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Document Version History

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DART Enterprise Technology Roadmap

Introduction
The DART Enterprise Technology Roadmap highlights architectural, operational, and procedural enterprise technology requirements that will be considered in IT software, hardware, and service acquisitions. DART’s IT Department maintains this document to inform technology providers of current and planned Enterprise IT directions. Suppliers are required to affirm their review of this document and commit that their products will operate in accordance with this roadmap unless otherwise explicitly documented in their proposals.

Overview of DART Technology
DART currently hosts internally all its enterprise class systems, except email, with an on-site primary data center and an off-site secondary data center for disaster recovery. Enterprise applications are hosted predominately on virtual servers on the Windows platform, as well as on Unix. Windows servers are standard for other applications. The primary standard database management system is Oracle, with increasing use of SQL/Server. There are significant custom developed interfaces between the various modules of different application suites. However, application middleware based on Apache ActiveMQ will start deployment in 2015. While internal hosting is the preferred platform, DART is not opposed to externally hosted solutions provided all interface and reliability requirements can be met.

All DART facilities are connected by an MPLS wide area network which also carries voice traffic for VoIP telephony system, with quality of service (QoS) implemented. Bandwidth can be adjusted as demand increases. There is an active project to deploy private Wi-Fi network in all operating facilities.
DART Enterprise Technology Architecture Diagram

**End User**
- **Managed Desktop**
  - Operating system: Windows 7 Enterprise & Professional
  - Browsers: Internet Explorer ver. 9 & Google Chrome
  - Security: DART owned devices must have MDM

**Mobile Devices**
- Operating system: Tablet: Android Ice Cream Sandwich (minimum); Phones: Android

**SaaS; Cloud Services**
- Infor Lawson v10 supports Finance, Procurement, & Human Capital
- Infor Spear v4 supports Asset Management, Work Orders, & Material Management
- Trapeze v12 supports Transportation Management, Planning, OPS & Customer Service

**Enterprise Applications**

**Integration**
- ESB: Infor ION
- Custom Interfaces
- Oracle Stored Procedures

**Database**
- Oracle 10gR1 and 11gR2
- SQL/Server 2008 R2; 2012 & 2014

**Information Management & BI**
- Cognos 10.2
- SAP Crystal Reports
- Ripplestone

**Server Hardware**
- HP Proliant C7000 Chassis with BL series blades, DL series servers
- HP Integrity nx7640

**Server Operating Systems**
- Windows 2008 R2
- HP-UX Unix 11.31

**Server Virtualization**
- VMware ESXi 5.

**Thin Client Terminal Service**
- 2X v10.5

**Storage**
- HP 3PAR StoreServ 7400
- HP StorageWorks 8100/8400 EVA

**Vehicle Business Systems**
- Rail – Init; Bus - TransitMaster
- Fare Collection: Ticket vending & Bus Farebox - Genfare

**Data Communications**
- Rocket Modem (3G/4G, WiFi, WLAN)

**Legend**
- Tactical Direction
- De-emphasize or “sunset”
- Current standard

**Cross-Cutting**
- **Network**
  - Core - Enterasys N Series Ethernet 10/100/1000/10000 switched and routed
  - Edge - Enterasys N Series Ethernet 10/100/1000 switched and routed
  - InterNet: Dell Sonicwall E5500, Ethernet 100Mbps
- **VPN**
  - Aventail
- **Transportation Radio System**
  - Harris 800/900 MHz
- **Identity Management**
  - Active Directory
  - Application based security
  - DARTnet
- **VoIP**
  - NEC 3C

**Primary Desktop Suite**
- Google Apps [document, presentation, spreadsheet]

**Project Management**
- Clarizen

**Clearing House**
- First Data

**Google**
- Google Sites
- Google Transit

**BI Analytics**
- Tableau

**Email**
- Google Gmail [eMail, Calendar, Contacts]
DART Enterprise Technology Roadmap

Major categories of DART Enterprise Technology are documented below along with the intended progression of upgrades expected over the next 5 years.

The current status is described under **Baseline Environment**, planned upgrades within 1-2 years are under **Tactical Deployment**, and **Strategic Direction** includes changes anticipated within a 3-5 year horizon. **Retirements** indicates components that will be decommissioned as their replacement capabilities come online. **Notes** provide additional information, emerging and current standards, and DART policy, as appropriate to the technology category.
## Enterprise Applications

### Baseline Environment
- Infor Lawson v9
- Trapeze v12
- Infor Spear v4

### Tactical Deployment
- Infor Lawson v10 (2015)
- Trapeze v12

### Strategic Direction
- SPEAR Replacement
- Infor Lawson
- Trapeze

### Notes
- Lawson supports Finance, Procurement, & Human Capital
- Spear supports Asset Management, Work Orders, & Material Management
- Trapeze supports Transportation Management, Planning, OPS & Customer Service

### Retirement Targets
- Spear (vendor EOL)

## Business Intelligence

### Baseline Environment
- Cognos 10.2
- SAP Crystal Reports

### Tactical Deployment
- Cognos
- SAP Crystal Reports
- Tableau (analytics)

### Strategic Direction
- Cognos
- SAP Crystal Reports
- Tableau

### Notes / Standards / Policies
- All coordinates should be in NAD83 Geodetic format
- Event related data must have a combined date & time timestamp, UTC preferred
- Data stores should provide for a network accessible ODBC connection

### Retirement Targets

## Database

### Baseline Environment
- Oracle 10gR1, 11gR1 & R2
- SQL/Server 2008R2, 2012

### Tactical Deployment
- Oracle 11gR2
- SQL Server 2012, 2014
- Enterprise SQL

### Strategic Direction
- Oracle DBMS
- SQL Server

### Retirement Targets
- Access
- Sybase
- MySQL

### Notes
- Enterprise SQL & Agency-wide SQL Consolidation being planned

## IT Security & Identity Management
## DART Enterprise Technology Roadmap

<table>
<thead>
<tr>
<th>Baseline Environment</th>
<th>Tactical Deployment</th>
<th>Strategic Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Active Directory</td>
<td>· Active Directory</td>
<td>· Active Directory</td>
</tr>
<tr>
<td>· Application-based Security</td>
<td>· Application-based Security</td>
<td>· Single Sign-on</td>
</tr>
<tr>
<td>· DARTnet (Security Fns)</td>
<td></td>
<td>· Role-based access controls</td>
</tr>
</tbody>
</table>

### Notes / Policies
- Some COTS products have embedded security functions

### De-emphasize
- Application-based security
- DARTnet (Security Fns)
Integration

Baseline Environment
- Oracle Stored Procedures
- Custom Interfaces

Tactical Deployment
- Apache ActiveMQ based ESB: Infor ION (2015)
- Oracle stored procedures

Strategic Direction
- Apache ActiveMQ based ESB: Infor ION
- Oracle stored procedures

Notes / Standards
- ION is an enterprise service bus (ESB) and message broker that's based on Java Messaging Service (JMS)-based Apache ActiveMQ.
- Interfaces: OAGi-conforming XML based Business Object Document; Web services API

Vehicle Systems - Bus

Baseline Environment
- Vehicle Business System: TransitMaster
- GFI Genfare (farebox, ticket vending)

Tactical Deployment
- TransitMaster

Strategic Direction
- TransitMaster
- Comprehensive Fare Payment System (CFPS)

Notes / Additional Information / Standards
- Data Communications: Rocket Modem (3G/4G, WiFi, WLAN)
- US DoT: National ITS Architecture
- North Texas Council of Governments: Regional ITS Architecture

Vehicle Systems - Rail

Baseline Environment
- Init
- GFI Genfare (ticket vending)

Tactical Deployment
- Init

Strategic Direction
- Init
- Comprehensive Fare Payment System (CFPS)

Notes / Standards
- US DoT: National ITS Architecture
- North Texas Council of Governments: Regional ITS Architecture

Development / Web
### End User: Desktop / Laptop

<table>
<thead>
<tr>
<th>Baseline Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 7 (Enterprise &amp; Professional)</td>
</tr>
<tr>
<td>Internet Explorer v9</td>
</tr>
<tr>
<td>Chrome</td>
</tr>
<tr>
<td>Thin client (default)</td>
</tr>
<tr>
<td>No user administrator rights</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tactical Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 7 (Enterprise &amp; Professional)</td>
</tr>
<tr>
<td>Internet Explorer v10/11</td>
</tr>
<tr>
<td>Chrome</td>
</tr>
<tr>
<td>Thin client (default)</td>
</tr>
<tr>
<td>No user administrator rights</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategic Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 9 or ?</td>
</tr>
<tr>
<td>Internet Explorer</td>
</tr>
<tr>
<td>Chrome</td>
</tr>
<tr>
<td>Thin client (default)</td>
</tr>
<tr>
<td>No user administrator rights</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Retirement Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Vista &amp; XP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Notes / Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin Client Terminal Service: 2X v10.2</td>
</tr>
<tr>
<td>Primary Desktop Suite: Office 2007 &amp; GMail; Secondary: Google Apps [document, presentation, spreadsheet]</td>
</tr>
<tr>
<td>Laptops have local storage and critical applications for mobility</td>
</tr>
</tbody>
</table>

### End User: Mobile Devices

<table>
<thead>
<tr>
<th>Baseline Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablet: Android Ice Cream Sandwich (minimum)</td>
</tr>
<tr>
<td>Smartphone: Android</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tactical Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows tablets are being evaluated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategic Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYOD policy under development</td>
</tr>
<tr>
<td>DART owned mobile devices must have MDM installed</td>
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</tbody>
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<table>
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<tr>
<td>BYOD policy under development</td>
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<td>DART owned mobile devices must have MDM installed</td>
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</tbody>
</table>

### Voice & Data Communications

<table>
<thead>
<tr>
<th>Baseline Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routing: Enterasys N Series</td>
</tr>
<tr>
<td>Edge: Dell Sonicwall E5500</td>
</tr>
<tr>
<td>VoIP: NEC 3C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tactical Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router Replacement Procurement</td>
</tr>
<tr>
<td>Edge: Dell Sonicwall E5500</td>
</tr>
<tr>
<td>VoIP: NEC 3C</td>
</tr>
<tr>
<td>Private WiFi 802.11ac</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategic Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet 10/100/1000/10000; switched and routed</td>
</tr>
<tr>
<td>LAN/WAN: MPLS / Opteman</td>
</tr>
<tr>
<td>IEEE 802.11ac (wireless)</td>
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<table>
<thead>
<tr>
<th>Retirement Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterasys N Series (vendor EOL 2016)</td>
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</table>

<table>
<thead>
<tr>
<th>Standards</th>
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<td>LAN/WAN: MPLS / Opteman</td>
</tr>
<tr>
<td>IEEE 802.11ac (wireless)</td>
</tr>
</tbody>
</table>
## Infrastructure

### Baseline Environment
- HP Proliant C7000, BL blades
- HP Integrity rx7640
- Windows 2008 r2
- HP-UX 11.31
- VMware ESXi 5.1

### Tactical Deployment
- Unix Server procurement

### Strategic Direction
- Windows 2012 r2 (tbd)

### Retirement Targets
- HP Integrity rx7640 (EOL 2016)

### Peripherals / Notes
- Storage: HP 3PAR StoreServ 7400; HP StorageWorks 6100/6400 EVA
- Microsoft HyperV virtualization (emerging)

## Partial List of Technology Standards and Standards Organizations

- American Institute of Certified Public Accountants (AICPA)
- American Public Transportation Association Standard for Transit Communication Interface Profiles
- Information Technology Infrastructure Library (ITIL)
- Institute of Electrical and Electronics Engineers (IEEE)
- International Organization for Standardization (ISO)
- National Institute of Standards and Technology (NIST)
- North Texas Regional ITS Architecture (NCTCOG)
- Society of Automotive Engineers
- The Open Group
- U.S. Department of Transportation: Federal Transit Administration (DOT / FTA)
- U.S. Department of Transportation: National ITS Architecture
- World Wide Web Consortium (W3C)