



# ***Building and Deploying ArcGIS Image Server Solutions (Best Practices)***

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# Presentation outline

**Aim: How to create ArcGIS Image Server Services in an automated manner**

- **Image Server Architecture**
  - Overview of data structures
- **Loading new data types**
  - RPDef generators
- **Automation of Service Creation**
  - ISCommands
- **Configuration and Optimization**

# Our assumptions

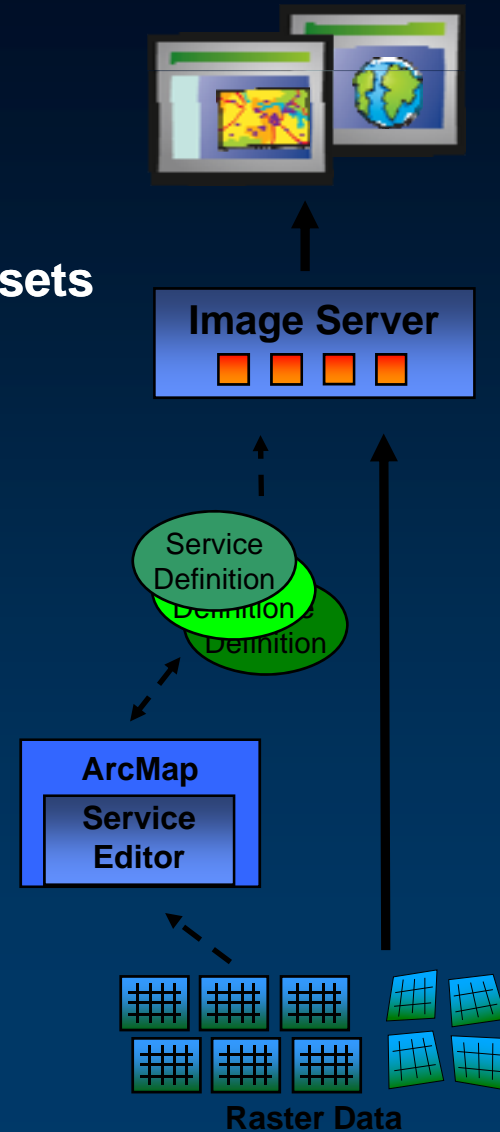
**You should:**

- **Have basic Image Server experience**
- **Be proficient XML**

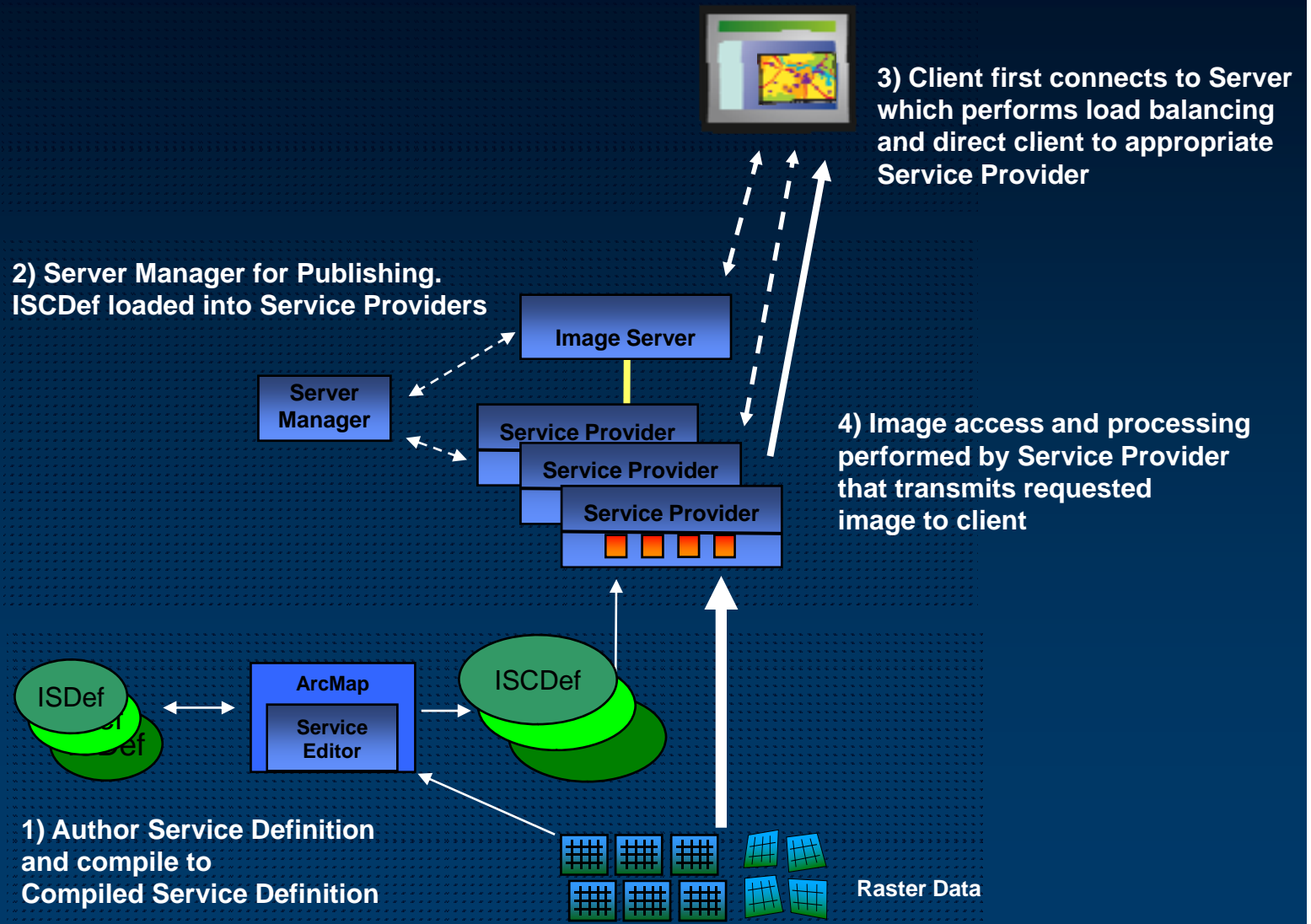
**Examples will use Image Server ISCommand scripting  
and VB .net**

# Image Server Methodology

- **Keep imagery in its native form**
  - Newly acquired imagery or existing raster datasets
  - Files or DBMS
- **Author image services that define:**
  - Image properties
    - georeferencing, metadata, ...
  - Processes to be applied
    - mosaicking, enhancements, ...
- **Publish image services**
- **Client access**
  - Fast access to imagery and metadata
  - On-the-fly server-based processing
  - Changeable service properties

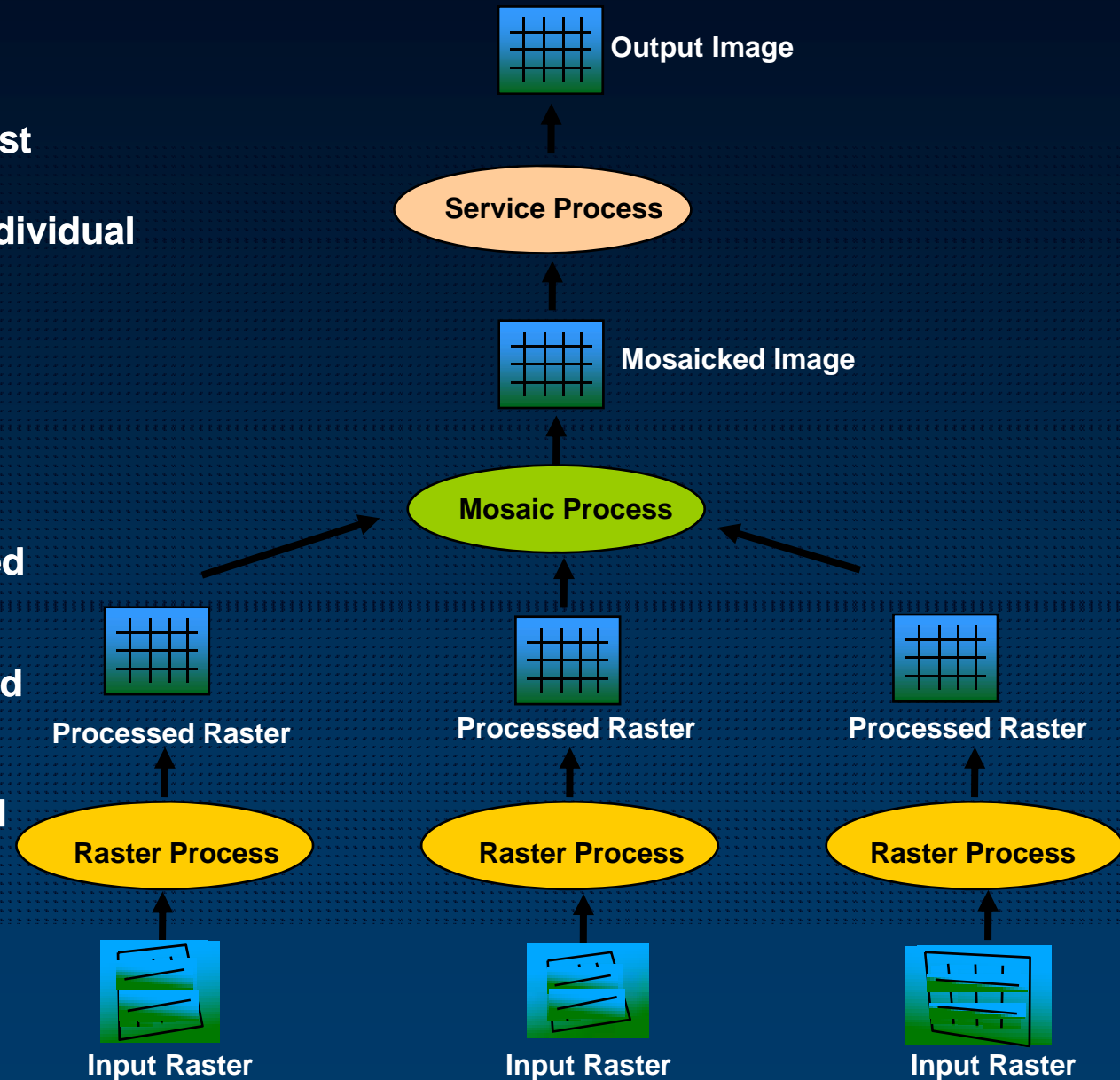


# Image Server Data Flow



# Image Server Process Chain

- Applied for each request
- Request is split into individual raster components
- Required pixels:
  - Read
  - Geometric process
  - Radiometric process
- Components mosaicked together
- Service Process applied
  - Radiometric process
- Optionally compressed
- Transmitted



# Structure of Service Definition

..\ServiceName.ISDef

ImageService.ISDef



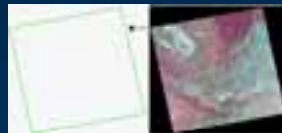
- Service Properties
  - Inc. Service process

Boundary.shp



- Boundary of the Service

Footprint.shp



- Footprint & service table
  - Properties for search

Seamline.shp



- Seamlines for mosaicking

.\RPDefs

Rasterid.RPDef



- Raster definitions

Raster Datasets



# ImageService.ISDef - <info>

## Information

- General information about image service definition.
- Used to help keep track of the changes made.
- Not sent to client

The screenshot shows a software dialog box titled "Image Service Properties - Information". On the left is a tree view with "Information" selected. The main area is titled "Image Service Definition Information" and contains several input fields: "Version" (1.0.0.0), "Author" (Peter), "Organization" (empty), "Last updated" (12/02/2007), "Service def. creation date" (12/02/2007), "Service def. creation time" (08:12:18), "Comments" (empty text area), and "Edit history" (empty list area). A "Status" button is located at the bottom left of the main area. At the bottom right of the dialog are "OK", "Cancel", and "Apply" buttons.

```
- <Info>  
  <Version>1.0.0.0</Version>  
  <Author>Peter</Author>  
  <Organization />  
  <LastUpdate>20070212</LastUpdate>  
  <ServiceCreationDate>20070212</ServiceCreationDate>  
  <ServiceCreationTime>081218</ServiceCreationTime>  
  <Comments />  
  <EditHistory />  
  <StatusId />  
  <StatusMsg />  
</Info>
```

# Image Service Properties - <Definition>

## Service Definition

- Key parameters of how the service works internally and how it is structured
- Includes the key service properties
  - SRS
  - NBands
  - Pixel Type

Image Service Properties - Service Definition

Information

Service Definition

Service Process

Output Definition

Metadata

Client Interface Control

Default Client Properties

Service Defaults

Field Properties

Definition of Service Parameters:

Service Name: untitled

Spatial Reference System: World\_Mercator

Home Folder:

Service Table:

Raster Source Field: RasterSrc

Seamline Source:

Boundary Source:

Max. Rasters Displayed: 20

Transparency: Off

Process Weight: 1

Generate Process Metadata:

Verbose Reporting:

Definition of Pixel Prior to Service Process:

Number of Bands: 3

Pixel Type: Unsigned 8-bit Integer

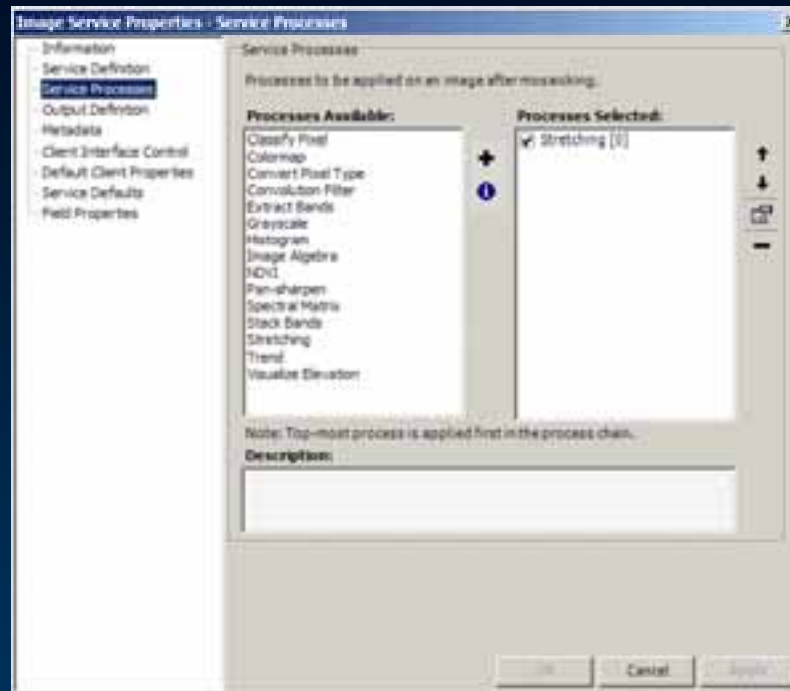
OK Cancel Apply

```
<Definition>
  <Name>untitled</Name>
  + <Srs>
    <HomeFolder />
    <ServiceTable />
    <RasterSourceField>RasterSrc</RasterSourceField>
    <SeamlineShapeSource />
    <BoundaryShapeSource />
    <NBands>3</NBands>
    <PixelFormat>byte</PixelFormat>
    <BitDepth>8</BitDepth>
    <ColorSpace>255</ColorSpace>
    <MaxRasterItemsSelected>20</MaxRasterItemsSelected>
    <Transparency>Off</Transparency>
    <GenerateProcessMetadata>False</GenerateProcessMetadata>
    <Verbose>False</Verbose>
    <ProcessChain />
    <ProcessWeight>1</ProcessWeight>
</Definition>
```

# Image Service Properties - <ProcessChain>

## Service Processes

- Processes applied after mosaic and before optional compression
- Process Chain may contain multiple processes



```
- <ProcessChain>
- <Process>
  <Description>Stretching</Description>
  <Name>Stretching</Name>
  <ProcessId>Stretching</ProcessId>
  <Version>1.0.0.0</Version>
  <Alias>Stretching [0]</Alias>
  <Enabled>True</Enabled>
  <Method>Standard</Method>
  <OutputNBits>8</OutputNBits>
  <InverseOutput-4>False</InverseOutput-4>
  <CorrectGammaGradient-4>True</CorrectGammaGradient-4>
  <LUTString-4 />
</Process>
</ProcessChain>
<ProcessWeight>1</ProcessWeight>
```

# Image Service Properties - <ServiceProperties>

## Output Definition

- Properties of the image service output.
- Can be different from the service definition.

Image Service Properties - Output Definition

Information  
Service Definition  
Service Processes  
**Output Definition**  
Metadata  
Client Interface Control  
Default Client Properties  
Service Defaults  
Field Properties

**Definition of Output Imagery:**

Number of Bands: 3  
Pixel Type: Unsigned 8-bit Integer  
Bit Depth: 8  
Color space: 1-2  
Minimum Pixel Size: 0.000000000000  
Maximum Pixel Size: 141.492000000000  
Base Pixel Size: 27.210000000000

**Bounding Box in Geographic Coordinates (WGS-1984)**

X-Minimum: 2.722224359655  
X-Maximum: 2.886345653748  
Y-Minimum: 24.162915931342  
Y-Maximum: 24.325405999612  
Z-Minimum: 0.000000000000  
Z-Maximum: 0.000000000000

OK Cancel Apply

```
- <ServiceProperties>  
  <MinPixelSize>0.000000000000</MinPixelSize>  
  <MaxPixelSize>12.480000000000</MaxPixelSize>  
  - <Envelope>  
    <XMin>2.722224359655</XMin>  
    <XMax>2.886345653748</XMax>  
    <YMin>24.162915931342</YMin>  
    <YMax>24.325405999612</YMax>  
    <ZMin>0.000000000000</ZMin>  
    <ZMax>0.000000000000</ZMax>  
  </Envelope>  
  <ServiceEnvelope>  
    <NBands>3</NBands>  
    <PixelFormat>Byte</PixelFormat>  
    <BitDepth>8</BitDepth>  
    <ColorSpace>1</ColorSpace>  
    <BasePixelSize>27.2100</BasePixelSize>  
  </ServiceEnvelope>  
</ServiceProperties>
```

# Image Service Properties - <Metadata>

## Metadata

- Meta information about the service that the client can view as service metadata
- Transmitted as a block to the client
- Can include user defined attributes

The screenshot shows the 'Image Service Properties - Metadata' dialog box. The left sidebar contains a tree view with the following items: Information, Service Definition, Service Processes, Output Definition, Metadata (selected), Client Interface Control, Default Client Properties, Service Defaults, and Field Properties. The main area is titled 'Service Metadata' and contains the following fields:

- Title: LongMont Quickbird 321 DG Products
- Edition: 1.0.0.1
- Identifier: (empty)
- Geographic Region: Longmont, Colorado, United States
- Pixel Unit: True Color
- Pixel Source: Quickbird
- Processing Summary: On The Fly Orthorectification, Panshaping, Image Enhancement and Band Extraction.
- Abstract: (empty)
- Purpose: Exhibiting On-the-fly Orthorectification, Panshaping, Image enhancements, Band extraction.
- Originator: ESRI

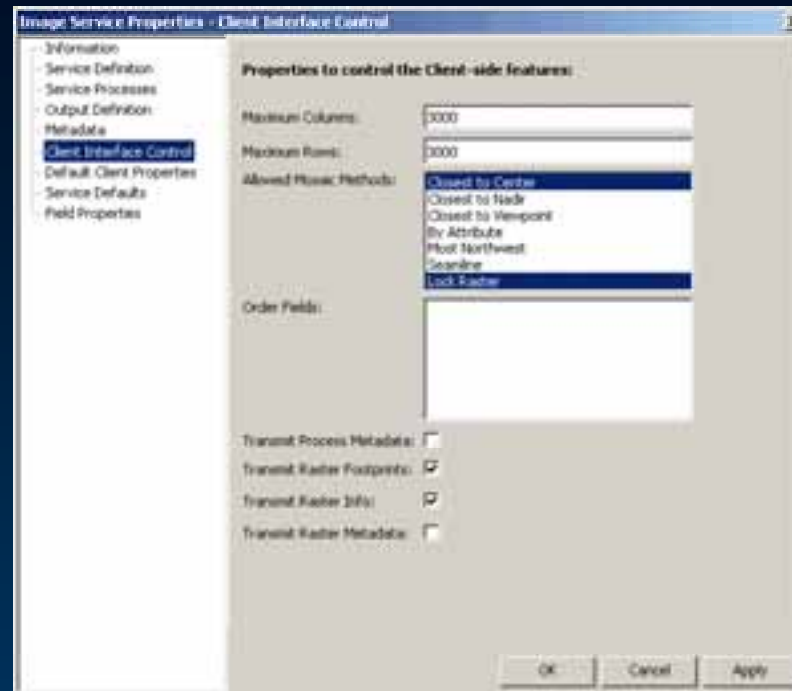
Buttons for OK, Cancel, and Help are visible at the bottom right.

```
<Metadata>
  <Title>LongMont Quickbird Basic 321 </Title>
  <Edition>1.0.0.1 </Edition>
  <Identifier />
  <GeoRegion>Longmont, Colorado, United States </GeoRegion>
  <PixelUnit>True Color </PixelUnit>
  <PixelSource>Quickbird </PixelSource>
  <ProcessSum>On The Fly Orthorectification, Extraction. </ProcessSum>
  <Abstract />
  <Purpose>Exhibiting On-the-fly Orthorectification, extraction. </Purpose>
  <Originator>ESRI </Originator>
  <Publisher>ESRI </Publisher>
  <Rights>Digital Globe </Rights>
  <ContactOrg>ESRI </ContactOrg>
  <ContactPer>ESRI Support </ContactPer>
  <TimePeriodBegin>20040706 </TimePeriodBegin>
  <TimePeriodEnd>20050704 </TimePeriodEnd>
  <ServiceCreationDate>2006-05-28 </ServiceCreationDate>
  <ServiceCreationTime>16:36:10 </ServiceCreationTime>
</Metadata>
```

# Image Service Properties - <ClientInterfaceControl>

## Client Interface Control

- Defines limitations of clients that accessing an image service.

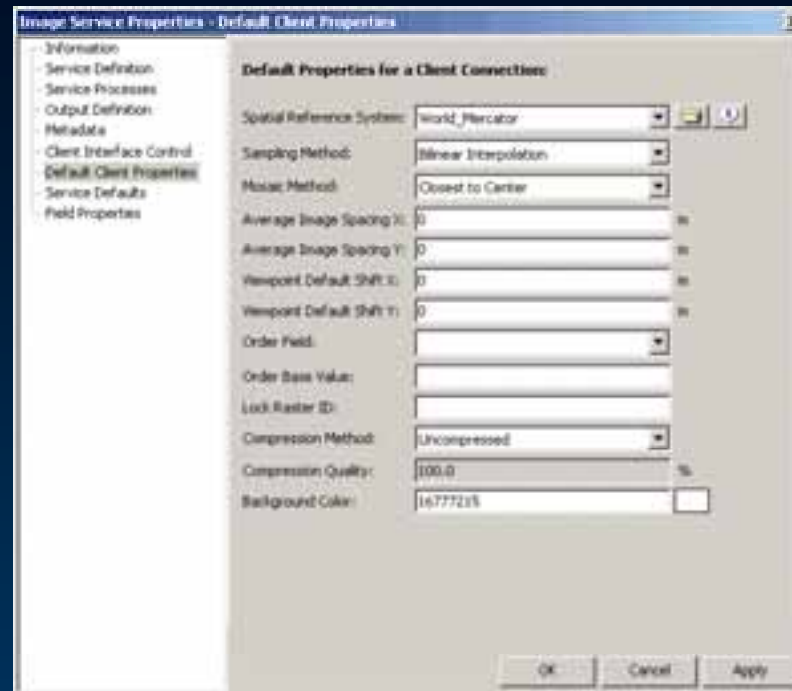


```
- <ClientInterfaceControl>  
  <MaxNCols>3000</MaxNCols>  
  <MaxNRows>3000</MaxNRows>  
  <AllowedMosaicMethod>Center;LockRaster</AllowedMosaicMethod>  
  <TileOrderFields />  
  <TransmitProcessMetadata>False</TransmitProcessMetadata>  
  <TransmitRasterFootprints>True</TransmitRasterFootprints>  
  <TransmitRasterInfo>True</TransmitRasterInfo>  
  <TransmitRasterMetadata>False</TransmitRasterMetadata>  
</ClientInterfaceControl>
```

# Image Service Properties - <DefaultClientProperties>

## Default Client Properties

- Default client service properties applied to the output raster dataset
- The image service will have these properties until the client changes them.

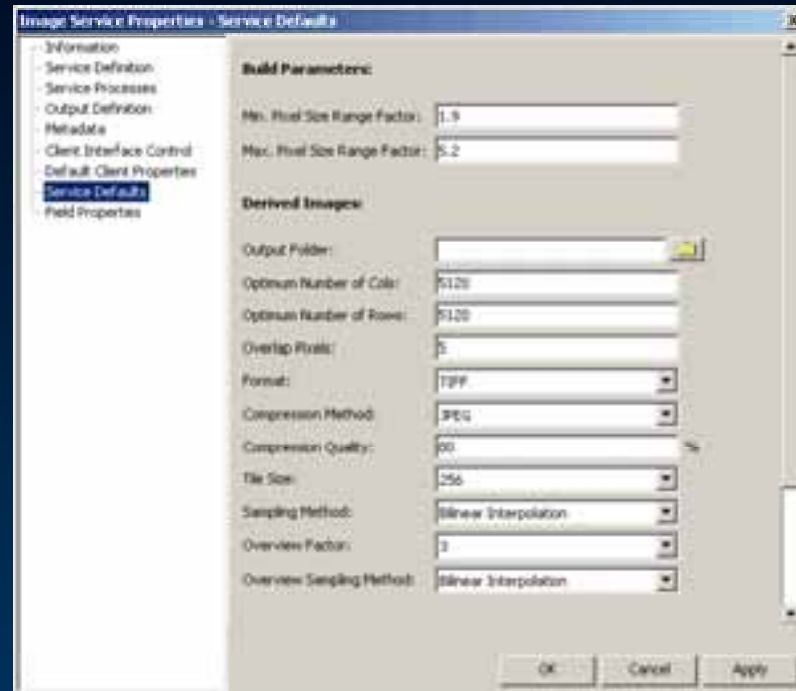


```
<DefaultClientProperties>
+ <Srs>
  <SamplingMethod>Bilinear</SamplingMethod>
  <MosaicMethod>Center</MosaicMethod>
  <TileOrderField />
  <TileOrderBase />
  <LockImageID />
  <CompressionMethod>None</CompressionMethod>
  <CompressionQuality>100.0</CompressionQuality>
  <BackgroundColor>16777215</BackgroundColor>
  <AvgImageSpacingX>0</AvgImageSpacingX>
  <AvgImageSpacingY>0</AvgImageSpacingY>
  <ViewPointDefShiftX>0</ViewPointDefShiftX>
  <ViewPointDefShiftY>0</ViewPointDefShiftY>
</DefaultClientProperties>
```

# Image Service Properties - ServiceEditorDefaults

## Service Defaults

- Values used by the Service Editor during the creation of an image service definition
- Properties that are prompted for – by service editor during various operations.

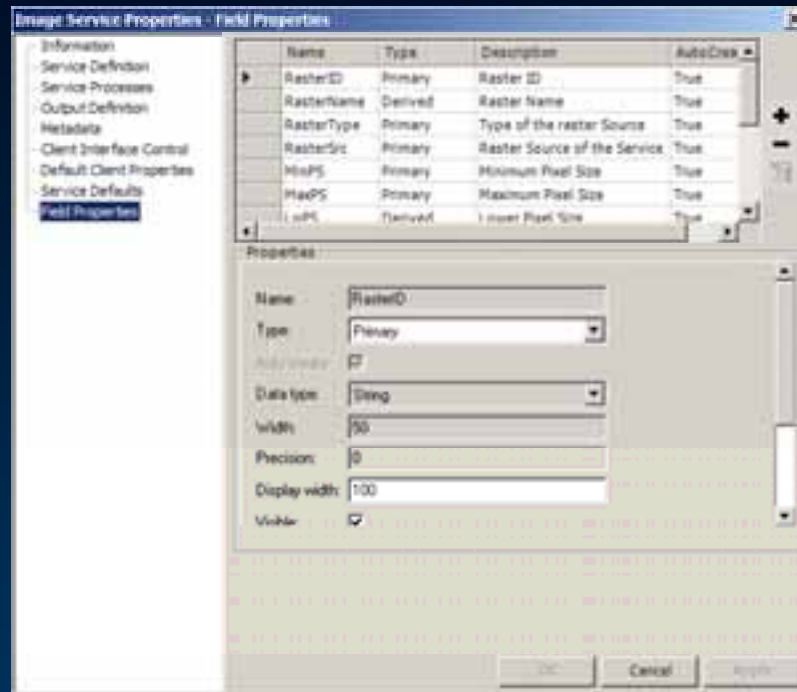


```
- <ServiceEditorDefaults>
  <MinPixelSizeRangeFactor>1.9</MinPixelSizeRangeFactor>
  <MaxPixelSizeRangeFactor>5.2</MaxPixelSizeRangeFactor>
  <DerivedImagesOutputFolder />
  <SamplingFactor>3</SamplingFactor>
  <SamplingMethod>Bilinear</SamplingMethod>
  <FormatName>TIFF</FormatName>
  <CompressionMethod>JPEG</CompressionMethod>
  <CompressionQuality>80</CompressionQuality>
  <InternalTileSize>256</InternalTileSize>
  <OptimumNCols>5120</OptimumNCols>
  <OptimumNRows>5120</OptimumNRows>
  <OverlapPixels>5</OverlapPixels>
  <OverviewSamplingMethod>Bilinear</OverviewSamplingMethod>
  <FeatherWidth>0</FeatherWidth>
  <FeatherWidthUnit>Pixel</FeatherWidthUnit>
  <SeamlineType>Around</SeamlineType>
```

# Image Service Properties - <Fields>

## Field Properties

- Defines all fields in the service table
- Type
  - Primary
  - Derived
  - Metadata
  - Private
- Display Order
- XPath
  - How to extract from RPDef



```
- <Fields>
- <Field>
  <Name>RasterID</Name>
  <Type>Primary</Type>
  <DataType>String</DataType>
  <Width>50</Width>
  <Precision>0</Precision>
  <DisplayWidth>100</DisplayWidth>
  <Visible>True</Visible>
  <Order>1</Order>
  <Frozen />
  <Description>Raster ID</Description>
  <XPath />
  <AutoCreate>True</AutoCreate>
</Field>
```

# Service Table

## Attributes of Footprint.shp

- **RasterID** - Unique Identifier for each raster dataset. Used for lock image, Seamline, etc.
- **RasterName** - Name of the Raster dataset.
- **RasterType** - Type of Raster (eg. Quickbird, geotiff).
- **RasterSrc** - Link to the RPDef.
- **MinPS/MaxPS** - Defines range of pixel size requests for which the raster dataset should be used.
- **LoPS/HiPS** - Defines range of Pixel sizes the raster dataset contains.
- **DispOrder** - Overrides the ordering of raster datasets while mosaicking.
- **StatusID** - Error indication
- **StatusMsg** - Error/warning message

RasterID	RasterName	RasterType	RasterSrc	MinPS	MaxPS	LoPS	HiPS	DispOrd	StatusID	StatusMsg
07031313391	n_3109063_n	Generic:Tiff	RPDefs\2007-03-13T13.39.19\070	0	9	1	0.007407	0	0	
07031313391	n_3109063_n	Generic:Tiff	RPDefs\2007-03-13T13.39.19\070	0	9	1	0.008319	0	0	
07031313391	n_3109063_s	Generic:Tiff	RPDefs\2007-03-13T13.39.19\070	0	9	1	0.005076	0	0	
07031313391	n_3109063_s	Generic:Tiff	RPDefs\2007-03-13T13.39.19\070	0	9	1	0.010125	0	0	
07031313394	ServiceOverv	ServiceOverv	RPDefs\2007-03-13T13.39.43\070	9	27	9	9	0	0	
07031313394	ServiceOverv	ServiceOverv	RPDefs\2007-03-13T13.39.44\070	27	81	27	27	0	0	
07031313394	ServiceOverv	ServiceOverv	RPDefs\2007-03-13T13.39.44.297\	81	421.2	81	81	0	0	

# Service Table – Pixel Size Ranges

- Used to filter Rasters to be processed depending on scale prior to mosaic
- Always defined in meters

- **LoPS and HiPS**

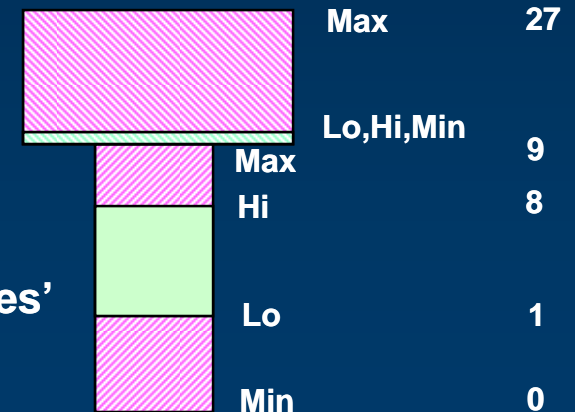
- Defines range of pixel sizes that the raster dataset contains (eg Internal Overviews).
- Populated when adding raster datasets to the service.

- **MinPS and MaxPS**

- Defines range of pixel sizes for which the raster dataset should be used.
- Computed during the build operation ‘Compute Pixel sizes’

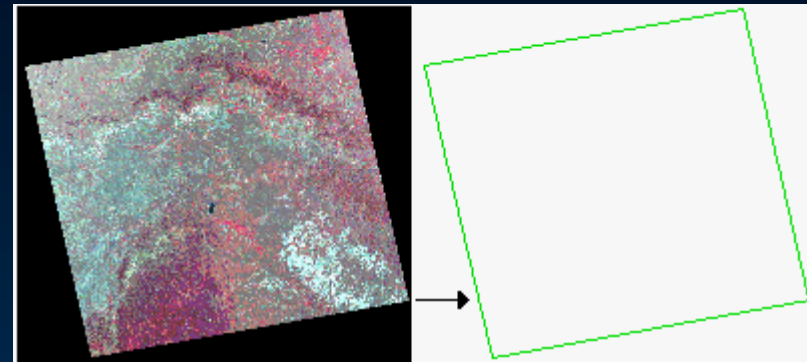
RasterID	RasterName	RasterType	MinPS	MaxPS	LoPS	HiPS
07031313391	n_3109863_ne_14	Generic:Tiff	0	9	1	8.007487
07031313391	n_3109863_nw_1	Generic:Tiff	0	9	1	8.008319
07031313391	n_3109863_se_14	Generic:Tiff	0	9	1	8.005076
07031313391	n_3109863_sw_1	Generic:Tiff	0	9	1	8.010125
07031313394	ServiceOverview	ServiceOverv	9	27	9	9
07031313394	ServiceOverview	ServiceOverv	27	81	27	27
07031313394	ServiceOverview	ServiceOverv	81	421.2	81	81

Profile of two rasters



# Footprint

- **Geometry of the service table.**
- **Used to**
  - **Select rasters that intersect with client AOI**
  - **Clip pixels**
- **Clipping using footprints more efficient than using transparency.**

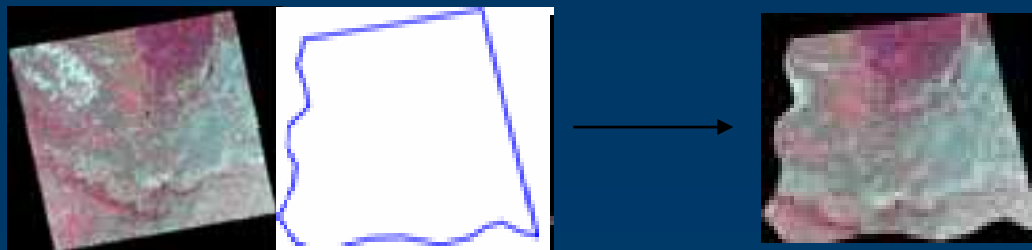


**Landsat  
Scene**

**Footprint**

# Seamline

- **Seamlines used for Seamline Mosaic method.**
- **Pixel clipped and Feathered along seamlines.**
- **Linked to Service table by RasterID**
- **Generated by:**
  - **Exporting footprints and editing them**
  - **Seamline generation in 9.3**
  - **An existing shape**



# Boundary

- Outlines the service extents
- Only used to determine the service extents when re-projected.
- Generated when the image service is built.
- Derived from the footprints of the primary raster datasets.

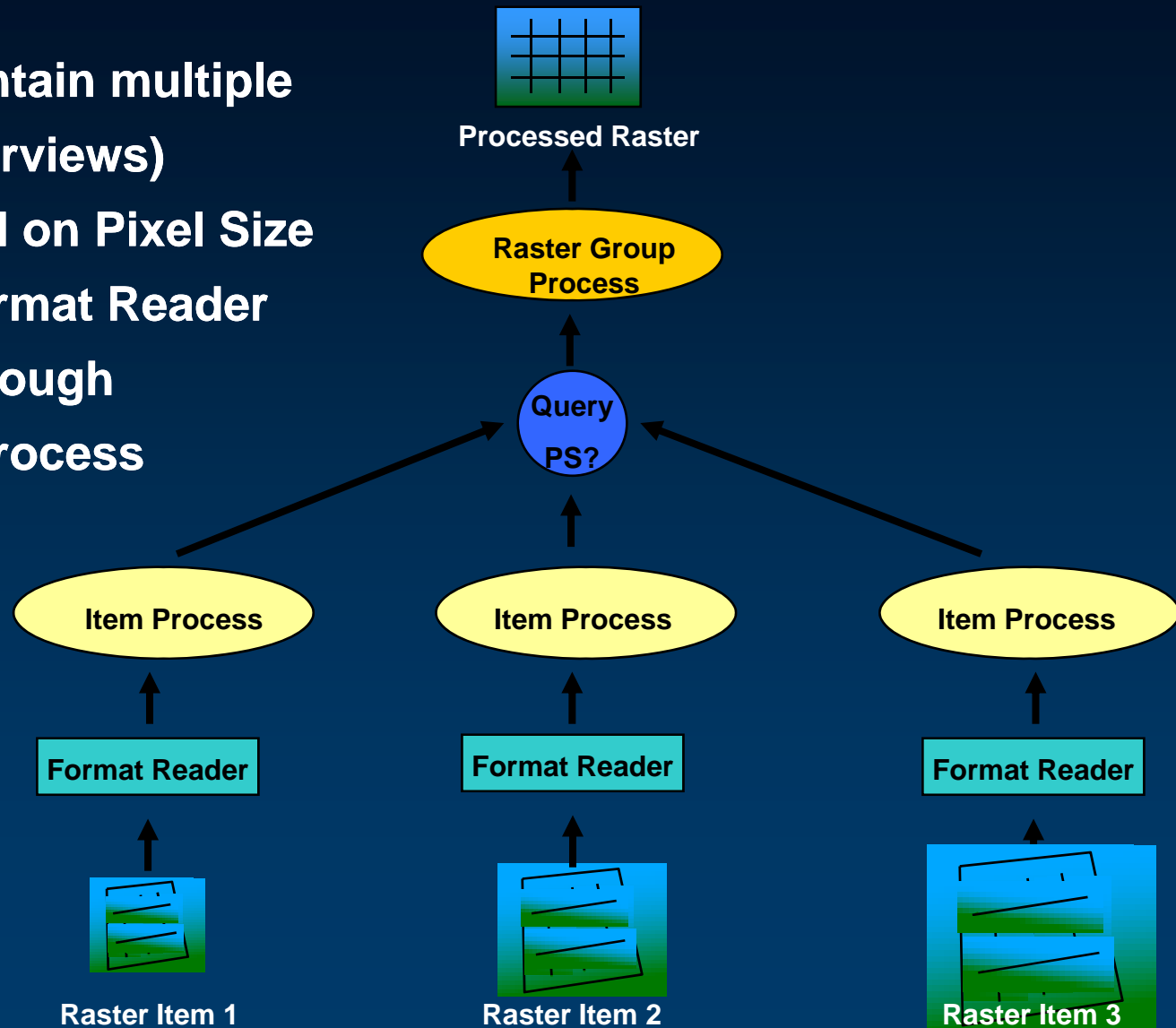


# Raster Process Definition Files (RPDefs)

- Fully defines each Raster datasets used in a service
- XML File
- Linked to by Service table (RasterSrc)
- Created by an RPDef generator (specific to a raster type)
- Adding a raster entails:
  - Creating an RPDef
  - Adding it to the Service Table

# Processes within an RPDef

- RPDef may contain multiple rasters (eg overviews)
- Selected based on Pixel Size
- Read using Format Reader
- Pixels pass through item + group process



# Structure of an RPDef

- XML based
- <Raster Group>
  - <Properties>
  - <Footprint>
  - <SRS>
  - <Metadata>
  - <ProcessChain>
- <Raster Item>
  - <Source>
  - <Properties>
  - <ProcessChain>
  - <Format info>

```
<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
  - <RasterProcessDefinition>
    + <Info>
      <Name>110211</Name>
      <LoPixelSize>0.100000000000</LoPixelSize>
      <HiPixelSize>0.100000000000</HiPixelSize>
      <NBands>3</NBands>
      <ColorSpace>1</ColorSpace>
      <PixelType>Byte</PixelType>
      <BitDepth>8</BitDepth>
    + <Srs>
    + <Footprint>
      <FeatherWidth>5</FeatherWidth>
      <FeatherWidthUnit>Pixel</FeatherWidthUnit>
      <SeamlineType>Inside</SeamlineType>
      <NoData>0</NoData>
      <Transparency>False</Transparency>
      <ProcessChain />
      <MetaData />
      <StatusId />
      <StatusMsg />
    - <Rasters>
      - <Raster>
        <Id>0</Id>
        <Description />
        <Source>D:\Data\Amberg\CompressedWithGeoHeader\110211.tif</Source>
        <SourceIndex>0</SourceIndex>
        <Enabled>true</Enabled>
        <PixelSize>0.1</PixelSize>
        <MinPixelSize />
        <MaxPixelSize />
        <FormatName>TIFF</FormatName>
        <DerivationMethod>P</DerivationMethod>
        <NoData />
        + <ProcessChain>
          <FormatInfo>
            <StatusId />
            <StatusMsg />
            <SkipGroupProcess />
          </FormatInfo>
        </ProcessChain>
      </Raster>
    </Rasters>
  </RasterProcessDefinition>
</ImageServer>
```

# Structure of an RPDef

- XML based
- <Raster Group>
  - <Properties>
  - <Footprint>
  - <SRS>
  - <Metadata>
  - <ProcessChain>
- <Raster Item>
  - <Source>
  - <Properties>
  - <ProcessChain>
  - <Format info>

```
<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
- <RasterProcessDefinition>
+ <Info>
  <Name>110211</Name>
  <LoPixelSize>0.100000000000</LoPixelSize>
  <HiPixelSize>0.100000000000</HiPixelSize>
  <NBands>3</NBands>
  <ColorSpace>1</ColorSpace>
  <PixelType>Byte</PixelType>
  <BitDepth>8</BitDepth>
+ <Srs>
+ <Footprint>
  <FeatherWidth>5</FeatherWidth>
  <FeatherWidthUnit>Pixel</FeatherWidthUnit>
  <SeamlineType>Inside</SeamlineType>
  <LoPixelSize>0.100000000000</LoPixelSize>
  <HiPixelSize>0.100000000000</HiPixelSize>
  <NBands>3</NBands>
  <ColorSpace>1</ColorSpace>
  <PixelType>Byte</PixelType>
  <BitDepth>8</BitDepth>
  <Source>D:\Data\Amberg\CompressedWithGeoHeader\110211.tif</Source>
  <SourceIndex>0</SourceIndex>
  <Enabled>true</Enabled>
  <PixelSize>0.1</PixelSize>
  <MinPixelSize />
  <MaxPixelSize />
  <FormatName>TIFF</FormatName>
  <DerivationMethod>P</DerivationMethod>
  <NoData />
+ <ProcessChain>
+ <FormatInfo>
  <StatusId />
  <StatusMsg />
  <SkipGroupProcess />
</Raster>
</Rasters>
</RasterProcessDefinition>
</ImageServer>
```

# Structure of an RPDef

- XML based
- **<Raster Group>**
  - <Properties>
  - <Footprint>**
  - <SRS>
  - <Metadata>
  - <ProcessChain>
- **<Raster Item>**
  - <Source>
  - <Properties>
  - <ProcessChain>
  - <Format info>

```
<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
- <RasterProcessDefinition>
+ <Info>
  <Name>110211</Name>
  <LoPixelSize>0.100000000000</LoPixelSize>
  <HiPixelSize>0.100000000000</HiPixelSize>
  <NBands>3</NBands>
  <ColorSpace>1</ColorSpace>
  <PixelType>Bvte</PixelType>
  <BitDepth>8</BitDepth>
+ <Srs>
+ <Footprint>
  <FeatherWidth>5</FeatherWidth>
  <FeatherWidthUnit>Pixel</FeatherWidthUnit>
  <SeamlineType>Inside</SeamlineType>
  <NoData>0</NoData>
  <Transparency>False</Transparency>
- <Footprint>
- <gml:MultiSurface xmlns:gml="http://www.opengis.net/gml" gid="Footprint">
- <gml:surfaceMember>
- <gml:Polygon>
- <gml:exterior>
- <gml:LinearRing>
  <gml:pos>4490039.950000000200 5478450.3230000000800</gml:pos>
  <gml:pos>4491005.049999999800 5478450.3230000000800</gml:pos>
  <gml:pos>4491005.049999999800 5477485.2230000001200</gml:pos>
  <gml:pos>4490039.950000000200 5477485.2230000001200</gml:pos>
  <gml:pos>4490039.950000000200 5478450.3230000000800</gml:pos>
  </gml:LinearRing>
  </gml:exterior>
  </gml:Polygon>
  </gml:surfaceMember>
  </gml:MultiSurface>
</Footprint>
  <StatusId />
  <StatusMsg />
  <SkipGroupProcess />
</Raster>
</Rasters>
</RasterProcessDefinition>
</ImageServer>
```

# Structure of an RPDef

- XML based
- **<Raster Group>**
  - <Properties>
  - <Footprint>
  - <SRS>**
  - <Metadata>
  - <ProcessChain>
- **<Raster Item>**
  - <Source>
  - <Properties>
  - <ProcessChain>
  - <Format info>

```
<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
- <RasterProcessDefinition>
+ <Info>
  <Name>110211</Name>
  <LoPixelSize>0.100000000000</LoPixelSize>
  <HiPixelSize>0.100000000000</HiPixelSize>
  <NBands>3</NBands>
  <ColorSpace>1</ColorSpace>
  <PixelType>Bvte</PixelType>
  <BitDepth>8</BitDepth>
+ <Srs>
+ <Footprint>
  <FeatherWidth>5</FeatherWidth>
  <FeatherWidthUnit>Pixel</FeatherWidthUnit>
  <SeamlineType>Inside</SeamlineType>
  <NoData>0</NoData>
  <Transparency>False</Transparency>
+ <Srs>
  <Prj>GEOGCS["GCS_WGS_1984",DATUM
    ["D_WGS_1984",SPHEROID["WGS_1984",6378137,298.
    257223563]],PRIMEM["Greenwich",0],UNIT
    ["Degree",0.017453292519943295]]</Prj>
</Srs>
  <Source>D:\Data\Amberg\CompressedWithGeoHeader\110211.tif</Source>
  <SourceIndex>0</SourceIndex>
  <Enabled>true</Enabled>
  <PixelSize>0.1</PixelSize>
  <MinPixelSize />
  <MaxPixelSize />
  <FormatName>TIFF</FormatName>
  <DerivationMethod>P</DerivationMethod>
  <NoData />
+ <ProcessChain>
+ <FormatInfo>
  <StatusId />
  <StatusMsg />
  <SkipGroupProcess />
</Raster>
</Rasters>
</RasterProcessDefinition>
</ImageServer>
```

# Structure of an RPDef

- XML based
- **<Raster Group>**
  - <Properties>
  - <Footprint>
  - <SRS>
  - <Metadata>**
  - <ProcessChain>
- **<Raster Item>**
  - <Source>
  - <Properties>
  - <ProcessChain>
  - <Format info>

```
<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
- <RasterProcessDefinition>
+ <Info>
  <Name>110211</Name>
  <LoPixelSize>0.100000000000</LoPixelSize>
  <HiPixelSize>0.100000000000</HiPixelSize>
  <NBands>3</NBands>
  <ColorSpace>1</ColorSpace>
  <PixelType>Byte</PixelType>
  <BitDepth>8</BitDepth>
+ <Srs>
+ <Footprint>
  <FeatherWidth>5</FeatherWidth>
  <FeatherWidthUnit>Pixel</FeatherWidthUnit>
  <SeamlineType>Inside</SeamlineType>
  <NoData>0</NoData>
  <Transparency>False</Transparency>
  <ProcessChain />
  <Metadata />
  <StatusId />
  <StatusMsg />
- <Rasters>
- <Raster>
  - <Metadata>
    <SourceID>50312740302151129292J</SourceID>
    <AcqDate>2003-02-15</AcqDate>
    <AcqTime>11:29:37</AcqTime>
    <AcqDate>2003-02-15</AcqDate>
    <AcqDateN>20030215</AcqDateN>
    <AcqTime>11:29:37</AcqTime>
    <AmecqTiN>112937</AmecqTiN>
    <MeanSatAz>158.904000</MeanSatAz>
    <MeanSunEl>37.122567</MeanSunEl>
    <MeanOffNadirViewAngle>11.757213</MeanOffNadirViewAngle>
  </Metadata>
  <StatusMsg />
  <SkipGroupProcess />
</Raster>
</Rasters>
</RasterProcessDefinition>
</ImageServer>
```

er\110211.tif</Source>

# Structure of an RPDef

- XML based
- **<Raster Group>**
  - <Properties>
  - <Footprint>
  - <SRS>
  - <Metadata>
  - <ProcessChain>**
- **<Raster Item>**
  - <Source>
  - <Properties>
  - <ProcessChain>
  - <Format info>

```

<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
  - <RasterProcessDefinition>
    + <Info>
      <Name>110211</Name>
      <LoPixelSize>0.100000000000</LoPixelSize>
      <HiPixelSize>0.100000000000</HiPixelSize>
      <NBands>3</NBands>
      <ColorSpace>1</ColorSpace>
      <PixelType>Byte</PixelType>
      <BitDepth>8</BitDepth>
    + <Srs>
    + <Footprint>
      <FeatherWidth>5</FeatherWidth>
      <FeatherWidthUnit>Pixel</FeatherWidthUnit>
      <SeamlineType>Inside</SeamlineType>
      <NoData>0</NoData>
      <Transparency>False</Transparency>
    <ProcessChain />
    <MetaData />
    <StatusId />
    <StatusMsg />
  - <Rasters>
    - <Process>
      <Description>Extract Bands</Description>
      <Name>ExtractBands</Name>
      <ProcessId>ProcessPixel</ProcessId>
      <Version>1.0.0.0</Version>
      <Alias>ExtractBands[0]</Alias>
      <Enabled>True</Enabled>
      <OutputNBands>3</OutputNBands>
      <BandSource-1>1</BandSource-1>
      <BandSource-2>2</BandSource-2>
      <BandSource-3>3</BandSource-3>
    </Process>
    <SkipGroupProcess />
  </Raster>
</Rasters>
</RasterProcessDefinition>
</ImageServer>
  
```

WithGeoHeader\110211.tif</Source>

# Structure of an RPDef

- XML based
- **<Raster Group>**
  - <Properties>**
  - <Footprint>**
  - <SRS>**
  - <Metadata>**
  - <ProcessChain>**
- **<Raster Item>**
  - <Source>**
  - <Properties>**
  - <ProcessChain>**
  - <Format info>**

```
<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
  - <RasterProcessDefinition>
    + <Info>
      <Name>110211</Name>
      <LoPixelSize>0.100000000000</LoPixelSize>
      <HiPixelSize>0.100000000000</HiPixelSize>
      <NBands>3</NBands>
      <ColorSpace>1</ColorSpace>
      <PixelType>Bvte</PixelType>
      <BitDepth>8</BitDepth>
    + <Srs>
    + <Footprint>
      <FeatherWidth>5</FeatherWidth>
      <FeatherWidthUnit>Pixel</FeatherWidthUnit>
      <SeamlineType>Inside</SeamlineType>
      <NoData>0</NoData>
      <Transparency>False</Transparency>
      <ProcessChain />
      <MetaData />
      <StatusId />
      <StatusMsg />
    - <Rasters>
      - <Raster>
        <Id>0</Id>
        <Description />
        <Source>D:\Data\Amberg\CompressedWithGeoHeader\110211.tif</Source>
        <SourceIndex>0</SourceIndex>
        <Enabled>true</Enabled>
        <PixelSize>0.1</PixelSize>
        <MinPixelSize />
        <MaxPixelSize />
        <FormatName>TIFF</FormatName>
        <DerivationMethod>P</DerivationMethod>
        <NoData />
        + <ProcessChain>
          <FormatInfo>
            <StatusId />
            <StatusMsg />
            <SkipGroupProcess />
          </FormatInfo>
        </ProcessChain>
      </Raster>
    </Rasters>
  </RasterProcessDefinition>
</ImageServer>
```

# Structure of an RPDef

- XML based
- **<Raster Group>**
  - <Properties>**
  - <Footprint>**
  - <SRS>**
  - <Metadata>**
  - <ProcessChain>**
- **<Raster Item>**
  - <Source>**
  - <Properties>**
  - <ProcessChain>**
  - <Format info>**

```
<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
- <RasterProcessDefinition>
+ <Info>
  <Name>110211</Name>
  <LoPixelSize>0.100000000000</LoPixelSize>
  <HiPixelSize>0.100000000000</HiPixelSize>
  <NBands>3</NBands>
  <ColorSpace>1</ColorSpace>
  <PixelType>Byte</PixelType>
  <BitDepth>8</BitDepth>
+ <Srs>
+ <Footprint>
  <FeatherWidth>5</FeatherWidth>
  <FeatherWidthUnit>Pixel</FeatherWidthUnit>
  <SeamlineType>Inside</SeamlineType>
  <NoData>0</NoData>
  <Transparency>False</Transparency>
  <ProcessChain />
  <MetaData />
  <StatusId />
  <StatusMsg />
- <Rasters>
- <Raster>
  <Id>0</Id>
  <Description />
  <Source>D:\Data\Amberg\CompressedWithGeoHeader\110211.tif</Source>
  <SourceIndex>0</SourceIndex>
  <Enabled>true</Enabled>
  <PixelSize>0.1</PixelSize>
  <MinPixelSize />
  <MaxPixelSize />
  <FormatName>TIFF</FormatName>
  <DerivationMethod>P</DerivationMethod>
  <NoData />
+ <ProcessChain>
  <FormatInfo>
  <StatusId />
  <StatusMsg />
  <SkipGroupProcess />
  </Raster>
</Rasters>
</RasterProcessDefinition>
</ImageServer>
```

# Structure of an RPDef

- XML based
- **<Raster Group>**
  - <Properties>
  - <Footprint>
  - <SRS>
  - <Metadata>
  - <ProcessChain>
- **<Raster Item>**
  - <Source>
  - <Properties>
  - <ProcessChain>**
  - <Format info>

```

<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
- <RasterProcessDefinition>
+ <Info>
  <Name>110211</Name>
  <LoPixelSize>0.100000000000</LoPixelSize>
  <HiPixelSize>0</HiPixelSize>
- <ProcessChain>
  - <Process>
    <Name>Warp-Affine</Name>
    <ProcessId>Warp</ProcessId>
    <Version>1.0.0.0</Version>
    <Alias>Warp-Affine</Alias>
    <Enabled>True</Enabled>
  - <GeoTransforms>
    - <GeoTransDef class="Affine">
      <Transforms>TG</Transforms>
      <A0>4490040.000000000000</A0>
      <A1>0.100000000000</A1>
      <A2>0.000000000000</A2>
      <B0>5478450.273000001000</B0>
      <B1>0.000000000000</B1>
      <B2>-0.100000000000</B2>
    </GeoTransDef>
  </GeoTransforms>
</Process>
</ProcessChain>
  <Source>CompressedWithGeoHeader\110211.tif</Source>
  <MinPixelSize />
  <MaxPixelSize />
  <FormatName>TIFF</FormatName>
  <DerivationMethod>P</DerivationMethod>
  <NoData />
  <ProcessChain>
  <FormatInfo>
  <StatusId />
  <StatusMsg />
  <SkipGroupProcess />
</Raster>
</Rasters>
</RasterProcessDefinition>
</ImageServer>
  
```

# Structure of an RPDef

- XML based
- <Raster Group>
  - <Properties>
  - <Footprint>
  - <SRS>
  - <Metadata>
  - <ProcessChain>
- <Raster Item>
  - <Source>
  - <Properties>
  - <ProcessChain>
  - <Format info>

```

<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
  - <RasterProcessDefinition>
    + <Info>
      <Name>110211</Name>
      <LoPixelSize>0.100000000000</LoPixelSize>
      <HiPixelSize>0.100000000000</HiPixelSize>
      <NBands>3</NBands>
      <ColorSpace>1</ColorSpace>
      <PixelType>Byte</PixelType>
      <BitDepth>8</BitDepth>
    + <Srs>
    + <Footprint>
  - <FormatInfo>
    <Ncols>9651</Ncols>
    <NRows>9651</NRows>
    <PixelType>Byte</PixelType>
    <BitDepth>8</BitDepth>
    <NBands>3</NBands>
    <ColorSpace>1</ColorSpace>
    <TileWidth>256</TileWidth>
    <TileHeight>256</TileHeight>
    <CompressionMethod>jpeg</CompressionMethod>
    <FloatData>False</FloatData>
    <Interleave>BIP</Interleave>
    <ByteOrder>I</ByteOrder>
  </FormatInfo>
  <MinPixelSize />
  <MaxPixelSize />
  <FormatName>TIFF</FormatName>
  <DerivationMethod>P</DerivationMethod>
  <NoData />
  + <ProcessChain>
  <FormatInfo>
  <StatusId />
  <StatusMsg />
  <SkipGroupProcess />
  </Raster>
  </Rasters>
  </RasterProcessDefinition>
</ImageServer>

```

# Extending support for Raster Types

## Two Parts

- Create RPDefs
- Import into Service

## Two Methods

- External
  - Externally create Raster Process Definition (RPDef) files
    - Simple templates
  - Import using “RPDef” Raster Type
- Create custom raster type using IRPDefGenerator interface
  - Prompt for files
  - Prompt for Parameters
  - Calls RPDef Generator
  - Validates and Adds to Service

# IRPDefGenerator interface

- Interface to be Implemented by any custom RPDef generator
- Functions available in the Interface (called sequentially by service editor)
  - **Init()**
    - Initializes RPDef generator with the RPDefGen file and raster type name
  - **ShowAddDataDialog()**
    - Called by Service Editor.
    - Allows the RPDef generator to popup a dialog asking users to point for input datasets
  - **ShowProcessParametersDialog()**
    - Prompts for the processing parameters linked to the raster type.
    - Returns XML

# IRPDefGenerator interface contd..

## – FindItemsToAdd()

- Logic to add data based on User parameters in showadddialog
- Default: Browse folders for datasets (based on add data parameters)
- Fire progress events (events are handled by SE )

## – GetItemsToAdd()

- Returns an array of items to be added

## – GenerateRPDefs()

- Array is split in subarrays of 100 items
- Sent for generation in chunks of 100
- Actual logic to translate item and process parameters is implemented

## – GeneratedRPDefs()

- Get array of Generated RPDefs

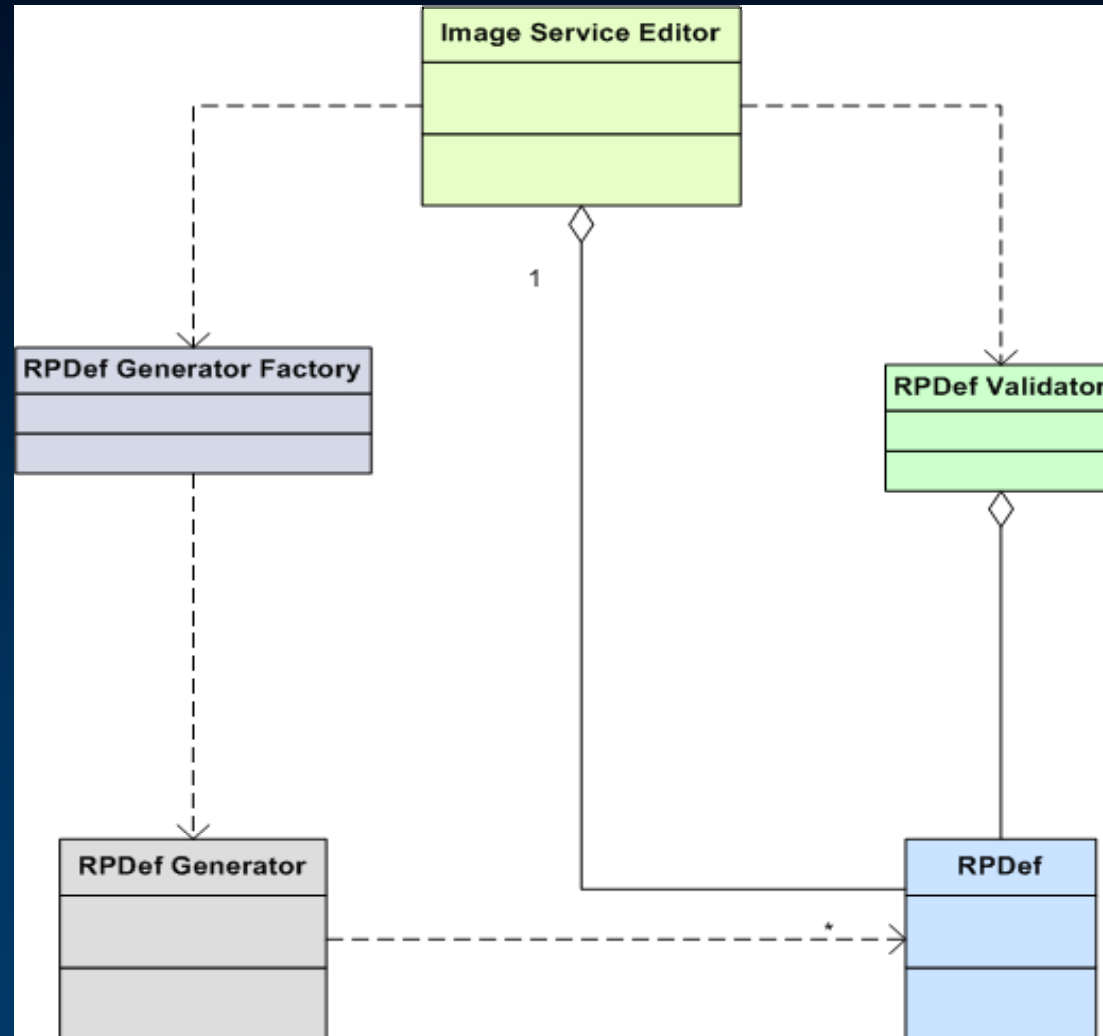
## – SE Validates

## – SE adds to service

# GenerateRPDefs

- **Implements Logic to generate RPDefs**
- **Inputs to the function are**
  - List of files to be processed
  - Add data parameters (XML)
  - Process Parameters (XML)
- **Processing Applied**
  - Add data logic
  - Process parameters logic
- **Output**
  - RPDef (Formatted XML interpreted by Image Server)

# RPDef Generator Object – Static Diagram



# The IRPDefGenerator Class Interface

```
public __gc __interface IRPDefGenerator
{
public:
    /// Initializes the object using the ISDef File
    Boolean Init(String* rpDefGenName, String* rpDefGenFilePath,
        String* isDefFilePath);

    /// Shows the Add Data dialog allowing users to specify parameters
    /// enabling the object to search for items.
    int ShowAddDataDialog();

    /// Finds source items that match the criteria
    /// Add Data and Process parameters
    Boolean FindItemsToAdd();

    /// Returns an array of RPDefEntry items
    Array* GetItemsToAdd();

    /// Shows the Process Dialogs that allow the user to specify
    /// parameters that control the generation of RPDefs.
    int ShowProcessParametersDialog();

    /// \param rasterSources An array of RPDef Entry structures.
    /// \return True if the RPDef Generator object successfully traversed the \
    /// list of source items and attempted RPDef generation
    Boolean GenerateRPDefs(Array* rasterSources);

    /// Get a value of an internal property of the object.
    String* GetProperty(String* name);

    /// Set a value of an internal property of the object.
    Boolean SetProperty(String* name, String* value);

    __property String* get_Name();

    __property String* get_AddDataParameters();
    __property void set_AddDataParameters(String* pars);

    __property String* get_ProcessParameters();
    __property void set_ProcessParameters(String* pars);

    __property Array* get_GeneratedRPDefs();
    __property String* get_Status();
};
```

# The RPDefGen File

- Defines the RPDef Generator
- Contains Information the application uses to create the RPDef generator object when the user picks a raster type viz.
  - RPDef generator Name / Properties
  - Visibility status
  - Assembly/Object Name
- First point of interaction between the service editor and the Raster Type

```
<?xml version="1.0" standalone="yes" ?>
- <ImageServer>
- <RPDefGenerator>
  - <Info>
    <Name>RPDefGenHDR</Name>
    <Version>1.0.0.1</Version>
    <Author>ESRI, Inc.</Author>
    <Description>Georeferenced Imagery/RAW with External HDR (SDK Sample)</Description>
    <LongDescription>Adds RAW raster datasets that have an external HDR file that defines
      georeferencing</LongDescription>
    <Visible>True</Visible>
    <GeoreferencingDetails>HDR contains the georeferencing information.</GeoreferencingDetails>
    <SrsDetails>Spatial reference information is obtained only from the external ESRI PRJ file which
      the user is allowed to pick.</SrsDetails>
    <RadiometryDetails />
    <EnhancementDetails />
    <MetadataDetails />
    <FootprintDetails>Footprint is simply the rectangular envelope of the raster
      dataset</FootprintDetails>
    <SeamlineDetails />
  </Info>
  <AssemblyName>ESRI.ImageServer.SampleRasterType</AssemblyName>
  <ObjectName>ESRI.ImageServer.SampleRasterType.RPDefGenHDR</ObjectName>
</RPDefGenerator>
</ImageServer>
```

# Installing the Custom Raster Type

- Copy the RPDefGen file and dependencies to:  
“<Common Files>/ESRI/Image Server/RPDef Generators”.
- Install the RPDef Generator DLL to the Global Assembly Cache.

# Demo: Create a Raster type to import ESRI BIL files

## Bil File

- Raw binary file
- Must have associated ASCII .hdr
- Interleaved by line

## Hdr File

Keyword	Acceptable Value	Default
nrows	any integer > 0	none
ncols	any integer > 0	none
nbands	any integer > 0	1
nbits	1, 4, 8, 16, 32	8
byteorder	I = Intel; M = Motorola	same as host machine
layout	bil, bip, bsq	bil
skipbytes	any integer ≥ 0	0
ulxmap	any real number	0
ulymap	any real number	nrows - 1
xdim	any real number	1
ydim	any real number	1

## Sample

```
nrows      766
ncols      831
nbits      8
byteorder  I
nbands     3
layout     BIL
xdim       2.70000000000
ydim       2.70000000000
ulxmap     4488760.79999999998
ulymap     5479552.79999999998
skipbytes  0
```

# Service creation process flow

- **Create ISDef**
  - **Add Rasters**
  - **Build (Pixel size etc.)**
  - **Optimize**
  - **Compile**
  - **Publish**
- 
- **Can be automated by programmatically performing the defined steps and/or calling ISCommands**

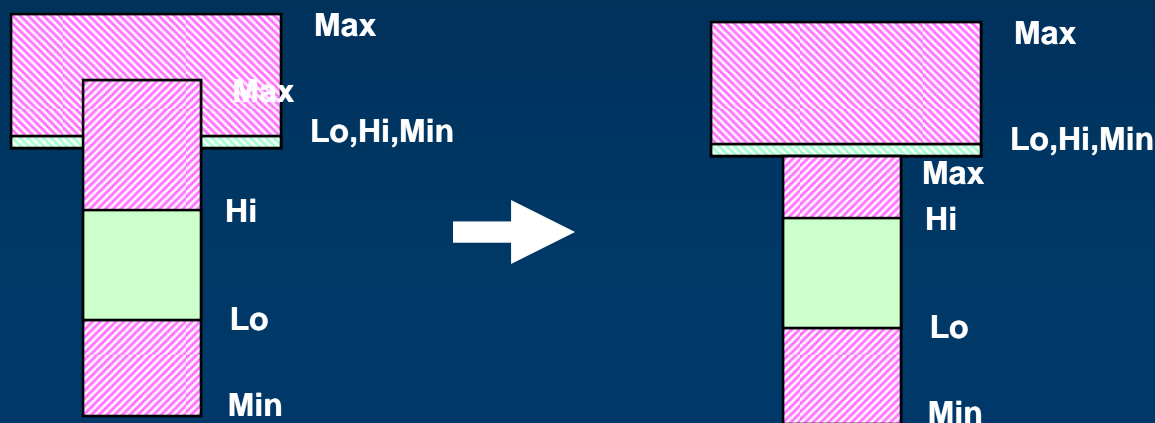
# Build process - Introduction

- **Determines derived properties**
- **Steps:**
  - **Compute Pixel Size Ranges**
  - **Create Service Boundary**
  - **Compute Output Pixel Properties**
  - **Compute Average image Spacing**
  - **Extract Metadata fields**
  - **Generate Derived Images**
  - **Validate Raster Sources**
  - **Validate RPDefs**
  - **Load Preview**
- **Generic functions can be time consuming**
- **There exist many optimization possibilities**

# Build - Compute Pixel Size Ranges

- LoPS,HiPS extracted from RPDef to Service Table during load
- Need to compute MinPS, MaxPS
- Generic function analyses overlap of all images
- If ranges are know can be directly set

Profile of two rasters



# Build - Create Service Boundary

- **Defines extent of Service**
- **Used to**
  - Determine extent of service after projection into client coordinate system
  - As indication of service extent (gray) if out of pixel range
- **Merge (Union) of Primary Rasters**
  - Can be issues with but joined tiles
- **Can be approximated to Envelope**

# Build - Compute Output Pixel Properties

- Define properties of imagery output from services
- Generic function takes sample raster and applies Service process
- Can be set to know values in ImageService.XML

# Build - Compute Average Image Spacing

- Determine average spacing between rasters
- Required only for ViewPoint Functionality
- Generic function analyses overlaps
- Generally know and can be set in XML

## Build - Extract Metadata

- **Extracts metadata from each RPDef and adds as attributes in Source table**
- **Required for Mosaic – Order by Attribute**
- **Tags to be extracted defined by Field Properties of ImageService.ISDef**
- **Alternative is to link existing table to source table**

# Build - Generate Derived Images

- **Generates predefined:**
  - Service Overviews >S<
  - Derived Rasters >D<
  - Derived Tiles >T<
- **Utilizes Derived Raster Generator**
- **Rasters to be created defined by <DerivationMethod> nodes within RPDef**
- **Passes rasters through required process chains**
- **Other rasters can be used as overviews instead**

# Build - Validate Raster Source

- **Performs a validation that the source rasters exist**
- **Updates**
  - **StatusMsg node in the RPDef**
  - **StatusMsg field in the Service Table**
- **May not be required if confident in the RPDefs**

# Build - Validate Raster Process Definitions

- Checks process chains all RPDefs
- Updates
  - StatusMsg node in the RPDef
  - StatusMsg field in the Service Table
- May not be required if confident in the RPDefs

# Build - Load Preview

- **Loads Preview module within Service Editor**
- **Interprets Service**
- **Useful for 'debugging'**
- **Not required for automation**

# Optimize

- **Optimizes Service performance**
- **Creation and definition of:**
  - **Service overviews**
    - **Low resolution overviews of service**
    - **May often be able to use other images**
    - **Some applications may not need overviews**
  - **Derived Rasters**
    - **Preprocessed Raster**
    - **Applies raster process**
    - **Can be used for format conversion**
  - **Derived Tiles**
    - **High resolution tiles**
    - **Can be created for areas of high use**
    - **Applies raster process and mosaics**

# Rebuild ?

- **Only necessary if Service Properties have changed**
- **Eg**
  - **Compute pixel size ranges due to addition of Service Overviews**

# Compile

- **Converts open structure (ISDef) to optimized proprietary binary structure (ISCDef)**
- **Can only performed by Service Editor or ISCommand**

# Publish

- **Adds ISCDef to list of services for a Service provider**
- **List defined within ISPCConfig (XML)**
- **Service Provider will synchronize with list**
  - **At Management Interval**
  - **Called by ISCommand**
- **Updated ISCDef will be automatically loaded**

# Overview of automation using an ISCommand

- Image Service Editor can be automated using ISCommands.
- ISCommands are a set of tasks
  - Adding Rasters
  - Building
  - Compiling
  - ....
- Defined in an XML.
- Combined together in an XML script
- Script executed using ISCommand.exe
  - Installed with the Image Server Developer Kit.
- ISCommand.exe
  - Usage
    - ISCommand.exe <Script> [Optional parameters]
  - EG

```
ISCommand.exe CreateService.ISCmd --ISDef=c:\Test1.ISDef --  
NBands=3 --BitDepth=8 --PixelFormat=Byte
```

# Sample ISCmd

```
- <ISCommand>
  - <Command>
    <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
    <Name>BuildImageService</Name>
    <Description>Building the Image Service.</Description>
  - <Arguments>
    - <Build>
      <ComputePixelSizeRanges>True</ComputePixelSizeRanges>
      <ExtractMetaFields>False</ExtractMetaFields>
      <DeriveBoundary>True</DeriveBoundary>
      <DeriveImages>False</DeriveImages>
      <ValidateRasterSrc>True</ValidateRasterSrc>
      <ValidateRPDefs>False</ValidateRPDefs>
      <OutputProperties>True</OutputProperties>
    </Build>
  </Arguments>
</Command>
</ISCommand>
```

# Sample ISCommand Script

```
- <ImageServer>
- <ISCommand>
  - <Command>
    <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
    <Name>NewImageServiceDefinition</Name>
    <Description>Creating a new Service.</Description>
  - <Arguments>
    - <NewServiceParameters>
      <FilePath>D:\Service\AmbergTiff.ISdef</FilePath>
      <BitDepth>8</BitDepth>
      <NBands>3</NBands>
      <PixelType>Byte</PixelType>
    - <Srs>
      <Prj>GEOGCS["GCS_WGS_1984",DATUM["D_WGS_1984",SPHEROID
        ["WGS_1984",6378137,298.257223563]],PRIMEM["Greenwich",0],UNIT["Degree",0.017453292519943295]]
      </Prj>
    </Srs>
    </NewServiceParameters>
  </Arguments>
</Command>
- <Command>
  <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
  <Name>BuildImageService</Name>
  <Description>Building the Image Service.</Description>
- <Arguments>
  - <Build>
    <ComputePixelSizeRanges>True</ComputePixelSizeRanges>
    <ExtractMetaFields>False</ExtractMetaFields>
    <DeriveBoundary>True</DeriveBoundary>
    <DeriveImages>False</DeriveImages>
    <ValidateRasterSrc>True</ValidateRasterSrc>
    <ValidateRPDefs>False</ValidateRPDefs>
    <OutputProperties>${OutputProperties}$</OutputProperties>
  </Build>
</Arguments>
</Command>
</ISCommand>
</ImageServer>
```

# Create Service

## ISCommand

*NewImageServiceDefinition*

## Arguments

Filepath

SRS

BitDepth

NBands

PixelType

ColorSpace

```
ISCommand CreateService.ISCmd --ISDef=c:\Test1.ISDef
```

or

```
ISCommand CreateService.ISCmd --ISDef=c:\Test1.ISDef --NBands=3  
--BitDepth=8 --PixelType=Byte --SrsPrj
```

- Copies a pre-existing Image Server Service definition template file from the XADefs folder

"c:\Program Files\Common Files\ESRI\Image Server\XADefs\ISDef.XADef"

- Fills in the nodes with user specified values, or default values

# Create Service contd..

```
- <ImageServer>
- <ISCommand>
  - <Command>
    <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
    <Name>NewImageServiceDefinition</Name>
    <Description>Creating a new Service.</Description>
  - <Arguments>
    - <NewServiceParameters>
      <FilePath>D:\Service\AmbergTiff.ISdef</FilePath>
      <BitDepth>8</BitDepth>
      <NBands>3</NBands>
      <PixelType>Byte</PixelType>
    - <Srs>
      <Prj>GEOGCS["GCS_WGS_1984",DATUM["D_WGS_1984",SPHEROID
        ["WGS_1984",6378137,298.257223563]],PRIMEM["Greenwich",0],UNIT["Degree",0.017453292519943295]]
      </Prj>
    </Srs>
  </NewServiceParameters>
</Arguments>
</Command>
</ISCommand>
</ImageServer>
```

# Add Rasters

## ISCommand

### *AddRaster*

```
ISCommand AddRasters.ISCmd --Folder=d:\rasters\ --Filters=*.tif --ISDef=c:\Test2.ISDef
```

## Arguments *(Specific to the Raster Type)*

### Add data parameters

- <RasterType> - Change Raster type
- <RasterInfoExtractor-FormatName> - Raster format info extractor

### Process parameters

- <IncludeInternalOverviews> - Boolean – use internal overviews
- <DefaultSrs> - Spatial reference
- <DefaultFormatName> - Raster format reader
- <Enhancement Parameters> - Enhancement parameters for the raster

# Add Raster Contd..

```
- <Command>
  <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
  <Name>AddRaster</Name>
  <Description>Adding raster datasets to the image service</Description>
  - <Arguments>
    <RasterType>Generic:TIFF</RasterType>
    - <AddDataParameters>
      <RasterInfoExtractor-AssemblyName>ESRI.ImageServer.FormatCore, Version=1.0.0.1, Culture=neutral, PublicKeyToken=1fe19dd100662792</RasterInfoExtractor-AssemblyName>
      <RasterInfoExtractor-ObjectName>ESRI.ImageServer.RasterBase.RasterBaseInfoExtractor</RasterInfoExtractor-ObjectName>
      <RasterInfoExtractor-InitXml />
      <RasterInfoExtractor-FormatName>TIFF</RasterInfoExtractor-FormatName>
      <Files>${Files}</Files>
      <Folder>${Folder}</Folder>
      <Filters>${Filters}</Filters>
      <Recursive>${Recursive}</Recursive>
    </AddDataParameters>
    - <ProcessParameters>
      <IncludeInternalOverviews>True</IncludeInternalOverviews>
      <DefaultSrs>${DefaultSrs}</DefaultSrs>
      <ForceDefaultSrs>${ForceDefaultSrs}</ForceDefaultSrs>
      <DefaultFormatName>TIFF</DefaultFormatName>
      <ForceDefaultFormatName>True</ForceDefaultFormatName>
      <AutoStretch-StretchMethod>None</AutoStretch-StretchMethod>
      <AutoStretch-GammaMethod>None</AutoStretch-GammaMethod>
      <AutoStretch-StdDev>3</AutoStretch-StdDev>
      <AutoStretch-Percentile>0p01-99p99</AutoStretch-Percentile>
      <AutoStretch-Lower>0.0</AutoStretch-Lower>
      <AutoStretch-Upper>255.0</AutoStretch-Upper>
      <AutoStretch-Gamma>1.0</AutoStretch-Gamma>
      <AutoStretch-TargetColor>8421504</AutoStretch-TargetColor>
    </ProcessParameters>
  </Arguments>
</Command>
```

Generic:Jpeg

JPEG

JPEG

# Building a Service

## ISCommand

### *BuildImageService*

```
ISCommand BuildService.ISCmd --ISDef=c:\Test2.ISDef  
or  
ISCommand BuildService.ISCmd --ISDef=<TheInputISDef>  
--ValidateRasterSrc=False  
--ValidateRPDefs=False  
--OutputProperties=True  
--ViewPointShift=False
```

## Arguments (Optional Parameters)

- |                        |   |
|------------------------|---|
| ComputePixelSizeRanges | - Computes pixel size ranges              |
| ExtractMetaFields      | - Extract Meta information                |
| Derive Boundary        | - Derive the service boundary             |
| DerivedImages          | - Generate the predefined derived imagery |
| ValidateRasterSrc      | - Validates the Raster Source             |
| ValidateRPDefs         | - Validates the RPDefs                    |
| OutputProperties       | - Computes Output Properties              |
| ViewPointShift         | - Computes ViewPoint Shift                |

# Building a Service contd..

```
- <ISCommand>
- <Variables>
  <ISDef />
  <ValidateRasterSrc>False</ValidateRasterSrc>
  <ValidateRPDefs>False</ValidateRPDefs>
  <OutputProperties>True</OutputProperties>
  <ViewPointShift>False</ViewPointShift>
</Variables>
- <Command>
  <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
  <Name>LoadImageServiceDefinition</Name>
  <Description>Loading the image service definition</Description>
- <Arguments>
  <ImageServiceFile>${ISDef}$</ImageServiceFile>
</Arguments>
</Command>
- <Command>
  <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
  <Name>BuildImageService</Name>
  <Description>Building the Image Service.</Description>
- <Arguments>
- <Build>
  <ComputePixelSizeRanges>True</ComputePixelSizeRanges>
  <ExtractMetaFields>False</ExtractMetaFields>
  <DeriveBoundary>True</DeriveBoundary>
  <DeriveImages>False</DeriveImages>
  <ValidateRasterSrc>${ValidateRasterSrc}$</ValidateRasterSrc>
  <ValidateRPDefs>${ValidateRPDefs}$</ValidateRPDefs>
  <OutputProperties>${OutputProperties}$</OutputProperties>
  <ViewPointShift>${ViewPointShift}$</ViewPointShift>
</Build>
</Arguments>
</Command>
</ISCommand>
```

# Optimize Service

## ISCommand

### *DefineServiceOverviews*

- Defines and generates Service Overviews for an Image Service.

```
ISCommand GenerateOverviews.ISCmd --ISDef=c:\Test2.ISDef
```

or

```
ISCommand GenerateOverviews.ISCmd --ISDef=c: \Test2.ISDef  
--OptimumRows=10000 --OptimumCols=10000  
--CompressionMethod=None --TileSize=512
```

### **Arguments** (Optional Parameters)

- |                                 |   |
|---------------------------------|---|
| <b>--OptimumRows=5120</b>       | <b>- Number of Rows in the Output Raster</b>    |
| <b>--OptimumCols=5120</b>       | <b>- Number of Columns in the Output Raster</b> |
| <b>--CompressionMethod=JPEG</b> | <b>- Compression method [Jpeg,LZ77,JPEG200]</b> |
| <b>--TileSize=256</b>           |   |

# Optimize Service contd..

```
- <ISCommand>
- <Variables>
  <ISDef />
  <OptimumNRows>5120</OptimumNRows>
  <OptimumNCols>5120</OptimumNCols>
  <FormatName>TIFF</FormatName>
  <CompressionMethod>JPEG</CompressionMethod>
  <CompressionQuality>80</CompressionQuality>
  <InternalTileSize>256</InternalTileSize>
  <PixelSize>0.1</PixelSize>
</Variables>
+ <Command>
- <Command>
  <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
  <Name>DefineServiceOverviews</Name>
  <Description>Defining Service Overviews</Description>
- <Arguments>
  - <ServiceOverviewsParameters>
    <PixelSize>${PixelSize}$</PixelSize>
    <OptimumNRows>${OptimumNRows}$</OptimumNRows>
    <OptimumNCols>${OptimumNCols}$</OptimumNCols>
    <DerivedImagesOutputFolder />
    <SamplingMethod>Bilinear</SamplingMethod>
    <FormatName>${FormatName}$</FormatName>
    <CompressionMethod>${CompressionMethod}$</CompressionMethod>
    <CompressionQuality>${CompressionQuality}$</CompressionQuality>
    <InternalTileSize>${InternalTileSize}$</InternalTileSize>
  </ServiceOverviewsParameters>
</Arguments>
</Command>
+ <Command>
</ISCommand>
```

# Compile the Service Definition

## ISCommand

### *CompileImageService*

- Command is run after the service is built and ready to compile.

```
ISCommand CompileService.ISCmd --ISDef=c: \Test2.ISDef  
--ISCDef=c:\Test2.ISCdef
```

## Arguments (Optional Parameters)

ISDef

- Service Name

ISCDef

- Compiled Service Name

# Compile Service Definition contd..

```
<ISCommand>
- <Variables>
  <ISDef />
  <ISCDef />
</Variables>
- <Command>
  <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
  <Name>LoadImageServiceDefinition</Name>
  <Description>Loading the image service definition</Description>
- <Arguments>
  <ImageServiceFile>${ISDef}$</ImageServiceFile>
</Arguments>
</Command>
- <Command>
  <Handler>ESRI.ImageServer.ServiceEditor:ESRI.ImageServer.ServiceEditor.ServiceEditorCmdHandler</Handler>
  <Name>CompileImageService</Name>
  <Description>Compiling the Service.</Description>
- <Arguments>
  <CompiledServiceFile>${ISCDef}$</CompiledServiceFile>
</Arguments>
</Command>
</ISCommand>
```

# Publishing the Service

## Update the Service provider Configuration file (.ISPConfig):

- Add the following nodes into the .ISPconfig configuration file

```
<Service>  
<DefinitionSource>Compiled Service name.ISCdef</DefinitionSource>  
<State>On</State>  
</Service>
```

- ManageInterval Option in Server manager automatically updates the Service Provider based on interval

# Publishing the Service contd..

## Synchronize the Service Provider

### ISCommand

#### *Synchronize*

```
- <ISCommand>
- <Variables>
  <ISPConfig />
  <Service />
</Variables>
- <Command>
  <Handler>ESRI.ImageServer.ServerManager:ESRI.ImageServer.ServerManager.ServerManagerCmdHandler</Handler>
  <Name>Synchronize</Name>
  <Description>Synchronizing the Service on Service Provider.</Description>
- <Arguments>
  <ISPConfig>${ISPConfig}$</ISPConfig>
  <Service>${Service}$</Service>
</Arguments>
</Command>
</ISCommand>
</ImageServer>
```

### Arguments

ISPConfig

ServiceName

# Server / Service Provider Startup

## Start Server:

### Command Line

```
EsriImageServer.exe --console ServerConfig  
or  
EsriImageServer.exe --console D:\Config\ISP.ISConfig
```

## Start Service Provider:

### Command Line

```
EsriImageServiceProvider --console ISPConfig  
ServerHost ServerPort  
or  
EsriImageServiceProvider.exe --console  
D:\Config\ISP.ISPConfig 127.0.0.1 10000
```

# Sample Script to Create and Publish a Service

- Sample Amberg script

# The Power of Variables

- What are Variables?
  - Substitute of a hard coded value within the RPDef.
  - Value within an RPDef contained in  $\${FieldName}\$$
  - Values are extracted from the service table during compile
- Enables multiple raster records to use the same RPDef
- For a set of similar rasters with existing footprint shape
  - Create template RPDef using attributes of source table
  - Copy shape to footprint.shp
  - Use Build, Extract Metadata to create required fields
  - Use calculate to fill in fields
  - Link to same RPDef
- Ideal where an existing database exists with processing parameters

# DEMO: Quickbird Browse Images

# Known Issues with Variables:

- **Unresolvable Variables**
  - Following parameters can not be set using variables
    - Name
    - HiPixelSize,LoPixelSize
    - SRS (Generally fixed for set of Rasters)
    - Footprint
- **Need footprint geometry**
  - Often exists or can be computed by other means
  - Recompute footprint should be available in 9.3
- **Causes errors in Derived Raster Generator**
  - When using Derived Rasters, use selection sets to only include Overviews
  - Fixed in SP2

# Log files and Reporting

- Log files list events that have occurred in different components
- Location
  - C:\Documents and Settings\All Users\Application Data\ESRI\Image Server\Logs
    - \ServiceEditor\YYYYMMDD-ServiceEditor.log
    - \Server\YYYYMMDD-Server.log
    - \ISDefClient\YYYYMMDD-ISDefClient.log
    - \Clients\YYYYMMDD-ClientObject.log
    - \ISCommand\ISCommand.log
- XML
  - View as txt file/XML
- Use Log Viewer in Server manager to:
  - View
  - Export (Mdb, Dbf, Txt formats)

# Log files and Reporting - Structure

- XML Format eg.

```
<Item>
  </Time>
  </ID>
  </Source>
  </Message>
  </Details>
</Item>
```

```
- <Item>
  <Time>2007-03-15T16:19:43.158</Time>
  <ID>000000</ID>
  <Source>ISDefDataProvider.SetAoi</Source>

  <Message>SummaryClientAppAoi|1317377.656272|6316946.130214|1322902.423289|63
  <Details />
</Item>
```

- Item - Denotes the log item.
- Time - Denotes the time when the item is logged.
- ID - Denotes the error ID. All IDs that are 000000 are normal log items. If the ID is anything other than 000000, it denotes an error.
- Source - The module that writes the item.
- Message - Description of the log.
- Details - Additional details about the message.

# Log files and Reporting – Demo

- **Service Provider Reporter log**
- **View as MDB**

# Optimization considerations

Speed affected by many factors:

- Hardware
- Pixels Read
- Processes
  - Geometric
  - Radiometric
- Mosaic
- Compress/Transmit

# Response Time

- **Total Response time  $TR = X + T$** 
  - **X = Process Time**
    - **Dependant on pixels required, format, processing**
  - **T = Transmit Time**
    - **Dependant on Network**
- **Each Connection is a separate thread**
- **Throughput  $rph = 3600 * C / X$** 
  - **C = Cores**
- **Typical**
  - **2Socket, Dual Core 3.0GHz, 2GB RAM**
  - **800x600 pixel request, RGB TIF(JPEG), Single SATA disk, 100mbps Lan**
  - **No Processes, Bilinear sampling**
  - **X = 0.4s**
  - **T = 0.3s**
  - **TR = 0.7s**
  - **rph = 36000**

# Optimization considerations - H/W

- **CPU Power**
  - Utilizes multiprocessors for multiple requests
  - 2 Socket Server
- **Memory**
  - Is memory efficient, but memory intensive
  - Get faster front side bus
  - Recommend 1GB + 500MB/Core
- **HardDisk**
  - Typical disk load = 15%/CompressionFactor
  - DAS RAID - Optimum
  - SAN/NAS – Consider throughput
  - External USB/FireWire – OK for workgroup
  - BlockFactor
    - Compressed 4K
    - NonCompressed 16k
- **Consider multiple machine configurations**

# Optimization considerations - Pixel Source

## – Request Size

- Pixels Output = Rows/Columns
- Pixels Read = Output x 1 to Output x 9
- Consider overview factor, 3 vs 2
  - $X = X * 1.2$  IE +20%
  - Size of overviews stored = 2x

## – Format & Compression

- Compressed formats can read less from disk, but need more processing
  - TIF JPEG Compressed +0%
  - TIF Raw +20%
  - MrSID +100%
  - JP2000 +200%
  - IMG (RRD) +50%
  - JPEG small files +0%
  - JPEG large files +400%

## – Bands/Bits

- Increasing Bands/Bits increases data volume read
  - 16bit vs 8bit +25%
  - 1Band vs 3Band -30%

## – #Rasters/Request

- Each Raster read adds file open
- File open depends on raster format
- $X = X + \#R * Q$ 
  - $Q = 0.01s$  to  $0.1s$
- Larger files better than many small files
- Larger tiles should be tiled

## – Rotation

- Rotation can slow down if larger files and not tiled

# Optimization considerations - Processing

- **Radiometric Processes applied to Raster or Service**
  - **Stretch +5%**
  - **Convolution Filter 3x3 +25%**
  - **Convolution Filter 5x5 +50%**
  - **Gray -10%**
  - **NDVI -10%**
  - **If applied to Raster vs Service +5%**
- **Geometric Processes**
  - **Consider complexity of transform**
  - **Dependant on Anchor Spacing**
    - **100 pixels +10%**
    - **50 pixels +20%**
    - **4 pixels +100%**
  - **Sampling method**
    - **Nearest Neighbor -10%**
    - **Cubic Convolution +20%**

# Optimization considerations - General Settings

- **Transparency**
  - Rasters clipped by footprint to minimize pixels read
  - Transparency requires underlying pixels to be read
  - Processing time can up 1000% if many overlapping rasters
- **Mosaic Method can affects # of rasters**
  - Closest to Center, Viewpoint often result in 1 raster
  - ByAttribute, Seamline may result in many rasters
- **#Vertices on footprint or seamline**
  - Generally footprints have 4 vertices
  - Seamlines may have large numbers
  - Consider thinning
- **Feathering (Blending)**
  - Increases processing +10% to +100%
- **Compression for transmission**
  - JPEG +5%, but offset but faster transmission
- **Network bandwidth**

# Optimization considerations - Other Considerations

- **Factors that generally do not affect speed**
  - Volume of Data
  - Number of Services
- **When using Files systems**
  - Plan a data structure
  - Keep files per directory <500
  - Do not read/write to same disk
  - Do not fill disk beyond 95%
- **Review Other applications running on the Server**
  - Better to have a dedicated server for Image Server
  - Virus Scanning?

# Throughput testing

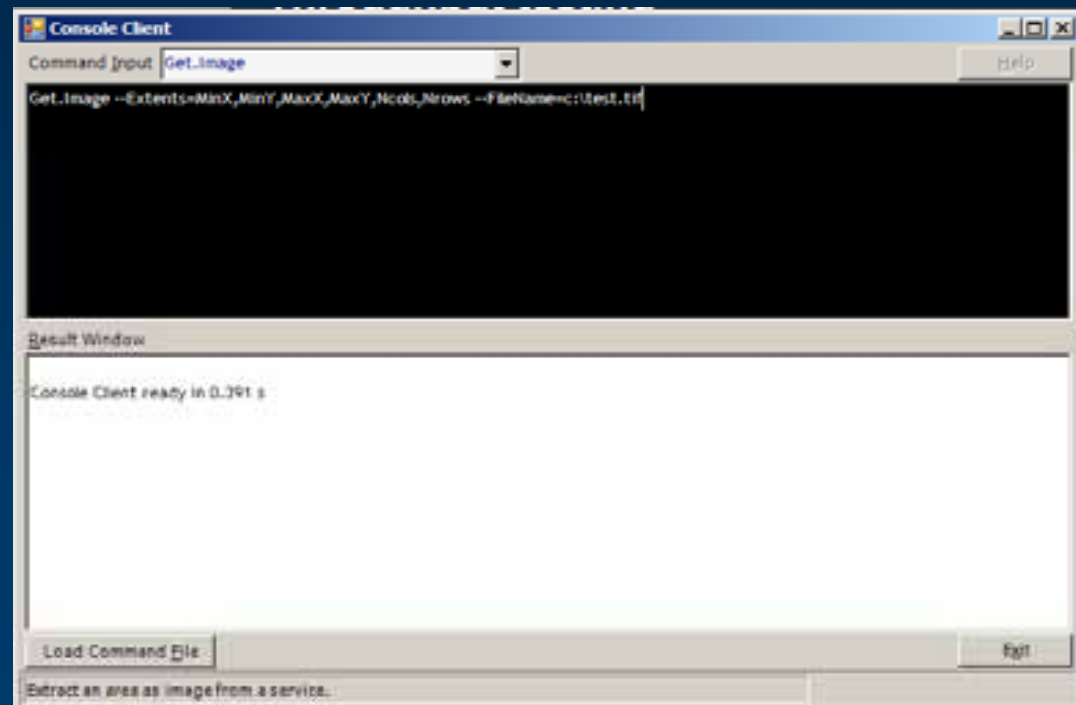
- **Console Client**

- **Get.image**

`Get.image --Extents=MinX,MinY,MaxX,MaxY, Ncols,Nrows --Filename=c:\test.tif`

- **Gen.RandomAOIs**

`Gen.RandomAOIs --AOIImage=MinWidth,MaxWidth --AOISize=NCols,NRos --Count=Count --Wait=wait`



# Presentation materials

- PowerPoint presentation and code are posted on the conference web site
  - <http://www.esri.com/events/devsummit/index.html>
- EDN – downloads and videos

# Further questions?

- **TECH-TALK AREAS**

- **What:** Further opportunity to discuss questions and concerns with presenters and subject matter experts
- **Where:** Tech Talk Area 6
- **When:** during the next 30 minutes

- **ESRI Showcase**

- **Meet the teams**

- **ESRI Developers Network (EDN) website**

- **<http://edn.esri.com>**