Sharing Multiband Imagery Analysis Using ArcSDE

By James Neild, ESRI Product Management

Note: Although this article includes examples that use Microsoft SQL Server, these techniques will work on all ArcSDE supported databases.

Imagery with multiple bands can easily be stored in a relational database management system (DBMS) using ArcSDE technology. By default, each band is returned and rendered in numeric order (i.e., red = 1, green = 2, and blue = 3). Remote sensing analysts may require that bands be presented or rendered in a specific order when analyzing individual channels from an image.

ArcGIS Desktop handles these situations by allowing on-the-fly manipulation of how the bands will be displayed and rendered. However, it can be difficult to share analysis that requires reproducing specific band combinations on another machine without sharing files (either .mxd or .lyr) or allow access to specific band combinations from another application such as ArcIMS.

One solution would be to store the image multiple times in the database. This requires preprocessing each stored image so that specific band combinations are ready for display.

A Landsat 7 image in ArcMap, simulated natural color view. Data courtesy of the University of New Hampshire, EOS–WEBSTER Earth Science Information Partner.

Landsat 7 image view with a false color band combination (Band 4, red; 3, green; 2, blue). Data courtesy of the University of New Hampshire, EOS–WEBSTER Earth Science Information Partner.
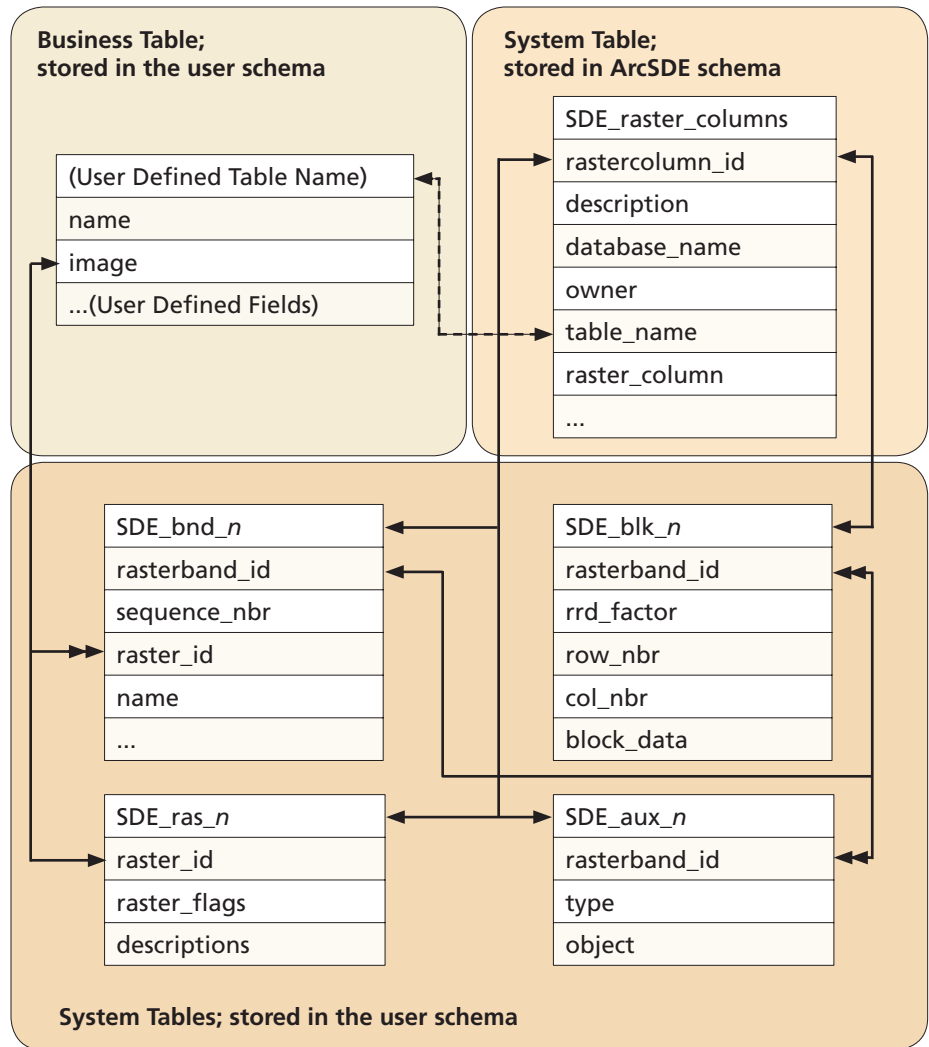

Figure 1: ArcSDE raster table structure

However, the data duplication needed for this method is a disadvantage. Rather than duplicating data, the image can be stored once in the database and a view created for each required band sequence. The view would return the bands in the appropriate order for display based on a lookup table. Multiple lookup tables can be created for each combination required or can be altered on the fly to allow for user manipulation.

The desired band order can be defined by creating a view of the raster data and applying a custom filter on the data with the help of a DBMS side table that defines the desired band order returned by the raster band table (bnd). This method, as defined in the following steps, requires an understanding of the table structure of ArcSDE rasters as well as a basic knowledge of SQL. The example and the accompanying illustrations use a seven-band Landsat 7 image that has been imported into ArcSDE.

Step 1. Create a view of the raster layer in ArcSDE using the command sdetable –o create_view. Doing this ensures that views for all the raster dictionary tables will be created and registered in the database. Verify that the raster view can be seen in the client application before continuing.

Step 2. Create a lookup table describing the bands and the desired order in which they should be returned to the client application. One column should be in ascending order—the order that the client application will use to render the bands. In this example, that column is srt_col. The other column, bnd_col, represents the band number. Ensure that it contains band numbers for all the bands that should be returned to the client application. The bands entered will be rendered in numeric order based on the srt_col (red = 1, green = 2, and blue = 3).

Step 3. To join the lookup table created in Step 2 and sort by the sort column, use the database SQL environment to modify the view creation statement for SDE_bnd_n view, where *n* is the ID associated with the raster base table in the raster_column table.

In this example, the view for the band table will be SDE_BND_3, and it will reference the original data stored in SDE_BND_1. Alter the view select statement as shown in Figure 5, re-placing the sample table names with the actual table names. Once the view is created, it can be used by any client application that understands ArcSDE raster data. The resulting image will be displayed by the client application with the bands chosen in the layer preparation used for rendering of the image on screen.

For additional information on ArcSDE, visit ArcSDE Developer Online at arcsdeonline.esri.com. To obtain sample data, visit the Landsat 7 ETM+ Sample Data Web site hosted by the USGS–NASA Land Process Distributed Active Archive Center Web site at edcdaac.usgs.gov/samples/ or the Landsat 7 Web site at landsat.gsfc.nasa.gov.

```
C:\ArcGIS> sdetable -o create_view -T v_landsat -t landsat -c oid,footprint,raster
 -a oid,footprint,raster -i esri_sde -s piopio -D sde_bob

ArcSDE 9.0 SQL Server  Build 1817 Thu Dec 11 16:17:18 PST 2003
Attribute       Administration Utility
--------------------------------------------------
Successfully created view v_landsat.
```

Figure 2: Create a view of the raster layer in ArcSDE.

```
1> CREATE TABLE falsecolor (srt_col int NULL, bnd_col int NULL )
2> INSERT INTO falsecolor (srt_col, bnd_col) VALUES (1,4)
3> INSERT INTO falsecolor (srt_col, bnd_col) VALUES (2,3)
4> INSERT INTO falsecolor (srt_col, bnd_col) VALUES (3,2)
5> INSERT INTO falsecolor (srt_col, bnd_col) VALUES (4,1)
6> INSERT INTO falsecolor (srt_col, bnd_col) VALUES (5,5)
7> INSERT INTO falsecolor (srt_col, bnd_col) VALUES (6,6)
8> INSERT INTO falsecolor (srt_col, bnd_col) VALUES (7,7)
9> go
```

Figure 3: Create lookup table that describes bands and their return order.

```
select table_name, rastercolumn_id from sde.sde_raster_columns
where table_name = 'landsat' or table_name = 'v_landsat'
go
table_name                 rastercolumn_id
 ------------------------ ---------------
LANDSAT                    1
V_LANDSAT                  3
```

Figure 4: Modify the view creation statement for SDE_bnd_n view (shows two rows affected).

```
1> alter view dbo.sde_bnd_3 as
2> SELECT  a.rasterband_id, b.srt_col AS sequence_nbr, a.raster_id, a.name,
3> a.band_flags, a.band_width, a.band_height, a.band_types, a.block_width,
4> a.block_height, a.block_origin_x, a.block_origin_y, a.eminx, a.eminy,
5> a.emaxx, a.emaxy, a.cdate, a.mdate
6> FROM    dbo.SDE_bnd_1 a INNER JOIN
7> dbo.falsecolor b ON a.sequence_nbr = b.bnd_col
8> go
```

Figure 5: Modifications to the view select statement