Architectural Level of Study of ArcGIS Server

Annie Vinuthna D,

II year M.Tech, Computer Science & Engineering Department,
Sri Vishnu Engineering College for Women, Bhimavaram, A.P, India.

P.J.R.Shalem Raju,

Senior Assistant Professor, Computer Science & Engineering Department,
Sri Vishnu Engineering College for Women, Bhimavaram, A.P, India.

Dr.Y.S.S.R.Murthy,

Professor, Computer Science & Engineering Department,
Sri Vishnu Engineering College for Women, Bhimavaram, A.P, India.

Abstract

Remote Sensing Satellites convert the pictures captured by them into radio-waves and transmit them to ground Stations. These ground stations convert the radio-waves into picture form with the help of computers and other electronic instruments.

All the images that are captured through the satellites, that is, satellite images, are stored in Image Servers. These image Servers maintain and serve the images in response to the query fired by the user. The images are stored in different forms such as tiled images or image services or raw datasets etc. The Images retrieved are displayed to the user through a client application interface.

Every organization has its own Image Servers to manage and maintain the images. Every Server has its own properties and its own architecture. The images retrieved are displayed in the form of services through an online web application associated with that organization.

Here, we are trying to compare different servers architecture to understand the functionality of each server differ from each other even though they perform the same work.

1. Introduction

A Server is a device with a particular set of programs or protocols that provide various services. These services are requested by other machines or clients to perform certain tasks. A server can interact with any number of clients. A Server and its clients together form a client/server network, which provides routing systems and centralized access to information, resources, stored data, etc.

Clients mainly include computers, printers, faxes, mobiles or other devices that can be connected to the server.

Servers can be categorized according to their applications. Various types of servers are Audio/Video Server, Chat Server, News Server, Web Server, Image Server, etc.

In this paper, we are trying to know about Image Servers and how ArcGIS Server and ArcGIS Server with Image Server as extension differ from each other at their architectural level.

This paper consists of the architectural study of the following sections

- ➢ ArcGIS Server
- ➢ ArcGIS Server with Image Server as extension

2. ArcGIS Server

An ArcGIS Server is a server that serves GIS Services such as map service, geodata service and image service.

An ArcGIS Server consists of
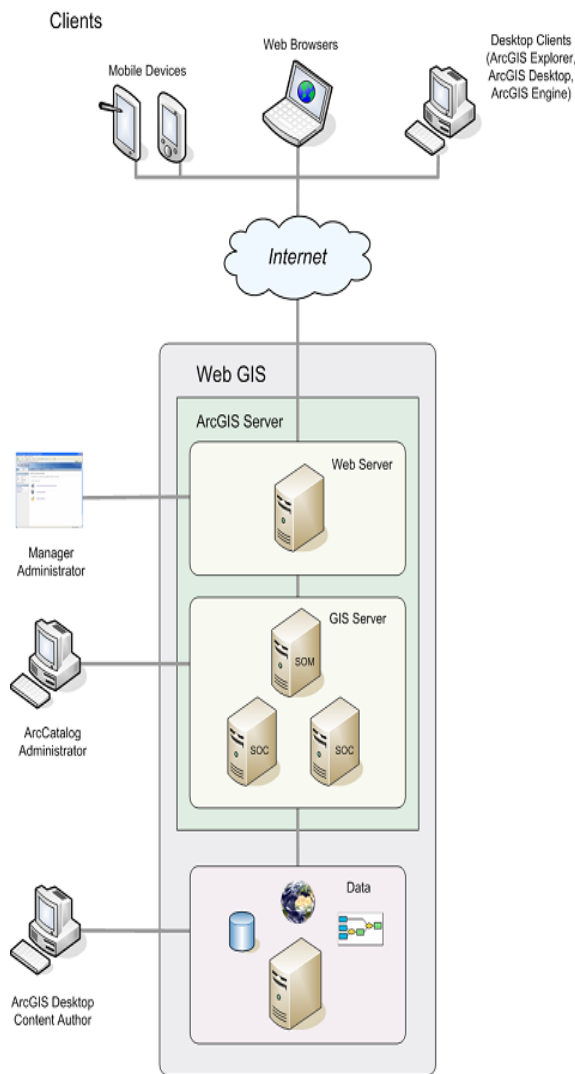
- Data Server
- GIS Server
- Web Server

Figure 1. ArcGIS Server Architecture

2.1. Data Server

The Data Server contains the services that are published on the GIS Server. These published services are the GIS resources in the form of services. These GIS resources can be a map document or a globe document or an address locator or a geodatabase or a raster dataset or a toolbox or an image service definition.

Using the desktop applications such as ArcMap, ArcCatalog, and ArcGlobe, GIS resources are published in the server. To create different type of services different type of desktop application are used.

For creating a cached map service, ArcCatalog is used to create the cache. For creating an image service, Image Service Definition Editor Toolbar is used in ArcMap. When services are created, they are published on the server.

2.2. GIS Server

The GIS Server hosts the GIS resources to the client applications.
The GIS Server consists of

- Server Object Manager (SOM)
- Server Object Container (SOC)

The Server Object Manager manages all the services that are running on that server. A single Server Object Manager can be connected to any number of Server Object Containers. Depending on the query fired by the user, the Server Object Manager provides the particular service to the user through a client application.

The Server Object Container consists of the services that the Server Object Manager manages.

Depending on the configuration of the system, Server Object Manager and Server Object Container can be run on the same system or on different machines.

Administrators use ArcCatalog to publish their GIS resources as services. The ArcCatalog includes a GIS Servers node. This node is used to add connections to GIS servers for a general server usage or for the administration of a server's properties and services.

2.3. Web Server

The Web browser contains the web applications and web services that use the resources running on the GIS server. Web services are the GIS resources that are published in the ArcGIS Server Manager as services. Web applications are client applications that are published as a web application on the ArcGIS Server Manager. Unless a client application is published in the ArcGIS Server Manager, it cannot act as a web application.

Client applications are connected to the ArcGIS Server through Internet or LAN or WAN facility.

When a user interacts with their browser, the browser makes a request to the web application. The web application directs this request to the Server Object

Manager (SOM). The Server Object Manager retrieves the response to the request from the GIS Server, where the execution is done.
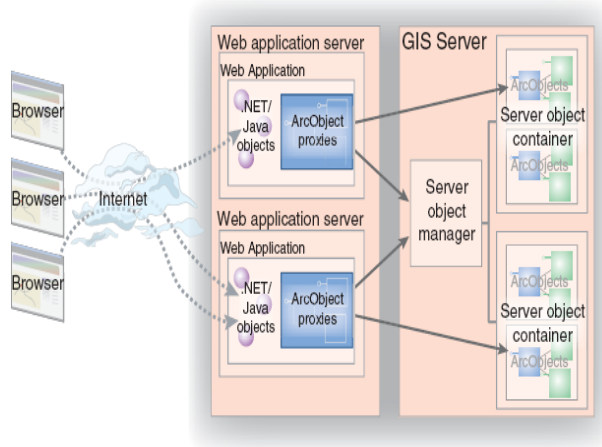

Figure 2. Web Server Architecture

3. ArcGIS Server with Image Server as Extension

Image Processing and distribution are considered to be two separate stages in image exploitation. This causes data redundancy, explodes volumes of data and also hinders efficient data management.
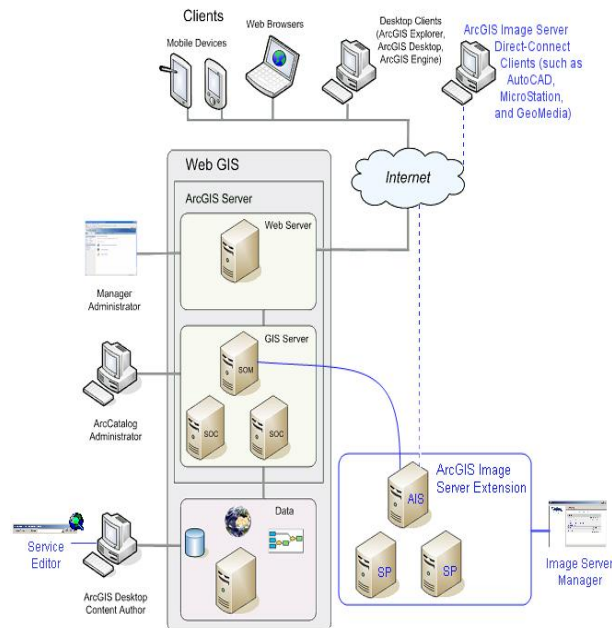

Figure 3. ArcGIS Server with Image Server as extension

The ArcGIS Image Server extension consists of two parts.

➢ Server (AIS)
➢ Service Provider

For the ArcGIS Image Server, to become an extension to the ArcGIS Server, the server (AIS) has to be registered with the Server Object Manage (SOM) on the ArcGIS Server.

When ArcGIS Server is used as an extension in an ArcGIS Server, it becomes a part of the ArcGIS Server Architecture (Figure 3.). With ArcGIS Image Server, the two stages above mentioned can be combined. This enables the data administrators to maintain only the primary imagery with multiple image products created instantly, on the fly, as required by users.

ArcGIS Server can serve image services created from image service definitions using ArcGIS Image Server extension. An image service definition can contain large numbers of raster datasets, along with their properties and metadata. Image Service definitions are created using the Image Service Definition Editor Toolbar in ArcMap. Using ArcGIS Image Server as extension, ArcGIS Server Manager or ArcCatalog publishes these image service definitions as image services.

The Service Provider of the Image Server is the central processing unit (CPU) that processes the components of the image service definition and distributes the data to the clients.
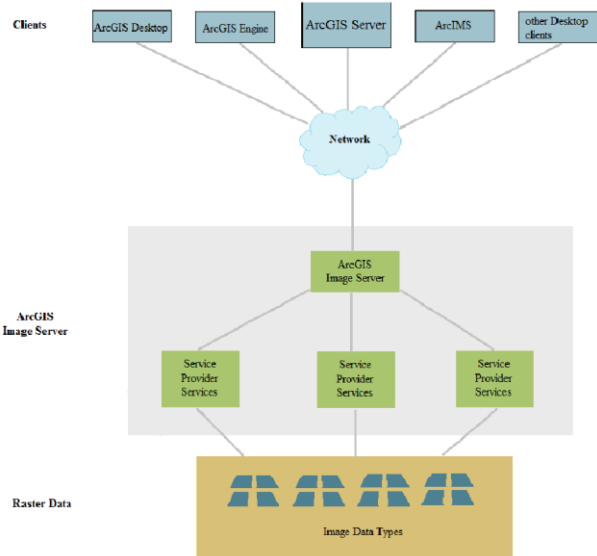

Figure 4. ArcGIS Image Server Architecture

Requests for the image services that are defined by image service definitions are forwarded to the Server (AIS) by the Server Object Manager (SOM). Server

(AIS) processes the request on the appropriate service provider.

The desktop services over a local area network (LAN) or a wide area network (WAN) utilize the Server (AIS) directly as do direct-connect ArcGIS Image Server Clients. Direct-Connection clients for ArcGIS Image Server include ArcMap application as well as third-party applications, such as AutoCAD, Micro Station, and GeoMedia.

The ArcGIS Image Server architecture consists of several components, which are organized into three main parts. (Figure 5)

> Image Server
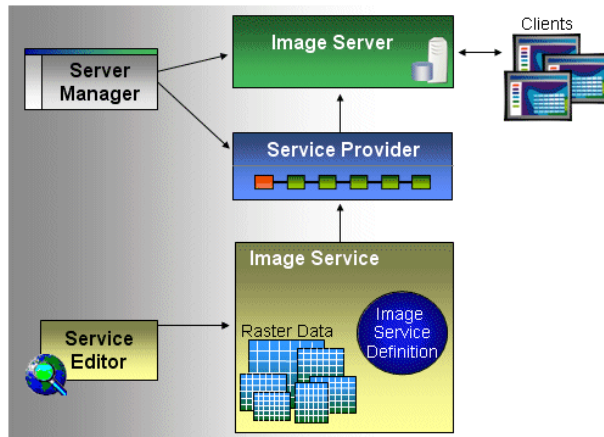> Service Provider
> Image Service

Figure 5. ArcGIS Image Server stand-alone architecture

3.1. Image Server

Image Server acts as a request broker between the processing component that provides data to the clients and clients. It publishes the available image services and ensures that the users have the rights to access image services. It also provides load balancing between service providers. The client applications interact with the image server which in turn interacts with the service providers and service definitions in-order to respond to the client application.

The main functions of the image server are

→ Maintains a list of all the available images services
→ Provides details of the available image services to the client applications.
→ Authenticates clients and provides access control to the image services.

→ Provides the client application with the appropriate connection details to connect to an allocated service provider.

3.2 Service Provider

Service provider is a processing component that processes image service components and distributes data to the client. Multiple service providers can be run within a single ArcGIS Image Server system architecture. When a service provider receives a request from the client, it performs the processing depicted in the image service and delivers the required data to the client.

Service provider contains a list of image services that a client can choose to receive. The service provider's architecture is multithreaded and hence, each request runs in its own thread. This request can be for any one of the image services the service provider providing. Multiple service providers can run in parallel and each service provider can work with multiple image services.

When a valid client connection for an image service is received, the service provider creates a connection. It maintains the connection until the client disconnects it or is timed out. Clients make request to the service provider for imagery through image server. The service provider processes the image service and returns the requested imagery to the client.

The main functions of the service provider are

→ Maintains one or more image services.
→ Communicate with the specified image server.
→ Communicates with the clients that require access to the imagery.
→ Maintains a detailed list of all the imagery requests made.
→ Provides a processed image data in reply to client requests.

3.3 Image Service

Image Service is a service definition file and a collection of raster to be served which have an extension of .ISCDef.

The image service definition is created and edited in ArcMap using tools on the Image Service Editor toolbar.

The image service definition file (.ISDef) contains all the information used to create the image service. This file references the raster data that is going to be served to the client. It defines the properties of the service such as spatial reference, metadata, also defines the image processing data applied to the raster data, and also defines information about the output image rendering, presentation, and properties, such as mosaic order and which images will display at what resolution.

The Image Service definition exists as a folder containing the footprint shapefile, a service table that is part of the footprint shapefile, a boundary shapefile, the ImageService.ISDef, a subfolder with the raster process definitios, ans a seamline shapefile. All these contents are compiled to create the image service file that is used by the service providers, with the extension .ISCDef.

4. References

[1] resources.esri.com
[2] webhelp.esri.com
[3] help.arcgis.com