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Version Number	Version Date	Revised By	Description
4.0	28 Aug 2014	Keith Andrews Enterprise Architect	New version with updated content
4.1	9 Sep 2014	Keith Andrews Enterprise Architect	Added: Standards Organizations; Table of Contents



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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.

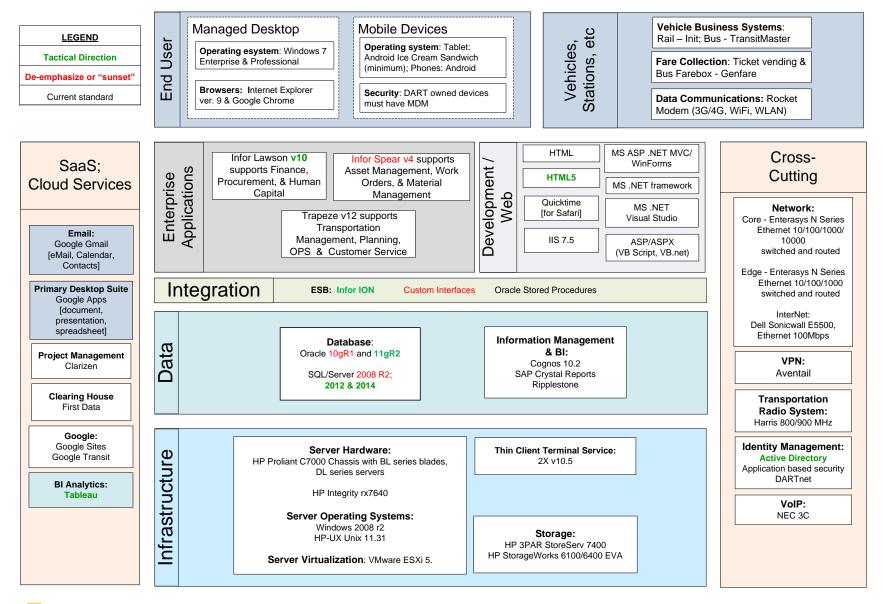
Overview of DART Technology

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.



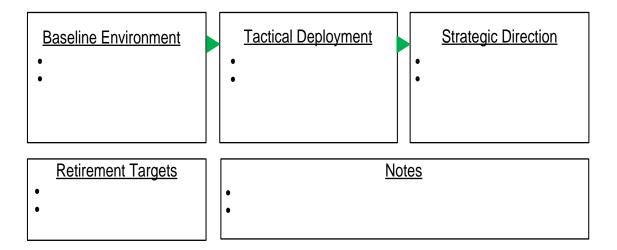
DART Enterprise Technology Architecture Diagram





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

Retirement Targets

• Spear (vendor EOL)

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

Business Intelligence

Baseline Environment

Retirement Targets

- 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

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

<u>Notes</u>

• Enterprise SQL & Agency-wide SQL Consolidation being planned

IT Security & Identity Management



Baseline Environment

- Active Directory
- Application-based Security
- DARTnet (Security Fns)

Tactical Deployment

- Active Directory
- Application-based Security

Strategic Direction

- Active Directory
- Single Sign-on
- Role-based access controls

<u>De-emphasize</u>

- Application-based security
- DARTnet (Security Fns)

Notes / Policies

- Some COTS products have embedded security functions
- Agency Policy IT-01: Utilization Directive & Intellectual Property



Integration

Baseline Environment

De-emphasize

· Custom Interfaces

- 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)

Retirement Targets

• GFI Genfare (farebox, ticket vending)

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)

Retirement Targets

• GFI Genfare (ticket vending)

Notes / Standards

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

Development / Web



Baseline Environment

- Microsoft .net
- Visual Studio

Tactical Deployment

- Microsoft .net
- Visual Studio

Strategic Direction

- HTML5
- Microsoft .net
- Visual Studio

Retirement Targets

:

Notes / Standards

- HTML5 (emerging)
- · Web services: IIS, Apache, WebSphere

End User: Desktop / Laptop

Baseline Environment

- Windows 7 (Enterprise & Professional)
- Internet Explorer v9
- Chrome
- Thin client (default)
- No user administrator rights

Tactical Deployment

- Windows 7 (Enterprise & Professional); Windows 9 (tbd)
- Internet Explorer v10/11
- Chrome
- Thin client (default)
- No user administrator rights

Strategic Direction

- Windows 9 or ?
- Internet Explorer
- Chrome
- Thin client (default)
- No user administrator rights

Retirement Targets

• Windows Vista & XP

Standards

- Thin Client Terminal Service: 2X v10.2
- Primary Desktop Suite: Office 2007 & GMail; Secondary: Google Apps [document, presentation, spreadsheet]
- · Laptops have local storage and critical applications for mobility

End User: Mobile Devices

Baseline Environment

- Tablet: Android Ice Cream Sandwich (minimum)
- Smartphone: Android

Tactical Deployment

 Windows tablets are being evaluated

Strategic Direction

Retirement Targets

Notes / Standards

- BYOD policy under development
- DART owned mobile devices must have MDM installed

Voice & Data Communications

Baseline Environment

- Routing: Enterasys N Series
- Edge: Dell Sonicwall E5500
- VoIP: NEC 3C

Tactical Deployment

- Router Replacement Procurement
- Edge: Dell Sonicwall E5500
- VoIP: NEC 3C
- Private WiFi 802.11ac

Strategic Direction

•

Retirement Targets

 Enterasys N Series (vendor EOL 2016)

Standards

- Ethernet 10/100/1000/10000; switched and routed
- LAN/WAN: MPLS / Opteman
- IEEE 802.11ac (wireless)



Infrastructure

Tactical Deployment Strategic Direction **Baseline Environment** • HP Proliant C7000, BL blades Unix Server procurement Windows 2012 r2 (tbd) • HP Integrity rx7640 Windows 2008 r2 • HP-UX 11.31 VMware ESXi 5.1 **Retirement Targets** Peripherals / Notes • HP Integrity rx7640 Storage: HP 3PAR StoreServ 7400; (EOL 2016) 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)

