

SuperMap iServer Map Cache

SuperMap Software Co., Ltd.



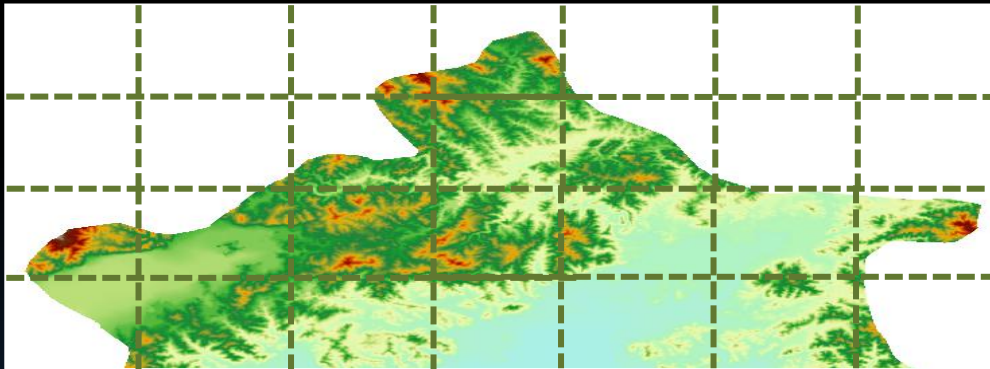
Main Contents

- **What is map cache?**
- **Why map cache?**
- **Mechanism of map cache.**
- **How to create map cache?**
- **How to use map cache?**
- **Suggestions for using map cache.**

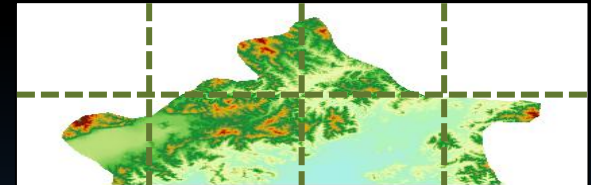
Declearation: all the 'iServer' mentioned in the ducument refers SuperMap iServer products if no other specific name mentioned

What is map cache?

- The pre-produced map tiles which can improve the map access efficiency



1:1000000

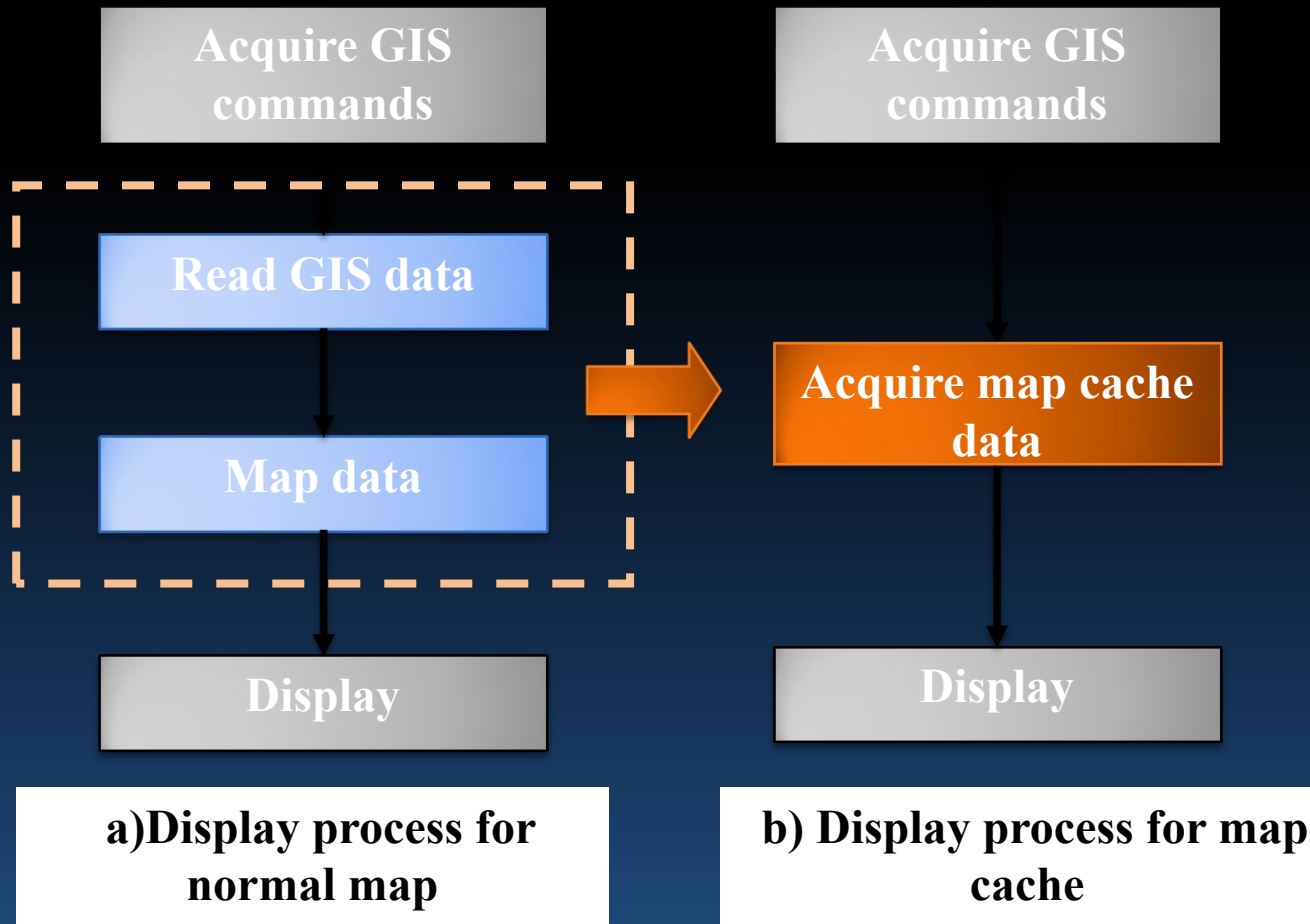


1:2000000

- Produce map cache according to pre-defined map scale.
- Produce according to tiling algorithm.

Why map cache?

- Cache technology

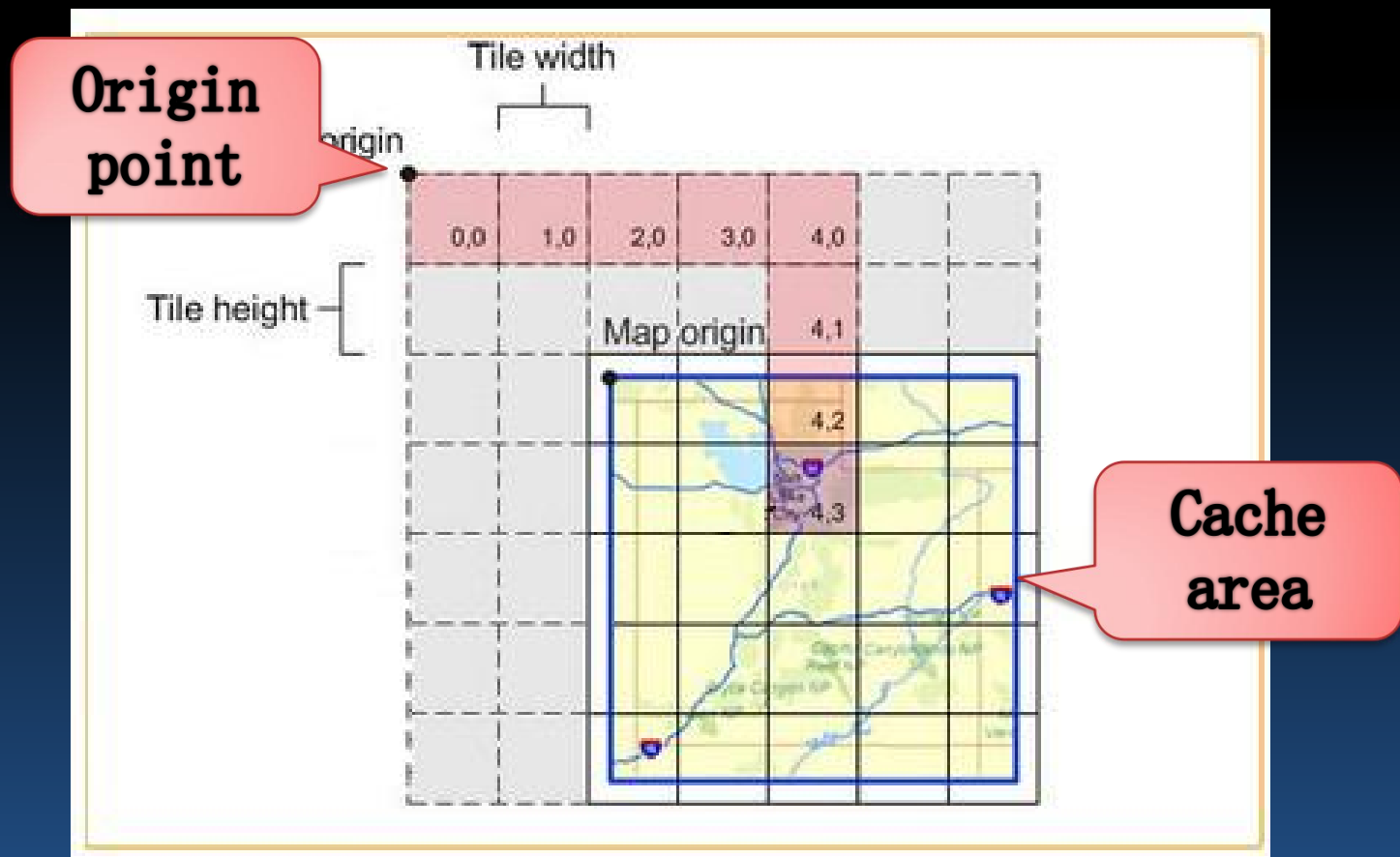


Cache Model

- **SuperMap products have unified cache model**
 - **From iDesktop to component products SuperMap iObjects Java/.Net, and server product iServer, they all have the same map cache model.**

Cache Construction Mechanism

- Construct cache through tile files generated by dividing layer and block, and consider the cache update problems from perspectives of coordinate system, map, layer style and data range



Map Cache Mechanism

Static cache mechanism

- Pre-cache
- SuperMap iServer directly use pre-produced cache data to respond to the mapping request from the client side, saving the time of server.
- For massive GIS data, they have lower update frequency, using cache mechanism is recommended

Dynamic cache mechanism

- SuperMap iServer dynamically generate cache in map viewing, and provide quick response for the same requests in the future.

Cache Storage Mechanism

File storage

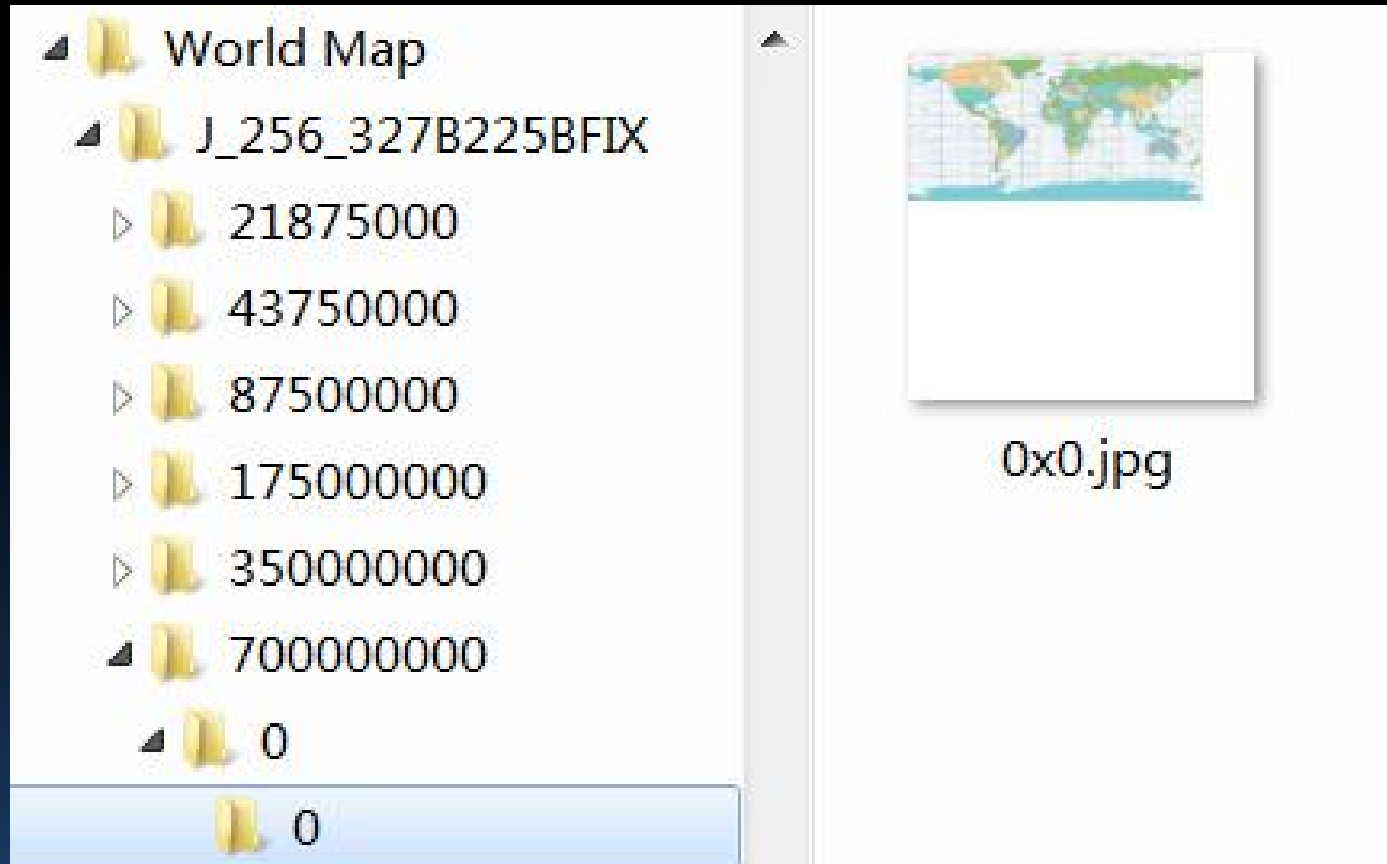
- Original picture
- Compact file

Database storage

- MBTiles
- FastDFS
- MongoDB

Original Picture Cache

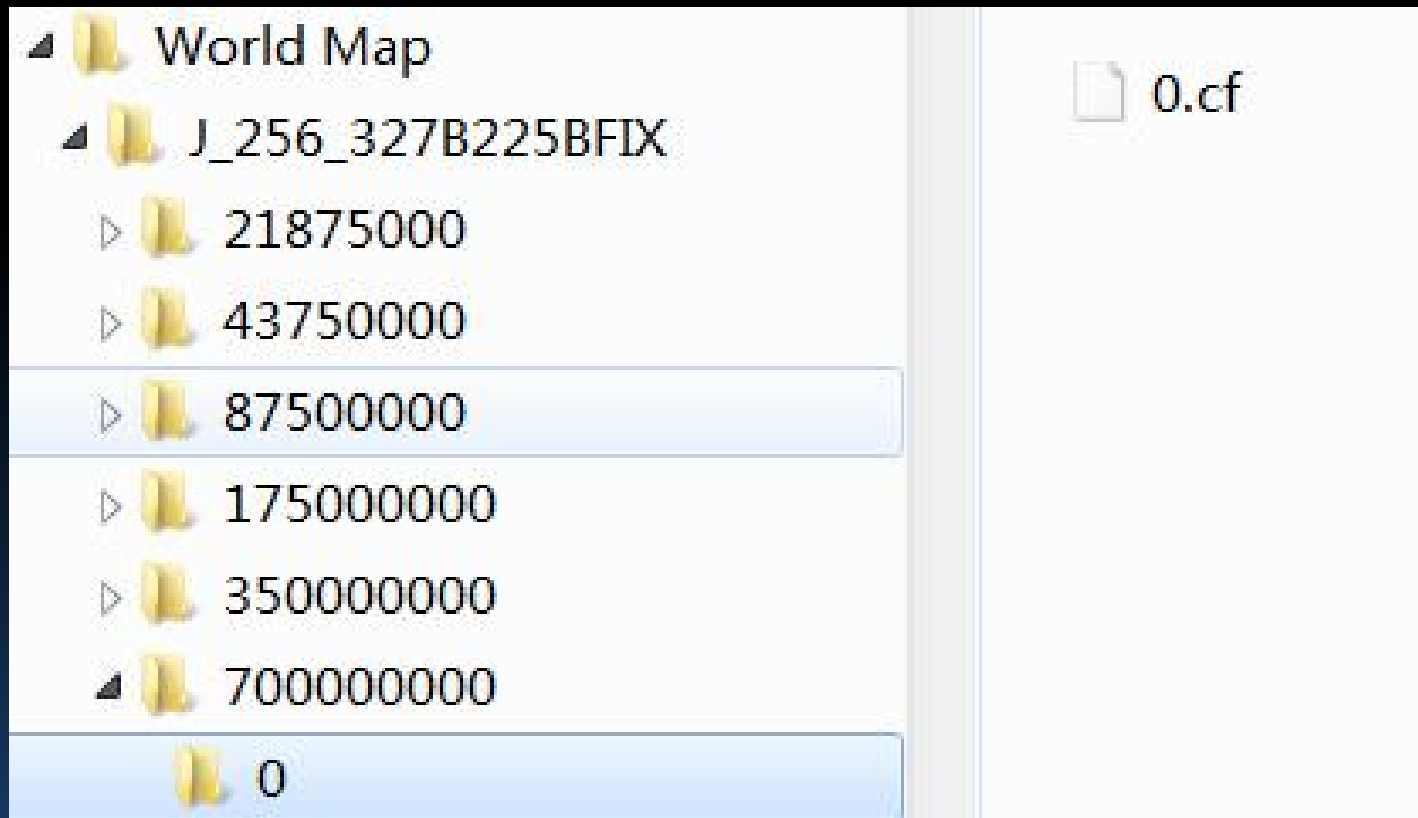
- Cache folder structure



V5.0 Cache structure

Compact File Cache

- Cache folder structure



V5.0 Cache structure

Comparison

- **Original picture cache**
 - **Readable**
 - **More utilization**
 - **Time consuming when copying and deploying**
- **Compact file cache**
 - **Less readable**
 - **Easy to copy and deploy**

MBTiles Cache

- **MBTiles** is a standard that putting tile map data stored into SQLite database and quickly use, manage and share.
- **Cache format:**



China_69470548_256X256_PNG.mbtiles

- When there is MBTiles cache in the service component, the map will be acquired directly from cache other than service provider.
- MBTiles cache are usually used in offline cache in mobile terminal.

FastDFS Cache

- **FastDFS is an open source lightweight distribution file system, which can manage the files, solving the problems of big volume storage and loading balance.**
- **FastDFS cache can do parallel tiling on multiple machines, distributed storage to improve the efficiency of cache.**
- **For service layer cache**

How to Create Cache

- **Generated pre-cache by SuperMap iDesktop**
- **Generate cache by iServer pre-cache server**
- **Generate by iServer distribution tiling service**

Create Map Cache

- Use SuperMap iDesktop to create cache
 - Select map. Click ‘create map cache’ in right-click menu

Create Map Cache(WorldMap)

No.	Scale	Label
1	1:700000000	700000000
2	1:350000000	350000000
3	1:175000000	175000000
4	1:87500000	87500000
5	1:43750000	43750000
6	1:21875000	21875000
*		

Basic Settings | Bounds Settings | Picture Storage

Output Settings

Version: 5.0 - For iServer 6R(2012) SP1

Tile Type: Local

☐ Update/Append Cache Creation

☐ Resume/restore Cache File

Config File: Untitled

Path Settings

Cache Name: WorldMap

Cache Path: C:\

☒ Auto close when finish ☒ Show Progress bar

OK Cancel

Set scale

Select
cache
version

5.0
supports
cache
appending

Set cache
path

Create Map Cache

- Use SuperMap iDesktop to create map cache

No.	Scale	Label
1	1:700000000	700000000
2	1:350000000	350000000
3	1:175000000	175000000
4	1:87500000	87500000
5	1:43750000	43750000
6	1:21875000	21875000
*		

☒ Auto close when finish ☒ Show Progress bar

OK Cancel

Cache Extent

Left: -180 Full
Top: 90 Current
Right: 180 Select
Bottom: -90

Index Extent

Left: -180 Full
Top: 90 Current
Right: 180 Select
Bottom: -90

Set cache range

Set index range

Index range directly influence the location of tiles, when appending cache, making sure the ranges are the same.

Create Map Cache

- Use SuperMap iDesktop to create cache

Create Map Cache(WorldMap)

Basic Settings Bounds Settings Picture Storage

Tile Parameters

Format:

Tile Size:

Compression:

☐ Transparent

☐ Fill Margins

Output Settings

Storage Type:

User password:

Confirm Password:

☐ Filter layers with selected objects

No.	Scale	Label
1	1:700000000	700000000
2	1:350000000	350000000
3	1:175000000	175000000
4	1:87500000	87500000
5	1:43750000	43750000
6	1:21875000	21875000
*		

☒ Auto close when finish ☒ Show Progress bar

OK Cancel

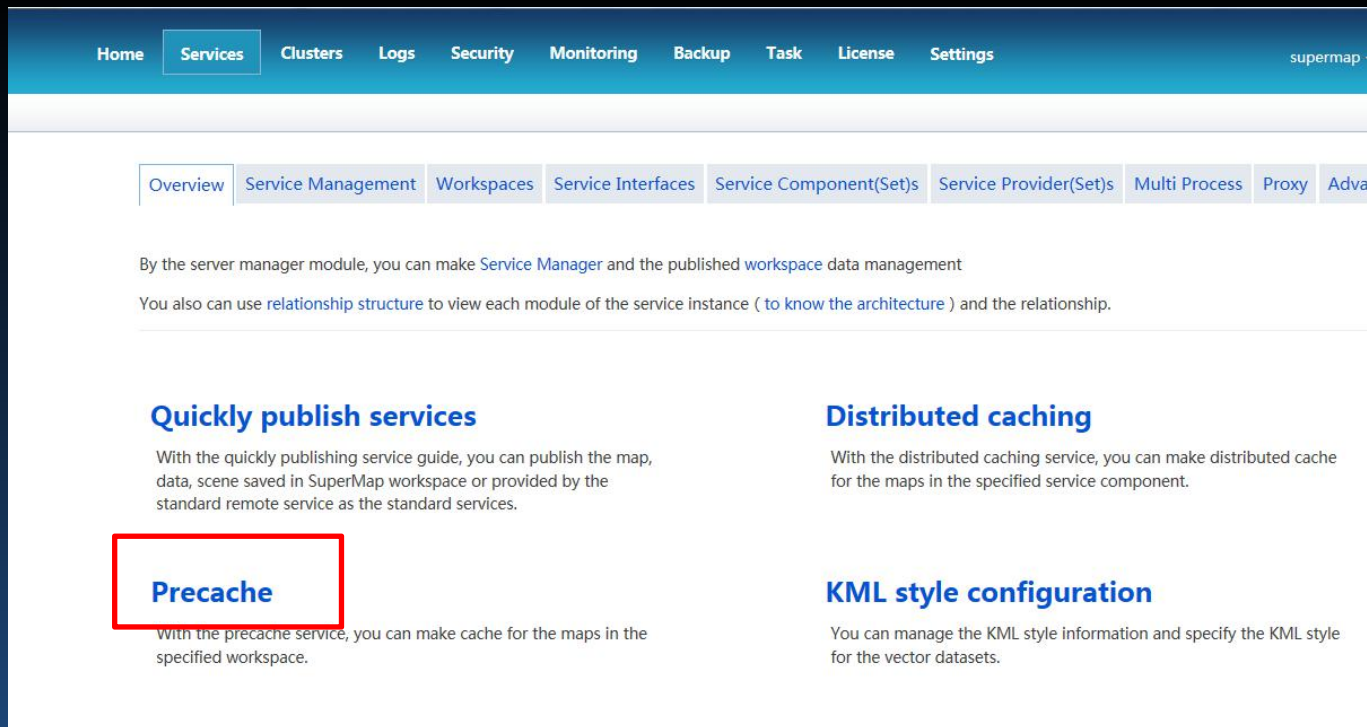
Set pic
parameter

Choose
storage
type

No need to encrypt cache when generating compact map cache.

Create Pre-cache

- Create cache in iServer pre-cache server.
- Also can create MBTiles cache
- Method: service management tool->service->overview->pre-cache



Create Pre-cache

- Create cache in iServer pre-cache server.
 - SuperMap iServer takes a process of map pre-cache generation as a task.
 - Multiple pre-cache tasks can run simultaneously in a pre-cache task list, however, only one task can take place in the tasks under the same map.

The dialog box 'Add/Edit precache task' contains the following fields and options:

- Workspace:** A text field with a dropdown arrow, showing the path `../samples/data/World/World.sxwu`.
- Map:** A dropdown menu showing 'WorldMap_Day'.
- Image size:** A dropdown menu showing '256*256'.
- Image format:** A dropdown menu showing 'PNG'.
- Cache version:** A dropdown menu showing '4.0', with a link '(Refer to Cache Scheme)'.
- Cache scales:** A text input field showing '10000000', an 'Add' button, and a list of scales: '1/50000', '1/100000', '1/200000', '1/500000', '1/1000000', '1/2000000'. There are 'Remove' and 'Remove All' buttons next to the list.
- Transparent:** A checkbox that is currently unchecked.
- Storage type:** A dropdown menu showing 'Original'.
- Specify cache bounds:** A checkbox that is currently unchecked.
- Configured to generate other tiles packages:** A section with three checkboxes: 'Create MBTiles', 'createUTFGridCache', and 'createVectorTileCache', all of which are unchecked.

The 'Precache Tasks' page displays a table with the following data:

Map name	Task info	Progress	Operation
WorldMap_Day	Size: 256x256 Format: Original Cache type: 4.0 Type: PNG Workspace: ../samples/data/World/World.sxwu	There are 92829469 Images. Finished: 338 Images. 84 hours, 36 minutes, 18 seconds	Stop

There is an '+ Add new task' button in the top right corner of the table area.

Pre-cache service supports adding scale, but please pay attention that all the pictures will be re-produced after editing

Create Map Cache

- **Create cache in iServer pre-cache server**
 - **For tile cache**
 - Cache will automatically be stored in [installation folder]\webapps\iserver\output\cache
 - **For MBTiles cache**
 - Cache will automatically be stored in [installation folder]\webapps\iserver\output\sqlite中
 - **Cache generated by iServer pre-cache server does not need to deploy the cache path.**

Distributed Tiling Service

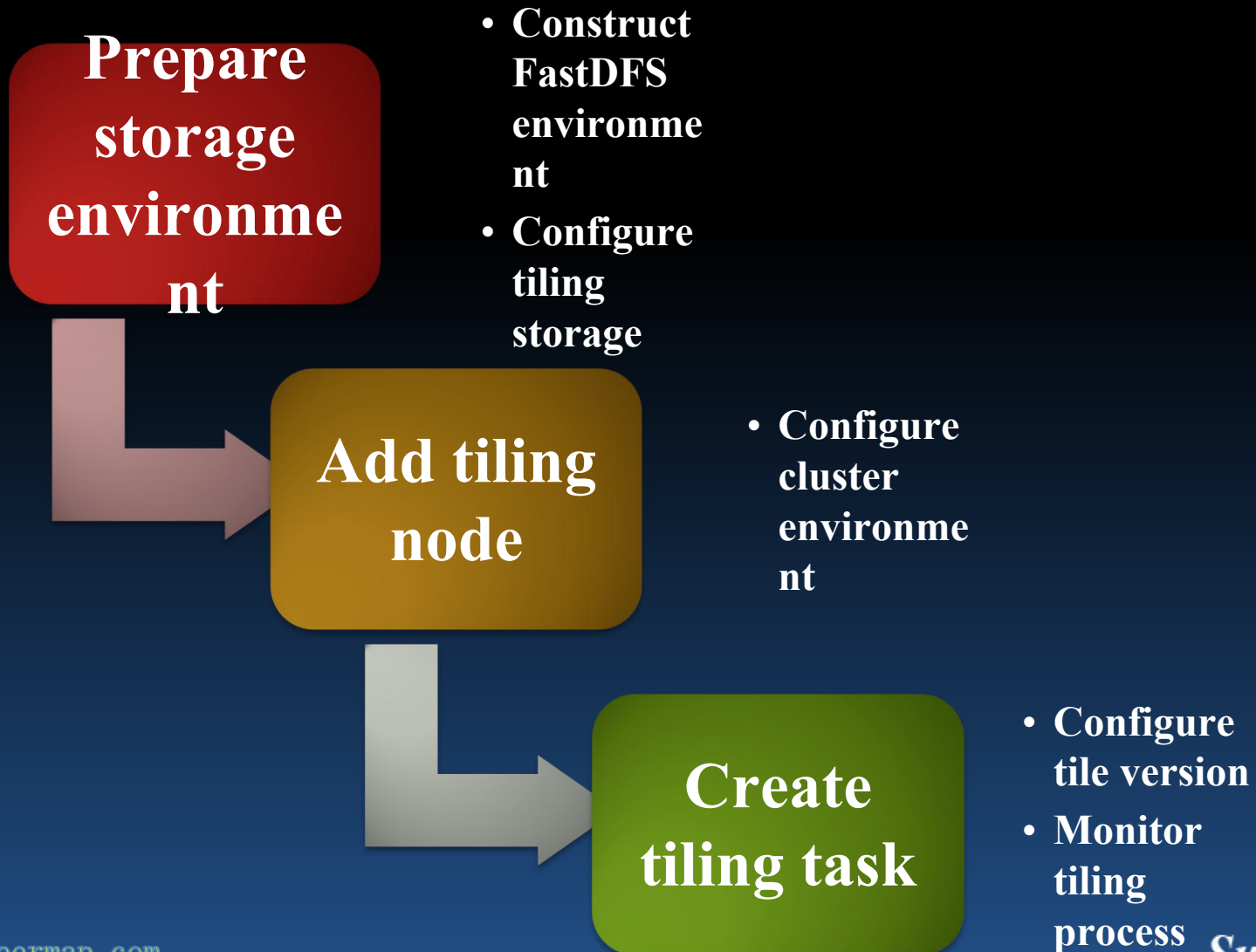
- **SuperMap iServer raised distributed map tile creation and dispatching technology.**
 - Through one TileMaster and multiple TileWorker to construct distributed map tiling system.
- **Distributed tiling technology supports distributed tiling and distributed storage management of map tiles.**
 - Supports multiple distributed file system, NAS and big data storage system (like FastDFS, MongoDB)

Create Distributed Tiling FastDFS

- Use iServer distributed tiling service to create FastDFS cache.
- iServer supports parallel tiling on multiple machines, can add multiple tiling nodes on different machines.
- Can effectively avoid the disadvantages of traditional cache tiling technology, like long response time, no malfunction disorder, etc.

Create Distributed Tiling FastDFS

- Steps



Prepare Storage Environment

- **Construct FastDFS**
 - **Version requirements**
 - **FastDFS 4.00 or above**
 - **FastDHT 1.21 or above**
 - **Libevent 1.4.x or above, latest version stable is recommended.**
 - **Berkeley DB 5.3 or above**
 - **FastDFS supports UNIX systems like Linux, FreeBSD**
 - **FastDFS needs to collaborate with FastDHT, which is an effective Hash system based on key value pair, it can be used to store massive key value pair, like file name mapping sheet, session data, user related data, etc.**
 - **The installation of FastDHT depends on libevent and oracle Berkeley Db**

Prepare Storage Environment

- Steps of installing FastDFS



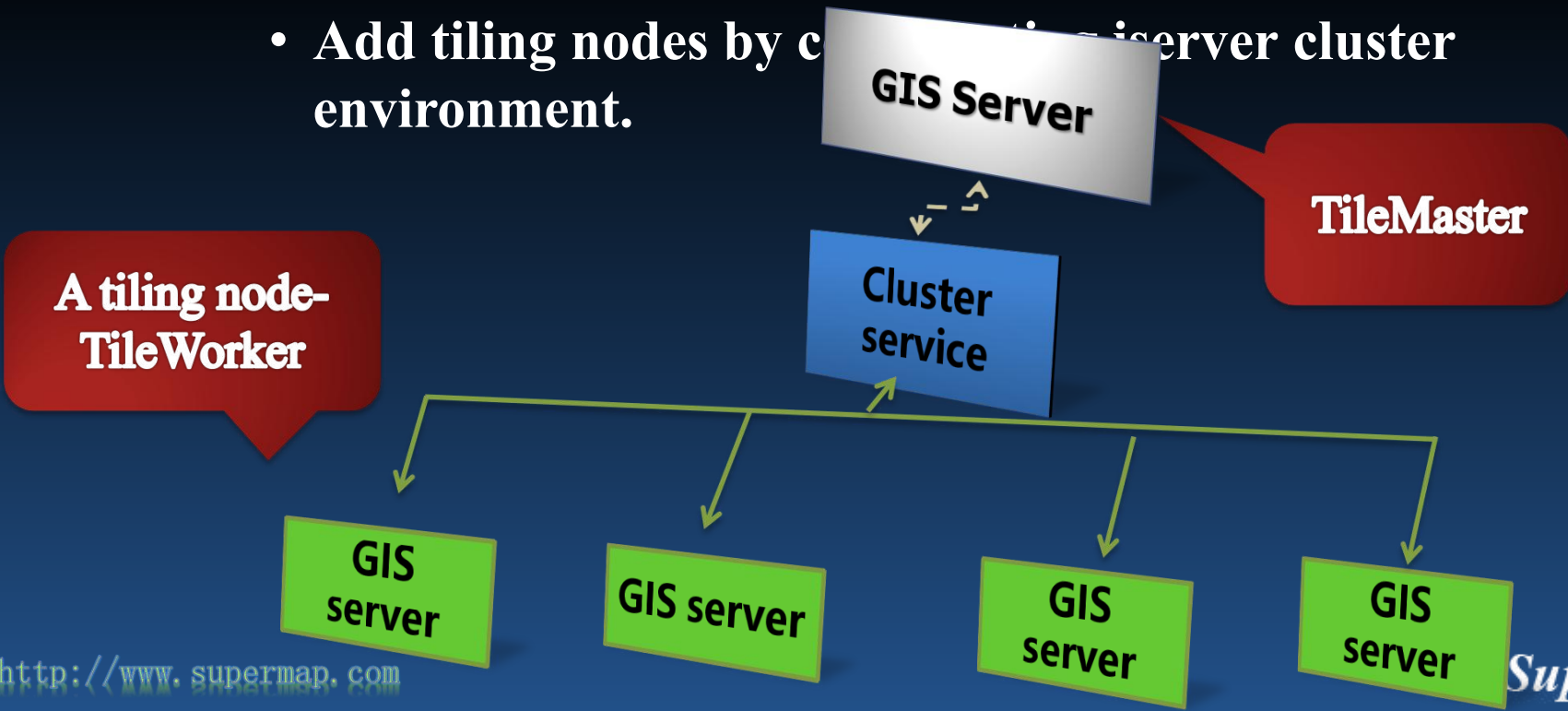
Refer the help document for more information

Add Tiling Nodes

- **Terms**
 - **TileMaster: Create nodes of tiling tasks**
 - Main function is to divide tiling tasks into multiple unit task according to scale and geographic range, and dispatch, manage tiling units, assign to TileWorker
 - **TileWorker: Add nodes which execute tiling task**
 - TileWorker executes the tasks dispatched by TileMaster
- **The relation between TileMaster and TileWorker is one to more.**

Add Tiling Nodes

- Tiling mode
 - Tiling on the single machine (TileMaster =TileWorker)
 - Default mode, no operation needed.
 - Parallel tiling on multiple machine
 - Add tiling nodes by cluster service environment.



Add Tiling Tasks

- View the added tiling nodes information in TileMaster
 - TileMaster management tool->Home>>Distributed tiles

The screenshot displays the TileMaster web interface. The top navigation bar includes links for Home, Services, Clusters (selected), Logs, Security, Monitoring, Backup, Task, License, and Settings. On the right of the bar are 'supermap' and 'Help' links, and a language dropdown set to 'Engl'. Below the navigation bar, a sub-menu contains 'Cluster Overview', 'Use Cluster', 'Configure Cluster', 'Join Cluster', 'Distributed Tiles' (selected), and 'Distributed Tiles Repository'. The main content area for 'Distributed Tiles' includes two paragraphs of text and two buttons: '+ Create tiling task' and '+ Create GDP tiling task'. The first paragraph states: 'Distributed tiling service supports parallel map tiling on multiple machines. Tiling nodes from different machines can be added for a common tiling task.' The second paragraph states: 'Distributed tiling service is parallel map tiling function based on cluster. Tiling nodes can be added through adding [cluster members](#).' Below this, a section titled 'Task being implemented:' shows a task named 'usmap' with a progress bar at 0%. To the right of the progress bar is the text: '数据预处理中, 已完成: 0张 (共: 2500张); 运行时间: 0秒; 速度: 0 张/秒;'. To the right of this text are 'Start' and 'Delete' buttons. At the bottom, a section titled 'Finished task:' is followed by a table with the following headers: 'Map name', 'Component name', 'Start time ^', 'Time cost for task', 'Tile count', 'Tile type', and 'Storage type'.

Home Services **Clusters** Logs Security Monitoring Backup Task License Settings

supermap - Help Engl

Cluster Overview Use Cluster Configure Cluster Join Cluster **Distributed Tiles** Distributed Tiles Repository

Distributed tiling service supports parallel map tiling on multiple machines. Tiling nodes from different machines can be added for a common tiling task.

Distributed tiling service is parallel map tiling function based on cluster. Tiling nodes can be added through adding [cluster members](#).

+ Create tiling task
+ Create GDP tiling task

Task being implemented:

usmap 0% 数据预处理中, 已完成: 0张 (共: 2500张); 运行时间: 0秒; 速度: 0 张/秒; Start Delete

Finished task:

Map name	Component name	Start time ^	Time cost for task	Tile count	Tile type	Storage type
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Add Tiling Tasks

- Add tiling tasks in distributed tiling page of TileMaster

The screenshot shows the 'Add tile task' form in the TileMaster application. The top navigation bar includes links for Home, Services, Clusters (selected), Logs, Security, Monitoring, Backup, Task, License, and Settings. Below the navigation bar, there are tabs for Cluster Overview, Use Cluster, Configure Cluster, Join Cluster, Distributed Tiles (selected), and Distributed Tiles Repository. The form is titled 'Task list Add tile task'. It contains several input fields: 'Service component' (UGCMapCom-testus), 'Map' (usmap), 'Tile type' (Image), 'Storage type' (SMTiles), 'Storage location' (E:/Deskpro Versions/supermap_iserver_8), 'Scale scheme' (Recommended scale), and 'Cache scale'. A text box explains that SMTiles split the map into map tiles based on a database, resulting in a local *.smtiles file. A 'Please select scale range:' section shows two dropdowns with values '2 : 1/64000000' and '8 : 1/1000000'. Below these are 'Remove' and 'Remove All' buttons. A list of scale values is shown: 1/64000000, 1/32000000, 1/16000000, 1/8000000, 1/4000000, 1/2000000, and 1/1000000. A 'Tiles count: 4012' is displayed. An 'Advanced settings' section is expanded, showing details about the main node joining in the tiling task, cache bounds, original point, tile size, picture format, and other settings. At the bottom, there are 'Create tile task' and 'Cancel' buttons.

Home Services **Clusters** Logs Security Monitoring Backup Task License Settings

Cluster Overview Use Cluster Configure Cluster Join Cluster **Distributed Tiles** Distributed Tiles Repository

Task list Add tile task

Service component: UGCMapCom-testus

Map: usmap

Tile type: Image

Storage type: SMTiles

Storage location: E:/Deskpro Versions/supermap_iserver_8

Scale scheme: Recommended scale

Cache scale:

SMTiles: Split the map into map tiles based on a database. The result is the local *.smtiles file

Please select scale range:

2 : 1/64000000

8 : 1/1000000

Remove

Remove All

1/64000000
1/32000000
1/16000000
1/8000000
1/4000000
1/2000000
1/1000000

Tiles count: 4012

Advanced settings

The main node joins in tiling task: Yes

Cache bounds: -2356258.8299719472, -1333372.562106357, 2258927.6567376414, 1565161.9463572262

Original point: X: -2356258.8299719472, Y: 1565161.9463572262

Tile size: 256*256 ; Picture format: PNG ; Transparent: No ; Enable auto avoiding: No

Enable data pre-processing: Yes ; Grid row: 50, column: 50

Convert picture into PNG8: Yes

Create tile task Cancel

The screenshot shows the 'Add storage location' form in the TileMaster application. The top navigation bar is the same as the previous screenshot. Below the navigation bar, there are tabs for Cluster Overview, Use Cluster, Configure Cluster, Join Cluster, Distributed Tiles, and Distributed Tiles Repository (selected). The form is titled 'Tile storage list Add storage location'. It contains several input fields: 'Storage ID: *', 'Tiles storage type: *' (FastDFS), 'FDHT Groups: *', and 'FDHT Trackers: *'. A text box explains how to prepare a FastDFS environment. There are 'Add' and 'Remove' buttons for the FDHT Trackers and FDHT Groups. At the bottom, there are 'Add storage location' and 'Cancel' buttons.

Home Services **Clusters** Logs Security Monitoring Backup Task License Settings

Cluster Overview Use Cluster Configure Cluster Join Cluster Distributed Tiles **Distributed Tiles Repository**

Tile storage list Add storage location

Storage ID: *

Tiles storage type: * FastDFS

FDHT Trackers: *

FDHT Groups: *

Add

Remove

Add Group

How to prepare FastDFS environment

Add storage location Cancel

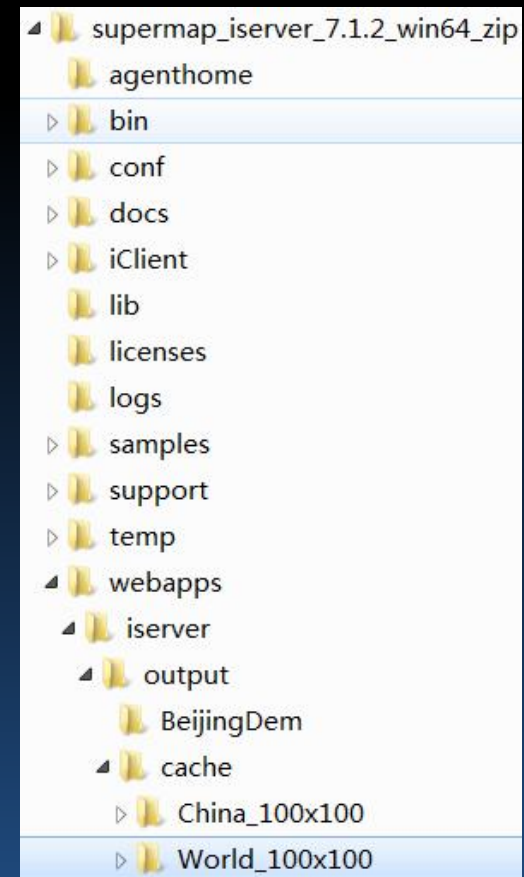
Create Distributed Tiling MongoDB

- **MongDB can be used for map tile storage**
- **Same steps as FastDFS**
- **Store different databases**

Please refer to iServer help document

How to use cache

- Usage of static cache (pre-cache)
 - Copy pre-cache generated by SuperMap iDesktop (Original/compact) to [iServer installation folder]
`\webapps\iserver\output\cache`



How to use cache

- Service component cache configuration

Add service component

Service component name: *

Service component alias:

Service component type: *

Map Component

Used service provider/set:

Name of service provider/set	Selected
ugcMapProvider-China400	☐
ugcMapProvider-World	☒
ugcMapProvider-Changchun	☐
ugcMapProvider-Jingjin	☐
ugcMapProvider-temperature	☐
map-ChinaProvinces	☐
ugcMapProvider-testus	☐
ugcMapProviderSet	☐

Interface bound to component: *

Name of bound interface	Selected
wms111	☐
wms130	☐
rest	☒
wmts100	☐
wmts-china	☐

GeneralSetting

Enable map tile caching:

☒

Stroage type:

SMTiles

SMTiles

FastDFS

MongoDB

Storage location:

Enable attribute tile caching:

☐

Enable vector tile caching:

☐

Whether cache is read-only:

☐

Cache survival time:

0

How to use cache

- The client side controls if use cache

//创建图层对象

```
layerWorld = new SuperMap.Layer.TiledDynamicRESTLayer("World", url, {  
  transparent: true, cacheEnabled: true }, { maxResolution: "auto", scales: [1/  
5000000, 1/2500000, 1/500000, 1/250000] });
```

Notice

- **When to use cache?**
 - **Massive data, especially with image data**
 - **Data with low update frequency.**
- **Choose suitable scale**
 - **Set more scale levels to have a smoother displaying when viewing**
 - **Consider if the elements need to be displayed in different scales**

Notice

- **Cache path setting**
 - **%SuperMap iServer**
_HOME%\webapps\iserver\output\cache
 - **When using SuperMap iDesktop to generate cache,**
can directly use the path mentioned above.
- **Map creation**
 - **Consider Anti-Aliasing on line or text type**
 - **Filter small objects**
 - **For complicated map, avoid too many objects,**
consider resampling.

Notice

- **Keep the same workspace**
 - The parameters may influence include map style, data connection status, layer order, default scale, map range, etc.
 - Cannot have the connection layer without datasource or dataset.
 - When editing objects in dataset, like adding, deleting, updating, etc., doesn't influence the cache picture outside the editing area.
- **Set map cache range and index range**
 - It is recommended setting index range as the same as extent map range of published map, being consistent with search index of SuperMap iServer.

Notice

- **Cached pictures and output devices**
 - **Different devices have different resolutions, so the cache on different devices may not work together, like map joining.**
 - **Configure map cache and device resolution as irrelevant**
 - **Change CustomDPIEnable attribute in SuperMap.xml file under bin folder, SuperMap iDesktop installation folder, as true.**
 - **Change the corresponding CustomDPIEnable attribute, in SuperMap.xml file under bin folder in SuperMap iServer installation folder\support\objectsjava as true.**
 - **Keep CustomDPIX and CustomDPIY in SuperMap.xml as the same value.**

Notice

- **Compact cache password setting**
 - **SuperMap iServer does not support setting password for compact cache, therefore, setting password when using SuperMap iDesktop to generate compact cache is not recommended.**

Notice

- The scale in iDesktop and in iClient have to be the same.
- The main versions of iDesktop and iServer have to be the same
- If there are codes that set background transparency attribute on iClient (like the parameter transparent= true in TiledDynamicRESTLayer), then the cache images need to be stored in iServer installation folder\webapps\iserver\output\cache_t
- When tiling, first tile 3-4 level of scale, test its effect and then execute the tasks.
- In the optimization function, tiling cache after the styles of data and map are fixed is recommended.

Thank You!

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