Data Management
Big Data Challenges and Opportunities in Transit

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aE
About Us

Ayers Electronic Systems, LLC (aE)

• Technology Company Founded in 2008
• Based in Richmond Virginia
• Provider of Standards-Based Products and Services
• Customer Base is Primarily Surface Transportation
Agenda

- Big Data Concepts/Technologies
- Big Data Trends
- Transit Data Sources
- Transit Opportunities
- Transit Challenges
Big Data
Concepts and Technologies
Concepts & Technologies

- Data Repositories
- Data Marts/Data Warehouses
- Data Mining
- Data Lakes
- Internet of Things (IoT)
- Data Governance & Cybersecurity
Data Repository

“Destination designated for data storage”

- Structured Data from Multiple Source Systems
- Data may be Normalized for Distribution
- Break down “Silos”
- Makes Enterprise Data Available to Multiple Consumer Applications
- Transit Data Examples: Schedules, Vehicle Data, Stoppoint Inventory, Assignment Data
Data Warehouse

“Store of data from a wide range of sources used to guide management decisions”

- Structured Data from Multiple Source Systems
- Data is “Cleaned” & “Transformed” on Ingestion
- Makes Enterprise Data Available to Multiple Consumer Applications
- Optimized for Canned and Ad Hoc Reporting on Large Data Sets
- Includes Analytics Package to Create Dashboards & Reports
Data Mining

“Discovering patterns and relationships in large datasets”

➢ Sequence of Processes not a System
➢ Structured Data from One or Multiple Source Systems
➢ Data Selected Organized Based on Type(s) of Analyses to be Performed
➢ Generally More Focused Analyses than Data Warehouse
➢ Many Types of Analyses Used
Data Lake

“System or repository of data stored in its natural format”

➢ Unstructured & Structured Data
➢ Schema on Read
➢ User Integration
➢ Generally Need Data Scientists
➢ Often used Distributed Storage
➢ Huge Datasets
➢ Beware the “Swamp”
Internet of Things (IoT)  
“Internet connectivity for computers embedded in everyday devices”

➢ “Everything Everywhere”
➢ Provides monitoring and/or control
➢ Security/Privacy are ongoing concerns
➢ By 2020 Cisco predicts there will 7 times as many devices connected as people
➢ Data volumes dependent on device type
➢ Processing Speed Issues
➢ Who owns & controls the data?
Data Governance & Cybersecurity

“Internet connectivity for computers embedded in everyday devices”

➢ Data Consistency Across Enterprise Applications
➢ Data Quality Throughout
➢ Rise of Cyber Bad Actors:
  ➢ Recreational Hackers
  ➢ Criminal Enterprises
  ➢ Industrial Spies
  ➢ Governments
  ➢ Transparency Advocates
Big Data
Trends
Trends

➢ Increase in Number and Size of Datasets
➢ More Data Sources
➢ More & Better Data Management Tools
➢ More Data Quality Concerns
➢ More Privacy Concerns
➢ More Security Concerns
➢ Rising Customer Expectations
➢ More Analytic Opportunities
➢ “Future Shock”
Big Data
Transit Data Sources
Transit Data Sources

Operational Systems

➢ Bus Dispatching/AVL Systems
➢ Automatic Train Supervision
➢ Passenger Information Systems
➢ Scheduling Systems
➢ Incident Management Systems
➢ General Order Systems
➢ Signaling/Train Control Systems
➢ SCADA Systems
➢ Fare Collection Systems
➢ Call Taking Systems (Paratransit)
Transit Data Sources
Maintenance/Diagnostic Systems

➢ Event Recorders
➢ Asset Management Systems
➢ Work Order Systems
➢ Network Management Systems
➢ Log File Tailing
➢ Alarm Systems
➢ SCADA Systems
Transit Data Sources

Administrative Systems

➢ Payroll
➢ Timekeeping
➢ “Pick” Systems
➢ Training Systems
➢ Other HR Systems
Transit Data Sources

Unstructured Systems/Sources

- Customer Complaints
- Social Media (Twitter, Facebook)
- Email
- Documents
Big Data
Transit Opportunities
Transit Opportunities
Leveraging Data to Change Your Business

➢ Enterprise Data Warehouses
  ➢ Cross Functional Data Insights
➢ Enterprise Asset Management
  ➢ Consolidation of Maintenance and Asset Information
  ➢ Key Source System for Data Warehouse
➢ Organization of Unstructured Data
  ➢ Connections/Patterns
Transit Challenges
Overcoming Existing Processes
Technical Part is Easy

➢ Inertia
➢ Construction Management Mentality
  ➢ Agile Resistance
  ➢ You Don’t Know What You Don’t Know
➢ Long Development Cycles
➢ Resources/Skillsets
➢ Budgets
Summary

> Technology & Data are Available

> Unprecedented Insights/Understanding are Possible

> Institutional Barriers are Formidable

> Payoffs can be Substantial
Thank You.

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