• Session T9 Data Analytics – Starting Small

• State of Hawaii Department of Education
  - Data strategies and growth
Data Architecture – Before State

Benchmark Assessments
- BMT/Learnia
- AIR
- School Based
- ETS/IDMS
- Edison
- Tech Paths
- Plato
- STAR

Student Information System (eSIS)

Student ID Assignment

10 digit Id

HSA Assessment Results
Summative Only

ODS Data Warehouse

Current connection to Data Warehouse is for demographic only

Current
Legacy

Transportation Management SQL SVRdB

Teacher Certification Payroll

Interim Data Base of teacher data (CHAPS???)

HI DOE Ad Hoc Reports

PDE3 -- True North Logic

SMS for Food Services (F&RL)

Charter School Via eMail

Library Management Destiny

VAX SPED ELL FARL Discipline

Session T9 Data Analytics

Nov. 21, 2013
• Problems with this picture
  – Great deal of IT budget spent on interfaces
  – If \( n = \) number of databases, then the possible number of interfaces = \( \frac{n^2 - n}{2} \), where \( n \geq 2 \).

• Conclusion:
  – Stop building custom interfaces
HIDOE Reference Architecture (summarized)

based on the Curriculum Development / Learning Management (CDLM) conceptual model

Community  Parents  Students  Teachers  Administrators  Leadership

Single Sign on and Authentication

Data for School Improvement (DSI)  Electronic Human Resources (eHR)  Professional Development (PDE3)  Student Information Systems (eSIS)  Web Portal  Special Education (eCSSS)  Student Programs  Financial Applications

Integration layer (based on SIF standards)

Operational Data Store (ODS)

K-12 Statewide Longitudinal Data Warehouse (K-12 SLDS)

P20 Statewide Longitudinal Data Warehouse (P20 SLDS)

Balanced Score Card (BSC)  Other SLDS Related Systems

Nov. 21, 2013
• **Key Accomplishments**

- K12 LDS
- P20W LDS
- Financial Reporting System (based on LDS technology)
• Key points
  - Total data volume in the hundreds of gigabytes range
  - Leverage industry standard interfaces where possible
  - Expansion options (cloud, hybrid, on-premise)
  - Future integration of unstructured data
  - Cost containment
  - Ease of access / use are critical
Data Analytics - Starting Small
Government Information
Is a Public Asset
Government Information Is a Public Asset

Are you getting the most business value from your data?
Key Issues

1. How does big data enhance analytic capabilities in government?

2. What decisions and steps are needed to gain value from big data analytics?

3. What are public sector use cases for big data analytics?
By 2015, more than 30% of analytic projects will deliver insights based on structured and unstructured data.

Correlating, analyzing, presenting, and embedding insights from structured and unstructured information together enables government agencies to better personalize the constituent experience and identify opportunities for efficiencies, innovation, and even new business models.
Government CIOs Have More Sources of Information to Do More With

- Descriptive Analytics
  - What happened?
  - Enterprise "Dark Data"
  - Open Data
  - Text
  - Documents
  - IT/OT
  - Operational

- Diagnostic Analytics
  - Why did it happen?
  - Social
  - Audio
  - Search Engine
  - Image
  - Mobile
  - Commercial

- Prescriptive Analytics
  - What should happen?
  - Open Data
  - Transactional Data
  - Video
  - Mobile
  - Public

- Predictive Analytics
  - What will happen?
  - Search Engine
  - Documents
  - Images
  - Mobile
  - Public

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Linking, Mining, and Sharing Data Expand Information Management Practices

**Why**

- Government
- Predictive; Outcomes

**What**

- Unstructured; Linked
- More sources
- More relationships
- More stakeholders
- More context

**Whose**

- Social

**How**

- In-line; Real Time
- Structured; "Simple"
- Offline; Batch
- Explanatory; Historical
- Linked Data
Big Data Capabilities Capture the Business Value

Correlations and patterns from disparate, linked data sources yield the greatest insights and transformative opportunities

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<th>Geographic</th>
<th>Economic</th>
<th>Contracts</th>
<th>Sentiment</th>
<th>Sensor</th>
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<td>Weather</td>
<td>Mobile</td>
<td>Network</td>
<td>Email</td>
<td>Industry</td>
</tr>
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</table>

Big Data Capabilities
- Ability to Store and Process Unstructured Data
- Ability to Link Data of Various Types
- Ability to Affordably Perform Comprehensive Analysis

Primary Use Cases
- Constituent Insights and Engagement
- Program and Outcomes Management
- Operations and New Services
- Risk Management and Public Safety
- Fraud Detection

Industry Use Cases

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Business: Shared Analytics and Business Intelligence Infrastructure Road Map

1. Establish Strategy and Program Governance
   - Create a Business Intelligence Competency Center
   - Implement Information Governance
   - Create a Performance Management Framework
   - Stand Up the Shared Analytics/BI Infrastructure
   - Analytics Deployment
Business: Shared Analytics/Business Intelligence User Profiles

Executive
- Provides senior leadership with BI support for budget, program, and policy planning and responsiveness mandates and reporting requirements
- Enhances capabilities to assess outcome/impact and trend analysis among all programs in the enterprise

Executive
- Program and Enterprise Dashboards
- Fixed Reports
- Parameterized Reports
- Results of Multi-dimensional Analysis and Modeling

Manager
- Provides management decision-maker BI support for program and policy development, allocation of resources, outcome/impact evaluation, and anticipating and responding to changing needs and mandates

Manager
- Program Dashboards
- Fixed Reports
- Parameterized Reports
- Multi-dimensional Analysis
- Requesting Modeling — “What If” Scenarios

Quantitative Analyst
- Focuses on highly complex analysis within agencies, programs, contractors and across the continuum of programs and services
- Greater flexibility and less labor-intensive capacity to conduct analysis

Quantitative Analyst
- Statistical Analysis
- Advanced Analytics and Data Mining
- Advanced Visualization Capabilities
- Modeling — “What If” Scenarios

Business Analyst
- Enhances capacity for complex analyses focused on program and/or service delivery targeting, planning, and other forward-looking activities
- Aligns within agency/program and across continuum of programs and services (as appropriate or needed)

Business Analyst
- Ad Hoc Query
- Multi-dimensional Analysis

Operational Analyst
- Supports worker planning, activities, and decision making
- Supports routine reporting needs
- Uses reports to inform operational processes

Operational Analyst
- Fixed Reports
- Parameterized Reports
- Alerts, Ticklers
- Operational Dashboard

Quality Assurance Analyst
- Focuses on highly complex analysis within agencies, programs, contractors and across the continuum of programs and services
- Greater flexibility and less labor-intensive capacity to conduct analysis

Quality Assurance Analyst
- Statistical Analysis
- Advanced Analytics and Data Mining
- Advanced Visualization Capabilities
- Modeling — “What If” Scenarios
IT: A Process Framework for Big Data Analytics

- **Measure**
  - **Objectives**
    - Create meaningful metrics
    - Identify BDA success and failures
  - **Participants**
    - Financial partner, data analyst, business analyst, EA, and so on

- **Frame Problem**
  - **Participants**
    - Business leader, IT leader, EA, domain expert, project manager, chief data officer (CDO)
  - **Objectives**
    - Gain mutual agreement on problem

- **Design Analysis**
  - **Participants**
    - EA, business analyst, machine learning expert, data mining engineer, data scientist
  - **Objectives**
    - Work with data sources
    - Determine relevant data

- **Gather Data**
  - **Participants**
    - Software engineer, network engineer, data architect, statistician, EA
  - **Objectives**
    - Technical skills to execute solutions
    - Business skills to interpret outcomes
    - Act upon big data insights

- **Execute and Interpret**
  - **Participants**
    - Machine learning expert, statistician, data miner, EA, data scientist
  - **Objectives**
    - Technical skills to implement BDA
    - BDA production environment
    - User training
    - Business skills to implement change

- **Implement**
  - **Participants**
    - Software engineer, network engineer, data analysts
  - **Objectives**
    - Create meaningful metrics
    - Identify BDA success and failures

- **Learning Library**
  - **Participants**
    - Financial partner, data analyst, business analyst, EA, and so on
  - **Objectives**
    - Financial partner, data analyst, business analyst, EA, and so on
Using Predictive Analytics in Foster Care Case Management
Protecting Public Services With Context: Enhanced Fraud Detection

Agency and Government Systems

User and Entity Profiles

Collective Network Analysis

Device Behavior Location

Transaction Profile

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Recommendations

- Do not postpone the implementation of big data analytics, but develop an information management strategy first.
- Identify big questions relevant to big data.
- Understand big data technology capabilities and manage organizational impacts.
- Validate your big data assumptions in a proof of concept.
Recommended Gartner Research

- **Invest in Information and Analytics to Benefit From Big Data**
  Douglas Laney, Frank Buytendijk (G00250120)

- **Toolkit: Big Data Business Opportunities From Over 100 Use Cases**
  Frank Buytendijk, Lisa Kart, and others (G00252112)

- **Information Governance in the Age of Big Data**
  Svetlana Sicular (G00251071)

- **Decision Point for Practical Big Data Use Cases**
  Svetlana Sicular (G00239633)

- **Predicts 2013: Business Intelligence and Analytics Need to Scale Up to Support Explosive Growth in Data Sources**
  Daniel Yuen, Bill Gassman, and others (G00227565)

For more information, stop by Gartner Research Zone.

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