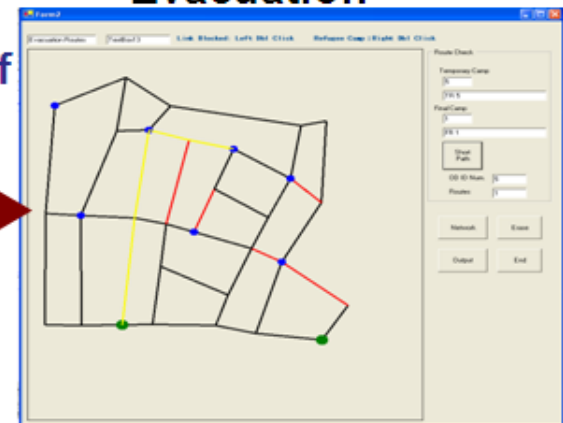


Hajj crowd

Network simulation of crowd dynamics in case of emergency evacuation in a community. Suitable to design refuge points for crowd in case of disaster.



Community Evacuation



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