Topics

- Integrated Corridor Mgmt.
- Lessons Learned
  - DART – Operating Practices
  - Transit Industry – Challenges
  - Best Practices – US, Europe, Asia
- Concept of Operations
  - DART IC3 & Regional Integration
  - DART IC3 – Concept 1 (Public Private Partnership)
  - Regional Integration – Concept 2 (Public Private Partnership)
- Regional Vision
Background

ICM & Why ICM?

- DFW – 5th most Congested
- #1 for worst region for growth is Congestion
- US 75 is a critical regional corridor
- Travel demand and congestion continues to grow
- No ability to expand freeway, arterials, or alternate routes
- Significant employers in the corridor
- Numerous special events
Background

ICM & Why ICM?

• **Key Indicators** *(Savings in Travel Time, Gallons of Fuel, Tons of Mobile Emissions, 10-Year Cost/Net Benefits/Benefit-Cost Ratio)*

• **Applications**
  - Smart NET
  - Freeway Management
  - HOV Management
  - Arterial Street Monitoring System
  - Weather
  - Responsive Traffic Signal System
  - Real-Time Transit Vehicle Information
  - Parking Management
  - Decision Support System
  - 511
Highway and Transit Systems
Integrated Networks?
Integrated Technology?
Integrated DSS?

1. Road Network
2. Light Rail Network
3. Bus Network
4. Commuter Rail Network
5. Street Car/Trolley Network
6. Site Specific Shuttle Network
7. Technology Network
8. ADA-Paratransit Network
9. Mobility on Demand Network
10. TNC Network

Non-Fixed Networks
DOWNTOWN HIGHWAY AND TRANSIT CORRIDOR

- Victory
- West End
- Pearl
- Deep Ellum
- St. Paul
- Akard
- Union
Field Supervisors -> affected stations along with the incident scene - OP
Without Instructions -> TCC & Or Bus Dispatch
How many buses?
How can operators report to Bus Bridge?
How can Field manage buses?
How do you know requisite buses are on Bus Bridge?
Extra Pay List (Bus Bridge)?
Establish a Route #/Headsign Code specific to BB//will decrease phone calls to Dispatch from Operators & Field as they can monitor the location of the bus on the tablets.
Operators should logout after the BB is cancelled, ONLY after Dispatch makes an ALL CALL that BB is cancelled.
CBD SERVICE DISRUPTION PLAN - RAIL

OPERATING PLAN A
- Both Tracks Down

OPERATING PLAN B1
- Catenary Power Outage in CBD/
  (Sectionalizing NOT Complete)

OPERATING PLAN B2
- Catenary Power Outage in CBD/
  (Sectionalizing Complete)
CBD SERVICE DISRUPTION PLAN – BUS BRIDGE ROUTE

Disclaimer: Map not to scale. For general reference only. Information depicted on this map is presumed to be accurate at the time of publication. Accuracy of this information needs to be verified prior to use.

Map Source: Emergency Response & Technical Administration; Publication Date: August 14, 2015
# DART INCIDENT MANAGEMENT SYSTEMS

<table>
<thead>
<tr>
<th>Incident Logged</th>
<th>OCC LOG</th>
<th>Incident is Logged//MS Access Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Movement Monitored</td>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
</tr>
<tr>
<td></td>
<td>VBS</td>
<td>Vehicle Business Systems</td>
</tr>
<tr>
<td>Staff/Public Informed</td>
<td>EVERBRIDGE</td>
<td>DART Staff informed regarding Incident</td>
</tr>
<tr>
<td></td>
<td>PUBLISHER</td>
<td>Public informed via Facebook/Twitter/DART.org, etc.</td>
</tr>
<tr>
<td></td>
<td>Platform PA System</td>
<td>Public Announcements on Platforms</td>
</tr>
<tr>
<td></td>
<td>Platform PAVMB</td>
<td>Audio/TXT Mssgs on Platform Visual Message Boards</td>
</tr>
<tr>
<td></td>
<td>Rail PA System</td>
<td>Onboard announcement by Rail Operator</td>
</tr>
<tr>
<td>Event Observation</td>
<td>Platform CCTV</td>
<td>Activity on the Platforms</td>
</tr>
<tr>
<td></td>
<td>Weather DTN</td>
<td>Monitoring Weather</td>
</tr>
<tr>
<td>Response</td>
<td>TRANSIT MASTER</td>
<td>Monitor Bus Location &amp; Request for Bus Bridge</td>
</tr>
<tr>
<td></td>
<td>TRAPEZE</td>
<td>Establish Bus Bridge by Station Office</td>
</tr>
<tr>
<td>Coordination</td>
<td>??????</td>
<td>??????</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Technology</th>
<th>TVMs</th>
<th>INFOTAINMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WHERE IS MY BUS?</td>
<td>HEAD SIGNS</td>
</tr>
<tr>
<td></td>
<td>WHERE IS MY TRAIN?</td>
<td>FAREBOXES</td>
</tr>
<tr>
<td></td>
<td>SMART DRIVE</td>
<td>TRANSIT CAMERAS</td>
</tr>
</tbody>
</table>
DART INCIDENT MANAGEMENT SYSTEMS
CBD SERVICE DISRUPTION PLAN – BUS BRIDGE OPERATION

WRONG TURN

GARAGE

OUT OF SERVICE

541 FAWN VALLEY

26 DOWNTOWN DALLAS

SERVICE PROTECTION
CBD SERVICE DISRUPTION PLAN – RAIL DISRUPTION STOP

RAIL DISRUPTION
WE’LL GET YOU BACK ON TRACK

Attention passengers, due to track fault, there is no train service between Tanah Merah and Pasir Ris SMRT stations. Free boarding of passing bus services are available.

In the event of train disruptions, replacement bus services will depart from here.

Disruption on North South Line
Between Marina Bay and Newton, in both directions

East West Line
North South Line
Circle Line
Bukit Panjang LRT

Normal
Disrupted
Normal
Normal

Buses on rail replacement services

Rail Replacement Service
Bus Stop
Both Directions

Rail Replacement Buses
Critical Incident Management and Clearance Practices for Rail Transit

A Synthesis of Transit Practice

Location of Responding Agencies

FIGURE 2 Survey respondents and case examples. Source: Survey results and case examples.
# Transit Incident Management

## Table 11
Major Impediments to Minimizing Passenger Impacts for On-Board Passengers

<table>
<thead>
<tr>
<th>Impediment</th>
<th>No. Agencies Responding</th>
<th>% Agencies Responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring consistent, accurate information</td>
<td>6</td>
<td>19%</td>
</tr>
<tr>
<td>Establishing alternate service</td>
<td>6</td>
<td>19%</td>
</tr>
<tr>
<td>Passenger issues (reassuring/keeping calm/</td>
<td>5</td>
<td>16%</td>
</tr>
<tr>
<td>preventing self-evacuation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time estimate for/obtaining train release</td>
<td>5</td>
<td>16%</td>
</tr>
<tr>
<td>Train location: bridge/tunnel/remote</td>
<td>4</td>
<td>13%</td>
</tr>
<tr>
<td>Response time/time of day/traffic</td>
<td>4</td>
<td>13%</td>
</tr>
<tr>
<td>Limited space/limited access to right of way</td>
<td>3</td>
<td>14%</td>
</tr>
<tr>
<td>Limited communication system/limited reception</td>
<td>2</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

## Table 12
Actions to Minimize Passenger Impacts for On-Board Passengers

<table>
<thead>
<tr>
<th>Action</th>
<th>No. Agencies Responding</th>
<th>% Agencies Responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear, detailed communication</td>
<td>12</td>
<td>41%</td>
</tr>
<tr>
<td>Faster response in getting more staff on-site</td>
<td>6</td>
<td>21%</td>
</tr>
<tr>
<td>Availability of equipment for alternate service</td>
<td>5</td>
<td>17%</td>
</tr>
<tr>
<td>More education of first responders</td>
<td>4</td>
<td>14%</td>
</tr>
<tr>
<td>Use of social media for faster communication</td>
<td>2</td>
<td>7%</td>
</tr>
<tr>
<td>Advance agreement on procedures</td>
<td>2</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>17%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>29</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

## Table 13
Actions Taken to Communicate with Other Affected Passengers

<table>
<thead>
<tr>
<th>Action</th>
<th>No. Agencies Responding</th>
<th>% Agencies Responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twitter/social media</td>
<td>15</td>
<td>48%</td>
</tr>
<tr>
<td>Station announcements</td>
<td>15</td>
<td>48%</td>
</tr>
<tr>
<td>Text alerts/e-mail</td>
<td>13</td>
<td>42%</td>
</tr>
<tr>
<td>Media updates</td>
<td>13</td>
<td>42%</td>
</tr>
<tr>
<td>Agency website</td>
<td>10</td>
<td>32%</td>
</tr>
<tr>
<td>On-board announcements</td>
<td>5</td>
<td>16%</td>
</tr>
<tr>
<td>Message boards at stations</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Alerts to connecting buses/agencies</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Prompt info by whatever means</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

## Table 14
Types of Alternate Service

<table>
<thead>
<tr>
<th>Alternate Service</th>
<th>No. Agencies Responding</th>
<th>% Agencies Responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus bridge/shuttle around critical incident site</td>
<td>29</td>
<td>94%</td>
</tr>
<tr>
<td>Alternate bus routes</td>
<td>25</td>
<td>81%</td>
</tr>
<tr>
<td>Adjacent-track operation</td>
<td>24</td>
<td>77%</td>
</tr>
<tr>
<td>Alternate rail lines within the agency</td>
<td>11</td>
<td>35%</td>
</tr>
<tr>
<td>Bus bridge/shuttle to another transit service</td>
<td>9</td>
<td>29%</td>
</tr>
<tr>
<td>Rail lines operated by other agencies</td>
<td>6</td>
<td>19%</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Given many cities’ growing dependence on public rail transport, simple network disruptions can lead to widespread confusion and significant productivity loss to the society. Therefore, a systematic approach to developing efficient disruption response and minimizing the negative impacts is required. Pg. 9
REGIONAL ICM SYSTEM
**CONCEPTUAL INTEGRATION**

**DART SYSTEMS**

### Video
1. Rail Station Cameras
2. Rail Yard Cameras
3. Bus Safety Cameras
4. Bus Security Cameras
5. Bus Garage Cameras
6. Bus Yard Garage
7. RAV Tower Cameras
8. Drone Cameras (Future)
9. Body Cameras (Future)
10. Onboard Rail Cameras (Future)
11. NTTA Tollway Cameras
12. City of Dallas Cameras
13. (Other City Cameras)

### Databases
- (SQL, Oracle, Access, etc)
- Transit Master
- Trapeze
- VBS
- Lawson
- Everbridge
- Publisher
- OCC Log
- BB Image Catalogue

### Streaming/Data Feeds
1. Weather
2. Highway Speeds

### AVL
1. Bus (Existing)
2. Rail (Existing)
3. Bus Supervisor Car
4. Rail Supervisor Car
5. Transit Police Cars
6. Maintenance Vehicles
7. Bus Supervisor Radio
8. Rail Supervisor Radio
9. Drones (Future)

### GIS Layers
1. Base Map Layers +
2. Bus Network (stops, routes, signs, bays, transit centers, incidents, etc.)
3. Rail Network (stops, routes, signals, switches, junctions, interlockings, incident, etc.)
4. WSA (ROW, catenary, track, substations, etc.)
5. Real Estate (DART owned properties, landuse, zoning, etc.)
6. Emergency Response (critical assets, storage tanks, fueling facilities, etc.)
7. Planning (demographics, ridership, OTP, base map layers, apr, data, etc.)
8. RPD (construction drawings, plats, etc.)
9. Finance (TVMs, transactions, etc.)
10. Transit Police (Crime stats, fare violations, cameras, car avls, etc.)

**OPEN ACCESS**
- Agency staff

**RESTRICTED ACCESS**
- Public

### Audio/Text
1. Rail Station PA
2. Rail Station VMB
3. Highway DMS (existing)
1. Parking Lot DMS (Future)
2. Transit Center PA (Future)
3. Transit Center VMB (Future)
4. Mobile DMS (Maintenance)

### Streaming/Data Feeds
1. Parking Lot DMS (Future)
2. Transit Center PA (Future)
3. Transit Center VMB (Future)
4. Mobile DMS (Maintenance)

### GIS Layers
1. Base Map Layers +
2. Bus Network (stops, routes, signs, bays, transit centers, incidents, etc.)
3. Rail Network (stops, routes, signals, switches, junctions, interlockings, incident, etc.)
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8. RPD (construction drawings, plats, etc.)
9. Finance (TVMs, transactions, etc.)
10. Transit Police (Crime stats, fare violations, cameras, car avls, etc.)
SERVICE DISRUPTION CONCEPT

**Base Map showing:**
1. Bus Bridge Buses
2. Disrupted Stations

**Bus Bridge Diagram**
- Green: Updated disrupted stations
- Blue: Bus Bridge Buses

**Updates**
- DARTAlerts filtered to the incident detail

**IN DEVELOPMENT PHASE**

Graphic Showing updated disrupted stations (in red) and bus bridge buses in Blue
With twitter feed (real-time updates) and bus bridge schematics showing the bus bridge route
# Conceptual Integration

## DART Systems

### Distribution Platform
- Phone, Tablet, Desktop, etc.

### Video
1. Rail Station Cameras
2. Rail Yard Cameras
3. Bus Safety Cameras
4. Bus Security Cameras
5. Bus Garage Cameras
6. RAV Tower Cameras
7. Drone Cameras (Future)
8. Body Cameras (Future)
9. Onboard Rail Cameras (Future)
10. Texas DOT Highway Cameras
11. NTTA Tollway Cameras
12. City of Dallas Cameras
13. (Other City Cameras)

### Databases
(SQL, Oracle, Access, etc)
1. Transit Master
2. Trapeze
3. VBS
4. Lawson
5. Everbridge
6. Publisher
7. OCC Log
8. BB Image Catalogue

### Streaming/Data Feeds
1. Weather
2. Highway Speeds

### AVL
1. Bus (Existing)
2. Rail (Existing)
3. Bus Supervisor Car
4. Rail Supervisor Car
5. Transit Police Cars
6. Maintenance Vehicles
7. Bus Supervisor Radio
8. Rail Supervisor Radio
9. Drones (Future)

### GIS Layers
1. Base Map Layers +
2. Bus Network (stops, routes, signs, bays, transit centers, incidents, etc.)
3. Rail Network (stops, routes, signals, switches, junctions, interlockings, incident..)
4. WSA (catenary, track, substations, etc)
5. Real Estate (DART owned properties, landuse, zoning, etc.)
6. Emergency Response (critical assets, storage tanks, fueling facilities, etc.)
7. Planning (demographics, ridership, OTP, base map layers, apc data, etc.)
8. RPD (construction drawings, plats, etc.)
9. Finance (TVMs, transactions, etc.)
10. Transit Police (Crime stats, fare violations, cameras, car avls, etc.)

### Audio/Text
1. Rail Station PA
2. Rail Station VMB
3. Highway DMS (existing)
4. Parking Lot DMS (Future)
5. Transit Center PA (Future)
6. Transit Center VMB (Future)
7. Mobile DMS (Maintenance)

### OPEN ACCESS
Agency staff

### RESTRICTED ACCESS
Public
**SERVICE DISRUPTION CONCEPT**

Base Map showing:
1) Bus Bridge Buses
2) Disrupted Stations

Graphic showing updated disrupted stations (in red) and bus bridge buses in Blue.

With Twitter feed (real-time updates) and bus bridge schematics showing the bus bridge route.

**PHASE 2: AVL**
SERVICE DISRUPTION CONCEPT

Bus Bridge Buses
Rail Supervisors
Bus Supervisors

SERVICE DISRUPTION INFORMATION

Updates
DARTAlerts filtered to the incident detail

Base Map showing:
1) Bus Bridge Buses
2) Disrupted Stations

Graphic Showing updated disrupted stations (in red) and bus bridge buses in Blue
With twitter feed (real-time updates) and bus bridge schematics showing the bus bridge route

PHASE 2: AVL
INCIDENT RESPONSE
Zones/Times
1. Rail Field Ops
2. Bus Field Ops
3. SPBs//Rail Disruption Shuttles
4. Travel Ambassadors
5. Station Concierges
6. Transit Police
7. Revenue Technicians
8. Fare Enforcement Officers
9. Safety Officers

INCIDENT Checklist
1. PAVMB
2. BUS SIGNS
3. Service Disruption Stop
4. Scheduled vs. Projected RTs
5. Customer Communication
6. Customer Satisfaction
CONNECTION PROTECTION CONCEPT

Phase 3: Connection Protection

Missed Connections:
- Route 210/Block 02: Direct Customers to catch Route 220 Bus
- Route 330/Block 01: No Pull-Out/Catch next block/30 min Delay
- Route 410/Block 02: Direct Customers to catch Route 230 Bus

Possible Missed Connections in the next 15 mins:
- Route 210/Block 02: Running 20 min late
- Route 320/Block 12: Running 22 min late
- Route 420/Block 02: Running 24 min late

DART Alerts filtered to the incident detail

DART Alerts
- @DARTAlerts Jan 11
  Red & Orange line passengers may experience delays due to a mechanical issue near Galleria Park Station. Our apologies for the inconvenience.
- @DARTAlerts Jan 7
  Rail lines through downtown Dallas are delayed due to an earlier accident near West End. Our apologies and thank you for your patience.
- @DARTAlerts Jan 4
  Trains are resuming normal operations & bus shuttle has been cancelled. Please allow time to get back on schedule. Apologies for the delays.
- @DARTAlerts Jan 4
  Green and Orange line passengers should expect delays due to police activity near Parkland. We appreciate your patience.
- @DARTAlerts Jan 4
  Passengers need to use bus shuttle. Please allow at least 30 min for travel.

Graphic showing ‘connection protection’ concept – Departure of the ‘Green’ bus at 7:30 AM is dependent on the arrival of five buses prior to 7:29 AM. In this scenario ‘Red’ bus will not make it in time and as such its customers will lose the connection. In this scenario the system will automatically send a message to ‘Green’ bus either to hold for two more minutes or send a message to the Station Concierge and/or post to the ‘Infotainment’ (Bus Visual Display Board) that the bus is running x minutes behind and recommend alternate connections/routes.
UNSCHEDULED DETOURS – CUSTOMER RESPONSE CONCEPT

Graphic Showing ‘unscheduled detour’ concept. Blue line is the regular route. Red dotted line is the detour route. Black Rectangles are the impacted Bus Stops. Inform the customers at those stops are not being serviced and of alternate travel options.

PHASE 3: UNSCHEDULED DETOURS
### Databases
- SQL, Oracle, Access, etc.
  1. Transit Master
  2. Trapeze
  3. VBS
  4. Lawson
  5. Everbridge
  6. Publisher
  7. OCC Log
  8. BB Image Catalogue

### Streaming/Data Feeds
- Weather
- Highway Speeds

### GIS Layers
- Base Map Layers +
- Bus Network (stops, routes, signs, bays, transit centers, incidents, etc.)
- Rail Network (stops, routes, signals, switches, junctions, interlockings, incidents)
- WSA (ROW, catenary, track, substations, etc.)
- Real Estate (DART owned properties, landuse, zoning, etc.)
- Emergency Response (critical assets, storage tanks, fueling facilities, etc.)
- Planning (demographics, ridership, OTP, base map layers, apc data, etc.)
- RPD (construction drawings, plats, etc.)
- Finance (TVMs, transactions, etc.)
- Transit Police (crime stats, fare violations, cameras, car avls, etc.)
CONCEPTUAL INTEGRATION

MAP CENTRIC

Where is my Bus?
Where is my Train?
What is the load on the train?

How is the weather? Past 30 mins, Projected 30 mins

What is going on the platform?
Are there any stranded passengers?

How heavy is the traffic?
How heavy is the snow falling?
Are the streets clear?
Has the accident been cleared?

Input Form(s):
- Incidents Details
- Alerts
- Public Input
- Employee Input

Report Generator:
- Post Incident Summaries
- Incident Queries by Date/Incident Type/Class, etc.
- Automated Periodic Reports (OCC Logs/Business?)

Core Intelligence: TTI optimized modeling engine against
Data Repository (Historical, Real-Time, Projected)

Use of ICM Technology For Transit Incident Management

GOALS

- OPERATION EFFICIENCY (Cost Savings)
- ACCOUNTABILITY  (Safety & Transparency)
- SERVICE RELIABILITY (Service Quality)
- INCREASED RIDESHIP (Decrease Highway Traffic)
Transit Incident Management utilizing Regional ICM technology

Scenario: On March 30, 2016, a Code Blue (Bomb Threat) was declared for Pearl Station, based on a suspicious package. DART Central Business District (CBD) Service Disruption – Operating Plan B was deployed. Incident lasted for two hours and sixteen minutes.

DART follows the process described below to manage service disruptions with varied response times based on an incident and occurrence time (weekday/weekend, Peak/Off-Peak). Similar to EcoTrafIX’s ICM incident creation functionality, this exercise is designed to model EcoTrafIX to provide outputs just by two pieces of inputs – disrupted station(s) & track(s). Data Source: DART’s CBD Blockage Plan and the recent Bomb Threat at Pearl Station: Closure of Both Tracks at Pearl Station, EcoTrafIX should automatically send out internal/external communication, contact garages and deploy Operating Plan B.

Modelling Scenario: Create Incident-----> Shutdown Pearl Station ---> Shutdown Both Tracks ---> identify affected track segment, interlockings, zones/supervisors cars----->recommend rail routing options with associated bus bridge plan ----> provide prompt to accept Rail & Bus Operating Plans ---->simulate’ associated Bus Bridge Plan (Ref. DART CBD Blockage Plan - Operating Plan B, in this case) ----> ‘simulate’ bus bridge count & auto-request to Garages ---> ‘simulate’ to send a message to both internal/external customers ----> ‘simulate’ location of bus supervisors, rail supervisors, trains, bus bridge busses, transit police cars and trains (Ref. March 30 Code Blue Field Staff Location Summary)

<table>
<thead>
<tr>
<th>0 Minutes</th>
<th>Start of the Incident process</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Minutes</td>
<td>4 key actions that take place within the first 3 minutes</td>
</tr>
</tbody>
</table>

### Rail Operator
Informs Train Control Center of Code Blue

### Train Control Center
1. **Inform Customers Onboard**: Direct Rail Operator to make Onboard Announcements
2. **Inform Field Supervisors**: Direct Field Supervisors to the Incident Location
3. **Establish OSC**: Establish an On Scene Coordinator (OSC)
4. **Inform Internal Staff**: Send out an Service Disruption Message (to DART Staff)
DART IC3 – CONCEPT 1: AUTOMATION & MODELING

3-10 Minutes
Key Items to create an incident

Incident Creation

Prior to Step 3, identify affected tracks & interlocking with all possible rail routing options and associated bus bridge plan. (Incident Manager must accept at least one plan in order to proceed to Step 3.)

**Goal:**
Model EcoTrafix to manage incident with just by two pieces of inputs – disrupted station(s) & track(s)

**Step 1: Tracks**
- Single Track 1/2
- Both Tracks
**Current Practice:**
- Reported via Radio By Rail Operator

**Communication (Internal)**
- Everbridge
- OCLs utilize Everbridge Program

**Communication (External)**
- Twitter, Facebook, dart.gov
- OCLs utilize Publisher Tool

**Step 2: Impacted Station**
- Station A
- Station B
- Station C
- Station D
**Manual Reporting:**
- Chief Control determines and reports to OCL and Bus Dispatch

**Step 3: Bus Bridges**
- From -> To X Buses
- From -> To X Buses
- Via - Telephone: Bus Dispatch Manager determines how many buses required to bus bridge, from & to stations.

**Step 4: Garage Requests**
- Garage A --→ X Buses
- Garage B --→ X Buses
- Garage C --→ X Buses
**Via - Telephone: Bus Dispatch Manager contacts Garages to request for buses.**

**PAVMBs**
- Passenger Announcements and Visual Message Boards
- OCLs utilize PACIS Program

**Infotainment: Bus Passengers**
- N/A: Installed on all DART Buses and can be utilized to inform bus passengers of disruption on the rail line. We do not utilize this system for service disruption updates at this time.
**DART IC3 – CONCEPT 1: AUTOMATION & MODELING**

### Incident Creation

**Prior to Step 3**, identify affected tracks & interlocking with all possible rail routing options and associated bus bridge plan. (Incident Manager must accept at least one plan in order to proceed to Step 3).

#### Step 1: Tracks
- Single Track 1/2
- Both Tracks

**Current Practice:**
- Reported via Radio by Rail Operator

#### Step 2: Impacted Station
- Station A
- Station B
- Station C
- Station D

**Manual Reporting:** Chief Control determines and reports to OCL and Bus Dispatch

#### Step 3: Bus Bridges
- From -> To: X Buses
- From -> To: X Buses
- Via - Telephone: Bus Dispatch Manager determines how many buses required to bus bridge, from & to stations.

#### Step 4: Garage Requests
- Garage A -> X Buses
- Garage B -> X Buses
- Garage C -> X Buses
- Via - Telephone: Bus Dispatch Manager contacts Garages to request for buses.

#### Communication (Internal)
- Everbridge
- OCLs utilize Everbridge Program

#### Communication (External)
- Everbridge Program
- Twitter, Facebook, dart.gov
- OCLs utilize Publisher Tool

#### PAVMBs
- Passenger Announcements and Visual Message Boards
- OCLs utilize PACIS Program

#### Infotainment: Bus Passengers
- N/A: Installed on all DART Buses and can be utilized to inform bus passengers of disruption on the rail line. We do not utilize this system for service disruption updates at this time.

**3-10 Minutes**

Key Items to create an incident

Goal:
- Model EcoTrafix to manage incident with just by two pieces of inputs – disrupted station(s) & track(s)
REGIONAL INTEGRATION – CONCEPT 2: PREDICTIVE ANALYTICS

Multimodal traffic orchestrator
SAFETY PYRAMID

a large enough number of unsafe acts eventually results in a fatality

• Herbert Heinrich, 1931
• Frank Bird, 1961
• Conoco Phillips, 2003

• 2 Million Accidents
• 300 Companies
• 3 Billion Hours Worked