Driving Digital Transformation in Smart Transportation

Rajesh Ramachandran
Joint Managing Director and Global CTO, Rolta
Why?

• Sustainable Urban Transportation is a key part of Smart City and Smart Corridor Innovation
• Cities around the world need a solution to better analyze traffic data for smarter planning
• Critical Need to extend asset life in a sustainable manner for aging infrastructure
The Need

• An Integrated View of Traffic Infrastructure
• Envision the impact of planned projects on resources and measured outcomes
• Ability to examine activities and problems in greater detail
• Ability to integrate Operational, IT and GIS data together into a single window
• Role based Insights for KPI management with increased visibility
• Exploratory Analysis of data utilizing location intelligence
Integrated Smart City Transportation Solution
Plan – Design – Build – Manage - Optimize
### Project Selection

#### Available Funding
- **National Highways Performance Program**
  - $245M
- **Surface Transportation Program**
  - $119M
- **Highway Safety Improvement Program**
  - $19M
- **Railway-Highway Crossings Program**
  - $2M
- **Congestion Mitigation & Air Quality Improvement**
  - $8.2M
- **Metropolitan Planning Program**
  - $0.5M
- **Local Funding Match**
  - $7.0M

#### Project Goals
- **Safety** - Fatal Accidents per 100M Vehicle Miles
  - 0.9 to 1.07
- **Percentage of Good Pavement (IRI<95/ Lane Mile)**
  - 26% to 33%
- **Deck Area on Deficient/ Obsolete bridges (%)**
  - 10% to 24%
- **Percentage of Lane Miles on Congested Sections during AM Peak**
  - 10% to 15%
- **KGs of Criteria Pollutants per 100M Vehicle Miles**
  - 0.5 to 0.7B
- **Annual Hours of Delay per 100M Vehicle Miles**
  - 20% to 25%

#### Projects and Locations
187 Projects selected with Total Cost $149,511,789

<table>
<thead>
<tr>
<th>Project Id</th>
<th>Project Name</th>
<th>Work Type</th>
<th>Total Cost</th>
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</thead>
<tbody>
<tr>
<td>66</td>
<td>MUD FORK RD</td>
<td>RESURF (15°)</td>
<td>$17,710</td>
</tr>
<tr>
<td>92</td>
<td>GREER BLVD - 39TH ST/P/C</td>
<td>(SPLIT FUNDED)</td>
<td>$4,221,889</td>
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<td>108</td>
<td>JERRY RUN RD</td>
<td>RESURF (15°)</td>
<td>$821,250</td>
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<td>170</td>
<td>BROAD RUN RD</td>
<td>RESURF (15°)</td>
<td>$96,100</td>
</tr>
<tr>
<td>153</td>
<td>BLUE CREEK RD</td>
<td>INST HDR</td>
<td>$260,800</td>
</tr>
<tr>
<td>156</td>
<td>JENNINGS RANDOLPH HWY</td>
<td>INST GUARDRAIL</td>
<td>$55,000</td>
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<tr>
<td>210</td>
<td>CYRUS CREEK RD</td>
<td>RESURF (15°)</td>
<td>$281,200</td>
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<tr>
<td>179</td>
<td>MILTON - OLEANDER</td>
<td>MICROSURFACE</td>
<td>$197,900</td>
</tr>
<tr>
<td>180</td>
<td>5TH AVE MICROSURFACE</td>
<td>MICROSURFACE</td>
<td>$180,000</td>
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<tr>
<td>181</td>
<td>PARKIN-BOWIES</td>
<td>MICROSURFACE</td>
<td>$179,100</td>
</tr>
</tbody>
</table>
Infrastructure Performance

Infrastructure Condition

Infrastructure Goal KPIs
- Deck Area on Deficient/Obsolete bridges (%)
  - 100 %
  - 75 %
  - 60 %
  - 25 %
  - 18 %
  - 0 %

- Bridges > 20 ft not inspected last 2 yrs (%)
  - 100 %
  - 75 %
  - 60 %
  - 25 %
  - 15 %
  - 5 %
  - 0 %

- Good Condition Bridges (%)
  - 100 %
  - 75 %
  - 60 %
  - 25 %
  - 20 %
  - 15 %
  - 10 %
  - 5 %
  - 28 %

- Poor Condition Bridges (%)
  - 100 %
  - 75 %
  - 60 %
  - 25 %
  - 20 %
  - 15 %
  - 10 %
  - 5 %
  - 3 %

- Percentage of Good Pavement
  - 100 %
  - 95 %
  - 80 %
  - 65 %
  - 28 %

- Per Mile Maintenance Cost
  - $150K
  - $120K
  - $90K
  - $60K
  - $35K
  - $15K

- Bridge Deficiency Status
  - Breakdown by Bridge Deck Area (in %)
    - Structurally Deficient, 5.68%
    - Functionally Obsolete, 12.29%
    - Not Deficient, 82.03%

- Breakdown by Bridge count

- Percent of Deck Area Deficient or Obsolete by District

Infrastructure Conditions
## Infrastructure Performance

### Worst Performing Bridges

<table>
<thead>
<tr>
<th>Bridge ID</th>
<th>Deck Area (sq.m)</th>
<th>Deck Width (Meters)</th>
<th>Deck Length (Meters)</th>
<th>Owner</th>
<th>Total Improvement Cost</th>
<th>Status</th>
<th>INSPECT_DATE_90</th>
<th>Material</th>
<th>State Crossing</th>
<th>Deck Area as % of Results</th>
<th>Is On NHS</th>
<th>Deck Area as % of NHS/Non-NHS Total</th>
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<tbody>
<tr>
<td>20A387</td>
<td>17426</td>
<td>24.00</td>
<td>726.00</td>
<td>Others</td>
<td>$18,500.00</td>
<td>FUNCTIONALLY OBSOLETE</td>
<td>00/2011</td>
<td>4 Steel Continuous</td>
<td>NA</td>
<td>5.14%</td>
<td>Yes</td>
<td>0.92%</td>
</tr>
<tr>
<td>31A17</td>
<td>13688</td>
<td>29.00</td>
<td>472.00</td>
<td>Others</td>
<td>$0.00</td>
<td>FUNCTIONALLY OBSOLETE</td>
<td>00/2011</td>
<td>4 Steel Continuous</td>
<td>NA</td>
<td>4.04%</td>
<td>Yes</td>
<td>0.73%</td>
</tr>
<tr>
<td>20A431</td>
<td>10094</td>
<td>34.00</td>
<td>721.00</td>
<td>Others</td>
<td>-1.00</td>
<td>FUNCTIONALLY OBSOLETE</td>
<td>00/2012</td>
<td>4 Steel Continuous</td>
<td>NA</td>
<td>2.98%</td>
<td>Yes</td>
<td>0.54%</td>
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<tr>
<td>30A187</td>
<td>9155</td>
<td>29.00</td>
<td>315.00</td>
<td>Others</td>
<td>$0.00</td>
<td>FUNCTIONALLY OBSOLETE</td>
<td>00/2010</td>
<td>4 Steel Continuous</td>
<td>NA</td>
<td>2.70%</td>
<td>Yes</td>
<td>0.48%</td>
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<td>20A84</td>
<td>8580</td>
<td>11.00</td>
<td>660.00</td>
<td>Others</td>
<td>-1.00</td>
<td>FUNCTIONALLY OBSOLETE</td>
<td>00/2011</td>
<td>4 Steel Continuous</td>
<td>NA</td>
<td>2.53%</td>
<td>Yes</td>
<td>0.43%</td>
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</table>
System Reliability - Transit Performance

- Travel Time Index for public transport modes: 1.0
- Peak hour speed of public transport buses (km/h): 32
- Delay from schedule for mass transit modes: 80%
- Annual increase in peak hour bus system capacity (passengers/hour): 6
- Mass transit network length (km/100,000 inhabitants): 89
- Average Modal Transfers per trip: 1.4

Improved Transportation Planning & Management – State or corridor level key performance indicators
# Traffic Congestion Analysis

## Worst Congested Sections

<table>
<thead>
<tr>
<th>Road Name</th>
<th>Road Section</th>
<th>Total Delay (Veh KM X hours)</th>
<th>Average Delay / Veh/KM (in min)</th>
<th>Traffic Volumes (Primary</th>
<th>Reverse)</th>
<th>LOS Distribution between 6 AM and 10 PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumeirah Road</td>
<td>Al Urouba St – 77B St</td>
<td>12.5K</td>
<td>6.5</td>
<td>52K</td>
<td>25K</td>
<td>10K</td>
</tr>
<tr>
<td>Sheikh Zayed Road</td>
<td>Financial Centre Rd – D69 St</td>
<td>12.0K</td>
<td>7.3</td>
<td>150K</td>
<td>20K</td>
<td>12K</td>
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<tr>
<td>Jumeirah Road</td>
<td>Umm Suqaim Rd – Thanya Rd</td>
<td>11.5K</td>
<td>6.9</td>
<td>55K</td>
<td>18K</td>
<td>8K</td>
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<tr>
<td>Al Wasl Road</td>
<td>Umm Suqaim Rd – Thanya Rd</td>
<td>11.25K</td>
<td>7.2</td>
<td>35K</td>
<td>16K</td>
<td>10K</td>
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<tr>
<td>Jumeirah Road</td>
<td>D65 St – Umm Al Shiekh Rd</td>
<td>9.75K</td>
<td>9.8</td>
<td>50K</td>
<td>15K</td>
<td>5K</td>
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<tr>
<td>Sheikh Zayed Road</td>
<td>Emirates Mall Metro Station – D69 St</td>
<td>9K</td>
<td>8.0</td>
<td>125K</td>
<td>14K</td>
<td>10K</td>
</tr>
<tr>
<td>Sheikh Rashid Road</td>
<td>Baniyas Road – Airport Road</td>
<td>9K</td>
<td>6.0</td>
<td>102K</td>
<td>12K</td>
<td>8K</td>
</tr>
<tr>
<td>Al Khaleej Road</td>
<td>D 79 – Baniyas Road</td>
<td>8.75K</td>
<td>4.5</td>
<td>90K</td>
<td>11K</td>
<td>6K</td>
</tr>
<tr>
<td>Dubai Sharjah Road</td>
<td>Airport Road D 89 – D91</td>
<td>6K</td>
<td>4.0</td>
<td>120K</td>
<td>10K</td>
<td>9K</td>
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<tr>
<td>Reference #</td>
<td>Developer</td>
<td>Consultant</td>
<td>Applied On</td>
<td>Level</td>
<td>Project Name</td>
<td>Project Type</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>------------</td>
<td>------------</td>
<td>-------</td>
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</tr>
<tr>
<td>TIS-150601</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L1</td>
<td>(Buildings C2 and C4) - Phase 1 A5, Dubai World Trade Centre</td>
<td>Shopping Mall</td>
</tr>
<tr>
<td>TIS-150651</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L1</td>
<td>Burj Dubai 4,5,6</td>
<td>Shopping Mall</td>
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<tr>
<td>TIS-150656</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L2</td>
<td>Meydan Apartment</td>
<td>Apartment</td>
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<tr>
<td>TIS-150606</td>
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<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L2</td>
<td>2020 Tower on plot 3431193</td>
<td>Residential</td>
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<tr>
<td>TIS-150611</td>
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<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L1</td>
<td>23 Marina Towers Plot 392-568</td>
<td>Shopping Mall</td>
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<tr>
<td>TIS-150643</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L2</td>
<td>Emaar Place</td>
<td>Shopping Mall</td>
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<tr>
<td>TIS-150631</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L2</td>
<td>Emaar Mall</td>
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<tr>
<td>TIS-150641</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L1</td>
<td>2B+G + (06) TYP+HC ON PLOT NO. (3730380)</td>
<td>Shopping Mall</td>
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<tr>
<td>TIS-150623</td>
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<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L1</td>
<td>3 Star Hotels on Plot 4124762</td>
<td>Shopping Mall</td>
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<tr>
<td>TIS-150611</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L1</td>
<td>3B+G+23+HC - On Plot Nos. Plot No. # 231-121</td>
<td>Apartment</td>
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<tr>
<td>TIS-150665</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L1</td>
<td>5 Star Hotel on plot R3a</td>
<td>Hotel</td>
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<tr>
<td>TIS-150657</td>
<td>Emaar</td>
<td>TrafQuest</td>
<td>05-05-2015</td>
<td>L3</td>
<td>558 &amp; 260 Key Villas</td>
<td>Residential</td>
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</tbody>
</table>
## Agreement Options

### Contributing Area Junctions

<table>
<thead>
<tr>
<th>Impacted Junction</th>
<th>Percentage Contribution</th>
<th>Estimated Cost (AED)</th>
<th>Contribution (AED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2</td>
<td>10% 12% 10% 12%</td>
<td>120000</td>
<td>14400</td>
</tr>
<tr>
<td>J4</td>
<td>8% 10% 8% 10%</td>
<td>120000</td>
<td>12000</td>
</tr>
<tr>
<td>J5</td>
<td>9% 10% 8% 10%</td>
<td>120000</td>
<td>12000</td>
</tr>
<tr>
<td>J6</td>
<td>7% 5% 6% 7%</td>
<td>120000</td>
<td>8400</td>
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### Disclaimer:

The cost share amount are estimates based on the cost share percentage, the conceptual layout of external Transportation Network and the construction cost unit rate determined by RTA as on the date this study was carried out. This is an indicative amount and the final cost share amount will be determined at the Supplementary Agreement stage.
SAFETY & OPERATIONAL PERFORMANCE
Transportation: Traffic Information System

Traffic Congestion
Transportation: Traffic Information System

City Map

Exceed Velocity
Transportation: Road Safety Audit System

Accident Summary

Fatal Accidents Summary

<table>
<thead>
<tr>
<th>Case #</th>
<th>Date</th>
<th>Day of Week</th>
<th>Time</th>
<th>AM/PM</th>
<th>Fatalities</th>
<th>Intersection Type</th>
<th>Weather</th>
<th>Light Conditions</th>
<th>Roadway Function</th>
<th>% of Total Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>540168</td>
<td>Jun 21, 2012</td>
<td>SATURDAY</td>
<td>10</td>
<td>AM</td>
<td>4</td>
<td>Not an Intersection</td>
<td>Clear</td>
<td>Daylight</td>
<td>Principal Arterial - Interstate</td>
<td>1.32</td>
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<tr>
<td>540083</td>
<td>Feb 15, 2012</td>
<td>WEDNESDAY</td>
<td>6</td>
<td>PM</td>
<td>3</td>
<td>Not an Intersection</td>
<td>Clear</td>
<td>Daylight</td>
<td>Principal Arterial - Other</td>
<td>0.99</td>
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<tr>
<td>540143</td>
<td>Jun 19, 2012</td>
<td>WEDNESDAY</td>
<td>3</td>
<td>PM</td>
<td>3</td>
<td>Not an Intersection</td>
<td>Clear</td>
<td>Dark - Not Lighted</td>
<td>Principal Arterial - Interstate</td>
<td>0.99</td>
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<tr>
<td>540287</td>
<td>Nov 26, 2012</td>
<td>SATURDAY</td>
<td>2</td>
<td>AM</td>
<td>3</td>
<td>Not an Intersection</td>
<td>Clear</td>
<td>Daylight</td>
<td>Principal Arterial - Other</td>
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<tr>
<td>540022</td>
<td>Jan 27, 2012</td>
<td>FRIDAY</td>
<td>5</td>
<td>AM</td>
<td>2</td>
<td>Not an Intersection</td>
<td>Rain</td>
<td>Daylight</td>
<td>Other Principal Arterial</td>
<td>0.66</td>
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DOT Operational Dashboard: Operational Dashboard > Safety: Fatal Accidents
Transportation: Road Safety Audit System

### Worst Guardrail Sections

<table>
<thead>
<tr>
<th>Highway Name</th>
<th>Start Mile</th>
<th>End Mile</th>
<th>AADT</th>
<th>Number of Fatal accidents</th>
<th>Carriageway Type</th>
<th>Number of lanes</th>
<th>COMMENT_</th>
<th>CO DESC</th>
<th>IDC_GUARDR</th>
<th>ELEMENT_ID</th>
<th>LOC</th>
<th>OFFSET</th>
<th>POST</th>
<th>RAIL</th>
<th>Guardrail Condition</th>
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<tbody>
<tr>
<td>I-77</td>
<td>0.28</td>
<td>0.38</td>
<td>11020</td>
<td>2</td>
<td>Two-Way Roadway</td>
<td>4</td>
<td>RALEIGH</td>
<td>0.00</td>
<td>RALE-15-010-00-TOLL</td>
<td>MEDIAN</td>
<td>5.96</td>
<td>METAL</td>
<td>W BEAM</td>
<td>GOOD</td>
<td></td>
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<tr>
<td>US 219</td>
<td>7.94</td>
<td>7.98</td>
<td>20516</td>
<td>2</td>
<td>One-Way Roadway</td>
<td>2</td>
<td>GREENSBURG</td>
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<td>GREE-US-219-00-001MA</td>
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<td>W BEAM</td>
<td>GOOD</td>
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<tr>
<td>I-77</td>
<td>29.56</td>
<td>29.78</td>
<td>41200</td>
<td>5</td>
<td>Two-Way Roadway</td>
<td>5</td>
<td>RALEIGH</td>
<td>0.00</td>
<td>RALE-15-077-00-TOLL</td>
<td>MEDIAN</td>
<td>10.087</td>
<td>METAL</td>
<td>W BEAM</td>
<td>GOOD</td>
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<td>I-77</td>
<td>30.56</td>
<td>30.59</td>
<td>41200</td>
<td>5</td>
<td>Two-Way Roadway</td>
<td>5</td>
<td>RALEIGH</td>
<td>0.00</td>
<td>RALE-15-077-00-TOLL</td>
<td>MEDIAN</td>
<td>11.866</td>
<td>METAL</td>
<td>W BEAM</td>
<td>GOOD</td>
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<td>I-77</td>
<td>48.83</td>
<td>48.85</td>
<td>24020</td>
<td>5</td>
<td>Two-Way Roadway</td>
<td>5</td>
<td>RALEIGH</td>
<td>0.00</td>
<td>RALE-15-077-00-TOLL</td>
<td>MEDIAN</td>
<td>18.3</td>
<td>METAL</td>
<td>W BEAM</td>
<td>POOR</td>
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ROLTA ONEVIEW™ FOR TRANSPORTATION

SOLUTION APPROACH
Overall Data Volumes for a large city with modern ITS systems

A typical city’s ITS systems provide Data to Operational Control Centers at a Volume and Velocity that needs to be understood in its Transportation context to be able to make assessment of System Performance.

Monitoring Systems

- Monitoring Systems
  - Unified Fare Card
    - (2.3 TB)
  - Urban Traffic Control
  - Taxi Radio System
  - Taxi Fare System
  - Automated Vehicle Monitoring
  - Traffic Counters
    - ~100K / day
  - Electronic Tolling
    - ~250K/day

Dimensional Warehouse Model

- Dimensional Warehouse Model
  - Key Information from Source System
    - Volume
    - Velocity

Parking Systems

- Parking
  - Parking Services System
    - 25.3 Million (1.35 GB)
  - Parking Central Management
    - 104 Million (37 GB)
  - mParking System
    - 78 Million (6.8 GB)
  - Parking Fines System
    - 468 Million (49 GB)
Rolta Brings 100x Value of Data

**BIG DATA**
- Operational Technology (OT) Systems
- Geographic Information System (GIS)
- Enterprise Information Systems (EIS)

**BIG DATA**
- Big Data (Social Media) "Human" Data
- Traditional Business Systems

**GIS**
- Advanced Spatial Analytics
- Locational Intelligence, SDI, Spatial Predictive Analytics
- Geospatial Fusion Platform
- Contextual integration of Geospatial and IT Data
- GIS, Mapping, Data Creation
- 2D/3D Terrain, City maps, Aerial, Vector, Raster

**EIS**
- Analytics for Operational Excellence
- Technical, Design and Operational Integrity
- Fusion of IT, Operational and Engineering Data
- Engineering Information Systems (EIS)
- Engineering Designs, Models, Digitization, Data Quality
Rolta Brings 100+ Rapidly Deployable Solutions

Urban Planning
- 2D/3D City Model
- 3D City Model Based Planning
- Land Management
- Electric Infrastructure Management
- Gas Infrastructure Management
- Pipeline Infrastructure Management
- Water Infrastructure Management
- Municipal Spatial Solution Infrastructure
- Crowd Sourcing for City Planning
- Building Permit Approval
- Transportation Engineering System
- Property Management
- Urban Expansion Monitoring
- Property Network Analysis
- Flood Simulation & Management
- Disaster Impact Analytics

Public Works
- Capital Project Management
- Enterprise Geo-Asset Management
- Safe to Dig
- Mobile Field Inspection
- CAD to Map
- Work Order Management
- Customer Complaint Analysis

e Governance
- Citizen Portal
- Single Window Citizen Service Desk
- Citizen Grievance Management
- Citizen Mobi-connect – Find Parking
- Citizen Mobi-connect – Find Route
- Citizen Mobi-connect – City Guide
- State Residential Data Hub
- Service Desk Infrastructure Monitoring
- Single Access for all Government Applications
- Billing Management
- Rolta GRP (Government Resource Planning)
- Rolta Geo-ERP (Spatial Enabled ERP)
- e-Procurement
- Project Management
- Facility Management
- Election Information
- Encroachment Management
- Job Management
- Fleet Management
- Road Sweeping Monitoring
- Parking Meter Monitoring
- Road Monitoring
- Mobile - Field Health Workers
- City Performance Dashboard

Power
- Enterprise Asset Management – Power
- Power Asset Junction
- Power Outage Monitoring
- Transmission Infrastructure Project Management
- Energy Meter Billing Analytics
- Power Distribution Performance Management
- Operational Excellence
- Predictive Asset Health Analytics

Water
- Water Resources Information System
- Water Tank Information System
- Water Quality Compliance Monitoring System
- Water Distribution Performance Management
- Waste Water & Clean Water Performance Analytics
- Asset Performance
- Investment Planning
- Operational Excellence
- Geospatial Pipeline Integrity
- Flood Simulation & Management

Waste Management
- Bin Management System
- Solid Waste Disposal
- Sewerage – Asset Management
- Preventive Maintenance Based on Sludge Forecast
- Single Window Clearance Management
- Sewage-Flooding Analyses

Safety & Security
- Rolta GeoCAD - Multi Agency Emergency Response
- Security Planning - Police
- Patrol Planning & Compliance Monitoring
- Distress Call & Emergency Response Management (Police)
- Medical Emergency Response
- Distress Call & Emergency Response Management (Fire)
- Rolta Suraksha
- Rolta Command & Control for Safer Cities
- City Surveillance
- Critical Infrastructure Protection
- Airport Security
- Coastal Security
- Vessel Traffic Management
- Crime Analytics
- 3D Model - Line of Sight & Line of Area

Environment
- Environment Management Portal
- Air Quality Monitoring
- Land Scarc Monitoring
- Ground Water Monitoring
- GeoEnvironment – Soil Mapping Analysis
- Forest Reservoir Monitoring
- River Pollution Monitoring

Economic Development
- Industrial Land Development
- Investor Portal
- Single Window Clearance

Transportation
- Traffic Portal
- Metro / Rail Information Portal
- Waterway Management
- Road Safety Audit System
- Road Permit System
- Traffic Challan Management
- Traffic Congestion Analytics
- Transportation Infrastructure Performance
- Asset Safety
- Transportation Planning & Budgeting
- Performance Analytics

Gas
- Gas Distribution Performance Management
- Gas Meter Billing Analytics
- Gas Asset Junction
- Geospatial Pipeline Integrity

400+ Smart City Projects implemented by Rolta Worldwide

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Rolta OneView™
Consumerizing the power of Analytics
Rolta OneView™ Smart City Operations Suite

Real-time Operations Hub

Command & Control Center
- Location Based Incident Management
- Alerts, EDXL & Notification
- Mobility
- SOP
- Resource Management
- Event Correlation
- Watch rule
- Threat Level
- Multi Sensor Framework
- Edge Device Alert Burst Protection

Enterprise Knowledge & Information Hub

Predictive Analytics Manager
Enterprise Search
Data Science Workbench
- Exploratory Analysis
- Data Quality Analysis
- Model Building
- Model Validation
- Publish Model

Analytical Models

Integration
- SMART CITY OPERATIONS
- SMART CITY ASSETS
- MAINTENANCE & RELIABILITY
- CITIZENS
- SAFETY & ENVIRONMENT
- PROJECTS

Big Data / IoT Fusion & Governance Platform

ROLTA Universal Connector Platform (UCP) - Pre-Built Connectors (Real-time Streaming, Batch mode, Event based)

Real Time Analytics Server and Data Bridge
Asset Junction
Referential Integrity & Quality

Real-time Situational Awareness
- Multiple Sensor Fusion
- Comms Server
- Integration Server
- Rules Engine

Work Process Automation
- Threshold Manager
- Message Bus
- Publish | Subscribe | Event Generator | Event Consumer

Structured Data/Other IT Apps
Geospatial Fusion
- Spatial Querying
- Spatial integration

Social Media/Unstructured Data
- Sentiment Analysis
- Crawling and Scraping

Integrated Solution of Real Time Operation Hub and Knowledge Hub
Operational Excellence 360 Dashboard

Rolta OneView™ Operational Excellence - Digital Transformation
Environmental Sensors

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<thead>
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<th>Air Quality Index (Last 24 hrs.)</th>
<th>Number of Sensors Not Working</th>
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<table>
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<th>PM10</th>
<th>PM2.5</th>
<th>NO2</th>
<th>O3</th>
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<td>65</td>
<td>411</td>
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<td>SO2</td>
<td>NH3</td>
<td>Pb</td>
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<td>1601</td>
<td>845</td>
<td>0.2</td>
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Weather Information

- **Temp.**: 32
- **Pressure**: 1013
- **Humidity**: 62

Weather Forecast

- **Monday**: PM2.5: 17, Temp: 26, Wind Speed: 3
- **Tuesday**: PM2.5: 17, Temp: 26, Wind Speed: 4
- **Wednesday**: PM2.5: 17, Temp: 26, Wind Speed: 4

Innovative Solutions for Insightful Impact
Self Service IoT Analytics
Thank You