ERDAS ENGINE

A SIMPLE AND COST-EFFECTIVE WAY TO INCREASE PROCESSING CAPACITY

White Paper
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Introduction

As geospatial analysts process the extremely large imagery datasets that are typical in this industry, they are faced with a choice: save money by slowly generating data products using the resources you already have, or generate them more quickly by purchasing additional software licenses.

ERDAS Engine is a new offering that allows these organizations to boost their processing power for less money. ERDAS Engine compliments ERDAS IMAGINE and IMAGINE Photogrammetry by enabling them to distribute demanding, resource-intensive processes among multiple workstations or multiple cores on a single workstation so multiple processes can run simultaneously, allowing faster completion of the work.

This offering is ideal for any organization that needs to cost-effectively increase throughput, either on a   daily basis or due to temporary surges in demand.

ERDAS Engine

ERDAS Engine is designed to complement the current ERDAS desktop products by enabling them to run more processes simultaneously.

To use ERDAS Engine, organizations must still obtain a seat license of IMAGINE and/or IMAGINE Photogrammetry for each user, and a seat license for the appropriate modules for the desired processes. For example, a license for IMAGINE SAR Interferometry would be required to batch process multiple SAR images overnight using the Coherence Change Detection (CCD) algorithms.

The desktop seat licenses themselves enable a certain number of simultaneous (parallel) processes (currently four) to be run locally, or a user can submit jobs to an application such as Condor for distributed handling. Each ERDAS Engine enables four more simultaneous processes to be initiated.

To best understand the benefit of the ERDAS Engine, consider a situation where a natural disaster has   just occurred in a tropical (cloud covered) region and the disaster response agencies are urgently in need   of change analysis maps for use in the field. Such products can be accurately produced by the   Coherence Change Detection (CCD) capabilities of the IMAGINE SAR Interferometry module, although   the process is resource-intensive and time consuming.

The response agency has not only purchased a seat of IMAGINE Advantage and IMAGINE SAR Interferometry, but also four licenses of ERDAS Engine to provide reserve capacity for this type of   situation. Now, they can set up a batch queue of 100 CCD SAR pairs to be processed. Because ERDAS   IMAGINE Advantage can handle 4 simultaneous processes and each of the 4 ERDAS Engines can   handle 4 processes, the response agency can now **simultaneously** process up to 20 CCD jobs at a time   to efficiently work through all 100 pairs in a timely fashion.

Licensing Checks

ERDAS Engine enables customers to scale their processing for their temporally varying needs, or to increase throughput in day-to-day work. ERDAS Engine can be used alongside all ERDAS desktop products.

Each ERDAS Engine product provides for four (4) more simultaneous processes to be run via Distributed   or Local batch processing. This is achieved by each license file for ERDAS Engine containing 4 unlocks   for the "eeprocess" feature code, one of which is consumed each time a process is started and which is   released when the process finishes.

Processes to be Parallelized

As already mentioned pretty much any process which can be run in ERDAS IMAGINE or IMAGINE Photogrammetry and which has a Batch button or other mechanism for setting up a queue of multiple jobs to be processed can benefit from parallelization of those processes to run more on them simultaneously whether that be locally using multiple CPU/cores or in a distributed fashion.

Below is a *sampling* of the types of common operations which can benefit from the parallelization which ERDAS Engine provides:

- **Import**, such as converting multiple images from

- **Export**, such as converting multiple images from IMG format to wavelet compressed ECW or JPEG 2000

- Creating **Pyramids** (RRDs), **Statistics**, and changing the projection information on multiple images using the Image Metadata editor tool

- Generate **RSETs** for NITF imagery

- **Reproject** images from one projected coordinate system to another

- **Resample** imagery, such as automatically orthoresampling NITF imagery using RPCs and terrain data

- **Image Interpreter** functions such as Subset, Pan Sharpen, Change Pixel Size, Layer Stack, LUT Stretch,

- Rescale, NDVI and so on

- Apply **Unsupervised Classification** to multiple images

- **Segmentation**

- Apply an object-based **feature extraction** model to multiple input tiles of GeoTIFF imagery using IMAGINE Objective

- **Ortho-generation** from IMAGINE Photogrammetry

- Automatically extract **terrain point clouds** from blocks of imagery using Auto DTM…and many more functions available in ERDAS IMAGINE and IMAGINE Photogrammetry

How many ERDAS Engines should I purchase?

This is a complex question which depends on several factors, including:

- How much data will you be processing?

- What processes are you trying to run?

- How long are you willing or able to wait for the processes to complete?

- What hardware resources (number of computers and number of cores) can you dedicate to the effort?

- Do you want to set up a distributed computing environment such as Condor?

Examining the following common use cases and their circumstances may be helpful as you consider your own situation.

Local Processing
The simplest scenario involves a **local computer** with multiple cores/CPUs.

For example, ERDAS IMAGINE Advantage may be installed on a computer with two quad-core chips capable of running up to eight heavy-duty processes simultaneously. You attempt to run decorrelation stretch on 100 input images by feeding all 100 images to the Batch Tool for local processing to start after   you leave work for the day. With IMAGINE Advantage, you can run up to four images though   Decorrelation Stretch at a time. Doing this, it is possible that four of the cores in the computer are not   being used during the processing. However, adding an ERDAS Engine means you can run up to eight   images through Decorrelation Stretch, fully utilizing the resource of the computer and completing the   overall job more rapidly. This might mean the difference between coming to work the next day to find your   batch job is complete or not.

The number of ERDAS Engine licenses to purchase and whether to buy any at all depends on the time-sensitivity of the work.

Distributed Processing
A more complex scenario involves using software such as Condor to set up a **distributed processing network** with multiple computers, which themselves might have multiple CPUs/Cores.

For example, a distributed processing network might include 10 computers, each with a quad-core CPU   and an installation of IMAGINE Photogrammetry. During the day, these are used for regular ERDAS processing. In the   evenings, these computers are designated as processing nodes in a Condor cluster. The 100-image decorrelation stretching job could then be sent to Condor from one of these computers. Condor can then schedule the jobs to run simultaneously on all ten machines, with one process per core and four   processes per node computer, for a total of 40 simultaneous jobs.

Since there are 40 ERDAS Engine Process (eeprocess) licenses available from the floating license server (because each of the 10 IMAGINE Photogrammetry licenses is able to run 4 simultaneous jobs) all 40 jobs can run   simultaneously and *no* additional ERDAS Engine licenses need to be purchased.

Cloud Computing
Another scenario includes the 10 desktop computers, as well as network access to a dedicated **cloud** of another 40   CPUs/cores for distributed processing. In this instance, there are a total of 80 CPUs/Cores potentially available for   simultaneous processing overnight. Fully utilizing all 80 CPUs/Cores simultaneously for ERDAS processing, such as   running Auto DTM to extract surface models from stereo pairs of imagery, would consume not only the 10 LPS Core   licenses, but also at least one Auto DTM (for the computer submitting the Auto DTM jobs) and 9 ERDAS Engine licenses.   With this level of licensing, 80 stereo pairs can be simultaneously processed to extract 80 surface models over the   cloud network.

The Simple Answer
Basically, average out the number of cores/processors you can access with the number of ERDAS   Engine Process (eeprocess) licenses. That should indicate the maximum number of ERDAS Engines   required.

Remember that one ERDAS Engine provides four ERDAS Engine Process (eeprocess) unlocks and that each core seat of ERDAS software (such as IMAGINE Advantage, IMAGINE Professional or IMAGINE Photogrammetry)   also provides four ERDAS Engine Process (eeprocess) unlocks.

Also note that IMAGINE Essentials only provides a single ERDAS Engine Process (eeprocess) unlock   and therefore can significantly benefit from additional ERDAS Engine licenses.

Frequently Asked Questions

Q: What is Condor?

A: Condor is a specialized workload management system for resource-intensive jobs. Like other full-featured batch systems, Condor provides a job queuing mechanism, scheduling policy, priority scheme, resource monitoring and resource management. Users submit their serial or parallel jobs to Condor,   Condor places them into a queue, chooses when and where to run the jobs based upon a policy, carefully   monitors their progress, and ultimately informs the user upon completion.

Condor can be used to manage a cluster of dedicated computer nodes (such as a "Beowulf" cluster). In addition, unique mechanisms enable Condor to effectively harness wasted CPU power from otherwise   idle desktop workstations.

For more information on this freely available software please refer to the Condor web site: http://www.cs.wisc.edu/condor/

Q: Do I have to use Condor to take advantage of ERDAS Engine?

A: No. Condor is extremely powerful if you wish to distribute processing across multiple computers in a cluster. But if you wish to simply take advantage of the processing power of a single computer, you can   also easily utilize the IMAGINE Batch interface (or command-line scripting) to initiate simultaneous   processing, which is then constrained to run only as many parallel processes as there are ERDAS Engine   Process (eeprocess) licenses available.

Q: Do I have to use the Condor for ERDAS installer to provide distributed processing, or can I use an existing Condor system?

A: The Condor for ERDAS installer is simply provided as a courtesy to make it easier for ERDAS customers who have not previously installed or used Condor to implement a Condor cluster which will work with ERDAS products. If you already have an existing Condor cluster you can configure it to work for ERDAS products too.

Q: Does my Software Maintenance (SWM) contract cover installing, configuring and trouble-shooting Condor?

A: No. ERDAS does not provide assistance with Condor except under additional-cost services contracts. The ERDAS SWM covers ERDAS Engine upgrades and support for issues related to the native use of core eeprocess or ERDAS Engine related processes running via local distributed processing only.

Q: What impact does this new capability have on existing desktop customers?

A: Existing users of ERDAS IMAGINE or IMAGINE Photogrammetry will see little to no change in the way that processes execute in comparison to version 2010 or earlier. Most scenarios which were legally permitted under the End User License Agreement are still possible.

Q: If I purchase additional ERDAS Engine licenses can I also use them to run extra seats of ERDAS IMAGINE?
A: No. Purchasing an ERDAS Engine license does not unlock the graphical user interface of ERDAS IMAGINE or IMAGINE Photogrammetry. In the example at the beginning of this document, the disaster relief agency might not   necessarily need to quickly perform offline processing of a large amount of data, but might be bringing in volunteer operators to develop and print maps for field personnel. In this instance, the four ERDAS   Engines cannot be used by four extra volunteers to run ERDAS IMAGINE. To extend the number of seats that can start and run ERDAS IMAGINE, the relief agency would need to purchase 4 copies of IMAGINE Essentials to import and rectify imagery, overlay vector features and update them and create map compositions for presentations or maps. However, these additional seats would also make additional ERDAS Engine Process licenses available to increase the parallel processing capacity at each computer.

Q: What constitutes a "process" for the purposes of limiting how many can be simultaneously run?
A: I In this case, a "process" is generally any ERDAS command which runs in the background, and does not lock the user interface during execution. For example, displaying, enhancing and roaming imagery in a 2D View does not count as a background process and therefore, does not count toward reducing the number of processes which can be run. Starting a subset, calculating NDVI, performing an unsupervised classification, and extracting a surface model using Auto DTM are all functions that are set up through a user interface. When these processes are launched by clicking the OK button or using the Batch wizard, they run in background and free up the user interface for further interaction . These types of commands will count toward consuming the number of simultaneous processes you can execute.

Q: In the case of an add-on module that can run a distributed process unique to itself, will ERDAS be providing four eeprocess unlocks with it? Do people receive so many engines for "free" that one would rarely need to buy an extra ERDAS Engine?
A: No. You only get the ability to run four simultaneous processes with the "seat" of desktop software or by adding additional ERDAS Engines. For example, If you buy an IMAGINE Professional, you can run four simultaneous processes from that seat. Adding an IMAGINE SAR Interferometry to the seat does not provide any additional simultaneous processes – just the ability to run 1 to 4 SAR Interferometry programs simultaneously from that seat. So the user could simultaneously be processing two CCD jobs,a supervised classification and a pan sharpening.

There is one exception to this rule which is the Auto DTM add-on to IMAGINE Photogrammetry. This particular module **does** include effectively an additional ERDAS Engine by providing 4 additional ERDAS Engine Process (eeprocess) unlocks.

Q: If I buy IMAGINE Essentials and upgrade to IMAGINE Advantage do I get four more eeprocess unlocks?
A: No. The current "Upgrade Essentials to Advantage" product only adds the *additional* licensing tokens (imadvan) to what the customer already owns and will continue to work this way. If you want additional eeprocess unlocks then you can purchase a full IMAGINE Advantage seat or additional ERDAS Engines.

Q: If imess is consumed when running a batch job (plus an eeprocess, of course), and the license checkout is done at GUI startup, can that user not do more work (because they can't start IMAGINE) unless there are spare imess licenses out there?

A: No. Firstly, the imess would be in use by the GUI, not by the batch process itself. If the customer started a batch job and then closed the IMAGINE interface, the only license being consumed would be eeprocess. The user will still be able to run ERDAS IMAGINE and submit jobs for processing. As is currently the case, even if the local computer has "consumed" the IMAGINE Essentials license (imess), such as by simply starting the ERDAS IMAGINE user interface, then whenever a new application does its license check and needs, say, an imess, then it will also see that this computer already has an imess assigned to it and therefore will run.

Put another way, IMAGINE Essentials licenses are only consumed by interactive use, and eeprocess licenses are only consumed by batch/distributed use. If local batch jobs *did* consume Essentials licenses, this would not conflict with the ability for the original user to run IMAGINE Essentials in the same context as when they submitted the job. A *different* user or a different context would require another IMAGINE Essentials license, as usual.

Q: If a user submits some processing jobs to Condor from their local computer but then shuts down their local computer, do the jobs still run?

A: Yes, provided the floating licenses are still available and the Condor "master node" is still active. After jobs enter the Condor processing queue, they are no longer on the initiating computer / terminal. When the distributed nodes start running the processes they will only need to be able to communicate to the floating license server to check out the necessary eeprocess licenses.

Q: What's the best way to set up licensing to take advantage of the processing boost provided by ERDAS Engine?

A: In the case of distributed processing, it is absolutely necessary to use a centralized floating license server that contains all the licenses that will be consumed by the nodes (and potentially also those required by the initiating seat computers).

Even for local batch processing there are advantages to using a centralized floating license server which stores licenses for all computers. This means that any given computer running a seat of ERDAS IMAGINE can run multiple processes, including more than four simultaneous processes if other users aren't using all their current allotment of eeprocess licenses.

Q: Does using a centralized license server mean that any given user could consume more than their "fair share" of simultaneous processing?

A: Yes. Consider an example whereby a company owns two seats of IMAGINE Advantage (and therefore has a maximum of eight eeprocess licenses). If both these seats are licensed via a single floating license server there is the potential that User A starts eight simultaneous processes running in background on their computer, thereby consuming all eight eeprocess licenses. User B can still start and interact with the ERDAS IMAGINE user interface and do interactive functions, but if they start a background process, there will be no eeprocess licenses available for that process to actual begin processing – the process (not the user interface) will sit and wait until the necessary eeprocess is freed up on the license server and will begin processing at that point.

If this is a concern, your System Administrator can use the FlexNet administration tools to limits the types and quantities of licenses that can be used by individual users or groups.

Q: I bought some Auto DTM Engines. How do those translate into this new structure?

A: Customers who purchased Auto DTM Engines at version 2010 will be upgraded to Auto DTM license issued for version 2011, which will contain four eeprocess unlocks and operate in accordance with everything discussed above – in other words, each Auto DTM still enables up to four parallel processes to be run. Customers wanting additional parallel processing for Auto DTM will buy ERDAS Engine products. SWM renewal quotes will be based on the list price of ERDAS Engine, not of Auto DTM Engine.

Q: Can I still request Nodelocked licenses for my software?

A: No. To provide optimal flexibility in the way the software can be used and scaled for varying hardware or Cloud processing capabilities, we will only provide floating licenses for ERDAS Software starting with the 2011 release.

However, you can still request one floating seat for each computer you wish to license.

Q: Do applications which are multi-threaded consume extra licenses now?

A: No. Running a process which is capable of multi-threading to multiple CPUs or Cores still only consumes a single eeprocess license. One process running = one eeprocess license consumed.

Q: Is it possible to lease ERDAS Engine?

A: Not at this time. ERDAS Engine is sold and licensed in the same fashion as most ERDAS IMAGINE and IMAGINE Photogrammetry products in that you purchase a perpetual license to use the software and can elect to pay annual maintenance to receive support and updates if desired.

Q: Can you use an ERDAS Engine with ERDAS APOLLO?

A: No. For the 2011 release, ERDAS Engine can only be used to increase the processing capability of desktop products such as ERDAS IMAGINE or IMAGINE Photogrammetry.

Q: What about desktop modules that use third-party components?

A: Due to the royalty-reporting obligations attendant with these modules, some add-on modules will not work in the general way described for distributed processing. These modules will *also* require that an application–level license is consumed on each processing node. For example, to distribute the compression of imagery to MrSID format, each node running parallel compression processes will need to consume sufficient eeprocess licenses and an immrsidunl license. The computer which submitted the job request will also require an immrsidunl license.

- Modules affected include:

- IMAGINE MrSID Desktop

- IMAGINE MrSID Desktop Plus

- IMAGINE MrSID Workstation

- IMAGINE Objective

- IMAGINE Feature Interoperability

- Map to GeoPDF

- ATCOR2/ATCOR3

- The ability to render MPEG movies from IMAGINE VirtualGIS (immpeg, but not imvirtual)

- Map2PDF for IMAGINE

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