World Government Summit 2017
Self-Driving Transport: Global Challenges and Opportunities
Historical vs Now

1970’s, 80’s

Present day
Society of Automotive Engineers (SAE) – Levels of Automation

- **Level 0**: Driver Only
- **Level 1**: Assisted
- **Level 2**: Partial Automation
- **Level 3**: Conditional Automation
- **Level 4**: High Automation
- **Level 5**: Full Automation

**Monitored Driving:**
- **Eyes On, Hands On**
- **Eyes On, Hands Off**

**Non-Monitored Driving:**
- **Eyes Off, Hands Off**
International Benchmark
Government investment programmes

North America $250M+
UK $60M+
EU $150M+
Japan & South Korea $75M+
Singapore $50M+
Self-Driving Testing and Testbeds
A Vision for the Future of Transport

“By 2030, 25 percent of all transportation trips in Dubai will be smart and driverless.”

His Highness Sheikh Mohammed bin Rashid Al Maktoum
Vice President and Prime Minister of the UAE and Ruler of Dubai
International Benchmark 2030 (Estimated)

- **Legislation/Policy Framework**
  - Unknown Inconsistencies
  - Known Inconsistencies
  - Consistent laws/Policies

- **Public Testing/Operations**
  - No testing
  - Controlled Testing
    - Technology Testing
      - South Asia/Polynesia
      - Africa
      - South America
      - Rest of GCC
      - USA
      - Spain
      - Germany
      - Italy
      - France
  - Dubai

- **Technology Testing**
  - Public Testing/Operations
    - No testing
    - Controlled Testing
      - Technology Testing
        - South Asia/Polynesia
        - Africa
        - South America
        - Rest of GCC
        - USA
        - Spain
        - Germany
        - Italy
        - France

Countries:
- Dubai
- Sweden
- Japan
- Singapore
- China
- Switzerland
- Germany
- France
- Italy
- Spain
- Netherlands
- UK
- Australia
- USA
- Japan
- Singapore
- China
Global Challenges

- Legislation
- Safety
- Infrastructure
- Technology
Self-Driving Vehicle Technology

Lane Guidance
Cameras behind rear-view mirror focus on lane markings and distinguish between road surface and boundary lines.

Radar
Detects obstructions in car’s blind spot; serves as accident prevention system that triggers alerts.

LIDAR
Ranging system comprising 64 lasers emits pulses of light to take in 360° view of surroundings, identifying nearby objects and obstacles with an accuracy of up to 2cm.

GPS
Accurate to within 1.9 meters, it pinpoints the macro location of the car combined with readings from tachometers, altimeters and gyroscopes it provides more precise positioning.

Stereo Vision
Two windshield mounted cameras real-time 3D images of the road ahead, looking for potential hazards.

Infrared Camera
Infrared beams emitted from the headlamps and picked up by camera extend vision for night driving, producing illuminated image in dashboard display.

Central Computer
Analyzes all information from the sensors; processes and translates data on the spot to control and adjust steering, accelerating and braking in response to real-time driving conditions.
Dubai Challenges

EXTREME WEATHER CONDITIONS
Humidity, Fog, Sandstorms

Cultural Diversity
People Acceptance

FIRST MILE / LAST MILE
High Temperatures
Dubai Self-Driving Transport (SDT) Strategy
### Dubai Self-Driving Transport (SDT) Targets

<table>
<thead>
<tr>
<th>Mode</th>
<th>2016 % of Total trips by SD mode</th>
<th>2030 % of Total trips by SD mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro</td>
<td>8.8%</td>
<td>12.2%</td>
</tr>
<tr>
<td>Tram</td>
<td>0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Shuttle &amp; Cable-cars</td>
<td>0%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Marine Transport</td>
<td>0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Taxi / Rideshare</td>
<td>0%</td>
<td>3.5%</td>
</tr>
<tr>
<td>BRT, Rider &amp; Runner</td>
<td>0%</td>
<td>6.4%</td>
</tr>
<tr>
<td><strong>Total Self-driving Public Transport</strong></td>
<td><strong>25%</strong></td>
<td></td>
</tr>
</tbody>
</table>
### Dubai Self-Driving Transport (SDT) Enablers

1. **Legislation**
   - Testing
   - Operations

2. **Driver Behavior & Acceptance**
   - Driver behavior in Level 2-3 vehicles
   - Driver acceptance of SDT

3. **Driver & Vehicle Licensing/Registration**
   - SDT driver licensing
   - SD vehicle testing, registration, renewal

4. **Insurance/Liability**
   - Crash liability of self-driving vehicles
   - Insurance requirements

5. **Infrastructure Requirements**
   - Infrastructure improvements for SDT
   - Crowd sourcing and analytics

6. **Cyber security/Data Privacy**
   - Self-driving vehicle security
   - On-board data recording and retrieval

7. **Connected Vehicle Enablers**
   - Communication (V2I, V2V, V2X)
   - Connected cloud

8. **HD Mapping**
   - Accurate HD Mapping
   - Over the air update

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![Graph showing percentage increase from 2016 to 2030]

- **25% Growth**

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*Timeline from 2016 to 2030 with milestones indicated for each year.*
Self-Driving Transport (SDT) Current Benefits in Dubai

6.4%  
Punctuality Improvements  
Compared to trains in other major cities

7%  
Reductions in Operational Costs  
Attributed to driver costs only
Self-Driving Transport (SDT) Future Benefits in Dubai

- Improved Road Safety: 12%
- Reduced Parking Spaces: 50%
- Increased Public Transport Efficiency: 20%
- Decreased Cost of Mobility: 44%
- Improved Productivity: 13%
- Decreased Pollution: 12%
- Increased Happiness

AED 22 B+ Annual Benefit

World Leader in Multimodal SDT Operations
Dubai is already Progressing: Trials
Satisfaction Results of Self-Driving Shuttle
“Mohammed Bin Rashid Boulevard” Trial

1200
Survey sample size for Self-Driving Vehicle Passengers
Ages between 40 and 20

95%
Overall Satisfaction of the driverless vehicle users

96%
Satisfaction on safety aspects of the Self-Driving vehicle

85%
Thinks that Self-Driving vehicle will reduce traffic accidents
MoUs and Partnerships
Self-Driving Transport: Global Challenges and Opportunities

Thank you