Learning Services Prototype

The figure (overleaf) illustrates an example of a collection of diverse user agents (operating on diverse delivery platforms) built upon a collection of learning services, and an underlying infrastructure of networked storage and information resources. The user agents use the learning services to provide their functionality, and communications and integration are provided via the infrastructure services.

About the Learning Systems Architecture Lab

The Learning Systems Architecture Lab (LSAL) is a research and development center at Carnegie Mellon University.

Our research program focuses on the design and creation of Internet-based technologies for education and training. The objectives of our projects and activities are the development, utilization and extension of learning systems architecture to enhance the accessibility, durability, interoperability, reusability, and cost-effectiveness of learning systems. The systems we develop and technologies we use aim to put the needs of the user and learner first, whether the user is a student in public school (K-12), college, the military, in a professional setting, a life-long learner or a learner in any other situation. Our staff of system architects, software engineers, instructional systems designers, and research programmers contributes their collective expertise to achieving these objectives.

We have expertise in:
- Design and development of architectures for learning systems
- Design and development of prototypes for test and evaluation
- Guidance on emerging specifications and standards
- Development of best practices for Web-based teaching and learning
- Technology transfer and adoption

For More Information

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The Learning Services Stack is based on current approaches used to develop Web Services and service-based systems. It elaborates on the conventional network communications stack. The learning services architecture divides functionality into three major groups or service layers: User Agents, Learning Services and Infrastructure. Each layer presents a well-defined standard communications interface, and functionality is isolated into the distinct layers or service collections. Services within each layer communicate only with services in the same layer and utilize the services provided by the layer directly below.

**User Agents Layer**

User Agents are the learning technology systems that provide the human computer interface to access and interact with all learning services and functions; access is only via User Agents. User Agents include systems for content and learning delivery, content and learning management, and authoring and content creation. User Agents are built using the collection of services provided by the Learning Services Layer.

**Learning Services Layer**

The Learning Services layer includes all services and components that have learning-specific functionality. It is further subdivided into three service sublayers: Tools, Common Applications and Basic Services.

The Tool Layer provides the high-level integrated services used to create a public interface to services for use by the user agents. Tools include those for content delivery, authoring, and learning management, e.g., course delivery, tutors, simulators, quiz and assessment, presentation applications, collaboration, grade and record book, registration, course administration and course management.

The Common Applications Layer provides the collection of standard, commonly-used services needed by tools and user agents. Common services include: content selection and sequencing, learner profiling, user tracking, learning object management, content management, report generation, and knowledge management.

The Basic Services Layer includes core learning services and learning technology-specific versions of commonly used system services such as storage management, workflow, rights management, authentication, validation, logging, etc.

The Infrastructure Layer is the base of the Learning Services Architecture and service stack and it consists of the services that independent of the learning domain. It contains the core enabling services such as Transport (SOAP), Discovery (UDDI), Description (WSDL), and Workflow (WSFL). It utilizes core networking services such as HTTP, SMTP, FTP, TCP/IP to create Internet and Web-based learning technology systems.

The LMS Services Stack is based on current approaches used to develop Web Services and service-based systems. It elaborates on the conventional network communications stack. The learning services architecture divides functionality into three major groups or service layers: User Agents, Learning Services and Infrastructure. Each layer presents a well-defined standard communications interface, and functionality is isolated into the distinct layers or service collections. Services within each layer communicate only with services in the same layer and utilize the services provided by the layer directly below.