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What is ECW?

Angela Manchester

Angela.manchester@hexagon.com

ECW compression provides industry-leading compression properties, capable of reducing terabyte-sized files to five percent of their original size while retaining the image's full visual quality. For ultimate image delivery performance of ECW and JPEG2000 imagery over networks.

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ECW Compression

Industry's fastest compression and decompression

Compress

- Compress raster data into ECW or JPEG200
- Achieves 15:1 compression ratio (95% reduction) while retaining visually lossless image quality
- Supplementary files such as pyramids, overviews, and tile caches are not required

Perform

- High-performance compressed file format designed specifically for extremely large imagery stores
- Provides the industry's fastest decompression and compression rates
- Decompression (rendering) is achieved with minimal hardware requirements

Disseminate

- ECW file format is widely adopted and supported across all major image server and storage platforms
- ECW is supported broadly in Hexagon's product offerings
- ECW is supported across all major desktop, mobile, and server GIS packages
- ECW files scale to terabytes in size

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What is enhanced compressed wavelets (ECW)?

An optimized geospatial raster file format

289 GB

12 GB

24x smaller and visually identical

Original uncompressed

ECW

- Fast

- Small

- Scalable to any project size

- Visually lossless

- Multiband, uint16, alpha

- Portable and accessible

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Image quality

Absolute vs. perceptive difference metrics: spot the difference

ECW 20:1	*COG JPG 75%*	*ECW 15:1*	*COG JPG 90%*	*Original tile*

Random sample

Over 5,000 256px tile random samples, reported average SSIM results:

SSIM rates higher than ~0.85 generally visually indistinguishable => <u>visually lossless</u>

|	ECW 20:1	COG 75% JPEG	ECW 15:1	COG 90% JPEG
Red	0.7992	0.8496	0.8415	0.8916
Green	0.8509	0.9002	0.8981	0.9415
Blue	0.7423	0.7919	0.7864	0.8247

ECW 15:1 is visually comparable to COG JPG 75% quality

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Who is ECW for?

All consumers and producers of geospatial imagery

- **Data capture production companies**
  - UAV, satellite, airborne

- Enterprise geospatial providers
  - Government, defense, environmental, mining/exploration, utilities, agriculture, …

- End users, data managers, image analysts
  - All markets

- Field-deployed solutions
  - Defense, utilities

- **Geospatial software developers**
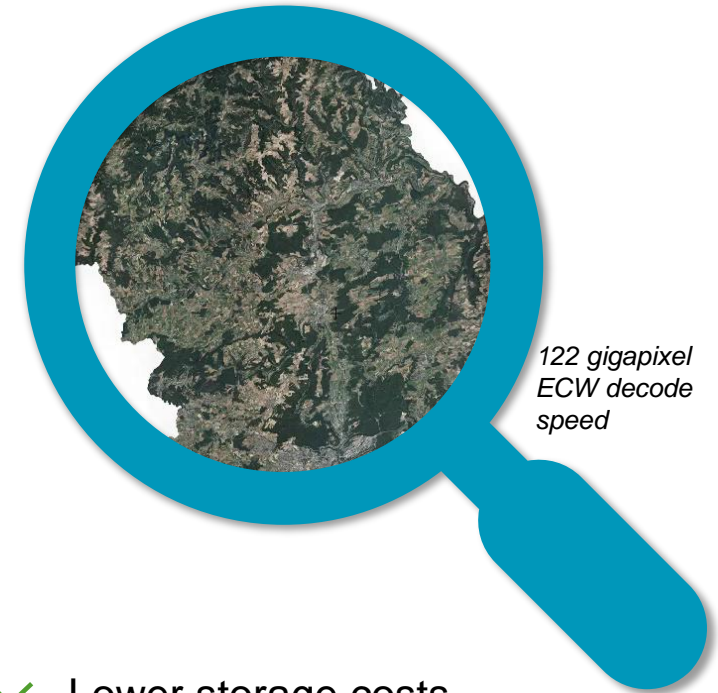
122 gigapixel ECW decode speed

✓ Lower storage costs

✓ Improved performance

✓ Decreased time to market

✓ Remove data duplication

✓ Portable and mobile

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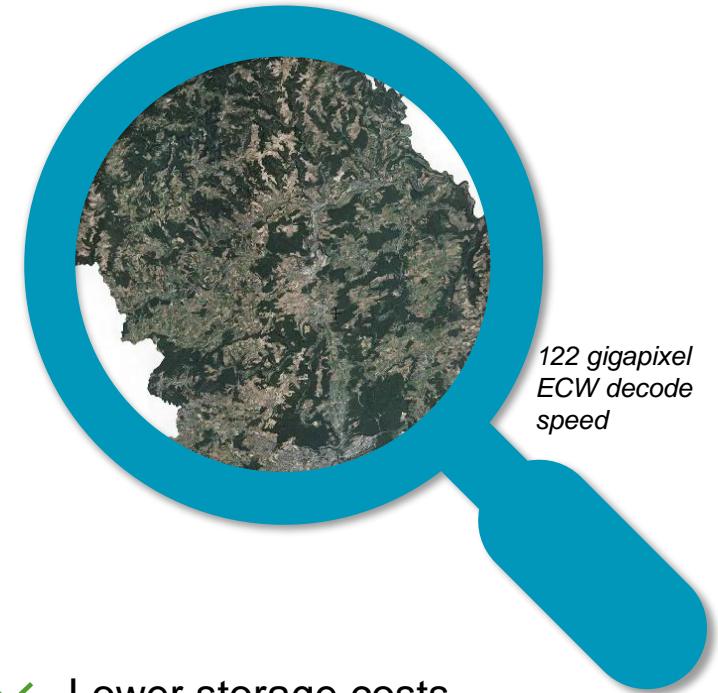# Why is it useful for the pacific

With the reduced file sizes

      it eases data storage demands

      improves webservices delivery

      more information (not data) is accessible
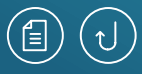
Full and Open OGC Web Services

122 gigapixel ECW decode speed

✓ Lower storage costs

✓ Improved performance

✓ Decreased time to market

✓ Remove data duplication

✓ Portable and mobile

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Why ECW can boost your data storage and dissemination?

ECW is the best format for archiving your terabyte or larger image files

- High-performance compressed file format designed specifically for extremely large imagery stores.

- Achieves 20:1 compression ratios (95% reduction).

- Fastest compression and decompression (rendering) rates in the industry.

- ECW file format is supported across Hexagon software and the wider industry.

- One format works across all workflows, from desktop to server to mobile. No need to convert the same data multiple times to support different software or workflows.

- Image data storage solved.

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ECW key differentiators

1. Effective storage strategy

- Four critical image format characteristics
  - **Encoding speed**
  - **File size**
  - **Image quality**
  - **Decoding speed**

- Functional requirements
  - Visually Lossless, multi-band, opacity, bit depth support

- Storage/network limitations
  - Data I/O requirements

2. Fast image delivery

- Server must make use of hardware optimizations to ensure software scalability

- Intelligent delivery protocols minimize network utilization and hardware usage to save organizations money

- Deliver performance indistinguishable from pre-cached solutions

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The four image format characteristics: ECW vs. other formats

Balancing is key for any format choice

Compression speed   **Image quality**

Storage requirements   **Decompression speed**
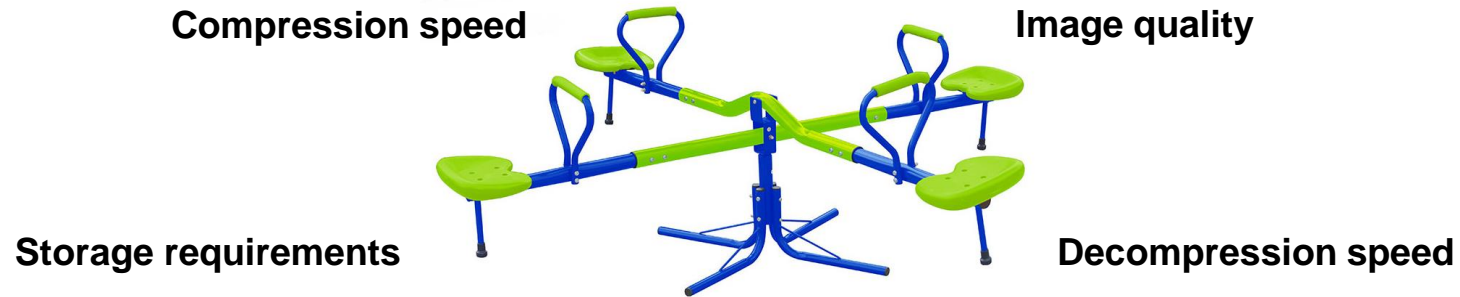
	ECW	JPEG2000	MrSID	COG JPG	IMG*
Compression speed	★★★★★	★★☆☆☆	★☆☆☆☆	★★☆☆☆	★★★☆☆
Decompression speed	★★★★★	★★☆☆☆	★☆☆☆☆	★★★★★	★★★★★
Storage requirements	★★★★★	★★★★★	★★★★★	★★★☆☆	★☆☆☆☆

At equivalent <u>image quality</u>

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# Conventional compression vs. ECW

Two approaches

Conventional compression

- Generates, stores, manages, and maintains image tiles, image pyramids, image overviews, and tile caches

ECW format compression

- Generates a single file that is optimized for all software purposes across vendors and device types

CONVENTIONAL

Image tiles   Tile pyramids

Mosaic overviews   Tile cache

VS

ECW

+1 ECW Mosaic file

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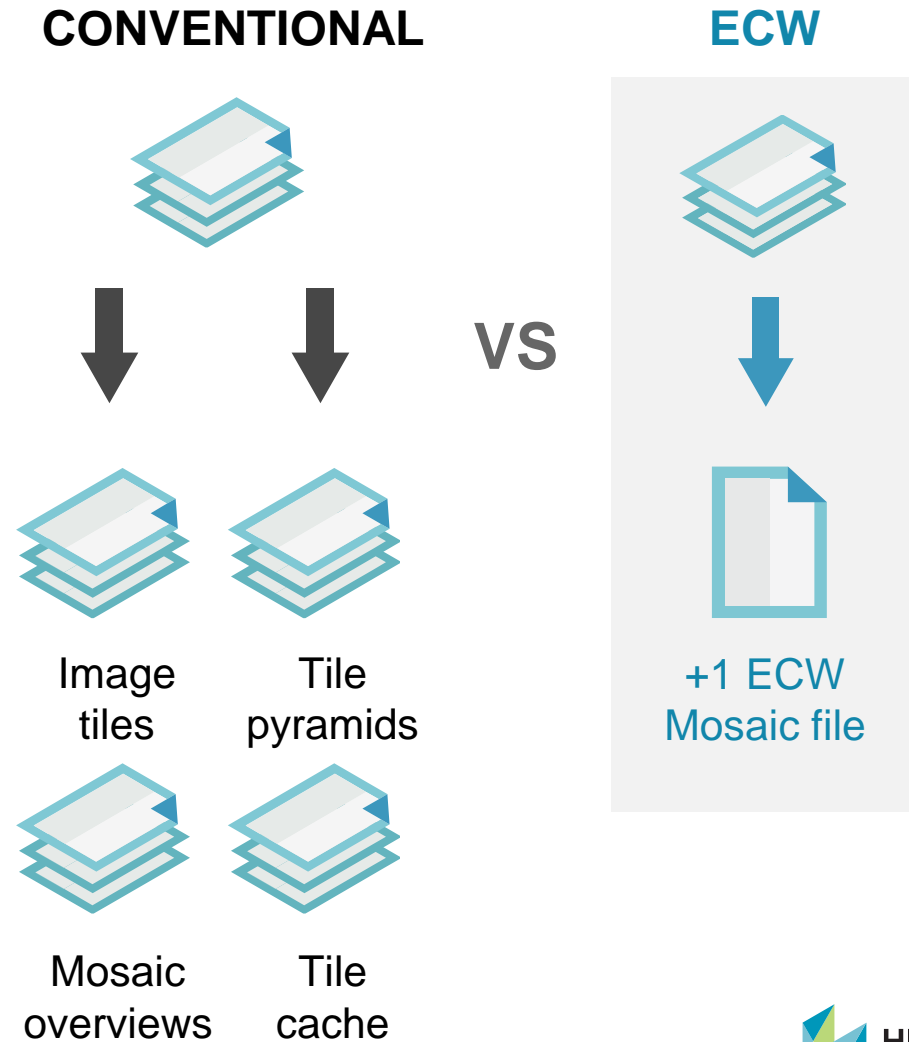
ECW performance

- Data production throughput remains a key release KPI for our Data Production customers

- Imagery throughput across the board up to **+20% faster** vs previous version
  - JPEG2000 creation up to 20% faster
  - Mosaicking projects with thousands of TIF/IMG up to 15% faster
  - Linux platform up to 40% faster

- Disk input speed remains the bottleneck, not the compression itself

ECW technology remains the most optimized, most capable technology for the creation of terapixel sized single image mosaics.

GEOCOMPRESSOR SPEED AGAINST INPUT MEDIUM
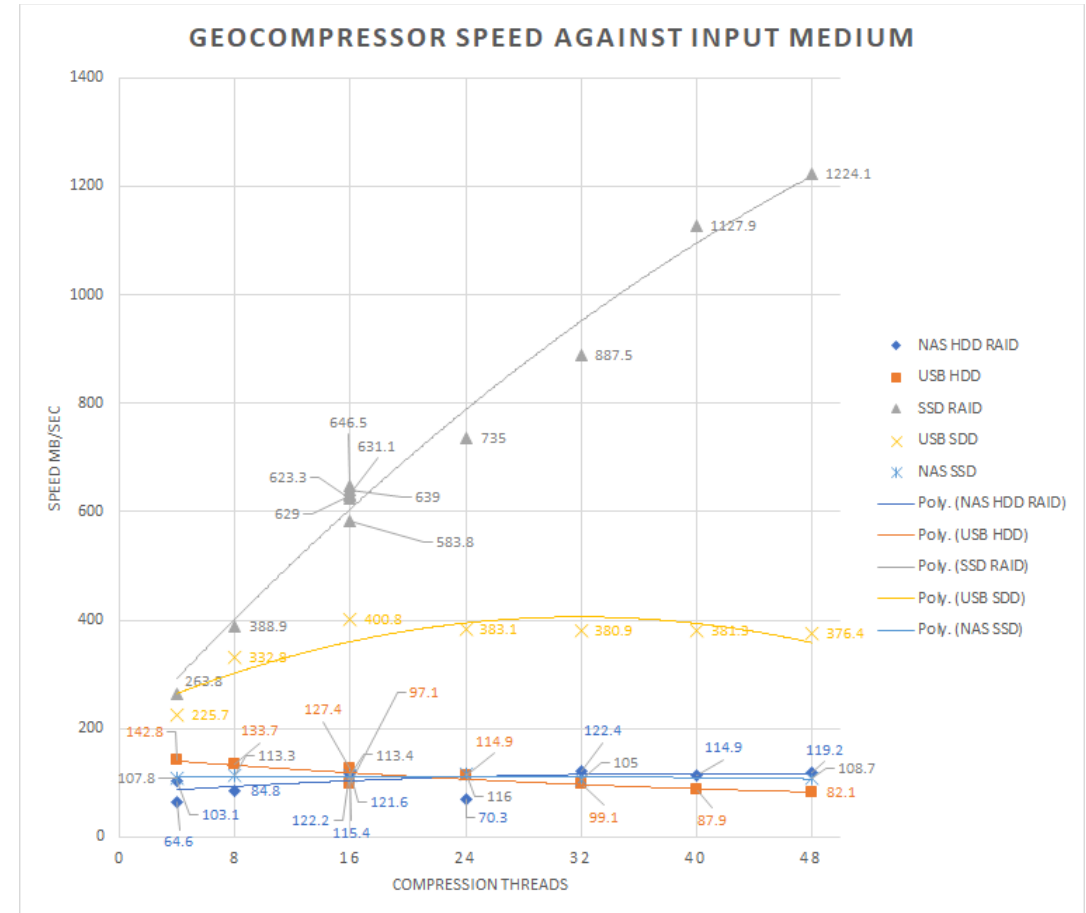
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ECW

Product family

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ECW ecosystem

The developer toolkit drives ECW (and JPEG2000) adoption

Hexagon

BricsCAD
ERDAS IMAGINE®
ERDAS APOLLO
GeoCompressor
GeoMedia®
GeoMedia WebMap
ImageStation
G/Technology
Leica Geosystems LisCAD®
LuciadRIA
LuciadCPillar
LuciadFusion
LuciadLightspeed
LuciadMobile
M.App Enterprise
Minesight
Xalt Visualization
ECW for ArcGIS Server
ECW Plugin for ArcGIS Desktop

ECWSDK

C++
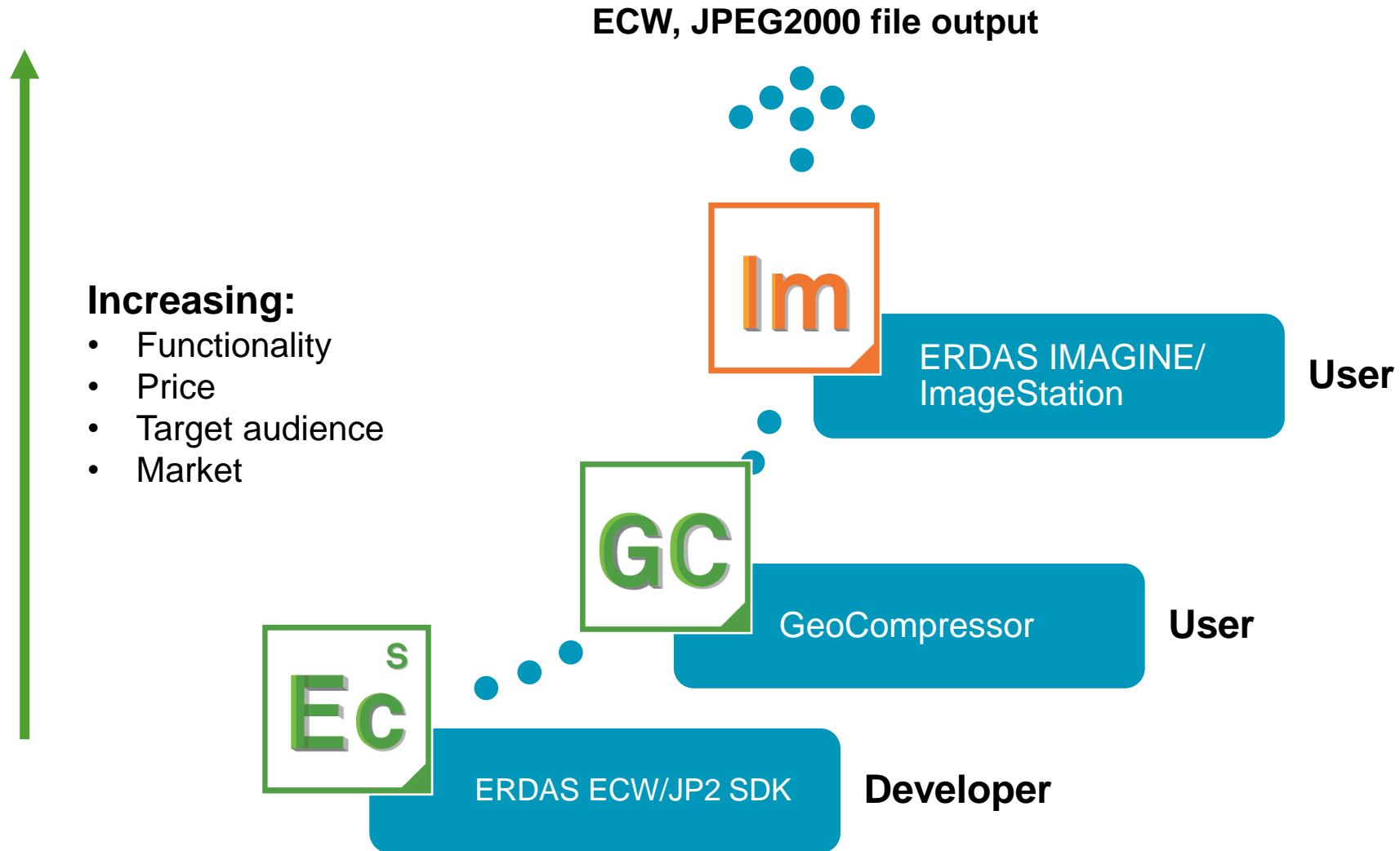JNI Bindings
Windows
Linux
MacOS
Android
iOS

Third-party

12d® Model
Autodesk AutoCAD®
BAE GXP®
Bentley Microstation
Bluemarble Globalmapper
Esri ArcGIS®
Dassault Systemes GEOVIA
GDAL
L3Harris ENVI
Manifold
Maptek Vulkan
Micromine
Precisely MapInfo®
QGIS
Seequent Geosoft
Skyline TerraExplorer
Safe Software FME®
Textron Systems®
….

Many, many more

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Compression product positioning

ECW, JPEG2000 file output

Increasing:
- Functionality
- Price
- Target audience
- Market

Im

ERDAS IMAGINE/
ImageStation

User

GC

GeoCompressor

User

Ec s

ERDAS ECW/JP2 SDK

Developer

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Corridor mapping – 2.5 terapixels

ECW v3 null blocks

- An important optimization for rasters with significant "empty" areas
  - Roads, railways, pipelines, power transmission lines
- Provides hint to the encoder to tag areas as null blocks rather than compress empty areas
- This can provide substantial improvements
- Related but in addition to Alpha/Opacity band support
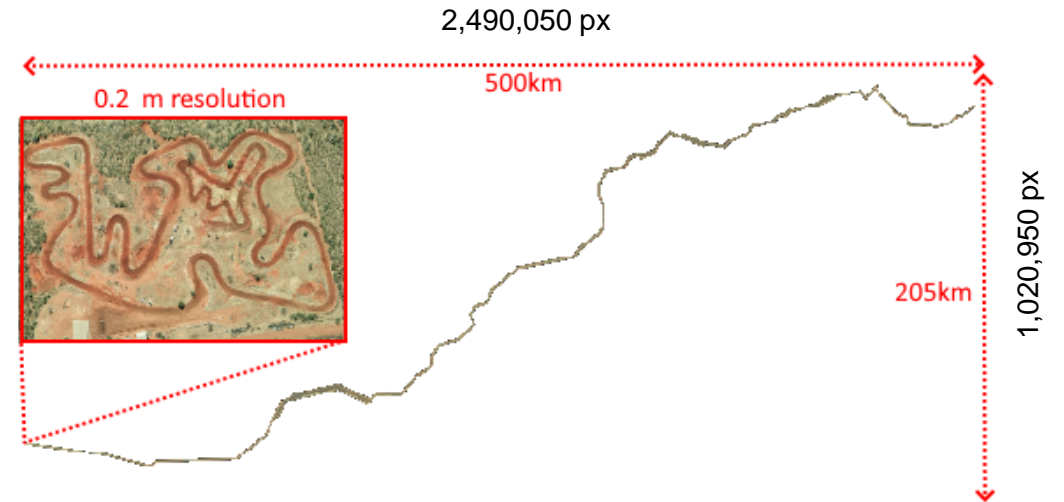
ECW v3

|	Baseline	With null blocks
Duration	5 hours 48 mins	0 hours 42 mins
Throughput	347.9 MB/sec	2853.5 MB/sec
File size	16.36 GB	12.51 GB
Opacity band	Yes	Yes
Target ratio:	15:1	15:1
Actual ratio:	434.3:1	521.4:1
Quality	Identical	

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GeoCompressor

GeoCompressor is a high-performance geospatial image and point cloud compression application that allowsyou to access Hexagon Geospatial's unparalleled compression technology in an independent fashion.

GeoCompressor key features

- Compress terapixel-sized imagery or point cloud files with billions of points

- Compress thousands of image files into a single mosaic

- Update a region within an existing mosaic instead of having to recreate the mosaic every time a region in it changes

- Clip to a polygon boundary to add the flexibility to create output products in accordance with arbitrary polygon definitions

- Compress & mosaic point cloud

- Includes the GeoCompressor Viewer, perfect for rapid visualization or QA of ECW and JPEG2000 file formats

- Windows & Linux support

- Targeted: just compression and mosaicking

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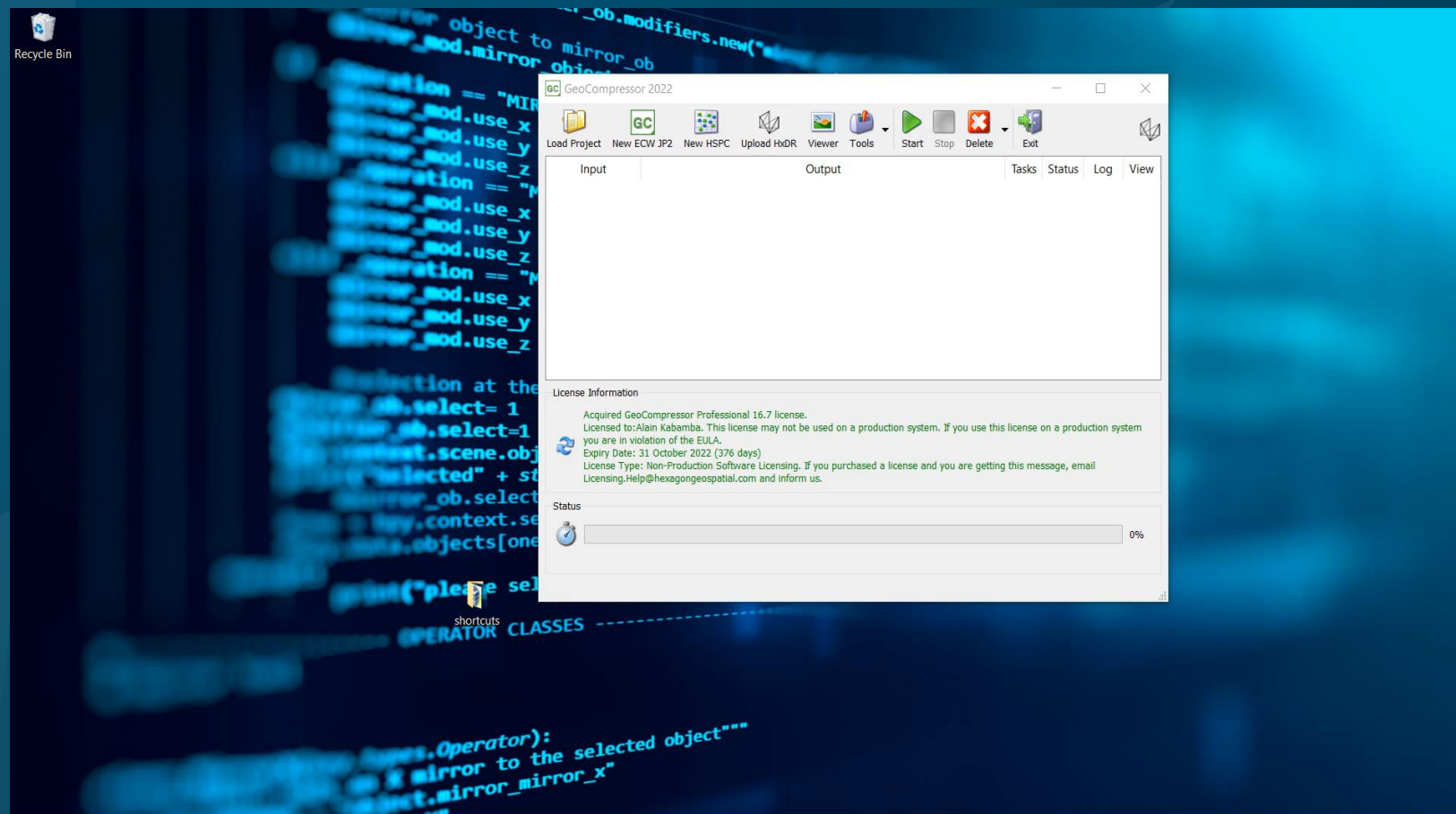
# GeoCompressor on Linux demo

Create Mosaic and publish it to ERDAS APOLLO in few clicks on a Linux VM
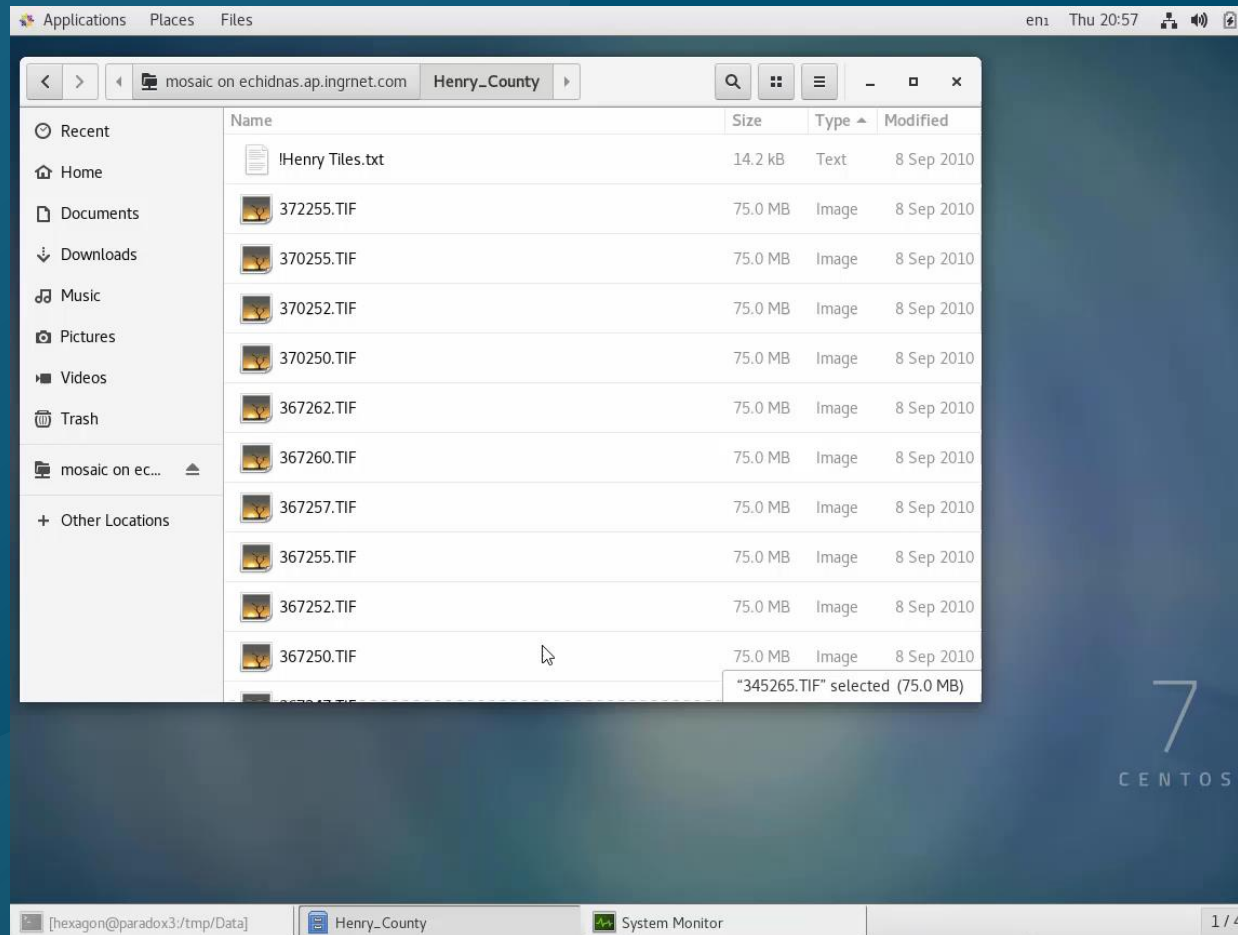
- Data production customers often require Linux

- The GecCompressor and APOLLO Essentials are cross-platform (supported both on Windows and Linux)

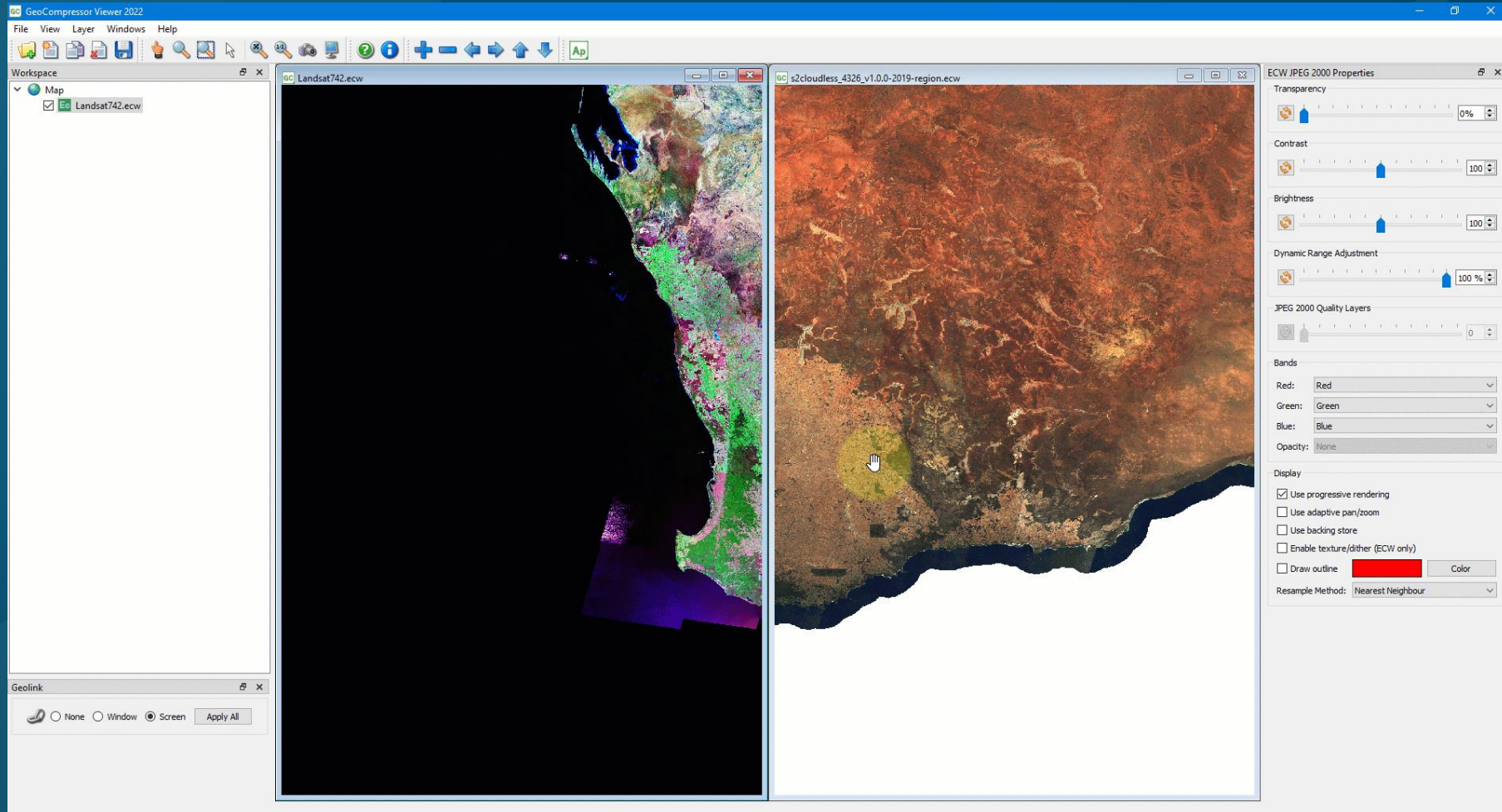- The GeoCompressor on Linux is 10 to 20% faster than on Windows

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GeoCompressor Viewer

Quality control : troubleshooting and understanding of the output mosaic project
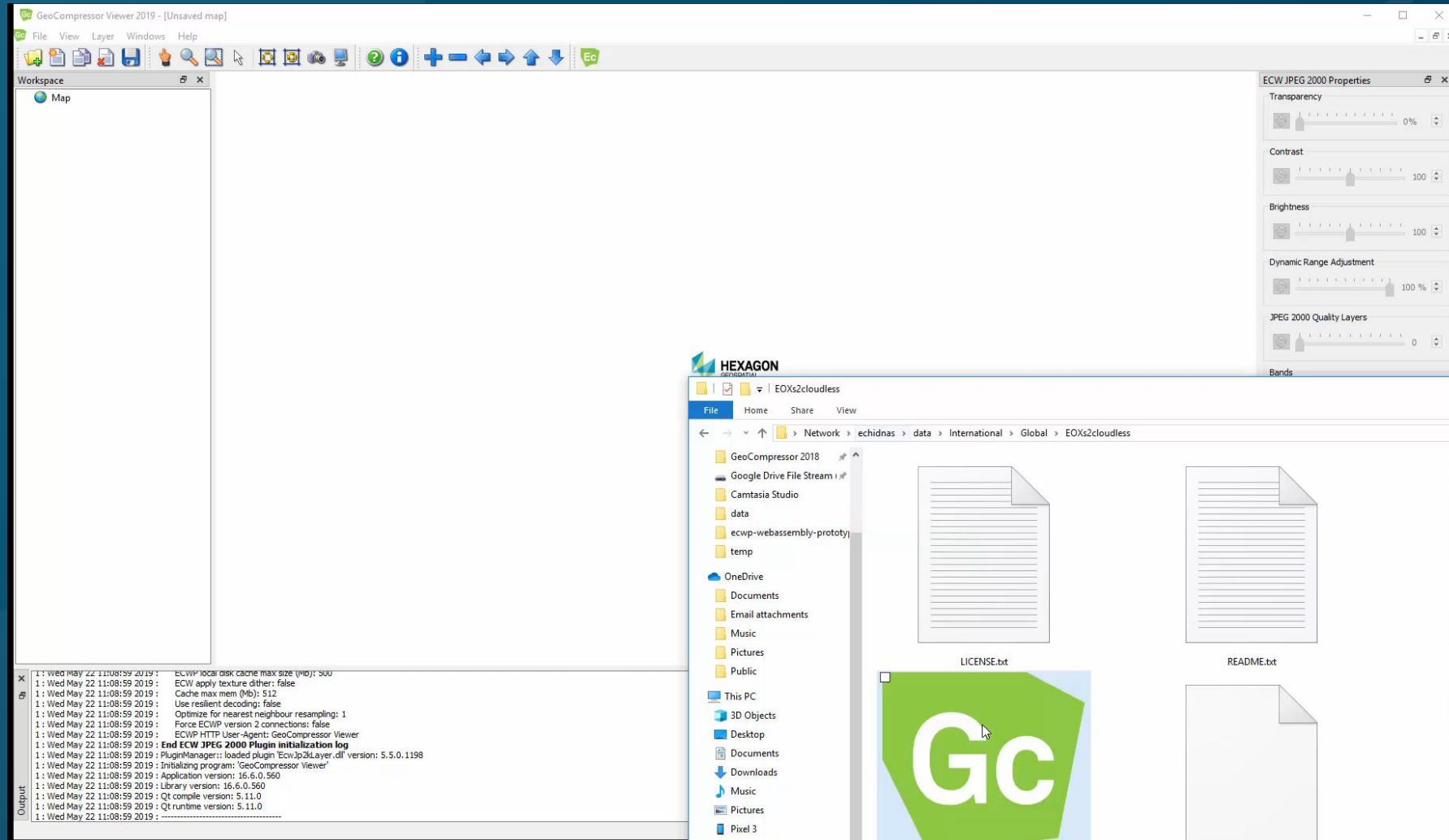
GeoCompressor Viewer

Quality control : Geolinking windows to support QA workflows

GeoCompressor: Image compression

- The service takes over 100 supported file types as input.
- Can output compressed ECW or JPEG2000 files.
- Compress a single file or compress a batch of images into a mosaic.
- Update a region within an existing ECW v3 file, eliminating the need to recreate a mosaic to include new data.
- Create multiple compressed output files from a single mosaic that has been clipped to polygon boundaries.

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GeoCompressor: Point cloud compression

- LAS, LAZ, E57, ASC input to **HSPC** (Hexagon Smart Point Cloud)
- **HSPC** is a new Hexagon optimized, compressed point cloud format
- Includes ability to mosaic tiled pointcloud inputs to one large HSPC
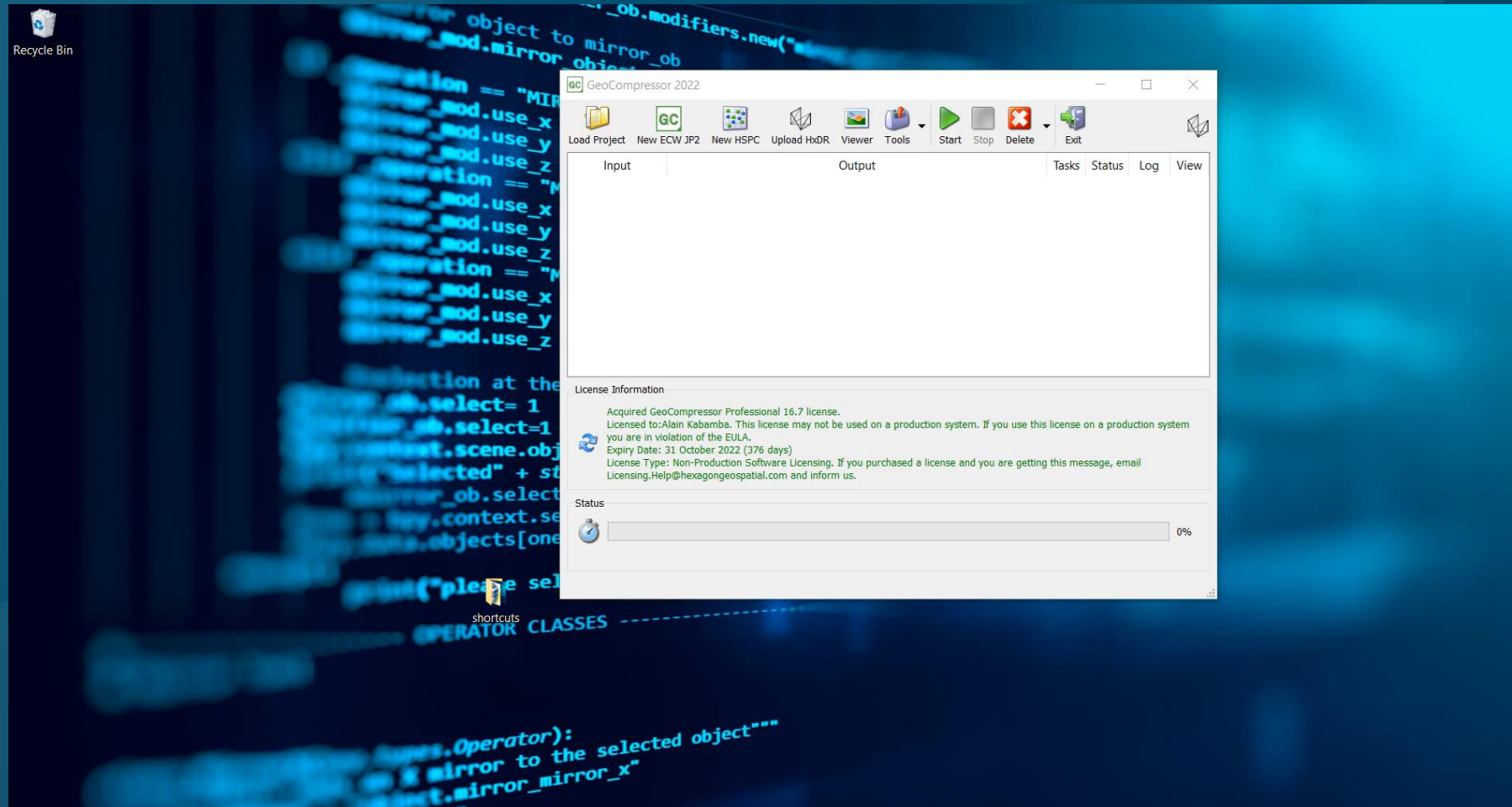- Usage will continue to expand across Hexagon software

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GeoCompressor

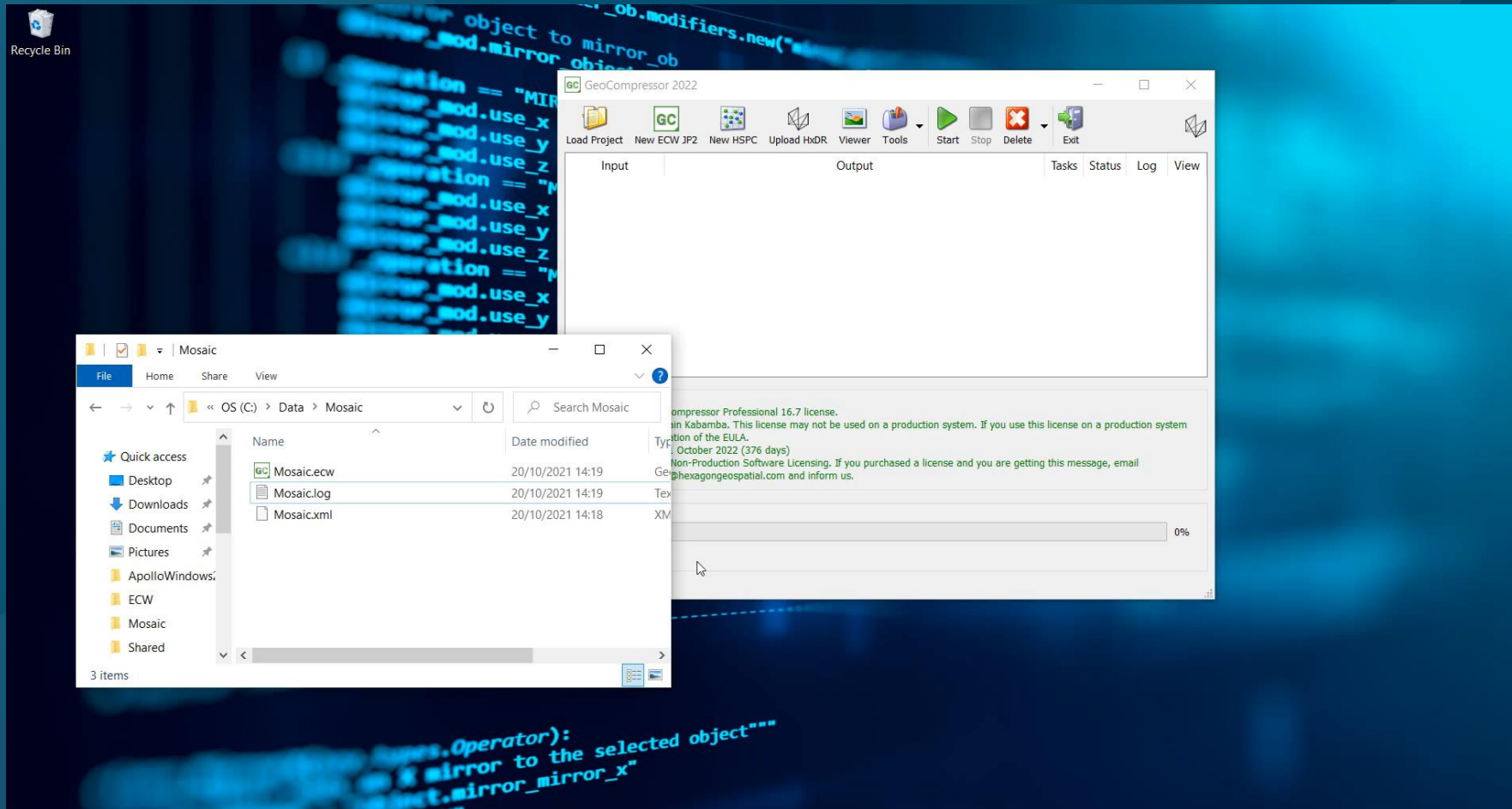Single file point cloud compression (E57 to HSPC)
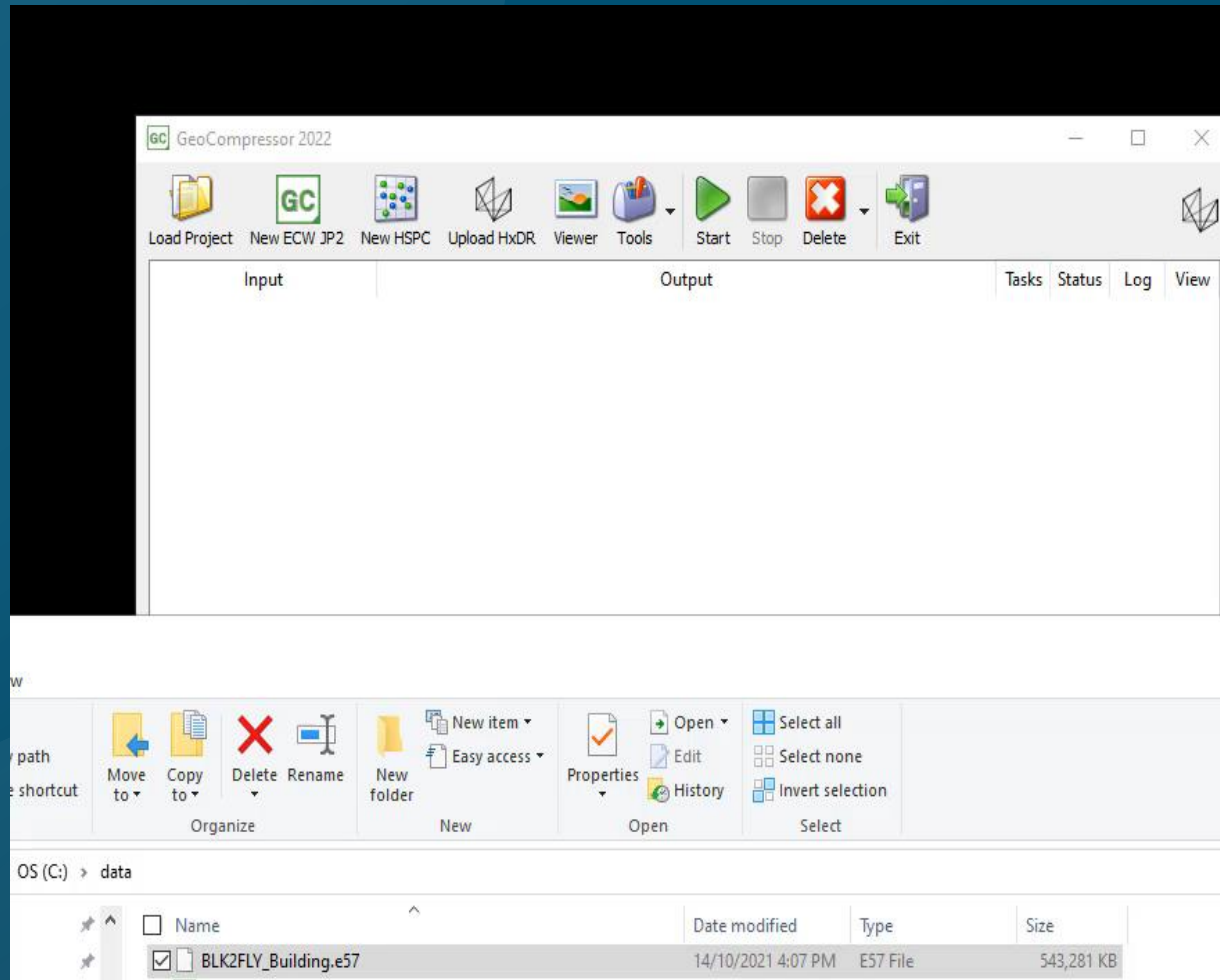
GeoCompressor

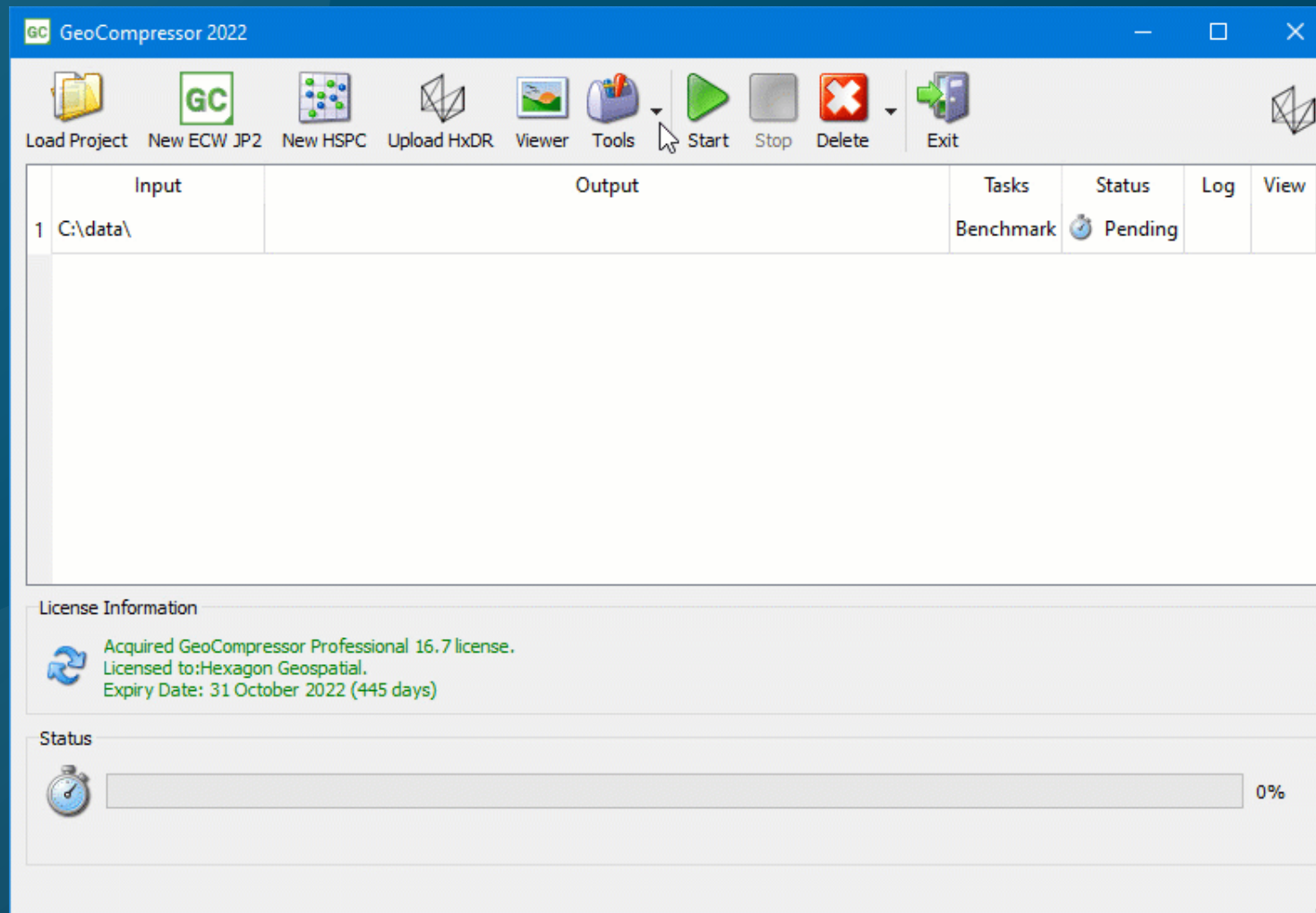Multiple point cloud files (LAS) compression into a mosaic (HSPC)

GeoCompressor tools

Calculate Checksum: Validate checksums on large output files to decrease chances of data corruption in transfer
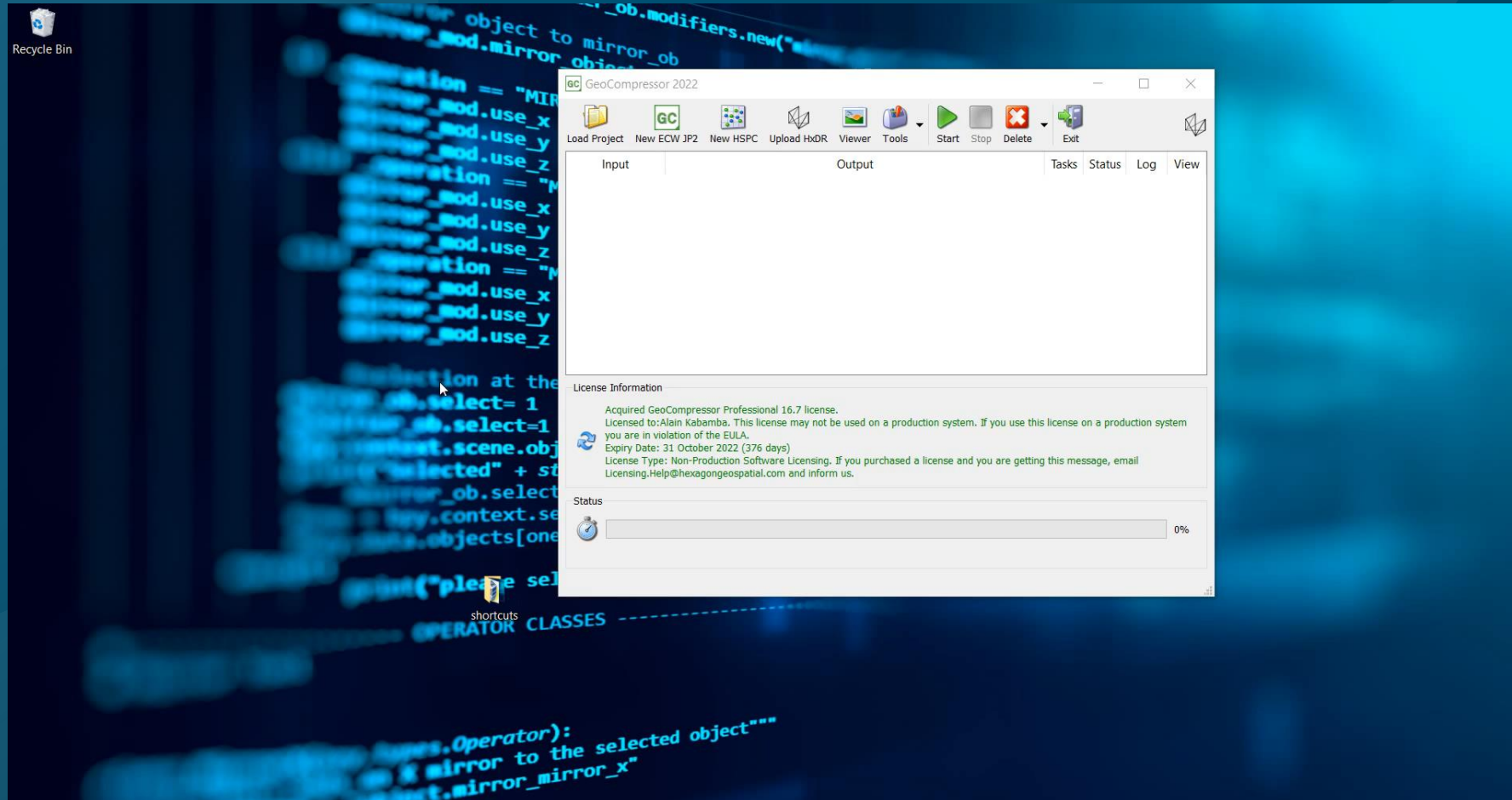
GeoCompressor tools

Benchmark Disk: Identify whether your disk infrastructure is sufficient to drive terapixel-sized mosaics

GeoCompressor tools

Upload to HxDR: E57 format (with time, more formats will become available)

GeoCompressor

Platform updates and changes

| Platform components	GeoCompressor 2020	GeoCompressor 2022
Windows	Windows Server 2016 Windows Server 2019 Windows 10	Windows Server 2016 Windows Server 2019 **Windows Server 2022** Windows 10 **Windows 11**
Linux	RHEL v7.x/CentOS v7.x RHEL v8.x/CentOS v8.x Debian/Ubuntu (viable)	RHEL v7.x/CentOS v7.x RHEL v8.x/CentOS/Oracle v8.x Debian/Ubuntu (viable)

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GeoCompressor licensing options

| License tier	Thread limits	Gigapixel limits
Professional	Unlimited	Unlimited
Advantage	<= 8	<= 500 gigapixels
Essentials	<= 4	<= 250 gigapixels

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ECW for ArcGIS Server

- Paid product that adds ECW file format support for Esri enterprise customers
  - Esri continues to release major platform changes that require Hexagon to release a paired version
  - 10.7 has made architectural changes that claimed significant performance gains due to shared memory pooling

- Despite these improvements, ERDAS APOLLO remains:
  - **3.4x faster** delivering ECW data in a reprojection benchmark
  - **5.7x faster** delivering ECW data in a native projection benchmark (below)

- **ECW for ArcGIS Server 2018 Update** is available now for download for Esri customers looking to upgrade.

ECW Delivery performance of 256px tiles
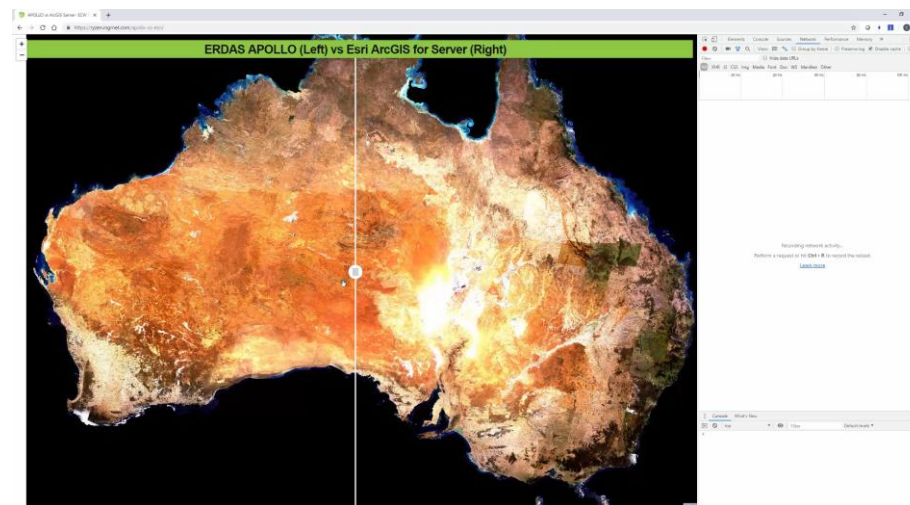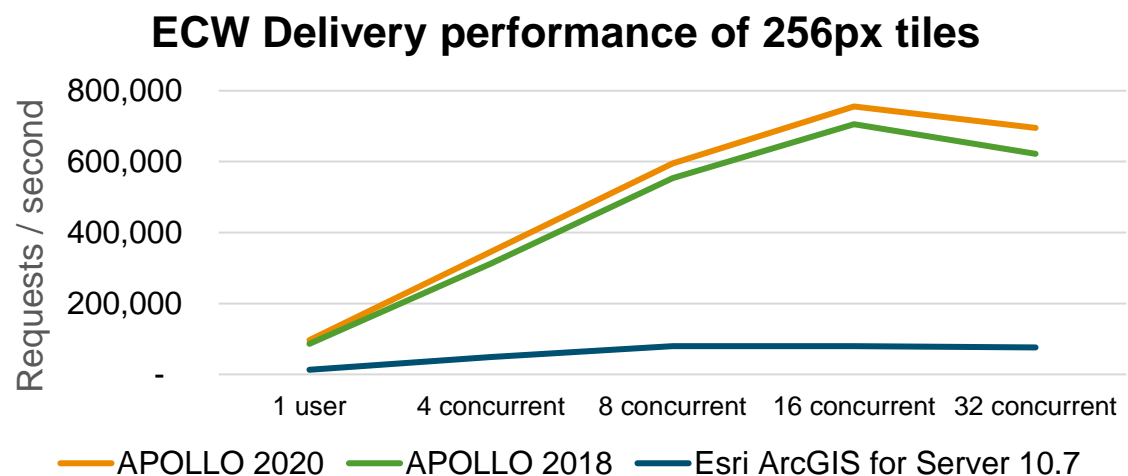
ECW Plugin for ArcGIS Desktop
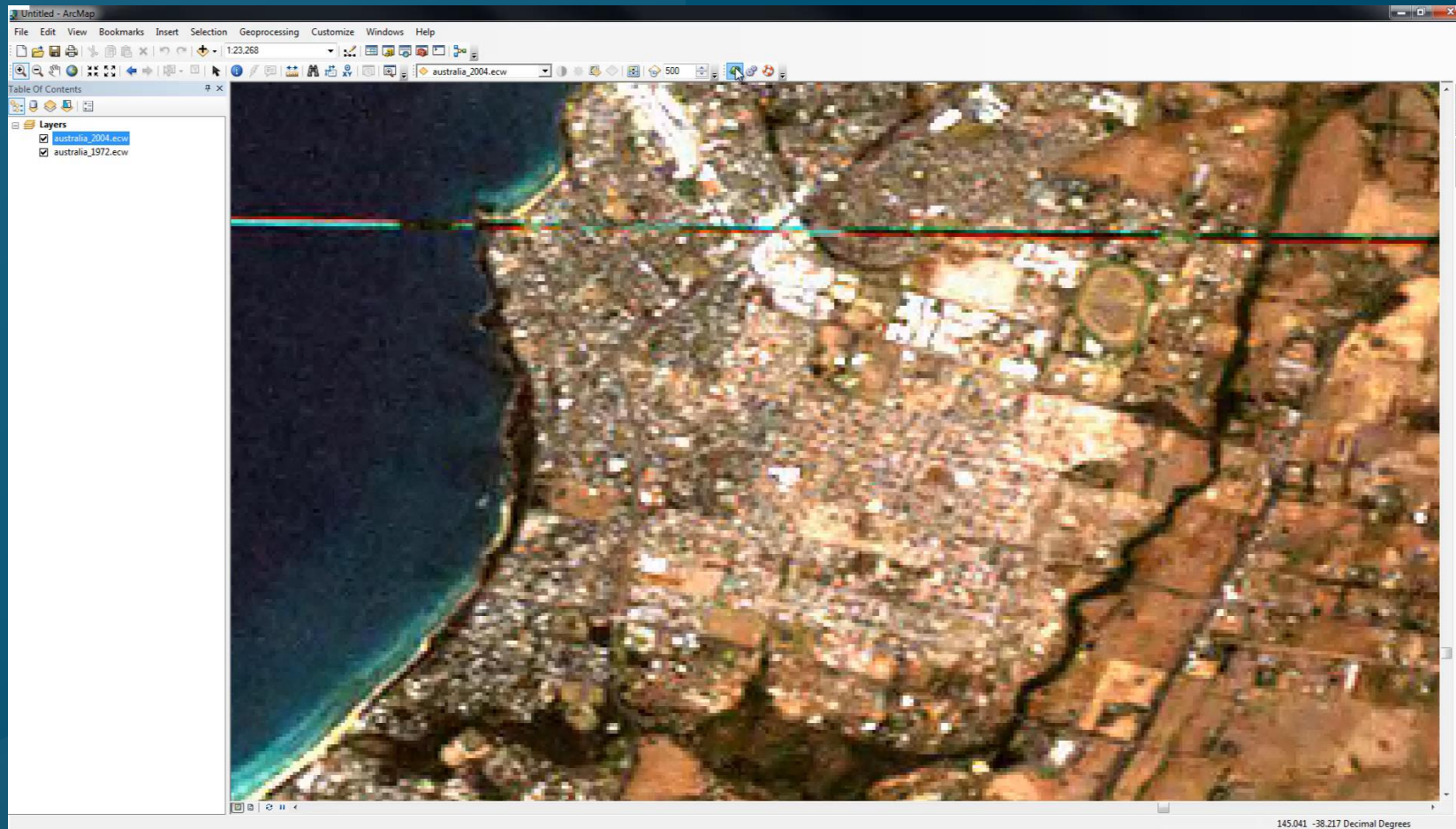
- Free plugin to enhance Esri with out-of-the-box ECW support that adds new ALG and ERS format support

- Add APOLLO integration for data discovery and ECWP layer support

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Customer references

RWE Deutschland (Germany)

One of Europe's leading electricity and gas companies, RWE Deutschland, sought to organize and manage geospatial data for the entire country of Germany, covering more than 365,000 square kilometers of land area. All mapping data had to be kept up to date, along with rapid delivery of the data to a variety of regional organizations.

38 TB of uncompressed imagery was processed and compressed down to a single 1-terabyte ECW file while retaining full image quality and excellent performance. With final pixel dimensions of 3,210,000 pixels x 4,340,000 pixels by 3 bands, or 14 terapixels in size, this was the largest ECW image file created at the time and the largest single image of any format in the world.

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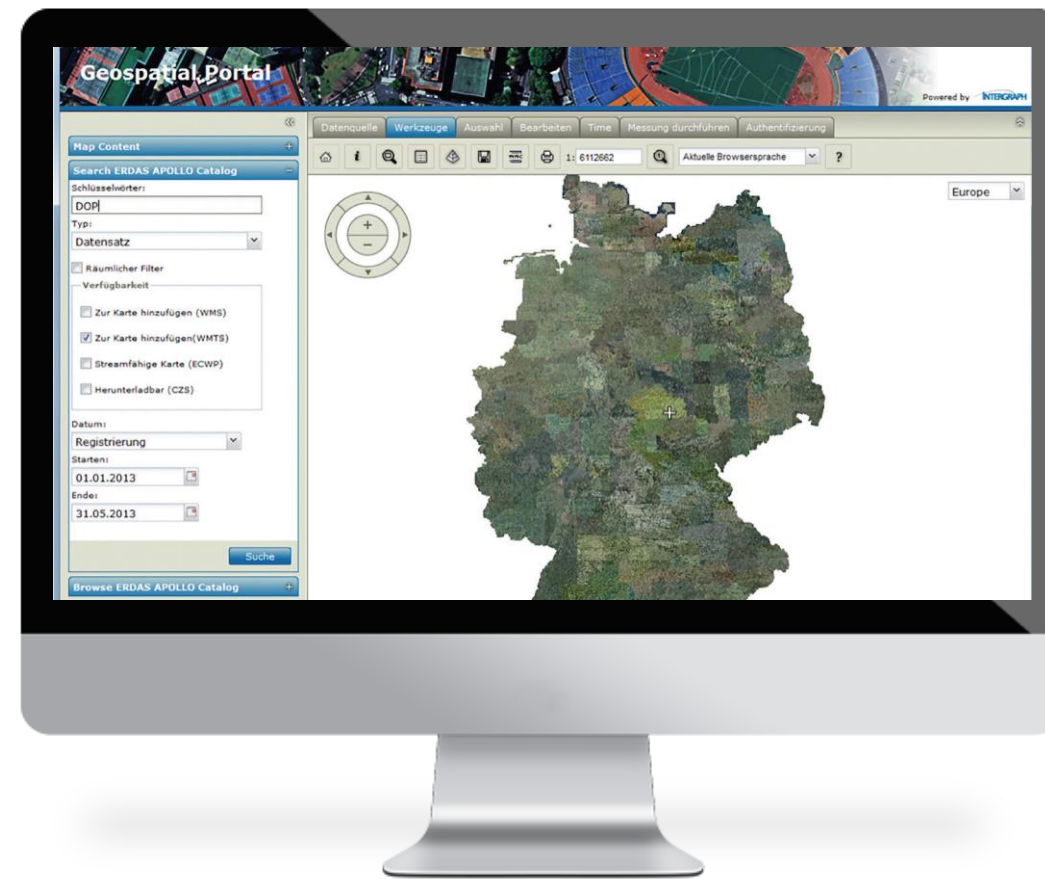
Chief Directorate National Geo-Spatial Information (South Africa)

CDNGI had thousands of files that covered their area of interest of 1.22 million square kilometers, so it was difficult to not only find the ones they wanted, but also to load and display them all at once. On top of that, 30 TB of disk space was required to house all 46,000 files.

GeoCompressor compressed 46,000 files at 50 cm resolution into a single, seamless mosaic in just 10 days. The resulting ECW image was compressed by a factor of 10, maintaining visually lossless quality.

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ARTEK

ARTEK is a Turkish Engineering and Design/Building company active in Middle East and in Europe. ARTEK has acquired ECW SDK Server to provide the most efficient compression technology to handle large imagery databases with minimized storage investments and without sacrificing in data visual quality. Artek will use ECW SDK for the injection of ECW technology into existing legacy systems.

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Baron Critical Weather Intelligence

Acceleration of data dissemination

- Baron Critical Weather Intelligence (Huntsville, AL) provides weather intelligence to businesses, government agencies, and consumers to help detect and keep them informed about potential critical weather conditions.

- In order to provide their raster data faster to their partners, Baron has chosen Hexagon ECW SDK server as their new compression solution. ECW will allow to share bigger and more precise images. This evolution will increase productivity and Baron ability to perform complex operations on their data to provide better information and warning to the public. This will also improve operational efficiency and reduce overall costs.

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Sigeo

Drone imagery compression and delivery

- **SIGeo** is an Italian company that provides services of support, monitoring and prevention within the Agriculture, Environment and Infrastructures sectors. They acquire aerial imagery through drones and elaborate geographical information through GIS in order to manage the territory.

- **SIGeo** has been supporting OpenFiber in the laying of fibre-optic cables throughout the whole Italian territory (8000 towns), and now it will adopt ECW's Software Development Kit (SDK) to improve their results.

- Hexagon's **ECW SDK** will enhance the capability of using GDAL libraries to read ECW data and provide it through Geoserver, as a Service.

- https://sigeosrl.com/

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Thank you!

Angela.Manchester@hexagon.com

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