ArcGIS Enterprise: Developing Server Extensions and Interceptors

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Agenda

- Development Kits :: Enterprise SDK, ArcObjects SDK
- Extension Types :: Server Object Interceptor, Server Object Extension
- Development :: create, update, debug
- SOE Demo :: basic deployment
- Development :: do’s and dont’s
- Development :: automate deployment
- SOI Demo :: custom labelling
Development Kits

• **Enterprise SDK**
  - MapServices and FeatureServices published from ArcGIS Pro
  - SDK for Java and .NET developers
  - IDE integration for Eclipse (Java) and Visual Studio 2015 and 2017 (.NET)

• **ArcObjects SDK**
  - MapServices, FeatureServices and ImageServices published from ArcMap
  - SDK for Java and .NET developers
  - IDE integration for Eclipse (Java) and Visual Studio 2015 and 2017 (.NET)
Extension Types :: Server Object Interceptor

Out-of-box applications

- Well-defined API

GIS Server

- SOI Feature Service
- SOI Image Service
Extension Types :: Server Object Interceptor

- **No changes in API**
  - Extended Functionality is hidden behind the standard API

- **Use cases**
  - Extended security requirements
  - Layer level access control
  - Data enrichment
  - Extended logging
  - Tracking activity

- **Multiple Server Object Interceptors can form a chain**
Extension Types :: Server Object Extension

Out-of-box applications
- Well-defined API

Custom applications
- Custom API

GIS Server
- Feature Service
- Image Service
- SOE
Extension Types :: Server Object Extension

- Custom functionality added to ArcGIS Server
- Faster than geoprocessing
- Usecases
  - Editing
  - Data processing
  - Network analysis
  - Image analysis
Extension Types :: common requirements

- **Required interfaces and annotations**
  - IServerObjectExtension → init, shutdown
  - @ArcGISExtension
  - @ServerObjectExtProperties → extension definition

- **Optional interfaces**
  - IObjectConstruct → construct with properties
  - IObjectActivate → activate, deactivate

- **Both SOEs and SOIs are packaged as “.soe” files**
Extension Types :: Server Object Interceptor

• **Required interfaces**
  - IRESTRequestHandler → REST API, including ArcGIS Pro
  - IRequestHandler and IRequestHandler2 → SOAP API, including ArcMap
  - IWebRequestHandler → OGC requests

• **Strategies**
  - Block all interfaces, then allow as suitable → security functionality
  - Allow all interfaces, implement where required → non security functionality
Extension Types :: Server Object Extension

- 1 or more of
  - IRESTRequestHandler $\rightarrow$ REST API
  - IRequestHandler and IRequestHandler2 $\rightarrow$ SOAP API, including ArcMap and ArcGIS Pro
  - IWebRequestHandler $\rightarrow$ OGC requests
Development :: creating extensions

• **Create extension**
  - Eclipse → plugin-in template
  - Visual Studio → template project

• **Add logic**

• **Create extension file, using utilities provided with the respective SDK**

• **Register extension in ArcGIS Server Manager**

• **Enable extension on service**
Development :: updating extensions

- Update extension in ArcGIS Server Manager
- Add logic
  - Must have the same name it had when originally being registered
- Create extension file, using utilities provided with the respective SDK
  - Must contain the same set of SOIs and/or SOEs it contained when being registered
  - Must restart services after extension update
Development :: debugging extensions

- **Configure settings in ArcGIS Server Manager** (Site → Extensions → Debug Settings)
  - Activate debugging
  - Optionally specify a delay (when you need to debug code running at startup)
  - Assign a port range
- **Restart service**
- **Find process in task-manager**
- **Attach to process for debugging**
SOE Demo
basic deployment
Development :: do’s

• Using the lifecycle defined by implemented interfaces
  - IObjectConstruct
  - IObjectActivate

• Using built in helper types
  - com.esri.arcgis.server.SOIHelper
  - com.esri.arcgis.server.IServerLog
  - com.esri.arcgis.system.ServerUtilities
  - com.esri.arcgis.system.Cleaner

• Separating your logic from extension logic
• Running a 1/1 instance configuration when debugging
Development :: dont’s

- Holding strong references to ArcObject instances
- Executing code in a thread other than the main thread
  - Stream::parallel
  - ExecutorService
  - CompleteableFuture
  - Running code after the instance was deactivated
- Updating extension on a busy server
- Not taking care of error handling, especially in SOI
Development :: automate with REST API Admin

- **Automate “.soe” file packaging**
- **Automate extension update**
  - Get Token
  - Upload “.soe” extension file
  - Update extension
- **Automate debugging**
  - Configure debugging
  - Find and restart affected services
  - Java: have debug configurations generated
SOI / SOE Demo :: boilerplate extension

- Shared code for SOE and SOI, Enterprise SDK and ArcObjects SDK
- Extension type and SDK get specified when cooking the “.soe” file
- Configurable operations

- Custom labelling solution with Server Object Interceptor
  - Manual label placement required - can not use standard labelling
  - Feature linked labels required - can not use graphics
  - Rendering on MapService export required - can not rely on ArcGIS API for Javascript
SOI Demo :: custom labelling

Berlin
SOI Demo :: custom labelling

Berlin
SOI Demo :: custom labelling
SOI Demo :: custom labelling
SOI Demo :: custom labelling

Berlin

Annotation (?)

City

Feature Service

Annotation

City
SOI Demo :: custom labelling

Feature Service

- Anchor
- Annotation
- City
SOI Demo :: custom labelling :: geometry update to anchor

```
{
    "geometry": {
        "x": 2396409,
        "y": 6278461
    },
    "attributes": {
        "OBJECTID": 7108
    }
}
```
SOI Demo :: custom labelling :: geometry update to anchor

```
{
    "geometry": {
        "x": 2396409,
        "y": 6278461
    },
    "attributes": {
        "OBJECTID": 7108
    }
}
```
updates to anchor

```json
{
    "geometry": {
        "x": 2396409,
        "y": 6278461
    },
    "attributes": {
        "OBJECTID": 7108
    }
}
```
SOI Demo :: custom labelling :: rewrite request to contain FEATUREID

updates to anchor

```json
{
    "geometry": {
        "x": 2396409,
        "y": 6278461
    },
    "attributes": {
        "OBJECTID": 7108,
        "FEATUREID": 64
    }
}
```
updates to anchor

```json
{
    "geometry": {
        "x": 2396409,
        "y": 6278461
    },
    "attributes": {
        "OBJECTID": 7108,
        "FEATUREID": 64
    }
}
```
SOI Demo :: custom labelling :: rewrite request to contain offsets

updates to anchor

```json
{
    "geometry": {
        "x": 2396409,
        "y": 6278461
    },
    "attributes": {
        "OBJECTID": 7108,
        "FEATUREID": 64,
        "XOFFSET": 9,
        "YOFFSET": 15
    }
}
```
SOI Demo :: custom labelling :: find Annotation and apply offsets

```json
{
    "geometry": {
        "x": 2396409,
        "y": 6278461
    },
    "attributes": {
        "OBJECTID": 7108,
        "FEATUREID": 64,
        "XOFFSET": 9,
        "YOFFSET": 15
    }
}
```
SOI Demo :: custom labelling

```
{ 
  "geometry": {
    "x": 2396409,
    "y": 6278461
  },
  "attributes": {
    "OBJECTID": 7108,
    "FEATUREID": 64,
    "XOFFSET": 9,
    "YOFFSET": 15
  }
}
```

Updates to anchor

Feature Service

- Anchor
- Annotation
- City
SOI Demo :: custom labelling :: execute the actual update

updates to anchor

```json
{
    "geometry": {
        "x": 2396409,
        "y": 6278461
    },
    "attributes": {
        "OBJECTID": 7108,
        "FEATUREID": 64,
        "XOFFSET": 9,
        "YOFFSET": 15
    }
}
```
SOI Demo :: custom labelling :: successful update to Anchor

```json
{
    "addResults": [],
    "updateResults": [
        {
            "objectId": 7108,
            "success": true
        }
    ],
    "deleteResults": []
}
```
SOI Demo :: custom labelling

```json
response
{
    "addResults": [],
    "updateResults": [
    {
        "objectId": 7108,
        "success": true
    }
    ],
    "deleteResults": []
}
```
SOI Demo
Custom labelling
Developing Server Extensions and Interceptors :: resources

- https://github.com/hfleischer/boilerplate-soe

  - http://desktop.arcgis.com/en/arcobjects/latest/java/#80146cac-6b50-4c82-a9f5-7a5be3406c5b.htm


- https://developers.arcgis.com/rest/services-reference/rest-api-admin.htm
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