Agenda

• The Enterprise Architecture Vision
• Enterprise Architecture Governance
• EA Program Approach
• Key Terminology
• Interoperation: Current State of Identity and SIS Data
• Interoperation: Domains and Plan
• Interoperation: Vision and Proposed Guiding Principles
# The Enterprise Architecture Vision

## Our Vision for Enterprise Architecture

Provide a technology framework and a set of standards to enable acquisition, development, and deployment of IT services that maximize interoperation, minimize duplication, and simplify the IT environment across all of Harvard.

### Strategic Objectives

- Deliver an enterprise architecture framework that drives technology and development standards across Harvard
- Provide common approaches for integration across enterprise applications, processes, and data
- Align and rationalize technology decisions and investments
- Identify redundant or conflicting processes and data across organizations

### Guiding Principles

- Ensure that EA provides active direction and delivers value to the organization
- Counter complexity with common solutions
- Enable sharing of data across organizations
- Preference for open-source, COTS, and programmatic interfaces — both in what we obtain and what is produced
- Encourage, define, and ultimately provide best-practice solutions
- Evolve framework and solutions with advances in technology

### Key Performance Indicators

- Decrease in project delivery timeframes to production
- Increase in the number of integrated applications using programmatic interfaces
- Increase in the number of funded projects that conform to an EA Checklist
- Decrease in ad-hoc data sharing
- Increase in automated data exchange
- Increase in the number of known authoritative data sources
- Decrease in the number of copies of data
Enterprise Architecture Governance

**Enterprise Architecture Executive Committee**

IT executives who ensure that the vision and plan are addressed by the working group. Also provides consistent direction and problem-solving approaches for the working group and the EA program at large. 
**Meets monthly.**

**Co-Chairs: Anne Margulies and Stephen Gallagher**
Members: Scott Bradner, Ben Gaucherin, Stephen Ervin, Gabriele Fariello, Praneeth Machettira, Pratike Patel, Jason Shaffner, Jason Snyder, Jim Waldo, Bob Wittstein

**Enterprise Architecture Working Group**

- Technical members of HUIT, Harvard Schools, and other IT departments that meet on a regular basis
- Defines the Enterprise Architecture framework for review by Steering Committee
- Defines sub-groups to detail layers
- Builds and reviews other EA components as per vision
- Publishes a monthly report on enterprise architecture progress, issues, and direction for the organization

**Chair: Jason Snyder**
Members: Scott Bradner, Bill Brickman, Dan Kaplan, Arnold Paul, Robert Piscitello, Jon Saperia, Raoul Sevier, Michael Thomas
EA Program Approach

Layers
- Security
  - User Experience
  - Applications and Software Components
  - Interoperation
  - Data
  - Middleware
  - Infrastructure and IaaS
  - Networking

Advisories, Methodologies, and Principles
- Architectures
- UX Consultation
- Ad-Hoc Consultation
- ITCRB and PRC Reviews

Outreach and Training

Communication & Education
- Evaluate Skills & Organizational Needs

Re-Evaluate: Identify Places Where EA Can Make an Impact
# Key Terminology: Layers

<table>
<thead>
<tr>
<th>Layers</th>
<th>Definition</th>
<th>Examples</th>
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<tbody>
<tr>
<td>User eXperience</td>
<td>End-user look-and-feel and navigation style of an application or service.</td>
<td>Appearance of the Harvard brand, color schemes, use of ‘breadcrumbs’, position and appearance of navigation bars.</td>
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<tr>
<td>Applications, services, SaaS</td>
<td>Algorithms and code that provide technical or business value.</td>
<td>Large-scale apps such as SIS, small apps such as Electronic Submission Tracking and Reporting (ESTR), services such as Informatica for data transfers, and Software-as-a-Service solutions such as Office365.</td>
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<tr>
<td>Interoperation</td>
<td>Exchanges of information and provisioning of business transactions between different applications and services.</td>
<td>Information exchanges include transfers of student registration from SIS to central directories, or transfer of account balance values from financial to CRM systems. One remote service is IAM’s Authentication service.</td>
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<tr>
<td>Data</td>
<td>Information represented in formats managed by apps and services.</td>
<td>Structured data include student records and general ledger financial data; unstructured data include e-books, wiki content, and most of the information available on the Internet.</td>
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<tr>
<td>Middleware</td>
<td>Common business or technical services that are implemented separately from applications and services.</td>
<td>Database technologies are the most common example of middleware, but this layer can also include reporting ‘engines’, rules ‘engines’, application servers, data transfer applications, and other common shared services.</td>
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<tr>
<td>Infrastructure</td>
<td>Hardware and virtualized platforms that operate applications, services, and their components.</td>
<td>Servers, associated storage components, operating systems, and other computing devices are common examples, as well as cloud-based infrastructures of Platform-as-a-Service and Infrastructure-as-a-Service.</td>
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<tr>
<td>Networks</td>
<td>Communications tech to join infrastructures in disparate locations.</td>
<td>Wired and wireless communications supported by devices such as routers, switches, and naming services.</td>
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<tr>
<td>Security</td>
<td>Use of resources by authorized individuals and computing services to information, business functions, and computing services.</td>
<td>Mechanisms include door locks, user IDs/passwords, and intrusion detection/prevention tools. These are supported by apps/services to manage user and systemic authentication, authorization, and access to functionality and data.</td>
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<tr>
<td>Processes</td>
<td>Definition</td>
<td>Examples</td>
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<tr>
<td>Principles</td>
<td>Foundational elements to drive decision-making and alignment.</td>
<td>Principles can be applied at many levels, from guiding principles that characterize strategic, enterprise-wide systemic behavior, to principles that help explain detailed technical behaviors of applications and services.</td>
</tr>
<tr>
<td>Methodologies</td>
<td>Methodologies divide IT work into phases for better planning and management, and determine methods or “best practices” to be applied to specific cases. May include specific deliverables/artifacts.</td>
<td>Waterfall, prototyping, iterative, and incremental development; spiral development; rapid application development; extreme programming; Agile.</td>
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<tr>
<td>Advisories</td>
<td>Recommendations offered as a guides to specific actions or practices.</td>
<td>Security notifications of newly discovered vulnerabilities with recommendations for patching systems or changing passwords; and announcements of changes to the features, forms, or functions of applications.</td>
</tr>
<tr>
<td>Patterns</td>
<td>Generic models or descriptions from which specific implementations can be based or derived.</td>
<td>Reusable approaches for connecting applications to databases, establishing user security within an application, or implementing user experience in a solution.</td>
</tr>
<tr>
<td>Reference Architectures</td>
<td>A template solution that defines an architecture for a particular domain using multiple patterns and a vocabulary that promotes commonality.</td>
<td>Business reference architectures include Insurance Application Architecture (insurance), and HL7 V2.5 (health records). One technical reference architecture is Java Enterprise Edition for IT systems construction.</td>
</tr>
<tr>
<td>Outreach</td>
<td>Elevating awareness of programs and initiatives to affected populations.</td>
<td>Broadly-focused outreach at Harvard includes ABCD meetings on a wide range of IT topics; more narrowly focused are Big Group meetings on specialist topics such as IT skills upgrades.</td>
</tr>
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<td>Training</td>
<td>Acquiring knowledge and skills as a result of teaching on specific competencies, with a goal of improving productivity and performance.</td>
<td>IT techniques training could include database design, software coding in node.js, and process modeling with BPMN. Vendor tool training could include Oracle Financials, PeopleSoft, and Informatica ETL.</td>
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Interoperation: Current State of Identity Data

[Diagram showing data flows and data formats]

GMAS (and others - e.g. Library Campus Services, HUHS)

Athletic Membership

Data Format
- XML IAM Format
- XML HBS Format
- XML PeopleSoft New Hire Schema
- PeopleSoft Input XML
- DB View
- Human Input
- Pipe Delimit
- Oracle Datapump File
- Fixed Length Field Text File
- FindPerson/JSON

Transfer Protocol/Creation Method
- SFTP
- HTTP Post
- SQL query and SQLLOAD
- Web service
- RESTful FindPerson (JSON) service
Interoperation: Current State of SIS Data

SIS/Campus Solutions

Data Format
- JSON - (FindPerson)
- XML SIS Standard Admission XSD
- Tab Delimited Admission Data
- Fixed Length Field Text File
- Pipe Delimited
- PeopleSoft HR to SIS XML
- PeopleSoft Payroll to SIS XML

Transfer Protocol/Creation Method
- SOAP/XML
- SFTP into SIS
- SFTP from SIS
- Web REST/JSON FindPerson service
Interoperation: Domains

Modular Approach to Data/Service Integration

Service and Data Integration

- Operations
- Operations (5)
- Organizational Structure and Approaches (4)
- Data Controls and Analyses (3)
- Data Analyses/Tools
- Data Governance
- Ad hoc analysis
- Routine Analyses
- Metrics/Time Variance/Series and Cross Subject Correlation
- Snapshot Operational Detail/Audit
- Master Data Management
- Data Controls
- Data Warehouse
- Information Bus
- Other Resources
- Training
- Operational Engineering
- Outreach support - Engineers on Loan
- Operational Engineering

Enterprise Architecture (1)

- Technologies for Integration
- Architectural Principles
- Design Patterns, etc.
- API's
- Documentation
- Change Management
- Educational (e.g., eduPerson)
- Standards
- Other de facto/de jure standards
- System/Technology Acquisition
- Selection and Acquisition Guidelines
- Exception Processes

Software and Systems Engineering (2)

- Data Warehouse
- Information Bus
- Data Marts
- Data Maintenance and Management
- Example code/libraries
- Automated instrumentation

Jon Saperia - 1/7/2015 - Version 1.0
Interoperation: Establishing a Domain Work Plan (DRAFT)

Architecture
- Propose and Ratify Arch
- Define Arch Principles & Methodologies
- Document and Publish Architecture
- Develop and Deliver Advisories
- Refine Patterns & Reference Arch

Patterns, Reference Architecture
- Deploy Prototype Integration Services
- Pilot Services with Selected Feeds
- Inventory Current Feeds & Apps
- Scale Integration Services
- Planned Upgrades

Operational Services
- Select and Integrate with Services
- Outsource School Integration to EA
- Integrate Existing School Capabilities with EA

Application Adaptors
- Establish InterOp Working Group
- Establish InterOp Working Group
- Outsource School Integration to EA

Governance
- Establish Master Data Standards
- Develop KPIs
- Develop KPIs

Strategic & Tactical Measurement
- Review Operational Metrics
- Review Operational Metrics

Operations
- Operate InterOp Services
- Operations Management: Measure Service QOS and Data Quality
- Deliver Operational Training and Support

Methodologies, Ops Mgmt, Training

KEY: EA Team | App Teams | Schools | Planned
Interoperation: Proposed Vision and Guiding Principles

<table>
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<th>Our Vision for Interoperation in the Enterprise Architecture</th>
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<td>Provide a framework and a set of standards to enable acquisition, development, and deployment of integration services that maximize information sharing, minimize duplication, and simplify the IT environment across all of Harvard.</td>
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<tr>
<td>• Similar data exchanged between applications have standard definitions and formats</td>
</tr>
<tr>
<td>• Publish event-driven data once, as soon as applications have it available</td>
</tr>
<tr>
<td>• Allow subscribers to data to specify the frequency of delivery</td>
</tr>
<tr>
<td>• Web services or APIs that perform business services are implemented once</td>
</tr>
<tr>
<td>• Interoperation improvements will displace, not break, current implementations</td>
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<tr>
<td>• Focus one organization with deep skills for continued development operation of Interoperation solutions</td>
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<tr>
<td>• Leverage existing successes</td>
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Questions or comments?
Thank you!