WEB TECHNOLOGIES

Express JS –

Introductions to Web Services and REST APIs

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Acknowledgement
The slides are created from various internet resources with valuable contributions from multiple professors

Introductions to Web Services and REST APIs

- A Web service is a service that lives on the Web.
- The ***Web*** is a huge information space filled with interconnected resources.
- A ***service*** is an application that can be consumed by software.
- A **service** is an application that exposes its functionality through an application programming interface (*API*)
- An interface hides the complexities of the internal system.
- One service can support many applications.

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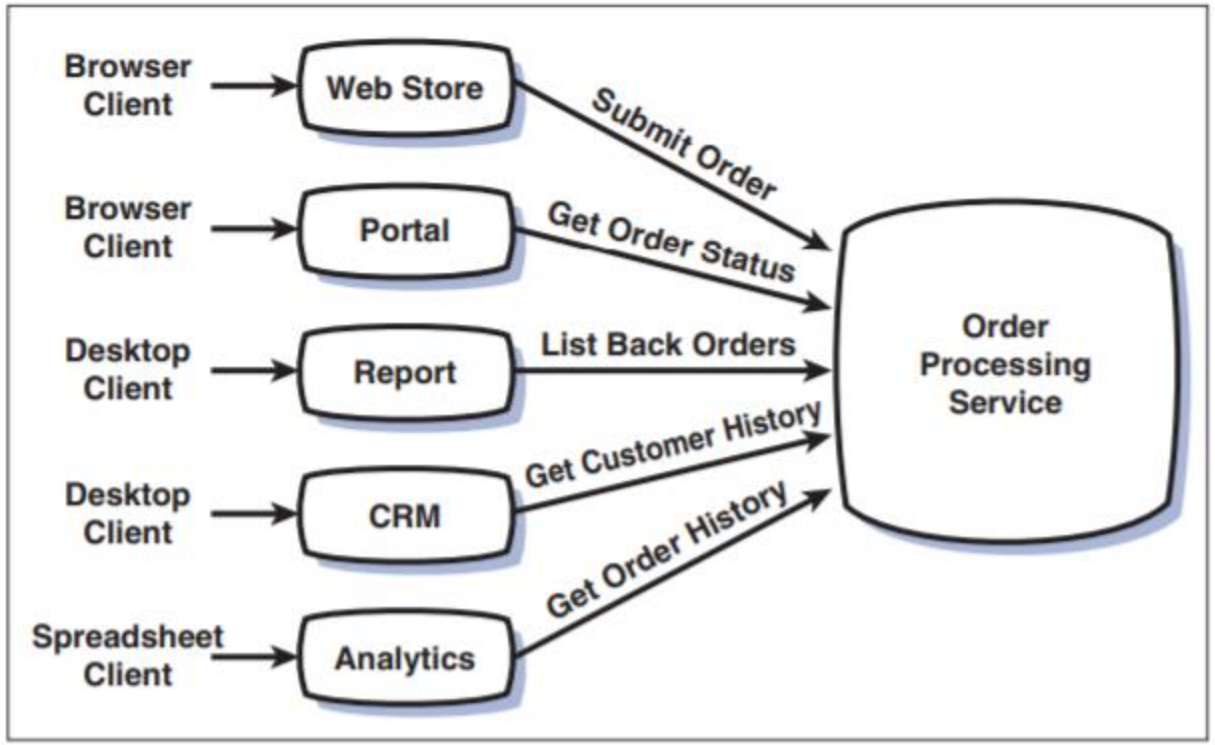
Introductions to Web Services



- A service can be shared by many different applications.
- Many different users can share a single service.

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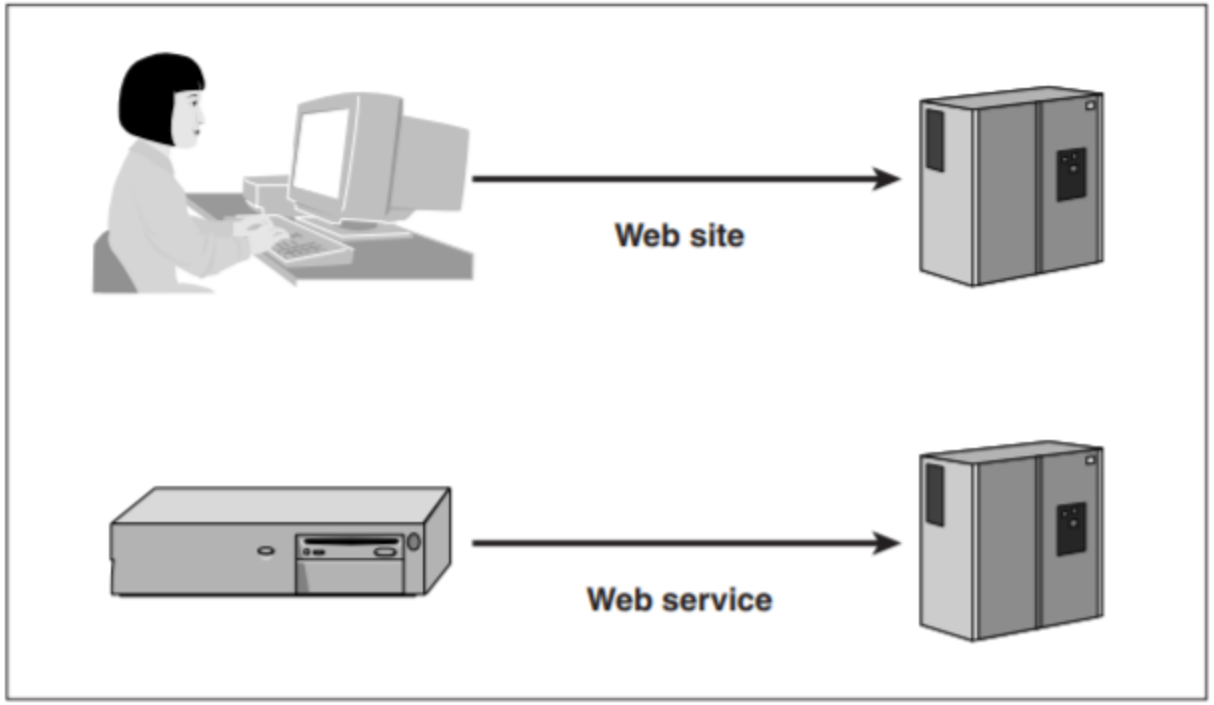
Introductions to Web Services

•A Web site is designed to be accessed by humans.

•A Web service is designed to be accessed by applications.



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Definition of Web Services

- A programmable application component that is accessible via standard Internet protocols.
- W3C definition: *Software system designed to support interoperable machine-to-machine interaction over a network.*
- A Web service is an application with a Web API.

Definition of Web Services

The key things to understand about Web services:

- Designed for machine-to-machine (or application-to-application) interaction.
- Should be interoperable - Not platform dependent.
- Should allow communication over a network.

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Why Web Services?

- Web services help you integrate applications.
- Web services support heterogeneous interoperability.
- Web services are inexpensive.
- Web services are flexible and adaptable.

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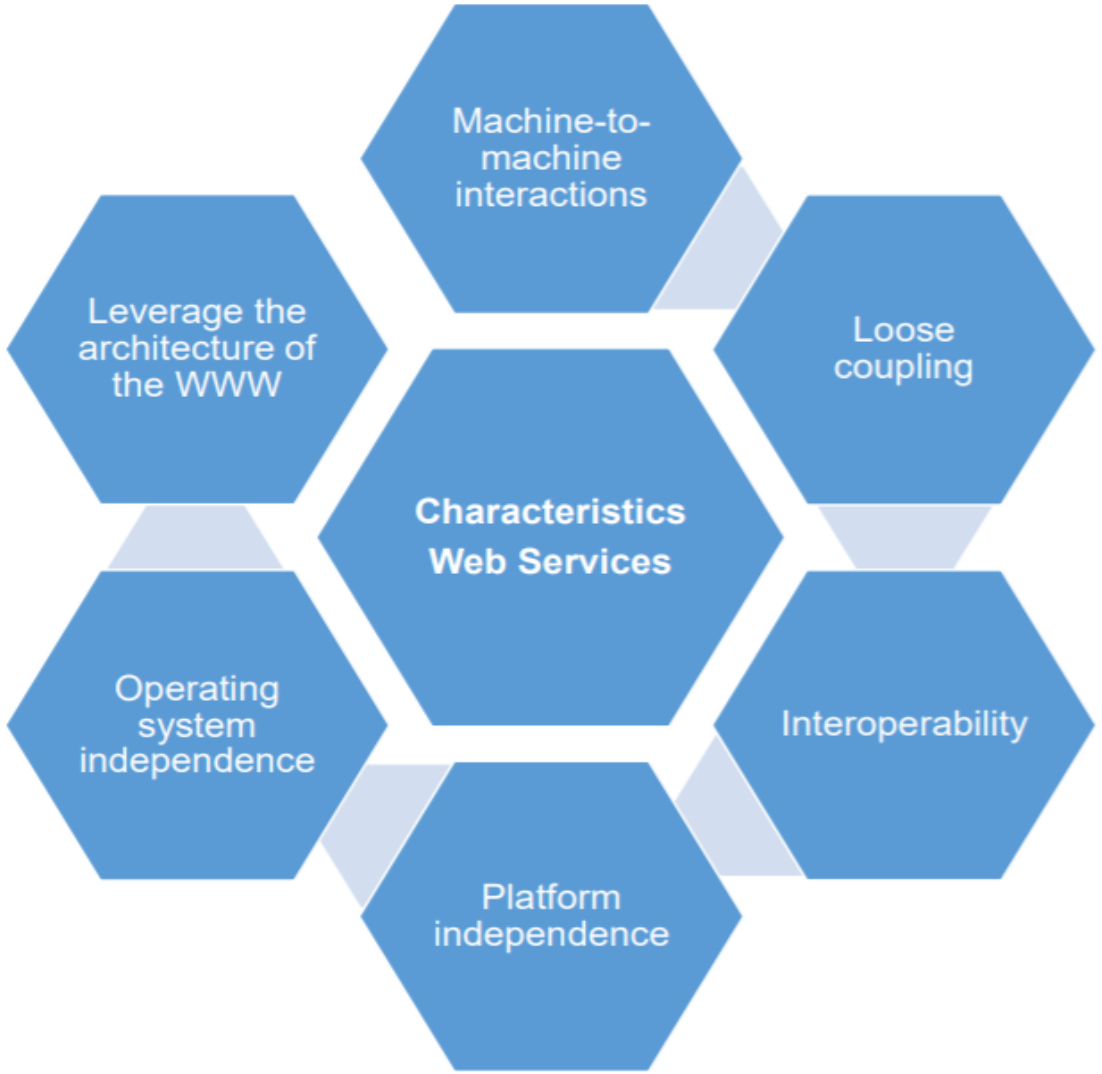
Characteristics of Web Services



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REST APIs(Representational State Transfer)

- REST is an architecture for developing web services.
- builds upon existing systems and features of the internet's Hypertext Transfer Protocol (HTTP) in order to achieve its objectives.
- Guided by REST constraints (design rules).
- Based on Resource Oriented Architecture.
- A network of web pages where the client progresses through an application by selecting links.
- Requests/responses relate to representations of states of a resource.
- When client traverses link, accesses new resource (i.e., transfers state).
- Uses simple HTTP protocol.

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REST APIs

- REST is about resources and how to represent resources in different ways.
- REST is about client-server communication.
- REST is about how to manipulate resources.
- REST offers a simple, interoperable and flexible way of writing web services that can be very different from other techniques.

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REST APIs

- Client **request**s a specific **resource** from the server.
- The server **respond**s to that request by delivering the requested resource.
- Server does not have any information about any client.
- So, there is no difference between the two requests of the same client.
- A model which the representations of the resources are transferred between the client and the server.
- The Web as we know is already in this form!

Resources

- Resources are consistent mappings from an identifier [such as a URL path] to some set of views on server-side state.
- Every resource must be uniquely addressable via a URI.
- “If one view doesn’t suit your needs, then feel free to create a different resource that provides a better view. ”
- “These views need not have anything to do with how the information is stored on the server. They just need to be understandable (and actionable) by the recipient.” *Roy T. Fielding*

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RESTful Design Specifications (Constraints)

Client-Server
- Separation of concerns - user interface vs data storage
- Client and server are independent from eachother

Uniform Interface
- All resources are accessed with a generic interface (HTTP-based) which remains same for all clients.

Stateless
- Each request from client to server must contain all of the information
- No client session data or any context stored on the server

Layered System
- Allows an architecture to be composed of hierarchical layers
- Each component cannot “see” beyond the immediate layer.

Cacheable
- Specify data as cacheable or non cacheable
- HTTP responses must be cacheable by the clients

Code On-Demand
- REST allows client functionality to be extended by downloading and executing code in the form of applets or scripts.

HTTP Methods

- GET – *safe, idempotent, cacheable*
- PUT – *idempotent*
- POST
- DELETE – *idempotent*
- HEAD
- OPTIONS

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REST APIs

Table 5-1. *CRUD Mapping for Collections*

Operation	HTTP Method	Resource	Example	Remarks
Read – List	GET	Collection	GET /customers	Lists objects (additional query string can be used to filter)
Read	GET	Object	GET /customers/1234	Returns a single object (query string may be used to filter fields)
Create	POST	Collection	POST /customers	Creates an object, and the object is supplied in the body.
Update	PUT	Object	PUT /customers/1234	Replaces the object with the object supplied in the body.
Update	PATCH	Object	PATCH /customers/1234	Modifies some attributes of the object, specification in the body.
Delete	DELETE	Object	DELETE /customers/1234	Deletes the object

RESTful Design Considerations : Steps for designing RESTful Web Service

- Identifying resources the service will expose over the network.
- Designing the URI Templates – map URIs to resources
- Applying the Uniform HTTP Interface – options available on each resource for different user groups.
- Security Considerations – Authentication and authorization

RESTful Design Considerations : Steps for designing RESTful Web Service

- Designing the Resource Representations – XML/JSON.
- Supporting alternate Representations – XML or JSON based on filters
- Providing Resource Metadata – Ability to discover resources and options

RESTful Design Considerations : RESTful Service Implementation Considerations

- Parse the incoming request to
  - Use URI to identify the resource.
  - Identify URI variables (and map them to resource variables)
  - HTTP method used in the request (and whether it's allowed for the resource).
  - Read the resource representation

- Authenticate and authorize the user.

RESTful Design Considerations : RESTful Service Implementation Considerations

- Use all of this information to perform the underlying service logic.

- Generate an appropriate HTTP response, including
  - Proper status code
  - Description
  - Outgoing resource representation in the response entity body (if any)

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REST APIs - Requests & Responses

REQUEST

GET /news/ HTTP/1.1

Host: example.org

Accept-Encoding: compress,

gzip

User-Agent: Python- httplib2

Here is a **GET** request to «http://example.org/news/»

Method = **GET**

REST APIs - Requests & Responses

RESPONSE

HTTP/1.1 200 Ok

Date: Thu, 07 Aug 2008 15:06:24 GMT

Server: Apache

ETag: "85a1b765e8c01dbf872651d7a5"

Content-Type: text/html

Cache-Control: max-age=3600

<!DOCTYPE HTML>

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REST APIs - Requests & Responses

- The request is to a resource identified by a **URI**
- (**URI** = **U**nified **R**esource **I**dentifier).
- In this case, the resource is «http://example.org/news/»
- Resources, or addressability is very important.
- Every resource is URL-addressable.
- To change system state, simply change a resource.

THANK YOU

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