BAE SYSTEMS

Appendix O - Supported Formats

SOCET GXP supports various native and web service based imagery, graphics, vector, and terrain file formats. Functionality is used for image analysis, manipulation and product creation, triangulation, feature extraction, terrain extraction, orthophoto, and automatic terrain generation. Refer to Web Service Layer.

Vector Formats

SOCET GXP supports various vector formats and their respective geometries..

Vector Formats Supported by SOCET GXP

FORMAT	FILE EXT	READ/WRITE	GRAPHIC STYLE	TEXTURES	FEATURE GEOMETRIES SUPPORTED
ADOBE ACROBAT 3D PDF	*.PDF	Write Only	Yes	Yes	Point, Line, Polygon, 3-D
COLLADA	*.DAE	Read/Write	No	Yes	3-D
Esri File Geodatabase **NOTE:** Limited support for annotation feature classes.	*.GDB	Read/Write	No	Yes	Point, Multipoint, Line, Polygon, 3-D (Multipatch)
Esri Multi-user Geodatabase **NOTE:** Limited support for annotation feature classes.		Read/Write	No	Yes	Point, Multipoint, Line, Polygon, 3-D (Multipatch)
Esri Multi-user Geodatabase-SDE Connection File **NOTE:** Limited support for annotation feature classes.	*.SDE	Read/Write	No	Yes	Point, Multipoint, Line, Polygon, 3-D (Multipatch)
Esri Multi-user Geodatabase Spatial Database Engine (SDE) Connection File **NOTE:** Limited support for annotation feature classes.	*.SDE	Read/Write	No	Yes	Point, Multipoint, Line, Polygon, 3-D (Multipatch)

FORMAT	FILE EXT	READ/WRITE	GRAPHIC STYLE	TEXTURES	FEATURE GEOMETRIES SUPPORTED
Esri Personal Geodatabase **NOTE:** Limited support for annotation feature classes.	*.MDB	Read/Write	No	Yes	Point, Multipoint, Line, Polygon, 3-D (Multipatch)
Esri REST Feature Service		Read/Write	No	No	Point, Multipoint, Line, Polygon
Esri Shapefile	*.SHP	Read/Write	Yes (PRF File)	No	Point, Multipoint, Line, Polygon, 3-D (Multipatch)
GPS Exchange Format	*.GPX	Read/Write	Yes	No	Point, Multipoint, Line
KML/KMZ	*.KML, *.KMZ	Read/Write	Yes	Yes (COLLADA only)	Point, Polygon, Line, 3-D (COLLADA)
OGC GeoPackage	*.GPKG	Read/Write	No	No	Point, Multipoint, Line, Polygon
OGC GML	*.GML	Read Only	No	No	Point, Line, Polygon
PostGIS Feature Database		Read/Write	No	Yes	Point, Multipoint, Line, Polygon, 3-D
Presagis OpenFlight	*.FLT	Write only	No	Yes	Polygon, 3-D

FORMAT	FILE EXT	READ/WRITE	GRAPHIC STYLE	TEXTURES	FEATURE GEOMETRIES SUPPORTED
SOCET GXP Feature Database	*.FDB	Read/Write	Yes	Yes	Point, Multipoint, Line, Polygon, 3-D
SOCET GXP Feature Layer File	*.FLAY	Read/Write	Yes	No	Point, Line, Polygon, 3-D
SOCET GXP Graphics **NOTE:** SOCET GXP graphics may include icons, markers, targets, brackets, and text. Refer to Graphics.	*.GRFX	Read/Write	Yes	No	Point, Line, Polygon
SOCET GXP Seamlines	*.SEAM	Read/Write	Yes	No	Polygon
VPF	*.DHT	Read Only	Yes	No	Point, Line, Polygon
Web Feature Service (WFS)		Read/Write	No	No	Point, Multipoint, Line, Polygon

Raster Formats

SOCET GXP supports specific image formats, sensor models, and standardization agreements (STANAG). Functionality loads data in its native format, such as formats with metadata included in auxiliary files or product specific formats. Schemas can be saved and reused for future image imports.

SOCET GXP provides a generic raster importer that enables and defines the following:

- Skip bytes at the beginning of import
- Bit-depth
- Number of lines and samples
- Byte order
- Band-Interleaved-by-Pixel (BIP)
- Band-Interleaved-by-Line (BIL)
- Band-Sequential (BSQ)
- Optional tile size

Raster Formats Supported by SOCET GXP

IMAGERY	FILE FORMAT
ARC-Digitized Raster Graphics Files (ADRG)	*.GEN, *.THF
Leica ADS	*.ADS
ASRP Files	*.GEN
ASTER Files	*.HDF
COSMO SkyMed Files	*.H5
Enhanced Compression Wavelet	*.ECW
Envi	*.HDR
ERDAS Files	*.IMG, *.IGE

IMAGERY	FILE FORMAT
Compuserve/Animated GIF	*.GIF
GXP URL Files	*.GXPURL
IKONOS Files	*_METADATA.TXT
ISIS Cube File	*.CUB
JPEG	*.JPG, *.JPEG
JPEG2000 Codestream	*.J2C, *.J2K
JPEG2000 Files	*.J2K, *.JPF, *.JPX
Landsat	*.FST, HEADER.DAT, *.HD
MrSID	*.SID
MBTiles	*.MBTILES
NITF	*.NTF, *.NITF, *.NITF20, *.NITF21, *.NTF_DETECTED, *.NTF_COMPLEX, *.R0, *.R0_PART*, *.EO_SPOT, *.EO_WAS, *.IR_SPOT, *.IR_WAS, *.SAR_SPOT, *.SAR_WAS
NSIF 1.0	*.NSF
PNG	*.PNG
RapidEye Files	*_METADATA.XML
SGI Files	*.RGB
SPOT	*.DAT
Sun Raster Files	*.RAS, *.SUN
SOCET GXP Support Files	*.SUP
TIFF/GeoTIFF/BigTIFF	*.TIF, *.TIFF

IMAGERY	FILE FORMAT
TIL	*.TIL
Windows Bitmap	*.BMP
Custom Format Images	Generic raster importer.

Sensor Model

A sensor model is a mathematical transformation allowing 3-D object space (ground) coordinates to be transformed into line and sample coordinates on an image. Sensor models conform to generic types including, Frame, Panoramic, Pushbroom, Whiskbroom, and radar or Synthetic Aperture Radar (SAR). SOCET GXP is used to perform image-to-ground and ground-to image calculations.

Sensor Models Supported by SOCET GXP

SENSOR MODEL	SUPPORT
ADS40, ADS80, and ADS100	The Airborne Digital Sensor model is a line scanner used to record multiple lines simultaneously to create accurate digital images with correct orientation. Output images are used for photogrammetric processing for viewing in stereo. Turbulent weather or platform vibrations may cause ADS line crossings to occur in the output images. Running a separate application prior to loading ADS images into SOCET GXP removes the line crossing and generates new orientation data for the sensor model.
ALOS AVNIR-2, ALOS PRISM , ALOS PALSAR, and ALOS PALSAR-2	Advanced Land Observing Satellite containing multiple sensors. PRISM contains both rigorous and RPC models. PALSAR-2 is a Synthetic Aperture Radar (SAR) sensor aboard the Japanese ALOS-2. Ground resolution is 3 meters in Ultrafine mode.
Arc Standard Raster Product (ASRP) 1.2 based on STANAG 4387	Raster Scanned Maps on a common, seamless worldwide datum.
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer is a 14-band multispectral image.

SENSOR MODEL	SUPPORT
Cartosat (RPC)	High-resolution optical sensors that provide RPC information as an auxiliary file in *.txt format.
Chandrayaan-1 TMC	CHANDRAYAAN-1 Terrain Mapping Camera (TMC) pushbroom Moon satellite camera with simultaneous Fore, Nadir, and Aft views.
Common Coordinate System (CCS) Mosaic	Mosaics based on image pixels.
Community Sensor Model (CSM) plugin support	Plug-in architecture allowing custom sensor model development. Refer to the SOCET GXP API for details on developing a plug-in sensor model.
Compressed ARC Digitized Raster Graphic (CADRG)	Scanned map products capable of auto-loader for map background.
Controlled Image Base (CIB)	Orthophoto base map capable of auto load for reference and background.
COSMO SkyMed	Constellation of small satellites for the Mediterranean basin observation with SAR satellites. The constellation consists of four satellites. Complex and Magnitude data types are supported.
Digital Point Positioning Database (DPPDB)	Rectified stereo pairs of imagery using RPC as the sensor model.
Direct Linear Transformation (DLT)	Projective linear rational polynomial consisting of 11 terms.
Earth - i DMC3	High resolution commercial satellite image provider. Earth-i - DMC3 acquires panchromatic and multispectral imagery.
EROS-B	Earth Resources Observation Satellite with an optical sensor capable of submeter resolution.
FORMOSAT-2 and FORMOSAT-5	High resolution optical satellites.

SENSOR MODEL	SUPPORT
Four-Corner	Metadata supplied with imagery in ArcWorld File, GeoTIFF, and NITF formats.
FrameAdvanced Sensor Model	Supports all central projection framing sensors allowing for import and association of imagery with metadata including camera calibration and exterior orientation parameters.
Generic Point Cloud Model (GPM)	Sensor model for point clouds with an error model and adjustable parameters.
Generic 2D and 3D polynomials	Supporting the simple affine, six parameter polynomial and higher order 2-D/3-D polynomial coefficients.
GeoEye-1	High-resolution optical sensor with less than half-meter panchromatic resolution and four times courser resolution for the multispectral bands. Rigorous and PRC are supported.
IKONOS (RPC)	High-resolution optical sensors that provide RPC information as an auxiliary file in *.txt format.
KOMPSAT-2 , KOMPSAT-3, and KOMPSAT-5	KOMPSAT-2 and KOMPSAT-3 are high- resolution optical sensors with a 1-meter resolution. KOMPSAT-5 is a Synthetic Aperture Radar (SAR) sensor with a 1-meter ground resolution in High Resolution mode.
Landsat	Landsat earth resource satellites with multispectral sensors. Landsat 7 and 8 are currently in service with all sensors support for historical exploitation.
Mensuration Services Program (MSP)	MSP provides a plug-in to SOCET GXP supporting U.S. government assets.
NCDRD (National Imagery Transmission Format [NITF] Version 2.1 Commercial Dataset Requirements Document)	NITF 2.1 data with TREs supporting rigorous and RPC sensor models for WorldView-1, WorldView-2, WorldView-3, and GeoEye-1.
Ortho	Metadata supplied with imagery in ArcWorld File, GeoTIFF, and NITF formats.

SENSOR MODEL	SUPPORT
PerúSAT-1	A high-resolution Earth observation satellite system built for the government and Space Agency of Peru. The satellite system observes the Earth through the optical New AstroSat Optical Modular Instrument (NAOMI) imager, designed and developed by Airbus Defence and Space. The silicon carbide imager provides imagery in high resolution at 0.7 meters.
PlanetScope	Multi-spectral sensor supporting 3-meter resolution.
Pleiades	The Pleiades sensor system is comprised of two identical high-resolution optical imaging satellites (Pleiades 1A and 1B). The satellites are on the same orbit and are offset by 180° from each other. Equipped for advanced roll, pitch, and yaw agility, enables the system to maximize repeat coverage of a given area. The sensor system has a black and white band with 50 cm resolution and four multispectral bands (Blue, Green, Red, and Near Infrared) with a 2-meter resolution and a swath width of 20 km.
Predator	Sensor model supporting the Predator mission.
Quickbird	High resolution optical sensor satellite (panchromatic only).
RADARSAT-1 Orbit Aligned, RADARSAT-2 North Aligned and Orbit Aligned	Canadian commercial SAR satellites. Complex and Magnitude data types are supported for RADARSAT-2.
Rational Polynomial Coefficients (RPC)	Generic projective model supplied as auxiliary files in *.txt format, or as NITF TREs.
Replacement Sensor Model (RSM)	Write metadata into a file in an RSM format.
RISAT-1	Satellite imaging system developed by Indian Space Research Organization (ISRO) and carries a C-band SAR payload capable of single up to quad polarization modes. Three image types are available to the public: L1-Slant-Plane-Complex; L1-Ground-Plane-Detected; and L2-GeoRef-Ortho. The image resolutions range from 3-meters to 50-meters. SAR image data supplied as a product-specific binary format DAT_01.001.

SENSOR MODEL	SUPPORT
SENSRA	NITF TRE supporting frame sensor data. SENSRA is the equivalent of a pinhole camera.
SENSRB	A frame camera that is more flexible than SENSRA and adds more coefficients for radial and tangential lens distortion. SGXP supports SENSRB NTF TREs.
Sentinel-1A, Sentinel-2A, and Sentinel 2B	Sentinel-1A supports Level 1 SLC (complex slant plane) in TIFF format and Level 1 GRD (detected ground plane). Sentinel-2A supports Level 1C (top-of-atmosphere ortho). Sentinel-2B is a high-resolution multi-spectral sensor.
Sensor Independent Complex Data (SICD)	Sensor-agnostic format for Synthetic Aperture Radar (SAR) data.
SkySat	High-performance satellite producing 0.9-meter pan and 2.0-meter multispectral resolution imagery.
Smart Image	Image format supporting single-image mensuration of XYZ ground for each pixel.
SPOT (1-3, 5+)	High-resolution optical sensor series of satellites. SPOT6 acquires panchromatic and multispectral imagery.
TanDEM-X	High-resolution SAR satellite. Complex and Magnitutde data types are supported. **NOTE:** The Multiport status bar displays with TerraSAR-X or a TanDEM-X complex sensor model.
TeLEOS-1	High-resolution satellite producing 1 meter resolution imagery of Near Equatorial Orbit (NEqO) every 12 to 16 hours.
TerraSAR-X,	High-resolution SAR satellite. Complex and Magnitude data types are supported.
USGS DOQ	United States Geologic Survey Digital Ortho Quad and Quarter Quad.

SENSOR MODEL	SUPPORT
USMSD	Rational polynomial.
VisionMap A3	Digital airborne camera system with post processing that creates Super Large Frame (SLF) imagery. The SLF sensor models supported.
WorldView-1, WorldView-2, WorldView-3, and WorldView-4	High-resolution optical satellites providing panchromatic and multispectral imagery.

STANAG

STANAG is used to provide standard military processes and procedures for countries affiliated with NATO.

STANAGs Supported by SOCET GXP

STANAG	DESCRIPTION
STANAG 4545 - NATO Secondary Imagery Format (NSIF)	Promotes interoperability for the exchange of Secondary Imagery among North Atlantic Treaty Organization (NATO) Command Control Communications and Intelligence (C3I) Systems. NSIF is the standard for formatting digital imagery files and imagery-related products and exchanging them among NATO members. The NSIF is a collection of related standards and specifications developed to provide a foundation for interoperability in the dissemination of imagery and imagery-related products among different computer systems.

STANAG	DESCRIPTION
STANAG 4559 - NATO Standard Imagery Library Interface (NSILI)	Promotes interoperability for the exchange of NATO Intelligence, Surveillance and Reconnaissance (ISR) products among NATO accessible C4I Library Systems. The NSIL is the standard interface for querying and accessing heterogeneous product libraries maintained by various nations and specifies a common software interface to be implemented and exist for all NATO interoperable library systems. The interface provides electronic search and retrieval capabilities for distributed users to find products from distributed libraries in support of, but not limited to, rapid mission planning and operation, strategic analysis, and intelligent battlefield preparation. Product Libraries and the NSIL Interface are envisioned as a key technology utilized within existing Request for Information (RFI) procedures. The overall goal is for the intelligence analysts, imagery analysts, cartographers, mission planners, simulations and operational users from NATO countries, to have timely access to distributed ISR information if Host Nation operational restrictions and security policies permit this access.
STANAG 4575 - NATO Advanced Data Storage Interface (NADSI)	Promotes interoperability for the exchange of data among North Atlantic Treaty Organization (NATO) Intelligence, Surveillance, and Reconnaissance (ISR) Systems. The NADSI defines the standard for an interface to allow cross-servicing of ISR platforms by NATO nations' ground stations.
STANAG 4607 - NATO Ground Moving Target Indicator Format	Promotes interoperability for the exchange of ground moving target indicator radar data among the North Atlantic Treaty Organization (NATO) Intelligence, Surveillance, and Reconnaissance (ISR) Systems.
STANAG 4609 - NATO Digital Motion Imagery Standard (MI)	The primary objective of the NATO MI (STANAG 4609) is to provide common methods for exchange of MI across systems within and among NATO nations. STANAG 4609 is intended to provide a consolidated, clear and concise view of the standards to build and operate motion imagery systems. The STANAG includes guidance on uncompressed, compressed, and related motion imagery sampling structures; motion imagery time standards, motion imagery metadata standards, interconnections, and common language descriptions of motion imagery system parameters.

STANAG	DESCRIPTION
STANAG 4676B - NATO Intelligence Surveillance Reconnaissance Tracking Standard (NITS)	Promotes interoperability for the exchange of tracking data among the North Atlantic Treaty Organization (NATO) Intelligence, Surveillance, and Reconnaissance (ISR) Systems.
STANAG 7024 - Air Reconnaissance Tape Recorder Standard	Document that is established to ensure the ability to exchange air reconnaissance sensor recordings and associated auxiliary data within NATO and Allies, by the use of recording standards for media and recording footprints.
STANAG 7085 - NATO Interoperable Data Link for ISR Systems	Provides interoperability standards for three classes of imagery data links used for primary imagery data transmission; Analogue links, Point-to-point digital links, and Broadcast digital links.

Terrain Formats

SOCET GXP supports native and non-native terrain file formats. Native files are read directly into SOCET GXP for use without format conversion. Non-native files require format conversion when imported or loaded into SOCET GXP.

Terrain Formats Supported by SOCET GXP

TERRAIN	IMPORT or NATIVE	FILE FORMAT
ASCII ArcGrid	Import	*.ASC
ASCII Digital Terrain Model (DTM)	Import	*.A, *.ASC*, *.TXT
Band Interleaved by Line (BIL)	Native	*.BIL
Binary Point Format (BPF)	Native	*.BPF
Digital Terrain Elevation Data (DTED)	Native	*.DTD, *.DT0, *.DT1, *.DT2, *.DT3, *.DT4, *.DT5, *.DT6
Geographical Survey Institute (GSI) 50 meter grid	Import	*.MEM
High Resolution Elevation (HRE)	Native	*.HR, *.HR5
Light Distance and Ranging (LiDAR)	Import	*.LAS
Light Distance and Ranging (LiDAR) Compressed	Import	*.LAZ
Light Distance and Ranging (LiDAR) ASCII	Import	*.A, *.ASC*, *.TXT

TERRAIN	IMPORT or NATIVE	FILE FORMAT
National Image Transfer Format (NITF)	Native	*.NTF, *.NITF, *.NITF20, *.NITF21, *.NTF_DETECTED, *.NTF_COMPLEX, *.R0, *.R0_PART*, *.EO_SPOT, *.EO_WAS, *.IR_SPOT, *.IR_WAS, *.SAR_SPOT, *.SAR_WAS
Shuttle Radar Topography Mission (SRTM)	Native	*.DT1, *.DT2
SOCET GXP	Native	*.DTH
SOCET GXP TIN	Native	*.DTH
Terrain Contour Matching (TERCOM)	Native	*.TCM
TIFF/GeoTIFF	Native	*.TIF, *.TIFF
USGS Digital Elevation Model (DEM)	Import	*.DEM
USGS Digital Elevation Dataset (NED)	Import	*.FLT

Miscellaneous Supported File Types

SOCET GXP supports various product and support files.

SOCET GXP Supported File Types

FILE TYPE	FILE EXTENSION
Aereotriangulation File	*.ATF
Frame camera calibration file	*.CAM
Terrain elevations	*.DTE
Terrain figures of merit	*.DTF
Terrain Header file. It is like a sup file but for terrain format	*.DTH
Terrain precision	*.DTP
Enhancement chain	*.ENH
Fly-through	*.FLY
Finishing Tool template	*.FTMPL
GeoJSON file	*GEOJSON
GXP job file	*.GJOB
Ground point file	*.GPF
Stores way points and routes for Garmin®	*.GPX
Graphics file	*.GRFX
Feature style sheet	*.GSLD
Image point file	*.IPF
Terrain levels of detail	*.LOD

FILE TYPE	FILE EXTENSION
Look up table	*.LUT
Covariance file. It is created when using Full Covariance solve strategy for Triangulation	*.OCOV
Triangulation report	*.REP
Feature specification file	*.SPC
Strategy files	.*STRAT/ *.STRATEGY
Support file pointing at the original images	*.SUP
Template	*.TMPL
Vector icon	*.VECICON
Workspace	*.WKSP