

SuperMap Full-process Image Management Technology Solution

Presenter
Jayson Yuan





CONTENTS



Technical
Solution



Key
Technology



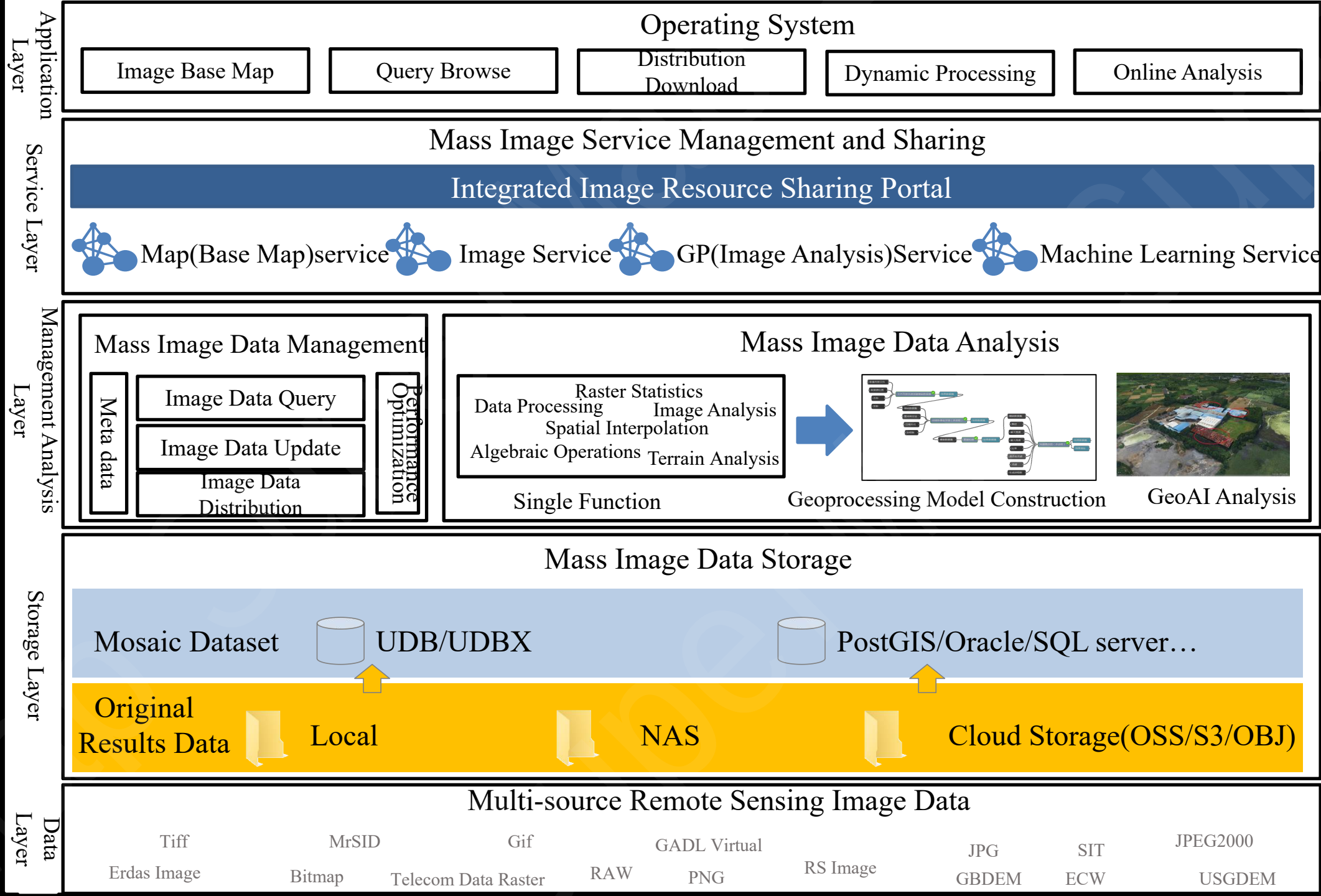
Typical
Application



PART 1

Technical Solution

Technical System Architecture Diagram



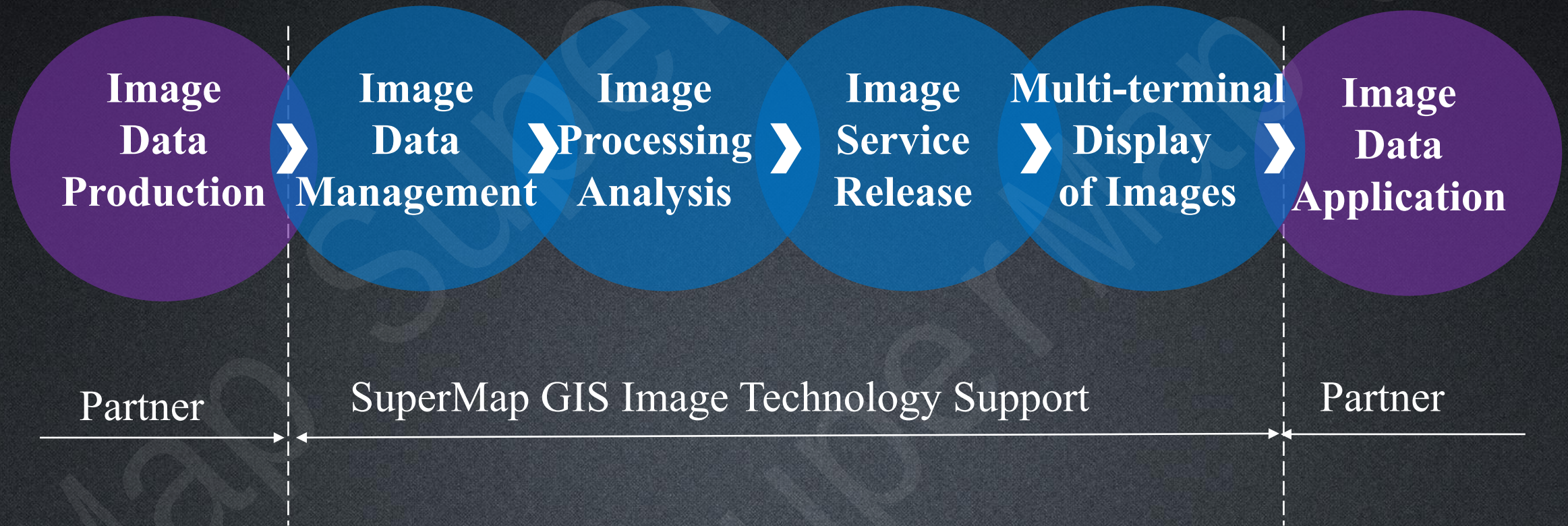


PART 2

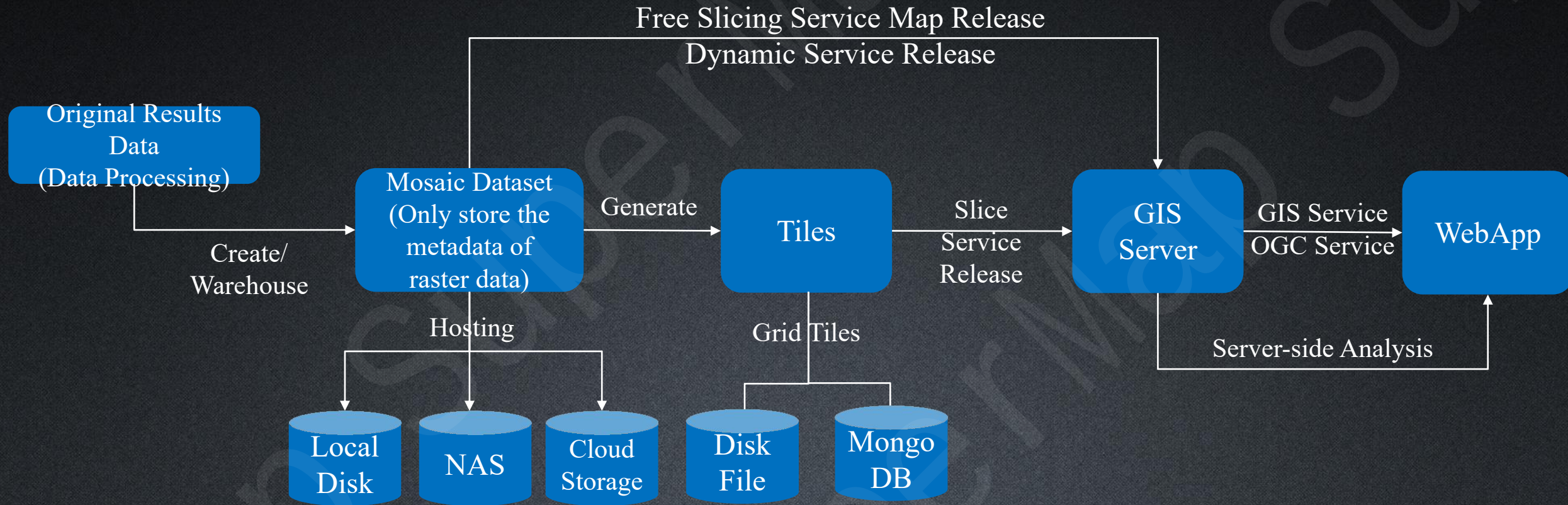
Key Technology



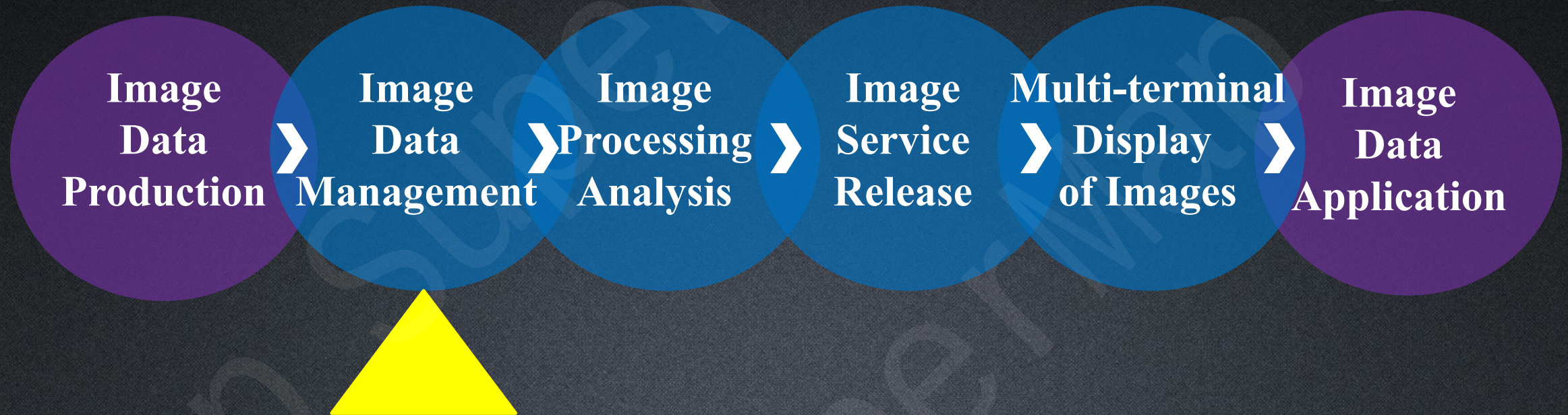
Full-process Imaging Technical Support



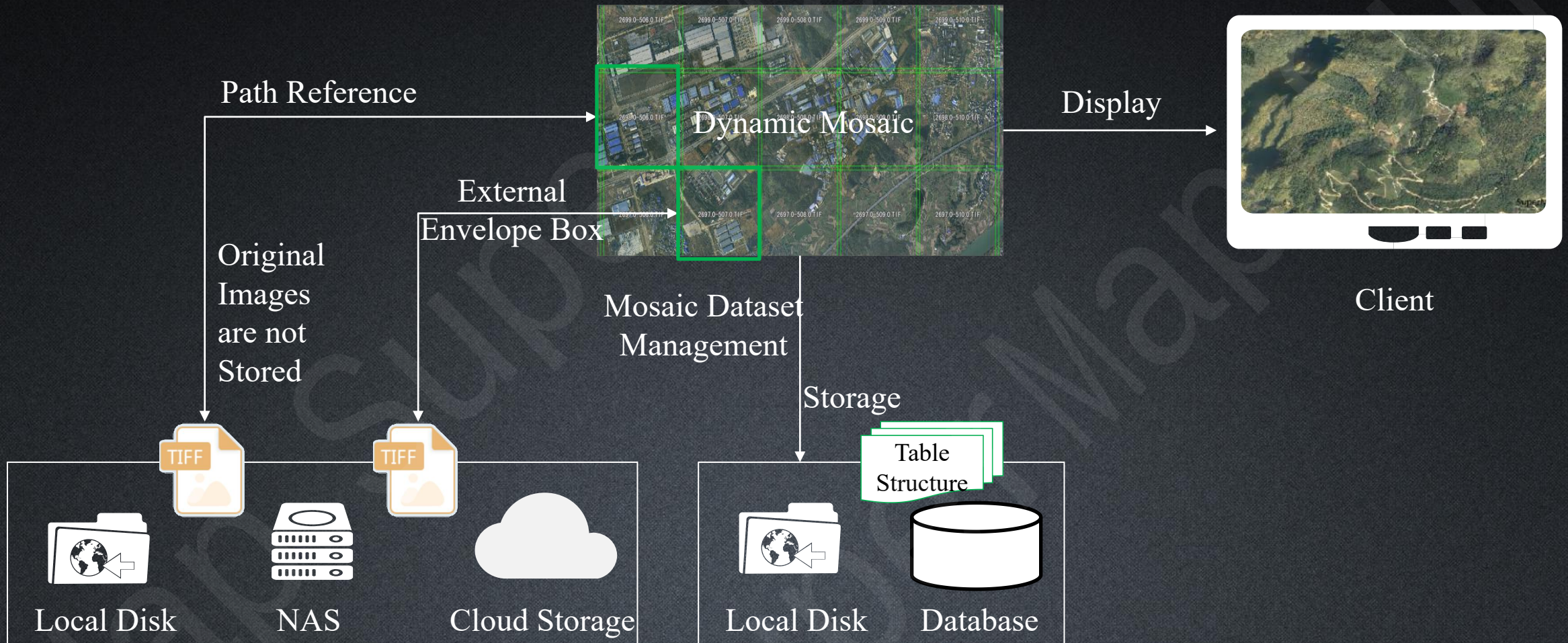
Raster Data Technology Route



Full-process Imaging Technical Support

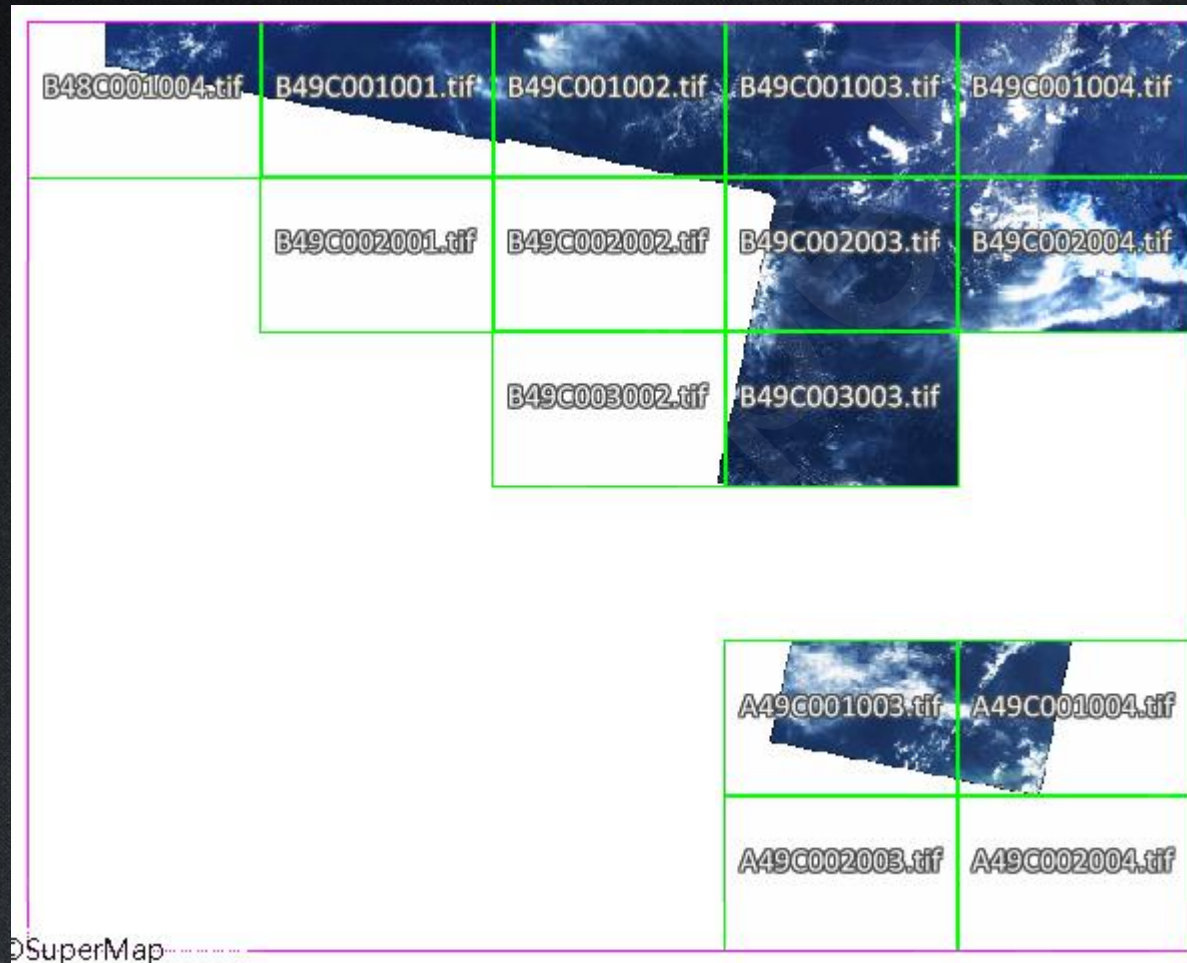


Storage Management based on Mosaic Dataset



File (Image Original File) + Database (Mosaic Dataset) Management Mode

External Structure of Mosaic Dataset



Boundary

The boundary is the range of all raster datasets defined by the outline of the raster dataset in the mosaic dataset

Footprint

The contour line contains the contour of each raster in the mosaic dataset.

Raster

Actually stored single/multi-band images

About Storage Recommendations

Local Disk

- Test Environment
- Data
Volume/Concurrency
Requirements are Not
High
- GB/TB Level

NAS

- Production
Environment
- County and City
Level
- TB Level

Object Storage

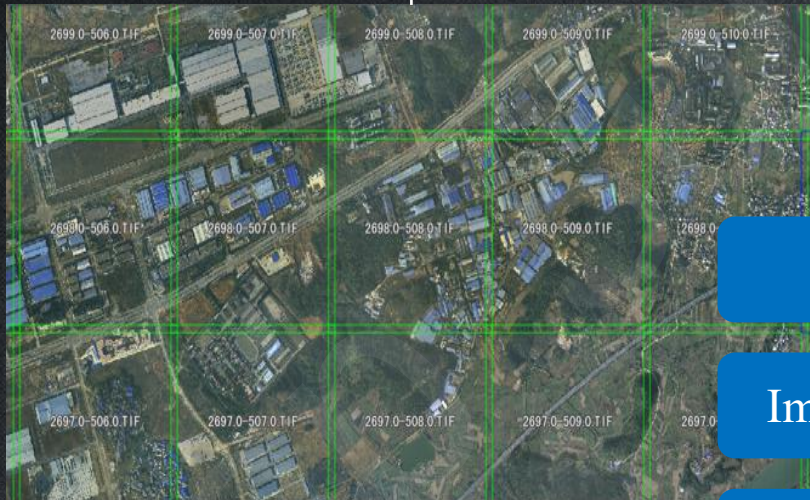
- Production
Environment
- Provincial/State and
Country Level
- TB/PB Level
- Object Storage
Professional Services

Image Format Support

Number	Category	Raster File Format Supported for Import	Whether to Support Export
1	Esri	Arcinfo Grid (*.Grd,*.Txt)	√
2	Erdas Image	*.Img	√
3	Tiff	*.Tif	√
4		*.Tiff	
5	Bitmap	*.Bmp	√
6	Png	*.Png	√
7	Jpg	*.Jpg	√
8		*.Jpeg	
9	Sit	*.Sit	√
10	Usgdem	*.Dem	
11	Gbdem	*.Dem	
12	RS Image	*.Bil	
13		*.Bip	
14		*.Bsq	
15	Raw	*.Raw	
16	Mrsid	*.Sid	
17	Telecom Data Raster	*.B	
18		*.Bin	√
19	Gif	*.Gif	√
20	Jpeg2000	*.Jp2,*.Jpk	
21	Ecw	*.Ecw	
22		*.Grib2	
23	GDAL Virtual	*.Vrt	
24	Military Data Elevation Model	*.Egc	√
25	Netcdf	*.Nc	

Display Capabilities Based on Mosaic Datasets

Demonstration

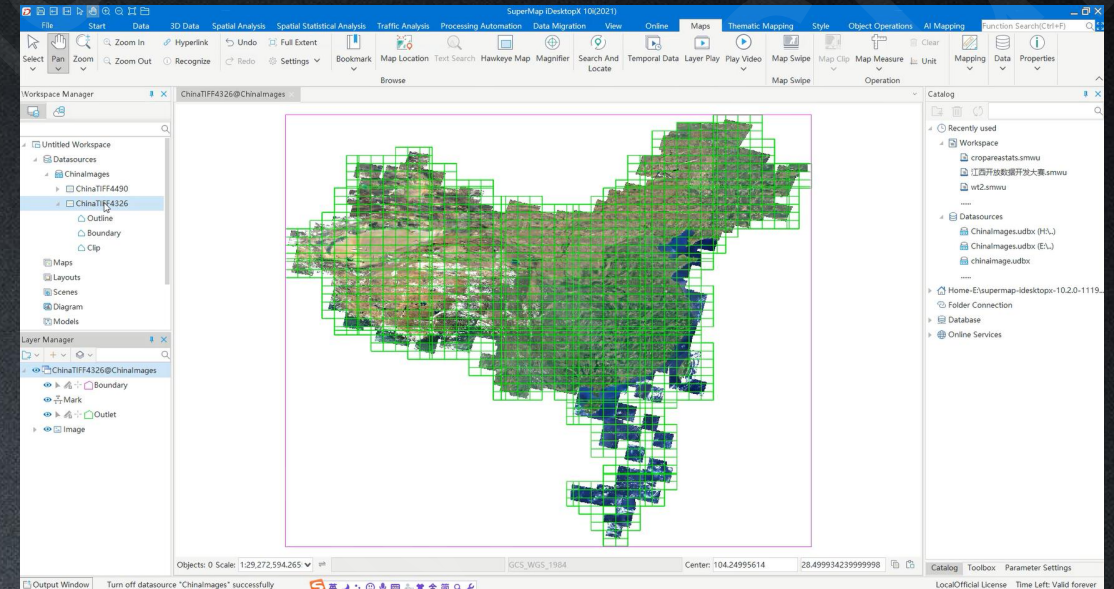


Overview

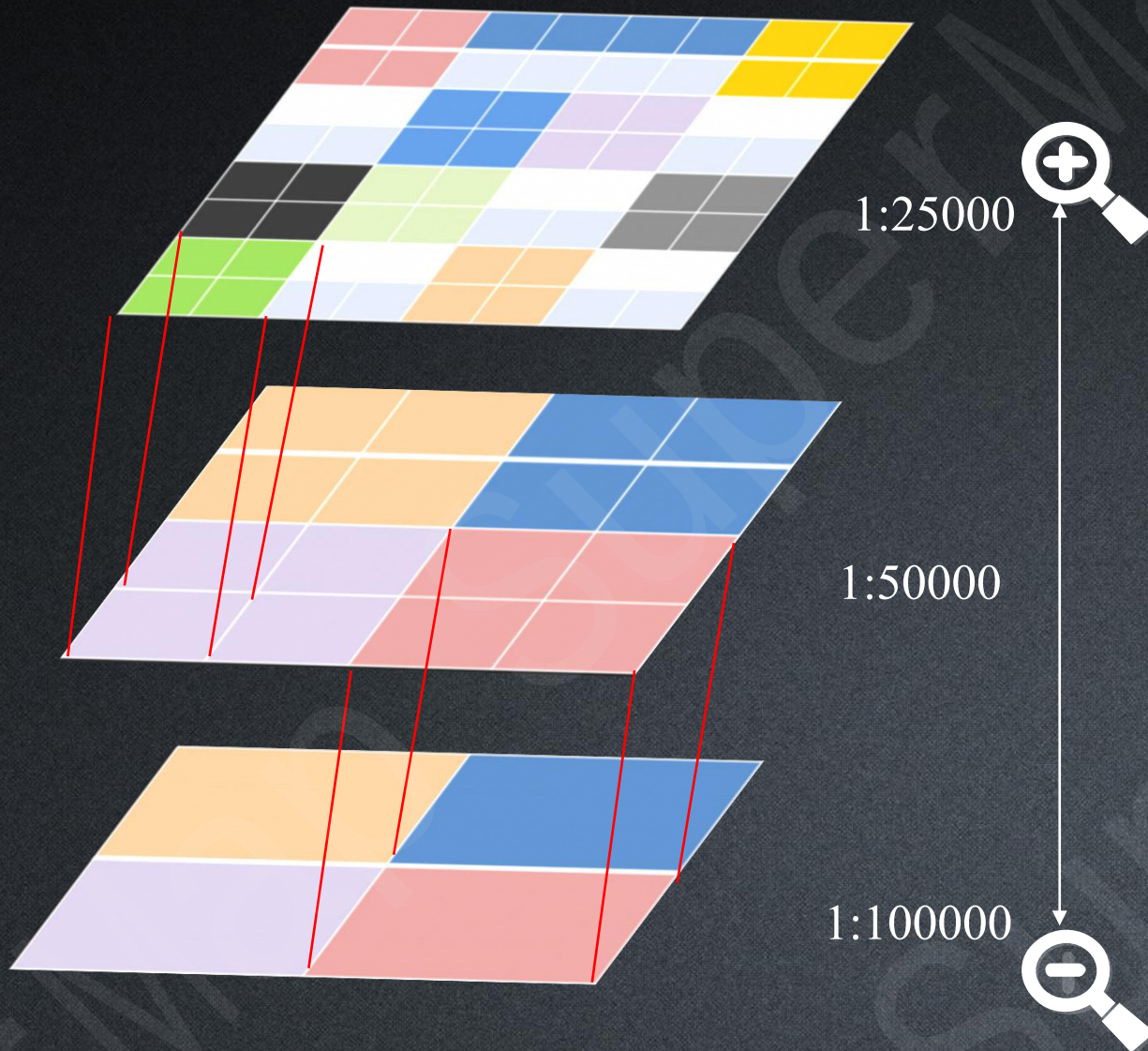
Image Pyramid

Dynamic Mosaic

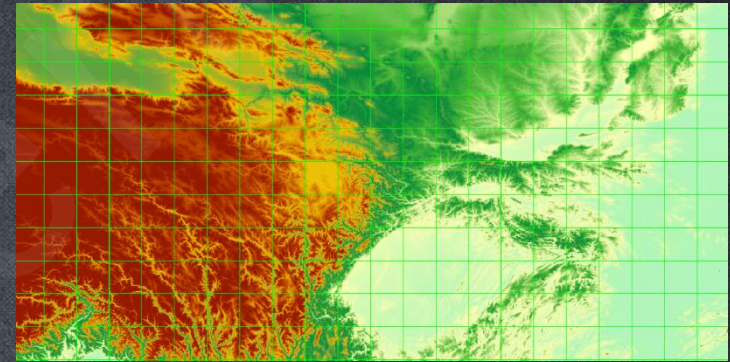
Mosaic Dataset



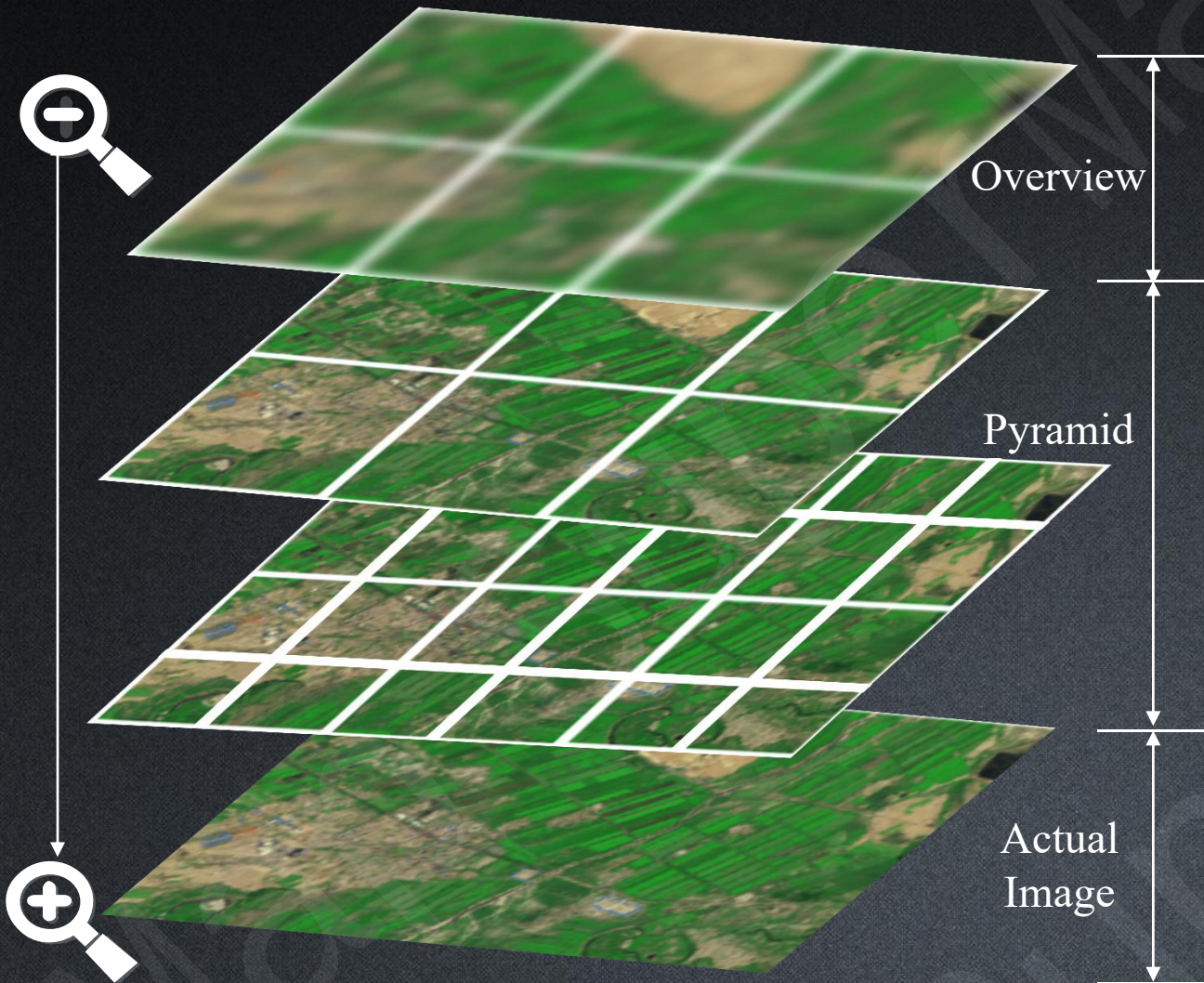
Grid Pyramid



- ✓ After the image pyramid is created, the display efficiency of the image data and the efficiency of creating overviews of the mosaic dataset can be greatly improved.



Overview



- ✓ The overview is similar to the image pyramid.
- ✓ It is a lower resolution image, created to increase display speed and reduce CPU usage.

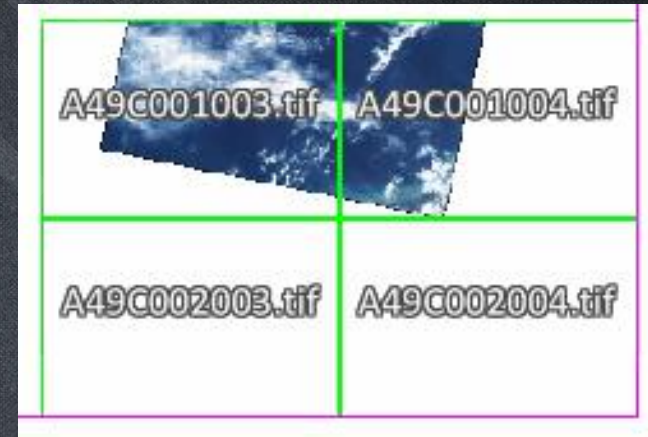
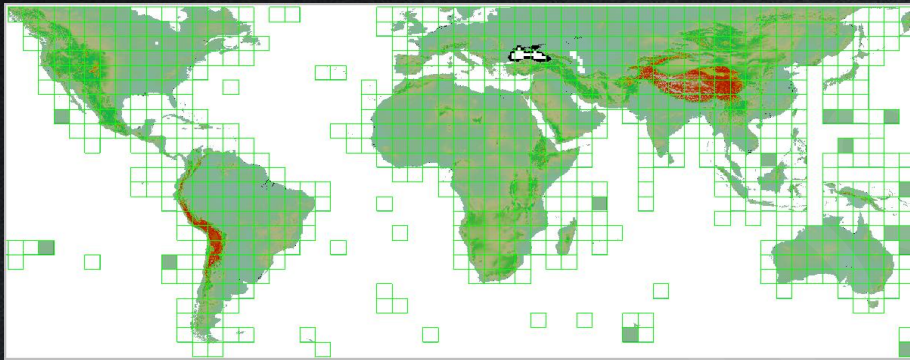
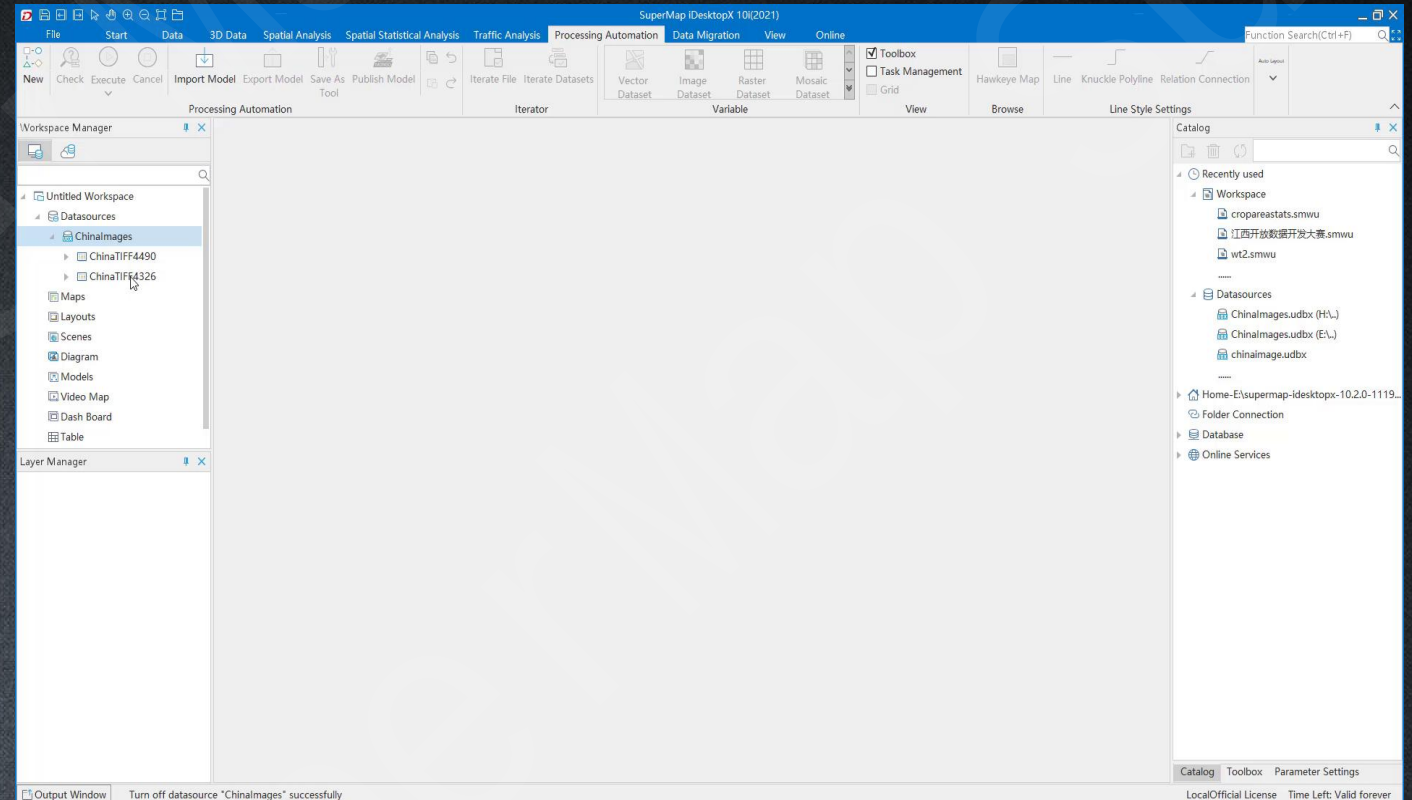
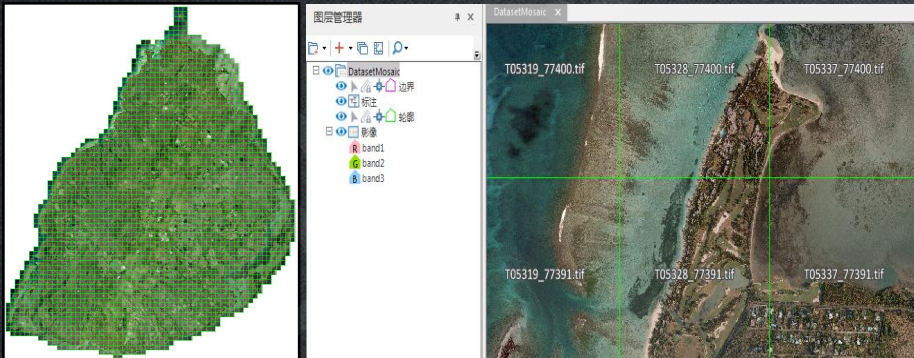


Image Big Data Management-mosaic Dataset

- Global DEM Data: 822 Tiles, 62.1GB
 - Generate Overview : 22 Minutes , 7.69 GB

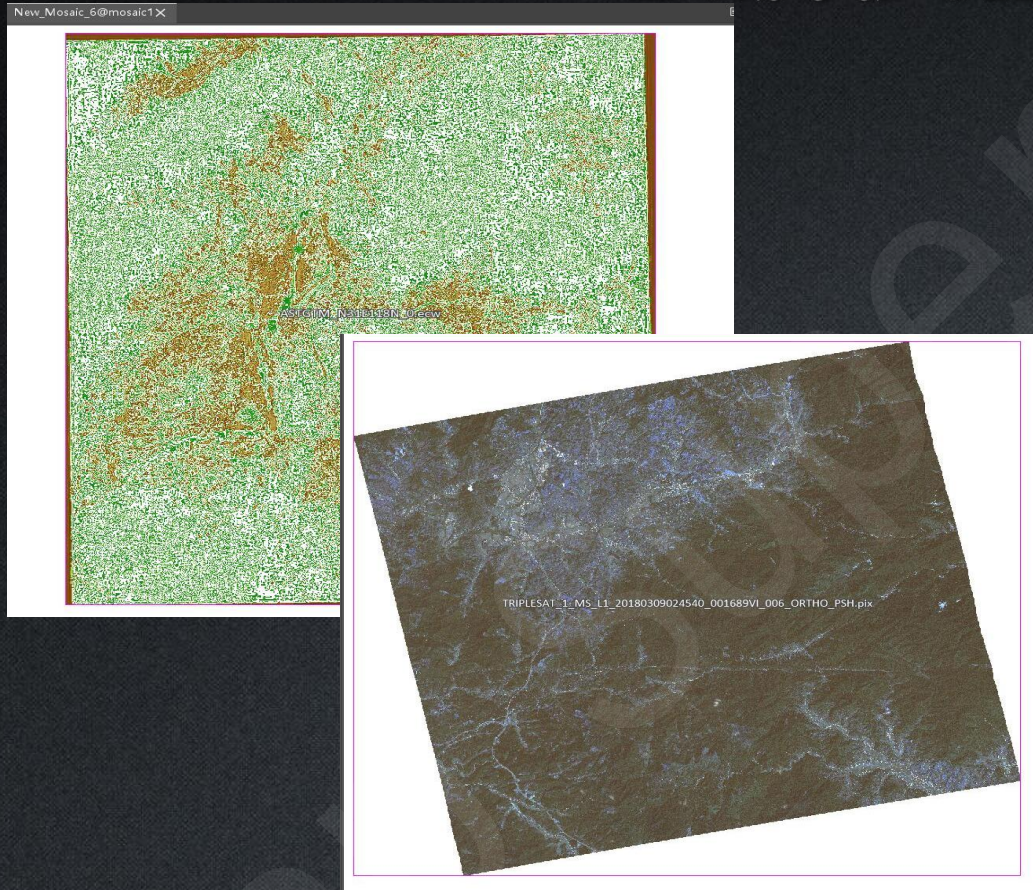


- Mauritius National Image : 2816 Tiles, 360 GB
 - Generate Overview : 43 Minutes , 37.3 GB



Mosaic dataset: no storage required, dynamic mosaic, quick browsing

Large-scale Raster Management Tool Support Based on Mosaic Dataset



Multiple Image Types

Image Management
Create Mosaic Dataset
Add Image Data
Quickly Create a Mosaic Dataset from a Single File
File List to Quickly Create Mosaic Dataset
Check the Mosaic Dataset
Batch Check COG Files
Export Data
Export Mosaic Dataset Geometry
Export File List
Open Mosaic Dataset
Modify the Mosaic Dataset
Optimize the Mosaic Dataset

Image Management Tool

Management Capabilities Based on Mosaic Datasets

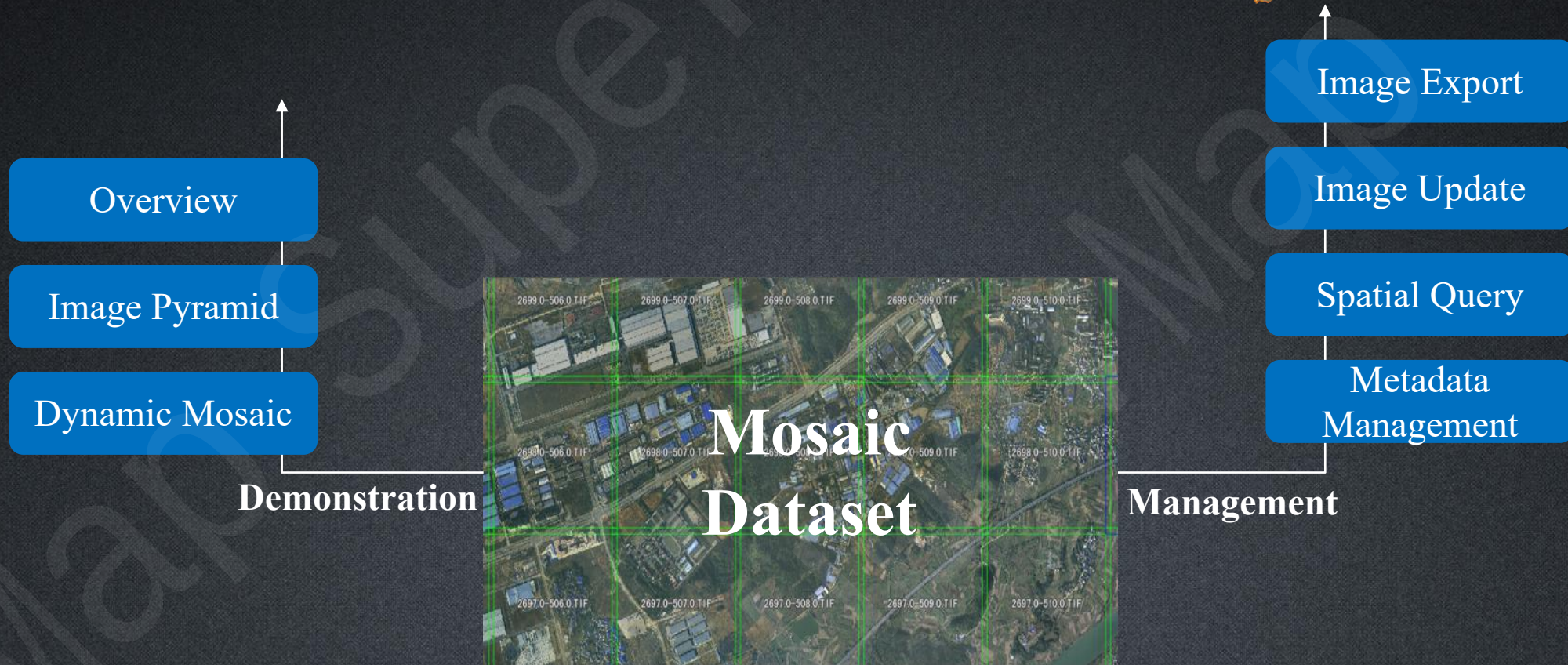
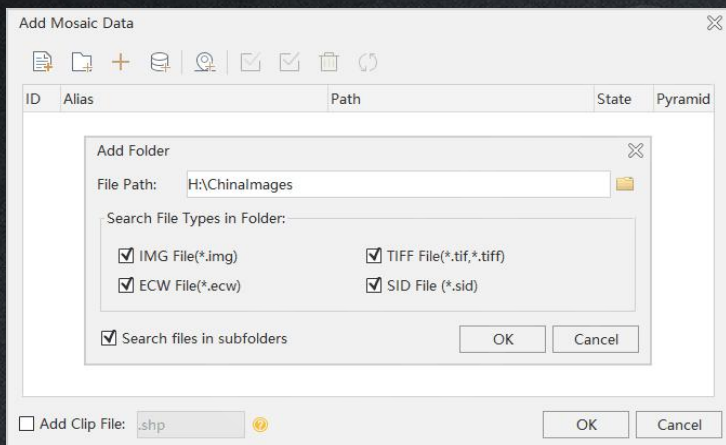


Image Data Management



One-click Loading of Massive Data

Metadata
Management

序号	SmPath	SmInfo	SmZOrder	SmFileHash	SmOvervie...	time	satellite	area
1	/home/data/liu...	<smi.RasterInf...	1	0x20E34CD CF	0			
2	/home/data/liu...	<smi.RasterInf...	1	0x20DE005D 1	0			
3	/home/data/liu...	<smi.RasterInf...	1	0x20E556AF 9	0			
4	/home/data/liu...	<smi.RasterInf...	1	0x20E5953F 3	0			
5	/home/data/liu...	<smi.RasterInf...	1	0x20E7724 18	0			
6	/home/data/liu...	<smi.RasterInf...	1	0x20E72DEC 5	0			
7	/home/data/liu...	<smi.RasterInf...	1	0x20E9968BA	0			
8	/home/data/liu...	<smi.RasterInf...	1	0x20EB276E 6	0			
9	/home/data/liu...	<smi.RasterInf...	1	0x20E92338A	0			
10	/home/data/liu...	<smi.RasterInf...	1	0x20EB8F7D 4	0			
11	/home/data/liu...	<smi.RasterInf...	1	0x20E87B07 7	0			
12	/home/data/liu...	<smi.RasterInf...	1	0x20E14D05A	0			
13	/home/data/liu...	<smi.RasterInf...	1	0x20E33390 9	0			
14	/home/data/liu...	<smi.RasterInf...	1	0x20DE4933 8	0			
15	/home/data/liu...	<smi.RasterInf...	1	0x20E0803BA	0			

名称	别名	类型
SmFileName	SmFileName	文本型
SmMinPS	SmMinPS	双精度
SmMaxPS	SmMaxPS	双精度
SmLowPS	SmLowPS	双精度
SmHighPS	SmHighPS	双精度
SmCategory	SmCategory	字节
SmPath	SmPath	文本型
SmInfo	SmInfo	文本型
SmZOrder	SmZOrder	32位整
SmFileHash	SmFileHash	文本型
UntitledField	SmOverview	文本型
time	time	文本型
satellite	satellite	字节
area	area	字节

Mosaic Dataset Attribute Table

Customized Image Data Metadata Database

Extension Development

Image Data Management

SuperMap iDesktopX 10i(2021)

File Start Data 3D Data Spatial Analysis Spatial Statistical Analysis Traffic Analysis Processing Automation Data Migration View Online Maps Thematic Mapping Style Object Operations AI Mapping Function Search(Ctrl+F)

Select Pan Zoom Zoom In Zoom Out Recognize Undo Full Extent Redo Settings Bookmark Map Location Text Search Hawkeye Map Magnifier Search And Locate Temporal Data Layer Play Play Video Map Swipe Map Clip Map Measure Unit Mapping Data Properties

Workspace Manager

ChinaTIFF4326@ChinalImages

Untitled Workspace

Datasources

ChinalImages

ChinaTIFF4490

ChinaTIFF4326

Outline

Boundary

Clip

Maps

Layouts

Scenes

Diagram

Models

Layer Manager

ChinaTIFF4326@ChinalImages

Boundary

Mark

Outlet

Image

Objects: 6 Scale: 1:3,143,120.8759° Longitude:109.308135°, latitude:33.653661° GCS_WGS_1984 Center: 109.93192532254531 31.815906154444264

ChinaTIFF4326_F@ChinalImages

ID	SmArea	SmPerimeter	SmGeomet...	SmFileName	SmMinPS	SmMaxPS	SmLowPS	SmHighPS	SmCategory	SmPath	SmZOrder	SmInfo	SmFileHash
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371	16,234,731,...	513,907.614...	BinaryData	H49C002002.tif	0	0.00172402...	0.00014372...	0.00057486...	1	H:\ChinalImages\H49C002002.tif	1	<SuperMap...	0022ac07da
372	16,234,731,...	513,907.614...	BinaryData	H49C002003.tif	0	0.00172402...	0.00014372...	0.00057486...	1	H:\ChinalImages\H49C002003.tif	1	<SuperMap...	0022ac07ea
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374	16,394,260,...	516,767.128...	BinaryData	H49C003001.tif	0	0.001724	0.000144	0.000575	1	H:\ChinalImages\H49C003001.tif	1	<SuperMap...	0022ac07fa
375	16,395,820,...	516,795.001...	BinaryData	H49C003002.tif	0	0.001724	0.000144	0.000575	1	H:\ChinalImages\H49C003002.tif	1	<SuperMap...	0022ac0809

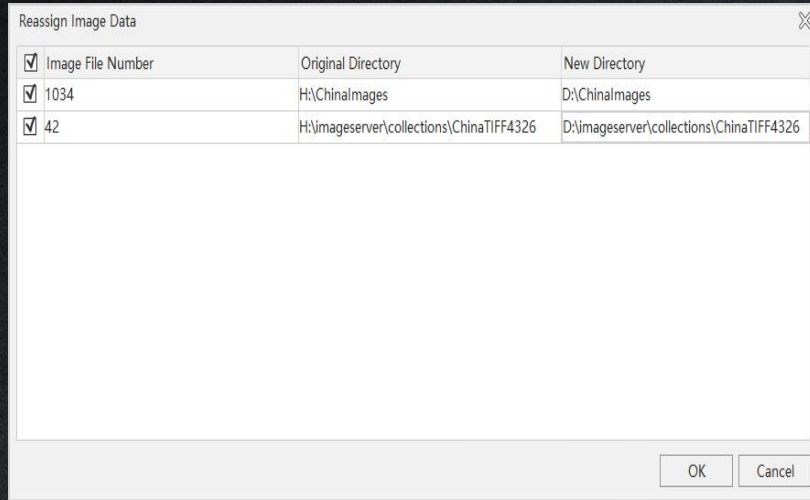
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Output Window Turn off datasource "ChinalImages" successfully LocalOfficial License Time Left: Valid forever

Data
Distribution

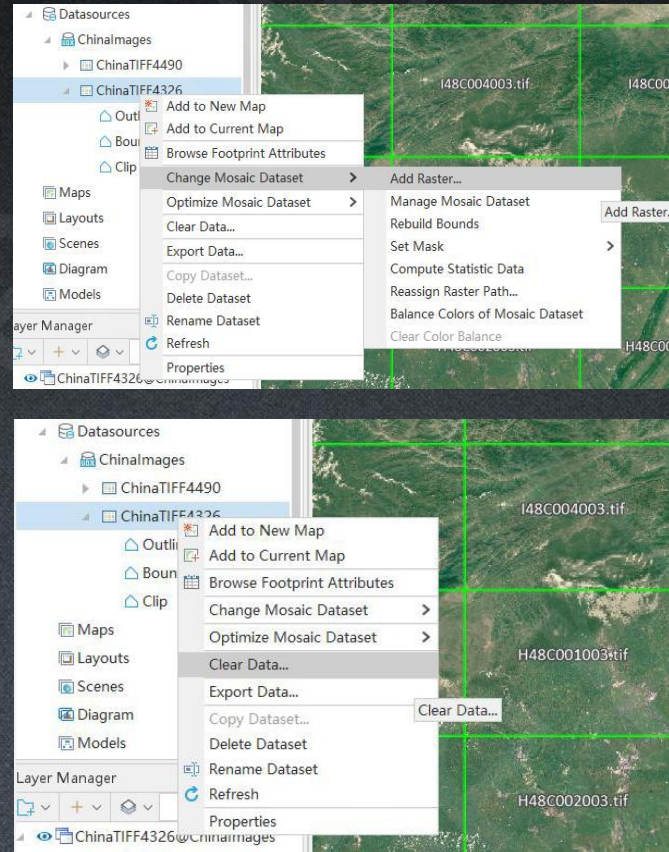
Spatial Query

Image Data Management



Update Path

Data
Management



Addition and Deletion



Update

Image Data Management

SuperMap iDesktopX 10i(2021)

File Start Data 3D Data Spatial Analysis Spatial Statistical Analysis Traffic Analysis Processing Automation Data Migration View Online Maps Thematic Mapping Style Object Operations AI Mapping Function Search(Ctrl+F)

Select Pan Zoom Zoom In Zoom Out Recognize Undo Full Extent Redo Settings Bookmark Map Location Text Search Hawkeye Map Magnifier Search And Locate Temporal Data Layer Play Play Video Map Swipe Map Clip Map Measure Unit Mapping Data Properties

Workspace Manager

ChinaTIFF4326@ChinalImages

Export Mosaic Data

☒ Export File ☐ Export File List

Export Bounds

Left: 104.30286876416999 Right: 106.40956279132571
Bottom: 30.112621621850266 Top: 32.7646655212839

Whole Map Current Windows Custom Bounds

Parameter Settings

☒ Export Overview ☒ Export Attached File

Result Data

Output Path: E:\data

OK Cancel

Objects: 0 Scale: 1:3,143,120.8759 Longitude:104.302869°, latitude:32.764666° GCS_WGS_1984 Center: 109.93192532254531 31.815906154444264

ChinaTIFF4326_F@ChinalImages

ID	SmID	SmUserID	SmArea	SmPerimeter	SmGeomet...	SmFileName	SmMinPS	SmMaxPS	SmLowPS	SmHighPS	SmCategory	SmPath	SmZOrder
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1072	1114	0	753,437,307...	6,468,662,9...	BinaryData	Ovr_L2_0x1.tif	0.005172	0.015516	0.005172	0.005172	2	H:/imageserver/collections/ChinaTI...	1
1073	1115	0	4,503,466,3...	13,601,345...	BinaryData	Ovr_L2_1x1.tif	0.005172	0.015516	0.005172	0.005172	2	H:/imageserver/collections/ChinaTI...	1
1074	1116	0	1,796,367,4...	680,385,692...	BinaryData	Ovr_L2_0x2.tif	0.005172	0.015516	0.005172	0.005172	2	H:/imageserver/collections/ChinaTI...	1
1075	1117	0	15,601,442...	27,967,791...	BinaryData	Ovr_L3_0x0.tif	0.015516	0.046549	0.015516	0.015516	2	H:/imageserver/collections/ChinaTI...	1
1076	1118	0	15,601,442...	27,967,791...	BinaryData	Ovr_L4_0x0.tif	0.046549	0.69823	0.046549	0.046549	2	H:/imageserver/collections/ChinaTI...	1

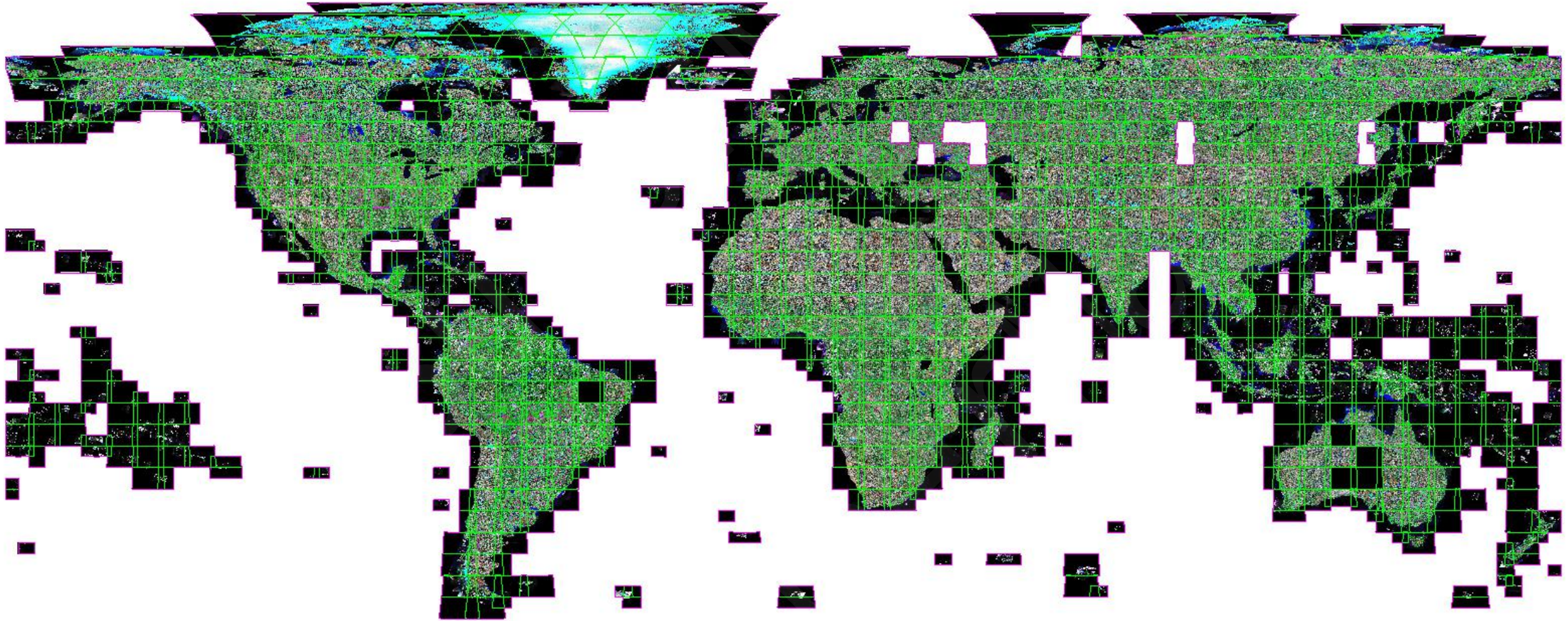
Hide System Fields Record Count: 1/1,076 Type: Int Name: SmID Max Number: 5,000,000 The 1 Page, total 1 page

Output Window Turn off datasource "ChinalImages" successfully LocalOfficial License Time Left: Valid forever

Data
Distribution

Typical Application : Global Management

HONEYCOMB.ORG



Full-process Imaging Technical Support

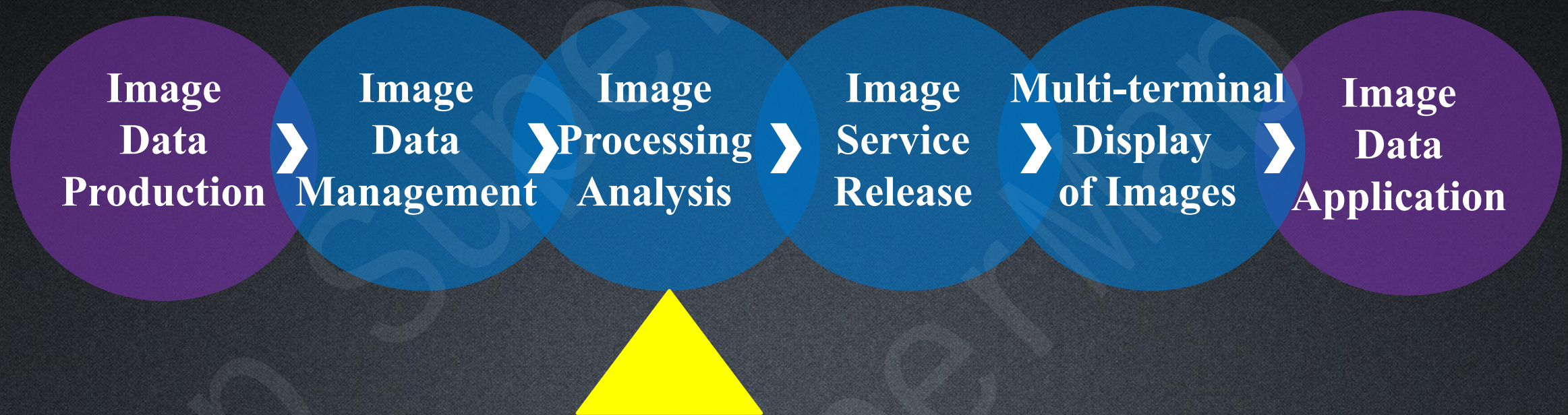


Image Data Analysis

Basic Analysis

Conventional raster/image analysis based on parallel computing and memory computing



Distributed Analysis

High-performance raster/image analysis based on Spark distributed computing



AI Analysis

Image analysis of deep learning technology based on GeoAI sample/training/reasoning process



GP Model

Basic Analysis and Calculation of Raster/Image Data

Vector to
Raster

Image Stretch

Image
Synthesis

Point To Grid

Arithmetic
Function

Conditional
Function

Data Type
Conversion

Map Roller

Image Mosaic

Re-sampling

Trigonometric
Function

Exponential
Function

Image
Registration

Temporal
Data

Image Cache

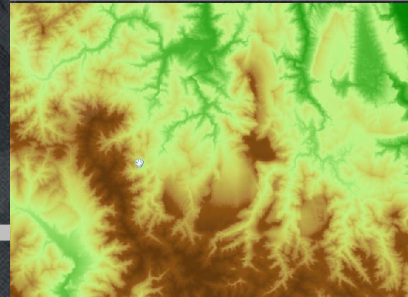
Reclassification
on

Pixel Format
Conversion

... ..

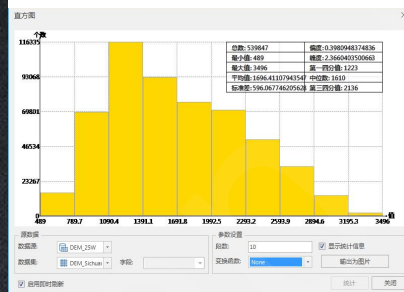
Raster Statistical Analysis

Original Data



5 Types of Statistical Methods

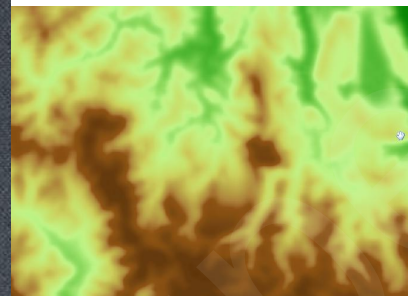
Basic Statistics



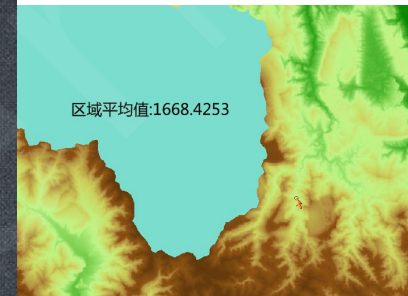
Common Statistics



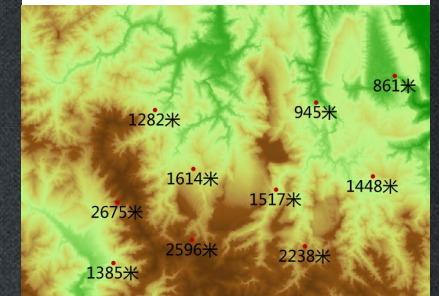
Neighbor Statistics



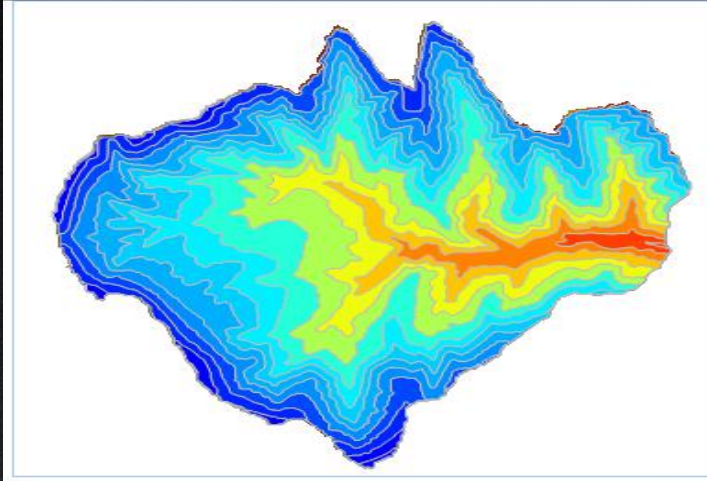
Zonal Statistics



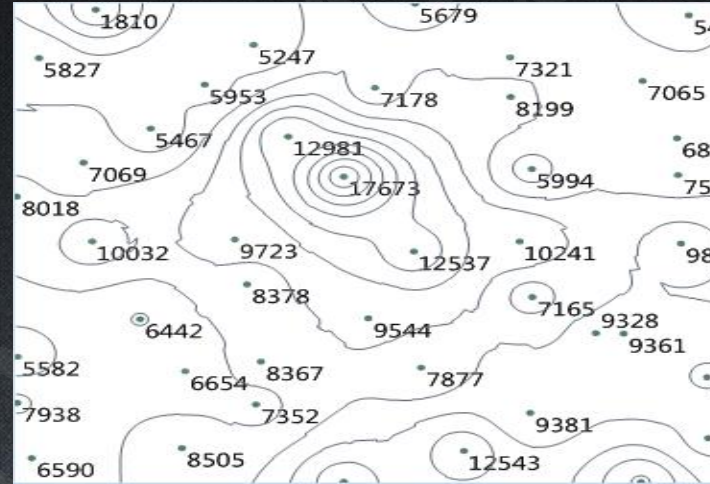
Elevation Statistics



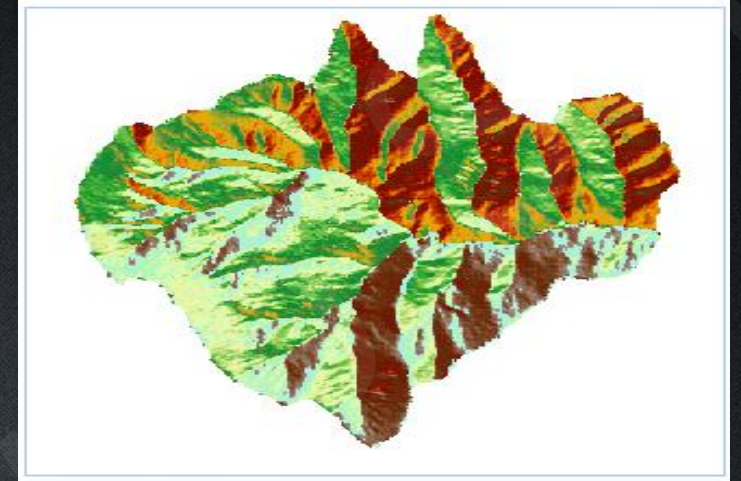
Terrain Surface Analysis



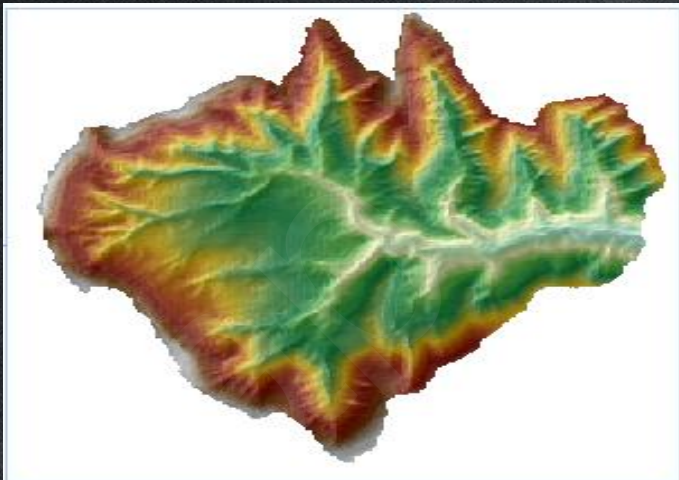
Extract All Isosurfaces



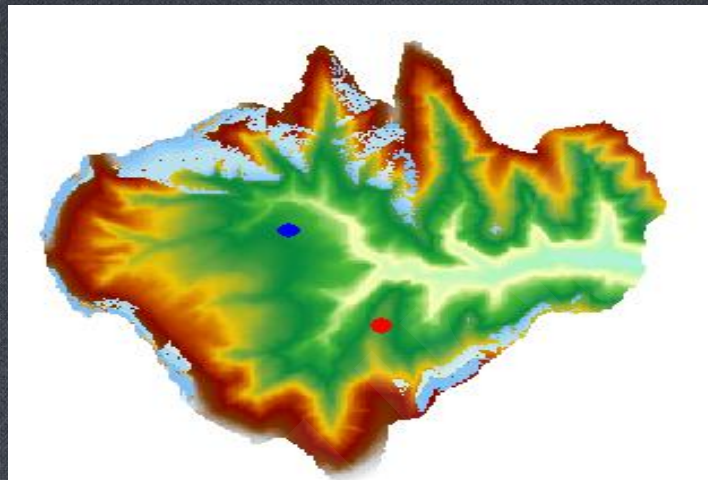
Point Data Extraction Contour



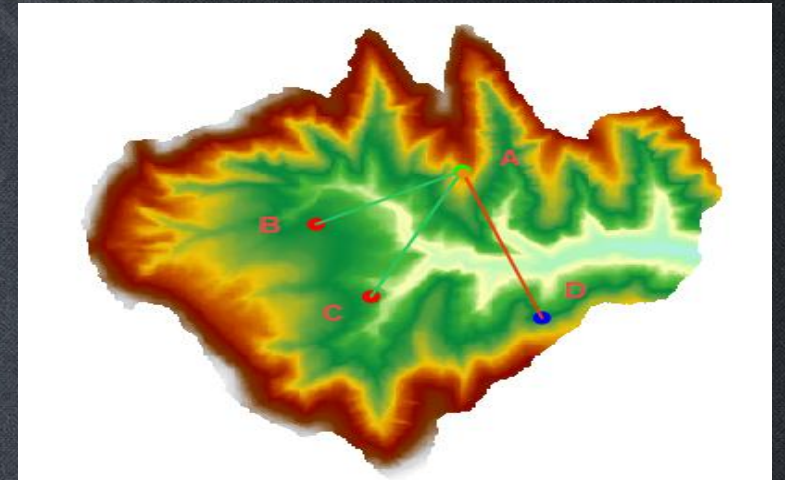
Aspect Analysis



3DShading Map

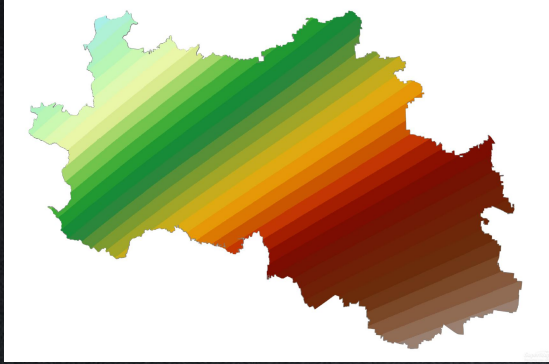


Visual Field Analysis

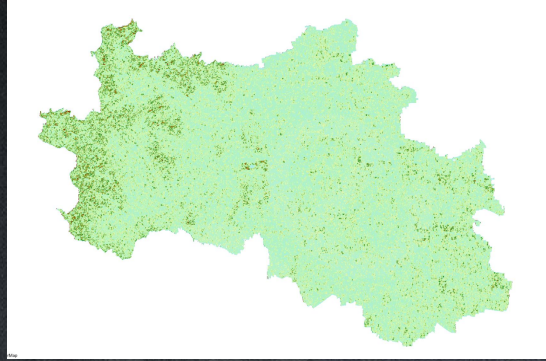


Multi-point Visibility Analysis

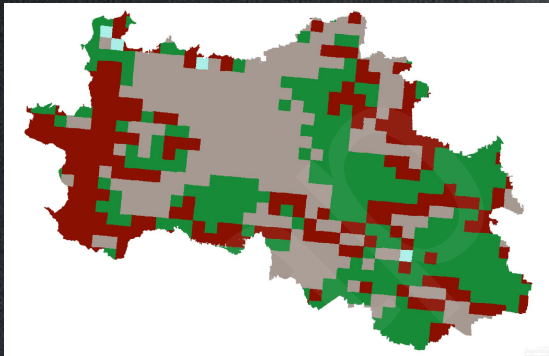
Reclassification



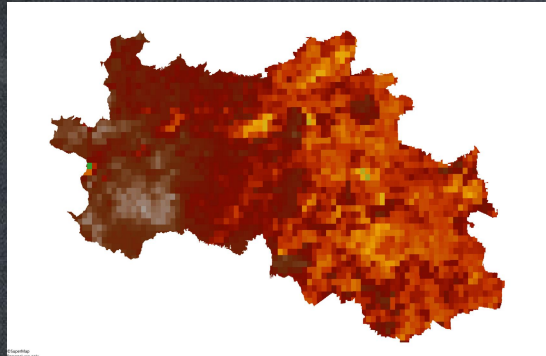
Rainfall
Erosion Factor



Terrain Factor

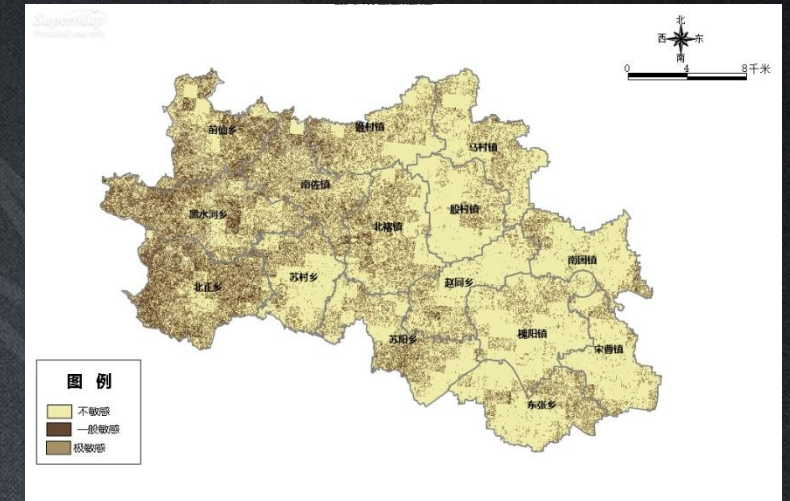


Soil Erodibility
Factor

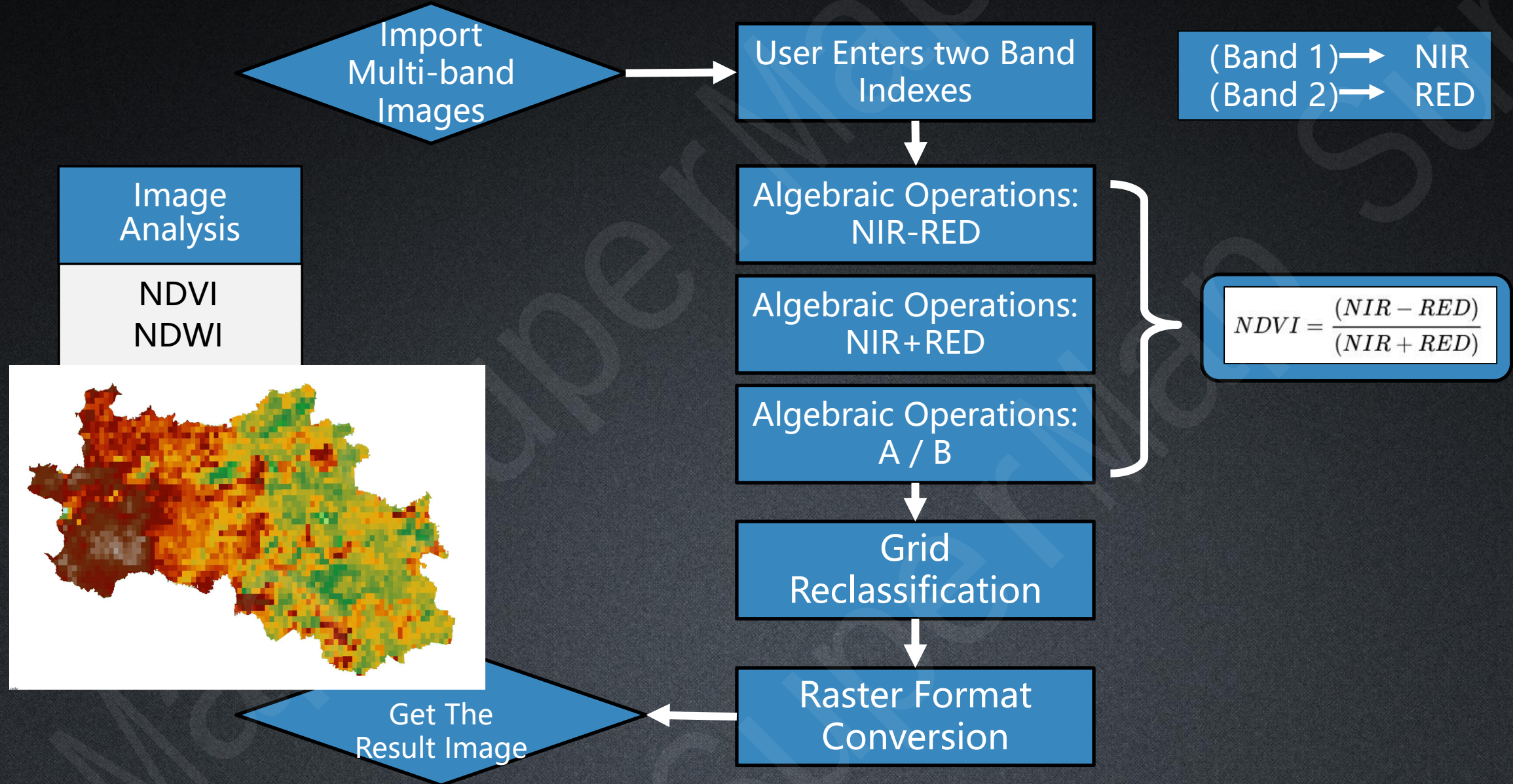


Vegetation
Coverage Factor

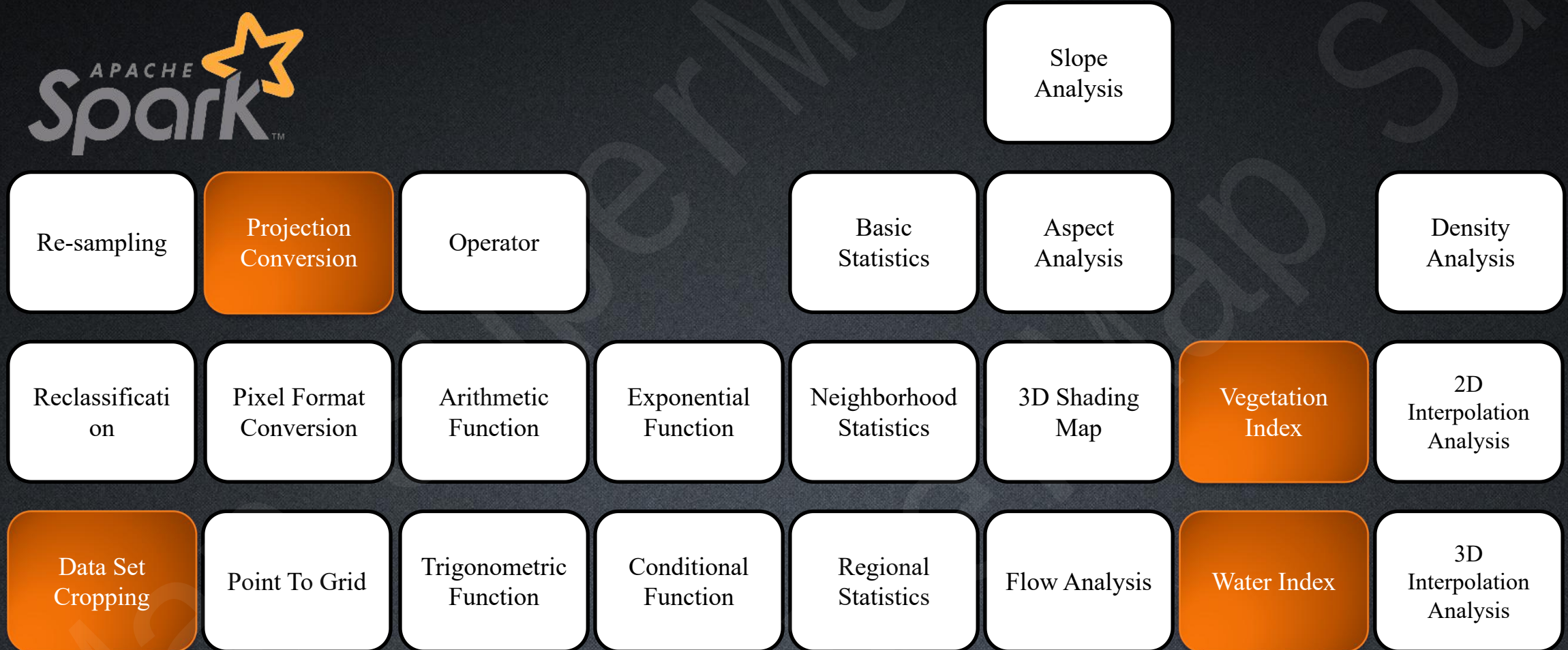
Data Processing
--Reclassification



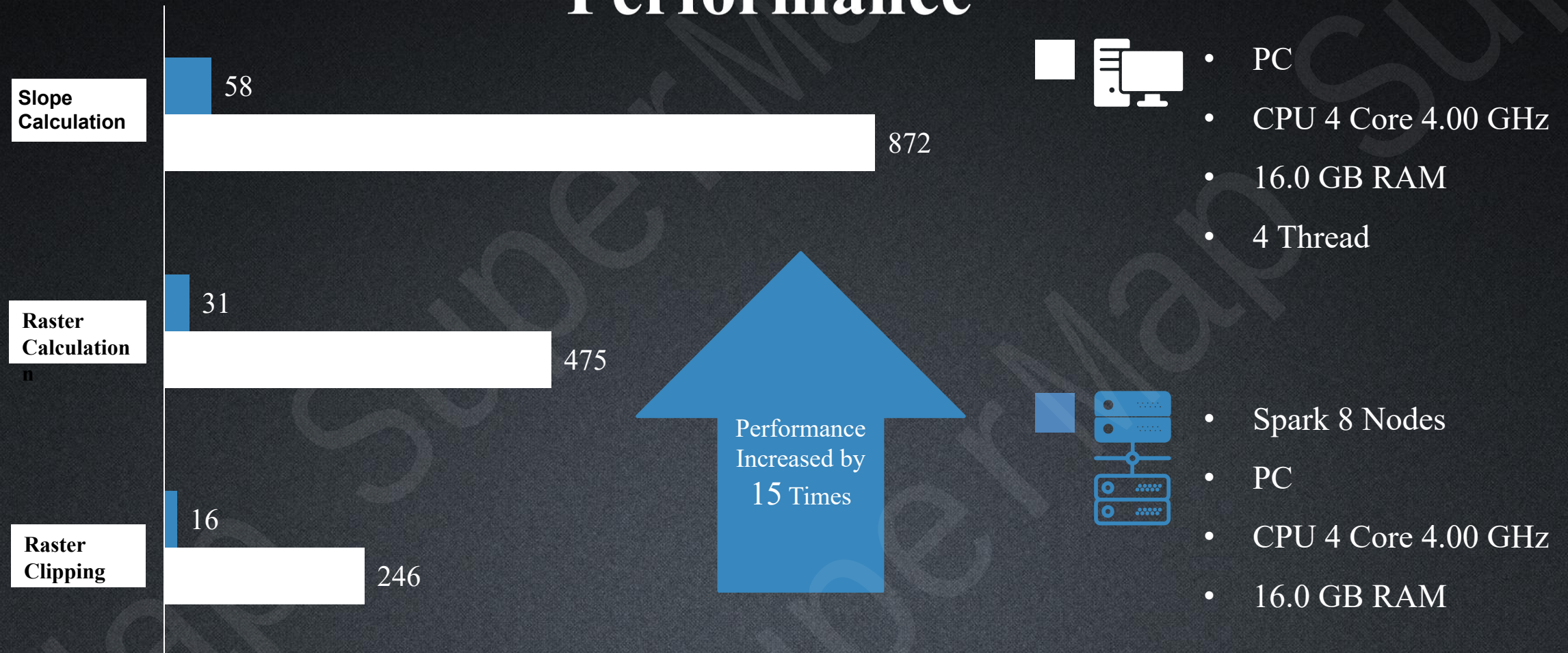
NDVI/NDWI



Raster/Image Data Distributed Analysis and Calculation

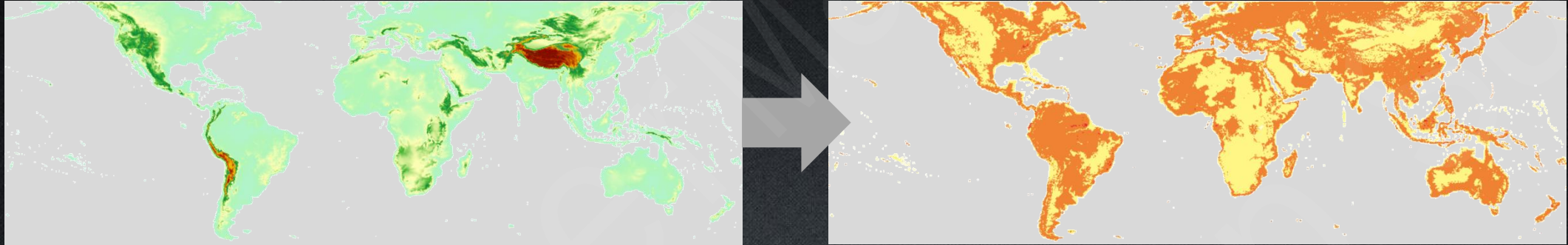


Raster Data Distributed Processing and Analysis Performance



*The Time Unit is Minutes. The Grid Data Used for Testing is 336,800 Wide and 215,601 High, Occupying 60GB of Disk

Terrain Suitability Analysis



52 Hours

Traditional Computing Model

Traditional computing model

A large amount of intermediate temporary data generated
in the process



CPU 4 Core 16.0 GB Storage

1.1 Hours

Distributed Computing Model

Function chain

No need to store intermediate data

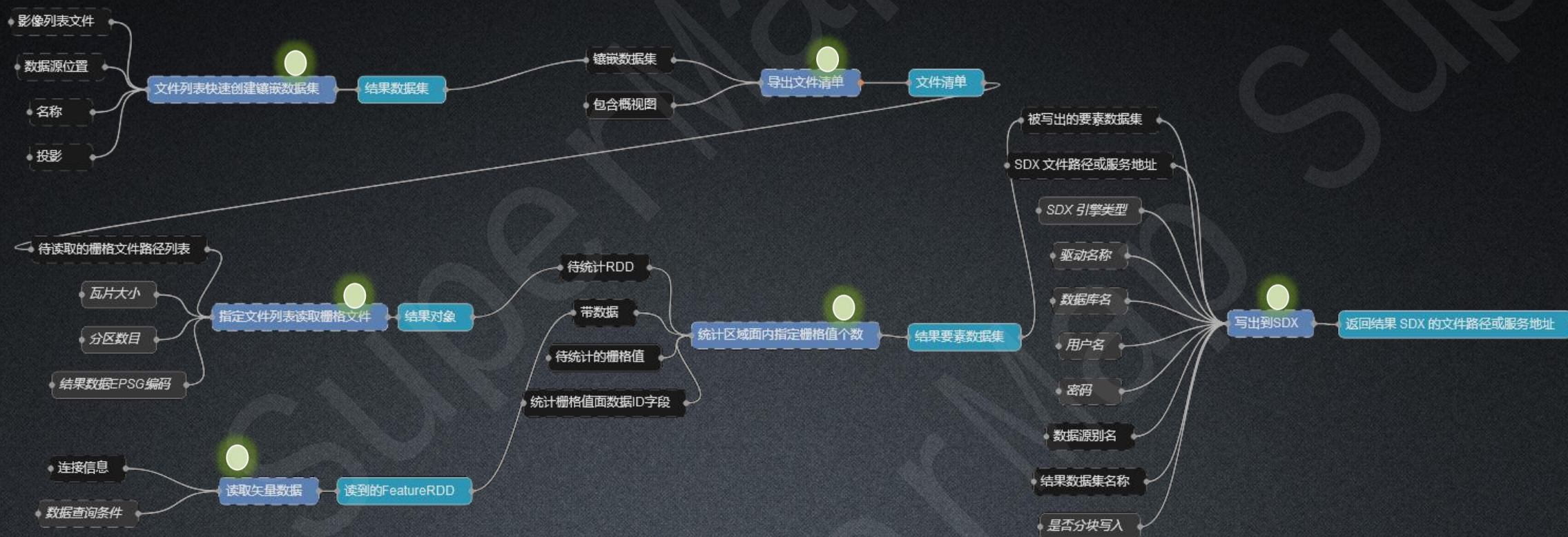


8 Thread : CPU 4 Core 16.0 GB Storage

Performance
Improvement
 $\approx$
50 Times

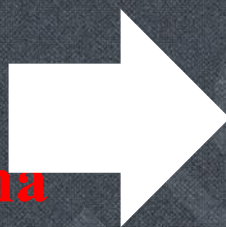
Visual Modeling Enables Large-scale Raster Analysis

——Statistics of Cultivated Land in Global Countries



Traditional Stand-alone Method:

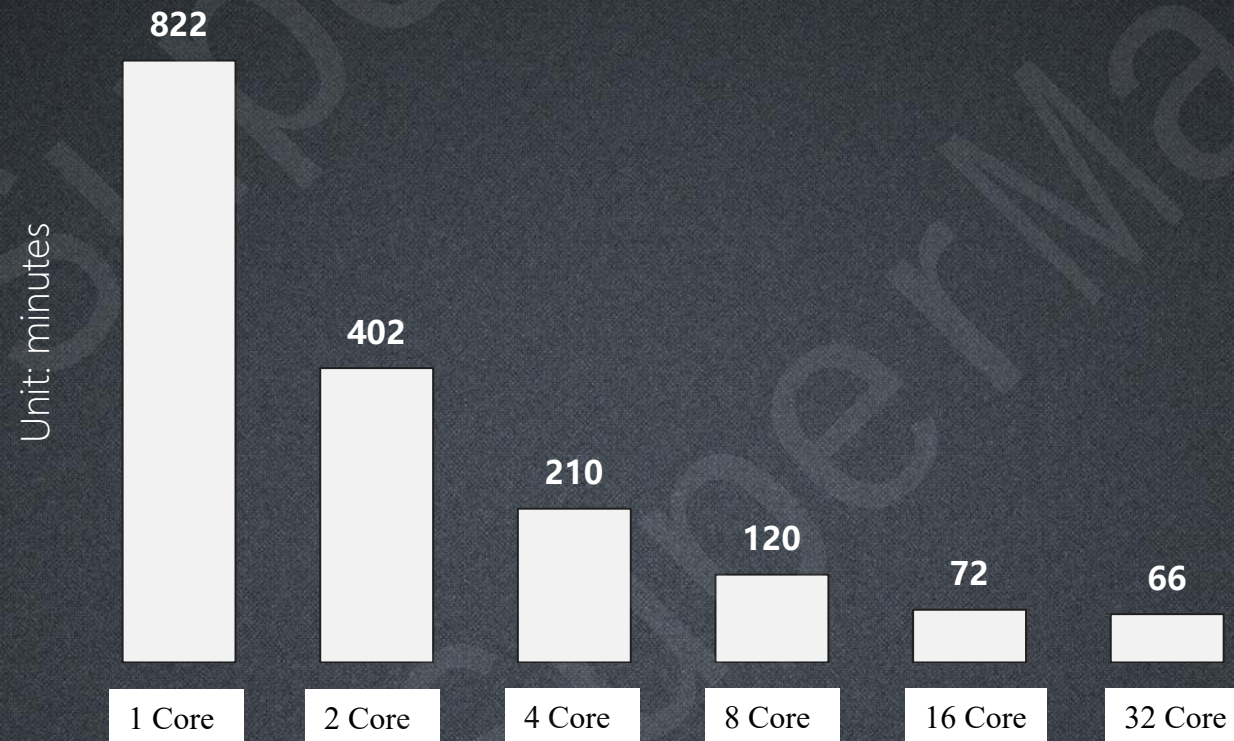
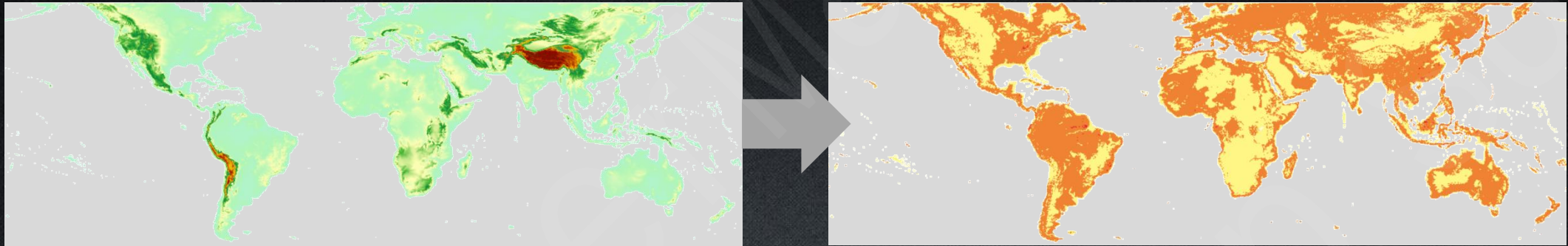
- Statistics by Country
- More Than 10 Hours in China**



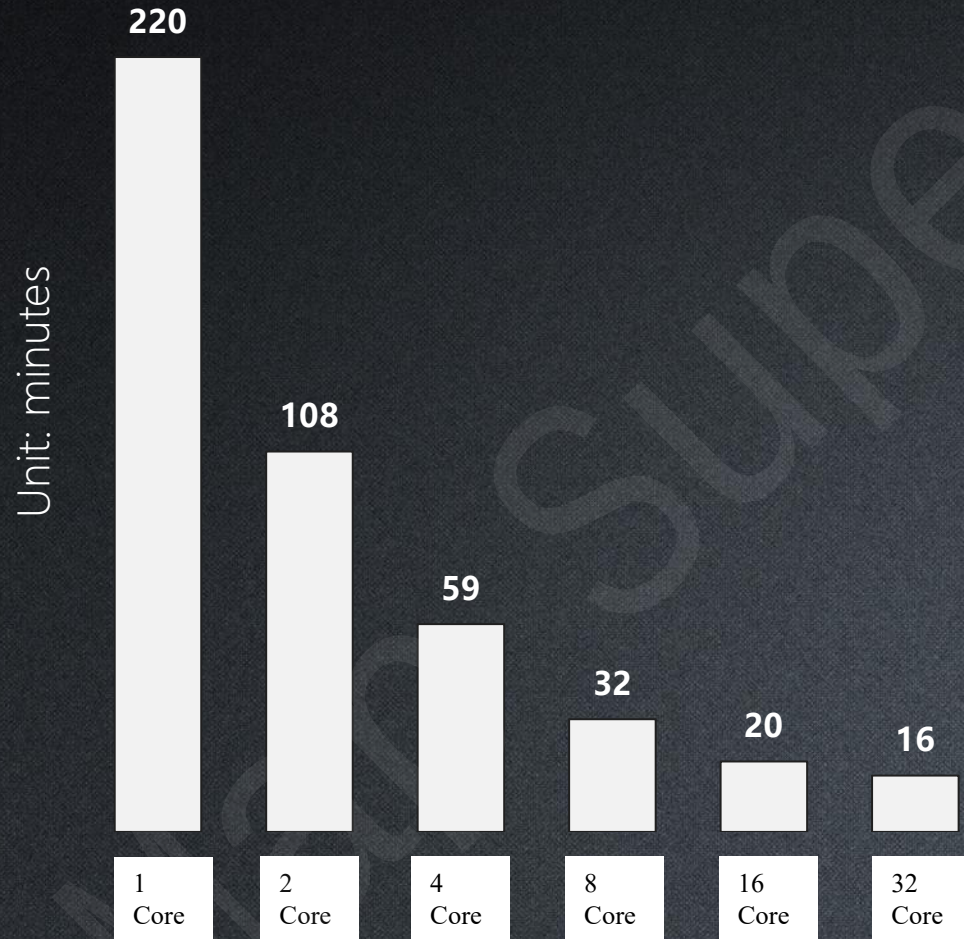
Distributed Analysis (6 Worker * 4 Core 16G) :

- Full Calculation of Global Countries
- 44 Minutes in Total**

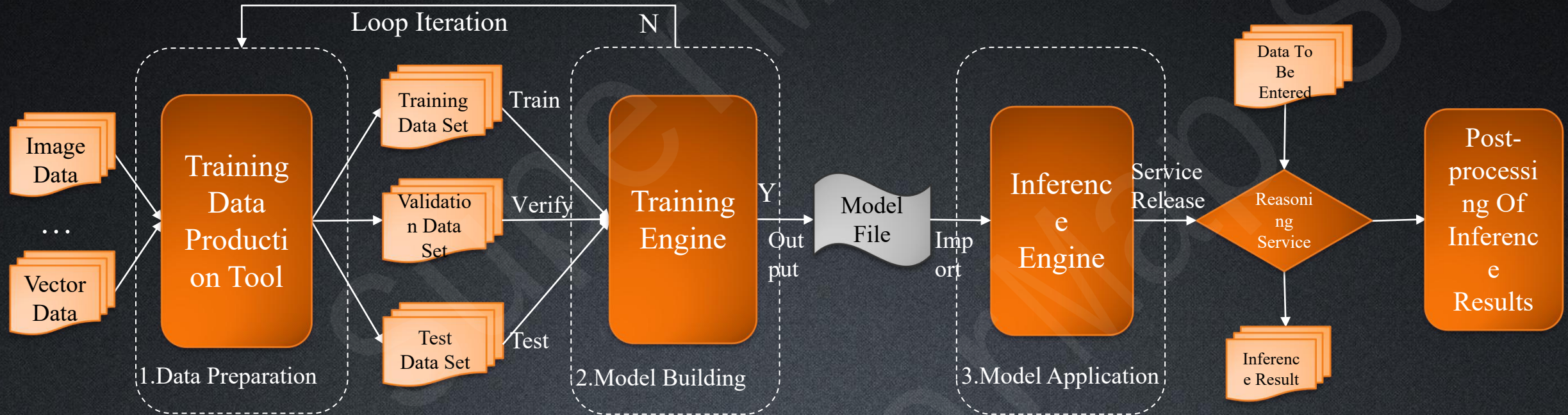
Terrain Suitability Analysis



Vegetation Cover Analysis



GeoAI



Full-process Imaging Technical Support

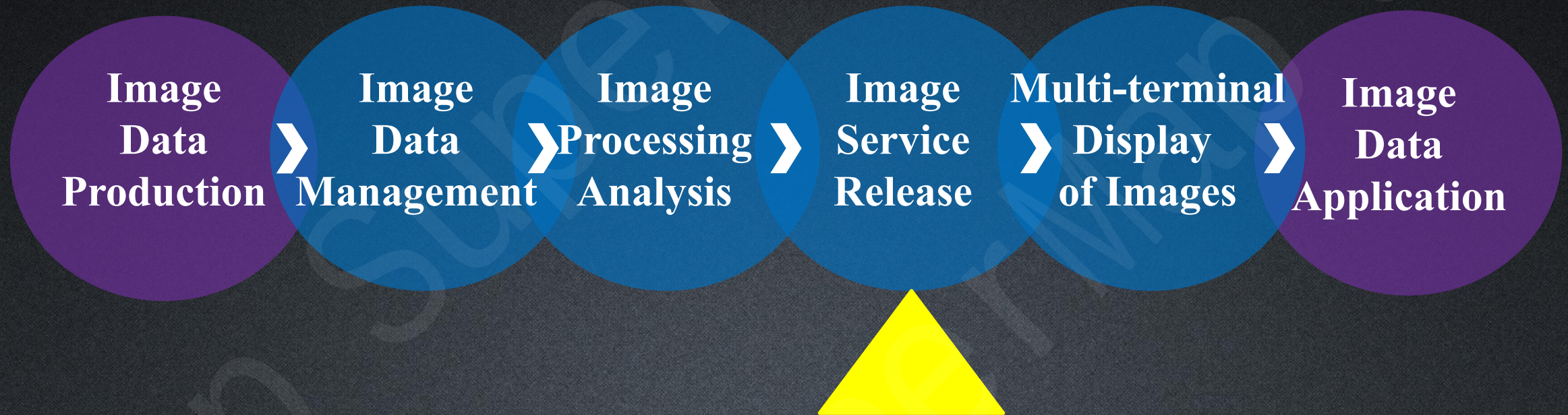


Image Base Map Service

- REST
- WMTS



Image Service

- Quick release based on image catalog
- Internal resource access based on STAC protocol
- Image service display (Tile\WMTS)
- Image service filtering
- Image service retrieval

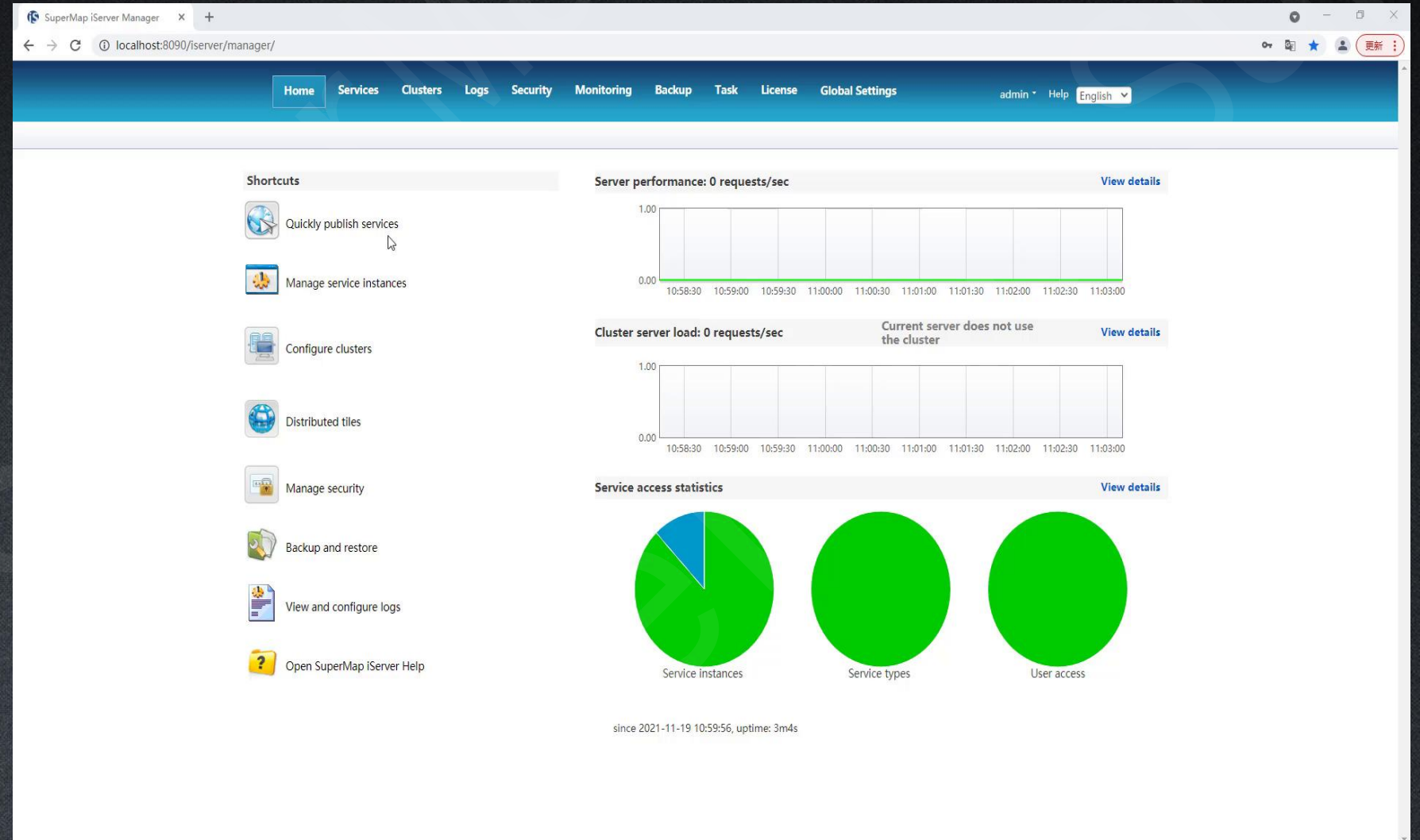


Image Service Inquiry and Browsing

SuperMap iServer Manager x SuperMap iServer REST API x SuperMap iServer REST API x 影像浏览 x +

localhost:8090/iserver/apps/imageservice/index.html?root=http://localhost:8090/iserver/services/imageservice-Chinalmages/restjsr

影像浏览

+
-

Q 查询

🗺️ 漫游



经度:145.14 纬度:52.57

▼ 查询

Collections

点击选择collection, 不选查询全部

行政区检索

Please select

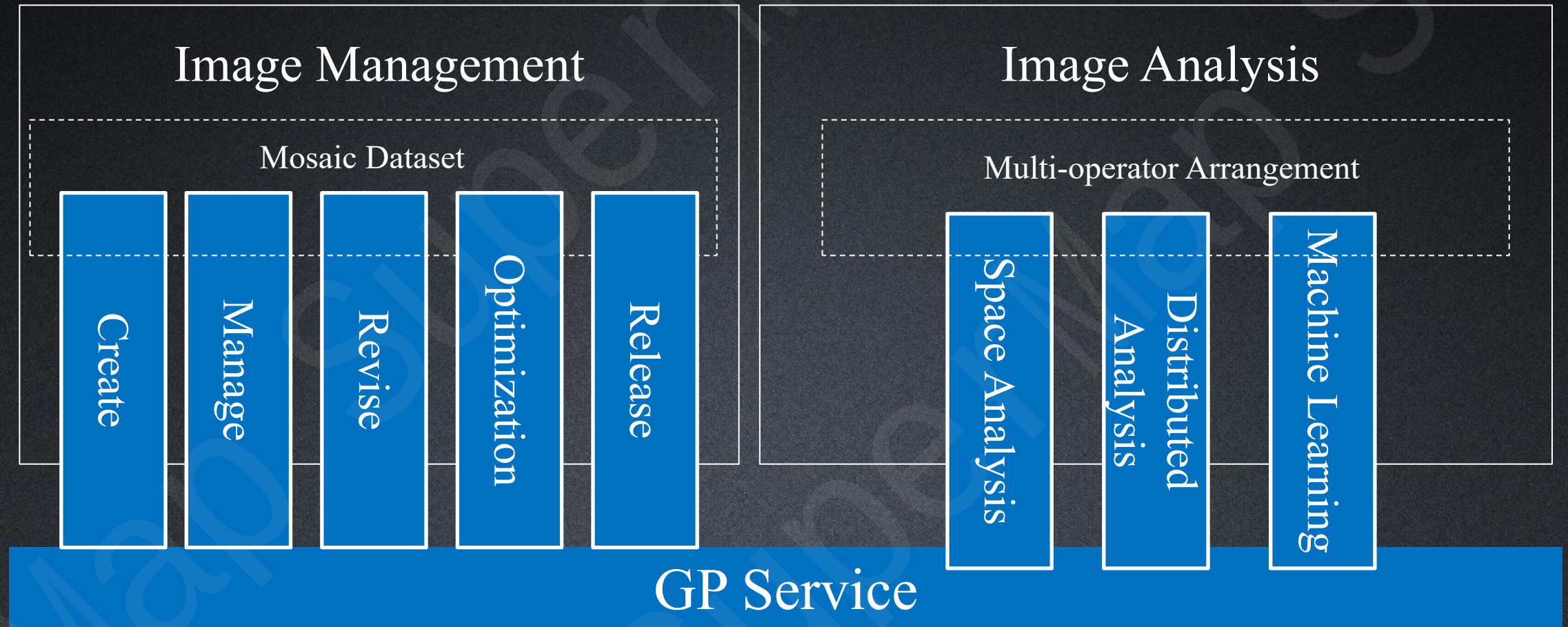
多边形检索

矩形检索

Q 查询

🔄 重置

GP Service



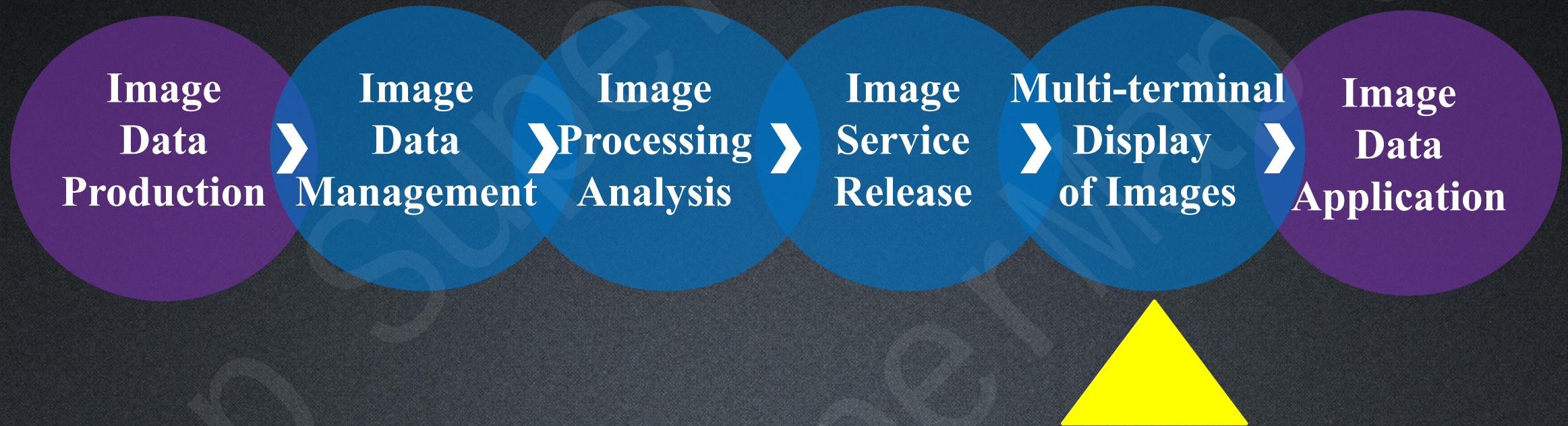


搜索

- 大数据栅格管理工具
- 大数据栅格分析工具
- 大数据矢量管理工具
- 大数据矢量分析工具
- geotools扩展算子
- 数据管理
- 数据迁移
- 数据处理
- 数据导出
- 数据导入
- 影像管理
- 三维数据
- 地图瓦片
- 栅格分析
- 空间统计分析
- 拓扑模块
- 交通分析
- 类型转换
- 矢量分析
- 空间深度学习
- 结果发布
- 自定义工具
- 空间机器学习

Analysis of Cultivated Land Quality Based on WebGP

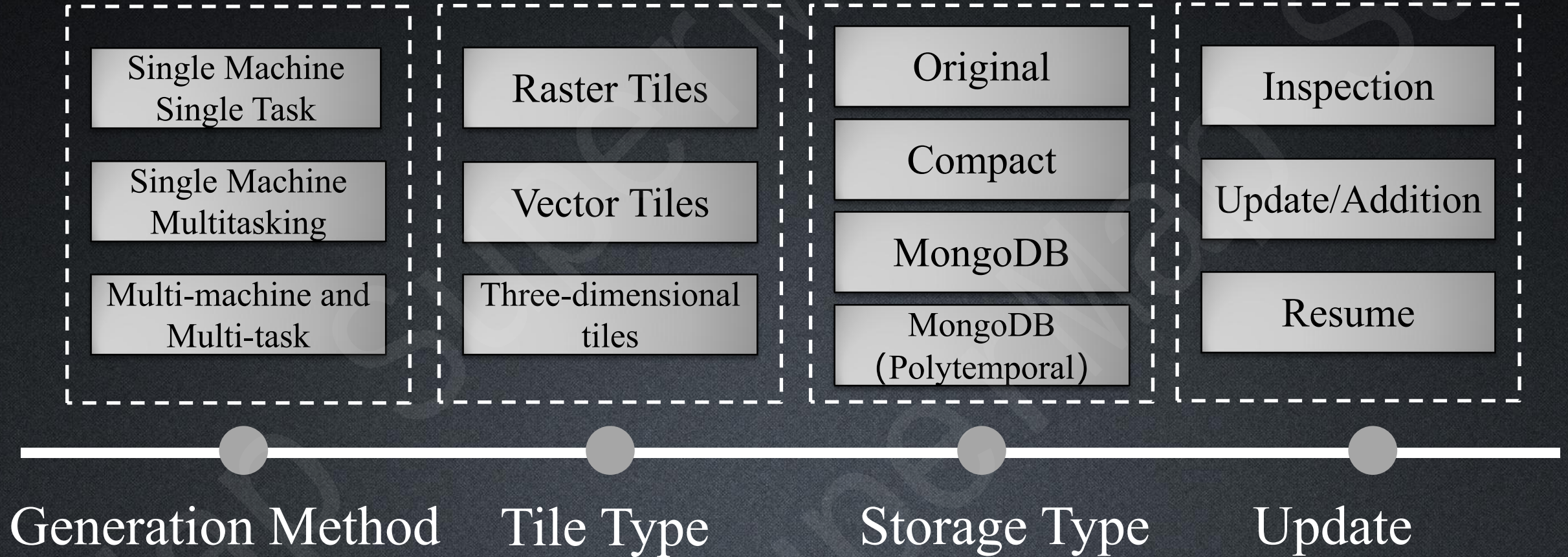
Full-process Imaging Technical Support



Pre Caching and Slicing Free

No.	Item	Caching	Slicing Free
1	Calculation Type	IO Intensive	IO + Compute Intensive
2	Data Storage	Compact Cache, MongoDB Cache	Original Image File (COG optimization)
3	Data Security	High (No need to provide original data)	Low (Need to provide original data)
4	Data Production Cycle	Long, and there will be copies of the data	Short
5	Computing Resource Requirement for 100 concurrency / s	Low Ordinary PC can meet the requirement	High, Requires 64-100 cores, high frequency CPU Better to store data locally
6	Web Side Optimization Strategy	No need, always can get good performance	1. 512 TileSizes 2. Full screen display Need to minimize concurrency
7	Suitable Application Scenarios	High Concurrency Basic Image Map Service	Data Management System Thematic data to be published quickly

Full-process Map Tile Production Technology Program



TB-level Raster Data "Slicing Free" Released





PART 3

Typical Application

Application Field of Remote Sensing Technology

Land Resources

Land Resource Survey
Classification of Land Use Types
Land Change Survey
Dynamic Monitoring and
Inspection
Satellite Remote Sensing for Land
Law Enforcement
Town and Country Planning
Water Source Forest Project
Monitoring
Large Equipment Management
Precise Forest Cultivation
.....

Water Conservancy

Water Resources Management
Water Environment Monitoring
Soil And Water Conservation
Water Conservancy Project
Monitoring
Flood and Drought
Ecological Environment
Monitoring

Agriculture

Agricultural Resource Survey
Monitoring The Dynamic Changes
of Agricultural Land
Agricultural Disaster Monitoring
Smart Agriculture

Emergency Management

Forest Fire Monitoring
Emergency Deployment For Natural
Disaster Evacuation
Auxiliary Patrol Deployment
Urban Emergency Mobilization
Police Integrated Geographic
Information System
Medical And Public Health Emergency

Meteorology

Weather and Climate Monitoring
(Temperature, Precipitation, Aerosol)
Meteorological Disaster Monitoring
(Typhoon, Sandstorm, Sea Ice)

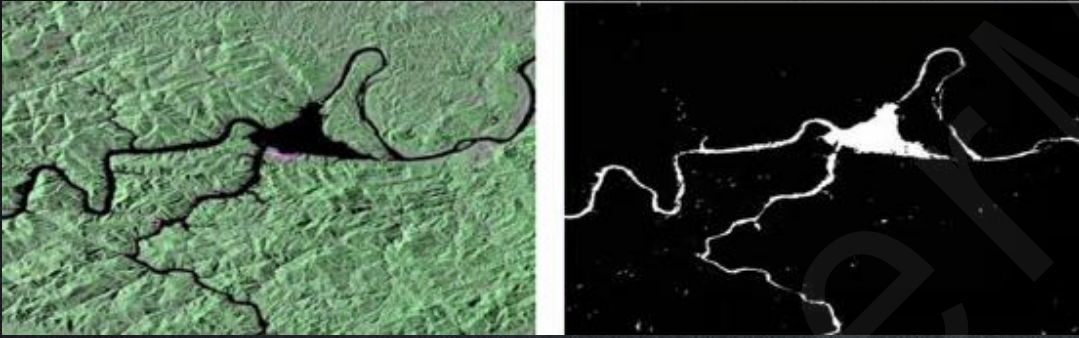
Smart City

Urban Thermal
Environment
Smart City Monitoring

Transportation

Road Network Planning And Design,
Operation And Maintenance
Environmental Monitoring and
Assessment of Key Road Areas
Sea Traffic

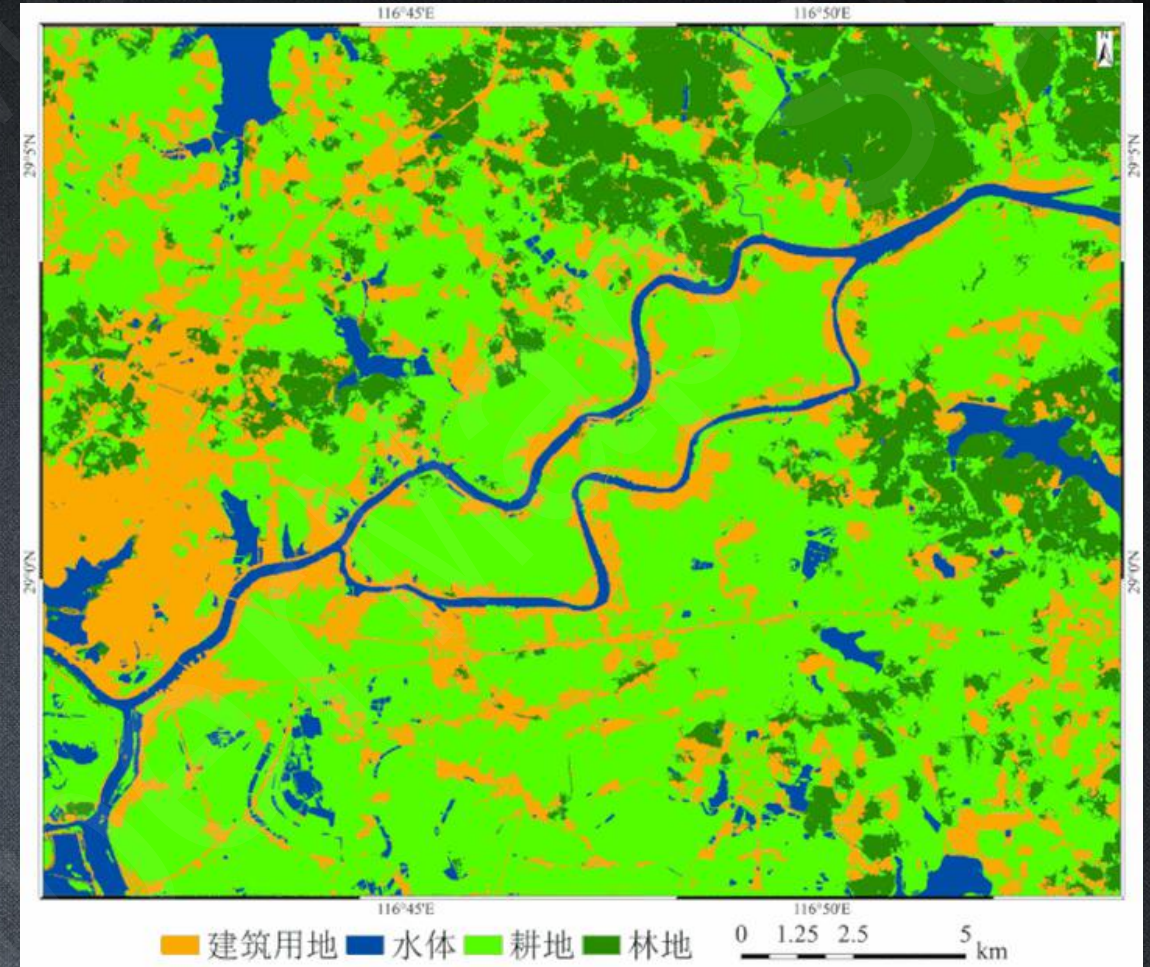
Water Conservancy Remote Sensing Application- Water Body Monitoring



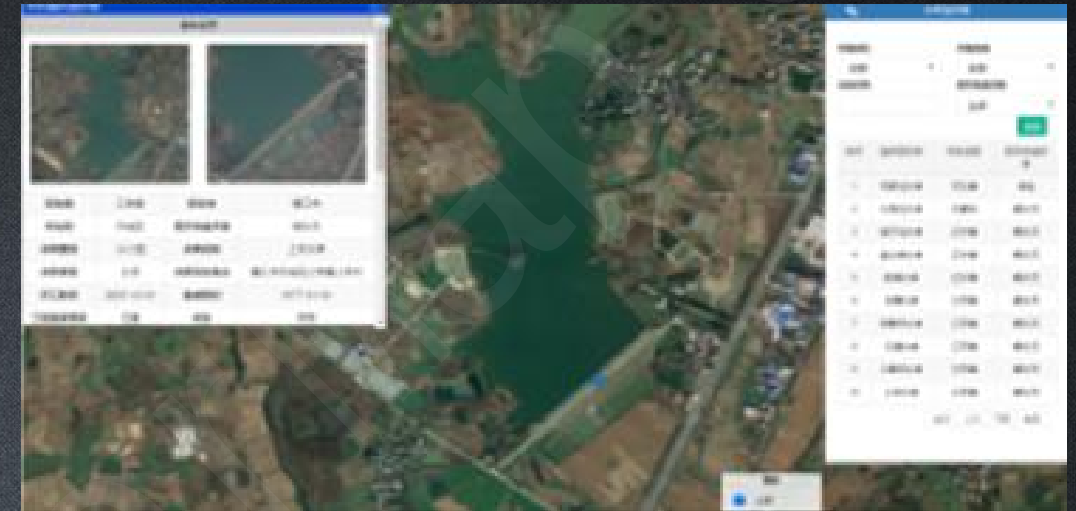
Water Body Identification



Analysis of Flood Disaster



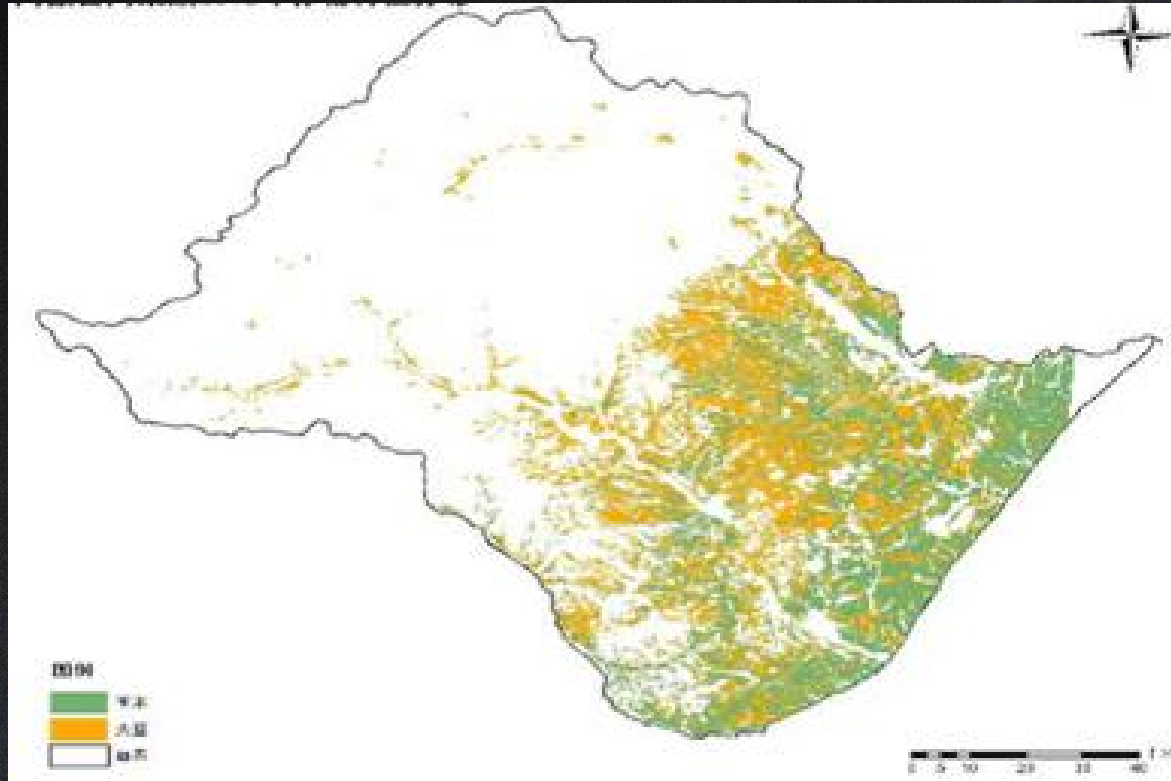
Water Conservancy Remote Sensing Application- Information Service



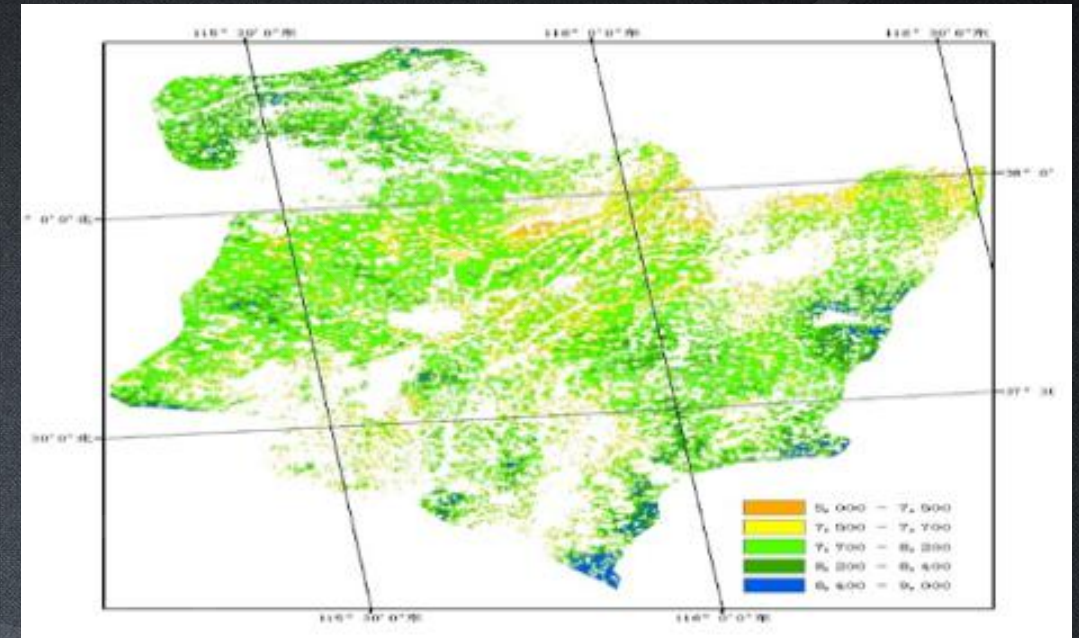
**Decision Support System for Safety Production
of Water Conservancy Project**

Flood Risk Map Management System

Agricultural Remote Sensing Application- Obtaining Agricultural Information



Crop Planting Distribution



Crop Yield Estimation

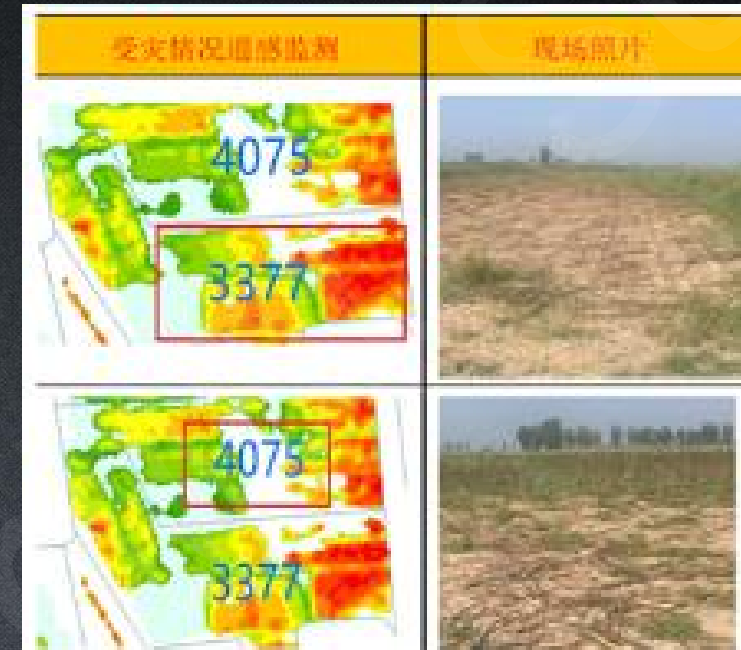
Agricultural Remote Sensing Application-monitoring



Crop Monitoring



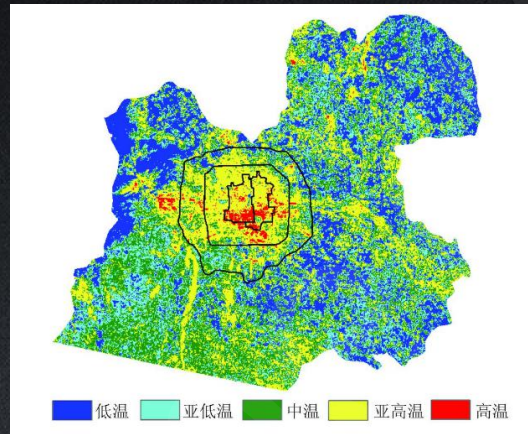
Agricultural Resource Monitoring



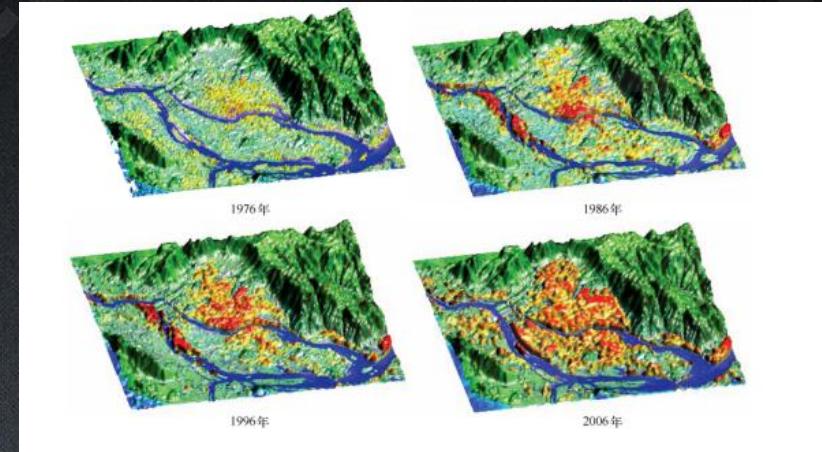
Crop Disaster Monitoring

Smart City Remote Sensing Application

Urban Thermal Environment

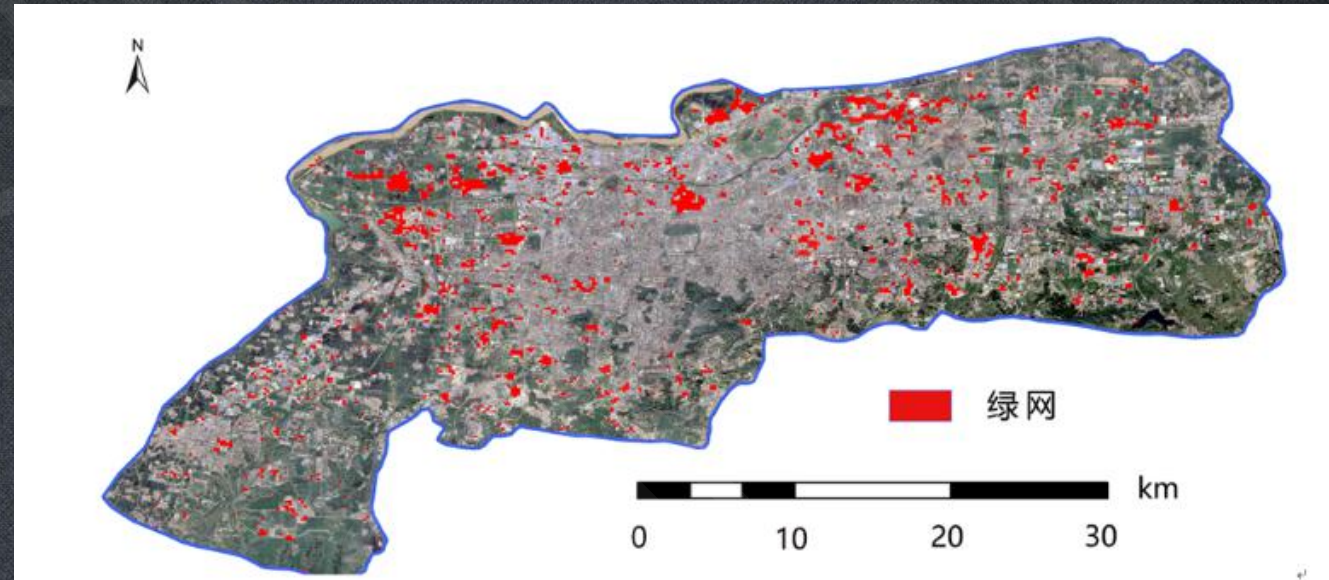


Analysis of Beijing Heat Island Effect



3D Urban Heat Island Model

Urban Construction



Smart City Remote Sensing Application



Smart City Platform

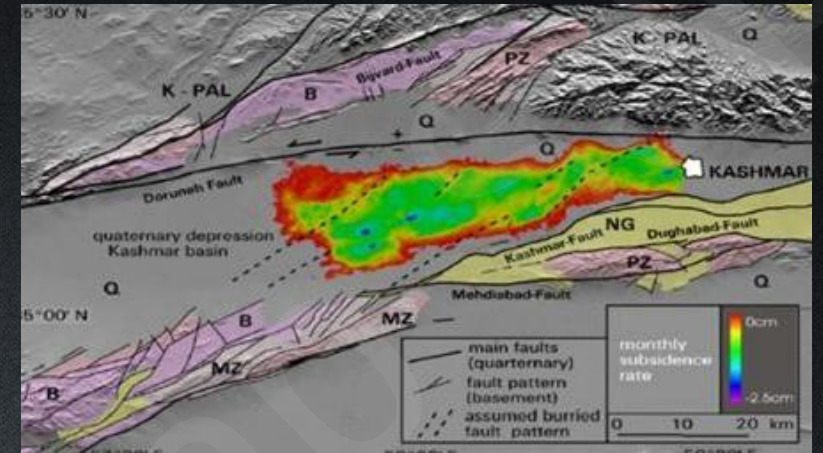
Traffic Remote Sensing Application



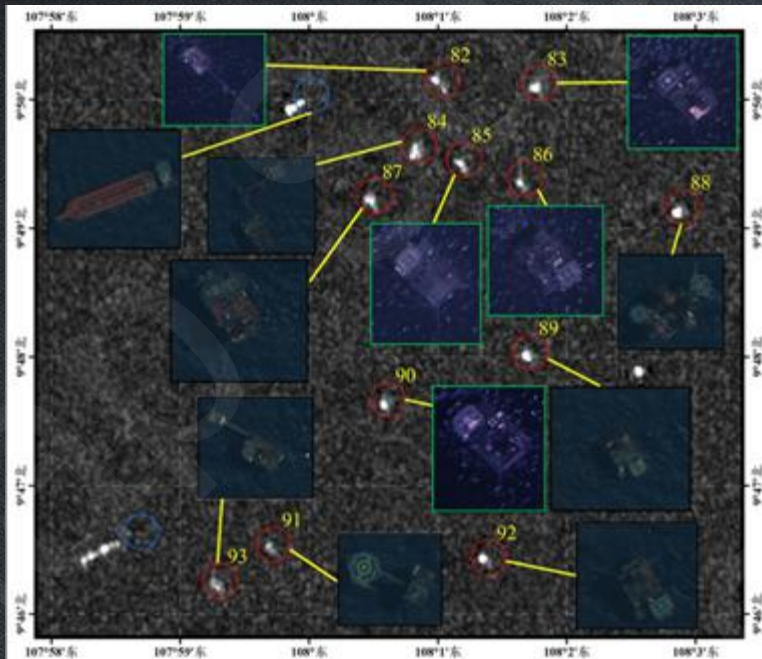
Highway Under Satellite Image



Extract and Update the Road Network Efficiently and Quickly



Use Remote Sensing to Monitor Geological Subsidence and Serve for Site Selection



Offshore Oil and Gas Platform Monitoring

THANK YOU

